

Article

First record of *Leptus (Leptus) holgeri* (Acari: Prostigmata: Erythraeidae) from Vietnam, with redescription of the species

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Abstract

Larvae of *Leptus (Leptus) holgeri* Haitlinger, 1999 were collected from undetermined Orthoptera (Acrididae) for the first time from Vietnam. This paper presents new morphological and meristic data for the species. All *Leptus* species found on Orthoptera are mentioned and their distribution are given.

Key words: Parasitengona, Trombidiformes, ectoparasites, Orthoptera

Introduction

In Vietnam erythraeid mites are very poorly known. Until now, only five species were found as follows: *Charletonia danangensis* Haitlinger, 1986, *C. huensis* Haitlinger, 1986, *C. volzi* (Oudemans, 1910) (syn.: *C. jolantae* Haitlinger, 1986), *Abrolophus aitapensis* (Southcott, 1948) and *Leptus (L.) kattikus* Haitlinger, 2009 (Haitlinger, 1986, 1987b, 2007f, 2009, Małol *et al.* 2012). *Leptus (L.) holgeri* Haitlinger, 1999 for the first time is reported from Vietnam. It was reported only from Laos (Haitlinger 1999a). In this paper, new or corrected morphological and meristic data for the species are presented; moreover, a list of orthopteran hosts for *Leptus* species is given.

Material and Methods

Three larvae of *Leptus (L.) holgeri* were collected in Vietnam, 6 December 2011. All specimens were obtained from undetermined Orthoptera (Acrididae). Specimens were preserved in 70% ethanol. Measurements (given in micrometers) and figures were taken under microscope NIKON Eclipse 50i. The terminology and abbreviations follow Haitlinger (1999a) and Wohltmann *et al.* (2007). Additional measurements comprised: OD – length of odontus, PaFe (W) – width of palpfemur, PaGe (W) – width of palpgenu. All specimens are deposited in the Museum of Natural History of the Faculty of Biology and Animal Sciences, Wrocław University of Environmental and Life Sciences, Wrocław, Poland.

Results

***Leptus (Leptus) holgeri* Haitlinger, 1999**

Diagnosis

One palpgenuala and one palpfemorala, four setae between coxae II and III. Anterior and posterior margin of scutum concave. AL 64–75, PL 70–77, L 114–130, W 120–138, Ti III 202–222 and fD 47–48.

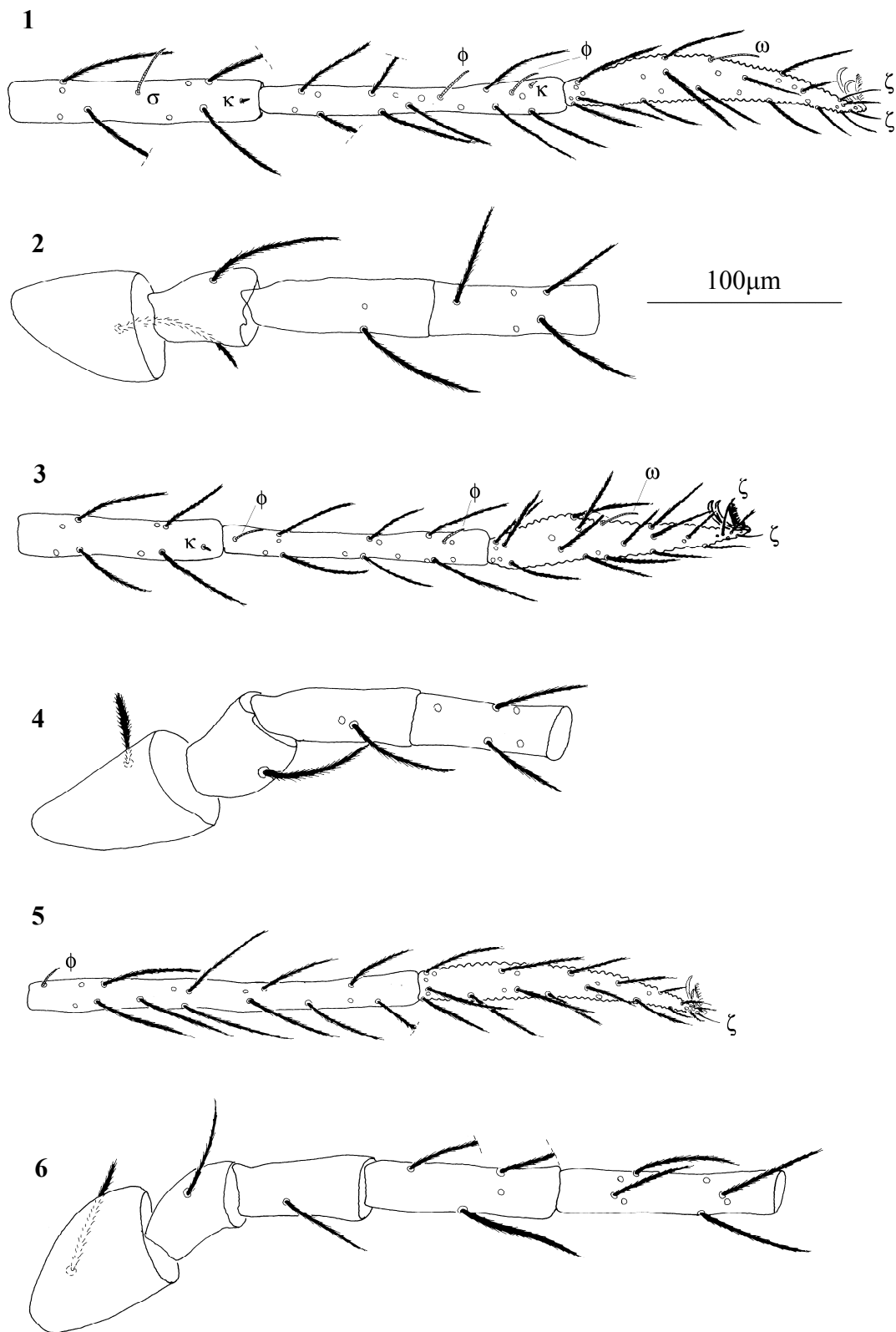
Description

Dorsal side of idosoma. Scutum with anterior and posterior margin concave. Setae AL slightly shorter or equal with setae PL; both setae with setules on $\frac{2}{3}$ their distal length. Anterior sensillae (ASE) sockets somewhat below level of AL bases. Anterior and posterior sensilla, both with some setules at distal end. Sockets of posterior sensilla surrounded with the cuticular line. Whole scutum punctate. Single eyes on circular sclerites located at the level of posterior margin of the scutum; diameter of eyes 6–14 μ m. Dorsum with 47–48 weakly barbed setae.

Ventral side of idiosoma. Setae *1a* and *2a* setulose, subequal in length, both longer than four setulose setae (with *3a*) placed near coxae III; their lateral pair located proximally to medial pair of setae. Behind coxae III, 24 (26) weakly barbed setae. Coxalae *1b*, *2b* and *3b* barbed; *1b* > *3b* > *2b*. Short supracoxal seta *elcI* present.

Table 1. Metric data for *Leptus (Leptus) holgeri* Haitlinger, 1999 from Laos (1 holotype, 2 paratypes) and Vietnam (3).

Character	1	2	3	Character	1	2	3
IL	685	508–933	1375–2065	PaFe (L)	62	60	57–65
IW	392	213–578	1197–1503	PaFe (W)	49	47	39–43
L	128	118–130	114–128	PaGe (L)	66	65	72–73
W	128	120–130	131–138	PaGe (W)	25	27	20–22
AW	96	88–96	97–108	Ta I	152	146–160	150–166
PW	116	106–118	120–127	Ti I	166	154–172	158–172
AA	14	12–14	13–15	Ge I	134	122–140	125–130
SB	18	14–18	15–19	Tf I	84	80–86	85–88
ISD	74	70–78	80–81	Bf I	102	86–104	100–108
AP	26	24–30	22–28	Tr I	54	46–64	62–65
AL.	68	64–74	67–75	Cx I	76	70–88	91–95
PL	72	70–76	71–77	Ta II	132	122–136	140–147
ASE	46	48–56	51	Ti II	142	134–146	137–146
PSE	74	70–80	75	Ge II	106	102–116	107–116
GL	230	214–230	220–240	Tf II	82	74–86	76–81
DS	50–64	50–70	56–77	Bf II	86	76–90	79–87
PsFd	46	52–64	50	Tr II	52	50–60	56–61
PsGd	58	60–66	59–61	Cx II	84	78–90	102–109
<i>1a</i>	50	40–54	42–47	Ta III	146	142–156	148–158
<i>2a</i>	52	46–54		Ti III	208	202–220	213–222
<i>3a</i>				Ge III	122	112–124	123–125
<i>1b</i>	72	64–80	77–95	Tf III	100	96–108	103–111
<i>2b</i>	38	36–42	37–41	Bf III	106	100–106	103–118
<i>3b</i>	58	54–62	61–65	Tr III	56	52–60	61–66
cs	12		7	Cx III	88	76–92	95–106
bs	47	47	43–47	Leg I	768	726–802	780–813
OD	35	34	29–37	Leg II	684	646–720	708–742
fD	48	48	47–48	Leg III	826	792–860	863–893
fV	24	24	24–26	IP	2278	2164–2382	2331–2446



Figures 1–6. *Leptus (Leptus) holgeri* Haitlinger, 1999 (larva). 1. Leg I, tarsus–genu; 2. Leg I, telofemur–coxa; 3. Leg II, tarsus–genu; 4. Leg II, telofemur–coxa; 5. Leg III, tarsus–tibia; 6. Leg III, genu–coxa.

Table 2. Distribution and hosts of all known larval species of *Leptus* found on Orthoptera.

Species	Hosts	Distribution	References
<i>L. (L.) aeolopae</i> Chinniah & Mohanasundaram, 1998	<i>Aiolopus tamulus</i> (Fabricius, 1798) (Acrididae)	India	Chinniah & Mohanasundaram (1998)
<i>L. (L.) agenori</i> Haitlinger, 1999	Orthoptera undet.	Malaysia, Thailand	Haitlinger (1999a)
<i>L. (L.) andae</i> Haitlinger, 2003	Orthoptera undet.	Greece (Rhodes)	Haitlinger (2003)
<i>L. (L.) annikae</i> Haitlinger, 2000	<i>Crotonotus</i> sp. (Acrididae)	Peru	Haitlinger (2000b)
<i>L. (L.) bakeri</i> Southcott, 1992	<i>Tettigidea lateralis</i> (Say, 1829), <i>Paratettix cucullata</i> Burmeister, 1838 (Tetrigidae)	USA	Southcott (1992)
<i>L. (L.) balicus</i> Haitlinger, 2006	Orthoptera undet.	Indonesia (Bali)	Haitlinger (2006b)
<i>L. (L.) bankensis</i> Southcott, 1999	Orthoptera undet.	Australia	Southcott (1999)
<i>L. (L.) bathypogonus</i> Womersley, 1934	Orthoptera undet.	Australia	Southcott (1999), Beron (2008)
<i>L. (L.) calcar</i> Southcott, 1999	<i>Heteropternis obscurella</i> (Blanchard, 1853), <i>Stenocantops vitripennis</i> (Sjöstedt), <i>Pardillana</i> sp., <i>Pycnostictus seriatus</i> Saussure (Acrididae)	Australia, Papua New Guinea	Southcott (1999)
<i>L. (L.) californicus</i> Southcott, 1992	<i>Dissosteira pictipennis</i> Bruner, 1905 (Acrididae)	USA	Southcott (1992)
<i>L. (L.) chrotogonae</i> Chinniah & Mohanasundaram, 1998	<i>Chrotogonus</i> sp. (Pyrgomorphidae)	India	Chinniah & Mohanasundaram (1998)
<i>L. (L.) cultellus</i> Southcott, 1999	<i>Chortoicetes terminifera</i> (Walker, 1870) (Acrididae)	Australia	Southcott (1999)
<i>L. (L.) draco</i> Southcott, 1984	Acrididae undet. Tettigonidae undet.	Papua New Guinea	Southcott (1984, 1999)
<i>L. (L.) dubius</i> (Paoli, 1937)	<i>Prionotropis hystrix</i> (Germar, 1817) (Pamphagidae), <i>Euchotyhippus declivus</i> , <i>Stauroderus</i> sp., <i>Dociostaurus maroccanus</i> (Thunberg, 1819), <i>Oedipoda miniata</i> (Pallas, 1771), <i>Calliptamus barbarus</i> (Costa, 1836) (Acrididae)	Italy	Paoli (1937), Beron (2008)
<i>L. (L.) foliatus</i> Southcott, 1999	Acrididae undet.	Australia	Southcott (1999)
<i>L. (L.) gagzoi</i> (Oudemans, 1910)	Tettigonidae undet.	Panama, Trinidad & Tobago	Oudemans (1910)
<i>L. (L.) holgeri</i> Haitlinger, 1999	Orthoptera undet.	Laos, Vietnam	Haitlinger (1999a)
<i>L. (L.) japonicus</i> Kawashima, 1958	Orthoptera undet.	Japan	Kawashima (1958)

Table 2. Continued.

Species	Hosts	Distribution	References
<i>L. (L.) josifovi</i> Beron, 1975	<i>Oedipoda caerulescens</i> (Linnaeus, 1758), <i>Oedaleus decorus</i> (Germar, 1825), <i>Calliptamus italicus</i> (Linnaeus, 1758) (Acrididae), Orthoptera undet.	Albania, Bosnia and Hercegovina, Bulgaria, Croatia, France (Corsica), Greece (Samos), Italy (Sardinia), Montenegro, Portugal, Switzerland	Beron (1975), Haitlinger (2004a, 2006a, 2007a, b, d, e, 2012)
<i>L. (L.) kamalii</i> Karimi Iravanlou & Saboori, 2001	<i>Sociostaurus hauensteini</i> (Acrididae)	Iran	Karimi Iravanlou & Saboori (2001)
<i>L. (L.) laviniacus</i> Haitlinger, 2002	<i>Catantops innotabilis</i> (Walker, 1870), <i>Oxya nitidula</i> (Walker, 1870) (Acrididae), Acrididae undet.	Cambodia, India, Sri Lanka	Haitlinger (2002, 2004c)
<i>L. (L.) lighti</i> Southcott, 1999	<i>Chortoicetes terminifera</i> , (Acrididae)	Australia	Southcott (1999)
<i>L. (L.) maldonadoicus</i> Haitlinger, 2000	<i>Crotonotus</i> sp.	Peru	Haitlinger (2000b)
<i>L. (L.) maranaensis</i> Haitlinger, 1987	Orthoptera undet.	Madagascar	Haitlinger (1987a)
<i>L. (L.) meloidarum</i> Beron, 1975	Orthoptera undet.	Bulgaria, Italy, Kirghizstan	Beron (1975), Haitlinger (1998)
<i>L. (L.) monolithosicus</i> Haitlinger, 2003	<i>Oedipoda</i> sp. (Acrididae)	Greece (Rhodes)	Haitlinger (2003)
<i>L. (L.) multisolenidia</i> Mayoral & Barranco 2011	<i>Episppmacris gruneri</i> (Descamps & Amedegnato, 1970) (Acrididae)	French Guiana	Mayoral & Barranco (2011a)
<i>L. (L.) nikanori</i> Haitlinger, 2000	<i>Pseudoprosopia scabra</i> (Klug, 1820), <i>Anaulacomera</i> sp. (Acrididae), Orthoptera undet.	Costa Rica, French Guiana	Haitlinger (2000a), Mayoral & Barranco (2011a, b)
<i>L. (L.) olafi</i> Haitlinger, 1991	Orthoptera undet.	Colombia, Venezuela	Haitlinger (1991, 2006c)
<i>L. (L.) olamukijacus</i> Haitlinger, 2001	Orthoptera undet.	Kenya	Haitlinger (2001)
<i>L. (L.) orthopterarum</i> Beron, 1975	<i>Bucephaloptera bucephala</i> (Brunner von Wattenwyl, 1882) (Tettigonidae), Orthoptera undet.	Bulgaria, Spain	Beron (1975), Haitlinger (2007e)
<i>L. (L.) oxyae</i> Vishnupriya & Mohanasundaram, 1988	<i>Oxya nitidula</i> (Acrididae)	India	Vishnupriya & Mohanasundaram (1988)
<i>L. (L.) pelebinus</i> Haitlinger, 2006	Orthoptera undet.	Benin	Haitlinger (2007c)
<i>L. (L.) pincheni</i> Southcott, 1999	<i>Apotrips</i> sp. (Acrididae)	Australia	Southcott (1999)
<i>L. (L.) pozzoicus</i> Haitlinger, 2007	Orthoptera undet.	Italy (Sardinia)	Haitlinger (2007d)
<i>L. (L.) rosellae</i> Haitlinger, 1999	Acrididae undet.	Turkey	Haitlinger (1999b)

Table 2. Continued.

Species	Hosts	Distribution	References
<i>L. (L.) simonettae</i> Haitlinger, 2000	Acrididae undet.	Guatemala, Honduras	Haitlinger (2000a)
<i>L. (L.) tetrigi</i> Southcott, 1988	<i>Scelimena gavialis</i> (Saussure, 1861) (Tetrigidae)	Sri Lanka	Southcott (1988)
<i>L. (L.) tindalei</i> Southcott, 1999	Orthoptera undet.	Australia	Southcott (1999)
<i>L. (L.) tiranicus</i> Haitlinger, 2006	Orthoptera undet.	Venezuela	Haitlinger (2006c)
<i>L. (Amaroptus) vuki</i> Haitlinger, 2000	Acrididae undet.	Peru	Haitlinger (2000b)

Gnathosoma. Gnathosoma long with slightly barbed setae *bs*, shorter setae *cs* and very short setae *as*, both nude. Palp genualae and palpfemoralae barbed; palp genualae little longer than palpfemoralae. Palptibia with two barbed setae and one nude seta. Palptarsus with four barbed setae, two nude setae, one solenidion in proximal part of the segment and one distal eupathidium. Palpal setal formula: 0-B-B-BBN-BBBBBNN $\omega\zeta$. Odontus (OD) simple.

Legs. All setae on legs barbed. Leg lengths are given in Table 1. Leg setal formula: Leg I: Ta 1 ω , 2 ζ , 26 (24–26); Ti 2 ϕ , 1 κ , 14 (14–15); Ge 1 σ , 1 κ , 8; Tf 5; Bf 2; Tr 1; Cx 1. Leg II: Ta 1 ω , 2 ζ , 23 (23–24); Ti 2 ϕ , 14 (14–15); Ge 1 κ , 8; Tf 5; Bf 2; Tr 1; Cx 1. Leg III: Ta 1 ζ , 24 (21–24); Ti 1 ϕ , 15 (14–15); Ge 8; Tf 4; Bf 1; Tr 1; Cx 1 (Figs. 1–6).

Remarks

Leptus (L.) holgeri belongs to the group of species with one palpfemorala, one palp genuala, four setae between coxae II and III, Ti I 140–176 μm and $\text{fD} < 70$. This group includes: *L. (L.) meloidarum* Beron, 1975, *L. (L.) leleupi* Fain & Elsen, 1987, *L. (L.) bankensis* Southcott, 1999, *L. (L.) calcar* Southcott, 1999, *L. (L.) cultellus* Southcott, 1999, *L. (L.) elderi* Southcott, 1999, *L. (L.) fisheri* Southcott, 1999, *L. (L.) francesi* Southcott, 1991, *L. (L.) jenseni* Southcott, 1993, *L. (L.) pincheni* Southcott, 1999, *L. (L.) swani* Southcott, 1991, *L. (L.) agenori* Haitlinger, 1999, *L. (L.) addari* Haitlinger, 1999, *L. (L.) balicus* Haitlinger, 2006 and *L. (L.) fozicus* Haitlinger, 2004. Moreover, *L. (L.) laviniacus* Haitlinger, 2002 and *L. (L.) masaimaraicus* Haitlinger, 2001 are included to this group because length of their Ti I are little beyond 140 μm (Beron 1975, Fain & Elsen 1987, Southcott 1991, 1992, 1999, Haitlinger 1998, 1999a, 2001, 2002, 2004b, 2006b). *Leptus (L.) holgeri* differs from *L. (L.) meloidarum* in the longer Ta I (146–166 vs. 122–134), Ge I (122–140 vs. 104–116), Ta II (122–147 vs. 102–120), Ti II (134–146 vs. 118–134), Ge II (102–116 vs. 90–100), Ta III (142–158 vs. 116–134) and Ti III (202–222 vs. 154–192); from *L. (L.) leleupi* in fD (47–48 vs. 60), the longer W 120–138 vs. 110), AL (64–75 vs. 54–57), PL (70–77 vs. 60), ISD (70–81 vs. 60), Ta I (146–166 vs. 128) and Ge I (122–140 vs. 113); from *L. (L.) bankensis* in fV (24–26 vs. 19), the longer ISD (70–81 vs. 60), L (114–130 vs. 100), W (120–138 vs. 110), AL (64–75 vs. 57), PL (70–77 vs. 55), and Ti III (202–222 vs. 183); from *L. (L.) calcar* in $\phi\text{Ti III}$ distinctly shorter than tibialae vs. $\phi\text{Ti III}$ longer than tibialae, the longer ISD (70–81 vs. 56–68), AP (22–30 vs. 16–22), AL (64–75 vs. 49–60), PL (70–77 vs. 45–57) and fV (24–26 vs. 19); from *L. (L.) cultellus* in the longer AW (88–108 vs. 71–76), PW (106–127 vs. 86–91), ISD (70–81 vs. 55–58), L (114–130 vs. 92–95) and W (120–138 vs. 95–99); from *L. (L.) elderi* in the longer AW (88–108

vs. 62–65), PW (106–127 vs. 70–78), L (114–130 vs. 80–85), W (120–138 vs. 78–85), AL (64–75 vs. 52–61), PL (70–77 vs. 62–67), ISD (70–81 vs. 50–53), Ta I (146–166 vs. 114–124) and Ta III (142–158 vs. 105–114); from *L. (L.) fisheri* in fV (24–26 vs. 14), the longer ISD (70–81 vs. 55), L (114–130 vs. 89), AP (22–30 vs. 17), AL (64–75 vs. 55) and PL (70–77 vs. 60); from *L. (L.) francesi* in one solenotibiala III vs. two solenotibialae III, the longer PW (106–127 vs. 98–104), L (114–130 vs. 91–102), W (120–138 vs. 108–113), ISD (70–81 vs. 59–69) and number of solenidion on Ge I (1 vs. 2); from *L. (L.) jenseni* in sternalae and intercoxalae narrow vs. sternalae and intercoxalae bushy-like, fD (47–48 vs. 59), fV (24–26 vs. 16), the longer L (114–130 vs. 86), W (120–138 vs. 98), AW (88–108 vs. 75), PW (106–127 vs. 89), ISD (70–81 vs. 55), AP (22–30 vs. 16), AL (64–75 vs. 50), PL (70–77 vs. 53), Ta I (146–166 vs. 113), Ta II (122–147 vs. 95) and Ta III (142–158 vs. 108); from *L. (L.) pincheni* in fV (24–26 vs. 16), the longer ISD (70–81 vs. 61–68), AP (22–30 vs. 18–20), AL (64–75 vs. 53–60), PL (70–77 vs. 50–60), ASE (46–56 vs. 25–36), PSE (70–80 vs. 45–60), Ta I (146–166 vs. 127–142), Ta II (122–147 vs. 108–119) and Ta III (142–158 vs. 120–127); from *L. (L.) swani* in AL ≤ PL vs. AL > PL, the longer PL (60–77 vs. 50), DS max. (64–77 vs. 35–39), shorter Ta I (146–166 vs. 174) and Ta III (142–158 vs. 164); from *L. (L.) agenori* in the longer PW (106–127 vs. 100–106), W (120–138 vs. 110–114), DS max. (64–77 vs. 56–64), GL (214–240 vs. 208–210), Ta I (146–166 vs. 138–140), Ti I (154–172 vs. 144–152) and Ti III (202–222 vs. 186–192); from *L. (L.) addari* in fD (47–48 vs. 39), the longer L (114–130 vs. 80), W (120–138 vs. 76), AW (88–108 vs. 62), PW (106–127 vs. 68), ISD (70–81 vs. 44), PL (70–77 vs. 60), GL (214–240 vs. 144), Ta I (146–166 vs. 114), AP (22–30 vs. 12) and Ti III (202–222 vs. 194); from *L. (L.) balicus* in the longer L (114–130 vs. 96–106), W (120–138 vs. 102–110), AW (88–108 vs. 76–86), PW (106–127 vs. 90–100), GL (214–240 vs. 192–202), Ta I (146–166 vs. 128–140), Ti III (202–222 vs. 170–180), leg I (726–813 vs. 630–676) and IP (2164–2446 vs. 1884–1980); from *L. (L.) masaimaraicus* in fV (24–26 vs. 18), the longer W (120–138 vs. 114), AL (64–75 vs. 52), PL (70–77 vs. 62), ISD (70–81 vs. 64), Ta I (146–166 vs. 126), Ta II (122–147 vs. 112), Ta III (142–158 vs. 120), Ti III (202–222 vs. 162) and leg I (726–813 vs. 642–662); from *L. (L.) fozicus* in the longer L (114–130 vs. 94–196), W (120–138 vs. 92–96), AW (88–108 vs. 72–78), PW (106–127 vs. 80–86), AL (64–75 vs. 50–56), PL (70–77 vs. 50–54), ISD (70–81 vs. 58–62), Ta I (146–166 vs. 130–132), Ta II (122–147 vs. 112–116) and Ta III (142–158 vs. 122–134) and from *L. (L.) laviniacus* in fV (24–26 vs. 18), the longer W (120–138 vs. 112–122), GL (214–240 vs. 190–216), Ta I (146–166 vs. 122–136), Ta III (142–158 vs. 122–134) and Ti III (202–222 vs. 164–190).

The genus *Leptus* is widely distributed in all continents, excluding Antarctica. Species of this genus are associated with many hosts belonging to 14 orders of Insecta: Archaeognatha, Blattodea, Coleoptera, Collembola, Diptera, Heteroptera, Homoptera, Hymenoptera, Lepidoptera, Mecoptera, Neuroptera, Odonata, Phasmodia, Thysanura, six orders of Arachnida: Amblypygi, Araneae, Opiliones, Pseudoscorpiones, Scorpiones, Trombidiformes of Acari, and Julida of Diplopoda, Columbiformes of Aves and Rodentia of Mammalia (among both last orders are only accidental hosts). Among 232 *Leptus* species based on larvae or larvae and adults, most species were collected from Coleoptera (Beron 2008). The only 41 *Leptus* species were obtained from Orthoptera. Among them 33 species were noted only on Orthoptera and 8 species were collected also from other arthropods. The only 33 hosts were determined to species or genus: 26 species of Acrididae, three of Tetrigidae, one of Tettigonidae, one of

Pyrgomorphidae and one of Pamphagidae. The order Orthoptera includes 39 families with over 24000 species (Zhang, 2011). Till now studies indicate that relatively small number of orthopteran species are hosts for *Leptus* species (Table 2).

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نخستین گزارش از گونه *Leptus (Leptus) holgeri* (Acari: Prostigmata: Erythraeidae) از ویتنام، همراه با بازتوصیف گونه

ریزارد هیتلینگر

چکیده

لاروهای *Leptus (Leptus) holgeri* Haitlinger, 1999 از روی راست‌بالان (Acrididae) شناسایی نشده از ویتنام جمع‌آوری شدند. این مقاله اطلاعات ریخت‌شناسی و مرستیک تازه‌ای برای این گونه ارائه می‌دهد. همه گونه‌های یافت‌شده روی راست‌بالان و پراکندگی آنها آورده شده است.

واژگان کلیدی: Parasitengona، Trombidiformes، انگل‌های بیرونی، راست‌بالان.

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