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ORIGINAL ARTICLE

# The second species of the subgenus *Leptus* (*Amaroptus*) (Trombidiformes: Erythraeidae) from Türkiye

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## Abstract

A new species of the subgenus *Leptus* (*Amaroptus*), *L.* (*A.*) *sivasensis* **sp. n.**, is described and illustrated from an ectoparasitic larva collected from *Cerceris sabulosa* (Panzer, 1799) (Hymenoptera: Crabronidae) in İmranlı district of Sivas province, Türkiye. The holotype and paratypes of *Leptus* (*Amaroptus*) *vuki* are studied and some corrections to the original description are presented. Also, new metric data and host records are given for *L.* (*L.*) *tridentatus* and *L.* (*L.*) *rosellae*, and intraspecific differences of both species are discussed.

**Keywords** Acari · *Cerceris sabulosa* · Larva · Mite · New species · Parasitengona · Prostigmata

## Introduction

The genus *Leptus* (Trombidiformes: Erythraeidae) is divided into two subgenera, *Leptus* (*Leptus*) Latreille, 1796 and *Leptus* (*Amaroptus*) Haitlinger, 2000. The subgenus *Leptus* (*Leptus*) has 234 species whereas *Leptus* (*Amaroptus*) has only one species up to now (Haitlinger 2000; Saboori et al. 2020; Kapankaya et al. 2023).

Compared to other terrestrial Parasitengona, studies on the genus *Leptus* in Türkiye are still at the starting point. Until quite recently, this genus was represented in Türkiye only by *L.* (*L.*) *rosellae*, which was described by Haitlinger (1999). After that, the following six species of *Leptus* were recently reported from Türkiye: *Leptus* (*L.*) *esmailii* Saboori & Ostovan, 2000; *Leptus* (*L.*) *tridentatus* Saboori et al., 2018; *Leptus* (*L.*) *dubius* Paoli, 1937; *Leptus* (*L.*) *pouryayevalii* Hakimitabar et al., 2021; *Leptus* (*L.*) *baspinari* Kapankaya et al., 2023; *Leptus (L.) molochinus* (Koch, 1837) (Haitlinger 1999; Pamuk and Sevsay 2020; Karakurt and Sevsay 2021; Can and Saboori 2023; Kapankaya et al. 2023).

In this study, a new species of *Leptus* (*Amaroptus*) is described from İmranlı district of Sivas province, Türkiye. The only hitherto known member of the subgenus *L.* (*Amaroptus*), *Leptus* (*A.*) *vuki* Haitlinger, 2000 was described as ectoparasitic on unidentified Catantopinnae (Orthoptera: Acrididae) from Puerto Maldonado, Peru. The holotype and paratypes of *L.* (*A.*) *vuki* were studied. Also, we present new metric data for *L.* (*L.*) *tridentatus* and *L.* (*L.*) *rosellae* which were reported only from their original locality.

## Materials and methods

The mite specimen was detached from the host wasp by an insect pin, cleared in Nesbitt's fluid, and mounted on microscope slides using Hoyer's medium (Walter and Krantz 2009). Figures were drawn, and measurements were

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calculated using an AxioImager A2 (Carl Zeiss, Germany) compound microscope with phase contrast and DIC illumination. Photomicrographs were taken with an AxioCam 506 color (Carl Zeiss, Germany) digital camera. Measurements are given in micrometers (µm). Terminology and abbreviations follow Southcott (1992) and Wohltmann et al. (2007) except for: PPL = post-posterolateral seta or its length, AL-PPL = distance between AL and PPL bases, PL-PPL = distance between PL and PPL bases, and PPW = distance between PPL bases (Goff et al. 1982). For hosts and localities of specimens of *L.* (*L.*) *tridentatus* and *L.* (*L.*) *rosellae*, see Can and Saboori (2023). The specimens of these two species are deposited in the Acarological Collection, Jalal Afshar Zoological Museum, Department of Plant Protection, Faculty of Agriculture, University of Tehran, Karaj, Iran.

### *Leptus* (*Amaroptus*) *sivasensis* sp. n. (Figs. 1, 2 and 3)

**Diagnosis.** Larva. Palpal femur with one and genu with two setae, two setae between coxae I–II, 25 setae between coxae II-III, 56 setae behind coxae III, fD 188, PSens placed before PL bases, Ti I 180, Ti II 151, Ti III 228, Ti III/AW 2.45.

**Description.** Larva. Gnathosoma cone-shaped, > 189 long (chelicerae are broken from the distal part of the first segment) with galealae (*cs*) 31 in length and with one barb, and with two pairs of hypostomalae, anterior hypostomala (*as*) spine-like, very short and 2 in length, posterior hypostomalae (*bs*) barbed and 33 in length. Palp trochanter without seta, palpal femur with one barbed seta, and palpal genu with two barbed setae, palpal tibia with three barbed setae, palpal tarsus with eight setae including a solenidion and an eupathidium. Chelicerae, subcapitulum, palpal trochanters and femora with punctation. Supracoxal seta of palp (*eP*), minute, peg-like. fPp = 0-B-B-BBB-3B3Nωζ (Fig. 1d).

Idiosoma oval with 188 barbed dorsal setae. Scutum punctate except anterolateral angles which are smooth, wider than long with deeply concave anterior border, almost convex anterolateral borders, and straight posterolateral borders; AL slightly longer than PL, both with many barbs. Anterior pair of sensilla (ASens) shorter than posterior one (PSens), both barbed in distal half (Fig. 1a, c). One eye on each side of scutum, 15 in diameter, both circular.

Ventral surface of idiosoma with barbed sternalae; 2 barbed sternalae between each coxae I and II (*1a* and *2a*); 2 setae between coxae I-II close to sternalae II, 25 barbed intercoxalae between coxae II and III and 56 barbed setae behind coxae III (Fig. 1b). Coxal fields punctate. NDV = 188 + 83 = 271.

Leg setal formula: Leg I (Fig. 2a, b): Ta- 1ω, 2ζ, 1ε, 27n; Ti- 2φ, 1κ, 14n; Ge- 1σ, 1κ, 8n; TFe- 5n; BFe- 2n; Tr- 1n. Leg II (Fig. 2c, d): Ta- 1ω, 2ζ, 26n; Ti- 2φ, 15n; Ge- 1κ, 8n; TFe- 5n; BFe- 2n; Tr- 1n. Leg III (Fig. 3a, b): Ta- 1ζ, 26n; Ti- 1φ, 15n; Ge- 8n; TFe- 5n; BFe- 1n; Tr- 1n.

Measurements are given in Table 1.

**Type material** Holotype larva, İmranlı district of Sivas province, Türkiye, 39°54'18.0" N, 38°07'48.0" E, 1775 m a.s.l, İlyas Can col., 7 July 2020, slightly engorged, attached to the posterior part of propodeum, ectoparasitic on *Cerceris sabulosa* (Panzer, 1799) (Hymenoptera: Crabronidae). The holotype is deposited in the Acarological Collection, Jalal Afshar Zoological Museum, Department of Plant Protection, Faculty of Agriculture, University of Tehran, Karaj, Iran.

**Etymology** The specific epithet is derived from the type locality, Sivas.

**Remarks** The new species differs from *L.* (*A.*) *vuki* in the number of setae on palpal genu (2 vs. 1), number of setae between coxae I (2 vs. 7), number of setae between coxae I-II (2 vs. ~42), number of setae between coxae II-III (25 vs. 92), number of setae behind coxae III (56 vs. 140), fD (188 vs. ~ 320), PSens placed before PL bases (vs. PSens placed after PL bases), Ti I (180 vs. 116–122), Ti II (151 vs. 96–106), Ti III (228 vs. 130–136), Ti III/AW (2.45 vs. 1.29–1.35), leg I (773 vs. 520–552), leg II (675 vs. 528–532), and leg III (828 vs. 598–618).

### *Leptus* (*A.*) *vuki* Haitlinger, 2000

We studied the holotype and paratypes of *Leptus* (*A.*) *vuki* and the corrected characters are as follows: number of setae on palpal tarsus is 8, there is no solenidion on Ge II, BFe III with one seta, there is a famulus on each Ta I and Ta II, there are two eupathidia on each Ta I and Ta II and one eupathidium on Ta III, number of normal setae on Ta I-III is 27-26-26. So, the leg setal formula is as follows:

Leg I: Ta- 1ω, 2ζ, 1ε, 27n; Ti- 2φ, 1κ, 14n; Ge- 1σ, 1κ, 8n; TFe- 5n; BFe- 2n; Tr- 1n. Leg II: Ta- 1ω, 2ζ, 26n; Ti- 2φ, 15n; Ge- 1κ, 8n; TFe- 5n; BFe- 2n; Tr- 1n. Leg III: Ta- 1ζ, 26n; Ti- 1φ, 15n; Ge- 8n; TFe- 5n; BFe- 1n; Tr- 1n.

**Remarks** Haitlinger (2000) considered the following characters as diagnosis of the subgenus *Leptus* (*Amaroptus*):

"*Scutum excluding scutalae AL and PL with additional two or more scutalae placed beyond PL. Bases of anterior sensillae are beyond bases of PL. Between coxae I more than four setae. Above eye more than two setae*". The discovery of another species of this subgenus shows that only having more than four scutalae is common for both species and other characters are species-dependent.

The discovery of the subgenus *Leptus* (*Amaroptus*) beyond Peru and on another continent shows a wider distribution of this little-known subgenus. For this reason, we decide to describe the new species based on only one specimen and we hope a greater number of specimens will be found in future research as it was for *L.* (*L.*) *pouryayevalii*

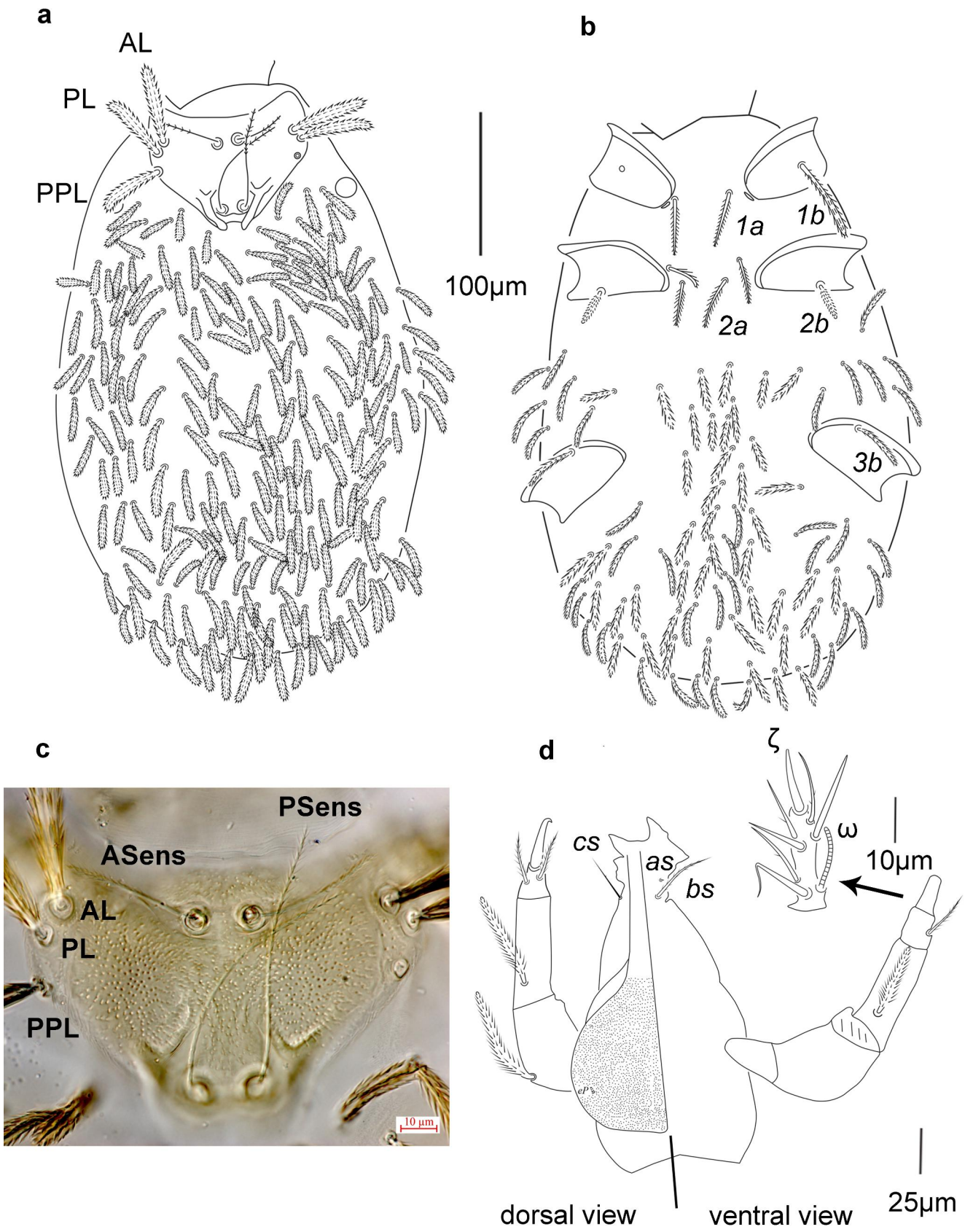


**Fig. 1** *Leptus* (*A.*) *sivasensis* **sp. n.** (larva). **a** Dorsal view of idiosoma; **b** ventral view of idiosoma; **c** scutum; **d** gnathosoma

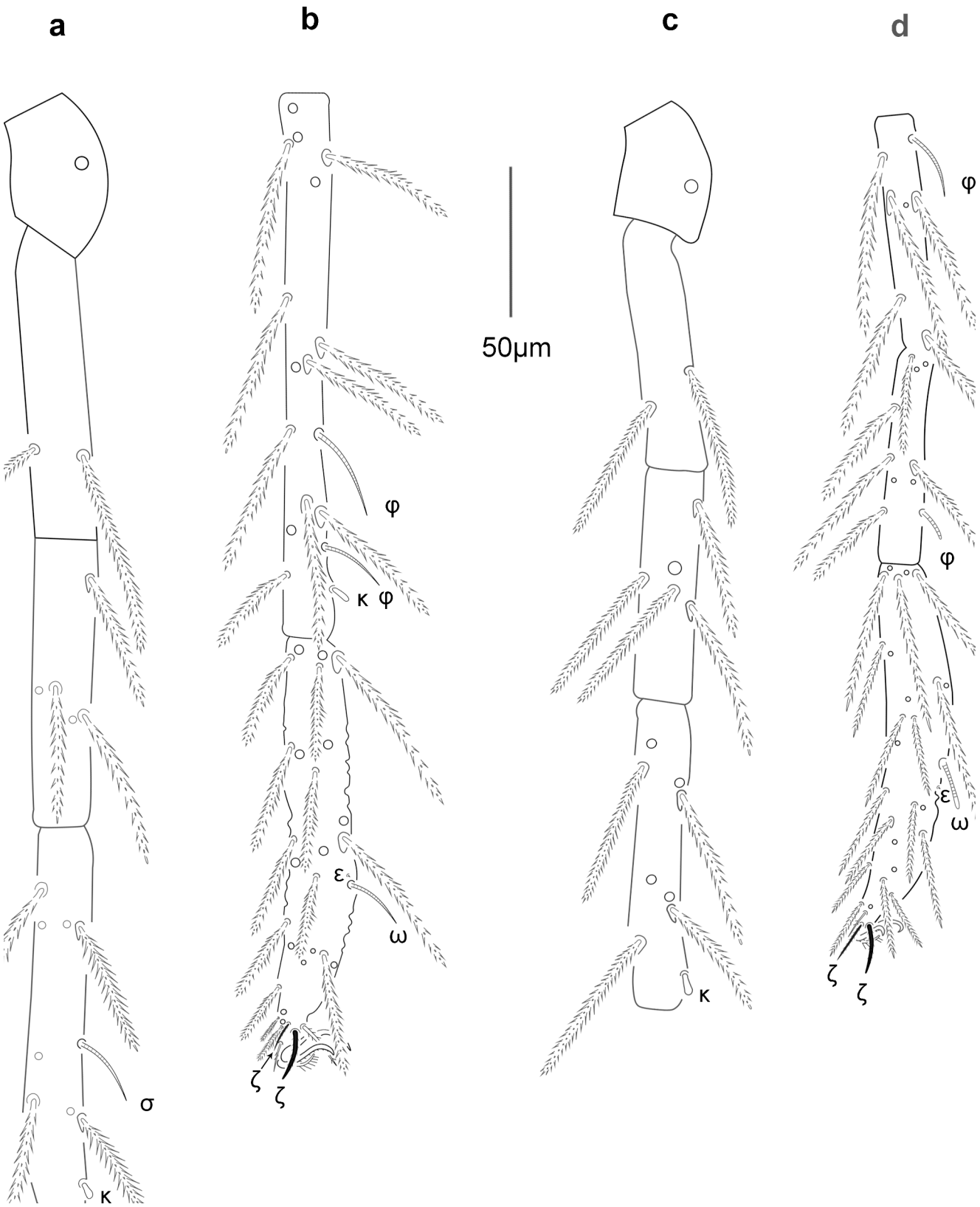


**Fig. 2** *Leptus* (*A.*) *sivasensis* **sp. n.** (larva). **a** Tr–Ge I; **b** Ti–Ta I; **c** Tr–Ge II; **d** Ti –Ta II

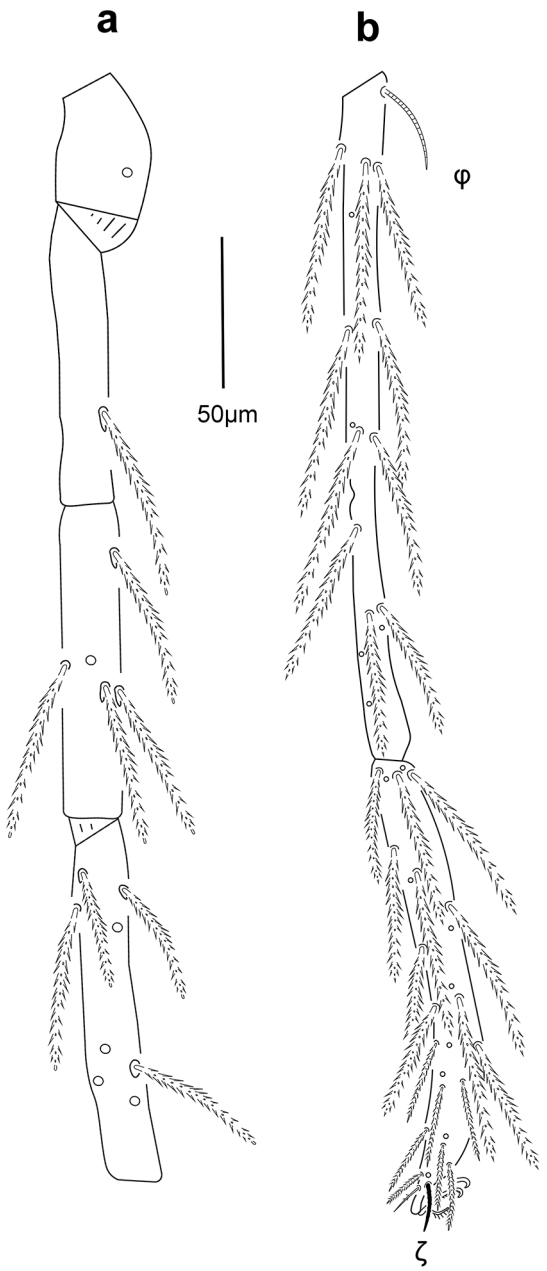


**Fig. 3** *Leptus* (*A.*) *sivasensis* **sp. n.** (larva). **a** Tr–Ge III; **b** Ti–Ta III

which was described based on one specimen but recently it was found in Türkiye (Kapankaya et al. 2023).

### *Leptus* (*L.*) *tridentatus* Saboori et al., 2018

The species was described based on four specimens from Iran. Can and Saboori (2023) reported this species as ectoparasite of Crabronidae wasps. In this study, *Leptus* specimens previously detected on *Prionyx kirbyi* Vander Linden, 1827 (Hymenoptera: Sphecidae) by Can (2022) were identified as *L. tridentatus* (Fig. 4a). Thus, *P. kirbyi* was added as the host of this mite species. Metric data for 23 specimens

**Table 1** Metric data for larva of *Leptus* (*Amaroptus*) *sivasensis* **sp. n.**

| Character | Holotype | Character | Holotype |
|---|---|---|---|
| IL | 410 | LX | 31 |
| IW | 263 | Ta I (L) | 151 |
| SD | 95 | Ta I (H) | 23 |
| W | 114 | Ti I | 180 |
| AW | 93 | Ge I | 122 |
| PW | 102 | TFe I | 91 |
| PPW | 99 | BFe I | 103 |
| MA (AAS) | 40 | Tr I | 44 |
| SBa | 14 | Cx I | 60 |
| SBp | 17 | Leg I | 750 |
| ISD | 48 | Ta II (L) | 132 |
| AP | 8 | Ta II (H) | 22 |
| AL | 60 | Ti II | 151 |
| PL | 51 | Ge II | 97 |
| PPL | 50 | TFe II | 83 |
| AL-PPL | 22 | BFe II | 73 |
| PL-PPL | 14 | Tr II | 47 |
| ASens | 41 | Cx II | 71 |
| PSens | 75 | Leg II | 653 |
| DS | 33–39 | Ta III (L) | 145 |
| PDS | 30 | Ta III (H) | 16 |
| *1a* | 41 | Ti III | 228 |
| *1b* | 65 | Ge III | 115 |
| *2a* | 38 | TFe III | 104 |
| *2b* | 25 | BFe III | 103 |
| *3b* | 37 | Tr III | 49 |
| GL | 189 | Cx III | 69 |
| PaScFed | 59 | Leg III | 812 |
| PaScGed | 52 | IP | 2215 |
| PaScGev | 49 | AL/AAS | 1.50 |
| *bs* | 33 | Ti III/Ti I | 1.26 |
| *cs* | 31 | Ti II/PW | 1.48 |
| *as* | 2 | SD/W | 0.83 |
| ASBM | 49 | PW/AW | 1.10 |
| ASBa | 32 | AL/PL | 1.18 |

are given in Table 2. Saboori et al. (2018) wrote ~170–204 dorsal idiosomal setae and Turkish specimens have ~170–~200 dorsal idiosomal setae. The number of normal setae between coxae I-II varied from 3 to 7 (+2 sternalae *2a*) in Turkish specimens whereas Saboori et al. (2018) reported 6–7 setae between coxae I-II and 6–7 setae between coxae II (sternalae II). Also, they mentioned ~30–44 setae between coxae II-III whereas Turkish specimens have 20–30 setae, and behind coxae III but we counted 40–77 setae and Saboori et al. (2018) reported ~46–56 setae. Our specimens extend the range of some leg segment measurements (Ge I-II, and Tr-Ti III) and some characters like AP, PL, PSens, and *1a* and extend minimum values for other characters like SBa, SBp, ISD, AL, PSens, DS, PaScGed, *bs* and some leg segments and extend maximum values like *1b*, *2b*, *3b*, PaScFed, *cs* and Ta I-III (L), Ge I-II, BFe I-II, and TFe II (Table 2). Also, sometimes the range of measurements of Turkish specimens is lower than the range of Iranian

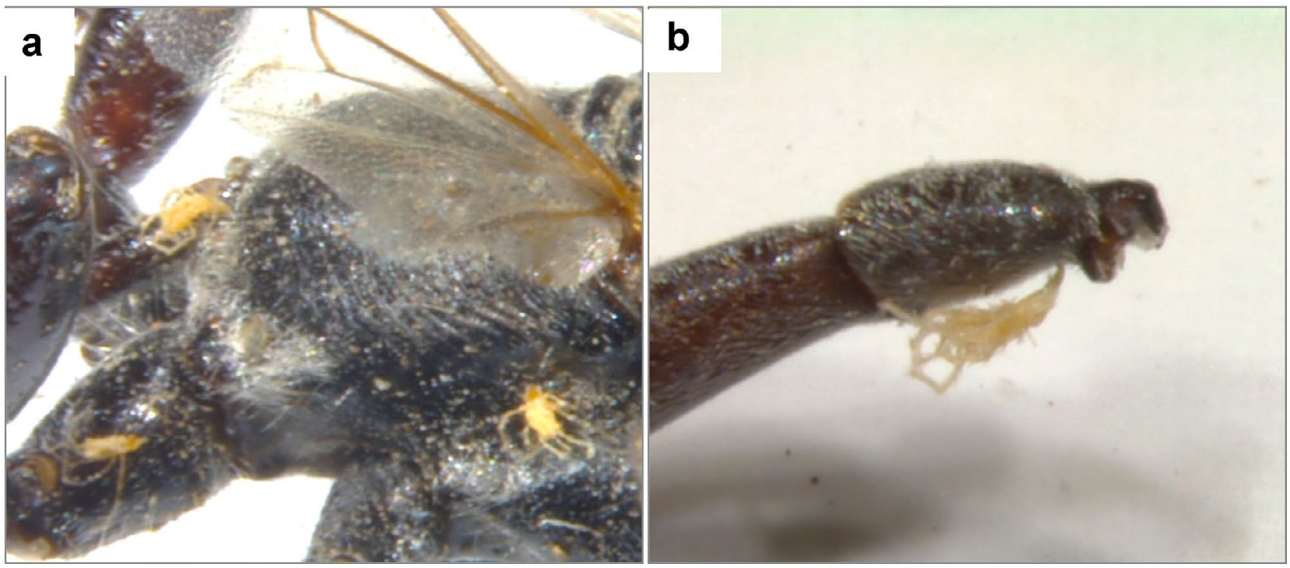


**Fig. 4** Larvae of *Leptus* (*L.*) *tridentatus* and *L.* (*L.*) *rosellae* parasitizing on *Prionyx kirbyi* and *Ammophila heydeni* species, respectively. **a***L. tridentatus* specimens attached to the propodeum and hind coxa of wasp species; **b***L. rosellae* specimen attached to the trochanter of wasp species

**Table 2** Comparison of metric data for larvae of *Leptus* (*L.*) *tridentatus* from Iran (Saboori et al. 2018) and Türkiye (this study)

| Character | Iran ($n=4$) | Türkiye ($n=23$) | Character | Iran ($n=4$) | Türkiye ($n=23$) |
|---|---|---|---|---|---|
| IL | - | 321–700 | Ta I (H) | 23–27 | 17–25 |
| IW | - | 213–470 | Ti I | 144–180 | 133–175 |
| SD | 109–126 | 83–103 | Ge I | 111–126 | 106–142 |
| W | 109–116 | 89–105 | TFe I | 69–89 | 72–98 |
| AW | 87–94 | 72–85 | BFe I | 64–89 | 82–109 |
| PW | 97–109 | 79–92 | Tr I | 50–64 | 39–62 |
| MA (AAS) | 38–40 | 29–37 | Cx I | 79–87 | 51–72 |
| SBa | 15–17 | 11–17 | Leg I | 628–769 | 672–836 |
| SBp | 15–17 | 13–17 | Ta II (L) | 119–121 | 121–148 |
| ISD | 47–57 | 45–54 | Ta II (H) | 20–25 | 17–24 |
| AP | 15–17 | 11–22 | Ti II | 116–131 | 117–149 |
| AL | 45–54 | 41–53 | Ge II | 99–104 | 90–114 |
| PL | 42–47 | 37–41 | TFe II | 64–74 | 64–84 |
| ASens | 47–52 | 43–56 | BFe II | 64–74 | 67–82 |
| PSens | 74–92 | 61–86 | Tr II | 52–57 | 42–53 |
| DS | 27–40 | 19–40 | Cx II | 72–87 | 50–75 |
| PDS | - | 24–34 | Leg II | 596–641 | 598–708 |
| *1a* | 30–40 | 28–43 | Ta III (L) | 129–149 | 125–183 |
| *1b* | 60–64 | 60–86 | Ta III (H) | 15–20 | 14–20 |
| *2a* | - | 27–36 | Ti III | 188–215 | 145–233 |
| *2b* | 22–30 | 22–32 | Ge III | 111–124 | 91–135 |
| *3b* | 27–35 | 28–36 | TFe III | 87–99 | 82–114 |
| GL | 173–210 | 173–202 | BFe III | 87–99 | 82–109 |
| PaScFed | 47–57 | 48–58 | Tr III | 54–62 | 41–68 |
| PaScGed | 50–54 | 42–51 | Cx III | 59–89 | 57–75 |
| PaScGev | 42–54 | 33–49 | Leg III | 720–829 | 591–898 |
| *bs* | 42–52 | 29–43 | IP | 1944–2239 | 1885–2391 |
| *cs* | 20–24 | 20–32 | AL/AAS | 1.06–1.20 | 1.23–1.79 |
| *as* | 7–8 | 3 | Ti III/Ti I | 1.04–1.37 | 0.86–1.41 |
| ASBM | - | 36–45 | Ti II/PW | 1.19–1.30 | 1.31–1.68 |
| ASBa | - | 20–34 | SD/W | 0.98–1.08 | 0.88–1.05 |
| LX | - | 17–33 | PW/AW | 1.11–1.17 | 1.05–1.14 |
| Ta I (L) | 129–158 | 138–184 | AL/PL | 1.06–1.20 | 1.14–1.41 |

specimens and we consider these differences due to dehydration of specimens, microscope, and preparation and measuring methods.

### *Leptus* (*L.*) *rosellae* Haitlinger, 1999

This species was described based on three specimens ectoparasitic on undetermined Orthoptera (probably Acrididae) from Kuşadası, Türkiye (Haitlinger 1999). There was no other report of this species up to 2023 when Can and Saboori (2023) reported it as an ectoparasite of Crabronidae wasps. *Leptus* specimens previously detected on *Ammophila heydeni* (Dahlbom, 1845) (Hymenoptera: Sphecidae) by Can (2022) were identified as *L. rosellae* in this study (Fig. 4b). Thus, *A. heydeni* has to be added to the host list of the mite species. Saboori et al. (2020) corrected some characters in the original description. Haitlinger (1999) referred to about 100 dorsal idiosomal setae (probably for the holotype only because there is no range) but our specimens have ~ 120–~160 but only in one specimen ~ 209 dorsal idiosomal setae. The number of normal setae between coxae II-III varied from 15 to 27 whereas Haitlinger reported ~ 12. Also, he mentioned ~ 24 setae behind coxae III but we counted ~ 30–62 except for one specimen which had 72 setae (with ~ 140 dorsal idiosomal setae). Our specimens extend the range of most leg segment measurements and some characters like W, PW, PSens, GL, SBa, PaScGev and *bs* and extend minimum ranges for other characters like SD, ISD, ASens, *1b*, *2b*, PaScFed, PaScGed, and Cx II but for some other characters, extend maximum ranges like DS, SBp and Ta I (L) (Table 3). We consider these differences due to dehydration of specimens, microscope, and preparation and measuring methods.

**Table 3** Comparison of metric data for larvae of *Leptus* (*L.*) *rosellae*: (1) Original description (Haitlinger 1999) and (2) this study

| Character | 1 ($n=3$) | 2 ($n=10$) | Character | 1 ($n=3$) | 2 ($n=10$) |
|---|---|---|---|---|---|
| IL | 387–457 | 275–430 | Ta I (H) | - | 20–28 |
| IW | 273–305 | 210–357 | Ti I | 174–184 | 166–192 |
| SD | 110–120 | 90–105 | Ge I | 130–132 | 117–140 |
| W | 114–116 | 96–118 | TFe I | 90–92 | 85–98 |
| AW | 90–96 | 84–94 | BFe I | 102–106 | 86–109 |
| PW | 104–106 | 91–108 | Tr I | 44 | 37–55 |
| MA (AAS) | - | 35–41 | Cx I | 60–62 | 50–75 |
| SBa | 14–16 | 12–18 | Leg I | 764–766 | 724–854 |
| SBp | 14–16 | 14–19 | Ta II (L) | 124 | 120–150 |
| ISD | 56–62 | 44–62 | Ta II (H) | - | 18–29 |
| AP | 14 | 9–16 | Ti II | 146–152 | 133–162 |
| AL | 50–60 | 51–63 | Ge II | 106 | 92–113 |
| PL | 44–50 | 45–54 | TFe II | 72 | 69–83 |
| ASens | ?44–56 | 39–45 | BFe II | 82–84 | 65–89 |
| PSens | 66–~70 | 52–80 | Tr II | 38–46 | 42–54 |
| DS | 26–38 | 27–47 | Cx II | 70–80 | 60–80 |
| PDS | - | 27–39 | Leg II | 638–664 | 604–740 |
| *1a* | - | 34–48 | Ta III (L) | 156–160 | 150–182 |
| *1b* | 60–74 | 55–67 | Ta III (H) | - | 16–22 |
| *2a* | - | 28–39 | Ti III | 210–222 | 192–233 |
| *2b* | 26–30 | 22–30 | Ge III | 116–124 | 110–145 |
| *3b* | 32–36 | 30–36 | TFe III | 94–96 | 86–105 |
| GL | 214–230 | 192–245 | BFe III | 100 | 82–103 |
| PaScFed | 60–70 | 50–64 | Tr III | 50–52 | 31–57 |
| PaScGed | 50–62 | 47–58 | Cx III | 64–70 | 55–79 |
| PaScGev | 50–54 | 37–47 | Leg III | 810–816 | 706–904 |
| *bs* | 36 | 22–41 | IP | 2238–2240 | 2159–2503 |
| *cs* | - | 21–30 | AL/AAS | - | 1.38–1.70 |
| *as* | - | 2–3 | Ti III/Ti I | 1.21* | 1.14–1.29 |
| ASBM | - | 42–51 | Ti II/PW | 1.43* | 1.30–1.65 |
| ASBa | - | 27–39 | SD/W | 1.03* | 0.80–1.09 |
| LX | - | 26–39 | PW/AW | 1.15* | 1.06–1.19 |
| Ta I (L) | 148–152 | 149–188 | AL/PL | 1.20* | 1.09–1.24 |

* Only for holotype

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## Declarations

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

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