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A collection of mites in the family Laelapidae from rodents in Western Australia

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ABSTRACT – This paper reports on four species of parasitic mites in the family Laelapidae from rodents in the Shark Bay World Heritage Area of Western Australia. New host and locality information is provided for *Laelaps lybacia* Domrow, 1979, *L. rothschildi* Hirst, 1914, *L. spatanges* Domrow, 1973, and *Mesolaelaps australiensis* (Hirst, 1926). The male of *L. lybacia* is described for the first time.

KEYWORDS: *Laelaps*, *Mesolaelaps*, habitat restoration, Dirk Hartog Island

INTRODUCTION

Dirk Hartog Island is the largest island in Western Australia, and lies in the Shark Bay World Heritage Area (Christensen and Jones 2020). It is the subject of a habitat restoration project following the eradication of sheep, cats and goats. As part of that project, native rodents are being re-introduced to the island (Algar et al. 2020; Cowen et al. 2021; Sims et al. 2021). Ectoparasites collected from rodents during that process and during the associated ecological monitoring contribute useful new information about the geographic distribution of and host range of four species of mites in the family Laelapidae Canestrini, 1891.

MATERIALS AND METHODS

Rodents were trapped as part of the translocation process and the subsequent ecological monitoring as part of the Dirk Hartog Island National Park Ecological Restoration Project (Cowen et al. 2021). Host species sampled were the greater stick-nest rat *Leporillus conditor* (Sturt, 1848), the sandy inland mouse *Pseudomys hermannsburgensis* (Waite, 1896), the Shark Bay Mouse *Pseudomys gouldii* (Waterhouse, 1839), and the house mouse *Mus musculus* Linnaeus, 1758. Localities sampled were Northwest Island (20º 21' 46"S, 115º 31' 30"E), Dirk Hartog Island (25º 49' 17"S, 113º 04' 46"E), Salutation Island (26º 32' 22"S, 113º 46' 04"E), and Bernier Island (24º 52' 03"S, 113º 08' 37"E).

Specimens were cleared in Nesbitt's solution and mounted in Hoyer's medium following Walter and Krantz (2009). The slides are deposited in the Western Australian Museum, Perth and the Australian National Insect Collection, Canberra. Mites were identified according to Domrow (1988). Terminology follows Lindquist and Evans (1965) (dorsal idiosoma chaetotaxy), Evans and Till (1965) (leg chaetotaxy) and Evans and Till (1979) (general anatomy).

RESULTS

Laelaps lybacia Domrow, 1979

Figures 1–5

Laelaps lybacia Domrow, 1979: 203.

Laelaps lybacia.— Domrow, 1988: 839.

MATERIAL EXAMINED

Australia: ***Western Australia***: 3 ♀, 4 ♂, Northwest Island, on *Pseudomys gouldii*, 20–22 April 2021; 13 ♀, 14 ♂, Bernier Island, on *P. gouldii*, 28 April to 2 May 2022.

Male

Dorsal idiosoma: Dorsal shield length 680–720 mm, width 530–560 µm (n=5), surface smooth but with distinct sigilla (Figure 1). Podonotal section with 19 pairs of setae; *j1* longest, 42–45 µm, *j2* 30 µm, others minute; *z3* absent. Opisthonotal section with 14 pairs of setae; *Z5* longest, 55–65 µm, *J5* short, 12–15 µm, others 20–30 µm, S3 absent; posterolateral region of shield with two pairs of large conspicuous gland pores.

Ventral idiosoma (Figure 2): Tritosternum with base 35 µm long, lightly pilose laciniae 140 µm long, base flanked by a pair of minute lenticular sclerites. Pre-sternal area ornamented with a series of faint curved lines. Sternal, genital, and anal shields fused to form a large shield bearing ten pairs of setae and three circum-anal setae, two pairs of lyrifissures, and two pairs of gland pores; its surface ornamentated with a pattern of polygons, weaker and irregular between coxae IV; strongly-developed sigilla between coxae III and IV. Genital opening in anterior margin of sternal shield, its anterior margin open. Setae *st1–st5* very long and conspicuous, each reaching well past the base of the following seta, length 80–100 µm. Opisthogastric section of shield with five pairs of setae, length 55–80 µm; anus surrounded by a lightly sclerotised

area of cuticle; para-anal setae 15–20 µm, inserted at posterior level of anus, post-anal seta 32–35 µm; anterior ends of cribrum projecting only slightly anterior to post-anal seta. Stigmata at the anterior level of coxa IV, peritreme narrow, reaching forward to anterior level of coxa I. Narrow parapodal plate embracing coxa IV, irregular and variable metapodal plate present behind coxa IV; opisthogastric cuticle lateral to ventri-anal shield with two pairs of long setae.

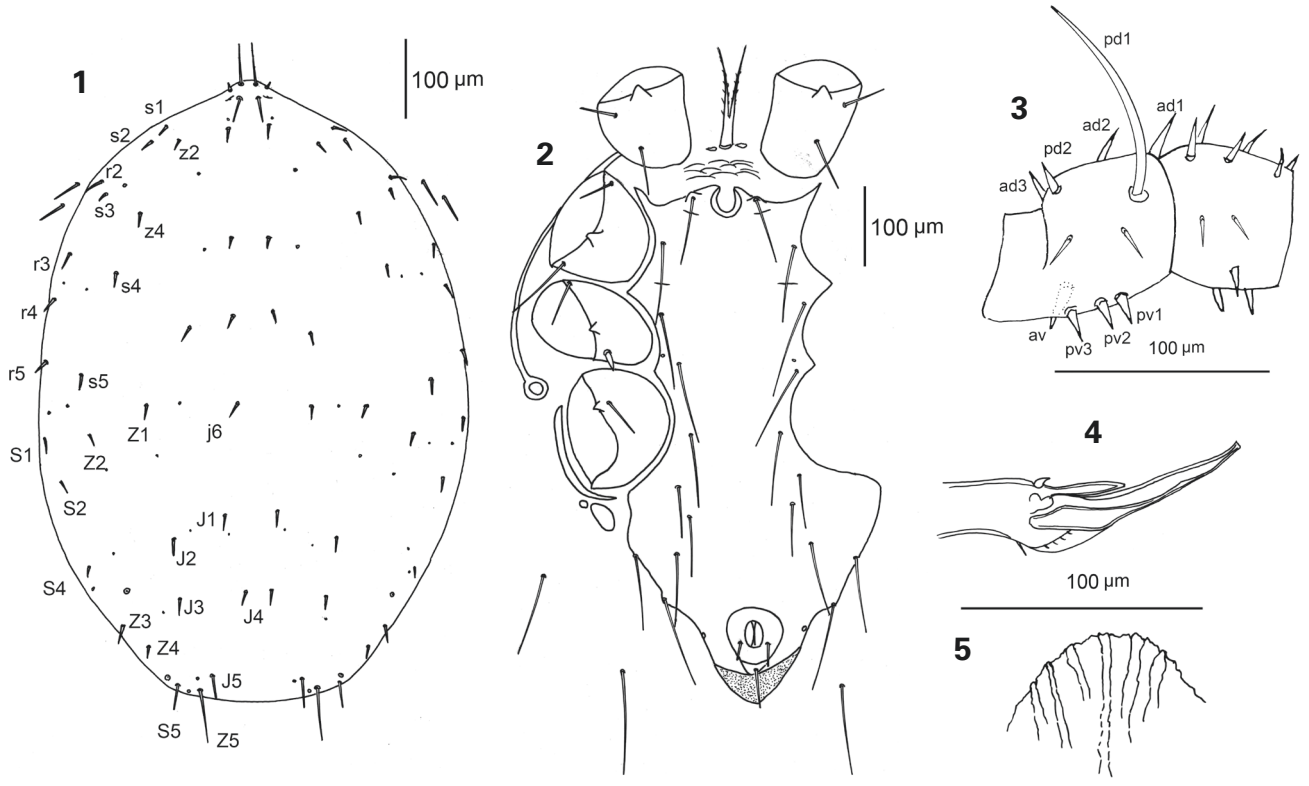
Legs: All tarsi with well-developed ambulacrum and a pair of claws, those on tarsus I smallest. Leg IV longest (820–850 µm), longer than idiosoma, other legs shorter than idiosoma. Chaetotaxy: Leg I: coxa 0 0/1 0/1 0 (*av* displaced posteriorly, much longer than *pv)*, trochanter 1 0/2 1/1 1, femur 2 3/1 2/3 2 (ventral setae displaced laterally, thick, blunt, spine-like; *pd1* greatly elongated, Figure 3), genu 2 3/2 3/1 2 (dorsal setae thick, blunt, spine-like), tibia 2 3/2 3/1 2. Leg II: coxa 0 0/1 0/1 0 (*pv* much longer and thicker than *av*), trochanter 1 0/2 0/1 1, femur 2 3/1 2/2 1 (ventral setae thick, blunt, spine-like), genu 2 3/1 2/1 2 (ventral setae thick, blunt, spine-like), tibia 2 2/1 2/1 2 (ventral setae thick, blunt, spine-like), tarsus 3 3/2 3/2 3 + *mv*, *md*, *al2* and *pl2* very long and thick. Leg III: coxa 0 0/1 0/1 0 (*pv* short, thick, spine-like), trochanter 1 0/2 0/1 1, femur 1 2/1 1/0 1, genu 2 2/1 2/1 1 (*pv* short, thick, spine-like), tibia 2 1/1 2/1 1 (*pv* short, thick, spine-like), tarsus 3 3/2 3/2 3 + *mv, md*. Leg IV: coxa 0 0/1 0/0 0, trochanter 1 0/2 0/1 1, femur 1 2/1 1/0 1, genu 2 2/1 3/0 1, tibia 2 1/1 3/1 2, tarsus 3 3/2 3/2 3 + *mv, md*.

Gnathosoma: As for female except movable digit of chelicera with very long upturned spermatodactyl, arthrodial membrane with a series of short filaments; fixed digit reduced, membranous, with bluntly tapering tip; dorsal seta robust, curved (Figure 4).

NOTES

Laelaps lybacia was described from the Shark Bay mouse on Bernier Island. It was previously known only from one female specimen. The females examined here agree with the description and illustrations in Domrow (1979, 1988). The male is described here for the first time. The male described here is identified as that of *L. lybacia* on the grounds of its association with females of *L. lybacia*. On five occasions males of the type described here were found on the same individual host as females of *L. lybacia*, with no other mites present. Most of the setae on the dorsal shield of the male are longer than the corresponding setae in the female.

Domrow (1979) did not describe the epistome of *L. lybacia*, but described that of the related species *L. janalis* as 'soft and diaphanous, apparently with two small lobes in median indentation', and that of *L. bycalia* as having 'four small weak median lobes'. The epistome of *L. lybacia* is not visible in most of the specimens examined here, but can sometimes be seen as an unsclerotised membranous arch, with a series of radiating lobes (Figure 5). Domrow (1979) described 19 pairs of podonotal setae and 14 opisthonotal pairs in the female, with *z3* and *S3* absent, and that interpretation is provisionally accepted here (Figure 1).



FIGURES 1–5 *Laelaps lybacia*. 1) male, dorsal idiosoma; 2) male ventral idiosoma; 3) male, leg I femur and genu, posterior face; 4) male, chelicera; 5) female, epistome.

Laelaps rothschildi Hirst, 1914

Laelaps rothschildi Hirst, 1914: 325.

Laelaps melomys Womersley, 1937: 534 (synonymy by Domrow and Smith, 1956).

Laelaps rothschildi.— Domrow, 1956: 202; Domrow, 1965; 19; Domrow, 1977: 215; Domrow, 1988: 840.

MATERIAL EXAMINED

Australia: ***Western Australia***: 30 ♀, 2 deutonymphs, Salutation Island, on *Leporillus conditor*, 19–21 May 2021.

NOTES

The female specimens identified as *Laelaps rothschildi* are consistent with the key to species of *Laelaps* in Domrow (1988) — dorsal shield setae short, not reaching next posterior seta; setae *px2* and *px3* present; posterior seta on coxa II fine and pointed; posterior seta on coxa III thick, blunt, spur-like; genitoventral shield greatly expanded behind coxae IV, its lateral margins sinuous, widest between third pair of setae, ratio of its width to length behind genital setae 2.0, distance between fourth pair of setae greater than width of anal shield, posterior margin of genitoventral shield concave, partly enclosing anal shield. The deutonymphs agree well with the description and illustration in Domrow (1977).

Domrow (1973) compared *L. rothschildi* with the related species *L. aella* Domrow, 1973. These two species differ in the shape of the genitoventral and anal shields. The post-anal seta is inserted in the normal sclerotised area of the anal shield in *L. rothschildi*, but in unsclerotised cuticle in *L.aella*. Seta *pd1* on femur II is longer than surrounding setae in *L. aella*, much more strongly so in *L. rothschildi*.

Domrow (1962, 1967, 1973) referred to an apparent giant variety of *L. rothschildi* that occurs on the giant white-tailed rat *Uromys caudimaculatus* (Krefft 1867) in north Queensland, and whose taxonomic status remains unresolved. In the specimens examined here the dorsal shield measures 924–1016 µm long x 609–680 µm wide (n=10), which is consistent with the length 0.95–1.2 mm orginally described for *L. rothschildi* by Hirst (1914) and the 1.2 mm for its synonym *L. melomys* Womersley, 1937.

Laelaps rothschildi occurs in northern Australia from 'coastal N. Australia (The Kimberley to SE. Queensland, including Atherton Tableland)' (Domrow 1988). Its hosts include multiple species of rodents and marsupials. The specimens examined here indicate a significant southward extension of its known range in Western Australia, and the first record of its occurrence on *Leporillus conditor*. This species of host was once widespread in semi-arid areas of southern Australia, but was reduced to a population on the Franklin Islands of South Australia following European settlement (Short et al. 2019). That population formed the basis of a captive breeding program followed by re-introduction to a range of sites including Salutation Island. This dramatic disruption of the biogeography of *L. conditor* may have had unpredictable effects on the biology of its parasites, and may have included contact with other species of hosts in captivity.

Laelaps spatanges Domrow, 1973

Laelaps spatanges Domrow, 1973: 73.

Laelaps spatanges.— Domrow, 1988: 841.

MATERIAL EXAMINED

Australia: ***Western Australia***: Dirk Hartog Island: 8 ♀, on *Pseudomys hermannsburgensis*, 13 May 2021 to 10 May 2022; 1 ♀, on *Mus musculus*, 23 May 2021.

NOTES

The females identified as *Laelaps spatanges* are consistent with the key to species of *Laelaps* in Domrow (1988) — dorsal shield setae *px2* present, *px3* absent; dorsal shield setae long, J5 projecting well beyond posterior margin of shield; genitoventral shield narrow, fourth pair of setae inserted in its postero-lateral corners; posterior seta on coxa I not spinose. The male is not known and was not present in the material examined here.

Laelaps spatanges has been recorded on several species of *Pseudomys* from scattered localities in northern Australia (Domrow 1973, 1988; Weaver and Smales 2012), and on *Pseudomys pilligaensis* in Taronga Zoo (Domrow 1992). The specimens examined here indicate a significant southward extension of its known range in Western Australia.

Mesolaelaps australiensis (Hirst, 1926)

Laelaps (*Mesolaelaps*) *australiensis* Hirst, 1926: 840.

Mesolaelaps australiensis.— Domrow, 1956: 203; Domrow, 1988: 8.

MATERIAL EXAMINED

Australia: ***Western Australia***: 1 ♀, Bernier Island, 28 April 2022, on *Pseudomys gouldii*.

NOTES

Mesolaelaps australiensis is very abundant and widespread in Australia and neighbouring countries on a wide variety of hosts, including birds and their nests, lizards, marsupials, and rodents (Domrow 1979, 1988). Its host range is now extended further to include *Pseudomys gouldii*. Previous records in Western Australian include several sites in the Kimberley and Mitchell Plateau, and the Wanjarri Nature Reserve (near Wiluna), inland from Shark Bay. The specimen examined here is in excellent agreement with the descriptions and illustrations in Hirst (1926) and Domrow (1988).

DISCUSSION

The females of the species discussed here are easily distinguished from each other. *Mesolaelaps australiensis* has four pairs of ventral setae on tibia I, while all the species of *Laelaps* have three. In *Laelaps rothschildi* the anal shield is wider than long, and is embraced by the concave posterior margin of the genital shield (Hirst 1914). In *L. lybacia* and *L. spatanges* the anal shield is longer than wide, and clearly separated

from the genital shield (Domrow 1973, 1979). In *L. lybacia* the genital shield has a broad, slightly concave posterior margin and bears four pairs of setae, two of which are minute (Domrow 1979). In *L. spatanges* the genital shield has a rounded and convex posterior margin and bears four pairs of very long setae (Domrow 1973). In *L. spatanges* the dorsal shield setae are very long and conspicuous, long enough to reach past the next posterior seta (Domrow 1973). In *L. rothschildi* and *L. lybacia* these setae are minute (Domrow 1963, 1979).

The results presented here add further information about the host range of the studied mites. *Laelaps rothschildi* was found on *Leporillus conditor*, which appears to be the first record of a parasitic mite on this host. *Laelaps spatanges* was found on its previously-known host *Pseudomys hermannsburgensis* and on *Mus musculus*; *Pseudomys gouldii* is a new host record for *Laelaps lybacia*. Only one of the hosts examined was found to carry two species of Laelapidae — one of the specimens of *Pseudomys gouldii* carried one specimen of *Laelaps lybacia* and one specimen of *Mesolaelaps australiensis*.

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ANIMAL ETHICS STATEMENT

All sampling was conducted as approved by and in accordance with the Murdoch University Animal ethics committee (RW 3307/21; RW3215/20; RW3305/21, Cadaver 713), and Department of Biodiversity, Conservation and Attractions (DBCA) ethics committee (2021-03A; 2021-08A; 2019-23A) and DBCA permits (TFA2021-0035, F025000276).

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