

**FUNCTIONAL ASPECTS OF THE MALE PALPAL ORGAN IN
DOLOMEDES TENEBROSUS, WITH NOTES ON
THE MATING BEHAVIOR (ARANEAE, PISAURIDAE)**

In this note, we describe a locking mechanism in the male palp of *Dolomedes tenebrosus* Hentz, 1843, and include notes on mating behavior of the species.

In numerous spider families, the adult males possess a conspicuous tibial apophysis. These tibial apophyses occur in a great diversity of shape and form. They are often species-typical and frequently figured in taxonomic works to facilitate identification. Their function, however, is unknown. While observing the copulation of a pair of *D. tenebrosus*, we were able to preserve the male palp in the naturally expanded stage. The investigation of the palp provided an insight into the functional complex of the expanded genital bulb and tibial apophysis.

Thus far, the European *Dolomedes fimbriatus* (Clerck, 1758) is the only species of this large genus for which mating behavior and copulatory position are well known (Bonnet 1924; Gerhardt 1926). The male of *D. fimbriatus* displays a courtship consisting of rapidly waving his front legs and extending the pedipalps. The female postures in a specific position: all legs are held close to the body, and the patellae touch each other above the prosoma (Schmidt 1957). The male mates with the female on the ground or in the vegetation, using copulatory position II

(i.e., male on female's dorsum, facing in opposite direction, his prosoma over her abdomen), typical of the "modern hunting spiders" (Gerhardt 1924).

Only one copulation of *D. tenebrosus* was observed in the laboratory. The female (27 mm body length; collected Lynchburg, Virginia) had molted 14 days before, and the male (9 mm body length; collected Washington, D.C.) 72 days before the observation was made. The male was stimulated with silk threads made by the female, which were placed in his cage four hours prior to copulation. After dark the pair was placed on an arch formed of 25 mm wire mesh. The behavior was recorded on videotape with a Panasonic WV1854 video camera, using infrared light (> 800 nm wavelength). The female terminated the copulation by killing the male. We retrieved his body (with the right palp still expanded) and preserved it in 80% ethanol.

Courtship and copulation lasted 1.5 hours. The female was placed onto the wire screen, where she moved around for a few minutes and finally assumed a "ventral-up" position. The male was placed onto the wire screen at a distance of approximately 15 cm from the female. He waved with the outstretched front legs, contacted her silk lines, and approached the female. After the male had initially contacted the female and stroked her I and II legs, the female groomed these legs vigorously. During 50 minutes of courtship, the male lightly stroked and tapped the distal segments of the female's anterior legs and proceeded to stroke her abdomen. The female remained mostly motionless when contacted by the male.

The male climbed on the female's dorsum, their bodies parallel but pointing in opposite directions, as if anticipating copulatory position II. The female pulled her legs closer to the body; legs III and IV were not in contact with the wire screen. The male approached the female's venter from both sides, about 35 times in total. The female responded to each attempt by rocking her venter laterally toward the male, thus providing more room for the male to approach her epigynal area. This phase lasted for 32 minutes; tempo and frequency of the male's attempts increased during that time.

Copulation itself lasted about 4.5 minutes. The male abruptly passed completely across her right side and onto her venter in a perpendicular position, inserted his right palp into her right copulatory pore (Fig. 1), and simultaneously expanded the basal and median hematodochae. During the insertion of the palp, we observed no hematodochal pulsing. Both animals were still.

The female slowly pulled the male's body with her front legs into a parallel orientation to hers, juxtaposing his abdomen to her mouth. When the female bit the tip of the male's abdomen the palp sprang free of the epigynum almost immediately, and remained, in an expanded state, still attached to the male's body.

At this point we retrieved the male's body. A study of the expanded bulb revealed that a heavily sclerotized part of the embolic division fitted behind the tibial apophysis, and apparently arrested the rotation of the bulb. Figure 2 shows the expanded right palp in retrolateral view. The sclerites of the genital bulb are labelled according to Comstock's nomenclature (1910:180) used for *Dolomedes scriptus* Hentz, 1845. Attached to the distal end of the tegulum by an inflatable membrane is a strongly sclerotized tube. At its distal tip, this sclerotized tube bears the fulcrum, the lateral subterminal apophysis and the spiral embolus. During expansion, the membrane connecting the tegulum and the sclerotized tube is inflated and the sclerotized tube assumes an erect position. Due to the inflation

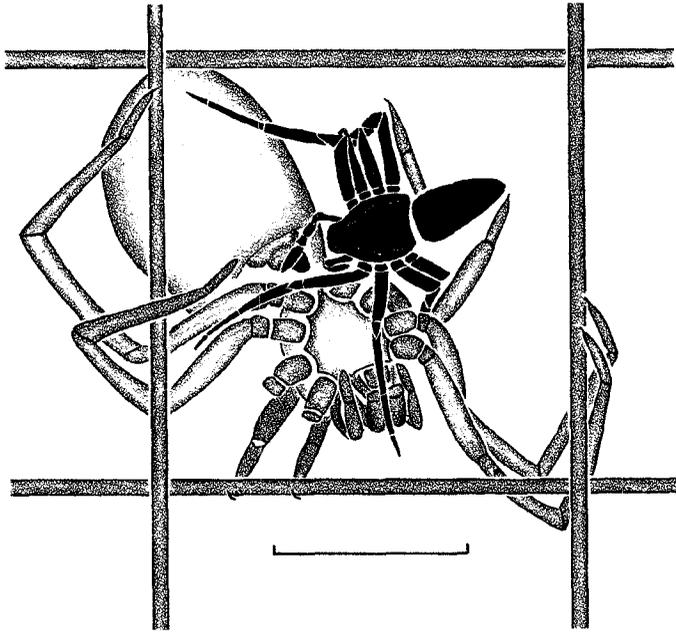


Fig. 1.—Copulatory position of *D. tenebrosus*, drawn from videotape. Male drawn in black. Scale = 1 cm.

and rotation of the basal and median hematodochae, the subtegulum-tegulum-complex is tilted towards the retrolateral side of the palp. In this position, the sclerotized tube fits snugly behind the tibial apophysis and arrests the rotation of the bulb. The described locking mechanism proved to be strong, and even repeated handling of the palp did not release the genital bulb from its arrested position.

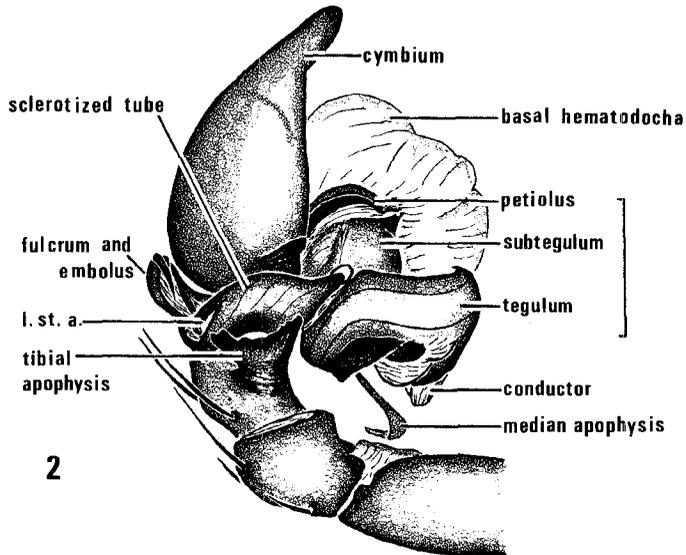


Fig. 2.—Dorsal view of expanded palp of *D. tenebrosus*. Bulb is "locked" behind tibial apophysis. l. st. a. = lateral subterminal apophysis. Scale = 1 mm.

The observation of an internal locking mechanism in the male palp during expansion sheds new light on the function of male tibial apophyses. Most genera currently assigned to the Pisauridae (or Pisauridae and Dolomedidae; Lehtinen 1967) possess well-developed and often large tibial apophyses. In many cases, they provide useful species-specific characters. Heimer (1982) described internal locking mechanisms in Theridiidae and Linyphiidae, in which the paracymbium and different parts of the bulb form a functional complex during copulation that arrests the rotation of the bulb. The locking mechanism in *D. tenebrosus* seems functionally similar although the structural elements of the mechanisms are not homologous.

The copulatory position of *D. tenebrosus* appears to be modified from the standard copulatory position II in *D. fimbriatus*, where the males are more similar in size to the females. The stroking motion of the male resembled the leg waving motion observed in *D. fimbriatus*, *D. scriptus*, *D. vittatus* Walckenaer, 1837, and *D. triton* (Walckenaer, 1837) (see Carico 1973; Roland & Rovner 1983). The female *D. tenebrosus* pulled her legs close to her body as if she were about to assume a posture similar to females of *D. fimbriatus*. *D. scriptus* and *D. vittatus* do not pull their legs close to the body while mating and the mating position is modified as well (Carico 1973).

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