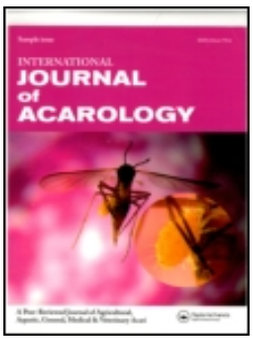

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Hexabdella persiaensis sp. nov. (Acari: Prostigmata: Bdellidae) as a first new species of the genus *Hexabdella* from Asia

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Hexabdella persiaensis Paktinat Saeej and Bagheri **sp. nov.** is described and illustrated from Amol city, Mazandaran province, Iran. This is the first species of this genus described from Asia. An updated key to all species of the genus *Hexabdella* is also presented.

http://zoobank.org/urn:lsid:zoobank.org:pub:3BA520C7-E2D7-4387-80CB-E2BA17590B3F

Keywords: Trombidiformes; Bdellinae; predator; Orchards; Iran

Introduction

Mites of the family Bdellidae Dugès (Acari: Bdelloidea) are often found in soil and litter in a variety of situations, ranging from dry exposed desert to cool moist forest habitats (Walter and Krantz 2009). They are predators, and some species may be effective in regulating populations of economically important arthropods (Gerson et al. 2003). Muma (1975) indicated that *Bdella distincta* Baker & Balock, 1944 prey on eggs and crawlers of armoured scale insects on citrus in Florida. van der Schyff et al. (2004) erected a new genus, *Hexabdella*, based on five species characterized by the absence of a trichobothrium on tarsus IV. They also transferred *Bdella mexicana* Baker & Balock to the new genus. Hernandes (2013) and Hernandes et al. (2007) described two new species from Brazil and Canada, respectively. In this article, another species, *Hexabdella persiaensis* Paktinat Saeej and Bagheri **sp. nov.**, is described and illustrated for the first time from Asia.

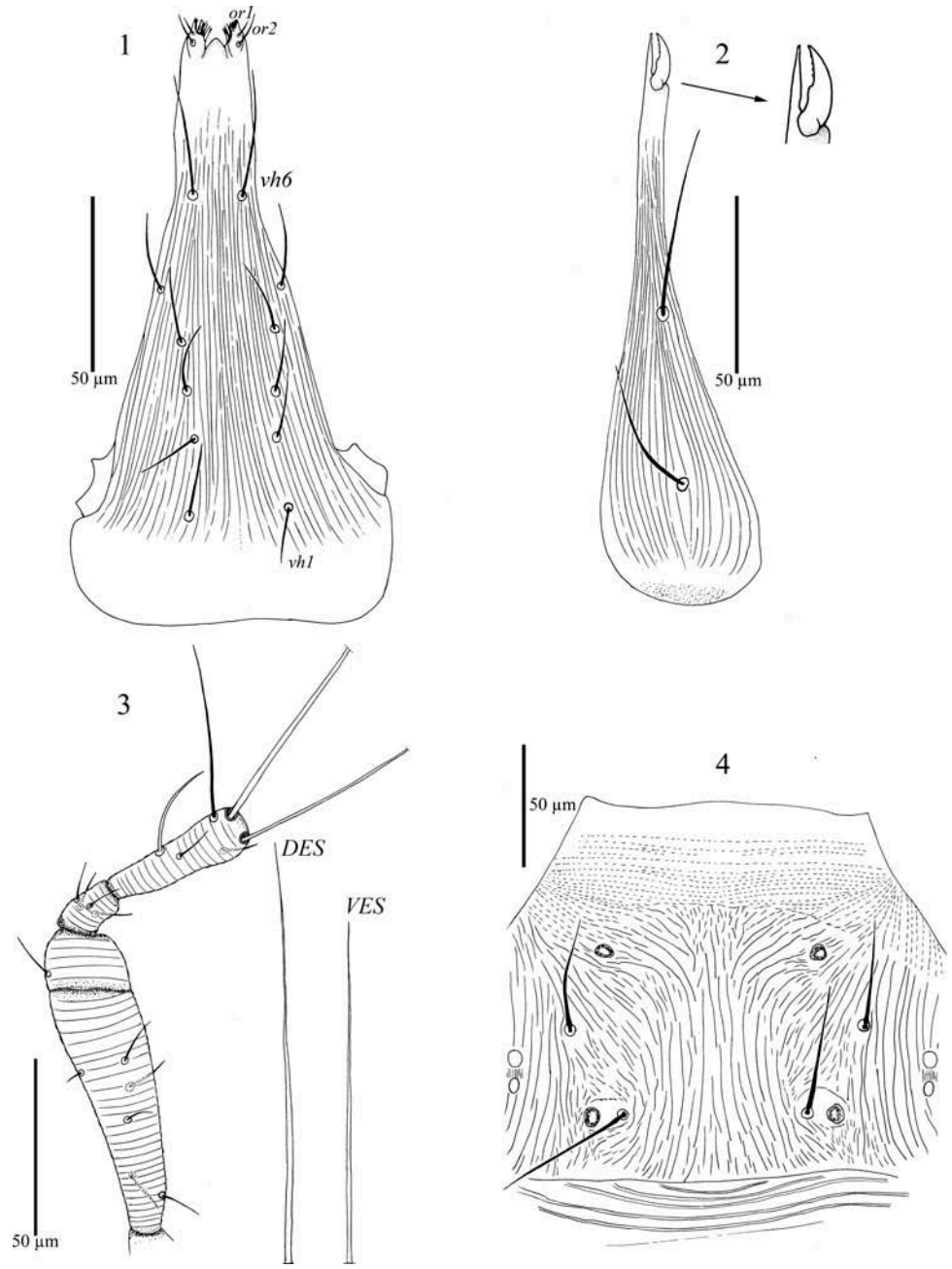
Materials and methods

Soil and rotten leaf samples were sampled and mites were extracted by using a Berlese–Tullgren funnel. Collected specimens were cleared in Nesbitt's fluid and mounted in Hoyer's medium (Walter and Krantz 2009), examined under a phase-contrast microscope, and figures were drawn with a drawing tube. The body length of all specimens was measured from the apex of hypostome to the posterior margin of idiosoma, and body width at the level of setae c_2 and setae was measured from their insertion to their tips. Legs were measured from the ventral insertion of coxae to the base of pretarsi. The setal nomenclature follows that of Kethley (1990). All measurements are given in micrometres (μm). Abbreviations of setae are as follows: Propodosomal setae: internal verticals (*vi*), external verticals (*ve*), internal scapulars (*sci*), external scapulars (*sce*). Opistosomal setae: internal humerals (c_1), external humerals (c_2), internal dorsals (d_1), internal lumbals (e_1), internal sacrals (f_1), external sacrals (f_2), internal clunals (h_1), external clunals (h_2). Anal region: postanals (ps_1), anal setae (*ad, an, ps*), median seta (*ms*). Genital region: aggenital setae (*ag*), genital setae (*g*). Hypostomal setae (vh_1–vh_6). Leg setae: solenidion (*s*), trichobothria (*tr*), tactile seta (*t*), macroseta (*macr*), microseta (*micr*), proprioceptor (*prop*). Ventral end seta (*VES*). Dorsal end seta (*DES*).

Family Bdellidae Dugès, 1834
Subfamily Bdellinae Grandjean, 1938
Genus *Hexabdella* van der Schyff, Theron & Ueckermann, 2004

Key to species of the genus *Hexabdella*

1. Eyes absent ..... *Hexabdella maraugia* van der Schyff, Theron & Ueckermann
– Eyes present 2
2. One pair of eyes present ..... *Hexabdella unusoculata* van der Schyff, Theron & Ueckermann
– Two pairs of eyes present. 3
3. Palp basifemur with four or five setae. 4
– Palp basifemur with six setae. 6
4. Palp basifemur with four setae, hypostome smooth ..... *Hexabdella brevitarsis* Hernandes
– Palp basifemur with five setae, hypostome with striae 5
5. Dorsal opistosomal setae smooth; movable cheliceral chela with about five small teeth;



Figures 1–4. *Hexabdella persiaensis* Paktinat Saeej and Bagheri **sp. nov.** (female): 1 – Hypostome, 2 – Chelicera, 3 – Palp, 4 – Propodosoma.

solenidotaxy of tibiae I–III 1–1–1 . . . *Hexabdella miranda* van der Schyff, Theron & Ueckermann

– Dorsal opistosomal setae distally branched; movable cheliceral chela with two teeth; solenidotaxy of tibiae I–III 3-2-0 . . . . . *Hexabdella singula* van der Schyff, Theron & Ueckermann

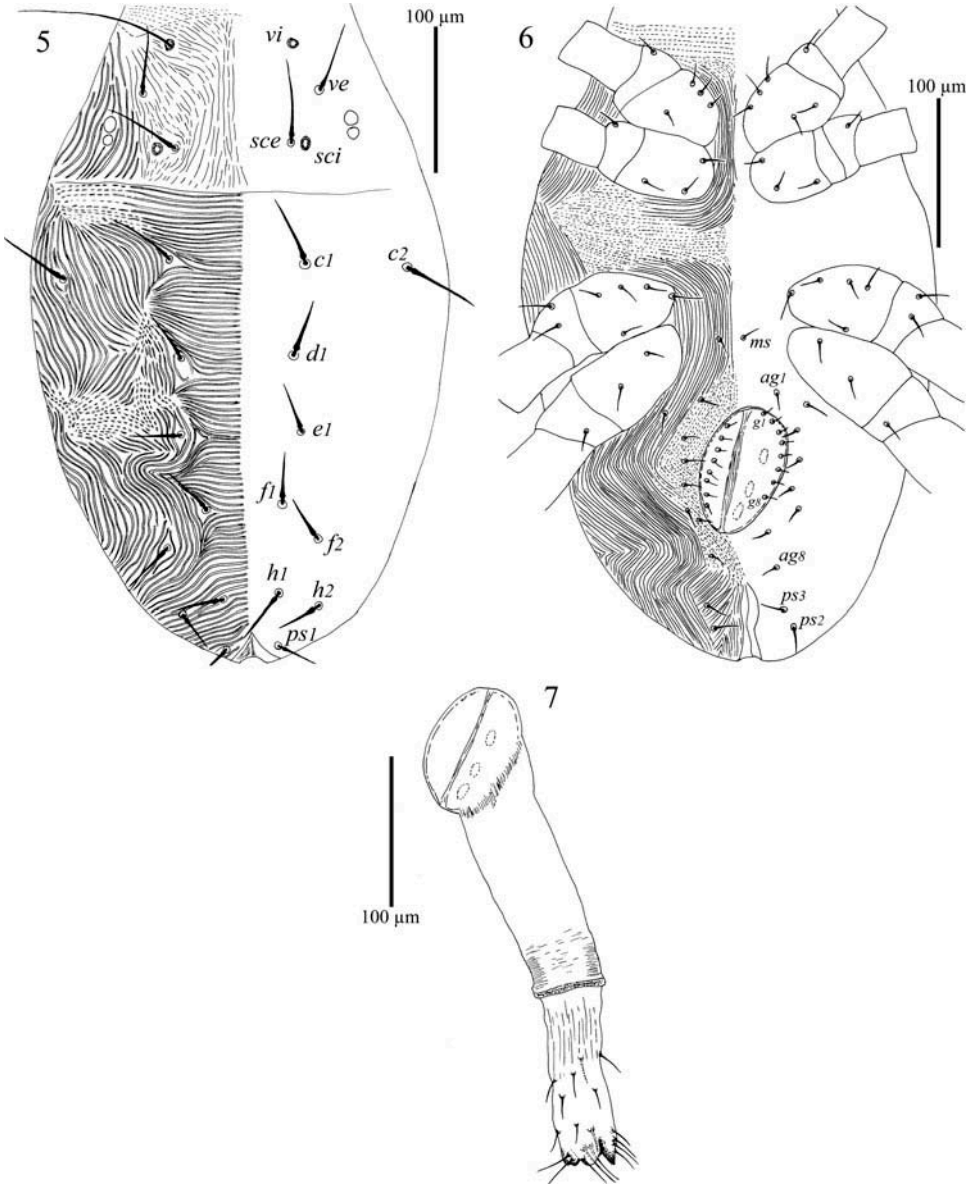
6. Solenidotaxy of tibiae I–II 2-1; seta ps_1 branched; coxa IV with a serrated macroseta . . *Hexabdella denheyeri* van der Schyff, Theron & Ueckermann

– Solenidotaxy of tibiae I–II 3-2; seta ps_1 smooth; coxa IV without macroseta 7

7. Dorsal opisthosomal setae smooth, coxa II with three setae, telofemur IV with five setae, microseta on tarsus I exactly inserted between distal and proximal solenidi . . . . . *Hexabdella persiaensis* **sp. nov.**

– Dorsal opisthosomal setae distally branched or slightly plumose, coxa II with four setae, telofemur IV with four setae, microseta on tarsus I inserted between distal solenidi 8

8. Dorsal opisthosomal setae slightly plumose, hypostome and chelicerae smooth, movable cheliceral



Figures 5–7. *Hexabdella persiaensis* Paktinat Saeej and Bagheri **sp. nov.** (female): 5 – Dorsal view of idiosoma, 6 – Ventral view of idiosoma, 7 – ovipositor.

chela with one tooth .....
..... *Hexabdella mexicana* (Baker & Balock)

– Dorsal opisthosomal setae distally branched, hypostome and chelicerae with striae, movable cheliceral chela with two teeth .....
.. *Hexabdella cinquaginta* Hernandes, Daud & Feres

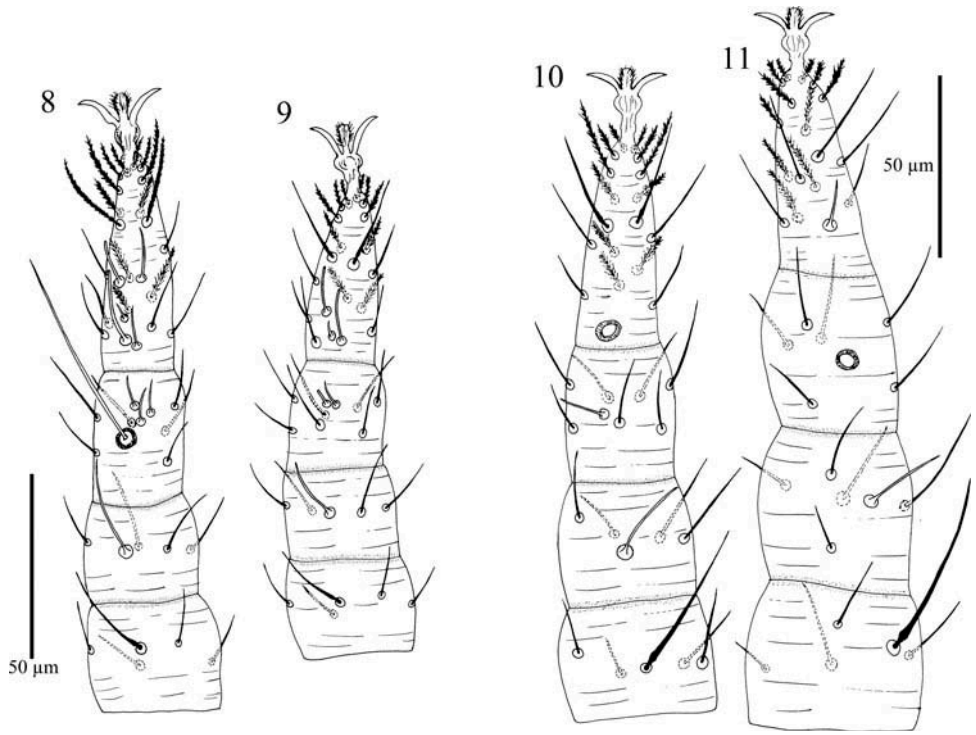
Hexabdella persiaensis Paktinat Saeej and Bagheri sp. nov. (Figures 1 –12)

Diagnosis

Dorsal striae sparsely broken to continuous; two pairs of eyes present; dorsal opisthosomal setae smooth; setae ps_1 smooth; hypostome with striae; movable cheliceral chela with three to four very small teeth; solenidotaxy of tibiae I–II 3-2; coxae IV without macroseta; microseta (*micr*) on tarsi I half way between proximal and distal groups of solenidia.

Description

Female (n = 4). Dimensions: Length of body 685 (620–695), width 305 (250–285); leg lengths: I 287 (273–288), II 262 (242–258), III 330 (292–321), IV 380 (337–369); *VES* 93 (95–96), *DES* 120 (120–125); palp segments I–V: 14 (13–15), 68 (62–72), 20 (16–20), 16 (14–16), 47 (43–46), *vi* ? (112), *ve* 47 (42–52), *sci* ? (150) , *sce* 65 (65–72), c_1 48 (50–52), c_2 56 (51–55), d_1 40 (40–48), e_1 38 (36–41), f_1 40 (40–41), f_2 36 (35–37), h_1 52 (48–52), h_2 35 (33–36); distance: *vi–vi* 87 (80–85), *sci–sci* 100 (95–100), c_1–d_1 75 (68–75).



Figures 8–11. *Hexabdella persiaensis* Paktinat Saeej and Bagheri **sp. nov.** (female): 8 – Leg I, 9 – Leg II; 10 – Leg III, 11 – Leg IV.

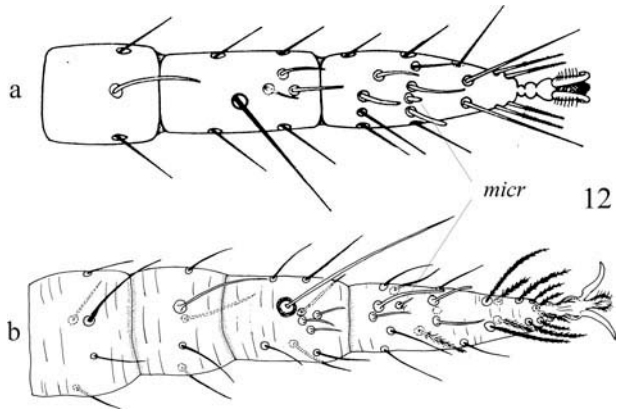


Figure 12. a – Tarsus I of *Hexabdella mexicana*, b – Tarsus I of *Hexabdella persiaensis* **sp. nov.**

Gnathosoma (Figures 1–3). Six pairs of ventral hypostomal setae longitudinally aligned (vh_1–vh_6) (Figure 1). Hypostome ended in two lateral lips, bearing two adoral setae (or_1, or_2). Chelicera with longitudinal striae and two setae, distal seta longer than proximal seta; movable cheliceral chela with three to four very small teeth, fixed chela smooth and with same length of movable chela (Figure 2). Palp chaetotaxy (Figure 3): trochantera 0, basifemur 6t, telofemur 1t, genu 4t, tibiotarsus 3t, 1s, 2 long end setae (*VES, DES*).

Dorsum. Propodosomal striae longitudinal along midline and coarsely broken (Figure 4); two pairs of eyes posterolateral to *ve* with longitudinal striae between each pair. Setae *ve* closer to *vi* than to *sci*. Dorsal striae of hysterosoma with double striae of which lateral area with irregularly broken striae (Figure 5); dorsal setae smooth and slender.

Venter (Figure 6). Genital valves each with eight setae; eight pairs of aggenital setae; setae ps_1–ps_3 smooth, ps_1 40 (38–44), ps_2 25 (25–29), ps_3 19 (17–21); one pair of ventral setae between coxae IV (*ms*) 15 (15–18). An eversible ovipositor (Figure 7) present and has nine subapical and nine medial setae.

Legs (Figures 8–11). Leg chaetotaxy: coxae I–IV 5(4)t-3t-4t, 1 prop-2t; trochantera I–IV 1t-1t-2t-1t; basifemora I–IV 8(7)t-8t-6t-4(6)t; telofemora I–IV 4t, 1 *macr.*-4t, 1 *macr.*-4t, 1 *macr.*-4t, 1 *macr.*; genua I–IV 4t, 1s-4t, 1s-4t, 1s-5(4)t, 1s; tibiae I–IV 6t, 3s, 1tr-7(5/6/7)t, 2s-7(5)t, 1s-6t, 1tr; tarsi I–IV 19(20)t, 4s, 1 *micr.*-17t, 2s, 1 *micr.*-17t, 1tr-16t, 1s.

Male and immature stages: Unknown.

Differential diagnosis

Among eight known species of *Hexabdella*, the new species can be distinguished from five species namely: *H. maraugia, H. unusoculata, H. singula, H. denheyeri, H. cinquaginta* by having smooth dorsal setae, two pairs of eyes, sparsely broken to continuous dorsal striae and solenidotaxy of tibiae I–IV 3-2-1-0; however, it resembles *H. brevitarsis, H. mexicana* and *H. miranda*, but can be distinguished from them by the combination of the following characters:

Table 1. Comparative characters between *Hexabdella persiaensis* Paktinat Saeej and Bagheri **sp. nov.** and related species.

Species	*sce*	Hypostome	Chelicerae	Movable teeth	Palp basifemur setae	Opistosomal setae	Prodorsum striae	Dorsal striae	Eyes	Solenidotaxy of tibiae I–IV	Coxae	Basifemora	Telofemora	Tibiae	Position of microsetae on tarsus I
***persiaensis* sp. nov.**	65–72	Striated	Striated	3–4 very small	6	Smooth	Coarsely	Sparsely to continuous broken	Two pairs	3-2-1-0	5(4)-3-5-2	8(7)-8-6-4(6)	5-5-5-5	6t, 3s, 1tr-7(5/6/7)t, 2s-7(5)t, 1s-6t, 1tr	Between distal and proximal solenidia
mexicana	34	Smooth	Smooth	1	6	Slightly plumose	Sparsely	Sparsely to continuous	Two pairs	3-2-1-0	5-4-5-2	8-7-7-5	5-5-5-4	6t, 3s, 1tr-5t, 2s-5t, 1s-6t, 1tr	Between distal solenidia
miranda	42–73	Striated	Striated	5 very small	5	Smooth	Coarsely	Finely broken	Two pairs	1-1-1-0	5-3-5-2	7 to 8-7 to 8-7-3	5-5-5-4 to 5	5 to 6t, 1s, 1tr-5 to 7t, 1s-5 to 6t, 1s-6t, 1tr	Between distal and proximal solenidia
Brevitarsis	17–23	Smooth	Striated	?	4	Plumose (barbulate, serrate)	?	Continuous	Two pairs	?	?	?	?	?	?

(1) Dorsal opisthosomal setae smooth in new species *vs*. minutely plumose in *H. brevitarsis* and *H. mexicana*.
(2) Palp basifemur with six setae in new species *vs*. four setae in *H. brevitarsis* and five setae in *H. miranda*.
(3) Movable cheliceral chela of new species with three to four very small teeth *vs*. one tooth in *H. mexicana*.
(4) Hypostome with striae in new species *vs*. smooth in *H. mexicana*.
(5) Leg chaetotaxy of new species show differences with related species (see Table 1).
(6) Microseta (*micr*) on tarsi I half way between proximal and distal groups of solenidia *vs*. between distal group of selenidia in *H. mexicana* (Figure 12).

Etymology

The name *persiaensis* was derived from old Mede and Persian Empire, Persia, about 3000 to 4000 years ago, of which Iran and neighbouring countries were part.

Type material

Holotype and three paratype females of *Hexabdella persiaensis* Paktinat Saeej and Bagheri **sp. nov.** were collected from soil and rotten leaves under hazelnut (*Corylus avellana*, Betulaceae), 20 May 2013, Osku Mahalleh village, Amol city, Mazandaran province, Iran, by Saeed Paktinat Saeej. The holotype female and one paratype female are deposited in the Acarological Collection, Department of Plant Protection, Faculty of Agriculture, University of Maragheh, Maragheh, Iran, and two paratype females are deposited in the Acarological Collection, Jalal Afshar Zoological Museum, Department of Plant Protection, Faculty of Agriculture, University of Tehran, Karaj, Iran.

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