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Two new species of *Spinibdella* and *Odontoscirus* (Acari: Prostigmata: Bdellidae) from Western Iran

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ABSTRACT — Two new species of Bdellidae, viz. *Spinibdella pourmirzaei* Eghbalian, Khanjani & Ueckermann n. sp. from soil and litter under apricot trees and *Odontoscirus denheyeri* Eghbalian, Khanjani & Ueckermann n. sp. (Acariformes: Bdellidae) from soil and litter under weeds are described, illustrated and a key to the adults of all species of *Spinibdella* with longitudinal striations on centre of prodorsum and Iraninan species of adult *Odontoscirus* are presented.

KEYWORDS — Mites; predator; Spinibdellinae; Odontoscrinae; Iran.

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INTRODUCTION

Bdellidae Dugès are predators of small arthropods such as insects and mites (Gerson et al. 2003, Atyeo 1960). Thor (1930) erected *Spinibdella* to accommodate the newly described *S. reducta*, which can be recognized by having 2 pairs of ventral setae on subcapitulum, lateral propodosomal setae (*ve*) present and palp-tibiotarsus truncate in contrast to the closely related *Biscirus* Thor, 1913 in which *ve* is absent and palp-tibiotarsus cylindrical, elongate, both belonging to the subfamily Spinibdellinae (Atyeo 1960, Hernandes et al. 2016).

*Spinibdella* contains 37 species (Hernandes et al. 2016, Paktinat-Saej et al. 2015). In this paper *S. pourmirzaei* Eghbalian et al. n. sp. is described as 38th species.

Thor (1913) erected *Odontoscirus* (as subgenus of *Biscirus*) based on *Bdella virgulata* Canestrini & Fanzago, 1876. Wallace & Mahon (1976) synonymized *Odontoscirus* with *Bdellodes* Oudemans (1937) but unfortunately validated the junior name. However, Hernandes et al. (2016) corrected this by recognizing that the name *Odontoscirus* has priority and therefore should be the valid name. *Odontoscirus* can be distinguished by having 6 or 7 pairs of ventral setae on the venter of the subcapitulum and trichobothrium present on tibia II. *Odontoscirus* differs from the other odontoscirine genus, *Neomolgus* Oudemans (1937), in having only 2 pairs of setae on each chelicera instead of more than 2 pairs (at least 4). Currently 93 *Odontoscirus* species (Hernandes 2013, Hernandes et al. 2016, Paktinat-Saeij et al. 2016) were recorded worldwide of which
nine species were recorded from Iran: O. meridionalis (Thor 1931), O. kazerni (Ostovan and Kamali 1995), O. alpinus Atyeo, 1960 (Bahrloo et al. 2006), O. lapidaria (Kramer 1881), O. virgulata (Canestrini & Fanzago, 1876), O. iraniensis (Ueckermann et al. 2007), O. longirostris (Hermann 1804), O. petila (Atyeo 1963)] (Ueckermann et al. 2007 and Abbaszadeh Rad et al. 2010), and O. mazandaranensis Paktinat-Saeij et al. 2016; in this paper, a 10th species is described. Also, a key to the adults of all species of Spinibdella with longitudinal striations on centre of prodorsum and adult Iranian species of Odontoscirus are provided.

**MATERIALS AND METHODS**

Specimens were extracted from soil and litter under apricot trees, Prunus armeniaca L., (Rosaceae), Tamozan village, Famenin vicinity, Hamedan Province, Iran and soil and litter under weeds, Songhor vicinity, Kermanshah Province, Iran, using Tullgren funnels. The specimens were mounted directly on slides in Hoyer’s medium. The slides were dried in an oven at 50°C for about one week, covered with industrial car paint and examined under an Olympus BX51 phase contrast microscope. Drawings were made with a camera lucida. Notations of the idiosomal and leg setae follow Kethley (1990) and Den Heyer (1981), respectively. All measurements are given in micrometers (µm) and the holotype measurements are followed by the range of the paratypes in parentheses. The body length of all specimens was measured from the apex of hypostome to posterior margin of idiosoma, and body width at the level of setae c2. Abbreviations of setae in this study are as follows: Propodosomal setae: internal verticals (vi), external verticals (ve), internal scapular (sci), external scapular (sce). Opistosomal setae: internal humeral (c1), external humeral (c2), internal dorsal (d1), internal lumbal (el1), internal sacral (f1), external sacral (f2), internal clunial (h1), external clunial (h2). Anal region: postanal (ps1), genital region: aggenital setae (ag), genital setae (g), subcapitular setae (oh1–oh6). Leg setae: solenidia (ω, ε, φ and σ), trichobothria (tr), Ventral end seta (VES), dorsal end seta (DES).

**FAMILY BDELLIDAE DUGÉS, 1834**

**Subfamily Spinibdellinae Grandjean, 1938**

**Genus Spinibdella Thor, 1930**

Type species: Spinibdella reducta Thor, 1930 (original designation).

**Spinibdella pourmirzaei n. sp.**

Eghbalian, Khanjani and Ueckermann (Figs. 1-2)

Diagnosis — Centre of prodorsum with longitudinal striations, two pairs of eyes present, narrow chelicerae and reduced needle-like chelae, chelicerae striated, well-developed genital tracheae, basifemur III with 4 setae; palp-basifemur with 6 setae.

**Male** (n= 4). Total body length (including gnathosoma from apex of hypostome to posterior margin of idiosoma) 873 (825 – 1005), body length (excluding gnathosoma) 680 (645 – 790); width 267 (225 – 278).

Dorsum (Fig. 1A) — Prodorsum with longitudinal striae posterior to vi to anterior to sci, but transverse between and anterior to vi and between setae sci with irregular striae; prodorsum with 2 pairs of eyes, diameters of anterior lateral eye 10 (10 – 13), and posterior lateral eye 8 (8 – 10), two lateral eyes separated by distance approximately 2.5 (1.9 – 2.4) times diameters of anterior lateral eyes, with longitudinal and oblique striae between each pair. Hysterosomal setae not extending to the bases of setae next behind (except seta h1). Dorsum of hysterosoma with continuous and transverse striae between setae (c1, d1, e1, f1, h1 and h2), but striae obliquely longitudinal between setae c1–2; seta sce the longest and f2 the shortest, hysterosomal region with three cupules (ia, im and ip) at level of setae d1, e1 and f1 (Fig. 1A). Measurements of dorsal setae as follows: vi 130 (130 – 158), ve 48 (48 – 50), sci 63 (58 – 60), sce 198 (175 – 218), c1 53 (53 – 93), c2 58 (45 – 83), d1 58 (45 – 83), e1 55 (55 – 100), f1 60 (58), f2 53 (43 – 70), h1 60 (55 – 93), h2 55 (48 – 90).

Distance between dorsal setae: vi–vi 50 (35 – 50); ve–ve 103 (90 – 105); vi–ve 63 (40 – 63); ve–sci 50 (48 – 53); sce–sce 98 (98 – 123); sci–sci 25 (20 – 30); sci–sci
Figure 1: Spinibdella pourmirzaei Eghbalian, Khanjani & Ueckermann n. sp. (Male): A – Dorsum of idiosoma; B – Palp; C – Chelicer; D – Hypostome; E – Venter of idiosoma; F – Amphiodid sclerets.
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Legs (Fig. 2) — Measurements of leg segments as follows: I 325 (288–333), II 305 (288–348), III 355 (345–415), IV 438 (405–473). Setal formulae of leg segments as follows: coxae I–IV: 7–6–5–5; trochanters I–IV: 1–1–2–1; basifemora I–IV: 7–7–4–3; telenomera I–IV: 5–5–4–4; genua I–IV: 5ts–5ts–5ts–6ts –5ts,1tr; tibiae I–IV: 11ts, 2φ,1tr–9ts, 1bls–12ts,1φ–12ts,1tr; tarsi(7,8),(993,990)

Female & Immatures — Unknown.

Habitat — soil and litter under apricot trees.

Distribution — Only known from Western Iran.

Remarks — Spinibdella pourmirzaei Eghbalian, Khandani and Ueckermann n. sp. is closely related to S. cronini (Baker and Balock 1944), re-described by Atyeo (1960), in having longitudinal striations in centre of prodorsum and two pairs of eyes; palp-tarsus with 7 setae and tibiae II with one blunt sensory seta, but differs from the latter in having: 1) Basifemur III with 4 setae in the former but 5 setae in the latter; 2) Palp-basifemur with 6 setae in the new species whereas 7 setae in S. cronini (Baker and Balock); 3) aggenital region with 16 pairs of setae vs 21–23 pairs of setae; 4) tibia I–II, IV with: 11ts, 2φ,1tr–9ts, 1bls–12ts,1tr vs 12(13)ts, 2φ,1tr–12(13)ts, 1bls–14ts,1tr; 5) tarsi I, III–IV with: 21ts,2ω–22ts,1tr–17ts,1tr vs 20ts,2ω–17ts,1tr–18(21)ts,1tr.

Etymology — This species is named in honor of Prof. Ali Asghar Pourmirmza, Professor of Entomology, Department of Plant Protection, College of Agriculture, Urmia university, Iran, for his great contribution to developing Entomology knowledge in North west Iran.

Type materials — The holotype and three paratype males were collected from soil and litter under apricot trees, Prunus armeniaca L., (Rosaceae), Tamozan village, Famenin vicinity, Hamedan Province, Iran, (35°15'07"N, 49°06'14"E, a.s.l. 1900 m), 17 January 2013, Col. Amir Hossein Eghbalian. The holotype and two paratype males are deposited in the Mite Collection of the Acerology Laboratory, University of Bu–Ali Sina, Hamedan, Iran, and one paratype male slide will be deposited in the National Collection of Arachnida, Plant Protection Research Institute, Pretoria, South Africa.
FIGURE 2: Spinibdella pourmirzaei Eghbalian, Khanjani & Ueckermann n. sp. (Male): A – Leg I; B – Leg II; C – Leg III; D – Leg IV.
Subfamily Odontoscirinae Grandjean, 1938
Genus Odontoscirus Thor, 1913

Type species: Bdella virgulata Canestrini & Fanzago, 1877, by original designation.

Odontoscirus denheyeri n. sp.
Eghbalian, Khanjani and Ueckermann (Figs. 3–4)

Zoobank: 95866086-DA7E-4E24-BA6E-956F85362C1F

Diagnosis — Each chelicer with 2 setae, palp basifemur with 6 setae, palp tibiotarsus with 6 setae and each genital plate with 7 setae, the proximal half of palp tibiotarsus with two setae, movable digit of chelicera with six tooth, base of prodorsal setae sci well separated from sce.

Female (n= 4). Total body length (including gnathosoma from apex of hypostome to posterior margin of idiosoma) 1376 (1151 – 1213), body length (excluding gnathosoma) 1013 (1238 – 1290); width 663 (808 – 855).

Dorsum (Fig. 3A) — Dorsum of idiosoma with irregular broken striae; striae between setae vi transverse, external verticals (ve) setae absent, prodorsum with 2 pairs of eyes, diameters of anterior lateral eye 28 (23 – 28) and posterior lateral eye 25 (18 – 25), two lateral eyes separated by approximately 3 (3.8-5.6) times diameters of anterior lateral eyes, with transverse and oblique striae between each pair. Striae anterior to internal verticals (vi) transverse; dorsal setae (c1-h2) smoothly; hysterosomal setae not extending to the bases of setae next behind. Area between hysterosomal setae (c1, d1, e1) with fine, longitudinal and transversal broken striae; between setae fl with longitudinal and setae h1-2 with transverse and oblique striae; area between setae c1-2 with oblique striae; seta vi the longest and f2 and h2 the shortest, hysterosomal region with three cupules (ia, im and ip) at level of setae d1, e1 and f1 (Fig. 11). Measurements of dorsal setae as follows: vi 140 (133 – 140), sce 125 (125 – 140), sci 83 (80 – 100), c1 65 (65 – 68), e1 60 (63 – 65), f1 65 (58 – 65), f2 55 (55 – 63), h1 63 (65 – 68), h2 55 (58 – 68). Distance between dorsal setae: vi–vi 58 (53 – 60); vi–sce 178 (170 – 175); sci–sci 170 (168 – 170); sce–sci 38 (33 – 35); sce–sce 123 (110 – 113); sci–vi 158 (153 – 155); sce–c1 148 (160 – 195); sce–c2 168 (200 – 263); c1–c1 195 (175 – 228); c1–c2 78 (83 – 123); c1–d1 133 (123 – 190); d1–d1 180 (175 – 218); d1–c1 103 (98 – 155); e1–e1 165 (130 – 213); e1–fl 100 (100 – 150); f1–f2 65 (45 – 63); f1–f2 58 (55 – 110); f2–f2 173 (138 – 208); f1–h1 88 (85 – 170); h1–h1 43 (33 – 63); h1–h2 83 (58 – 93); h2–h2 90 (78 – 105).

Gnathosoma (Figs. 3B–C) — Subcapitulum 363 (343 – 358) long, width at base 138 (128 – 135); base of subcapitulum with faint broken and transverse striae, hypostome with long broken longitudinal striae; (Fig. 12). Palp five–segmented, palp tibiotarsus with six setae + one solenidion + two long end setae, DES and VES 170 (153 – 170) and 173 (158 – 178) respectively; genu with four setae; telofemur with one seta; basifemur with six setae; trochanter without setae (Fig. 13); measurements of palp segments as follows: trochanter 15 (15 – 20), basifemur 210 (195–230), telofemur 33 (28 – 35), genu 20 (20 – 23), tibiotarsus 193 (163 – 195). Subcapitulum with six pairs of ventral setae (vh1–6), distal pair (vh6) 43 (38 – 40) as long as proximal pair (vh1) 40 (38 – 43); two pairs of short dorsal setae near the tip of hypostome, 29 (28) and 23 (24) in length. Chelicerae 335 (288 – 345) long, width 100 (80 – 88), reticulated and with two dorsal setae (ch1–2), proximal setae 38 (35 – 40), and distal setae 65 (50 – 73), respectively; movable chelae with six teeth and fixed digit with one subapical tooth; distal seta (ch1) normal in length and about less than half distance between seta (ch1) and base of chela (Fig. 12).

Venter (Fig. 3D) — Aggenital region with 3 pairs of setae (ag1–3), each genital plate with 7 pairs of setae (g1–7) (Fig. 13); anal region with two pairs of smooth setae (ps1–2); ps1 65 and ps2 63.

Ovipositor (Fig. 3E) — Ovipositor with 10 smooth setae and laminated gland clearly observed.

Legs (Figs. 4) — Measurements of leg segments as follows: I 820 (763 – 788), II 818 (700 – 785), III 943 (813 – 863), IV 1193 (1105 – 1113). Setal formulae of leg segments as follows: coxae I–IV 4–3–4–2; trochanters I–IV 1–1–1–1; basifemora I–IV 15–15–9–3; telofemora I–IV 7–7–6–6; genua I–IV 5ts, 7σ–5σ, 4σ–6ts, 2σ–4ts, 5τ tibiae I–IV 12ts, 5φ,1tr–14ts, 4φ 1tr–10ts,1φ–13ts,1tr; tarsi I–IV.
Figure 3: *Odontoscirus denheyeri* Eghbalian, Khanjani & Ueckermann n. sp. (Female): A – Dorsum of idiosoma; B – Gnathosoma; C – Palp; D – Venter of idiosoma; E – Ovipositor.
FIGURE 4: Odontocirus denheyeri Eghbalian, Khanjani & Ueckermann n. sp. (Female): A – Leg I; B – Leg II; C – Leg III; D – Leg IV.

35ts,5ω, 1bls–36ts,3ω, 1bls–36ts,1tr–32ts,1tr (Figs. 16-19).

Remarks — *Odontoscirus denheyri* n. sp. Eghbalian, Khanjani and Ueckermann is closely related to *O. virgulata* (Canestrini and Fanzago) in having prodorsal setae *sci* and *sce* well separated, each chelicera with two setae but differs from the latter in having: 1) Two palp tibiotarsus setae located on proximal half the segment in the former opposed to all palp tibiotarsus setae located on distal half the segment in the latter; 2) Movable digit of chelicera with one tooth in new species whereas movable digit of chelicera with 4-5 teeth in other species; 3) Distal cheliceral seta (*ch1*) about 1.7 (1.45 – 1.83) times longer than the proximal seta vs. subequal in other species; 4) Chelicera reticulated in *O. denheyri* opposed to not reticulated in *O. virgulata*.

*Odontoscirus denheyri* is also closely related to *O. alpinus* (Atyeo) in having base of prodorsal trichobothria *sci* well separated from *sce*; chelicera reticulated; median propodosomal trichobothria (*sce*) simple and each chelicera with two setae but differs from the latter species in having: 1) Movable digit of chelicera with 6 teeth in the former but 4-5 in the latter; 2) Dorsal hysterosomal setae smooth in new species but finely plumose in the other species; 3) Two palp tibiotarsus setae inserted on the proximal third of the segment in *O. denheyri* but absent in *O. alpinus*; 4) The length of proximal cheliceral seta (*ch2*) less than 1.4 distance of *ch1*-*ch2* vs. more than 2.2; 6) Coxae I-II with 3 and 4 setae respectively in the new species but 5 and 4 setae in other species.

Etymology — The species is named in honor of Prof. Jacob den Heyer (Department of Zoology and Entomology, University of the Free State, Bloemfontein, South Africa), for his great efforts promoting Bdelloidea systematics, especially creating many genera and species in the families Bdelliidae and Cunaxidae.

Type materials — The holotype and four paratype females were collected from soil and litter under weeds, Songhor vicinity, Kermanshah Province, Iran, (34°47’01”N, 37°37’22”E, a.s.l. 864 m), 14 April 2013, by Amir Hossein Eghbalian. The holotype and three paratype females are deposited in the Mite Collection of the Acarology Laboratory, University of Bu–Ali Sina, Hamedan, Iran, and one paratype female slide will be deposited in the National Collection of Arachnida, Plant Protection Research Institute, Pretoria, South Africa.

Key to the adult species of *Spinibdella* with longitudinal striations on centre of prodorsum and adult Iranian species of *Odontoscirus*

1. Venter of hypostome with 2 pairs of setae; genital tracheae well developed ..... *Spinibdella* Thor......2

2. Basifemura I-II with 7-7 setae .................3

3. Basifemur III with 5 setae; Palp-basifemur with 7 or 10 setae ..........4

4. Palp-basifemur with 7 setae, Basifemura IV with 3 setae .........................5

5. Palp tarsus with 6 setae; tarsus II with 1 blunt sensory seta ..................*S. subrufa* Rack — Palp setae with 7 setae; tarsus II with 2 blunt sensory setae ............*S. cronini* (Baker & Balock)

6. Each chelicera with one seta ...................7

7. Area between prodorsal setae (*vi-sci*) with transverse striae, palp basifemur with 14 setae..............*O. longirostris* (Hermann)

8. Median propodosomal trichobothria (*sce*) simple ..................................9
— Median propodosomal trichobothria (sce) leaf like .................. O. lapidaria (Kramer)

9. Base of prodorsal trichobothria sce closely associated with sce .................. 10
— Base of prodorsal trichobothria sce well separated from sce .................. 12

10. Palp tibiotarsus with 11 or 12 setae (including solenidion, VES and DES) ........ 11
— Palp tibiotarsus with 7 setae (including solenidion, VES and DES) ........ O. meridionalis (Thor)

11. Palp basifemur with 4 setae, proximal cheliceral seta (ch2) not extending beyond base of distal seta (ch1) ........ O. kazeruni (Ostovan and Kamali)
— Palp basifemur with 7 setae, proximal cheliceral seta (ch2) extending beyond base of distal seta (ch1) ........ O. petila (Atyeo)

12. Chelicera reticulated .................. 13
— Chelicera not reticulated .................. 14

13. Movable digit of chelicera with 4-5 teeth, Coxae I-II with 5 and 3 setae .......... O. alpinus (Atyeo)
— Movable digit of chelicera with 6 teeth, Coxae I-II with 3 and 4 setae .......... O. denheyeri n. sp.

14. Both cheliceral setae subequal in length, movable digit of chelicera with 4-5 teeth, ovipositoral gland without lateral lobes at base .... O. virgulata (Canestrini & Fanzago)
— Proximal cheliceral seta about 1/3 to 1/2 the length of the distal seta, movable digit of chelicera with 6-8 teeth, ovipositoral gland with lateral lobes at base .... O. mazandaranensis (Paktinat-Saeij et al.)

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