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First record of the genus *Bak* Yunker (Acariformes: Prostigmata: Cheyletidae) from Iran with description of a new species

Saeid PAKTINAT-SAEIJ¹✉, Mohammad BAGHERI² and Michael SKVARLA³

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¹Young Researchers and Elite Club, Maragheh Branch, Islamic Azad University, Maragheh, Iran. (✉) saeedpaktinat@yahoo.com,

²Department of Plant Protection, Faculty of Agriculture, University of Maragheh, Maragheh, Iran. mbagheri20022002@yahoo.com

³Department of Entomology, University of Maryland, 4112 Plant Sciences Building, College Park, MD 20742, USA. mskvarla36@gmail.com

ABSTRACT — A new species, *Bak iranica* n. sp. (Acariformes: Prostigmata: Cheyletidae) is described on the basis of adult males from Amol, Mazandaran province, northern Iran. The new species can be distinguished from other species by the following features: having one seta on each trochanter, tarsi I–IV with 9(+1 ω)–7(+1 ω)–7(+1 ω)–7(+1 ω); a palpal claw with two basal teeth and most of the dorsal body setae slightly lanceolate and barbed. Additionally, a key to world species (females and males) of the genus *Bak* Yunker is provided. This genus is recorded from Iran for the first time.

KEYWORDS — *Bak*; Cheyletidae; Iran; key; new species; taxonomy

ZOOBANK — 15663805-55C1-429B-B8C2-E60139342D4B

INTRODUCTION

Currently, the family Cheyletidae (Acariformes: Cheyletoidea) includes more than 440 species in 75 genera (Zhang *et al.* 2011; Bochkov 2005). Most of these mites are free-living predators although some are permanent ectoparasites of small mammals and birds (Skoracki *et al.* 2012; Bochkov and Abramov 2016).

The genus *Bak* was erected by Yunker (1961), with *Bak sanctaehelenae* Yunker, 1961 as the type species collected from USA (California). This genus comprises 12 species (*Bak ligysculatus* Flechtmann, 1971 is nomen nudum because it was described in an unpublished thesis (Fain and Bochkov 2001)). Eleven species are described on the basis of female specimens and only *B. nadchatrami* is described

based on male. Overall, males are described for six species. The genus is distributed in the Nearctic, Neotropical and Oriental regions, where most species inhabit organic debris and only occasionally are found in house dusts (Fain and Bochkov 2001; Bochkov and Otto 2010).

During taxonomic studies of cheyletid mites from northern Iran, a new species of *Bak* was discovered. Herein, we describe *B. iranica* n. sp., the first species of *Bak* recorded from Iran, and provide an identification key to *Bak* species of the world.

MATERIALS AND METHODS

Soil and rotten leaves were taken from Amol county, Mazandaran Province. Mites were extracted by using a Berlese-Tullgren funnel and preserved in AGA

solution (Smiley 1992). Specimens were cleared in lactophenol fluid, mounted in Hoyer's medium (Walter and Krantz 2009), and were examined under a phase contrast microscope (Olympus BX41). Drawings were made with a camera lucida and differential interference contrast (DIC) optics. The body length of specimens was measured from the apex of subcapitulum to posterior margin of idiosoma, the length of the gnathosoma was measured from the base to the tip of the subcapitulum, the width of the body at its broadest level, and the legs from the ventral insertion of coxae to the base of the pretarsi. In the description below, the idiosomal setation follows Grandjean (1939) as adapted for Prostigmata by Kethley (1990). The nomenclature for leg setae follows that of Grandjean (1944). All measurements are given in micrometres (µm). Measurements (range) of paratype are given in brackets following that of holotype.

RESULTS

Family Cheyletidae Leach, 1815

Genus *Bak* Yunker, 1961

Type species: *Bak sanctaehelenae* Yunker, 1961

Bak iranica n. sp. (Figs. 1–2)

Zoobank: 97ACFECF-69FB-4795-8989-8837B8911620

Diagnosis (male) — Body (including gnathosoma) 407 (371) long, 136 (112) wide; gnathosoma 130 (113) long, 77 (58) wide; propodonotal shield 141 (148) long, 76 (63) wide; median plate 27 (23) long, 17 (12) wide; palp 97 (81) long; palp femur 43 (38) long, 33 (29) wide; dorsal seta on palpal femur (*dF*) ? (30) long. Length of legs I–IV: 167 (155); 123 (117); 158 (144); 156 (140). Dorsal seta on femur IV (*dFIV*) 30 (26).

Description. Male (n=2).

Dorsum (Figs. 1A–B, 2A) — Dorsum with a single propodonotal shield and one small weakly sclerotized hysteronotal shield situated posteriorly. Eyes absent. Dorsal setae slightly lanceolate and

finely barbed. Propodonotal shield in shape of elongate pentagon with rounded posterior margin, broken longitudinal striae, and bearing five pairs of setae (*vi*, *ve*, *sci*, *sce* and *c1*); setae *c2* smooth filiform, situated ventrally. Hysteronotum bearing six pairs of setae and unpaired median hysteronotal shield lacking setae. Setae *d1*, *d2*, *e1* and *f1* on small platelets. Setae *h1* and *h2* smooth filiform and slightly shorter than propodonotal setae. Lengths of dorsal setae: *vi* 20 (22); *ve* 13 (12); *sci* 15 (12); *sce* 11 (11); *c1* 14 (12); *c2* 56 (62); *d1* 15 (12); *d2* 13 (13); *e1* 6 (6); *e2* 10 (10); *f1* 5 (5); *f2* 5 (5); *h1* 17 (16). Distances between dorsal setae: *vi*–*vi* 52 (39); *sci*–*sci* 62 (51); *c1*–*c1* 62 (51); *c1*–*d1* 70 (58); *d1*–*d1* 34 (33).

Venter (Fig. 1C) — Ventral surface ornamented with striations; bearing three pairs of setae on small platelets (*1a*, *3a* and *4a*). Genitoanal area with one pair of genital setae (*g1*). All ventral setae smooth and setiform. Lengths of setae: *1a* 22 (18); *3a* 61 (69); *4a* 15 (15); *g1* 12 (10). Aedeagus located internally; outline visible, fine structure obscured by body.

Gnathosoma (Figs. 2B–C) — Peritremes M-shaped, with 12 pairs of chambers. Rostral shield (tegmen) with one pair of distinct lateral teeth. Gnathosoma bearing subcapitular setae *n* 54 (63) and adoral setae *ao1* 6 (5) and *ao2* 17 (14). Distance between *n*–*n* 37 (32). All setae smooth and setiform. Rostrum (protegmen + tegmen) ventrally and dorsally with longitudinal striations. Palp setal formula as follows: trochanter without seta; femur with one smooth seta (*dF*) (in paratype, Fig. 2B) and one smooth setiform seta (*v'*) and one stout seta (*v''*); genu with two smooth setiform setae (*dG*, *l''G*); tibia with three smooth and setiform setae (*dTi*, *l'Ti*, *l''Ti*), tibial claw 39 (35) long, strong and with two basal teeth; tarsus with one comb-like eupathidium (*sul*) with approximately 23 tines, three smooth eupathidia (*acm*, *ul'*, *ul''*) and one solenidion (ω).

Legs (Figs. 2D–G) — All leg setae smooth setiform, excluding lanceolate and serrate setae *dF* on femora III–IV. Chaetotaxy of legs I–IV: coxae (excluding *1a*, *3a* and *4a*) 2–1–2–1, trochanters 1–1–1–1, femora 2–2–1–1, genua 1(+1 σ)–1–1–0, tibiae 4(+1 Φ)–4(+1 Φ)–4(+1 Φ)–4, tarsi 9(+1 ω)–7(+1 ω)–7(+1 ω)–7(+1 ω). Length of solenidia: ω I 10 (10); ω II 9 (9); ω III 10 (9); ω IV 9 (8); Φ I 4 (3); Φ II

FIGURE 1: *Bak iranica* n. sp. (Male): A – Body in dorsal view, B – Seta *vi*, C – Body in ventral view.

FIGURE 2: *Bak iranica* n. sp. (Male): A – Dorsal view of opisthosoma, B – Seta *dF* on palp femur (paratype), C – Gnathosoma (holotype), D – Leg I, E – Leg II, F – Leg III, G – Leg IV.

9 (10); ϕ III 10 (10).

Immature stages and female: Unknown.

Remarks — Where both sexes are known, conspecific female and male *Bak* specimens possess some of the same distinguishing characters, including the shape of dorsal body setae, and chaetotaxy of coxae, trochanters, femora, genua, tibia I and tarsi I–II. We therefore use these characters to distinguish *B. iranica*, which is known only by male specimens, from other *Bak* species, half of which are known only by female specimens.

The new species resembles *B. faini* Corpuz-Raros, 2000 and *B. sanctaehelena* Yunker, 1961 in having the same femora and genua chaetotaxy. *Bak iranica* **sp. nov.** can be distinguished from *B. faini* by 1) tarsus I with 9 setae (vs. 8 setae in both sexes); 2) tibia IV without solenidion ϕ (vs. solenidion ϕ present in male); and 3) trochanter III with one seta (vs. trochanter III without seta). *Bak iranica* **sp. nov.** differs from the males of *B. sanctaehelena* by 1) palpal claw with two basal teeth instead of a single tooth; and 2) tibia IV with 4 setae and ϕ absent instead of 4(+1 ϕ). Furthermore, the new species differs in the shape of dorsal body setae from *B. indonesiensis* Bochkov and Otto, 2010 as most of dorsal body setae are slightly lanceolate and barbed instead of clavate shape.

Etymology — The specific epithet is derived from the country of origin, Iran.

Type materials — Holotype and paratype males were collected from samples of soil and rotten pine leaves, Haraz road, Polour, Amol county, Mazandaran province, Iran, 11 August 2015 by Saeid Paktinat-Saeij. The holotype male is deposited in the Acarological Collection, Department of Plant Protection, Faculty of Agriculture, University of Maragheh, Maragheh, Iran, and the paratype male is deposited in the Acarological Collection, Jalal Afshar Zoological Museum, Department of Plant Protection, Faculty of Agriculture, University of Tehran, Karaj, Iran.

Key to the females and males of known species of *Bak*

Previously, Fain and Bochkov (2001) established a key based on characters shared by females and

males. Other keys are based on females (Gerson and Fain 1991; Corpuz-Raros 2000). However, given the number of species presently known from males, we decided to provide a key for each sex separately.

1. Tibiae II–III without solenidia; inner palp tarsal comb with teeth; without aedeagus female 2
— Tibiae II–III usually with one solenidion; inner palp tarsal comb usually without teeth; with an aedeagus male 12
2. Dorsal setae setiform or lanceolate 3
— Dorsal setae clavate or bifurcate 9
3. Femora I–II with one seta each 4
— Femora I–II with two setae each 5
4. Genu III nude *B. micidus* Summers and Price
— Genu III with one seta *B. deleoni* Yunker
5. Genu II nude 6
— Genu II with one seta 7
6. Genu III nude *B. ozarkensis* Thewke and Enns
— Genu III with one seta *B. gersoni* Corpuz-Raros
7. Genu I with one seta
..... *B. truncatus* Corpuz-Raros and Sotto
— Genu I with two setae 8
8. Femur III with one seta; tarsus I with 9(+1 ω) setae *B. sanctaehelena* Yunker
— Femur III with two setae; tarsus I with 8(+1 ω) setae *B. payatus* Corpuz-Raros and Sotto
9. Trochanter III nude 10
— Trochanter III with one seta 11
10. Setae *vi*, *ve* and *sci* thickened and serrate, other dorsal setae clavate and plumose
..... *B. faini* Corpuz-Raros
— Setae *vi*, *ve* and *sci* clavate and plumose like other dorsal setae *B. elongatus* Diaz-Patxot and Goff
11. Dorsal setae bifurcate; tarsus I with 8(+1 ω) setae *B. furcatus* Gerson and Fain

- Dorsal setae clavate; tarsus I with 9(+1 ω) setae ..
..... *B. indonesiensis* Bochkov and Otto
12. Dorsal setae setiform or lanceolate 13
— Dorsal setae clavate or bifurcate 16
13. Genua II and III nude
..... *B. ozarkensis* Thewke and Enns
— Genua II and III each with one seta 14
14. Femur III with one seta 15
— Femur III with two setae
..... *B. payatus* Corpuz-Raros and Sotto
15. Tibia IV with four setae; palpal claw with two
basal teeth *B. iranica* **n. sp.**
— Tibia IV with 4(+1 ϕ) setae; palpal claw with one
basal tooth *B. sanctaehelenae* Yunker
16. Trochanter III nude; tibia IV with 4(+1 ϕ) setae ..
..... *B. faini* Corpuz-Raros
— Trochanter III with one seta; tibia IV with four
setae 17
17. Dorsal setae bifurcate
..... *B. furcatus* Gerson and Fain
— Dorsal setae clavate, only seta *e1* bifurcate
..... *B. nadchatrami* Fain and Bochkov

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