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Article

A new species of the little-known subgenus *Leptus* (*Amaroptus*) (Trombidiformes: Erythraeidae) from southeastern Iran

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ABSTRACT

A new species of the subgenus *Leptus* (*Amaroptus*), *L. (A.) saboorii* Haddadi & Noei **sp. nov.** is described and illustrated based on an ectoparasitic larva collected from an unidentified grasshopper (Orthoptera: Acrididae) in Chah Nimeh reservoir, Zahak County, Sistan and Baluchestan Province (Southeastern Iran). It represents the first record for the occurrence of the subgenus *Leptus* (*Amaroptus*) Haitlinger, 2000 in Iran. An updated key to the world species of subgenus *Leptus* (*Amaroptus*) is also presented.

KEYWORDS: Acari, Acrididae, larva, Parasitengona, Sistan and Baluchestan.

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INTRODUCTION

The genus *Leptus* Latreille, 1796 belongs to the family Erythraeidae encompassing two subgenera; *Leptus* (*Leptus*) Latreille, 1796 and *Leptus* (*Amaroptus*) Haitlinger, 2000 (Mağol and Wohltmann 2012). Saboori *et al.* (2020) listed 225 valid species (however, they mentioned 220 species) of the genus *Leptus* based on larval or both larval and post-larval stages. Seven species including *L. (L.) aeolopae* Chinniah & Mohanasundaram, 1998, *L. (L.) aggoratus* Haitlinger, 1990, *L. (L.) chrotogonae* Chinniah & Mohanasundaram, 1998, *L. (L.) coccineus* (Scopoli, 1763), *L. (L.) fernandezi* Wohltmann, 1995, *L. (L.) groenlandicus* (Tragardh, 1904), *L. (L.) karachiensis* Anwarullah & Ahsan, 1970 and *L. (L.) samsingensis* (Gupta, 1992) were not included at that time (Scopoli 1763; Tragardh 1904; Anwarullah and Ahsan 1970; Wohltmann 1995; Chinniah and Mohanasundaram 1998; Gupta 1992; Haitlinger 1990). Later on, 19 additional species were discovered and described from various countries (Hakimitabar *et al.* 2020; Bassini-Silva *et al.* 2020; Haitlinger *et al.* 2020; Haitlinger and Šundić 2020; Hakimitabar *et al.* 2021; Xu *et al.* 2022a, b; Khoobdel and Pakarpour Rayeni 2023; Kapankaya *et al.* 2023; Hakimitabar *et al.* 2024; Kiany *et al.* 2024; Saboori *et al.* 2024). Therefore, this genus includes 251 species. So far, only two species of the subgenus *Leptus* (*Amaroptus*) are known: *L. (A.) vuki* Haitlinger, 2000 and *L. (A.) sivasensis* Saboori, Can & Cakmak, 2024, which were described as ectoparasites on Orthoptera (Catantopidae)

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[misspelling of the original family name in Haitlinger (2000): 149, 157] from Peru and Hymenoptera (Crabronidae) from Türkiye, respectively (Haitlinger 2000; Saboori *et al.* 2024). Saboori *et al.* (2024) re-examined the type specimens of *L. (A.) vuki* and presented some corrections.

In this study, the third species of the subgenus *Leptus (Amaroptus)* is described and illustrated as an ectoparasitic on an unidentified grasshopper species (Orthoptera, Acrididae) in the surrounding lands of Chah Nimeh reservoir, Zahak County, Sistan and Baluchestan Province, Iran.

MATERIAL AND METHODS

The mite specimen was collected by direct host observation method, detached from the cross-vein of the hind wing of an unidentified grasshopper (Orthoptera, Acrididae) by an insect pin, cleared in Nesbitt's fluid, and mounted on microscope slides using Hoyer's medium (Walter and Krantz 2009). Examination and measurements (given in micrometers, μm) were done under a CH30 Olympus microscope. Illustrations were completed using a drawing tube mounted on an Olympus BX51 microscope. Terminology and abbreviations follow Southcott (1992), Wohltmann *et al.* (2007) and Wohltmann and Małol (2012) 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).

RESULTS

Systematics

Family Erythraeidae Robineau-Desvoidy, 1828

Subfamily Leptinae Billberg, 1820

Genus *Leptus* Latreille (1796)

Subgenus *Leptus (Amaroptus)* Haitlinger, 2000

Leptus (Amaroptus) saboorii Haddadi & Noei sp. nov. (Figs. 1–4)

<http://zoobank.org/urn:lsid:zoobank.org:act:6D5B42FF-191F-4526-8F93-DD0E0D6539C1>

Diagnosis (larva)

Palp femur and genu each with one seta, ASens placed anterior to the PL scutalae bases, Ti III 208, SD/W 0.98, Ti III/AW 2.36, ASBM 15.

Description ($n = 1$)

Dorsum (Fig. 1A) – Idiosoma oval with 53 barbed dorsal setae. The scutum punctate, the length of the scutum is slightly longer than the width (SD/W 0.98) and with three pairs of barbed and blunted normal setae (AL, PL, PPL) and two pairs of sensillary setae (ASens and PSens). The scutum with concave anterior border (ASBM 15), almost straight anterolateral borders and slightly concave posterolateral borders, posterior border of scutum produced two projections with a relatively shallow notch. ASens and PSens broken. ASens bases level with AL bases and anterior to the PL scutalae bases. One eye on each side of the scutum, both circular in shape and 25 in diameter.

Venter (Fig. 1B) – Ventral surface of idiosoma with two pairs of barbed sternal setae (*1a*, *2a*), sternalae *1a* slightly shorter than sternalae *2a*; five barbed intercoxalae between coxae II and III and 24 barbed setae behind coxae III. Coxa I–III punctate. A peg-like supracoxal seta (*elc I*) is present on coxa I, 5 long. NDV = $53 + 29 = 82$.

Gnathosoma (Figs. 2A–D) – Bulbus of basal segment of chelicerae punctate on dorsal surface and cheliceral blade curved. Gnathosoma cone-shaped, with nude galealae (*cs*), and two pairs of hypostomalae, anterior hypostomala (*as*) spine-like, 2 in length, posterior hypostomalae (*bs*) barbed, 57 in length. Palp femur and palp genu each with one barbed dorsal seta, palp tibia with three barbed

setae, palp tarsus with eight setae including five barbed setae, one nude seta, one eupathidium and one solenidion. fPp = 0-B-B-BBB-5BN $\omega\zeta$. Supracoxal seta of palp (*elc P*), minute, peg-like, 5 long.

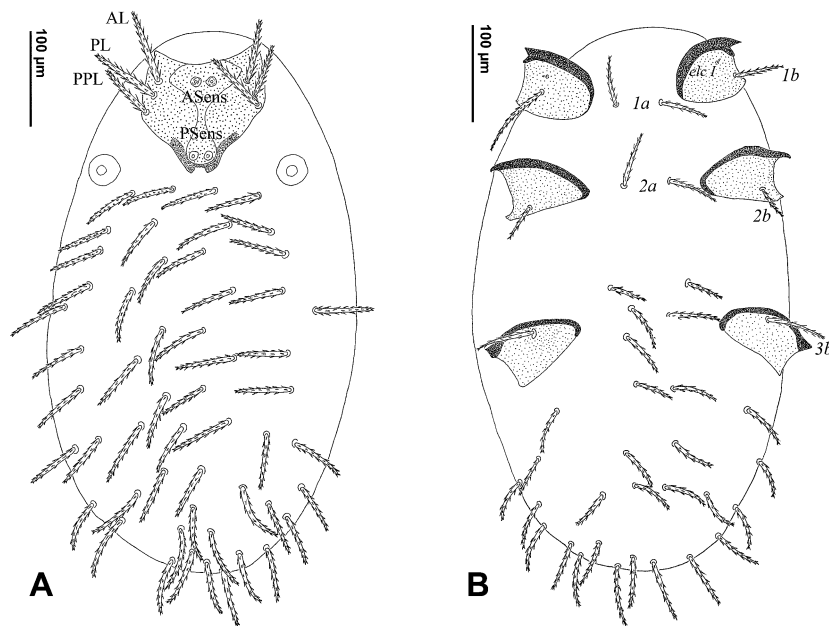


Figure 1. *Leptus (Amaroptus) saboorii* Haddadi & Noei **sp. nov.** (larva) – **A.** Dorsal view of idiosoma; **B.** Ventral view of idiosoma.

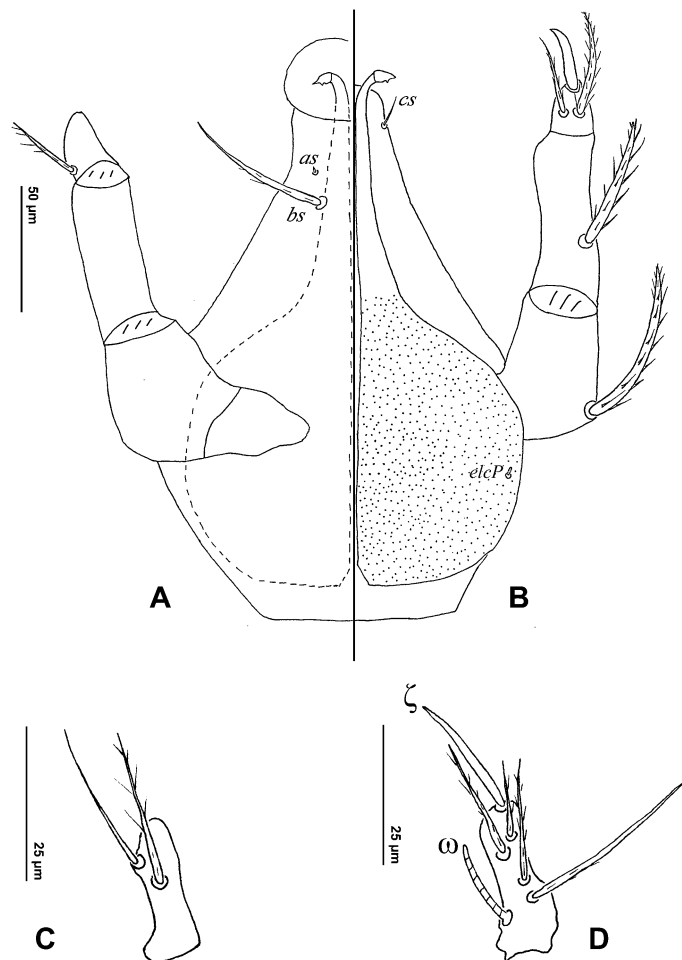


Figure 2. *Leptus (Amaroptus) saboorii* Haddadi & Noei **sp. nov.** (larva) – **A.** Gnathosoma, ventral view; **B.** Gnathosoma, dorsal view; **C.** Palpal tarsus, dorsal view; **D.** Palpal tarsus, ventral view.

Legs (Figs. 3–4) – Leg segmentation formula 7-7-7. Leg setal formula: Leg I: Ta- 1 ω , 2 ζ , 1 ϵ , 28n; Ti- 2 ϕ , 1 κ , 14n; Ge- 1 σ , 1 κ , 8n; TFe- 5n; BFe- 2n; Tr- 1n; Cx-1n. Leg II: Ta- 1 ω , 2 ζ , 26n; Ti- 2 ϕ , 15n; Ge- 1 κ , 8n; TFe- 5n; BFe- 2n; Tr- 1n; Cx-1n. Leg III: Ta- 1 ζ , 26n; Ti- 1 ϕ , 15n; Ge- 8n; TFe- 5n; BFe- 1n; Tr- 1n; Cx-1n. All tarsi with two claws and an empodium. Anterior claw and empodium falciform, posterior claw feather-like.

Measurements are given in Table 1.

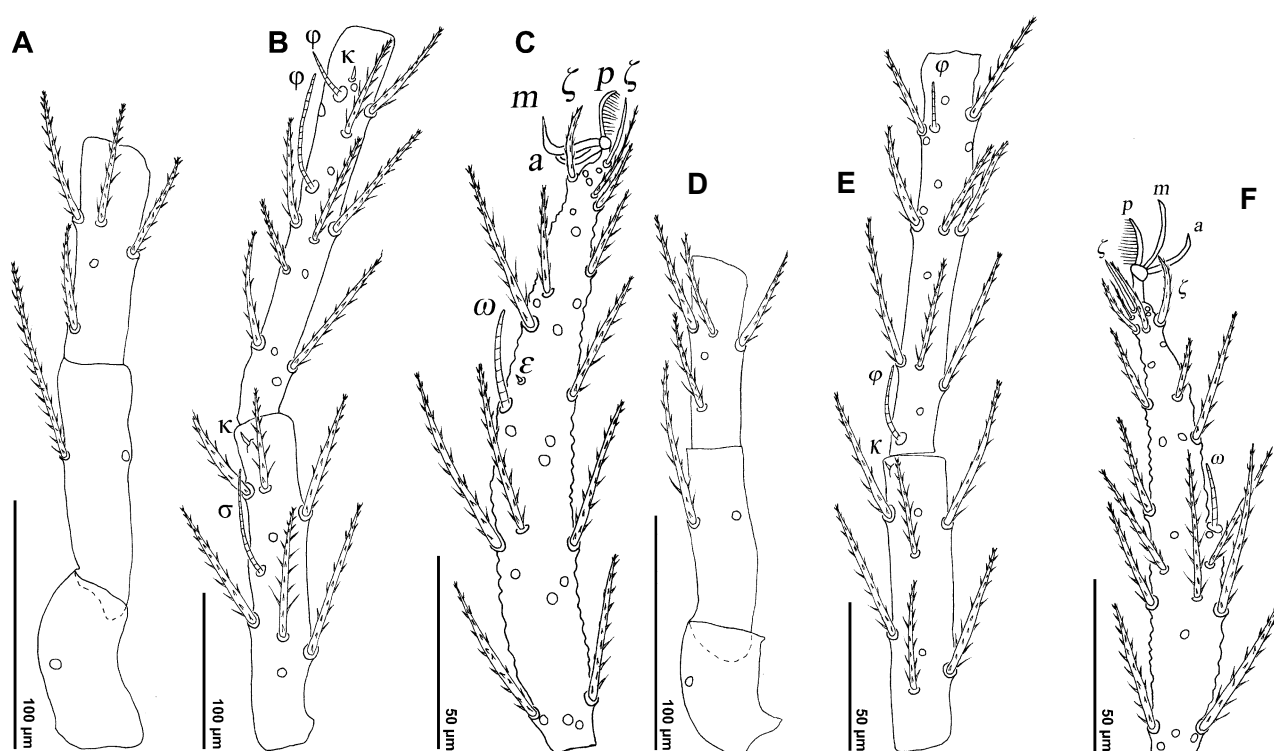


Figure 3. *Leptus (Amaroptus) saboorii* Haddadi & Noei **sp. nov.** (larva) – A. Tr–TFe I; B. Ge–Ti I; C. Ta I; D. Tr– TFe II; E. Ge–Ti II; F. Ta II.

Material examined

The holotype larva (ARS-20240909-1a) was collected on an unidentified Acrididae (Orthoptera) IRAN: Sistan and Baluchestan Province (Southeastern Iran), Zahak County, Chah Nimeh recreational reservoir, 30° 50' 39" N, 61° 43' 07" E, 483 m a.s.l., 11 May 2020, coll. Alireza Arjmandi-Nezhad.

Type deposition

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 species is named in honor of Prof. Alireza Saboori (Jalal Afshar Zoological Museum, Department of Plant Protection, Faculty of Agriculture, University of Tehran, Tehran, Iran), for his great efforts to develop Acarology in Iran.

Remarks

The new species belongs to the subgenus *Leptus (Amaroptus)* in having more than four scutalae. This subgenus includes the following species: *L. (A.) sivasensis* Saboori, Can & Cakmak, 2024 and *L. (A.) vuki* Haitlinger, 2000. *Leptus (A.) saboorii* Haddadi & Noei **sp. nov.** differs from *L. (A.)*

sivasensis in the number of setae on palp genu (1 vs. 2 in *L. (A.) sivasensis*), number of setae between coxae II–III (5 vs. 25), number of setae behind coxae III (24 vs. 56), fD (53 vs. 188), fV (29 vs. 83), in the longer *bs* (57 vs. 33), DS (55–67 vs. 33–39), SD (120 vs. 95), ISD (72 vs. 48), AP (15 vs. 8) and differs from *L. (A.) vuki* in the number of setae between coxae I (2 vs. 7 in *L. (A.) vuki*), number of setae between coxae I–II (2 vs. ~42), number of setae between coxae II–III (5 vs. ~92), number of setae behind coxae III (24 vs. ~140), fD (53 vs. ~320), ASens bases (placed anterior to the PL bases vs. placed posterior to the PL bases), in the longer Ti I (155 vs. 112–122), Ti II (135 vs. 96–106), Ti III (208 vs. 130–136), Ti III/AW (2.36 vs. 1.29–1.35), leg I (776 vs. 508–560), leg II (710 vs. 508–556), leg III (822 vs. 580–626), DS (55–67 vs. 18–40), SD (120 vs. 110–114) Ta I (L) (155 vs. 104–108), Ta II (L) (135 vs. 92–96), Ge II (105 vs. 84–86), LX (32 vs. 14–16), PPW (115 vs. 32–40) and NDV (82 vs. ~594).

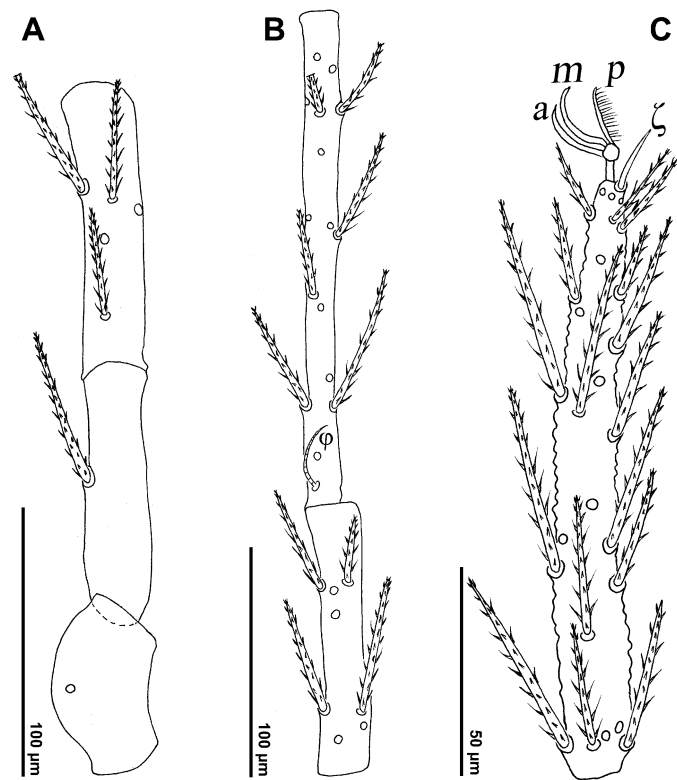


Figure 4. *Leptus (Amaroptus) saboorii* Haddadi & Noei **sp. nov.** (larva) – **A.** Tr– TFe III; **B.** Ge–Ti III; **C.** Ta III.

Table 1. Metric data and hosts for larvae of three species of the subgenus *Leptus (Amaroptus)*.

Characters	<i>L. (A.) saboorii</i> sp. nov.; Iran (N = 1)	<i>L. (A.) sivasensis</i> Türkiye (N = 1)*	<i>L. (A.) vuki</i> Peru (N = 4)	Characters	<i>L. (A.) saboorii</i> sp. nov.; Iran (N = 1)	<i>L. (A.) sivasensis</i> Türkiye (N = 1)	<i>L. (A.) vuki</i> Peru (N = 4)**
IL	550	410	838–952	as	2	2	-
IW	320	263	612–660	cs	21	31	-
SD (= L)	120	95	110–114	Ta I (L)	155	151	104–108
W	122	114	110–122	Ta I (H)	20	23	-
LX	32	31	14–16	Ti I	155	180	112–122
AW	88	93	96–104	Ge I	123	122	88–100
PW	100	102	104–110	TFe I	89	91	56–70

* The ASBM was calculated from Figure 1a, page 117 of Saboori *et al.* (2024), because their measurement (49) might be an error. ** Based on three specimens for SD.

Table 1. Continued.

Characters	<i>L. (A.) saboorii</i> sp. nov.; Iran (N = 1)	<i>L. (A.) sivasensis</i> Türkiye (N = 1)*	<i>L. (A.) vuki</i> Peru (N = 4)	Characters	<i>L. (A.) saboorii</i> sp. nov.; Iran (N = 1)	<i>L. (A.) sivasensis</i> Türkiye (N = 1)	<i>L. (A.) vuki</i> Peru (N = 4)**
PPW	115	99	32–40	BFe I	102	103	52–56
AL-PPL	27	22	-	Tr I	67	44	46–50
PL-PPL	12	14	-	Cx I	85	60	50–54
SBa	13	14	12–14	Leg I	776	750	508–560
SBp	15	17	20–24	Ta II (L)	135	132	92–96
ISD	72	48	64–70	Ta II (H)	20	22	-
AP	15	8	12–16	Ti II	135	151	96–106
AL	70/65	60	66–80	Ge II	105	97	84–86
PL	65/52	51	~64–70	TFe II	82	83	60–66
PPL	52/67	50	32–40	BFe II	87	73	50–60
ASE	-	41	~48–52	Tr II	67	47	46–56
MA (= AAS)	40	40	42–46	Cx II	99	71	80–86
ASBa	34	32	-	Leg II	710	653	508–556
ASBM	15	~13	-	Ta III (L)	148	145	96–102
PSE	-	75	~76–90	Ta III (H)	17	16	-
DS min	55	33	18	Ti III	208	228	130–136
DS max	67	39	40	Ge III	103	115	92–102
PDS min	50	-	-	TFe III	102	104	72–82
PDS max	52	30	-	BFe III	102	103	68–74
1a	47	41	-	Tr III	65	49	46–50
1b	72/66	65	58–60	Cx III	94	69	76–80
2a	51	38	-	Leg III	822	812	580–626
2b	36	25	28–32	IP	2308	2215	1596–1742
3a	44/50	-	-	AL/AAS	1.75/1.62	1.50	1.57–1.73
3b	54/57	37	28–42	Ti III/Ti I	1.34	1.26	1.16–1.11
GL	212	189	180–184	Ti II/PW	1.35	1.48	0.92–0.96
PaScFed	broken/67	59	44–54	SD/W	0.98	0.83	1–0.93
PaScFev	-	-	-	PW/AW	1.13	1.10	1.30–1.67
PaScGed	55	52	40–44	AL/PL	1.07/1.25	1.18	1.03–1.14
PaScGev	-	49	-	TiIII/AW	2.36	2.45	1.29–1.35
bs (= pHy)	57	33	52–54	Host	Acrididae	Crabronidae	Catantopidae

* The ASBM was calculated from Figure 1a, page 117 of Saboori *et al.* (2024), because their measurement (49) might be an error. ** Based on three specimens for SD.

DISCUSSION

Considering the known host association of the newly described species, the host spectrum of the subgenus *Leptus* (*Amaroptus*) is still limited to Orthoptera and Hymenoptera. Based on Haitlinger (2000), the subgenus *L. (Amaroptus)* has been recorded for the first time from Peru in South America (Neotropical region). Description of *L. (A.) sivasensis* Saboori, Can & Cakmak, 2024 from Türkiye by Saboori *et al.* (2024) and discovery of the new species, *L. (A.) saboorii* Haddadi & Noei **sp. nov.** from Iran in the present study, expanded the known distribution of this subgenus into the Northern hemisphere (Palearctic region). The distinct differences from the other species justify its description as a new species based on a single specimen and we hope to collect more specimens from the original location in future research.

Key to world species of larval subgenus *Leptus* (*Amaroptus*)

1. Palp genu with one seta 2
- Palp genu with two setae *L. (A.) sivasensis* Saboori, Can & Cakmak, 2024
2. Five setae between coxae II–III, two setae between coxae I, two setae between coxae I–II
..... *L. (A.) saboorii* Haddadi & Noei **sp. nov.**
- ~140 setae between coxae II–III, seven setae between coxae I, ~42 setae between coxae I–II
..... *L. (A.) vuki* Haitlinger, 2000

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گونه جدید از زیرجنس کمتر شناخته شده *Leptus (Amaroptus)* (Trombidiformes: Erythraeidae) از جنوب شرقی ایران

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چکیده

گونه جدید *L. (A.) saboorii* sp. nov. متعلق به زیرجنس *Leptus (Amaroptus)* در مرحله لاروی به صورت انگل بیرونی مرتبط با ملخ شاخک کوتاه (Orthoptera: Acrididae) در مکان تفریحی چاه‌نیمه، شهرستان زهک، استان سیستان و بلوچستان (جنوب شرقی ایران)، ایران توصیف و ترسیم می‌شود. این نخستین گونه از زیرجنس *Leptus (Amaroptus)* Haitlinger, 2000 از ایران است. کلید شناسایی برای گونه‌های زیرجنس *Leptus (Amaroptus)* جهان ارائه می‌شود.

واژگان کلیدی: کنه‌ها، Acrididae، لارو، پارازیت‌نگونا، سیستان و بلوچستان.

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