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Article

Re-description of *Bdella muscorum* Ewing (Acari: Bdellidae) from Western Iran

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ABSTRACT
This paper presents the re-description of *Bdella muscorum* Ewing, 1909, collected from soil and litter under apricot trees, *Prunus armeniaca* L. (Rosaceae), Hamedan region, Iran. Also, a key to Iranian *Bdella* species is provided.

KEY WORDS: Agricultural pests; Bdelloidea; Hamedan region; predator; snout mites.

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INTRODUCTION

Because of their cone like gnathosoma projecting from between palp bases, Bdellidae Dugès (Acari: Trombidiformes: Bdelloidea) are known as snout mites. They are active predators (Gerson *et al*. 2003) feeding on tiny arthropods such as springtails (Wallace and Mahon 1972), oribatids (Alberti 1973), tetranychid mites, and other agricultural pests (Dean 1952; Gerson and Smiley 1990; Ireson *et al*. 2002; Gerson *et al*. 2003). *Bdella* was erected by Latreille (1795) with type species *Bdella longicornis* [syn.: *Acarus longicornis* Linnaeus, 1758]. Members of this genus were recorded from all biogeographic regions (Hernandes *et al.* 2016). To date, 54 species have been recorded world-wide (Atyeo 1960; Wallace and Mahon, 1972; Swift and Goff, 1987; van der Schyff *et al.* 2005; Hernandes *et al.* 2008, 2016; Hernandes 2013), seven of which are present in Iran [*B. captiosa* Atyeo, 1963 by Barimani-Varandi (1996) and Barimani-Varandi and Kamali (1998); *B. farabii* Paktinat-Saeej *et al*., 2015 by Paktinat-Saeej *et al*. 2015; *B. humida* Wallace and Mahon, 1972 by Barimani-Varandi (1996) and Barimani-Varandi and Kamali (1998); *B. karajiensis* Ueckermann *et al*., 2007 by Ueckermann *et al*. (2007); *B. lattakia* Soliman and Zaher, 1975 by Kamali *et al.* (2001); *B. longicornis* (Linnaeus, 1758) by Kamali *et al*. (2001); *B. muscorum* Ewing, 1909 by Ueckermann *et al.* (2007)]. Herein, the species *B. muscorum* Ewing, 1909 was re-described, from specimens collected in Hamedan province, Iran. The re-description details of specimens could be helpful for improving identification and assessing intraspecific variations. Furthermore, a key to known Iranian *Bdella* species is presented.

MATERIALS AND METHODS

Specimens were extracted from soil and litter from under apricot trees, *Prunus armeniaca* L. (Rosaceae) from Hamedan province, Iran, with Berlese-Tullgren funnels. Slides were prepared with

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Hoyer's medium, dried at 50 °C for one week, covered with insulating varnish, and examined with an Olympus BX51 phase contrast microscope. Drawings were made by using a camera Lucida. The setal nomenclature is according to Kethley (1990) updated by Fisher *et al*. (2011) in propodosomal region and legs according to Den Heyer (1981). Abbreviations of setae are as follows: Prodorsal setae: anterior trichobothria (*at*), posterior trichobothria (*pt*), lateral proterosomal setae (*lps*), median proterosomal setae (*mps*). Dorsal hysterosomal setae: internal humeral (c_1), external humeral (c_2), internal dorsal (d_1), internal lumbal (e_1), internal sacral (f_1), external sacral (f_2), internal clunal (h_1), external clunal (h_2). Anal region: postanal (ps_1), anal setae (*ad*, *an*, *ps*). Genital region: aggenital setae (*ag*), genital setae (*g*). Ventral hypostomal setae (vh_1– vh_6); dorsal hypostomal setae (*DHS*). Palp setae: Ventral end seta (*VES*), dorsal end seta (*DES*). Leg setae: attenuate (sharply) solenidion (*asl*), blunt-pointed rod-like solenidion (*bsl*), peg-like seta (*pe*), simple tactile seta (*sts*), macroseta (*ms*), duplex setae (*dxs*), trichobothria (*T*). All measurements are given in micrometres (µm) and specimen measurements are followed by the range.

Bdellidae Dugès, 1834

Genus *Bdella* Latreille, 1795 – As defined by van der Schyff *et al.* 2005
Type species: *Bdella longicornis* (L.)

Bdella muscorum Ewing, 1909 (Figs. 1–11)

Diagnosis

Prodorsal striae between *pt* convex posteriorly and sparsely broken; pedipalpal tibiotarsus with 6 setae; Hysterosomal setae setiform, not branched distally; genu II with duplex seta; genu IV without duplex seta (Atyeo 1960; Ueckermann *et al*. 2007).

Female (n = 6)

Total body length (including gnathosoma from apex of hypostome to posterior margin of idiosoma) 730–775, body length (excluding gnathosoma) 507–555; width 295–350.

Dorsum (Figs. 1, 11) – Central region of prodorsum between setae *at*, *mps* and *pt* with continuous to sparsely broken transverse striations and two prominent internal apodemes between anterior and posterior trichobothria (bases of setae *at* and *pt*); prodorsum with two pairs of eyes, diameters of anterior lateral eye 15–16 and posterior lateral eye 11–13. Anterior region of setae *at* with broken transverse striae and prodorsum anteriorly with elongated chamber (Figs. 1, 11); all dorsal setae smooth; hysterosomal setae not extending to setae next behind (except seta *h1*). Dorsum of hysterosoma with continuous, finely broken transverse striae between setae (*c1*, *d1*, *e1* and *f1*), but striae obliquely longitudinal between setae *c1–c2* and *h1–h2*; Seta *pt* the longest and *lps* the shortest dorsal setae; hysterosomal region with three cupules (*ia*, *im* and *ip*) at level of setae d_1, e_1 and *f1* (Fig. 1).

Measurements of dorsal setae as follows: *at* 138–143, *lps* 45–48, *mps* 58–75, *pt* 175–177, *c1* 63–70, *c2* 75–88, *d1* 50–58, *e1* 45–55, *f1* 48–53, *f2* 48–53, *h1* 65–66, *h2* 63–70. Distance between dorsal setae: *at–at* 63–65; *lps–lps* 108–120; *at–lps* 53–58; *lps–pt* 43–45; *pt–pt* 120–158; *mps–mps* 88–95; *mps–pt* 18–20; *mps–c1* 68–75; *mps–c2* 115–125; *c1–c1* 103–123; *c1–c2* 68–83; *c1–d1* 88–90; *d1–d1* 98–125; *d1–e1* 48–63; *e1–e1* 100–105; *e1–f1* 58–68; *f1–f1* 60–63; *f1–f2* 43–48; *f1–h1* 43–45; *f1–h2* 50–78; *h1–h1* 35–38; *h1–h2* 50; *h2–h2* 98–102. Ratio: *at*/*lps* 2.9–3; *at*/*pt* 0.8–0.82; *pt*/*pt–pt* 1.1–1.5; *at*/*at–at* 2.1–2.2, *c1*/*c1–c1* 0.6, *d1*/*d1–d1* 0.4–0.6, *e1*/*e1–e1* 0.5–0.6, *f1*/*f1–f1* 0.8, *h1*/*h1–h1* 1.7–1.9, *h2*/*h2–h2* 0.6–0.7, *h1*/*h2* 0.9–1.0, *c1–c1: d1–d1: e1–e1: f1–f1*: 1.7–1.9: 1.6–1.9: 1.6–1.8: 1.0.

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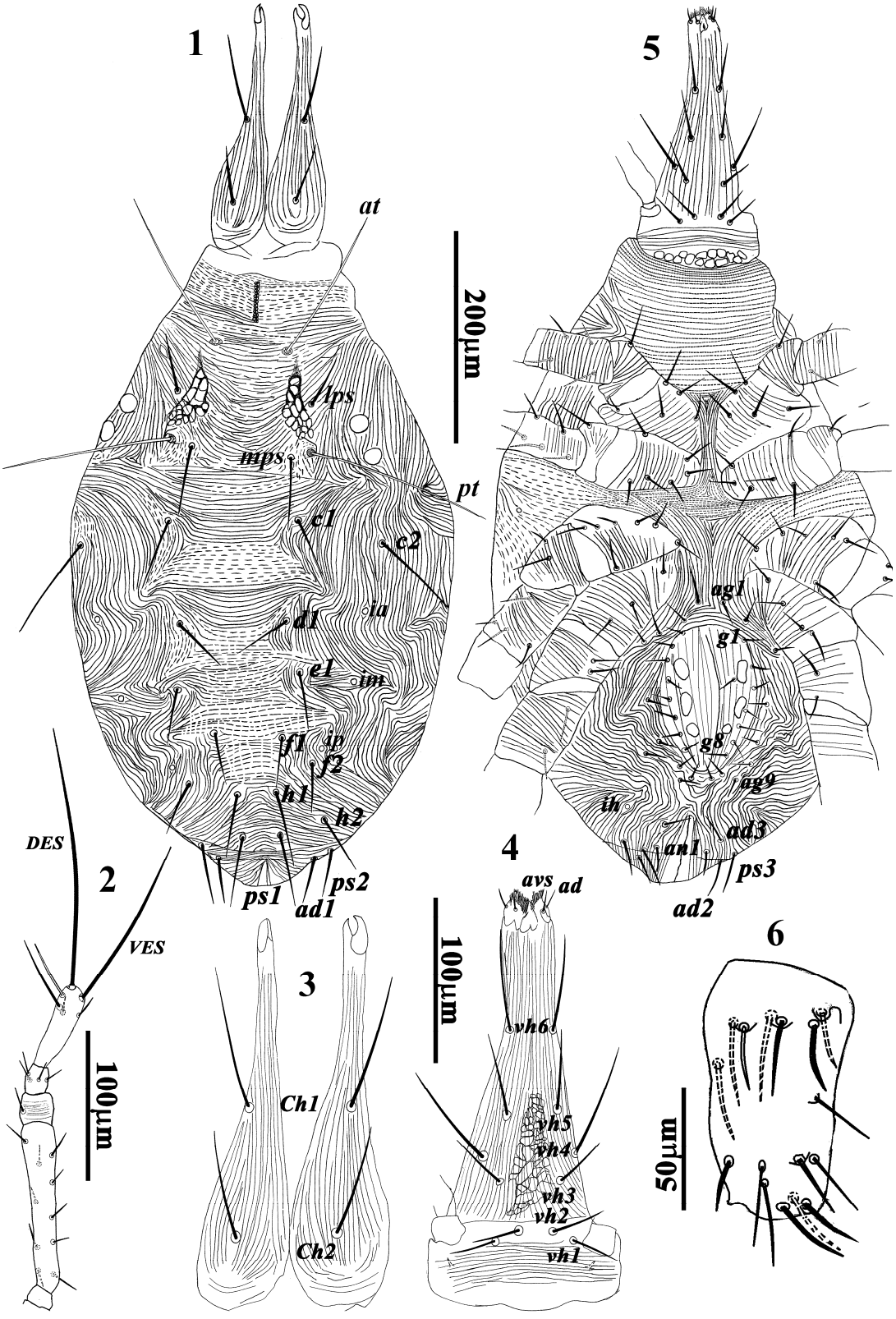

Figures 1–6. *Bdella muscorum* Ewing, 1909 (Female) – 1. Dorsal view; 2. Palp; 3. Chelicerae; 4. Subcapitulum; 5. Ventral view; 6. Ovipositor.

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Gnathosoma (Figs. 2–4) – Subcapitulum 223–238 long, width at base 113–150; base of gnathosoma with transverse striae; palp five–segmented, palp tibiotarsus with three setae + one solenidion + two long end setae (*DES* and *VES*), 180–188 and 128–135 respectively; genu with four setae; telofemur with one seta; basifemur with 10 (9) setae; trochanter without setae (Fig. 2); measurements of palp segments as follows: trochanter 13–15, basifemur 120–125, telofemur 15–20, genu 18–19, tibiotarsus 54–65. Hypostome with six pairs of long ventral hypostomal setae (*vh1–6*), distal pair (*vh6*) 53–58 almost twice length of proximal pair (*vh1*) 25–28; two pairs of short adoral setae near the tip of hypostome, *avs* 10 and *ad* 12 and setae *vh4* is the longest 58; hypostome with sparsely longitudinal striations, which are transverse at base; setae *DHS* absent (Fig. 4). Chelicerae 212–228 long, finely striated and with two dorsal setae (*ch1–2*), proximal seta 50–58, and distal seta 65–85 respectively. Movable chela without teeth and fixed chela smooth and attenuate, shorter than movable chela in length; distal seta (*ch1*) not extending to base of chela (Fig. 3).

Venter (Fig. 5). Striae between coxae I–II and III–IV continuous, longitudinal but between coxae II–III finely broken and oblique. Aggenital region with nine pairs of setae (*ag1–9*), genital valves each with eight pairs of setae (*g1–8*) (Fig. 5); anal region surrounded with oblique and continuous striae and covered with three pairs of smooth pseudo anal setae (*ps1–3*): *ps1* 26–28, *ps2* 30–32 and *ps3* 32–35 long, three pairs of para–anal setae or adanal setae (*ad1–3*): *ad1* 25–35, *ad2* 20–28 and *ad3* 27–30 and one pair of anal setae *an1* 18–23 (Fig. 5).

Ovipositor (Fig. 6) – Ovipositor tube like and with 16 smooth setae (dorsal ovipositor setae = *od1–5* and ventral ovipositor setae = *os1–11*) (Fig. 6).

Leg (Figs. 7–10) – Length of legs as follows: I 388–438, II 370–413, III 428–465, IV 505–523. Setal formulae of leg segments as follows (solenidia in paranthesis): coxae I–IV: 5-6-7(6)-4sts; trochanters I–IV: 1 (smooth seta enlarged)-1-2-2sts; basifemora I–IV: 13-7(8)-9-3 (5) sts; telofemora I–IV: 10-8(6)-6-8sts; dorso-medial leg III and IV smooth seta enlarged; genua I–IV: 6sts, 2asl, 1 duplex setae- 6sts, 1 duplex setae- 6sts, 1 duplex setae- 8sts, 1asl; tibiae I–IV: 13sts, 4asl, 1pe, 1T- 11sts, 2asl, 1bsl- 11sts, 1asl- 12sts, 1T; tarsi I–IV: 28sts, 2asl, 2bsl, 1pe- 24sts, 2bsl,1pe- 25sts, 1T- 22sts, 1asl, 1T (Figs. 7–10).

Distribution

Asia, Europe, North America (see Hernandes *et al.* 2016); Iran: Karaj (Ueckermann *et al.* 2007), Mashhad and Amol regions (Paktinat-Saeij *et al*. 2014 and 2016).

Remarks

The collected specimens are similar to those considered in the re-description of Atyeo (1960) from USA, in having the same striae structure between setae *pt–pt* (transverse) and sparsely broken striae; six setae on palp tibiotarsus; duplex setae present on genua I–III and absent on genu IV but differs from the latter in having: 1) Basifemur IV with 3 setae in Iranian specimens but 5–6 setae in American specimens; 2) Tarsi I–IV with 28sts, 2asl, 2bsl, 1pe- 22sts, 2bsl,1pe- 25sts, 1T- 24sts, 1asl, 1T *vs*. 29 (30) + 2asl + 2bsl + 1pe- 24 (25–26) + 2bsl + 1pe- 25 (23–25) + 1T- 23 (22) + 1asl + 1T; 3) Ovipositor with 16 setae instead of 18; 4) Aggenital region with nine pairs of setae in the former but 10 pairs of setae in the latter.

This re-description is also very similar to the re-description of Tseng (1978) from Taiwan but it differs in having: 1) Palp tibiotarsus with 6 setae vs. 7 setae; 2) Genital valves each with eight pairs of setae in Iranian specimens but seven pairs of setae in Taiwanese specimens; 3) Aggenital region with nine pairs of setae vs. seven in other; 4) Leg chaetotaxy: coxae I–IV: 5-6-7(6)-4; basifemora I–IV: 13-7(8)-9-3 (5); telofemora I–IV: 10-8(6)-6-8; genua I–IV: 9-7-7-9; tibiae I–IV: 19-14-12-13 in Iranian specimens whereas coxae I–IV: 6-5-5-3; basifemora I–IV: 11-9-6-5; telofemora I–IV: 8-9-8-8; genua I–IV: 10-8-8-8; tibiae I–IV: 20-14-14-15 in Taiwanese specimens.

These differential characters are categorized as geographical features

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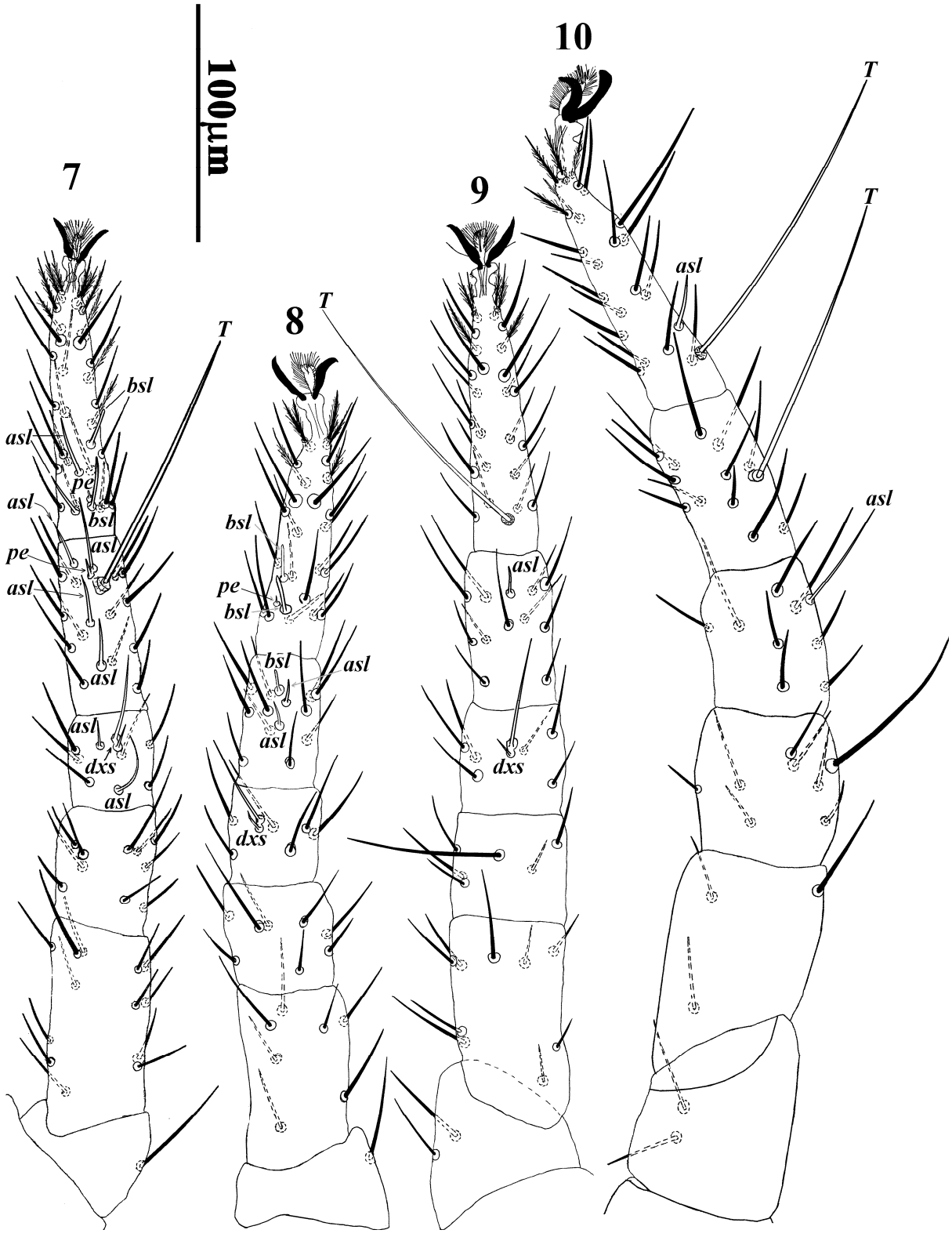

Figures 7–10. *Bdella muscorum* Ewing, 1909 (Female) – 7. Leg I; 8. Leg II; 9. Leg III; 10. Leg IV.

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Figure 11. *Bdella muscorum* Ewing, 1909 (Female) – Prodorsal region.

Materials

All specimens were collected from soil and litter under apricot trees, *Prunus armeniaca* L. (Rosaceae), Hamedan vicinity, Hamedan Province, Iran, (34° 47' N, 48° 28' E, a.s.l. 1540 m), 25 November 2015. All specimens are deposited in the Collection of the Acarology Laboratory, University of Bu–Ali Sina, Hamedan, Iran.

Key to Iranian species of *Bdella* Latreille

1. Palp tibiotarsus with 7 setae ……...…… 2
– Palp tibiotarsus with 6 setae …...…… 3
2. Prodorsal striae transverse between *at* and *pt*, palp basifemur with 13 setae ……...……
……...……..…… *B. longicornis* (Linnaeus)
– Prodorsal striae longitudinal between *at* and *pt*, palp basifemur with 15 setae …...…….

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…… *B. karajiensis* Ueckermann *et al.*

3. Genu II without duplex setae ……..……..……..……..…. 4
– Genu II with duplex setae ……..……... 5
4. Palp basifemur with 7 setae, prodorsal striae between setae *at* and *pt* longitudinal ……. ……..…….. ….*B. captiosa* Atyeo
– Palp basifemur with 10 setae, prodorsal striae between setae *at* and *pt* transverse …….…… ……..……... *B. lattakia* Soliman & Zaher
5. Genu IV without duplex setae, prodorsal striae between setae *pt–pt* transverse, palp basifemur with 9–11 setae ……..……..……..…... *B. muscorum* Ewing
– Genu IV with duplex setae, prodorsal striae between setae *pt–pt* longitudinal, palp basifemur with 6-7 setae ……..……..……..…….. 6
6. Prodorsal striae finely broken, telofemora I–III 5-5-5, palp basifemur with 6 setae …… ……..…. *B. humida* Wallace & Mahon
– Prodorsal striae continuous to sparsely broken, telofemora I–III 7-7-8, palp basifemur with 7 setae ……..……. *B. farabii* Paktinat-Saeej *et al.*

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باز توصیف کنهٔ *Bdella muscorum* Ewing (Acari: Bdellidae) از غرب ایران

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* مسئول مکاتبات

چکیده

در این مقاله بازتوصیف کنه *Bdella muscorum* Ewing (Acari: Bdellidae) از نمونه‌های خاک و بقایای گیاهی زیر سایه‌انداز درختان زردآلو *Prunus armeniaca* L. (Rosaceae) از منطقهٔ همدان در غرب ایران جمع آوری، شناسایی و باز توصیف شده است. همچنین کلیدی برای تشخیص گونه‌های جمع‌آوری شده از ایران ارایه شده است.

واژگان کلیدی: آفات کشاورزی؛ Bdelloidea ؛ منطقهٔ همدان، شکارگر، کنه‌های پوزه‌دار.

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