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Article

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A new mite species of *Pseudoparasitus* Oudemans (Acari: Mesostigmata: Laelapidae), and a key to known Iranian species of the genus

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Abstract

Pseudoparasitus hajiqanbari **sp. nov.**, a new free-living species of the family Laelapidae is described based on adult females collected from forest litter in southern Caspian Sea, Mazandaran and Golestan Provinces, Iran. The new species can be easily distinguished from other members of the genus by a combination of characters, including presence of eight denticulate rows in deutosternal groove, edentate fixed digit of chelicerae, elongate post-stigmatic region of peritrematal shield and insertion of palp trochanter setae *av1* on a protuberance. Also, a key to the known Iranian species of *Pseudoparasitus* Oudemans is provided.

Key words: Soil mites, Parasitiformes, taxonomy, Iran.

Introduction

The family Laelapidae is a morphologically and ecologically diverse group of mites which currently comprise nine subfamilies and more than 1300 described species of parasites of vertebrates and invertebrates, as well as free-living forms and arthropod symbionts (Evans & Till 1966; Casanueva 1993; Radovsky & Gettinger 1999; Beaulieu 2009; Lindquist *et al.* 2009; Beaulieu *et al.* 2011).

The genus *Pseudoparasitus* Oudemans, 1902 is poorly known worldwide including about 20 described species usually occur in soil and litter (Hunter 1966; Evans & Till 1966; Karg 1978, 1981, 1989, 2003; Ma 2004, 2007; Joharchi *et al*. 2011). The genus was established by Oudemans (1902) under the family Parasitidae, based on *Laelaps meridionalis* G. Canestrini, 1882, and without giving a detailed description. Hunter and Evans & Till defined the *Pseudoparasitus* in the same year (1966) as a separate genus of the family Laelapidae, but in some references (e.g. Karg 1981, 1989, 2003) it has divided to the subegenera: *Gymnolaelaps* Berlese, 1916, *Ololaelaps* Berlese, 1904, *Oloopticus* Karg, 1978 and *Pseudoparasitus*. Hunter (1966) described or redescribed several species, regarded to synonymy of the genus *Austrogamasellus* Domrow, 1956 with *Pseudoparasitus*, and transferred *Gymnolaelaps austriacus* (Sellnick, 1935) to *Pseudoparasitus*, but two of these species were transmitted later to other genera (Joharchi *et al*. 2011; Shaw 2012).

Iranian mites of the genus *Pseudoparasitus* are poorly known and so far only two species, *P. dentatus* (Halbert, 1920) and *P. missouriensis* (Ewing, 1909), have been collected and reported mostly from northern area of Iran (Babaeian *et al.* 2010; Joharchi

et al. 2011; Kazemi & Ahangaran 2011).

Herein, a new species of *Pseudoparasitus* is described, and a key to the known species of the genus in Iran is provided.

Material and methods

Mite specimens were extracted from forest litter samples collected in Mazandaran and Golestan Provinces, southern Caspian Sea, using Berlese-Tullgren funnels. Mites were cleared in Nesbitt's fluid and then mounted in Hoyer's medium on microscope slides before examination.

Morphological observations, measurements and illustrations were made using compound microscopes equipped with differential interference contrast and phase contrast optical systems, and a drawing tube (Olympus BX51). Measurements were made in micrometers (μm). Dorsal shield length and width were respectively taken from anterior to posterior shield margins along the midline, and from the lateral margins at the level of setae j6. The width of the sternal shield was measured from lateral margins of the shield at the level of setae *st2*, and the length from anterior to posterior margins along the midline. Length and width of genitoventral shield respectively were taken from anterior margin of hyaline membrane to posterior margin of shield along the midline and at the broadest point. The anal shield length was measured along the midline from the anterior margin to the posterior margin of the shield including the cribrum, and the width at the broadest point. Length of the legs was taken from the base of the coxa to the apex of tarsus, excluding the pretarsus. The second segment of the chelicera was measured from the base to the apex of the fixed digit, and the width at the broadest point. The length of the fixed cheliceral digit was taken from the dorsal lyrifissure to its apex and that of the movable digit from the base to its apex. The notation for idiosomal setae follows that of Lindquist & Evans (1965) and Lindquist (1994), for palp chaetotaxy that of Evans (1963a), and for leg setae follows that of Evans (1963b). Notation of pore-like structures on the idiosomal integument follows that of Johnston and Moraza (1991), as modified from Athias-Henriot (1969a, b).

Abbreviations are as follows:

ACISTE- Acarological Collection, Institute of Science and High Technology and Environmental Sciences, Graduate University of Advanced Technology, Kerman, Iran.

ACJAZUT- Acarological Collection, Jalal Afshar Zoological Museum, Faculty of Agriculture, University of Tehran, Karaj, Iran.

Genus *Pseudoparasitus* Oudemans, 1902

Type species: *Laelaps meridionalis* G. & R. Canestrini, 1882, by original designation.

Diagnosis (adults). Dorsal shield completely covering dorsal idiosoma and slightly extending ventral idiosoma, usually with 39 pairs of thin and simple setae, short to moderately elongate, including 0–2 pairs of setae *Px* and 0–3 median unpaired setae *Jx*, usually anteriad of level *J3*, some posterior opisthonotal setae sometimes inconspicuously barbed. Well sclerotized presternal platelets present. Sternal shield with three pairs of simple setae and two pairs of lyrifissures. Metasternal setae *st4* and related poroids present and usually inserted on soft cuticle. Genitoventral shield broadened behind coxae IV, posteriorly reaching to anterior margin of subtriangular anal shield, posterior margin of shield truncate, without two distinct Λ-shaped lines on surface, bearing two pairs of setae *Jv1*-*Jv2* well removed from lateral margins of shield, in addition to setae *st5* and 1–

2 pairs of setae *Zv* inserted near lateral margins of shield. Parapodal platelets usually enlarged and triangular posteriorly. Peritrematal shields widely fused to dorsal shield anteriorly and free from exopodal and parapodal elements, usually not continued behind coxae IV level. Male with holovenral shield. Anterior margin of tectum denticulate. Chelicera chelate-dentate, movable digit of chelicera usually in female bidentate and in male unidentate. Pilus dentilis setiform and short. Spermadactyle relatively long and usually narrow, directed anteriorly. Deutosternal groove usually with six rows of denticles. Corniculi stout and usually horn like. Apotel with three tines, posterior tine reduced. Leg chaetotaxy normal for Laelapidae (sensu Evans 1963b), with nine setae on genu IV, including only one posterolateral seta.

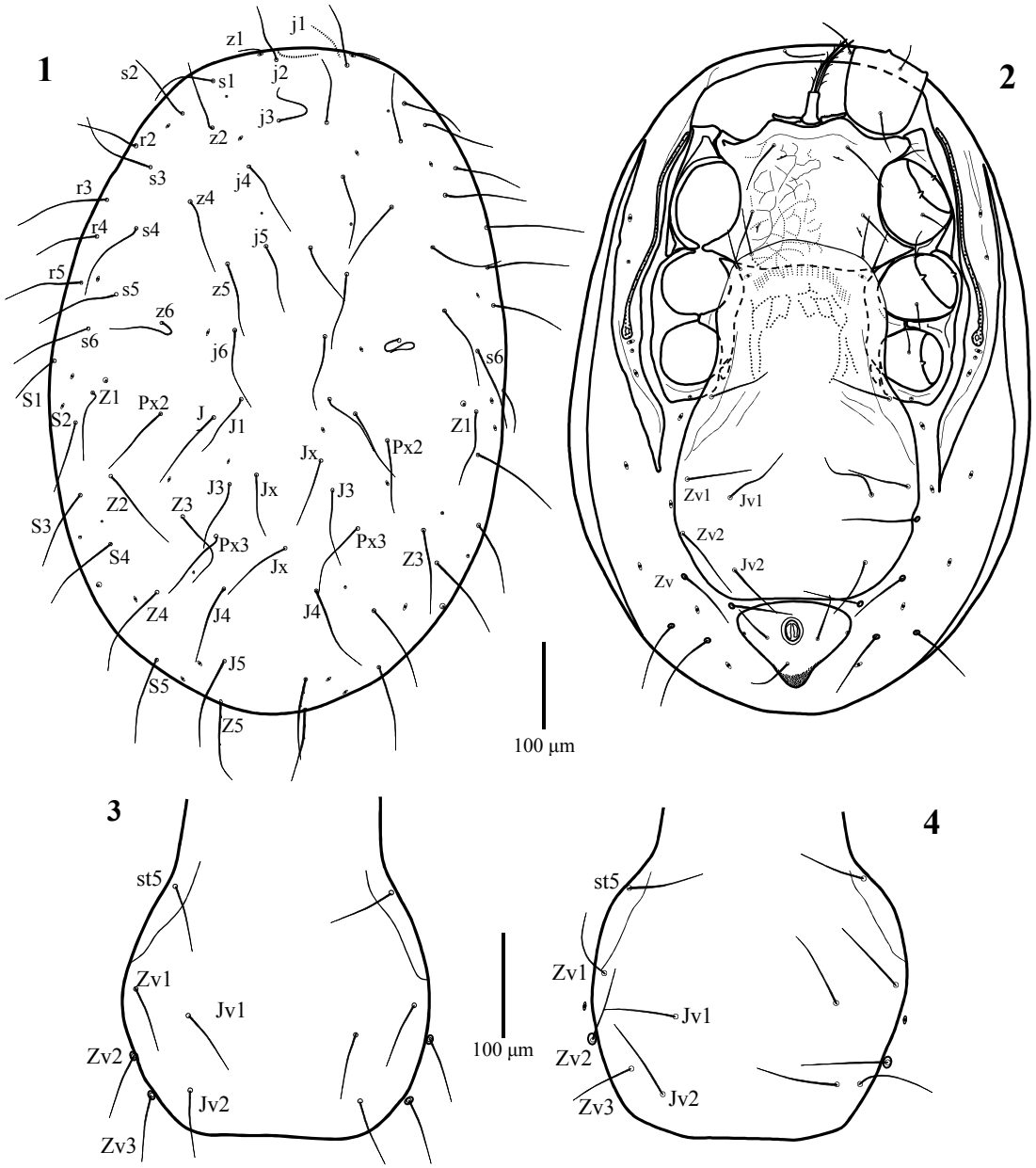
***Pseudoparasitus hajiqanbari* sp. nov. (Figs. 1–12)**

Diagnosis (adult female). Dorsal shield oval-shape, smooth, bearing 38 pairs of delicate and relatively elongate setae (*z3* absent), one opisthonotal seta (*Z2*?) sometimes asymmetrically absent, usually reaching the base of next setae, with three unpaired setae *Jx* of which one seta situated behind *J3* level, some posterior setae e.g. *J4*-*J5*,*Z5* and *S5* with sparsely minute barbs. One pair of presternal platelets present, anterior margin of platelets usually denticulate. Sternal shield wider than long, ratio of length/width 0.92–0.94. Genitoventral shield longer than wide, ratio of length/width 1.4–1.5, shield surface with fine reticulation anterolaterally, otherwise almost smooth, setae *Zv1* always in the shield, *Zv2* or *Zv3* symmetrically or asymmetrically in or off the shied. Opisthogasteric region with only eight pairs of setae in series *Jv* and *Zv*. Poststigmatic area of peritrematal shields elongate and captured metapodal platelets. Parapodal platelets slightly enlarged posteriorly, with truncate posterior edge. Corniculi narrow and straight. Deutosternal groove with eight rows of denticles. Fixed digit of chelicerae edentate. Palp seta *av1* on trochanter inserted on a protuberance. Median and anterior tines of palp apotel spatulate. Leg I considerably longer than idiosoma, legs without modified setae to spur/spine, or apically blunt setae (except on tarsus I), leg setae mostly slender, gradually tapered, apically fine and relatively elongate.

Description

Female. Dorsal idiosoma (Fig. 1). Dorsal shield 774–804 long, 503–538 wide, with 38 pairs of delicate and gradually tapered setae, *j1* and *z1* shortest, ca. 45–50 long, *j1* situated subventrally, other setae mostly ca. 75–115 long, posterior setae *J4*-*J5*, *Z5* and *S5* with sparsely minute barbs, usually inconspicuous; with a complement of 19 visible pairs of discernible pore-like structures, of which seven pairs appear secretory gland pores (circular symbols) and 12 non-secretory lyrifissures (oval-shaped symbols).

Ventral idiosoma (Fig. 2). Tritosternum with a columnar base, 71–73 long, 23–24 wide medially, and two free sparsely pilose laciniae (154–157). One pair of well sclerotized small, narrow presternal platelets present laterad tritosternal base usually with small denticles at anterior margin. Sternal shield well sclerotized, wider than long, 154–162 long, 168–173 wide, reticulated throughout, anterior margin bilobed and posterior margin slightly concave, shield fused to endopodals between coxae I-II and II-III, abutting to exopodals between related coxae, with three pairs of simple setae, *st1*-*st3* 61–67 long, and two pairs of small slit-like lyrifissures. Metasternal setae *st4* (63–68) and related lyrifissures inserted in soft integument.



Figures 1–4. *Pseudoparasitus hajiqanbari* **sp. nov.** (adult female). 1. Dorsal idiosoma; 2. Ventral idiosoma; 3 & 4. Part of genitoventral shield of two paratypes.

Genitoventral shield longer than wide, 398–410 long, 300–313 wide, anterior hyaline margin of shield covering posterior surface of sternal shield, reaching to mid-level of setae *st2*-*st3*, posterior margin of shield truncate, shield surface faintly reticulated anterolaterally, setae *st5* (67–70) inserted in lateral margins of shield almost at level of posterior edge of parapodal platelets, setae *Jv1*-*Jv2* (72–77) always situated well inside the shield, *Zv1* (71–76) in all specimens in the shield, setae *Zv2* and *Zv3* symmetrically or asymmetrically in or off the shield, near lateral margins (Figs. 3–4). Endopodal platelets between coxae III-IV well developed, free from exopodal platelets, mostly covered by anterolateral area of genitoventral shield. Anal shield subtriangular, 96–108 long, 131–140 wide, without conspicuous reticulation, anterior margin of shield slightly convex; circumanal setae simple, slender and subequal, 46–54 long; cribrum well

developed, without paranal extensions laterally; gland pores *gv3* on lateral margins of shield at mid-level of anus. Peritrematal shields developed, widely fused anteriorly to dorsal shield at anterior level of coxae II, with one pair of gland pores at posterior level of coxae II, and one pair of lyrifissures at anterior level of coxae III, poststigmatic section of shields elongate, well continued to almost *Zv1* level and captured metapodal platelets, posteriorly tapered or blunt, with a longitudinal line and two pairs of lyrifissures and one pair of gland pores. Peritremes narrow, relatively long (256–284), and anteriorly reaching to the posterior edge of coxae I. Exopodal platelets relatively enlarged, embraced coxae II-IV, those between coxae III-IV fused to relatively wide parapodal platelets, with almost truncate posterior margin, bearing a glad pore *gv2* at level of setae *st5*. Opisthogasteric soft integument with 4–5 pairs of setae *Jv* and *Zv* (84–112), setae usually surrounded with a narrow sclerotized strip, and six pairs of lyrifissures, including *iv5*.

Gnathosoma (Figs. 5–8). Anterior margin of tectum almost round and denticulate, with different in size teeth, and few transverse lines posteriorly (Fig. 5). Labrum blade-like and longer than median projections of internal malae. Corniculi 78–52 long, shorter than lateral projections of internal malae. Internal malae with a pair of narrow and smooth median projections, and a pair of shorter and apically fringed lateral projections. Deutosternal groove with eight denticulate rows, anterior three rows with 8–11 denticles, and posterior rows with 5–8 denticles each. Hypostomal and capitular setae simple and slender, *h1* 66–69, *h2* 49–53, *h3* 80–84 and *cs* 64–67 long. Basal segment of chelicerae 79–84 long, 42–45 wide, second segment 215–219 long, 37–40 wide, fixed digit (52–55) edentate, pilus dentilis short and setiform, dorsal seta needle-like, movable digit (66–71) bidentate (Fig. 7). Palp 235–241 long, palpal segments setation normal for Gamasina (Evans 1963a), trochanter setae slightly thickened basally, *av1* inserted on a protuberance; setae *al* on palp femur and setae *al* on palp femur and genu apically spatulate, *al* on femur and *al1* on genu slightly thickened and *al2* on genu widened along length; median tine of apotel spatulate and wide, anterior tine longest and apically spatulate (Fig. 8).

Legs (Figs. 9–12). All legs with well developed pretarsus and claws; lengths of legs I-IV, excluding pretarsus, as follows: 1045–1083, 694–712, 633–655, 916–929, respectively. Lengths of trochanters I 81–84, II 81–88, III 74–84, IV 99–116; femora I 216–217, II 146–154, III 122–135, IV 184–186; genua I 174–176, II 108–113, III 89–92, IV 148–150; tibiae I 202–211, II 106–111, III 92–98, IV 159–162; tarsi I 300–306, II 189–192, III 184–189, IV 263–279. Leg chaetotaxy normal for the genus, leg setae mostly slender and relatively long, subapical setae on tarsus II-IV (*av1-av2*, *pv1-pv2*, *al1*, *pl1*, *md*) slightly thickened, without thick and modified setae as spine/spur on leg segments.

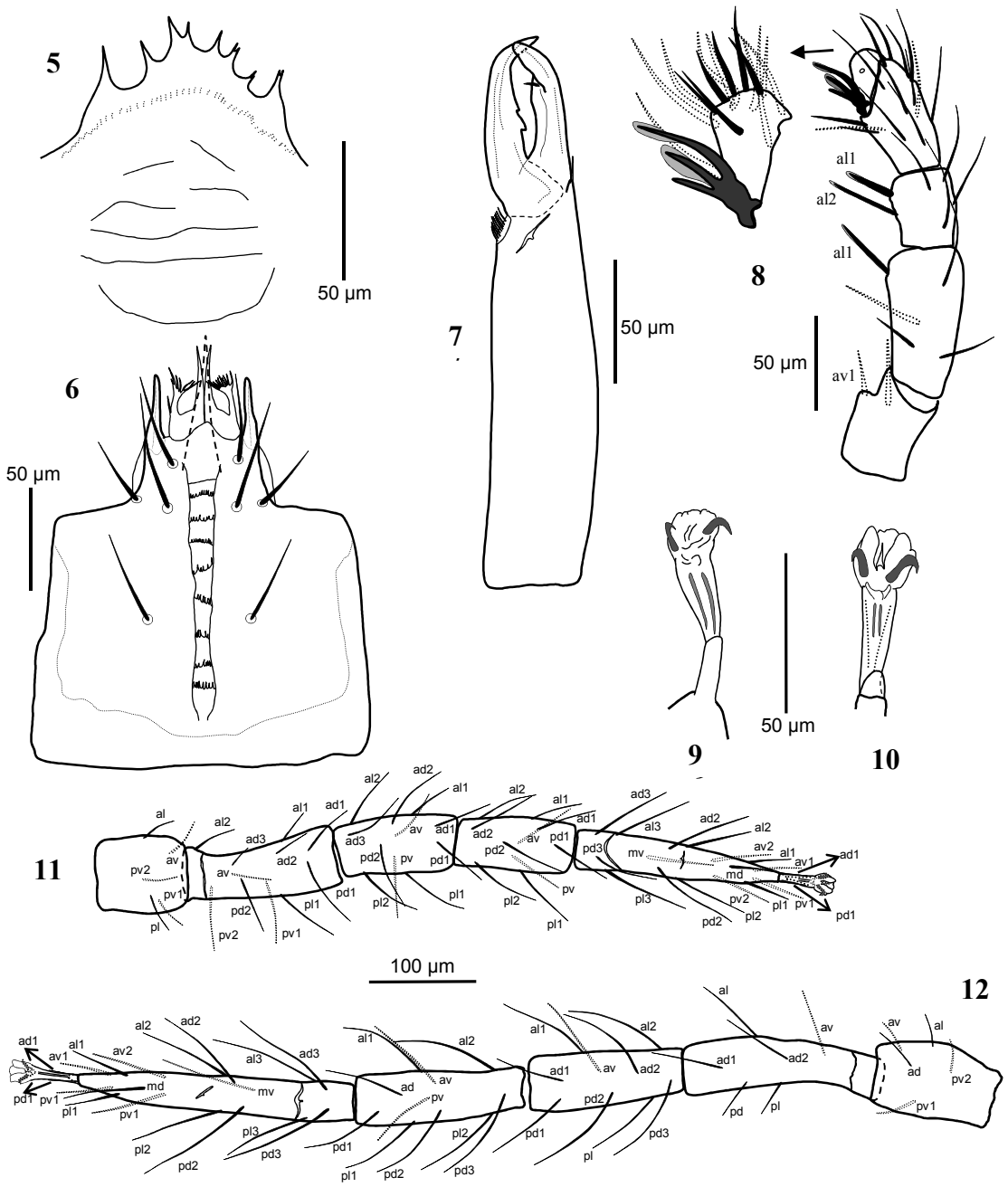
Material examined

Holotype: female northern Iran, Mazandaran Province, Sisangan Forest Park (36° 34′ N; 51° 48′ E), altitude 48 m above sea level, extracted from forest litter, 22 April 2000, deposited in ACISTE. Paratypes: one female from same collection data as holotype, deposited in ACJAZUT; one female northern Iran, Golestan Province, Jafarabad Forest Park, (36° 50′ N; 54° 41′ E), altitude 273 m above sea level, extracted from forest litter, 14 Oct 2011, deposited in ACISTE.

Etymology

This species is named in honor of Dr. Hamidreza Hajiqanbar, Department of Entomology, Faculty of Agriculture, Tarbiat Modares University, Tehran, Iran, friend and

Ph.D. classmate of the author for his valuable collaboration, especially in sampling, during the Ph.D. dissertation.



Figures 5–12. *Pseudoparasitus hajiqanbari* **sp. nov.** (adult female). 5. Tectum; 6. Subcapitulum; 7. Chelicera, lateral view; 8. Right palp, dorsal view; 9. Right pretarsus I, ventrolateral view; 10. Right pretarsus II, ventral view; 11. Right leg II, dorsal view; 12. Left leg IV, dorsal view.

Note. The new species by a combination of characters can be placed in *Pseudoparasitus*, such as: dorsal shield slightly turned onto venter; presence of well sclerotized presternal platelets; genitoventral shield expanded behind coxae IV, with four pairs of setae of which

Jv1-*Jv2* well inside, posterior margin of the shield truncate and reaching to anterior margin of subtriangular anal shield, without a pair of distinct Λ-shaped lines on surface; denticulate anterior margin of tectum; three-tined apotel with small and narrow basal tine; leg chaetotaxy normal for the genus. However, *P. hajiqanbari* **sp. nov.** can be easily distinguished from all other members of the genus by some diagnostic features like eight denticulate rows in deutosternal groove, elongate poststigmatic section of peritrematal shields captured metapodal platelets, fixed digit of chelicera edentate, with one unpaired seta *Jx* behind setae *J3* level, podonotal setae *z3* absent, and inserting palp trochanter seta *av1* on a protuberance. Paragenital lyrifissures *iv5* in the new species and also in other recorded Iranian species were inserted on soft integument, tough in some references they are mentioned to be mostly on the expanded genitoventral shield (Hunter 1966; Shaw 2012).

There are several undescribed or poorly described species of *Pseudoparasitus* and related genera such as *Alloparasitus* Berlese, 1920 and *Gymnolaelaps* worldwide. On the other hand, the Laelapidae genera mostly have not been established well defined with clear boundaries. So, although some of the diagnostic characters of the new species were unique within the known *Pseudoparasitus* species, at the present time I do not think to create a new monotypic genus to accommodate the new species would help to clarify the taxonomic problems existing within the family Laelapidae.

Key to the known Iranian species of *Pseudoparasitus* (based on adult females)

1. Deutosternal groove with six denticulate rows; poststigmatic region of peritrematal shields short, at most reaching to posterior level of coxae IV, free from metapodal platelets; without protuberance at the base of palp trochanter seta *av1*; corniculi horn-like; dorsal shield setae short, ca. 35–40 μm 2
– Deutosternal groove with eight denticulate rows; poststigmatic region of peritrematal shields elongate, captured metapodal platelets, reaching to level of setae *Zv1*; palp trochanter seta *av1* inserted on a protuberance; corniculi straight; dorsal shield setae long, mostly ca. 75–115 μm ..... *P. hajiqanbari* **sp. nov.**
2. Exopodal platelets behind coxae IV enlarged, posterior edge triangular; movable digit of chelicerae bidentate; usually with five small presternal platelets ..... *P. dentatus* (Halbert, 1920)
– Exopodal platelets behind coxae IV relatively narrow, posterior edge almost truncate; movable digit of chelicerae unidentate; with only two presternal platelets ..... *P. missuriensis* (Ewing, 1909)

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گونهٔ جدیدی از کنه‌های جنس *Pseudoparasitus* Oudemans (Acari: Mesostigmata: Laelapidae) از ایران و کلید شناسایی گونه‌های شناخته شدهٔ این جنس در ایران

شهروز کاظمی

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چکیده

Pseudoparasitus hajiqanbari sp. nov. یک گونهٔ جدید آزادزی از کنه‌های خانواده Laelapidae است که بر اساس ماده‌های بالغ جمع‌آوری شده از خاک‌برگ جنگل در استان‌های مازندران و گلستان در جنوب دریای خزر، ایران، توصیف می‌شود. این گونه با داشتن مجموعه ویژگی‌هایی شامل هشت ردیف دندانه‌دار در شیار دئوتواسترنال، انگشت ثابت کلیسر فاقد دندانه، ناحیهٔ عقبی صفحهٔ پریترمی پس از استیگما بلند و قرارگرفتن موی av1 پیش‌ران پالپ روی یک برجستگی به سادگی از دیگر اعضای این جنس قابل شناسایی است. هم‌چنین کلید شناسایی گونه‌های شناخته شده از جنس *Pseudoparasitus* Oudemans در ایران نیز ارایه می‌شود.

واژگان کلیدی: کنه‌های خاک‌زی، Parasitiformes، تاکسونومی، ایران.

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