

**TWO NEW SPECIES OF *LEPTUS* LATREILLE, 1796
(ACARI: PROSTIGMATA: ERYTHRAEIDAE)
ASSOCIATED WITH TENEBRIONIDAE (INSECTA: COLEOPTERA)**

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ABSTRACT

Two new species of *Leptus* are described: *L. horiacus* from *Adesmia carinata* (Syria) and *L. tammuzy* from *Pimelia* sp. (Syria), *P. milleri* (Israel) and *Vieta millingani* (Saudi Arabia).

KEY WORDS: Acari, Erythraeidae, *Leptus*, Syria, Israel, Saudi Arabia, Tenebrionidae.

INTRODUCTION

In Asia the genus *Leptus* Latreille is represented by 16 species described from their larval stage, especially from Japan, Malaysia and Indonesia. No species have been reported from the Middle East, except undetermined larvae that were reported from Iraq (Shamsuddin and Mohammad, 1979).

The following *Leptus* species were recorded from Japan: *ashinai* Kawashima, *gifuensis* Kawashima, *hidakai* Kawashima, *japonicus* Kawashima, *kuroshimaensis* Kato and Kitahara, *kyushuensis* Ishii and *saigusai* Kawashima. *Leptus siemsseni* (Oudemans) was recorded from China. *Leptus calidus* Shiba, *L. cameronensis* Shiba and *L. hozumii* Shiba were recorded from Malaysia, *L. gagrellae* (Oudemans) and *L. managarus* Haitlinger from Java, *L. terebrans* Vitzthum from Sumatra, *L. tetrigi* Southcott from Sri Lanka and *L. guus* Haitlinger from Turkmenia (Oudemans, 1912; Vitzthum, 1926; Ishii, 1933; Kato and Kitahara, 1958; Kawashima, 1958; Shiba, 1976; Southcott, 1988; Haitlinger, 1990b). Of all these species only *L. guus* is known to be associated with tenebrionid beetles.

Two new species of *Leptus* are described and illustrated in this paper; they are associated with Tenebrionidae and were collected in Syria, Israel and Saudi Arabia. For the terminology of setae and other morphological characters used, see Southcott (1992).

Larvae were obtained from the collection of insects of the Museum of Natural History, Wrocław University (MNHWU), where holotype and paratypes are deposited. Measurements are expressed in micrometers (μm).

Leptus horiacus n. sp.

(Figs. 1–7)

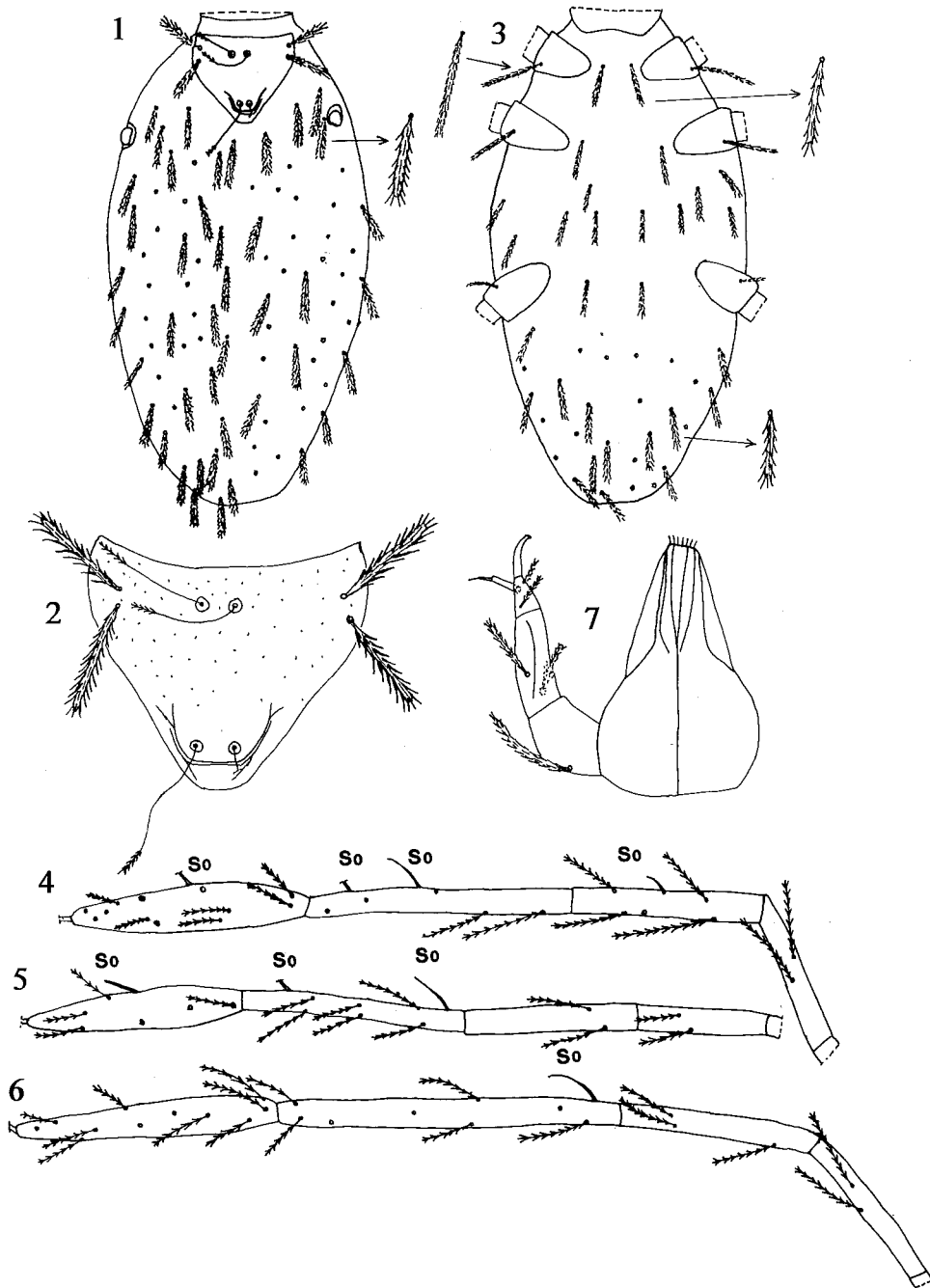
DIAGNOSIS. Two palpgenualae, 1 pedal solenogenuala, ~12 intercoxalae, AL and PL scutalae almost equal, slightly enlarged, PL scutalae bases only slightly behind AL scutalae bases, AW < 80 μm , PW < 90 μm , GL (length of gnathosoma) < 190 μm , GB (width of gnathosoma) < 100 μm .

Description of larva. Scutum wider than long, slightly punctate, with distinctly cuticular lines bounding PSE and extending behind their bases (Fig. 2). Sensilla distally ciliated, AL and PL almost equal in length. Bases of PSE relatively far from posterior margin of scutum. Dorsal setae slightly enlarged with moderate setules, 26–32 μm long (Fig. 1); number no more than 100. Metric data as in Table 1.

Ventral surface of idiosoma: sternalae I and II with long setules, about 12 intercoxalae similar to the last. Behind coxae III setae as dorsal but thinner, 28–30 μm long (Fig. 3). Coxalae I–III bear distinct setulae; the first of them is the longest. Legs short, lengths (including coxae, excluding claws): I 636 μm paratype, II 552 μm holotype; the other legs broken. Leg specialized setae: SoTiI 80d (distal position), (?20 μm long), SoTiI 58d (32 μm), SoGeI 59d broken (Fig. 4). Tarsus I with SoTaI 53d (34 μm), paratype; tarsus II with SoTaII 54d (20 μm), holotype. Gnathosoma rather short, 160–170 μm and narrow, 78–90 μm , palpal femorala with long setulae. Palpgenu with two palpgenualae; the dorsal seta of them is longer (Fig. 7). Hypostomalae nude.

MATERIAL EXAMINED. Holotype, larva, SYRIA: from *Adesmia carinata* Solier (Tenebrionidae). Paratypes, 2 larvae, locality and host as for holotype.

REMARKS. *L. horiacus* n. sp. is most similar to *L. josifovi* Beron, *L. dubius* (Paoli), *L. tammuzi* n. sp., *L. sudanensis* (Oudemans), *L. mogadoranus* Haitlinger and *L. akkus* Haitlinger. It can be separated from *L. josifovi* from Bulgaria (Beron, 1975) by the shape of the scutum (in *L. josifovi* the angles of the anterior margin of the scutum are rounded), shorter AW, PW, ISD, AL and almost equal AL and PL. It differs from *L. dubius* from Italy (Paoli, 1937) by bases of the ASE placed on a level between the bases of AL and PL (in *L. dubius* these bases are placed above the bases of scutalae AL), much less concave anterior margin of scutum, shorter distance between AL and PL (AP), also by weakly ornamented scutum and W longer than L. It differs from *L. tammuzi* n. sp. by shorter W, L, AW, PW, GL, GB, gd, gv, fd, longer StI, StII and smaller GL/Pgl and ISD/AP ratio. It differs from *L. sudanensis* from Sudan (Oudemans, 1912) by L/W ratio (0.86–0.89 in *L. horiacus*; 0.60 in *L. sudanensis*), shorter L and W and smaller number of dorsal setae (about 100 to 150). It differs from *L. mogadoranus* from Morocco (Haitlinger, 1990a) by shorter AW, PW, W and by L/W ratio (0.86–0.89 in *L. horiacus*; 0.58–0.63 in *L. mogadoranus*). It differs from *L. akkus* from Spain (Haitlinger, 1990a) by shorter AW, PW, W and by L/W ratio (0.69–0.73 in *L. akkus*).



Figs. 1-7. *Leptus horiacus* n. sp. 1. Idiosoma, dorsal view; 2. Scutum; 3. Idiosoma, ventral view; 4. Leg I, tarsus-telofemur; 5. Leg II, tarsus-telofemur; 6. Leg III, tarsus-telofemur; 7. Gnathosoma, dorsal view.

TABLE 1
Metric data (expressed in μm) for *Leptus horiacus* n. sp., larva

Character	Holotype	Paratypes	Character	Holotype	Paratypes		
Body length	640	536	784	TfI	–	80	–
Body width	272	224	360	BfI	–	82	–
L	78	84	80	TrI	–	44	–
W	90	96	90	CxI	–	52	–
AW	72	74	74	TaII	104	–	–
PW	80	78	84	TiII	116	–	–
AL	44	46	–	GeII	90	–	–
PL	40	44	42	TfII	70	–	–
ISD	38	40	40	BfII	72	–	–
AP	8	10	10	TrII	42	–	–
ASE	44	40	46	CxII	56	–	–
PSE	–	–	60	TaIII	–	136	–
DS	26–32	26–30	26–30	TiIII	–	184	–
SBa	14	14	16	GeIII	–	102	–
SBp	14	14	16	TfIII	–	88	–
OC*	22	22	22	BfIII	–	84	–
StI	38	40	36	TrIII	–	44	–
StII	34	–	–	CxIII	–	56	–
ASBa	20	20	20	TiI/GeI	–	1.31	–
GL	160	170	168	TiII/GeII	1.29	–	–
GB	90	78	84	AW/ISD	1.89	1.85	1.85
Pgl**	54	60	62	PW/AW	1.11	1.05	1.13
fd	52	50	–	AL/PL	1.10	1.04	–
gd	42	–	–	GL/Pgl	2.96	2.83	2.71
gv	32	36	–	PW/AP	10.00	7.80	8.40
Coxalae I	58	50	60	ISD/AP	4.75	4.00	4.00
Coxalae II	32	28	–	AW/AP	9.00	7.40	7.40
Coxalae III	32	32	30	TiI/AW	–	1.92	–
TaI	–	128	–	TiII/AW	–	1.61	–
TiI	–	142	–	AW/AL	1.63	1.61	–
GeI	–	108	–	TiII/PW	1.45	–	–
				L/W	0.86	0.87	0.89

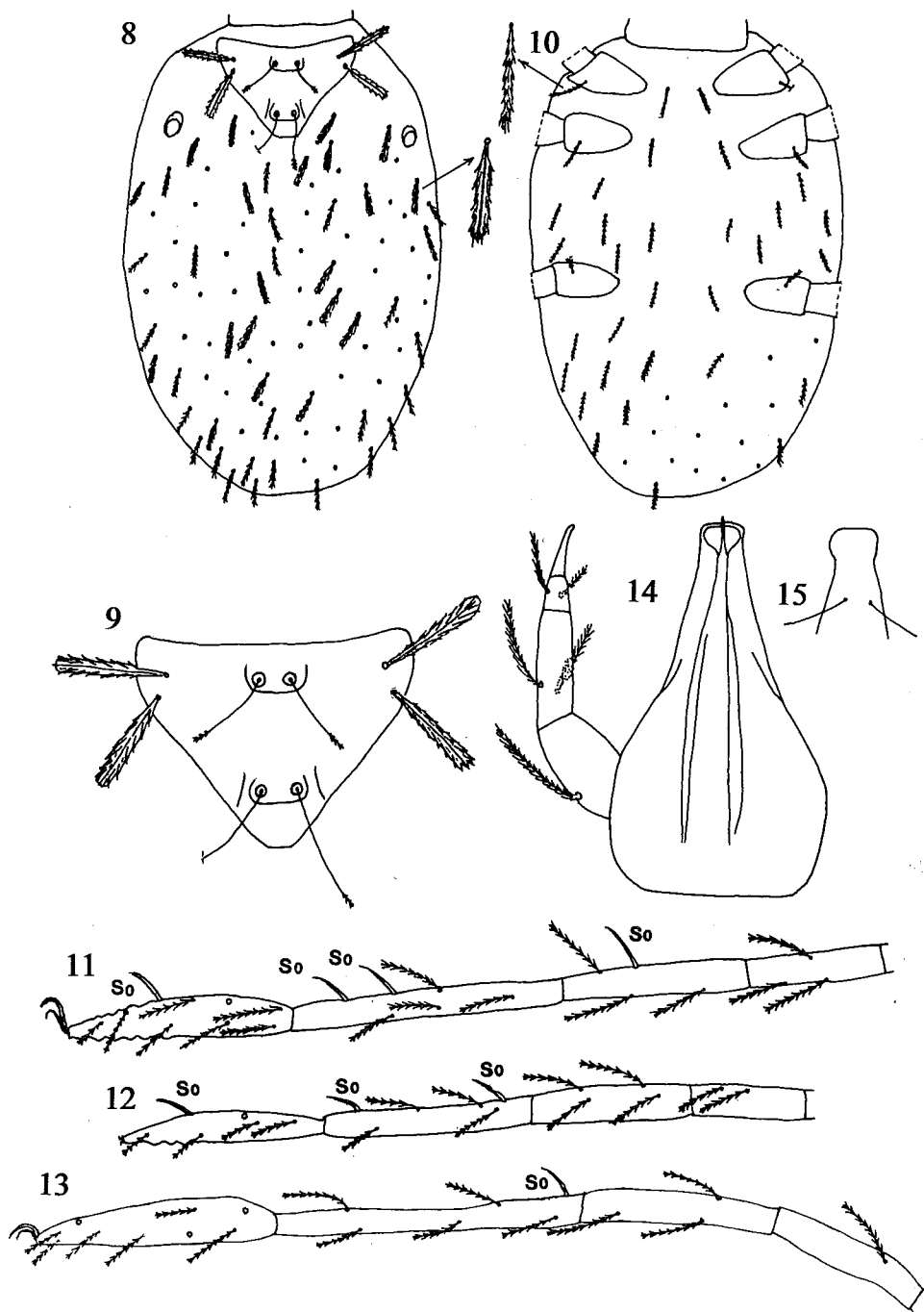
* – length of eye; ** – length of palpgenu.

Leptus tammuzi n. sp.

(Figs. 8–15)

DIAGNOSIS. Two palpgenuae, 1 pedal solenogenua, ~10 intercoxalae, L > 86 μm , W > 110 μm , PW > 90 μm , GL > 200 μm , GB > 100 μm .

Description of larva. Scutum wider than long with short lines below bases of ASE and PSE (Fig. 9). Scutalae with moderately protruding setules, AL somewhat longer than PL. Sensilla distally ciliated. Anterior sensilla sockets between levels of anterolateral and posterolateral



Figs. 8–15. *Leptus tammuzi* n. sp. 8. Idiosoma, dorsal view; 9. Scutum; 10. Idiosoma, ventral view; 11. Leg I, tarsus–telofemur; 12. Leg II, tarsus–telofemur; 13. Leg III, tarsus–telofemur; 14. Gnathosoma, dorsal view; 15. Hypostomalac.

TABLE 2
Metric data (expressed in μm) for *Leptus tammuzi* n. sp., larva

Character	S y r i a					Israel	Saudi Arabia
	Holotype	Paratypes				Paratype	Paratype
Body length	720	808	672	596	696	624	624
Body width	344	344	336	248	344	248	304
L	96	104	—	90	94	94	92
W	116	120	120	114	116	116	116
AW	92	90	94	92	90	94	94
PW	100	102	104	100	100	100	102
AL	50	54	48	54	—	—	196
PL	48	52	44	48	—	42	196
ISD	50	52	48	54	50	48	40
AP	10	8	10	10	10	8	8
ASE	—	40	—	—	40	—	—
PSE	—	—	—	—	60	—	—
DS	28–34	34	34	30–36	32	32–36	28–30
SBa	12	14	14	—	14	14	14
SBp	16	16	14	—	14	14	14
OC	26	24	24	22	22	24	26
StI	30	30	—	28	—	28	30
StII	—	24	—	—	—	26	30
ASBa	—	26	—	—	—	—	—
GL	224	218	—	228	204	222	216
GB	120	148	118	134	114	—	—
Pgl	64	68	66	64	68	64	68
fd	60	60	62	62	64	—	64
gd	54	56	56	56	52	56	—
gv	44	42	46	44	42	—	—
Coxalae I	60	50	52	54	—	—	—
Coxalae II	—	24	24	20	—	—	—
Coxalae III	—	—	—	46	—	—	—
TaI	126	—	116	126	126	—	—
TiI	150	—	146	158	162	—	—
GeI	104	114	106	110	108	—	114
TfI	76	76	84	72	83	—	76
BfI	76	76	74	76	80	—	84
TrI	46	48	48	46	46	—	46
CxI	52	62	52	56	—	—	—
TaII	—	—	—	100	—	—	—
TiII	—	—	—	128	—	—	—
GeII	—	92	—	86	—	—	—
TfII	—	74	—	70	—	—	—
BfII	—	64	—	64	—	—	—
TrII	—	44	—	46	—	—	—
CxII	—	64	—	—	—	—	—

TABLE 2 (continued)

Character	Syria					Israel	Saudi Arabia
	Holotype	Paratypes				Paratype	Paratype
TaIII	126	—	—	—	—	126	140
TiIII	170	—	—	—	—	180	204
GeIII	104	—	—	—	—	106	118
TfIII	84	—	—	—	—	—	94
BfIII	86	—	—	—	—	82	86
TrIII	44	—	—	—	—	46	48
CxIII	—	—	—	—	—	66	72
TiI/GeI	1.44	—	1.38	1.44	1.50	—	—
TiII/GeII	—	—	—	1.49	—	—	—
AW/ISD	1.84	1.73	1.96	1.70	1.80	1.96	2.35
PW/AW	1.13	1.09	1.11	1.09	—	1.06	1.08
AL/PL	1.04	1.04	1.09	1.12	—	—	—
GL/Pgl	3.20	3.50	—	3.56	3.00	3.47	3.18
PW/AP	12.75	10.00	10.40	—	10.00	12.50	12.75
ISD/AP	6.50	5.00	4.80	5.40	5.00	6.00	5.00
AW/AP	11.23	9.20	9.40	9.20	9.00	11.75	11.75
TiI/AW	1.63	1.55	1.80	1.75	1.75	—	—
TiII/AW	—	—	—	1.39	—	—	—
AW/AL	1.73	1.84	1.96	1.70	—	—	—
TiII/PW	—	—	—	1.28	—	—	—
L/W	0.86	0.82	—	0.79	0.81	0.81	0.79

scutalae bases. Dorsum of idiosoma with ca. 100 setae. Dorsal setae slightly enlarged as in Fig. 8 with moderate setules. Eyes short (length small, 22–26 μm).

Ventral surface of idiosoma: sternalae I, II and coxalae I–III bear distinct setules; about 10–12 intercoxalae present. Coxala I more than twice longer than coxala II. Metric data as in Table 2. Legs short, leg I in holotype 630 μm long, in paratype 644 μm (with coxa), leg II damaged, leg III in paratype (Saudi Arabia) 762 μm long. Leg specialized setae: SoTiI 64d (32 μm), SoTiII 83d (26 μm), SoGeI 60d (36 μm) (Fig. 11). Tarsus I with SoTaI 59d (24 μm) holotype, SoTiIII 52d (24 μm) holotype. Gnathosoma rather long, (to tip of hypostomal lip) 204–224 μm , palpal femorala with distinct setules. Palpgenu bears two palpgenualae, fd somewhat longer than gd and distinctly longer than gv (Fig. 14). Hypostomalae nude (Fig. 15).

MATERIAL EXAMINED. Holotype, larva, SYRIA: from *Pimelia* sp. (Tenebrionidae). Paratypes, four larvae, locality and host as for holotype; ISRAEL: near Bahr Tabariye (Yam Kinneret), one larva from *Pimelia mittrei* Solier, 31.vii.1941; SAUDI ARABIA: one larva from *Vieta millingeni* Kirchsberg (Tenebrionidae).

REMARKS. *L. tammuzi* n. sp. can be separated from *L. sudanensis* by the L/W ratio (over 0.8 in *L. tammuzi*; 0.6 in *L. sudanensis*), distinctly larger L and smaller number of dorsal setae (about 90–96 in *L. tammuzi*; 150 in *L. sudanensis*). It differs from *L. josifovi* by the shape of

scutum, shorter AL, TaIII, ASBa (28 μm in *L. tammuzi*; 35 μm) in *L. josifovi*), TiI/GeI ratio (1.38–1.50 in *L. tammuzi*; 1.21 in *L. josifovi*), TiII/GeII (1.40 in *L. tammuzi*; 1.28 in *L. josifovi*), AW/ISD (1.70–2.35 in *L. tammuzi*; 1.54 in *L. josifovi*), and AL/PL (1.04–1.12 in *L. tammuzi*; 1.26 in *L. josifovi*). It differs from *L. dubius* by bases of ASE placed on level between the bases of AL and PL, and W longer than L. It differs from *L. akkus* and *L. mogadoranus* by shorter AW, PW and by L/W ratio.

DISCUSSION

Leptus larvae are associated mainly with insects and arachnids, but are found sporadically on rodents, myriapods and possibly on birds (known from nests of birds) (Fain and Elsen, 1987; Haitlinger, 1987, 1991; Southcott, 1992). A list of species associated with insects and arachnids in Europe and North America is given by Southcott (1992). Larvae of *Leptus* were found on Collembola, Thysanura, Odonata, Dermaptera, Orthoptera, Homoptera, Heteroptera, Diptera, Hymenoptera and Coleoptera. More than 100 families of Coleoptera are known but only from 13 (Meloidae, Chrysomelidae, Anthribiidae, Lagriidae, Cerambycidae, Elateridae, Buprestidae, Cantharidae, Lycidae, Scarabaeidae, Curculionidae, Cicindellidae and Tenebrionidae) *Leptus* larvae were obtained. The absence of these larvae from widely distributed families such as Carabidae, Coccinellidae and only single records from Scarabaeidae, Curculionidae and Cerambycidae are remarkable. From Cantharidae, Lagriidae and Cerambycidae only one nonspecific species, *L. japonicus* Kawashima, was obtained. Among 27 species of *Leptus* larvae (Table 3) obtained from Coleoptera, as many as 11 species were found on Tenebrionidae, which points to a closer association with Tenebrionidae than with other Coleopteran families.

TABLE 3
Hosts and distribution of *Leptus* larvae

Distribution Host family	Europe	South America	Asia	Africa	Australia
Meloidae	<i>L. meloidarum</i> , Beron, Bulgaria				
Scarabaeidae				<i>L. lovaniensis</i> , Fain and Elsen, Zaire	
Elateridae			<i>L. japonicus</i> , Kawashima, Japan	<i>L. soddagus</i> , Haitlinger, Tanzania	
Anthribiidae		<i>L. stefani</i> , Haitlinger, Colombia			
Lycidae		<i>L. cyryli</i> , Haitlinger, Brazil			

TABLE 3 (continued)

Distribution Host family	Europe	South America	Asia	Africa	Australia
Buprestidae	<i>Leptus</i> sp., Spain				
Cicindellidae		<i>L. olafi</i> , Haitlinger, Colombia			<i>L. boggo- horanus</i> , Haitlinger, New Guinea
Chrysomelidae	<i>L. phyllotretae</i> , Feider, Romania <i>L. mariae</i> , Haitlinger, Poland	<i>L. stolae</i> , Haitlinger, Brazil <i>L. mariani</i> , Haitlinger, Brazil <i>L. alberti</i> , Haitlinger, Brazil	<i>L. japonicus</i> , Kawashima, Japan		
Cerambycidae			<i>L. japonicus</i> , Kawashima, Japan		
Lagriidae			<i>L. japonicus</i> , Kawashima, Japan		
Cantharidae			<i>L. japonicus</i> , Kawashima, Japan		
Curculionidae	<i>L. galerucae</i> , Feider, Romania <i>L. mariae</i> , Haitlinger, Poland			<i>L. mogadoranus</i> , Haitlinger, Morocco <i>L. aggoratus</i> , Haitlinger, Zambia <i>L. ogazulacus</i> , Haitlinger, Mozambique	<i>L. gauphalus</i> , Haitlinger, Australia
Tenebrionidae	<i>L. echinopus</i> , Beron, Poland <i>L. akkus</i> , Haitlinger, Spain		<i>L. guus</i> , Haitlinger, Turkmenia <i>L. horiacus</i> , Haitlinger, Syria <i>L. tammuzi</i> , Haitlinger, Syria, Israel, Saudi Arabia	<i>L. bertoldi</i> , Haitlinger, Ghana <i>L. pasopaicus</i> , Haitlinger, Namibia <i>L. sudanensis</i> , Oudemans, Sudan	

Leptus larvae were found on various tenebrionids in Europe, Asia, Africa, South America and Australia (Haitlinger, 1987, 1990c, 1991, 1993). The important morphological feature distinctly differentiating *Leptus* larvae is a number (most often 4) of setae between legs II–III. Among almost 110 species of *Leptus* (larvae) known hitherto, hardly 16 (including the two species described above and one species still undescribed) have more than 4 setae. Among them as many as 10 are species associated with Tenebrionidae.

Little is known about the host associations of *Leptus* larvae. Some species are nonspecific and were found on many hosts belonging to various orders of insects. However, the majority of *Leptus* larvae were obtained from tenebrionid beetles and may be host-specific on the family level. Their host associations on the species level are poorly known.

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