

RESEARCH NOTE

Slit Cuticular Structure Observed by Scanning Electron Microscopy: Presence on the Walking legs of *Amblyomma cajennense* (Fabricius, 1787) (Acari: Ixodidae)

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Several types of cuticular structures on ticks have been observed by scanning electron microscopy (SEM) (TA Wooley 1972 *Trans Amer Micros Soc* 91: 35-47, E Hess & M Vlimant 1984 p. 253-260. In DA Griffiths & CE Bowman (eds) *Acarology* Ellis Horwood Ltd, Chichester, UK, KM Famadas et al. 1984 *Mem Inst Oswaldd Cruz* 89: 571-573). One of them, described by Hess and Vlimant (*loc cit.*), was named the distal tarsal slit sense organ (DTSSO) since exteriorly it resembles the slit sense organ of spiders. The common house spider has a tarso-metatarsal lyriform organ on each of its eight legs (C Walcott 1969 *Am Zoologist* 9: 133-144).

Slits were also described on the legs of adult ticks of *Ixodes ricinus* (Linnaeus), mainly associated with eudesmatic or adesmatic articulations (L Van der Hammen 1983 *Zoologische Meded Leiden* 57: 209-242).

Since the first description of the slit in spiders by Bertkau (1878, in JWS Pringle 1955 *J Exp Biol* 32: 270-278) different terms have been used to designate it. The term lyriform organ has been used to describe a compound organ of spiders, it is marked mainly by a group of slits. Single slits are common in Acari, referred to as lyrifissures (Van der Hammen *loc cit.*, TA Wooley 1988 *Acarology - Mites and human welfare* J Wiley & Sons, New York, USA 484 pp.).

Although slits occur in nearly all Chelicerata (NE M'Indod 1911 *Prod Acad Natur Sci Philadelphia* 63: 375-418, BJ Kaston 1935 *J Morphol* 58: 189-209, Pringle *loc cit.*) most studies on this structure are made from Aranea.

Recent advances in electrophysiology, electron microscopy and experimental models with spiders have shown many sensorial functions attributed to this organ, also indicating that the slit acts as a mechanoreceptor sensitive to pressure upon the cuticle (EA Seyfarth & FG Barth 1972 *J Comp Physiol* 78: 176-191, FG Barth 1972 *J Comp Physiol* 78: 315-336) or vibration receptor (Walcott *loc cit.*). Seyfarth and Barth (*loc cit.*) and Barth (*loc cit.*) have proved its role on the kinetic direction. Besides these functions, Hess and Vlimant (*loc cit.*) supposed that it could also play a role as a gravity receptor in ticks.

Knowledge of a new sense structure of ticks is an important step for the development of better methods, based on the ticks' need to find suitable feeding host.

The aim of this paper is to record the presence of slits on the dorsal surface of telotarsus II, III, IV in larvae, nymphs and adults of *Amblyomma cajennense* (Fabricius, 1787).

Engorged larvae and nymphs of *A. cajennense*, collected on horses, were kept under laboratory conditions (25-29°C, 80 ± 10% RH), until ecdysis.

Larvae aged 15 days, nymphs and adults for 24 hr after hatching, unfed, were killed and preserved in 70% ethanol (Famadas et al. *loc cit.*).

A sample of 30 larvae, 30 nymphs, 20 males and 20 females of *A. cajennense* was prepared for optical microscopy (MO) according to KM Famadas' (1993 Universidade Federal Rural do Rio de Janeiro, RJ, Brasil xx + 86pp.; 1996 *Mem Inst Oswaldd Cruz* 91: 139-140) method. Another batch of 20 larvae, 10 nymphs, 5 males and 5 females was prepared for SEM using the method of JE Keirans et al. (1976 *Acarologia* 18: 217-225).

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The electron micrographies were carried out on a Stereoscan 200 SEM at 16 Kv.

All measurements are expressed in millimeters. The average is followed by standard deviation and the variation interval, representing a sample of right-legs II-IV of specimens measured on a Olympus BH2 optical microscope.

In order to compare regression and correlation means, T tests were applied.

A slit on the dorsal telotarsus face of walking legs of larvae, nymphs and adults of *A. cujennense* was observed through MO and SEM. Although Hess and Vlimant (Zoc. cit.) only have depicted the adult slit of *A. variegatum* (by SEM micrography), based on their description of DTSSO, we think it would be the same structure in *A. cajennense*.

The slit can be easily observed through optical microscopy (200 \times) in larvae (Figs 1, 2) and nymphs, rather than in adults of *A. cujennense* ($\geq 400\times$) in which this structure appears to be inconspicuous. Moreover, Hess and Vlimant (loc. cit.) pointed out that specimens untreated by ether-chloroform method, may present wax, dirt, or secretions covering the slit, which may be confused with non-sensory cuticular folds.

As also observed by M'Indo (loc. cit.) and Kaston (loc. cit.), in Arachnida, the slits in each stage of *A. cujennense* are located on a slight elevation of

the cuticle (Figs 1-8). In MO it is seen as a thick orange brown area darker than other areas (Figs 1, 2). This slit is constituted of a larger proximal and distal border (Fig. 2) and it is arranged crosswise to the segment axis. Through SEM, in dorsal and lateral views, the slit resembles a mouth (Figs 3-6).

Based on statistical analysis of data presented on the Table, it was seen that the slit would not range in size between tarsus II, III, IV and among stages, even with the great increase of tarsal segment length.

The size of the slit seems relatively constant about the taxa up to now reported (*Ixodes ricinus*, Van der Hammen loc. cit.; *A. variegatum*, Hess & Vlimant Zoc. cit.; spiders, Kaston Zoc. cit.).

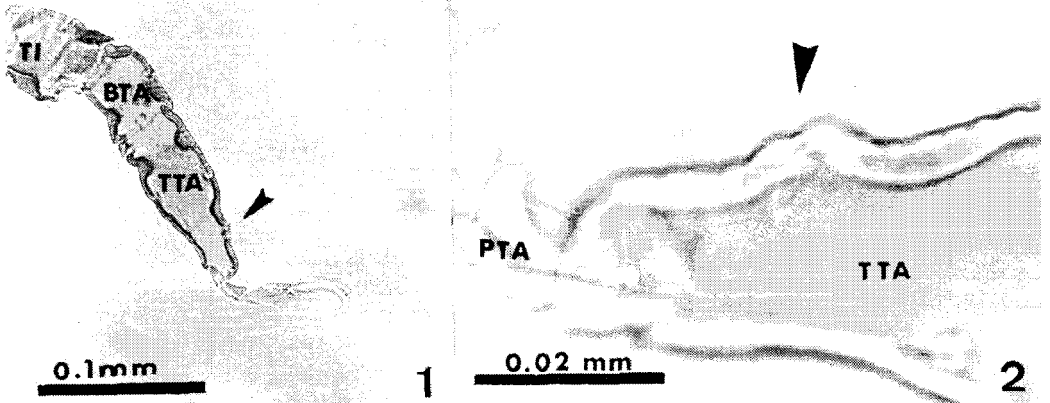
The slits present on the tibia and femur of spiders legs have an important role in the kinesthetic orientation and they are specifically adapted to change the stimulus on cuticle surface deformations into a stimulus carried via sense cells. In addition the deformation of a single slit is greatest in its middle region and decreases towards its ends; the deformability of the slit increases according to its length (Barth Zoc. cit.).

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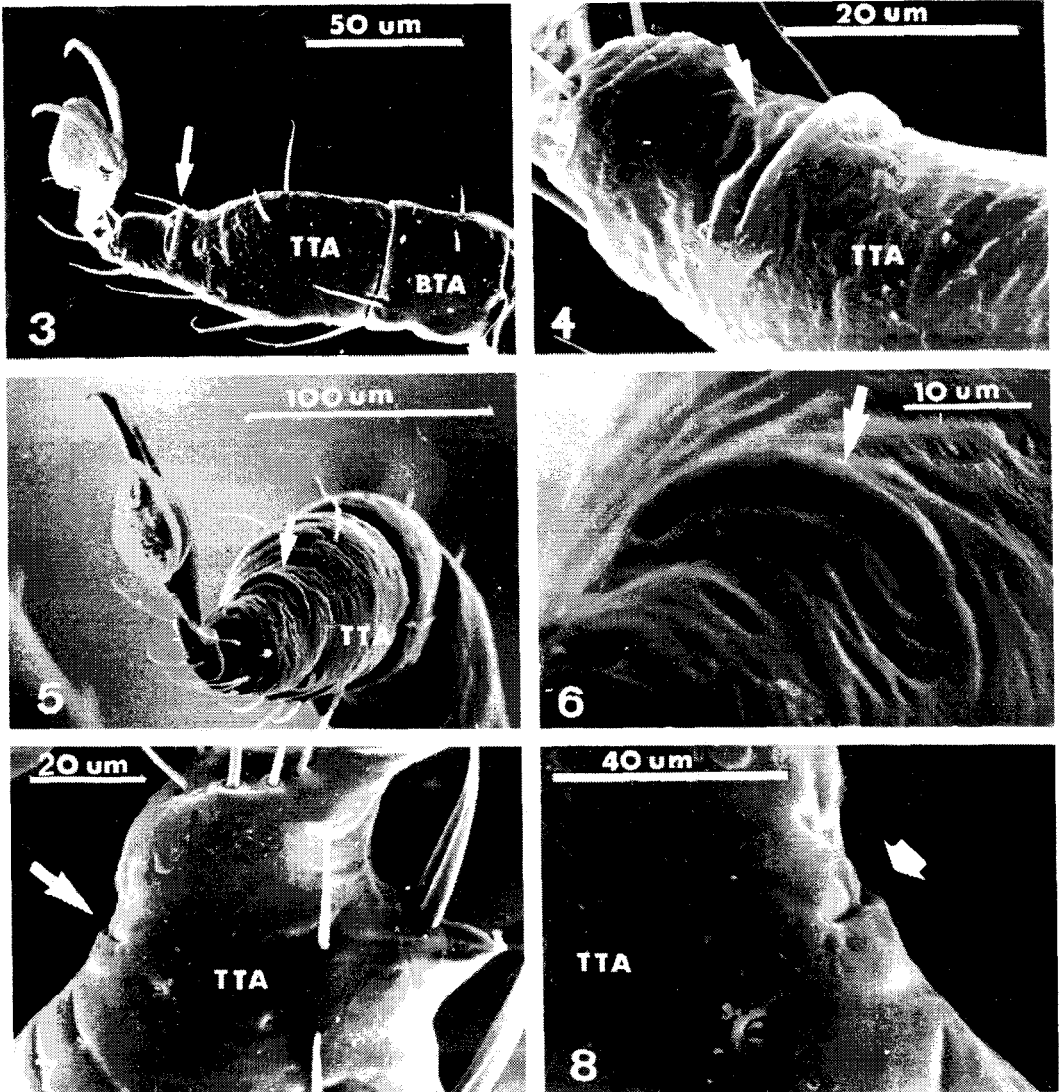
TABLE
Morphometric data on the walking leg tarsus of *Amblyomma cujennense* (Fabricius, 1787)
(Acari: Ixodidae) larva, nymph and adults

Stage	Value	Larva		Nymph		Male ^a		Female ^b	
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
		(m \pm s)		(m \pm s)		(m * s)		(m \pm s)	
Tarsi II	Length	0.131	0.142	0.201	0.286	0.528	0.660	0.550	0.759
		(0.138 \pm 0.003)		(0.238 \pm 0.023)		(0.605 \pm 0.035)		(0.638 \pm 0.060)	
	Wide	0.032	0.051	0.069	0.090	0.176	0.264	0.132	0.231
Slit	Wide	(0.046 \pm 0.004)		(0.079 \pm 0.006)		(0.221 \pm 0.020)		(0.187 \pm 0.024)	
		0.021	0.032	0.016	0.027	0.022	0.054	-	-
		(0.027 \pm 0.003)		(0.019 \pm 0.003)		(0.037 \pm 0.010)			
Tarsi III	Length	0.0140	0.152	0.212	0.292	0.528	0.638	0.572	0.792
		(0.147 \pm 0.003)		(0.254 \pm 0.021)		(0.572 \pm 0.030)		(0.610 \pm 0.062)	
	Wide	0.040	0.054	0.069	0.095	0.187	0.297	0.163	0.242
Slit	Wide	(0.049 \pm 0.003)		(0.085 \pm 0.006)		(0.220 \pm 0.036)		(0.198 \pm 0.021)	
		0.022	0.038	0.016	0.027	0.027	0.054	-	-
		(0.027 \pm 0.003)		(0.022 \pm 0.003)		(0.039 \pm 0.010)			
Tarsi IV	Length	—	—	0.238	0.339	0.605	0.737	0.583	0.847
				(0.304 \pm 0.025)		(0.671 \pm 0.034)		(0.742 \pm 0.065)	
	Wide	—	—	0.069	0.095	0.176	0.308	0.165	0.253
Slit	Wide			(0.085 \pm 0.006)		(0.242 \pm 0.031)		(0.203 \pm 0.023)	
		—	—	0.016	0.027	0.022	0.043	-	-
				(0.022 \pm 0.003)		(0.030 \pm 0.007)		—	

m: middle value; s: standard deviation; a: number of examined specimens for slits in tarsus II, III and IV, was 11, 11 and 9, respectively; b: data on the tarsal slits were not analyzed.



Amblyomma cajennense, micrographies of leg II of larva. Fig. 1: distal portion. TI: tibia; BTA: basitarsus; TTA: telotarsus; arrow, slit cuticular structure. Fig. 2: detail of slit cuticular structure. PTA, pretarsus.



Amblyomma cajennense, electron micrographies of leg II. Figs 3,4: Larva. Figs 5,6: nymph. Figs 7,8: adult. Arrow, slit cuticular structure: TTA: telotarsus: BTA:basitarsus.