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Description of a new species of the genus *Leptus* (Acari: Erythraeidae) from Iran and new data for two *Abrolophus* species

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ABSTRACT

Leptus (*Leptus*) *tridentatus* Saboori, Hakimitabar & Khademi **n. sp.** (Acari: Erythraeidae) is described and illustrated from larvae (off host) from Damavand mountain, Tehran Province, Iran. Some meristic data of *Abrolophus khanjanii* (Haitlinger & Saboori, 1996) and *A. stanislavae* (Haitlinger, 1986) are amended or given.

Keywords *Abrolophus khanjanii*, *A. stanislavae*, larva, *Leptus* (*L.*) *tridentatus*, mite, Parasitengona, Prostigmata, Trombidiformes
Zoobank http://zoobank.org/D995D9E4-D42D-4288-A809-EE96EDE70134

Introduction

There are approximately 280 larval species in this important and worldwide genus, in two subgenera *Leptus* and *Amaroptus* (with only one species: *L.* (*Amaroptus*) *vuki* Haitlinger, 2000 (Southcott 1992; Haitlinger 2000; Beron 2008; Mąkol & Wohltmann 2012, 2013). *Leptus* larvae are ectoparasites of different arthropods specially insect orders e.g. Orthoptera, Coleoptera, and Lepidoptera (Welbourn, 1983) but their potential in biological control has not been investigated.

Mites of the genus *Leptus* are poorly studied in Iran. So far only six species have been described from Iran as follows: *L.* (*L.*) *fathipeuri* Haitlinger & Saboori, 1996; *L.* (*L.*) *zhangi* Saboori & Atamehr, 1999; *L.* (*L.*) *esmailii* Saboori & Ostovan, 2000; *L.* (*L.*) *kamalii* Karimi Iravanlou & Saboori, 2001; *Leptus* (*Leptus*) *eslamizadehi* Saboori, 2002; and *L.* (*L.*) *delijanensis* Khademi, Saboori & Hakimitabar, 2015 (Mąkol & Wohltmann, 2012; Khademi *et al*., 2015). In this paper, we describe the larva of *L.* (*L.*) *tridentatus* Saboori, Hakimitabar & Khademi **sp. nov.** from Damavand mountain, Tehran Province, Iran. Also, the first and second authors re-examained some species in private Haitlinger's collection and amend some of their meristic data or give new meristic data.

Materials and methods

Larvae of *L.* (*L.*) *tridentatus* Saboori, Hakimitabar & Khademi **n. sp.** were collected from Damavand mountain, Tehran province, Iran, on 3 July 2009, by Masoud Hakimitabar. Specimens were collected from under a stone (off host) by minute brush. They were preserved

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in 70% ethanol, cleared in Nesbitt's fluid and mounted using Faure medium on microscope slides (Walter & Krantz, 2009). Figures were drawn and measurements were made using a BX51 Olympus microscope equipped with a drawing tube. The terminology and abbreviations used in the description are adapted from Haitlinger (2013) and Wohltmann *et al.* (2007). All measurements are given in micrometers (µm).

Reuslts

Leptus (*Leptus*) *tridentatus* Saboori, Hakimitabar & Khademi n. sp. (Figs. 1-3)

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Diagnosis — With three denticles on dorsal part of palpal tibial claw; palpal femur with one and palpal genu with two setae; fn Fe = 3-3-2; ~30–44 setae between coxae II & III; Ti III < 225.

Description — **Larva (N = 4)** — Idiosoma oval in shape, and with ~170–204 barbed setae. Scutum longer than or equal with wide, punctate, with two pairs of sensilla and two pairs of scutalae, anterior border deeply concave (Fig. 1), ASens and PSens barbed on distal 1/3; cuticular lines around bases of PSens, and parallel conjunct to posterolateral borders, also narrow cuticular lines beyond bases of ASens (Fig. 1A); AL longer than PL. One eye on each side of scutum, both circular in shape and 24–30 across.

Ventral surface of idiosoma with barbed sternalae; 2 barbed sternalae between coxae I, 6–7 barbed sternalae between coxae II; ~30–44 barbed intercoxalae between coxae II and III and ~46–56 barbed setae behind coxae III. Sternalae *1a* longer than other sternalae (Fig. 1B).

Coxae I-III each with one seta, coxa I with a peg-like supracoxal seta; coxalae *1b* about twice the length of coxalae *2b*; coxalae *3b* longer than coxalae *2b*; all coxalae barbed (Fig. 2). NDV = ~272–287.

Gnathosoma narrow and cone-shaped, 173–210 long with barbed and thick galealae (Ga) and two pairs of hypostomalae, anterior hypostomalae (aHy) smooth, small and peg-like, posterior hypostomalae (pHy) thicker, stronger and barbed. Palpal femur with one and palpal genu with two barbed setae. Palpal tibia with three barbed setae, palpal tibial claw with 3 small denticles on dorsal side (Fig. 1C). Palpal tarsus with 8 setae including 4 barbed and 2 nude setae, a solenidion, and an eupathidium. Palpal setal formula: fPp= 0-B-BB-BBB-4B2Nωζ (Fig. 3). Supracoxal seta of palp (*eP*) peg-like, 5 long. Chelicerae, subcapitulum and palps with punctation. Length of legs I-III 723–769, 637–660 and 802–848, respectively. IP = 1944–2239. Measurements are given in Table 1.

Leg segmentation formula: 7–7–7. Leg setal formula: Leg I: Ta– 1ω, 1ε, 2ζ, 27–28B; Ti– 2φ, 1κ, 14B; Ge– 1σ, 1κ, 8B; TFe– 5B; BFe– 3B; Tr– 1B; Cx– 1B (Figs. 2 A, 3A).
Leg II: Ta– 1ω, 1ε, 2ζ, 25–26B; Ti– 2φ, 1κ, 15B; Ge–1σ, 1κ, 8B; TFe– 5B; BFe– 3B; Tr– 1B, Cx– 1B (Figs. 2B, 3B).
Leg III: Ta– 1ζ, 25–26B; Ti– 1φ, 15B; Ge– 8B; TFe– 5B; BFe– 2B; Tr– 1B; Cx– 1B (Figs. 2C, 3C). Coxa III abnormally with two setae on left side. Tarsal claws slender, anterior and middle pointed, posterior with long onychotrichs.

Etymology — Name of the new species is derived from three small denticles on palpal tibial claw.

Type material — The holotype larva (ARS–20090703–1a) and paratype larvae (ARS–20090703–1b, 1c, 1d) were collected by Masoud Hakimitabar, under the stones (off host) from Damavand Mountain, Tehran Province, Iran, 9 July 2009. The specimens are deposited in Acarological Collection, Jalal Afshar Zoological Museum, Faculty of Agriculture, University of Tehran, Karaj, Iran.

Remarks — *Leptus* (*L.*) *tridentatus* Saboori, Hakimitabar & Khademi **n. sp.** is unique in having 3 denticles on dorsal side of palpal tibial claw. Also, it is unique in having the

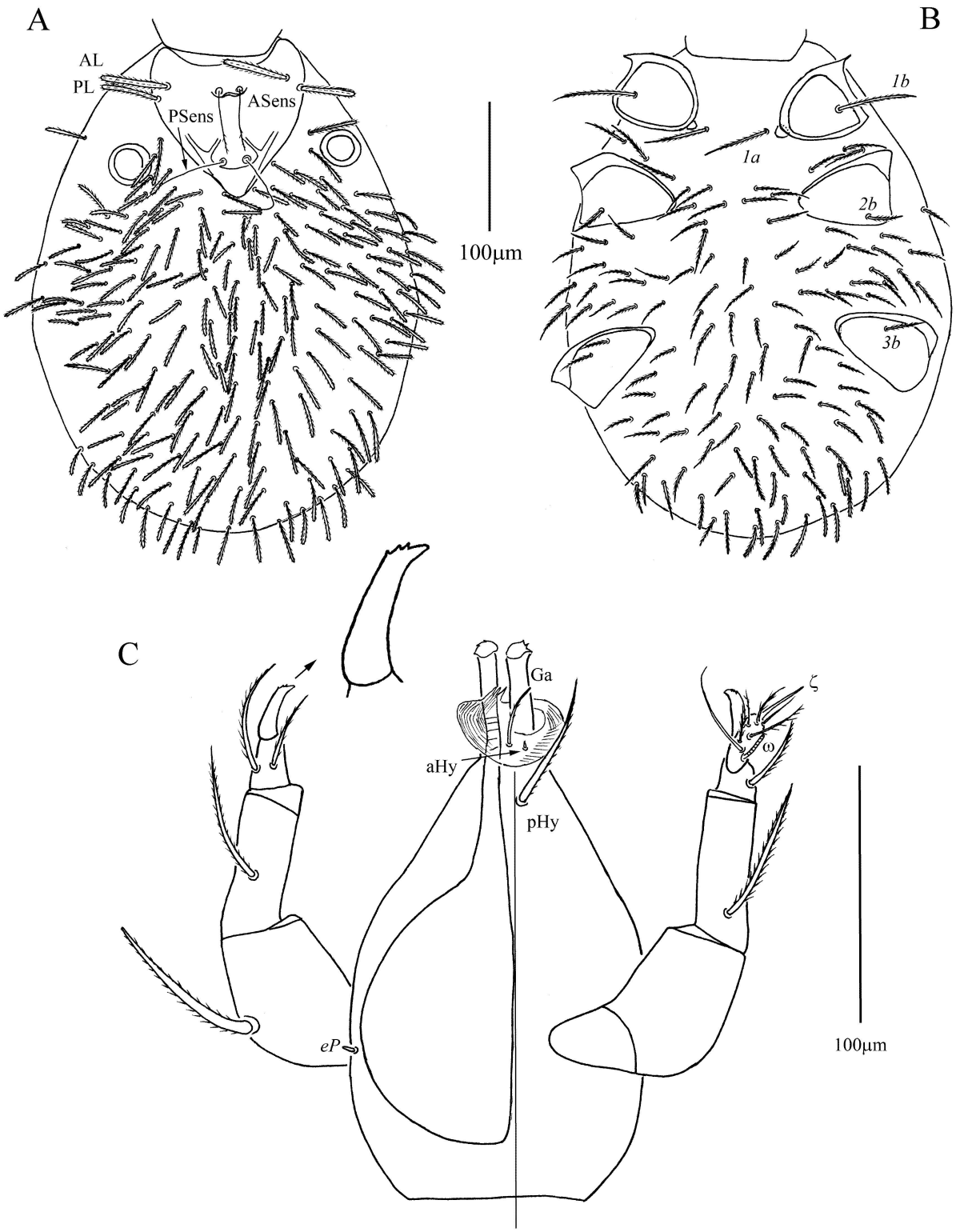

Figure 1 *Leptus* (*Leptus*) *tridentatus* Saboori, Hakimitabar & Khademi **n. sp.** (larva): A – Dorsal view of idiosoma; B – Ventral view of idiosoma; C – Gnathosoma (Left, dorsal view; Right, ventral view).

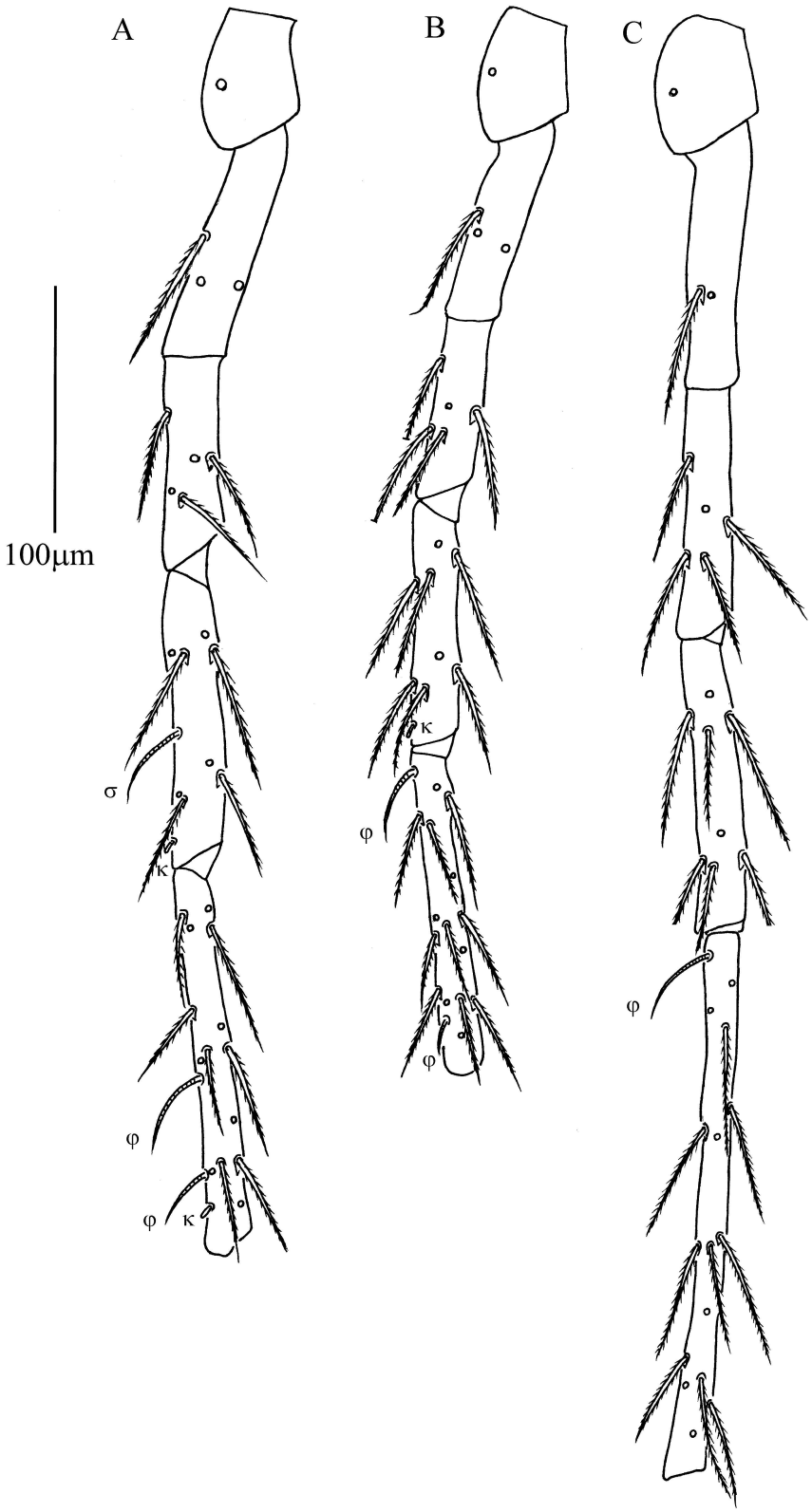

Figure 2 *Leptus* (*Leptus*) *tridentatus* Saboori, Hakimitabar & Khademi **n. sp.** (larva): A – Tr I-Ti I; B – Tr II-Ti II; C –. Tr III-Ti III.

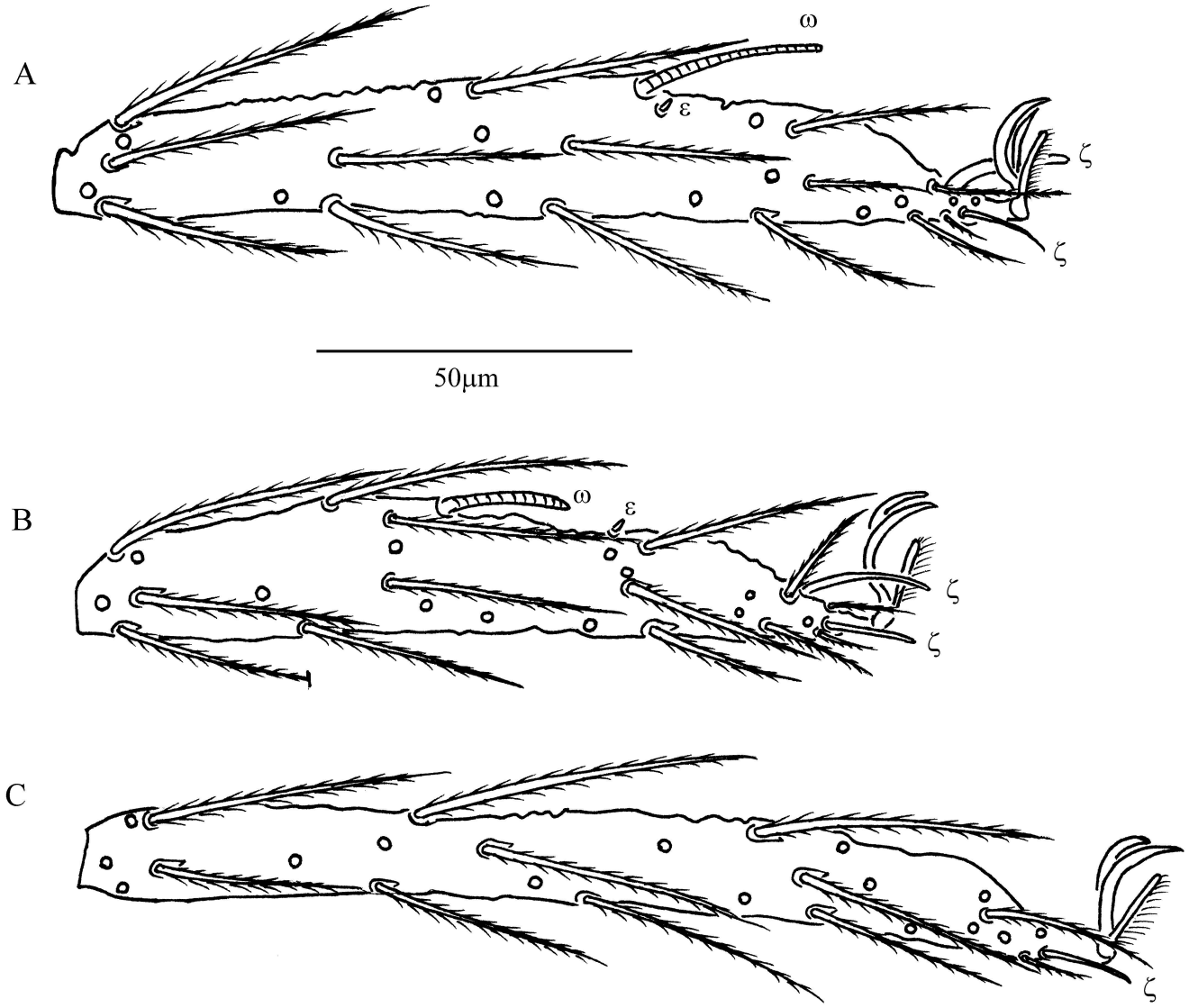

Figure 3 *Leptus* (*Leptus*) *tridentatus* Saboori, Hakimitabar & Khademi **n. sp.** (larva): A – Ta I; B – Ta II; C – Ta III.

following combination of characters: palpal femur with one and palpal genu with two setae and basifemoral setae formula 3–3–2. There is one species, *L.* (*L.*) *maldonadoicus* with the basifemoral setae formula 3–3–2. It differs from *L.* (*L.*) *maldonadoicus* in the number of setae on palpal femur (1 vs. 2), number of setae between coxae I-II (6 vs. 0), number of setae between coxae II-III (∼30–44 vs. 6), number of setae behind coxae III (∼46–56 vs. 22), longer SD (109–126 vs. 64–∼76), W (109–116 vs. ∼84–86), AW (87–94 vs. 74–76), PW (97–109 vs. 76), ISD (47–57 vs. 40–42), Ti I (144–180 vs. 106–112), Ti II (116–124 vs. 82–94), Ti III (188–215 vs. 130–134), leg I (723–769 vs. 484–502), leg II (637–660 vs. 394–406), and leg III (802–848 vs. 502–520). It is closely related to *L.* (*L.*) *dubius* (Paoli, 1937), *L.* (*L.*) *pyrenaeus* André, 1953, *L.* (*L.*) *josifovi* Beron, 1975, *L.* (*L.*) *guus* Haitlinger, 1990, *L.* (*L.*) *mogadoranus* Haitlinger, 1990, *L.* (*L.*) *ogazulacus* Haitlinger, 1990, *L.* (*L.*) *pasopaicus* Haitlinger, 1990, *L.* (*L.*) *comosus* Southcott, 1991, *L.* (*L.*) *bertoldi* Haitlinger, 1993, and *L.* (*L.*) *batoricus* Haitlinger, 1998, according to the setal counts on palpal genu and palpal femur. It differs *L.* (*L.*) *dubius*

Table 1 Metric data for larvae of *Leptus* (*Leptus*) *tridentatus* Saboori, Hakimitabar & Khademi **n. sp.**

Character	1a	1b	1c	1d	Character	1a	1b	1c	1d
SD	126	114	109	–	Ti I	158	151	144	180
W	116	109	111	109	Ge I	126	116	111	111
AW	94	89	87	89	TFe I	89	87	77	69
PW	109	101	97	104	BFe I	89	87	89	64
AA	17	15	15	15	Tr I	62	59	64	50
SB	17	15	17	15	Cx I	87	79	84	79
ISD	57	52	52	47	Leg I	769	723	698	628
AP	17	15	17	15	Ta II (L)	119	119	121	121
AL	54	50	–	45	Ta II (H)	20	25	25	25
PL	45	47	47	42	Ti II	131	131	116	124
AAS	40	40	38	–	Ge II	104	101	99	99
ASens	50	50	52	47	TFe II	74	74	64	67
PSens	87	74	89	92	BFe II	74	74	64	69
DS	27–40	27–40	28–38	28–39	Tr II	52	54	57	54
1a	40	37	33	30	Cx II	87	84	82	72
1b	64	64	64	60	Leg II	641	637	603	596
2b	27	22	25	30	Ta III (L)	149	149	149	129
3b	27	30	27	35	Ta III (H)	15	17	17	20
GL	210	205	173	176	Ti III	215	208	188	188
PaScFed	50	54	57	47	Ge III	124	116	111	111
PaScGed	54	52	54	50	TFe III	99	94	92	87
PaScGev	54	50	42	47	BFe III	99	94	89	87
Ga	24	22	22	20	Tr III	54	62	62	59
aHy	8	8	7	8	Cx III	89	79	74	59
pHy	51	52	50	42	Leg III	829	802	765	720
Ta I (L)	158	144	129	144	IP	2239	2162	2066	1944
Ta I (H)	25	23	27	24					

in the number of setae between coxae II (6–7 vs. 2), number of setae between coxae II & III (~30–44 vs. 8–10), shape of scutum, SD (109–126 vs. 90), W (109–116 vs. 90), AW (87–94 vs. 74), PW (97–109 vs. 81), Ti I (144–180 vs. 128), Ti II (116–131 vs. 96), and Ti III (188–215 vs. 154); from *L.* (*L.*) *pyrenaeus* in the number of setae between coxae II (6–7 vs. 2), number of setae between coxae II & III (~30–44 vs. 14–16), SD (109–126 vs. 57), W (109–116 vs. 83), AW (87–94 vs. 64), PW (97–109 vs. 79), AL (45–54 vs. 25), PL (42–47 vs. 25), *1b* (60–64 vs. 110), *2b* (22–30 vs. 80), and *3b* (27–35 vs. 80); from *L.* (*L.*) *josifovi* in the number of setae between coxae II (6–7 vs. 2), number of setae between coxae II & III (~30–44 vs. 15), AL (45–54 vs. 63), *3b* (27–35 vs. 45), and shape of scutum; from *L.* (*L.*) *guus* in the number of setae between coxae II & III (~30–44 vs. 20), SD (109–126 vs. 100–102), W (109–116 vs. 142–154), AW (87–94 vs. 124–132), PW (97–109 vs. 136–146), GL (176–210 vs. 244–288), Ti I (144–180 vs. 210), Ti II (116–131 vs. 186–192), and Ti III (188–215 vs. 324); from *L.* (*L.*) *mogadoranus* in the number of setae between coxae II (6–7 vs. 2), number of setae between coxae II & III (~30–44 vs. ~20), shape of scutum, SD (109–126 vs. 82–92), W

(109–116 vs. 134–146), AW (87–94 vs. 110–118), PW (97–109 vs. 122–130), Ti I (144–180 vs. 312), Ti II (116–131 vs. 254), and Ti III (188–215 vs. 362); from *L.* (*L.*) *ogazulacus* in the number of setae between coxae II (6–7 vs. 2), number of setae between coxae II & III (∼30–44 vs. 22), shape of scutum, SD (109–126 vs. 80–82), W (109–116 vs. 100–102), AL (45–54 vs. 64–72), and PL (42–47 vs. 52–56); from *L.* (*L.*) *pasopaicus* in the number of setae between coxae II (6–7 vs. 2), number of setae between coxae II & III (∼30–44 vs. 16), shape of scutum, SD (109–126 vs. 72), W (109–116 vs. 94), GL (176–210 vs. 142), ASens (47–52 vs. 40), and PSens (74–92 vs. 64); from *L.* (*L.*) *comosus* in the number of normal setae on basifemora (3-3-2 vs. 3-2-2), number of solenidia on TFe I (0 vs. 3), on TFe II (0 vs. 4), on Ge II (1 vs. 4–5), on TFe III (0 vs. 6–7), on Ge III (0 vs. 6), longer leg I (723–769 vs. 590), leg II (637–669 vs. 540), and leg III (802–848 vs. 600); from *L.* (*L.*) *bertoldi* in the number of setae between coxae II (6–7 vs. 2), shape of scutum, SD (109–126 vs. 66–68), SD ≥ W in *L.* (*L.*) *tridentatus* Saboori, Hakimitabar & Khademi **n. sp.** (vs. SD < W in *L.* (*L.*) *bertoldi*), AL (45–54 vs. 70), PL (42–47 vs. 60–62), *1b* (60–64 vs. 90), GL (176–210 vs. 244), Ti I (144–180 vs. 332), Ti II (116–131 vs. 258–264), and Ti III (188–215 vs. 384); from *L.* (*L.*) *batoricus* in the number of setae between coxae II (6–7 vs. 2), number of setae between coxae II & III (∼ 30–44 vs. ∼18), Ti I (144–180 vs. 114), Ti II (116–131 vs. 100), and Ti III (188–215 vs. 150), fD (∼170–204 vs. 86), number of setae behind coxae III (∼46–56 vs. ∼32).

Genus *Abrolophus* Berlese, 1891

Holotypes of *Abrolophus khanjanii* (Haitlinger & Saboori, 1996) and *A. stanislavae* (Haitlinger, 1986) were studied.

Examination of type specimens showed that some meristic data provided in the descriptions of Haitlinger (1986) and Haitlinger & Saboori (1996) should be amended and completed.

Abrolophus khanjanii (Haitlinger & Saboori, 1996)

Abrolophus khanjanii was described by Haitlinger & Saboori (1996) based on a single specimen. We re-examined the holotype and present amended data as follows:
Leg setal formula: Leg I: Ta– 1ω, 1ε, 2ζ, 1Cp, 22B; Ti– 2φ, 1κ, 13B; Ge– 1κ, 1σ, 11B; TFe– 8B; BFe– 4B; Tr– 2B; Cx– 1B.
Leg II: Ta– 1ω, 2ζ, 1Cp, 19B; Ti– 2φ, 13B; Ge– 1κ, 1σ, 9B; TFe– 5B; BFe– 4B; Tr– 2B, Cx– 1B .
Leg III: Ta– 1ζ, 20B; Ti–13B; Ge– 1σ, 9B; TFe– 5B; BFe– 4B; Tr– 2B; Cx– 1B.
Palpal tarsus with 8 setae and gnathosoma with two pairs of hypostomalae and one pair of galealae. Palpal femur with one projection whereas in figure 18 of original description, the projection was shown on palpal genu.

Abrolophus stanislavae (Haitlinger, 1986)

It was described by Haitlinger in 1986 and redescribed by Haitlinger & Sundic (2015). We checked the holotype and present amended data in the redescription here.
Leg setal formula: Leg I: Ta– 1ω, 1ε, 1Cp, 2ζ, 25B; Ti– 1Cp, 2φ, 1κ, 13B; Ge– 1κ, 1σ, 11B; TFe– 7B; BFe– 4B; Tr– 2B; Cx– 1B.
Leg II: Ta– 1ω, 1Cp, 2ζ, 20B; Ti– 2φ, 12/13B; Ge– 1κ, 1σ, 9B; TFe– 5B; BFe– 4B; Tr– 2B, Cx– 1B.
Leg III: Ta– 1ζ, 20B; Ti–13B; Ge– 1σ, 9B; TFe– 5B; BFe– 4B; Tr– 2B; Cx– 1B.
Palpal tarsus with 8 setae and gnathosoma with two pairs of hypostomalae and one pair of galealae.

ASens bases in level with AL bases.

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References

Beron P. 2008. Acarorum Catalogus I. Acariformes: Calyptostomatoidea (Calyptostomatidae), Erythraeoidea (Smarididae, Erythraeidae). Edition of Pensoft Publishers and the National Museum of Natural History, Sofia. Bulgarian Academy of Sciences, Sofia-Moscow. 271 pp.

Haitlinger R. 1986. The genus *Hauptmannia* Oudemans, 1910 (Acari, Prostigmata, Erythraeidae) in Poland. Pol. Pismo Entomol., 56: 181-191.

Haitlinger R. 2000. Four new species of *Leptus* Latreille, 1796 (Acari, Prostigmata, Erythraeidae) from Peru. Boll. Mus. Reg. Sci. Nat. Torino, 17: 149-162.

Haitlinger R. 2013. First record of *Leptus* (*Leptus*) *holgeri* (Acari: Prostigmata: Erythraeidae) from Vietnam, with redescription of the species. Persian J. Acarol., 2: 341-351. doi:10.22073/pja.v2i3.10038

Haitlinger R., Saboori A. 1996. Seven new larval mites (Acari, Prostigmata, Erythraeidae) from Iran. Misc. Zool., 19: 117-131.

Khademi N., Saboori A., Ahadiyat A., Hakimitabar M. 2015. A new species of the genus *Leptus* (Acari: Erythraeidae) ectoparasitic on Acrididae (Insecta: Orthoptera) from Iran. Biologia, 70(7): 929-934. doi:10.1515/biolog-2015-0109

Mąkol J., Wohltmann A. 2012. An annotated checklist of terrestrial Parasitengona (Actinotrichida: Prostigmata) of the world, excluding Trombiculidae and Walchiidae. Ann. Zool., 62 (3): 359-562. doi:10.3161/000345412X656671

Mąkol J., Wohltmann A. 2013. Corrections and additions to the checklist of terrestrial Parasitengona (Actinotrichida: Prostigmata) of the world, excluding Trombiculidae and Walchiidae. Ann. Zool., 63(1): 15-27. doi:10.3161/000345413X666075

Southcott R.V. 1991. Descriptions of larval *Leptus* (Acarina: Erythraeidae) ectoparasitic on Australian Diptera, and two earlier described Australian larvae. Inverteb. Taxon., 5(1): 717-763. doi:10.1071/IT9910717

Southcott R.V. 1992. Revision of the larvae of *Leptus* Latreille (Acarina, Erythraeidae) of Europe and North America, with descriptions of post-larval instars. Zool. J. Lin. Soc., 105(1): 1-153.

Walter D.E., Krantz G.W. 2009. Collecting, rearing, and preparing specimens. In: Krantz G.W., Walter D.E. (Eds.), A manual of acarology, 3rd edition. Texas Tech Univ. Press. p. 83-96.

Welbourn W.C. 1983. Potential use of trombidioid and erythraeoid mites as biological control agents of insect pests. In: Hoy M.A., Cunningham G. L., Knutson L. (Eds.), Biological control of pests by mites. Univ. of California, Berkeley, Spec. Publ. 3304. p.103-140.

Wohltmann A., Gabryś G., Mąkol J. 2007. Terrestrial Parasitengona in habiting transient biotopes. In: Gerecke R, (Ed.), Die Süßwasserfauna Mitteleuropas. Vol. 7/2–1, Chelicerata, Acari I., Elsevier Spektrum Akademischer Verlag, München. p. 158-240.