

# RAILLIETIA AURIS, R. FLECHTMANNI AND R. CAPRAE (ACARI: GAMASIDA) - DIFFERENTIAL DIAGNOSIS UNDER SCANNING ELECTRON MICROSCOPY.

F.R.A. FERRY<sup>1</sup>, J.L.H. FACCINI<sup>2</sup>, T. INADA<sup>3</sup> & R.M. LANFREDI<sup>3</sup>

(1) Laboratório de Histologia, ICB/UFRRJ, Ilha do Fundão, Rio de Janeiro, Brasil, CEP 21941-590. E-mail: ferry@leao.biof.ufrj.br; (2) Departamento de Parasitologia Animal, IB/UFRJ, Km 47, Antiga Rio-São Paulo, Seropédica, Rio de Janeiro, Brasil; (3) Instituto de Biofísica Carlos Chagas Filho/UFRRJ, Ilha do Fundão, Rio de Janeiro, Brasil. E-mail: reylanf@ibcef.biof.ufrj.br.

**SUMMARY:** Seven stable morphological characters which aid diagnosing the three species of the ear mite parasite *Raillietia* described in Brazil were studied under the Scanning Electron Microscopy. They were: position of the first and last pairs of setae associated with dorsal shield in both sexes, chaetotaxy of tibia IV in both sexes, movable digits of male chelicerae, morphology of setae AV<sub>1</sub> of genua, tibia and tarsi II of male, ventral process of femora II of male, shape of gnathotectum in both sexes and cuticular spines on anal shields in both sexes.

**KEY WORDS:** *Raillietia auris*, *R. flechtmanni*, *R. caprae*, acari, diagnosis, Scanning Electron Microscopy.

## INTRODUCTION

There are seven described species of *Raillietia* Trouessart. Three of them, *R. auris* (Leidy), *R. caprae* Quintero, Bassols and Accvedo and *R. flechtmanni* Faccini, Leite and Costa, have been recorded from the ear canals of cattle, goats and sheep and buffalo and cattle, respectively in Brazil (FACCINI *et alii*, 1992). The first two are cosmopolitan in distribution, the last one has only be recorded from Brazil.

Research carried out in the last decade in Brazil (LEITE *et alii*, 1989b) and elsewhere (JUBB *et alii*, 1993), has shown that these mites are pathogenic although the economic importance of the parasitism is still unknown.

As research progresses ease of correct species identification is essential. The purpose of this paper is to redescribe/describe selected morphological characters based on Scanning Electron Microscopy (SEM), that might be used in species diagnosis.

## MATERIALS AND METHODS

The mites used in this study were obtained from the external ear canals of cattle from southern part of the State of Minas

Gerais, MG, and goats from the city of Rio de Janeiro, State of Rio de Janeiro, by flushing water in to the ear canals of living hosts (LEITE *et alii*, 1989a). They were prepared for SEM according to FERRY *et alii* (1994). Briefly, 20 living mites of each specie were cleaned in 10% comercial detergent solution, washed in water, killed and fixed in 70% ethanol, dehydrated in ethanol series, processed in a critical point drier with CO<sub>2</sub>, sputter-coated with gold and examined in a Jeol JSM 25 SII operating at 15 kV.

## RESULTS

Seven stable morphologic characters for diagnosing the three species were selected based on published informations and experience in using them as species diagnosis at the Departamento de Parasitologia Animal, UFRJ, for the past 10 years. They are:

### Gnathotectum

The gnathotectum (Fig. 1A) consists of a sclerotized portion and an elaborated distal fringed (Fig. 1C) structure less sclerotized than the basal portion, and it is dorsally convex

whereas the ventral surface is concave. In *R. auris* the basal portion has a isosceles triangle shape (Fig. 1B), in *R. flechtmanni* a pentagonal shape (Fig. 1C) and in *R. caprae* it is rounded (Fig. 1D).

#### Chelicerae of male

The Fig. 2A shows a ventral view of the gnathosoma of the male of *R. flechtmanni*. The movable digit has two filamentous and a third smaller, digitiform projection, fused to form the spermatodactyle in *R. auris* and *R. flechtmanni* (Fig. 2B,C). In *R. auris* the ventral basis of the larger projection resembles a

bulb (Fig. 2B). In *R. caprae* the projections are shorter and spinc-like (Fig. 2D).

#### First (anterior) and last (posterior) pairs of setae associated with the dorsal shield

In *R. auris* and *R. caprae* they are implanted in the shield (Fig. 3A,B,C,D), but in *R. flechtmanni* these setae are located out of the shield (Fig. 3E,F).

#### Setae AV<sub>1</sub> of genua, tibia and tarsi II of male

In *R. flechtmanni* they are peg-like (Fig. 4A, B) whereas in *R.*



Fig. 1 - Morphology of gnathotectum. A. General view of gnathotectum of *Raillietia caprae* (325X); B. *R. auris* (1.000X); C. *R. flechtmanni* (2.700X); D. *R. caprae* (1.200X).

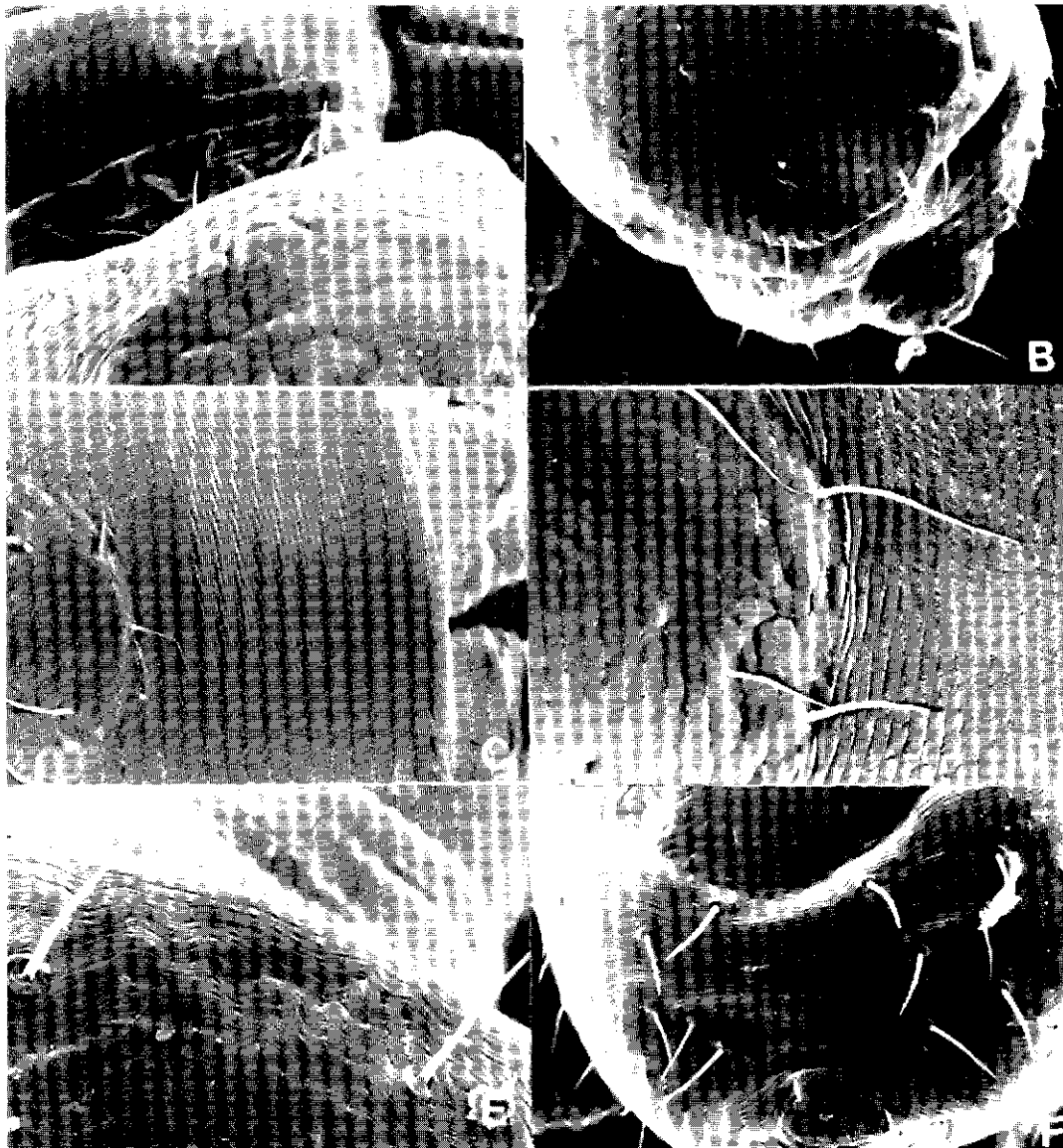


Fig. 2 - Chelicerae of male. A. Ventral view of gnathosoma of *Raillietia flechtmanni* (1.990X). Movable digits of B. *R. auris* (2.500X); C. *R. flechtmanni* (4.600X); D. *R. caprae* (5.000X).

*auris* they are shorter and irregular (Fig. 4C,D). In both species longitudinal grooves were observed (Fig. 4B,D). Contrary to the above mentioned species, setae  $AV_1$  of *R. caprae* are not modified and is implanted in a reduced process-like protuberance (Fig. 4F).

#### Ventral process of the femora II of male

The ventral process of the femora II of male of *R. flechtmanni*, *R. auris* and *R. caprae* are pointed, rounded or absent, respectively (Fig. 4A,C,E).

#### Chaetotaxy of tibia IV

The chaetotaxy of tibia IV (Fig. 5A) in both sexes of *R.*

*auris* (Fig. 5B), *R. flechtmanni* (Fig. 5C) and *R. caprae* (Fig. 5D) are as follows: 2 1/1 3/1 1 (scoring 9), 2 1/1 3/1 2 (scoring 10) and 2 2/1 3/1 2 (scoring 11).

#### Anal shield

The posterior region of the anal shield is covered with sharp papiliform processes that becomes quite visible with magnifications above 4.500X (Fig. 6A). In *R. auris* (Fig. 6B) and *R. caprae* (Fig. 6D) these papiliform structures are sparse and lesser developed. Otherwise, in *R. flechtmanni* (Fig. 6C) they are more dense and developed.

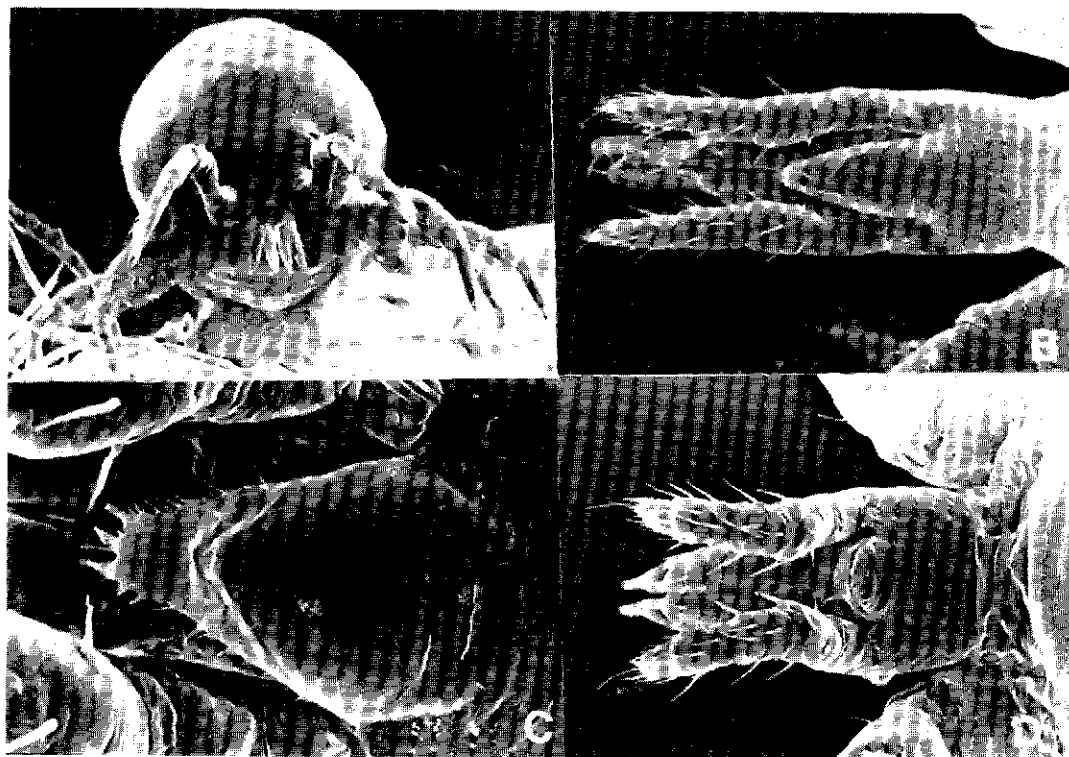


Fig. 3 - Setae associated with dorsal shield. A e B. *R. auris* (720X; 460X); C e D. *R. caprae* (1.300X; 1.500X); E e F. *R. flechtmanni* (1.025X; F460X). A, C, E (first pair); B, D, F (last pair).

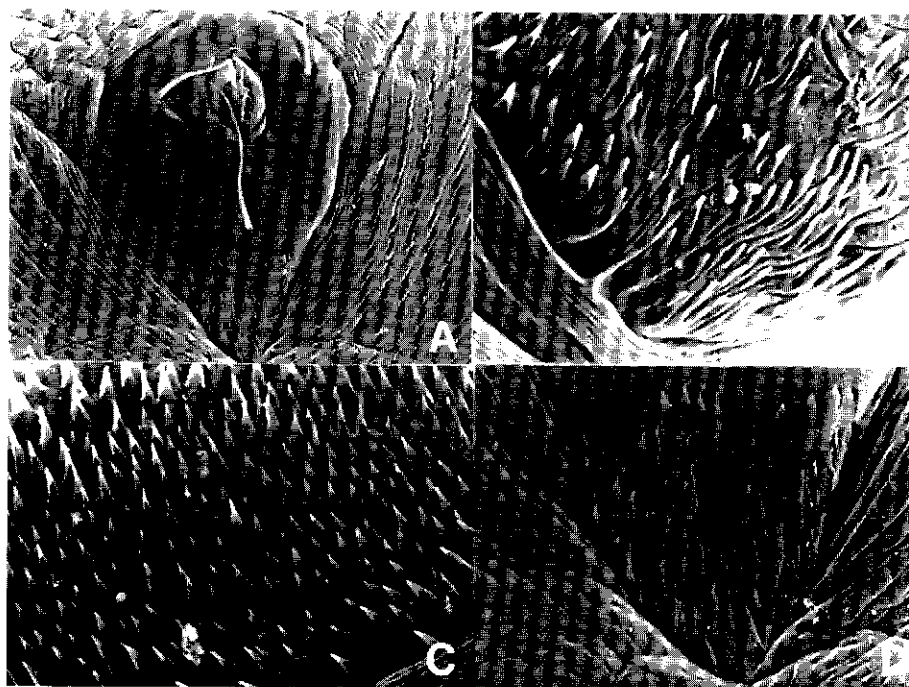


Fig. 4 - Setae AV<sub>1</sub> of genua, tibia and tarsi of the second pair of legs in male. A e B. *R. flechtmanni* (460X; 2.500X); C e D. *R. auris* (700X; 2.300X); E. *R. caprae* (700X). Ventral process of the femur II. A. *R. flechtmanni*; C. *R. auris*; F. *R. caprae* (2.200X), arrowhead.



Fig. 5 - Chaetotaxy of tibia IV. A. Male of *R. auris* showing tibia IV, arrow (120X); B. *R. auris* (1.000X); C. *R. flechtmanni* (700X); D. *R. caprae* (2.000X). AD<sub>1,2</sub> - anterodorsal; PL<sub>1,2</sub> - posterolateral.

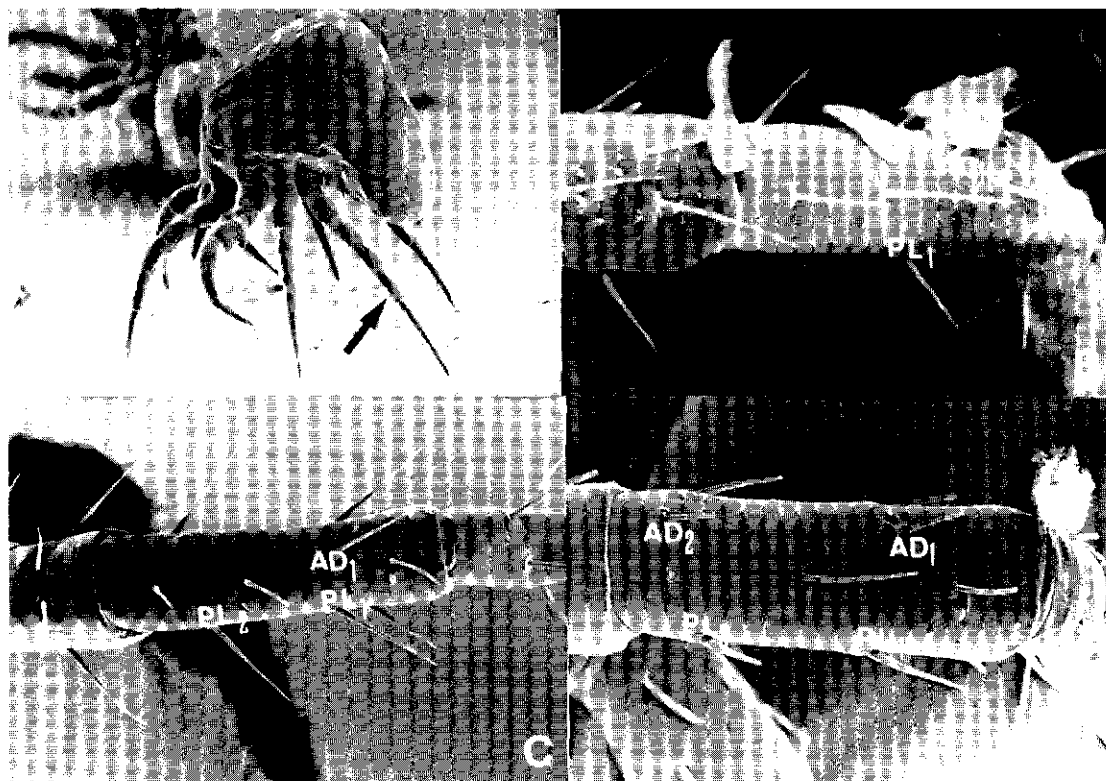


Fig. 6 - Anal shield. A. General view of anal shield of *R. caprae* (1.900X); B. *R. auris* (5.000X); C. *R. flechtmanni* (5.000X); D. *R. caprae* (5.550X).

A summary of the hosts and morphological characters for diagnosing of the three species is presented in Table 1.

Table 1: Hosts and morphological characters for diagnosing the species of *Raillietia* Trouessart reported from Brasil.

	<i>R. auris</i>	<i>R. flechtmanni</i>	<i>R. caprae</i>
Hosts	Cattle	Buffalo/Cattle	Goat/Sheep
Shape of gnathotectum (M)	Isosceles triangle	Pentagonal	Rounded
Movable digits of chelicerae (M)	2 filamentous 1 spine-like	2 filamentous 1 spine-like	3 spine-like
First/last pair of setae on dorsal shield (M,F)	On	Out	On
Setae AV1 (M)	Short/irregular	Peg-like	Absent
Ventral process of femora II (M)	Rounded	Pointed	Absent
Number of setae on tibia IV (M,F)	9	10	11
Spines on anal shield (M,F)	Sparse	Dense	Sparse

M-male; F-female.

## DISCUSSION

Previous descriptions of six morphological characters (shape of the gnathotectum, chelicerae of male, first and last pairs of setae associated with the dorsal shield, setae AV<sub>1</sub> of genua, tibia and tarsi II of male, ventral process of femora II of male and chaetotaxy of tibia IV) were confirmed by the SEM studies. In addition, the longitudinal grooves of setae AV<sub>1</sub> were described for the first time in *R. auris* and *R. flechtmanni*.

Although the number of total setae in the dorsal shield instead of position of the first and last pairs have been used by POTTER & JOHNSTON (1978) and DOMROW (1979/80) to key the species of *Raillietia*, we used the position of the first and last setae associated with dorsal shield due to intraspecific variation already observed in the setae of dorsal shield of both sexes in *R. flechtmanni* (FACCINI *et alii*, 1992).

The arrangement of the anal shield papiliform processes can only be visible with magnifications above 4500x. This character has a slight granulated surface when observed under light microscopy (DOMROW, 1979/80).

## ACKNOWLEDGMENTS

We are indebted to Dr. Sergio M. de Faria and the technicians Valeria Carneiro and Geraldo Cruz (EMBRAPA-CNPAB) for their help with the SEM procedures.

## SUMÁRIO

Sete caracteres morfológicos capazes de estabelecer o diagnóstico diferencial das três espécies de ácaros parasitos do gênero *Raillietia*, descritas no Brasil, foram estudados ao Microscópio Eletrônico de Varredura. São eles: posição do primeiro e último par de cerdas associadas ao escudo dorsal em ambos os sexos, quetotaxia da tibia IV em ambos os sexos, dígito móvel das quelíceras do macho, forma da cerda AV<sub>1</sub> do genu, tibia e tarso II do macho, processo ventral do fêmur II em macho, forma do gnatoteto em ambos os sexos e espinhos cuticulares na placa anal em ambos os sexos.

PALAVRAS-CHAVE: *Raillietia auris*, *R. flechtmanni*, *R. caprae*, acari, diagnóstico, Microscópio Eletrônico de Varredura.

## REFERENCES

- DOMROW, R. (1979/80). The genus *Raillietia* Trouessart in Australia (Acari: Dermanyssidae). *Proc. Linn. Soc. N.S.W.* 104:183-193.
- FACCINI, J.L.H.; LEITE, R.C. & COSTA, A.L. (1992). Description of *Raillietia flechtmanni* sp. n. (Acari: Gamasida). *Mem. Inst. Oswaldo Cruz.* 87:95-96.
- FERRY, F.R.A.; LANFREDI, R.M.; FARIA, S.M.; INADA, T. & FACCINI, J.L.H. (1994). Método de preparo de ácaros do gênero *Raillietia* Trouessart, 1902 (Acari:Gamasida) para estudo ao microscópio eletrônico de varredura. *Rev. Bras. Parasitol. Vet.* 3:65-68.
- JUBB, T.F.; VASSALLO, R.L. & WROTH, R.H. (1993). Suppurative otitis in cattle associated with ear mites (*Raillietia auris*). *Aust. Vet. J.* 70:354.
- LEITE, R.C., FACCINI, J.L.H. & COSTA, A.L. (1989a). Avaliação de uma técnica in vivo para medir a infestação por ácaros do gênero *Raillietia* Trouessart, 1902 (Acari) em bovinos. *Mem. Inst. Oswaldo Cruz.* 84:309-311.
- LEITE, R.C.; NUNES, V.A.; FACCINI, J.L.H.; LOPES, C.W.G.; NUNES, I.J. & COSTA, A.C. (1989b). Aspectos clínicos da Raillietiose bovina. *Arq. Univ. Fed. Rural do Rio de Janeiro.* 12:83-91.
- POTTER, D.A. & JOHNSTON, D.E. (1978). *Raillietia whartoni* sp. n. (Acari: Mesostigmata) from the uganda kob. *J. Parasitol.* 64:139-142.

(Received 15 March 1998, Accepted 1 September 1998)