

N. Abreu-Acosta · P. Foronda Rodríguez ·  
B. Valladares · J. C. Casanova

## ***Raillietiella morenoi* sp. n. (Pentastomida) from *Gallotia atlantica* (Peters and Doria, 1882) (Lacertidae) in the Canary Islands**

Received: 30 September 2005 / Accepted: 18 October 2005 / Published online: 28 December 2005  
© Springer-Verlag 2005

**Abstract** *Raillietiella morenoi* sp. n., a new cephalobaeid pentastomid found in the lungs of *Gallotia atlantica* collected in the Canary Islands, is described. The new species belongs to the sharp-tipped posterior-hook type. The annulus number, morphology, and dimensions of copulatory spicules and the dimensions of anterior and posterior hooks separate *Raillietiella* sp. n. from the other raillietiidid sharp-tipped posterior-hook species of small lizard parasites in Africa. The host character of endemic protected species of *G. atlantica* in Alegranza Island posed great difficulty in obtaining more parasite materials. However, more studies are required to state the variability of this species and its possible distribution in other species in the Canary Islands, as well as in other *Gallotia* spp.

### **Introduction**

Pentastomids of the genus *Raillietiella* Sambon, 1910, which has a sharp-tipped posterior hook and infects predominantly insectivorous small lizards, are a reduced species group with representatives in Australia, Africa, and America (Ali et al. 1985). These species are classified as

“group I” and are separated from blunt-posterior-hook species in small lizards, which are classified as “group II” (Ali et al. 1985). During a survey on the endoparasitic fauna of the endemic Atlantic lizard *Gallotia atlantica* (Peters and Doria, 1882) in Alegranza Island, cephalobaeid pentastomids were isolated from the lungs of two individual hosts. In this paper, both a description and a graphic representation of these parasitic individuals are presented.

### **Materials and methods**

The Canary Islands are situated in the northeast Atlantic Ocean between 27°37' and 29°24'N and 13°23' and 18°8' W. Alegranza is one of the islands situated close to the continent at approximately 110 km off the northwest coast of Africa (Cabo Jubi). The island is uninhabited and belongs to a protected preserve. *G. atlantica* (Lacertidae) and *Tarentola angustimentalis* (Geckonidae), which are endemic species in the Canary Islands, are the only two reptiles that live on Alegranza. In the case of *G. atlantica*, it inhabits the islands of Lanzarote and Fuerteventura and the eastern islets, and there is a small introduced population on the east of Gran Canaria. In July 2000, the Canarian Government allowed the capture of ten individuals of each reptile species in Alegranza for parasitological study. Hosts were captured with live pitfall traps in “Los Hornitos” (*G. atlantica*) and “El Cortijo” (*T. angustimentalis*). The hosts were dissected after cervical dislocation, and live endoparasites were recovered from viscerae. Lung pentastomids were isolated from two individuals of *G. atlantica* (a male, an immature female, and a mature female), relaxed in saline solution (9% NaCl), and preserved in 70% ethanol prior to examination. Parasites were examined under a microscope. Annulus counting and both hook and spicule measurements were carried out following the methods described in Ali et al. (1981, 1982a–c, 1984a,b). The maturity of the female was estimated from the percentage of fully developed eggs in the uterus, as stated by Ali and Riley (1983).

N. Abreu-Acosta · P. Foronda Rodríguez (✉) · B. Valladares  
Department of Parasitology, Ecology, and Genetics,  
Faculty of Pharmacy, University of La Laguna,  
Avda. Astrofísico Fco. Sánchez s/n,  
38203 Tenerife, Canary Islands, Spain  
e-mail: pforonda@ull.es  
Tel.: +34-922-318486  
Fax: +34-922-318514

J. C. Casanova  
Laboratory of Parasitology,  
Faculty of Pharmacy,  
University of Barcelona,  
Avda. Diagonal s/n,  
08028 Barcelona, Spain

## Results

### Description of *Raillietiella morenoi* sp. n.

The typical morphology of *Raillietiella* Sambon, 1910 from small lizards (Pence and Canaris 1973; Riley and Heideman 1998) is presented as follows:

- Male (holotype)
  - Claviform-type morphology wider in the region of copulatory spicules, with gradual tapering posterior to bifid tail
  - Holotype male: 5.7 mm long (Fig. 1d)
  - Copulatory spicules curved (Fig. 1a)
  - Base flaved and rounded hollow back involved in the sleeve of chitin
  - Ornamented base overall length 124.2  $\mu\text{m}$ , with opposite hollow back 631.5  $\mu\text{m}$  long
  - Oral cadre with 93.2  $\mu\text{m}$  external diameter

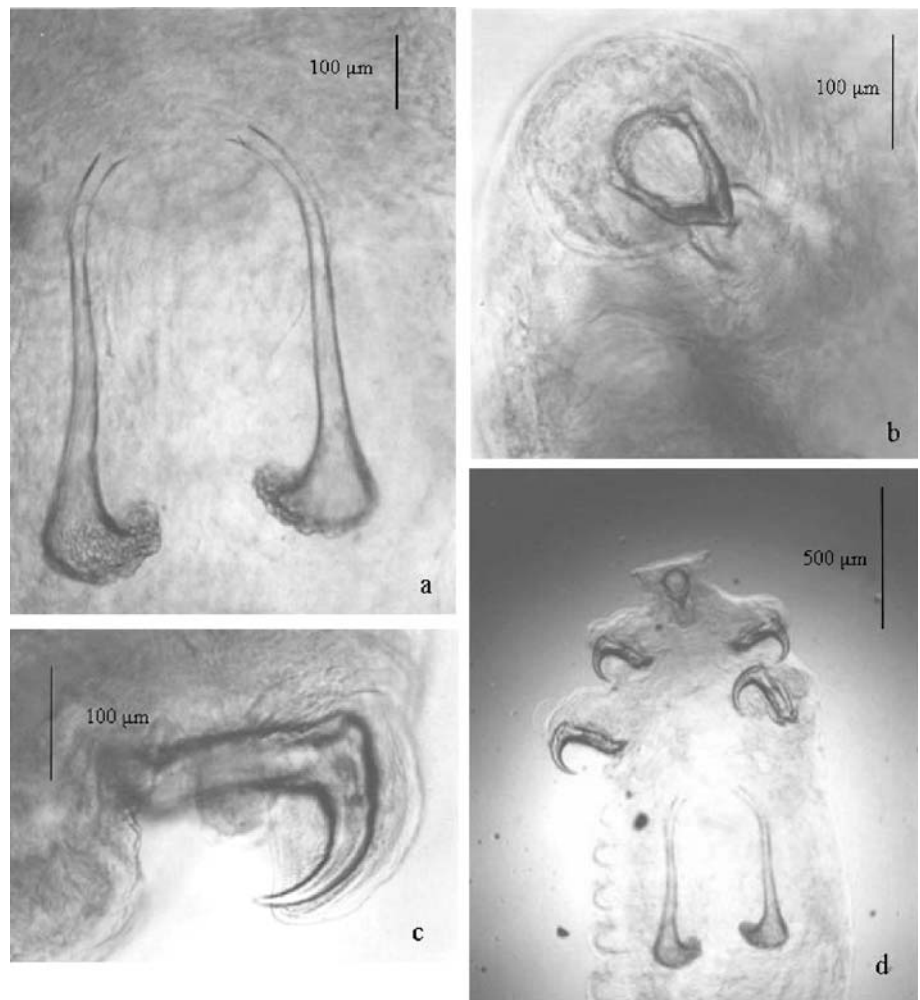
- Female (allotype)

- Claviform-type morphology widest in the region of the first annuli, with gradual tapering posterior to bifid tail
- Allotype mature female: 25 mm long, with 36 annuli (Fig. 2h)
- Anterior hook: 258 (AB) $\times$ 278 (BC)  $\mu\text{m}$  (Fig. 2e)
- Posterior hook: 309 (AB) $\times$ 401.7 (BC)  $\mu\text{m}$  (Fig. 1c) and 236 (AB) $\times$ 309 (BC)  $\mu\text{m}$
- Oral cadre with 144.9  $\mu\text{m}$  external diameter (Fig. 1b)
- Eggs: 84.2 $\times$ 53  $\mu\text{m}$  (Fig. 2g)

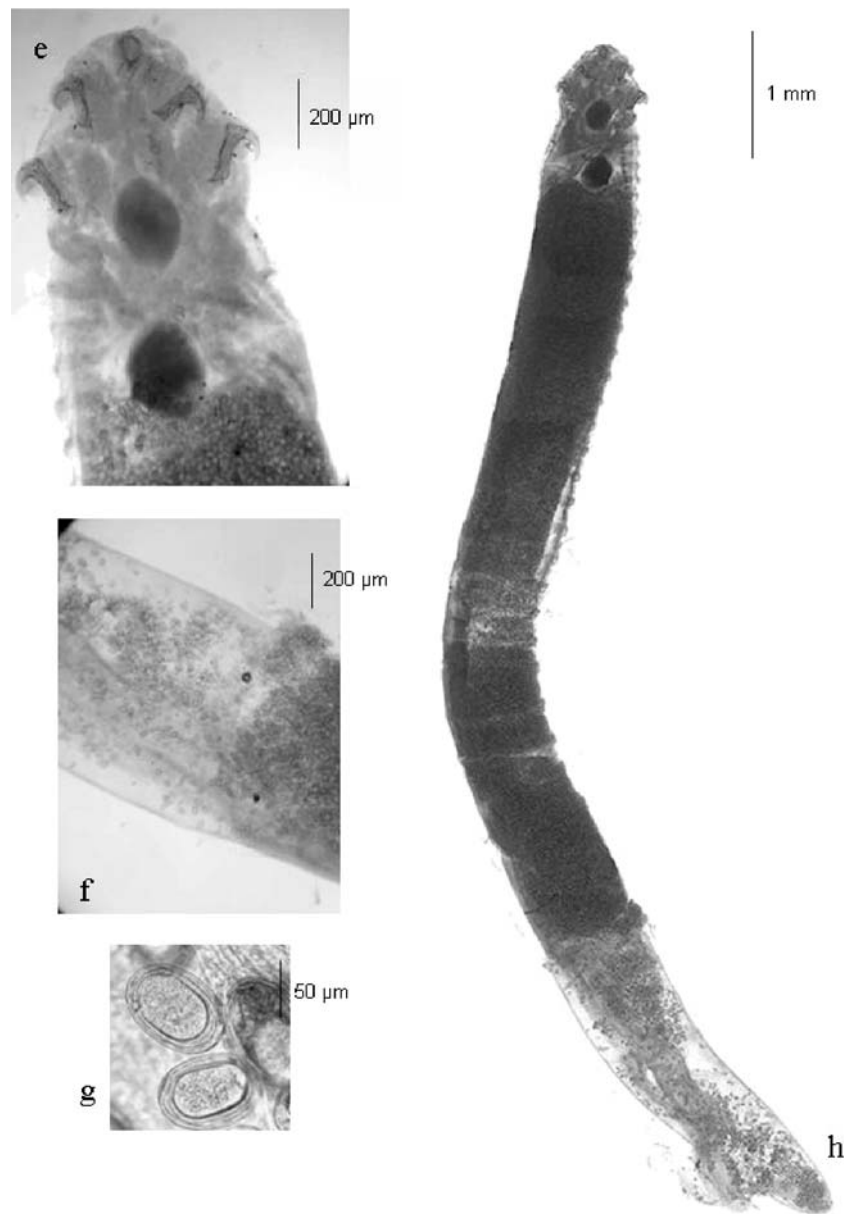
### Taxonomic summary

- Type specimens: holotype male (TFMC/PE1), allotype female (TFMC/PE2), and paratype female (TFMC/PE3) preserved in 70% ethanol in the parasite collection of the Natural History Museum of Tenerife
- Type host: *G. atlantica* (Peters and Doria, 1882)
- Common name: Atlantic lizard

**Fig. 1** *Raillietiella morenoi* sp. n. **a** The paired copulatory spicules of the holotype male. **b** Details of the oral cadre and the pharynx of the female holotype. **c** Details of a hook. **d** Head of the cleared male holotype showing the oral cadre, with two pairs of hooks relative to the copulatory spicules



**Fig. 2** *R. morenoi* sp. n.  
**e** Anterior part of the cleared female allotype. **f** Eggs in the uterus. **g** Eggs. **h** Total female allotype



- Type locality: 27°37' and 29°25'N, 13°20' and 18°10' W, Los Hornitos, Alegranza, Canary Islands
- Site of infection: lung
- Prevalence of host: 2/10
- Etymology: specific name referring to Juan Carlos Moreno (“Área de Medio Ambiente”), General Director of the Canary Government, who allowed the collection of the host material

#### Remark

The genus *Raillietiella* has been included several times in the families Cephalobaenidae Heymons, 1922 and Rail-

lietiellidae Sambon, 1922 in the order Cephalobaenida and, more recently, in Raillietiellida (de Oliveira Almeida and Lindsey Christoffersen 1999), which is not in accordance with recent works (Riley et al. 2003; Spratt 2003). The taxonomy and systematics of the pentastomid genus *Raillietiella* were reviewed by Ali et al. (1985) in the description of *Raillietiella cartagenensis* and in the re-description of *Raillietiella amphiboluri* (Mahon, 1954), *Raillietiella kochi* (Heymons, 1926), *Raillietiella shipleyi* (Heymons, 1926), and *Raillietiella indica* (Gedoelst, 1921). Ali et al. (1985) reorganized the known and valid species of *Raillietiella* into five groups (small lizards, varanid lizards, amphisbaenians, snakes, and amphibians), which are mainly based on host characteristics (host type, ecology,

**Table 1** Metrical data of raillietiellids possessing sharp-tipped hooks and infecting insectivorous lizards

Species	Female				Male			
	Length (mm)	Annulus number	Posterior hook		Length (mm)	Annulus number	Posterior hook	
	[mean (range)]	[mean (range)]	AB	BC	[mean (range)]	[mean (range)]	AB	BC
<i>R. amphiboluri</i> (Mahon, 1954)	32 (20–44)	32.5 (30–34)	208 (200– 220)	370		27–29		
<i>R. chamaeleonis</i> (Greillat and Brygoo, 1959)	15–18	17–22		277	6.5	23		
<i>R. aegypti</i> (Ali, Riley, and Self, 1982)	26	26 (25–27)	247 (237– 267)	384 (366– 410)	<11	22 (21–24)	135 (118– 153)	212 (148– 238)
<i>R. cartaginensis</i> (Ali, Riley, and Self, 1985)	(61–69)		(190– 200)	(315– 325)	(3.9–4.7)			
<i>R. morenoi</i> sp. n.	25	36	309	401.7	5.7	30	192	267.8

Sources: Ali et al. (1985) and Greillat and Brygoo (1959)

and zoogeography) (Riley and Heideman 1998). Two of these groups (groups I and II; after Ali et al. 1985) include species infecting small insectivorous lizards and are easily differentiated by the initial ideas of Self (1969) in species with sharp-tipped posterior hooks (group I) and blunt-tip posterior hooks (group II). Species differentiation in these two groups is mainly based on a combination of characteristics, including body size, annulus number, posterior-hook dimensions, and size and shape of the male copulatory spicule (Riley and Heideman 1998).

The sharp-tipped posterior-hook *Raillietiella* includes four well-characterized species (Ali et al. 1985): *R. amphiboluri* Mahon, 1954 in Australian bearded lizard *Amphibolurus barbatus*; *Raillietiella chamaeleonis* Greillat and Brygoo 1959 in *Chamaeleo oustaleti* and *Chamaeleo verrucosus* from Madagascar; *Raillietiella aegypti* Ali, Riley, and Self, 1982 in different small lizards from Egypt; and *R. cartagenensis* Ali, Riley, and Self, 1985 in *Hemidactylus* sp. and *Gonatodes* sp. from Colombia. The reported presence of *Raillietiella affinis* Bovien, 1927 in *Lepidactylus lugutris* from the British Salomon Island awaits confirmation (Ali et al. 1982a) and also that in *Lioheterodon modestus* from Madagascar due to the inclusion of *R. chamaeleonis* as a host (Greillat and Brygoo 1961).

*Raillietiella* sp. n. could be distinguished from *Raillietiella* sharp-hooked species of small lizards at the level of males and mature females (Table 1). Different combinations of characteristics, such as measurements of body length, annulus number, anterior-hook and posterior-hook size, and dimensions of the copulatory spicule, differentiate *Raillietiella* sp. n. from other similar species in group I of Ali et al. (1985). Posterior hooks of both sexes in the new species are substantially larger than those described in the latter species. There is only an overlap in the length of the hook (dimension BC) with mature females of *R. aegypti* only. The taxonomic and systematic morphological

characteristics stated by Ali et al. (1985) and others referring to male hooks (Riley and Heideman 1998) are reliable in distinguishing group I *Raillietiella* spp. and in separating *Raillietiella* sp. n. from the rest. More specimens are required in order to state the variability of this species, but the endemic character of the hosts and the status of the protected species make it difficult to obtain more specimens for parasitological studies. Lacertids of the genus *Gallotia* are endemic species of the Canary Islands. Lizard fauna of the genus *Gallotia* comprises seven species—all endemic in the Canary Islands and represented by at least ten subspecies with restricted distribution in a particular island (Delgado 2001). *G. atlantica* is an omnivorous lizard that feeds mainly on arthropods. The *Gallotia* species living in the Canary Islands have been surveyed for endoparasites, but no species of pentastomid have been reported (Cordero del Campillo et al. 1994). This is the first report of a pentastomid in a reptile species from the Canary Islands. Known endoparasites from Canarian lacertids and geckonids are restricted to platyhelminths and nematodes (Cordero del Campillo et al. 1994). In view of the parasitic helminth fauna found in *Gallotia* spp. and *Tarentola* spp. in Canarian islands other than Alegranza, it is clear that host isolation offers a good scenario for parasitic speciation, particularly in oxyurid nematodes. Moreover, the helminth fauna of *Gallotia* spp. reveals similar characteristics (Fain and Bannert 2000). This phenomenon is also known to be present in the endoparasitic fauna of reptiles in Madagascar and concretely in pentastomids (Greillat and Brigoo 1959; Greillat et al. 1962).

**Acknowledgements** We wish to thank the “Exmo. Cabildo Insular de Lanzarote” for permission to capture samples of *G. atlantica* in Alegranza Island, as well as the “Exmo. Cabildo Insular de Tenerife” and 2001 SGR00088 project by the “Comissionant per la Recerca y Universitats de la Generalitat de Catalunya (Catalonia Government)” for their support.

## References

- Ali JH, Riley J (1983) Experimental life-cycle studies of *Raillietiella frenatus* Ali, Riley, Self, 1981: pentastomid parasites of Geckos utilizing insects as intermediate host. *Parasitology* 86:147–160
- Ali JH, Riley J, Self JT (1981) A revision of the taxonomy of the blunt-hooked *Raillietiella*, pentastomid parasites of African, South-East-Asian and Indonesian lizards, with a description of a new species. *Syst Parasitol* 3:193–207
- Ali JH, Riley J, Self JT (1982a) A description of a new species of *Raillietiella* (Pentastomida: Cephalobaenida) from Egyptian lizards with a reassessment of the taxonomic status of *Raillietiella geckonis* (Diesing, 1850) Sambon, 1910 and *Raillietiella affinis* Bovien, 1927. *Syst Parasitol* 4:169–180
- Ali JH, Riley J, Self JT (1982b) A revision of the taxonomy of *Raillietiellaboulengeri* (Vaney and Sambon, 1910) Sambon, 1910, *R. orientalis* (Hett, 1915) Sambon, 1922 and *R. agcoi* Tubangui and Masiluñgan, 1956 (Pentastomida: Cephalobaenida). *Syst Parasitol* 4:285–301
- Ali JH, Riley J, Self JT (1982c) Amphibians as definitive hosts for pentastomids: *Raillietiella bufonis* n. sp. from *Bufo lemur* in Puerto Rico and a reassessment of *Raillietiella indica* Geddoelst, 1921. *Syst Parasitol* 4:279–284
- Ali JH, Riley J, Self JT (1984a) A revision of the taxonomy of pentastomid parasites (genus *Raillietiella*, Sambon, 1910) from American snakes and amphisbaenians. *Syst Parasitol* 6:87–97
- Ali JH, Riley J, Self JT (1984b) Further observations of blunt-hooked raillietiellids (Pentastomida: Cephalobaenida) from lizards, with descriptions of three new species. *Syst Parasitol* 6:147–160
- Ali JH, Riley J, Self JT (1985) A review of the taxonomy and systematics of the pentastomid genus *Raillietiella* Sambon, 1910 with a description of a new species. *Syst Parasitol* 7:111–123
- Cordero del Campillo M, Castañón L, Reguera A (1994) Índice-Catálogo de Zooparásitos Ibéricos, 2nd edn. Secretariado de Publicaciones, Universidad de León, León
- Delgado G (2001) División Chordata. In: Izquierdo I, Martín JL, Zurita N, Arechavaleta M (eds) Lista de especies silvestres de Canarias (Hongos, Plantas y Animales terrestres) 2001. Consejería de Política territorial y Medio Ambiente Gobierno de Canarias, pp 285–290
- de Oliveira Almeida W, Lindsey Christoffersen M (1999) A cladistic approach to relationships in Pentastomida. *J Parasitol* 85 (4):695–704
- Fain A, Bannert B (2000) Two new species of *Ophionyssus* Megnin (Acari: Macronyssidae) parasitic on lizards of the genus *Gallotia boulengeri* (Reptilia: Lacertidae) from the Canary Island. *Int J Acarol* 26(1):41–50
- Gretillat S, Brygoo ER (1959) *Raillietiella chamaeleonis* n. sp. Première espèce de Cephalobaenidae (Pentastomida) signalée a Madagascar. *Ann Parasitol Hum Comp* 34(1–2):12–20
- Gretillat S, Brygoo ER (1961) Les “dilatateurs de copulation” chez *Raillietiella (Heimonsia) hemidactyli* et valeur taxonomique possible de ces organes chez les Pentastomida. *Arch Inst Parasitol Madagascar* 29:71–74
- Gretillat S, Brygoo ER, Domergue CA (1962) Pentastomes de reptiles malgaches. *Ann Parasitol Hum Comp* 37:295–313
- Pence DB, Canaris AG (1973) Observations on the pentastome *Raillietiella gehyae* Bovien, 1927 (Cephalobaenida: Cephalobaenidae) from *Mabuya homalocephala* in Kenya. *Z Parasitenkd* 41:1–10
- Riley J, Heideman NJL (1998) A new blunt-hooked pentastomid belonging to the genus *Raillietiella* Sambon, 1910, from two species of agamid lizards in Namibia. *Syst Parasitol* 41:41–46
- Riley J, Oaks JL, Gilbert M (2003) *Raillietiella trachea* n.sp., a pentastomid from the trachea of an oriental white-backed vulture *Gyps bengalensis* taken in Pakistan, with speculation about its life-cycle. *Syst Parasitol* 56:155–161
- Self JT (1969) Biological relations of the Pentastomida. A bibliography on the Pentastomida. *Exp Parasitol* 24:63–119
- Spratt DM (2003) *Rileyella petauri* gen. nov., sp. nov. (Pentastomida: Cephalobaenida) from the lungs and nasal of *Petaurus breviceps* (Marsupialia: Petauridae) in Australia. *Parasite* 10:235–241