An SEM study on pedipalpal stridulation in Iberian lycosids (genera *Lycosa* and *Hogna*; Araneae, Lycosidae)

C. Fernández-Montraveta
Departamento de Psicología Biológica y de la Salud,
Universidad Autónoma de Madrid,
Cantoblanco, 28049 Madrid, Spain

J. Moya-Laraño and **J. M. Orta-Ocaña**
Departamento de Biologia Animal, Biologia Vegetal i Ecologia,
Universitat Autònoma de Barcelona,
08193 Bellaterra, Barcelona, Spain

Summary

Pedipalpal stridulation is one of the mechanisms by which wolf spiders (Araneae, Lycosidae) produce courtship signals. Males of three Iberian species of the family (*Lycosa tarentula fasciiventris* Dufour, 1835, *Lycosa* sp. and *Hogna radiata* (Latreille, 1817)) drum with their pedipalps during courtship, one of the movements causing the tarsal *scraper* to move across the tibial *file* in lycosid pedipalpal stridulation. Scanning electron microscopy of the pedipalpal tibio-tarsal joint shows that only *H. radiata* males have a well developed structure at opposite sides of the medio-dorsal surface of this joint. It consists of a tarsal crest and an arch-shaped prolongation of the tibial cuticle with a series of parallel corrugations on its inner surface. The location and morphology of this structure are identical to those of the stridulatory apparatus in other lycosid species which stridulate by drumming (in genera *Hogna*, *Schizocosa*, *Rabidosa* and *Gladicosa*) and we hypothesise that it also plays this role in *H. radiata*. Neither *L.* sp. nor *L. t. fasciiventris* males have this structure. The distribution of pedipalpal stridulation in lycosids and its role in systematics are discussed.

Introduction

The large number of *Lycosa* Latreille, 1804, species originally described from the Iberian Peninsula have been reduced to only three: *Lycosa tarentula fasciiventris* Dufour, 1835, *L. radiata* Latreille, 1817 (Barrientos, 1981) and *L.* sp. (Orta-Ocaña *et al*., 1996; Parellada, 1998); or even two, as *L. radiata* has been transferred to the genus *Hogna* (Dondale & Redner, 1990; Zyuzin, 1993). Besides other differences between *L.* sp. and *L. tarentula fasciiventris*, the latter is the only obligate burrower.

Courtship in all three species includes a pattern of behaviour called pedipalpal drumming (Fernández-Montraveta & Schmitt, 1994; Orta-Ocaña *et al*., 1996). This is an extremely common behaviour in lycosid courtship. Rovner (1975) first related one mechanism for this behaviour in lycosids, pedipalpal stridulation, to a structure located on the medio-dorsal surface of the tibio-tarsal joint. The original description of this pedipalpal stridulatory mechanism, in *Lycosa* and *Schizocosa*, was later expanded (review in Uetz & Stratton, 1982) and has even been considered to occur widely in the family (Brady & McKinley, 1994).

Morphological evidence for the existence of lycosid pedipalpal stridulation is best revealed by examination of the cuticle by scanning electron microscopy (SEM). We used SEM to investigate a possible role for stridulation in the production of courtship signals by the pedipalps in the three Iberian species.

Material and methods

Specimens came from populations in central Spain (Madrid) (22 adult male *L. t. fasciiventris*), eastern (Alicante) and north-eastern Spain (Barcelona) (5 adult male *H. radiata* and 5 adult male *L.* sp.), and southern Spain (Almería) (2 adult male *L. t. fasciiventris*). Material was prepared either immediately after the natural death of the animal or after preservation in 70% ethanol.

The pedipalps were cut off and all hairs were removed from the tibio-tarsal joint before dehydrating by standard procedure (ethanol series and acetone). After gold metallisation (BIO-RAD SC-502) samples were observed by SEM (Philips XL 30). As dehydrated material was extremely fragile, some pedipalps were directly observed under a dissecting microscope.

Results

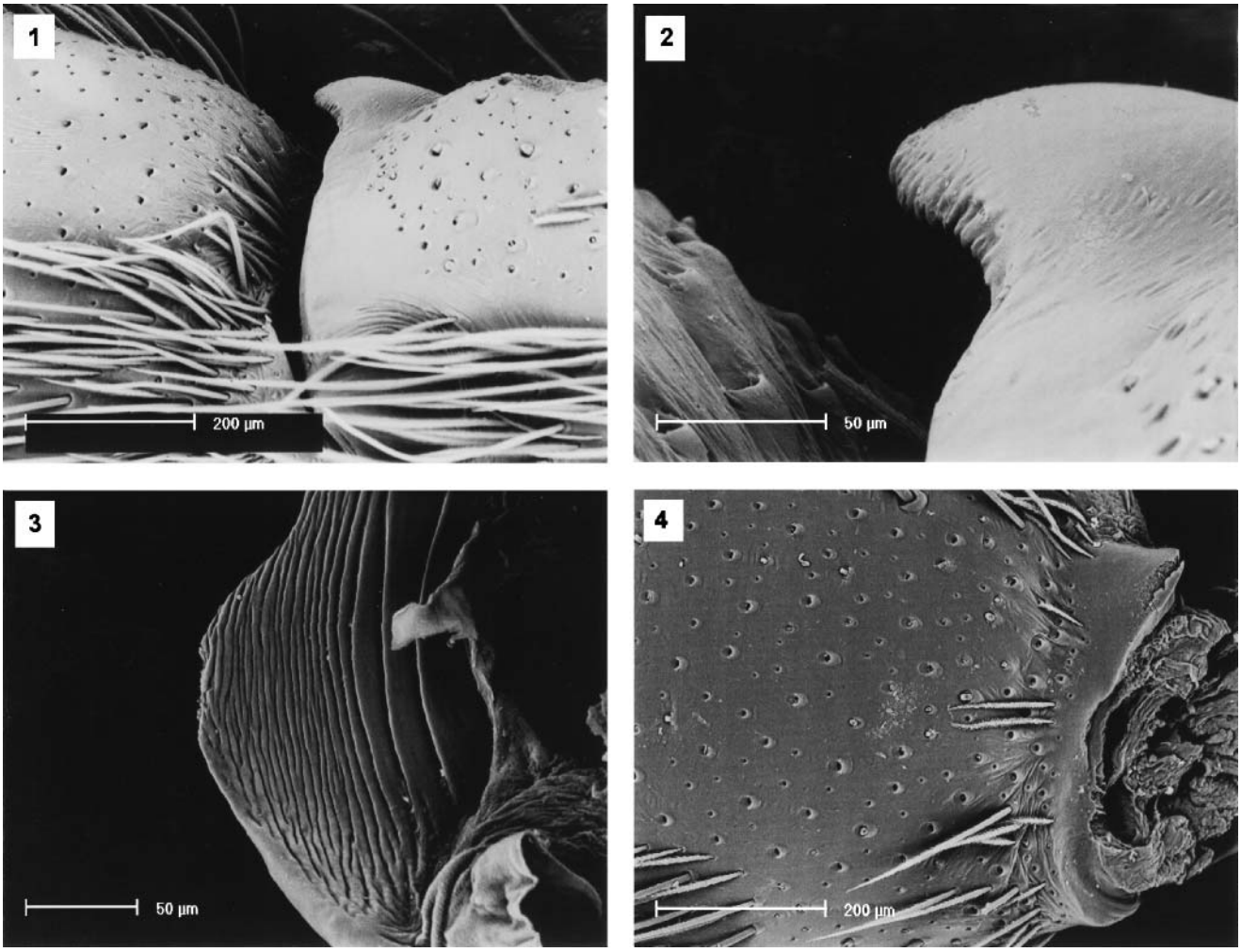
The microsculpture of the tibio-tarsal joint of an adult male *H. radiata* pedipalp is shown in Figs. 1–4. The joint could be easily opened, even in old ethanol-preserved material. In the medio-dorsal region of the distal tibia, an arch-shaped protrusion is clearly observed (Figs. 1–2) which looks darker in colour under the dissecting microscope. The inner surface could be seen properly only after complete separation from the tarsus. It consists of a series of parallel corrugations (*file*) (Fig. 3) and it faces a crest-like structure (*scraper*) on the proximal end of the tarsus (Fig. 4).

The corresponding area of the pedipalp of an *L.* sp. male is shown in Figs. 5–6. There is no clear stridulatory-like structure on the medio-dorsal surface of the joint, and no protrusion of the distal tibia can be seen (Fig. 5). Even in recently dead animals, opening the joint was extremely difficult and most palps were broken when we tried to remove the tarsus. This suggests a reduced mobility of the joint during palpal drumming, which fits with the lack of any *file*-like structure (Fig. 6).

Regarding the appearance of the tibio-tarsal joint, male *L. tarentula fasciiventris* pedipalps closely resemble those of *L.* sp. and are completely different from *H. radiata*. This is true for both Almería and Madrid (Figs. 7–8) material. There is no protrusion of the distal tibia (Fig. 7), nor any *file* structure on its inner surface (Fig. 8), and it was difficult to open the joint.

Discussion

Males of *H. radiata* show a well developed cuticular structure, the location and general morphology of which are identical to those of the pedipalpal stridulatory devices previously reported in other lycosid species in the genera *Hogna, Gladicosa, Rabidosa* and *Schizocosa* (Rovner, 1975; Uetz & Stratton, 1983). We therefore hypothesise that this structure also functions as a



Figs. 1–4: *Hogna radiata*, micrographs of medio-dorsal region of tibio-tarsal joint of male left palp. **1** Tarsus and tibia (right) with distal protrusion; **2** Distal protrusion of tibia, enlarged; **3** Inner surface of tibial protrusion, enlarged, showing parallel corrugations (*file*); **4** Proximal end of tarsus, showing single crest (*scraper*) which faces the *file*.

stridulating mechanism in this Iberian species. Males of both *L. tarentula fasciiventris* and *L.* sp. lack such a structure.

These results indicate a difference in the potential role of stridulation in the production of courtship signals among these species, which requires further investigation. Additionally, they support the placement of *L. radiata* in the genus *Hogna*, where pedipalpal stridulation has been previously documented, and close to the other well-documented stridulating genera (Rovner, 1975). However, pedipalpal stridulation still remains to be demonstrated in the genus *Lycosa*. The original reports attributed to this genus (Rovner, 1975) refer to species which are currently placed in the genera *Rabidosa, Gladicosa* and *Hogna* (Dondale & Redner, 1990; Brady & McKinley, 1994). The classification of *L. radiata* is not a new question, as Simon (1885) first used the generic name *Hogna* to describe this species, and its placement in the genus *Lycosa* has been repeatedly discussed (Zyuzin, 1990, 1993).

Our argument for considering stridulation in lycosid systematics is based on the remarkably close resemblance of the stridulatory structure found in *H. radiata* with those previously described in the genus (Rovner, 1975). Such a similarity is likely to be due to close phylogenetic origin. Morphological differences have been reported, on the contrary, in *Schizocosa*, where the stridulatory structures are larger (Rovner, 1975) and especially in *Hygrolycosa*, where the configuration is different altogether (Kronestedt, 1996). In interpreting this difference, Kronestedt (1996) considered the arrangement in *Hygrolycosa* as homoplastic to that in *Schizocosa, Hogna, Rabidosa* and *Gladicosa*, and probably apomorphic at some supraspecific (e.g. generic) level. This supports the expectation of similarity in the morphological configuration of the stridulatory devices in species belonging to the same or closely related genera. Though there is no agreement regarding the role of behavioural attributes in lycosid systematics, several authors include behavioural characters, e.g. burrowing or transporting the egg sac, in their classifications (Brady & McKinley, 1994; Dondale, 1986; Zyuzin, 1990). There is room for using stridulation as such a character, but this possibility is still obscured by the poor taxonomic background in the family.

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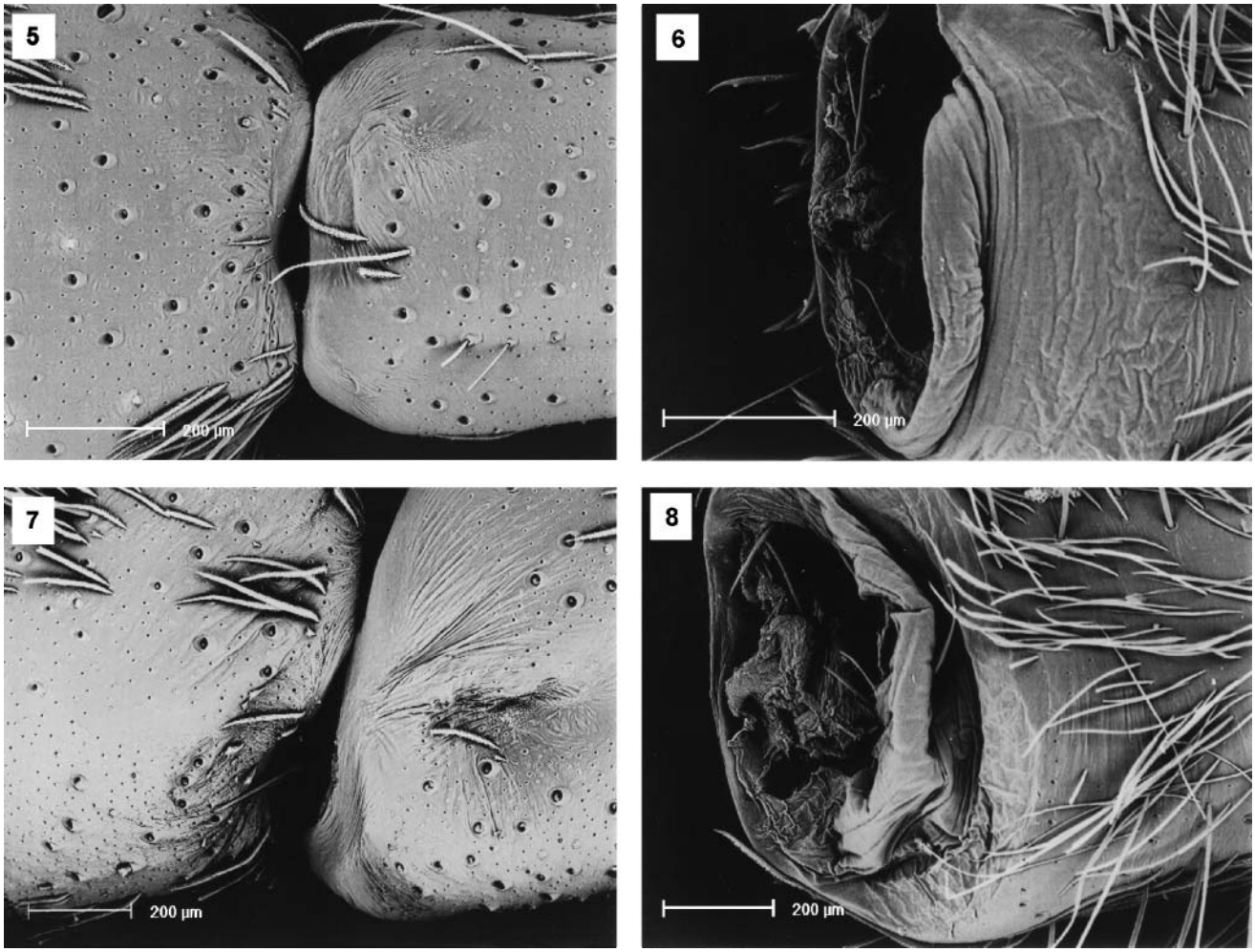

Figs. 5–8: Micrographs of tibio-tarsal joint of male left palps. **5–6** *Lycosa* sp. **5** Tarsus and tibia (right), showing no clear protrusion; **6** Inner surface of distal end of tibia, lacking any *file*-like structure. **7–8** *Lycosa tarentula fasciiventris* (central Spain population). **7** Tarsus and tibia (right), showing no clear protrusion; **8** Inner surface of distal end of tibia, lacking any *file*-like structure.

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Palaeothele, replacement name for the fossil mesothele spider *Eothele* Selden *non* Rowell

Paul A. Selden
Department of Earth Sciences,
University of Manchester,
Manchester, M13 9PL

The name *Eothele* was proposed by Selden (1996: 586) for the oldest, and only known fossil, mesothele genus, with type species *E. montceauensis*, of Upper Carboniferous (Stephanian) age from Montceau-les-Mines, France. I am grateful to J. K. Page of Biosis, UK, for alerting me to the fact that the generic name is a junior homonym, having been given to a Cambrian inarticulate brachiopod by Rowell (1980: 17).

To replace the homonym *Eothele* Selden, I propose *Palaeothele* nom. nov. (gender feminine), derived from the Greek words *palaios*, meaning ''ancient'', because of the great antiquity of the fossil, and *thele*, meaning ''nipple'', a common suffix for mesothele and mygalomorph spider generic names.

I am also grateful to Dr Page for advising that Biosis has a facility on the World Wide Web: ''Index to Organism Names'', at the internet address ''http://www.york.biosis.org/triton/nameind.htm''. This is a searchable index to all taxonomic names listed in the Zoological Record, from volume 115 up to the most recently published volume, and can be used to check prior publication of any new names.

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