



# A new species of *Leptus* (Trombidiformes: Erythraeidae) from Australia

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## Abstract

A new species of the genus *Leptus*, *L. (L.) brevitarsus* sp. n., is described and illustrated from ectoparasitic larvae collected from grasshoppers (Orthoptera: Acrididae) in Australia. The new species belongs to the *phalangii* species group and *torresianus* species subgroup. An updated key to species of *torresianus* species subgroup is presented.

**Keywords** Acari · Acrididae · *Austroicetes cruciate* · Key · *Phalangii* species group · *Torresianus* species subgroup

## Introduction

The cosmopolitan genus *Leptus* is the biggest genus in the family Erythraeidae with about 231 species described based on larval or larval and post-larval forms (Haitlinger and Šundić 2020; Hakimitabar et al. 2020, 2021; Haitlinger et al. 2020a, b; Saboori et al. 2020, 2024; Xu et al. 2022a; Kapankaya et al. 2023; Khoobdel and Pakarpour Rayeni 2023). Kapankaya et al. (2023) wrote that 13 species have been described after Saboori et al. (2020) but they included only 11 species. The names of two species described by Xu

et al. (2022b) are not available because the descriptions were issued in electronic form only and the paper is not correctly registered in Zoobank (see ICZN 2012).

Australia has a rich fauna of *Leptus*, including the species described by Southcott (1991, 1993, 1999) and catalogued by Mağol and Wohltmann (2012), but no new species have been described since 1999. The Australian National Insect Collection includes a large number of specimens of *Leptus* that were examined by H.G. Womersley and R.V. Southcott, but which have not been formally described. Womersley applied the name *Leptus (L.) brevitarsus* to one of those undescribed species. After Womersley's passing, Southcott added some handwritten notes to the slide labels (main characters of the species) but did not describe this species either. Our purpose in this paper is to formalise the description of that species and present an updated key to *torresianus* species subgroup.

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## Materials and methods

The description is mainly based on four specimens examined by the first author, with additional data from 50 specimens examined by the second author. Figures were drawn and measurements were calculated using an AxioImager A2 (Carl Zeiss, Germany) compound microscope with phase contrast and DIC illumination. The photomicrograph was taken with an AxioCam 506 color (Carl Zeiss, Germany) digital camera. The digital figures were prepared using Adobe Illustrator version 2022 based on the original pencil line drawings. Measurements are given in micrometres (µm). Terminology and abbreviations follow Robaux

(1974), Southcott (1992) and Saboori et al. (2009) except for Anterior Sensillary setae (ASens) and Posterior Sensillary setae (PSens).

### *Leptus (L.) brevitarsus* sp. n. (Figs. 1, 2, 3)

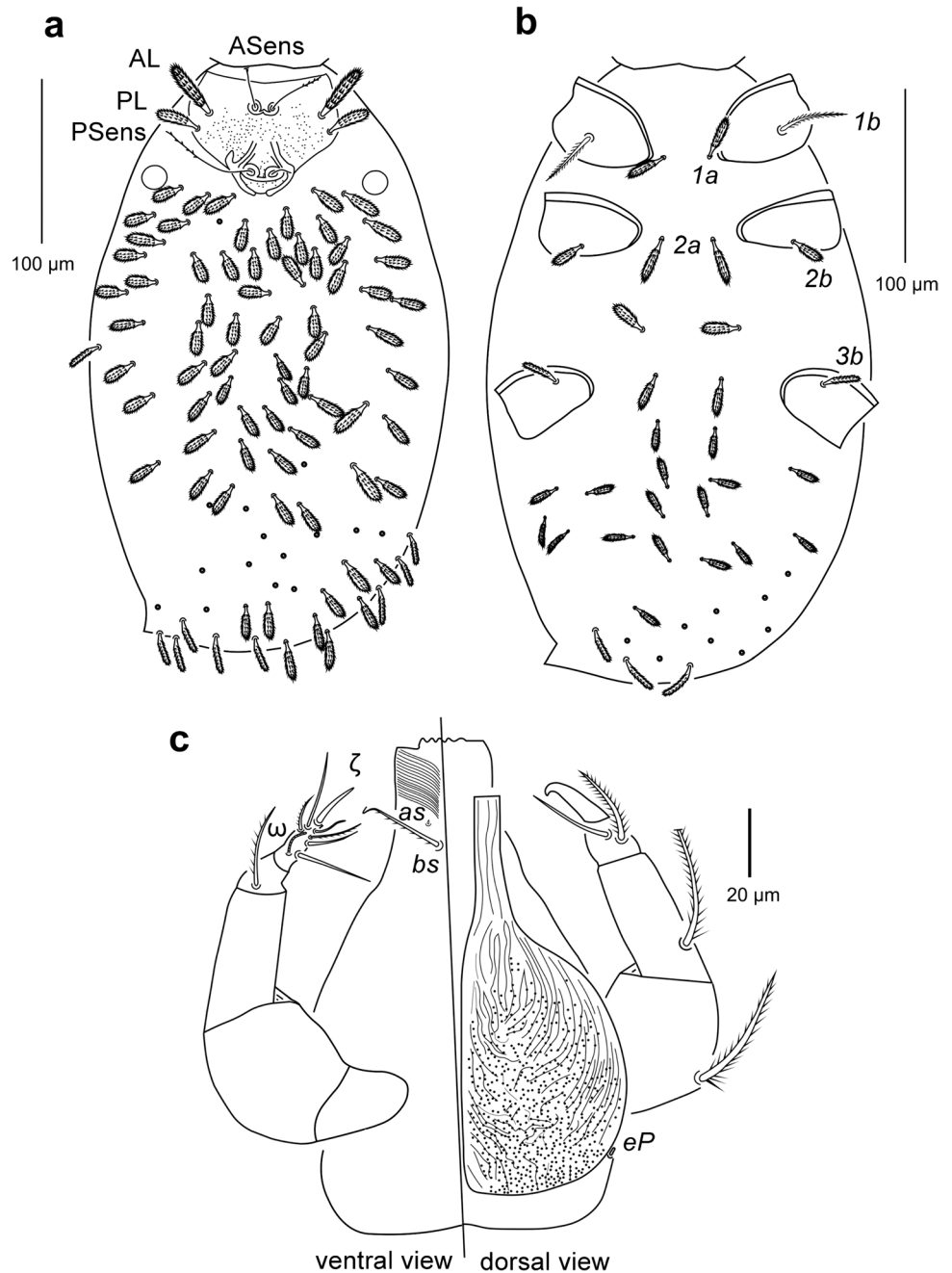
<https://zoobank.org/urn:lsid:zoobank.org:act:7624FC4F-D46D-4A6C-8390-F31400F8A2B6>

**Diagnosis.** Larva. With characters of the *torresianus* species subgroup, Ti I 88–100, Ti III 112–126, AW/AL 1.72–2.53.

### Description

Larva ( $n=4$ ). Gnathosoma cone-shaped, 147–163 long (chelicerae are broken from the distal end of the first segment) with galealae (*cs*) 14–17 in length (only can be seen

**Fig. 1** *Leptus brevitarsus* sp. n. (holotype larva). **a** Dorsal view of idiosoma; **b** ventral view of idiosoma; **c** gnathosoma





**Fig. 2** *Leptus brevitarsus* sp. n. (larva). Scutum and idiosomal setae in one paratype (ARS-20230922-1d)

in some paratypes; anterior part of gnathosoma broken in most specimens) and barbed, and with one pair of posterior hypostomalae (*bs*), barbed and 23–33 in length, and one pair of anterior hypostomalae (*as*) very minute. Palp trochanter without seta, palpal femur and genu each with one barbed seta, palpal tibia with one nude and two barbed setae, palpal tarsus with eight setae including a solenidion and an eupathidium. Subcapitulum, and all palpal segments punctate. Cheliceral bases with punctations and striations; striations thicker in distal half (Fig. 1c). Supracoxal seta of palp (*eP*), minute, 3–4 in length, peg-like.  $fPp=0-B-B-BNB-2B4N\omega\zeta$  (Fig. 1c).

Idiosoma oval with ~83–96 barbed short dorsal setae. Scutum sparsely punctate except anterolateral angles which are smooth (in holotype more parts are smooth as shown in Fig. 1a), wider than long with concave anterior border, almost straight anterolateral borders, and slightly concave posterolateral borders (Figs. 1a, 2); AL longer than PL, both with many barbs. Anterior pair of sensilla (ASens) shorter than posterior one (PSens), both barbed in distal half (Fig. 1a), ASens bases placed anterior to AL bases. One eye on each side of scutum, 14–17 in diameter, both circular.

Ventral surface of idiosoma with barbed sternalae; two barbed sternalae between each coxae I and II (*1a* and *2a*, respectively); four barbed intercoxalae between coxae II and III and 26–34 barbed setae behind coxae III (Fig. 1b). Coxal fields punctate. NDV = 119–134.

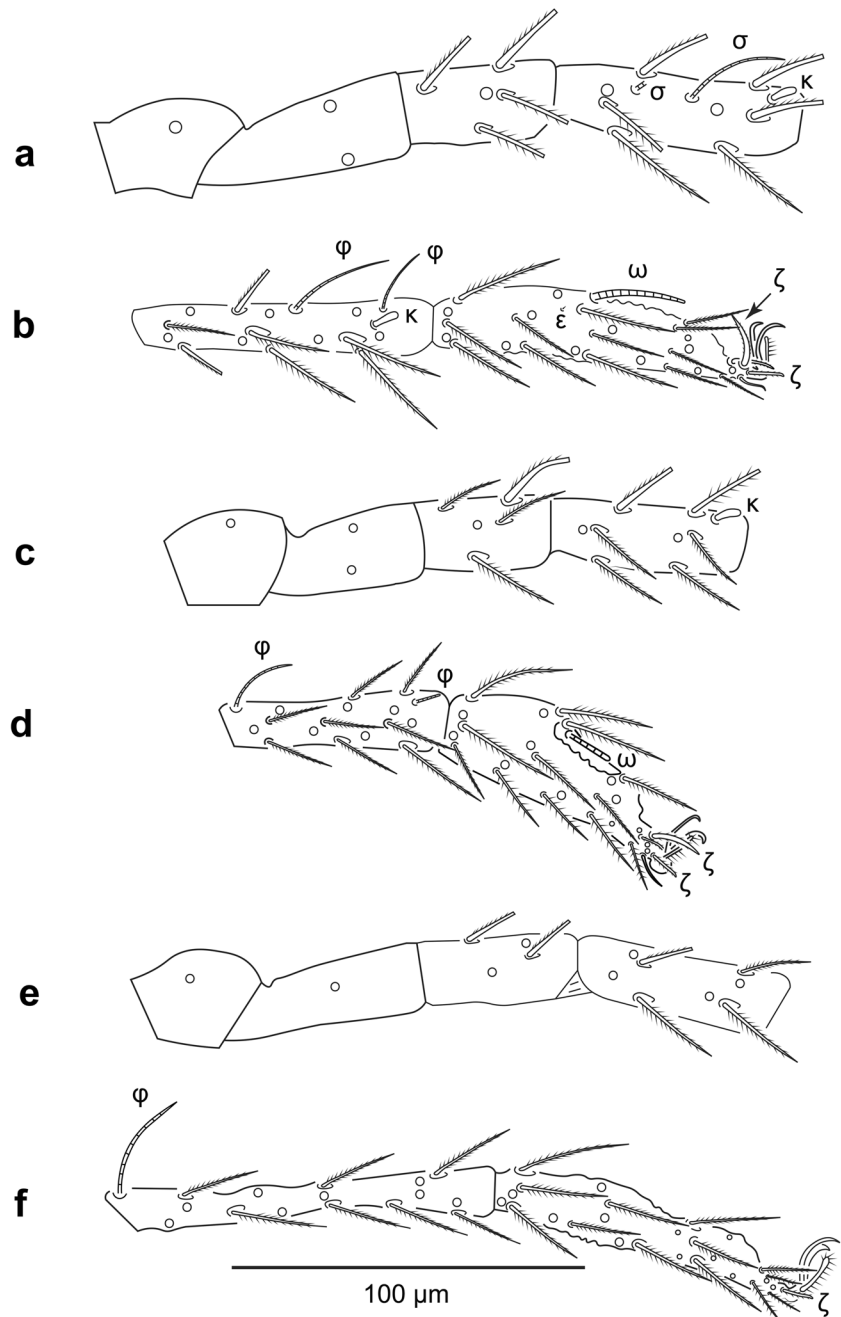
Leg setal formula: Leg I (Fig. 3a, b): Ta- 1 $\omega$ , 2 $\zeta$ , 1 $\epsilon$ , 27–28n; Ti- 2 $\phi$ , 1 $\kappa$ , 14n; Ge- 2 $\sigma$ , 1 $\kappa$ , 8n; TFe- 5n (in one paratype 4n only on one side); BFe- 2n; Tr- 1n. Leg II (Fig. 3c, d): Ta- 1 $\omega$ , 2 $\zeta$ , 26n; Ti- 2 $\phi$ , 15n; Ge- 1 $\kappa$ , 8n; TFe- 5n; BFe- 2n; Tr- 1n. Leg III (Fig. 3e, f): Ta- 1 $\zeta$ , 26n; Ti- 1 $\phi$ , 15n; Ge- 8n; TFe- 5n; BFe- 1n; Tr- 1n. Microseta on Ti I placed slightly proximal to distal solenidion. It is not common in *Leptus* species. Solenidion on Ta II placed in a big cavity and famulus was not visible.

Measurements are given in Table 1.

### Type material

*Holotype* larva, 4 miles NNE of Holt Rock, Western Australia, 32°38' S × 119°26' E, 3 November 1947, on a male grasshopper *Austroicetes cruciata*, collector not known (ANIC 52–003969). *Paratypes*: 1 larva, same data as holotype (ARS-20230922-1b); 2 larvae, 4 miles south of Lake Grace, Western Australia, 33°10' S × 118°28' E, 4 November 1947, on female *Austroicetes cruciata*, collector not known (ARS-20230922-1c, ARS-20230922-1d); 10 larvae, 36 miles east of Ongerup, Western Australia, 33°58' S × 119°00' E, 9 November 1947, on *A. cruciata* female (ANIC 52–003970 – ANIC 52–003979); 1 larva, 2 miles SSW of Ravensthorpe, Western Australia, 33°36' S × 120°02' E, 10 November 1947, on *A. cruciata* male (ANIC 52–003980); 3 larvae, 9 miles east of Yellowdine, Western Australia, 31°10' S × 119°50', 2 November 1947, on *A. cruciata* female (ANIC 52–003981); 2 larvae, 4 miles NNE of Holt Rock, Western Australia, 32°39' S × 119°28' E, 3 November 1947, on *A. cruciata* female (ANIC 52–003982, ANIC 52–003983); 3 larvae, 4 miles south of Lake Grace, Western Australia, 33°09' S × 118°29' E, 4 November 1947, on *A. cruciata* female (ANIC 52–003984, ANIC 52–003985, ANIC 52–003986); 7 larvae, 4 miles south of Lake Grace, Western Australia, 33°09' S × 118°29' E, 4 November 1947, on *Austroicetes arida* female (ANIC 52–003987 – ANIC 52–003993); 2 larvae, 6 miles west of Newdegate, Western Australia, 33°06' S × 118°54' E, 4 November 1947, on *A. arida* female (ANIC 52–003994, ANIC 52–003995); 2 larvae, 4 miles SE of Pingrup, Western Australia, 33°34' S × 118°32' E, 4 November 1947, on *A. arida* female (ANIC 52–003996, ANIC 52–003997); 18 larvae, 2 miles SSW of Ravensthorpe, Western Australia, 33°36' S × 120°02' E, 4 November 1947, on *Austroicetes vulgaris corallipes* male (ANIC 52–003998 – ANIC 53–004015); 1 larva, 2 miles SSW of Ravensthorpe, Western Australia,

**Fig. 3** *Leptus brevitarsus* sp. n. (holotype larva). **a** Tr–Ge I; **b** Ti–Ta I; **c** Tr–Ge II; **d** Ti–Ta II; **e** Tr–Ge III; **f** Ti–Ta III



33°36' S × 120°02' E, 10 November 1947, on *A. vulgaris corallipes* male (ANIC 53–004016); 2 larvae, 7 miles SE of Deakin, Western Australia, 30°49' S × 129°00' E, 24 October 1947, on *Chortoicetes terminifera* (ANIC 53–004017, ANIC 53–004018); 1 larva, 1 mile north of Wirrappa, South Australia, 31°24' S × 136°59' E, 14 October 1947, on *C. terminifera* (ANIC 53–004019); 1 larva, 2 miles WNW of Kingoonya, South Australia, 30°54' S × 135°15' E, 16 October 1947, on *C. terminifera* (ANIC 53–004020); 2 larvae, Forster to Cape Hawke, New South Wales, 32°12' S × 152°33' E, 15 December 1947, on *Praxibulus laminatus* female (ANIC

53–004021, ANIC 53–004022); 3 larvae, Forster, New South Wales, 32°12' S × 152°31' E, 4 December 1947, on *P. laminatus* male (ANIC 53–004023, ANIC 53–004025); 1 larva, Goolong to Forbes, New South Wales, 33°29' S × 148°17' E, 27 November 1947, on *C. terminifera* female (ANIC 53–004026). The holotype and 57 paratypes are deposited in the Australian National Insect Collection, CSIRO, Canberra ACT, Australia (ANIC). Three paratypes are deposited in the Acarological Collection, Jalal Afshar Zoological Museum (JAZM), Department of Plant Protection, Faculty of Agriculture, University of Tehran, Karaj, Iran.

**Table 1** Metric data of *Leptus brevitarsus* sp. n. (larva)

Character	Holotype	Paratypes (n = 3)	Character	Holotype	Paratypes (n = 3)
IL	365	244–638	Ge I	73	71–80
IW	226	195–362	TFe I	45	44–52
SD	76	76–89	BFe I	58	55–62
W	88	83–94	Tr I	34	32–34
AW	73	66–76	Cx I	50	51–54
PW	81	74–86	Leg I	445	435–480
MA (AAS)	32	29–33	Ta II (L)	75	71–86
SBa	12	9–15	Ta II (H)	26	23–26
SBp	14	13–15	Ti II	66	64–70
ISD	40	42–45	Ge II	57	54–60
AP	13	10–12	TFe II	39	38–42
AL	35	26–44	BFe II	41	38–45
PL	26	17–25	Tr II	36	28–32
ASens	27	23–34	Cx II	48	53–55
PSens	55	52–57	Leg II	362	352–385
DS	17–26	17–27	Ta III (L)	92	97–98
PDS	22–25	19–27	Ta III (H)	18	17–18
1a	25	25–28	Ti III	112	118–126
1b	43	32–42	Ge III	61	65–66
2a	30	25–30	TFe III	45	52–55
2b	20	20–23	BFe III	57	61
3b	21	22–30	Tr III	37	32–36
GL	153	147–163	Cx III	47	47–52
PaScFed	34	31–36	Leg III	451	481–484
PaScGed	36	34–36	IP	1258	1339–1340
bs	23	26–33	Ti I/AW	1.21	1.22–1.36
cs	-	14–17	Ti III/AW	1.53	1.59–1.65
as	-	-	AW/AL	2.08	1.72–2.53
ASBM	6	8–11	AL/AAS	1.09	0.89–1.33
ASBa	25	24–32	Ti III/Ti I	1.27	1.26–1.29
LX	26	26–33	Ti II/PW	0.81	0.80–0.86
Ta I (L)	97	92–109	SD/W	0.86	0.91–0.94
Ta I (H)	21	19–22	PW/AW	1.10	1.12–1.13
Ti I	88	90–100	AL/PL	1.34	1.18–2.23

**Etymology**

The name *brevitarsus* (Latin *brevi*, short) refers to the short tarsi of the species. It was named by H. Womersley.

**Remarks**

The new species belongs to *phalangii* species group and *torresianus* species subgroup in having one seta on each palpal femur and genu, four setae between coxae II-III, BFe III and TFe I without solenidion and Ge I with two solenidia (see Saboori et al. 2020). There are three species in this subgroup *i.e.* *L. (L.) torresianus* Southcott, 1988, *L. (L.) francesi* Southcott, 1991, *L. (L.) multisolenidia* Mayoral & Barranco, 2011. Two of them were collected from Australia

and only *L. (L.) multisolenidia* was collected from French Guiana (South America).

The new species differs from all species of the subgroup in the placement of microseta on Ti I which is placed slightly prior to distal solenidia. In other species of the subgroup, it placed distinctly after distal solenidia. Also, it differs from *L. (L.) multisolenidialae* in the number of solenidia on Ge III (0 vs. 7–9), on Ge II (0 vs. 2), cheliceral bases (striate and punctate vs. only punctate), IP (1258–1340 vs. 2813–3097) and measurements of all leg segments; from *L. (L.) francesi* in the number of solenidia on Ti III (1 vs. 2), on Ti II (2 vs. 3), cheliceral bases (striate and punctate vs. only punctate), Ge I (71–80 vs. 126–143), Ti I (88–100 vs. 166–195), Ta I (97–109 vs. 152–159), Ge II (54–60 vs. 107–124), Ti II (64–70 vs. 149–184), Ta II (71–86 vs. 129–136), Ge III



(61–66 vs. 116–147), Ti III (112–126 vs. 199–246), Ta III (92–98 vs. 141–154) and from *L. (L.) torresianus* in the fd (~83–96 vs. 50), cheliceral bases (striate and punctate vs. smooth), Ge I (71–80 vs. 155–160), Ti I (88–100 vs. 226–230), Ta I (97–109 vs. 162–165), Ge II (54–60 vs. 122–140), Ti II (64–70 vs. 195–199), Ta II (71–86 vs. 138–140), Ge III (61–66 vs. 139–155), Ti III (112–126 vs. 267–288), Ta III (92–98 vs. 156–160).

### Key to species of *torresianus* species subgroup (modified after Saboori et al. 2020)

1. Ge II with 2 solenidia, Ge III with 7–9 solenidia ..... *L. (L.) multisolenidiae*, French Guiana – Ge II & III without solenidion ..... 2
2. Ti II with 3 solenidia, Ti III with 2 solenidia ..... (*L. (L.) francesi*, Australia – Ti II with 2 solenidia, Ti III with 1 solenidion ..... 3
3. Ti I 226–230, Ti III 267–288 ..... *L. (L.) torresianus*, Australia – Ti I 88–100, Ti III 112–126 ..... (*L. (L.) brevitarsus* sp. n., Australia

## Discussion

The specimens examined here show that *Leptus brevitarsus* occurs in most areas of Australia. The species in the *Leptus torresianus* subgroup occur on a wide variety of hosts – *L. torresianus* was described from two species of cicadas (Hemiptera: Cicadidae), *L. francesi* from two species of flies (Diptera: Culicidae and Tabanidae), and *L. multisolenidiae* from a grasshopper (Orthoptera: Acrididae). We now add *L. brevitarsus* from several species of grasshoppers. Observations like these make it clear that the classification of species in the genus *Leptus* does not follow the classification of their hosts.

## Declarations

**Conflict of interest** The authors declare that there is no conflict of interest.

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