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Article

New ascid mite of the genus *Antennoseius* Berlese (Acari: Mesostigmata) from Iran

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ABSTRACT
Antennoseius (*Antennoseius*) *gwiazdowiczi* Kavianpour & Nemati was described based on morphological characters of adult females and published in Iranian Journal of Entomology. This journal was published in electronic form only without permanent archiving and is not available now. Also, the work is not registered in ZooBank. To be considered validly published, according to the ICZN rules a work that has been issued and distributed electronically, must possess several conditions such as registration in ZooBank. Due to the absence of such a condition, this species is not available now. For this reason, the description of this species based on morphological characters of adult females is presented here.

KEY WORDS: ICZN; Parasitiformes; registration; soil; ZooBank.

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INTRODUCTION

The genus *Antennoseius* Berlese has been divided into two subgenera based on presence of pretarsus and claws on leg I and usually nine setae on tibiae III (subgenus *Vitzthumia* Thor) and lack of claws and pretarsus on leg I and usually eight setae on tibia III (subgenus *Antennoseius*) (Beaulieu *et al.* 2008; Gwiazdowicz and Halliday 2010; Moraza and Kazemi 2009). So far, approximately 61 species of *Antennoseius* are known worldwide (de Moraes *et al*. 2016).

Some species of the genus *Antennoseius* have different numbers of short spiniform setae (4, 5, 6 and 8 pairs) on podonotal shield, among them, *Antennoseius bregetovae* Chelebiev, *A. bytinskii* Costa, *A. imbricatus* Ishikawa, *A. pannonicus* Willmann and *Antennoseius quadrispinosus* Gwiazdowicz and Haitlinger with four pairs of spiniform setae; *A. masoviae* Sellnick and *A. ponticus* Trach and Makarova with five; *A. sabulicola* Bregetova, *A. sharonovi* Eidelberg, and *A. vysotskajae* Sklyar with six; and also *Anystipalpus livshitsi* (Eidelberg) [syn.: *Antennoseius* (*A.*) *livshitsi*] and *A. maltzevi* Eidelberg have eight spiniform setae on podonotal shield (Ishikawa 1969; Bregetova 1977; Chelebiev 1984; Eidelberg 1989, 1994; Karg 1993; Sklyar 1994; Gwiazdowicz 2007; Gwiazdowicz and Haitlinger 2010; Trach and Makarova 2008; Lindquist and Moraza 2009).

This genus was reported for the first time from Iran by Mossadegh, who reported an unknown species from bee hives (Mossadegh 1997). Moraza and Kazemi (2009) described *A.* (*Vitzthumia*) *kamalii* as a new species on carabid beetles from northeast of Iran. Up to now, 13 species of the genus *Antennoseius* (11 species of the subgenus *Antennoseius* and two species of *Vitzthumia*) have been reported from different habitats in Iran (Kazemi and Rajaei 2013; Kazemi 2018; Nemati *et al.* 2018).

A new species of *Antennoseius* namely *A.* (*A.*) *gwiazdowiczi* was described based on morphological characters of adult females by Kavianpour *et al*. (2013) and published online in Iranian Journal of Entomology (Vol. 3, pp. 36–44).

There are some important conditions in the case of the registration of new animal species published online. To be considered published, a work issued and distributed electronically: (1) must have been issued after 2011; (2) must state, within the work itself, its date of publication; (3) must be registered in ZooBank; (4) must contain evidence, within the work itself, that it is registered in ZooBank; (5) the entry in ZooBank must include the name and internet address of a site where the work is archived (not the publisher); (6) the entry in ZooBank must include the ISSN of the electronic journal (ICZN 2012). The Iranian Journal of Entomology was published in electronic form only without permanent archiving and is not available now. Also, the mentioned work is not registered in ZooBank. So according to the ICZN rules this species [*A.* (*A.*) *gwiazdowiczi*] is not available now and should be considered as a *nomen nudum*. For this reason the description of this species based on morphological characters of adult females is presented here.

MATERIALS AND METHODS

Soil and litter samples were collected in plastic bags from a pomegranate orchard in Shahreza, Esfahan province, transported in to the laboratory and placed in Berlese funnels for mite extraction. Specimens were sorted and kept in 75-80% ethanol for a few days, then cleared in lactic acid and mounted on microscopic slides in Hoyer's medium. Line drawings were made using a drawing tube and figures were performed with Corel X-draw software, based on the scanned line drawings. Structure measurements expressed as minimum-maximum ranges or as a single average value in micrometers (μm) which were obtained using the scaled ocular lens of Olympus BX-43 and Digimizer Software. Shield lengths and widths were taken from anterior to posterior margins along midline and across broadest parts, respectively. Leg lengths were measured from the base of the coxa to the apex of the tarsus without the stalk and pretarsus. The dorsal setae notation followed that of Lindquist and Evans (1965). Leg and palp setal notation and chaetotactic formulae are adapted from Evans (1963a, b) and Evans and Till (1965).

RESULTS

Genus *Antennoseius* Berlese

Type species: *Antennoseius delicatus* Berlese, 1916

Antennoseius (*Antennoseius*) *gwiazdowiczi* Kavianpour & Nemati sp. nov. (Figs. 1–21)

Antennoseius (*A.*) *gwiazdowiczi*.— Kavianpour *et al*., 2013: 37; de Moraes *et al*., 2016: 69; Kazemi, 2018: 4 **(*nomen nudum*)**.

Type material

Holotype, female, soil of a pomegranate orchard in Shahreza (32° 01′ 27″N, 51° 51′ 47″E),

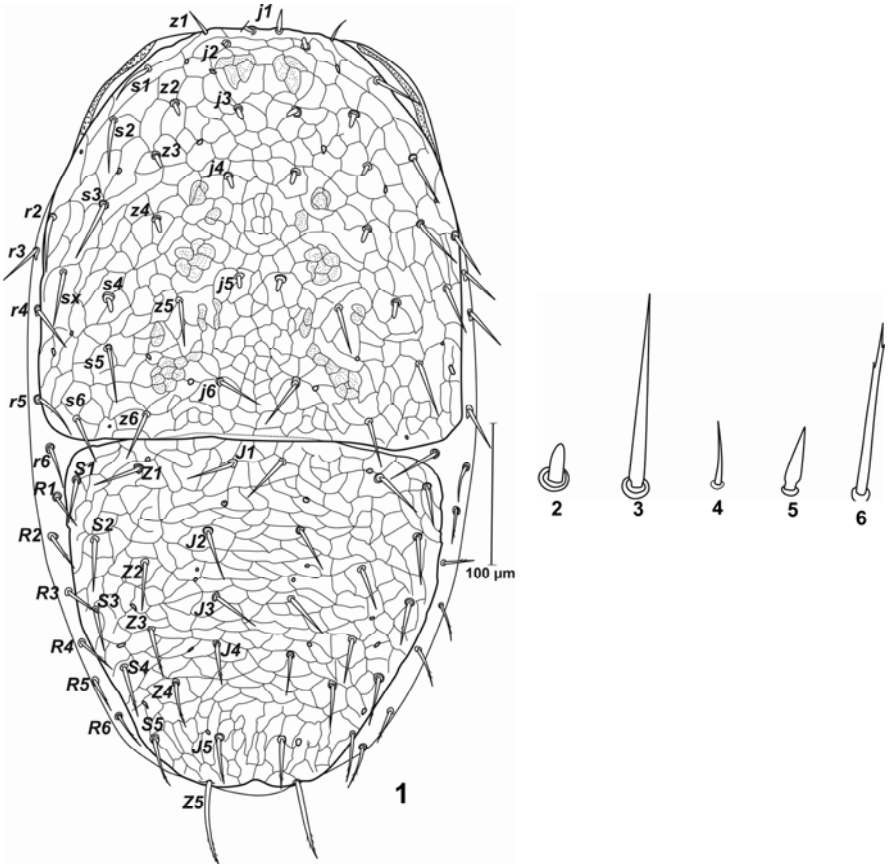
1825 m a.s.l., Esfahan Province, Iran, coll. M. Kavianpour, and three female paratypes: Shahreza county, soil, 2018, coll. A. Nemati, are deposited in the Acarological Laboratory, Plant Protection Department, Agricultural College, Shahrekord University, Shahrekord (APAS) Iran. One female paratype (same data as holotype) deposited in the Acarological collection, Jalal Afshar Zoological Museum (JAZM), Department of Plant Protection, Faculty of Agriculture, University of Tehran, Karaj, Iran. One female paratype, same data as holotype, deposited in Senckenberg Museum für Naturkunde Görlitz Am Museum 1 02826 Görlitz, Germany.

Diagnosis (adult female) – Podonotal and opisthonotal shields reticulated throughout. Podonotal shield with 20 pairs of setae of which eight pairs (*j2-j5, z2-z4* and *s4*) spur-like (except *j1* spine-like) and short, setae *r3-r6* on soft cuticle; with one extra paired setae (*sx*) between *s3-s4*. Opisthonotal shield with 15 pairs of setae, of which *J1-5, Z4-5* and *S4-5* barbed; 16 pairs of setae on soft lateral cuticle. Deutosternal groove with seven denticulate rows with diverse teeth arrangement. Without distinct and sclerotised presternal plates, remnants of presternal plates and wrinkle integument observed at anterior part of sternal shield. Sternal shield with quite divers in posterior margin and the situation of *st3* placement. Tibia I with spin-like seta (*al1*) with sharp tip (apically curved in fresh specimens), coxa I with simple and normal setae.

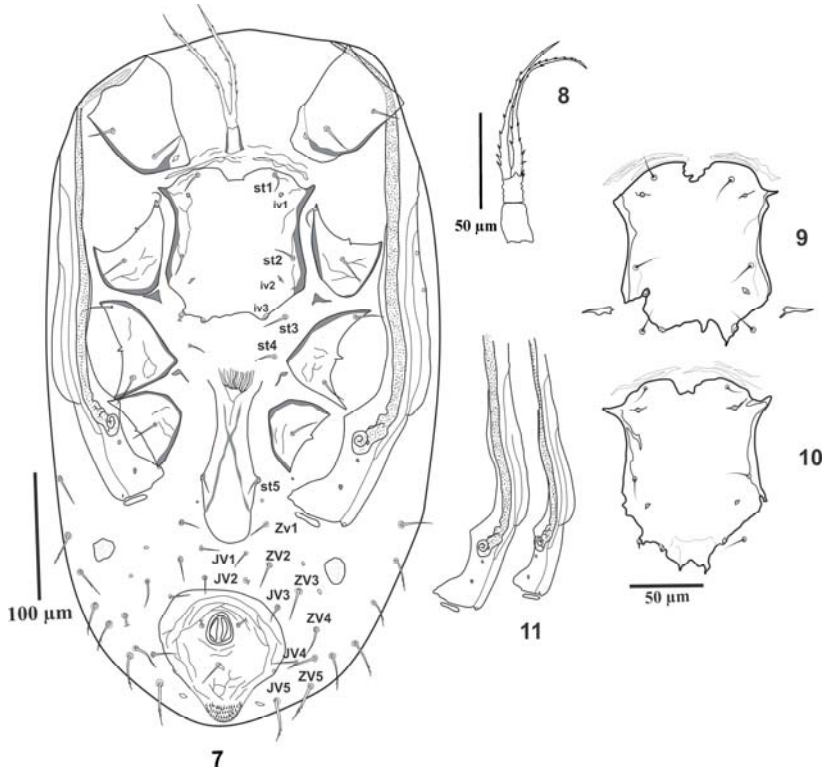
Description (adult female)

Dorsal idiosoma (Fig. 1) – Dorsal idiosoma 559–585 long and 325–328 wide (n = 5), divided into two shields, podonotal with 310-315 long, 325-330 wide and opisthonotal shield with 254-265 long and 286-308 wide. Podonotal with 20 pairs of setae: *j1-j6, z1-z6, s1-s6, r2* of which eight pairs: *j2-j5, z2-z4* and *s4* spur-like (Fig. 2) and short (7–8 long), other setae of podonotal shield long, except setae *j1* and *z1* (Figs. 4–5), shield with one extra set of paired setae (*sx*) between *s3-s4*. Nine pairs of pore-like structures are visible on the surface of podonotal shield, *r3-r6* located on soft cuticle, *r3-r5* adjacent to lateral margin of podonotal shield and *r6* on the cuticle lateral to podonotal and opisthonotal shield borders. Setae *s6* barbed, the right one of *s6* on podonotum in holotype absent (Fig. 1). Opisthonotal shield with 15 pairs of setae, (*J1-J5, Z1-Z5* and *S1-S5*), without extra setae, *J1-5, Z4-5* and *S4-5* barbed, which some of them shown in Figure 6. Opisthonotal shield with nine pairs of pore-like structures, and soft lateral cuticle bears six pairs of setae (*R1-R6*).The measurement of dorsal setae is as follows: *j1* (5–6), *j6* (36–39); *z1* (10–13), *z5* (35–40), *z6* (37–40); *s1* (28–30), *s2* (35), *s3* (39–40), *s5* (40), *s6* (37–42), *sx* (35); *r2* (30–34), *r3* (29–30), *r4* (25–30), *r5* (28–32), *r6* (25–28); *J1* (32–39), *J2* (32–35), *J3* (34–35), *J4* (33–35), *J5* (35); *Z1* (33–40), *Z2* (35), *Z3* (34–35), *Z4* (35–36), *Z5* (47–54); *S1* (26–32), *S2* (32–35), S3 (33–34), *S4* (34) and *S5* (37). Opisthonotum with setiform setae (Fig. 3). An example of opisthonotal barbed setae shown in Figure 6. Podonotal and opisthonotal shields with throughout reticulation as in Figure 1. The shapes of some dorsal setae shown in Figures 2–6.

Ventral idiosoma (Figs. 7–11) – Tritosternum with columnar base divided nearly at midlevel and two serrated laciniae (Figs. 7, 8). Without distinct and sclerotised presternal plates, remnants of presternal plates and wrinkle integument with transverse lines observed at anterior part of sternal shield. Sternal shield 125–132 long and 112–117 wide at level of *st2*, with irregular notch at median anterior margin (Figs. 9, 10), usually with two pairs of setae: *st1* = 17–20 and *st2* = 12–19 and three pairs of lyrifissures (*iv1*-3), setae *st3* 19–20 and *st4* 17–19 on soft cuticle. One of *st3* setae (the left one) located adjacent to the posterolateral corner and another well out of sternal shield and both of them out of sternal shield in paratypes. Posterior and postero-lateral margins of sternal shield with quite diverse situation (Figs.7, 9, 10). Epigynal shield 148–150 long and 49–52 wide, with one pair of simple setae (16–20) adjacent to its lateral margin at widest point, surface with two converged longitudinal prominence as inverted V-shaped (Fig. 7).



Figures 1-6. *Antennoseius gwiazdowiczi* Kavianpour & Nemati **sp. nov.** (female) – 1. Dorsal view; 2. Dorsal setae *j2-5*, *z2-4* and *s4*; 3. An example of dorsal simple setae; 4. *z1*; 5. *j1*; 6. An example of dorsal barbed setae.



Figures 7–11. *Antennoseius gwiazdowiczi* Kavianpour & Nemati **sp. nov.** (female) – 7. Ventral view; 8. Tritosternum; 9–10. Variation of posterior and lateral margins of sternal shield; 11. Variation of posterior part of poststigmatal shield.

Stigmatal openings at mid-level of coxae IV, peritreme extending anteriorly to level of setae *z1*, peritrematal shield and its extension posterior to the stigmatal opening (poststigmatal shield) with diverse shape (Fig. 11), bears five pore-like structures, poststigmatal shield extending posteriorly beyond coxae IV as in Figures 7 & 11. Opisthogastric area with two pairs of metapodal plates, the larger oval and granulate located posterior to poststigmatal shield and another narrow transverse between oval metapodal and poststigmatal shields. Anal shield pear shaped, ornamented with curved lines at anterior and lateral sides, 83–104 long and 109–114 wide, with one pair of para-anal setae (14–16) at the middle part of anal opening and post-anal seta (20–22), *gv3* on lateral margins of anal shield nearly at level of postanal seta insertion;. Opisthogastric area with 15 pairs of setae: *JV1-2* (15–17), *JV3* (16–19), *JV4* (18–21), *JV5* (26–28), *ZV1* (17–20), *ZV2* (15–17), *ZV3* (18–21), *ZV4-5* (16–18). In one of paratype specimen, the left seta of *JV3* located on lateral margin of anal shield and another one out of shield.

Gnathosoma – Corniculi horn-like and robust; hypostome with simple hypostomal setae, rostral setae (*h1*) longest (30–33), external posterior setae (*h2* = 18–21), internal posterior setae (*h3* = 16–17) and palp coxal setae (*pc* = 16–21) in length (Fig. 12). Deutosternum with seven transverse rows of denticles with variation in teeth arrangement (Figs. 12, 13). Anterior margin of epistome rounded (Fig. 14) or nearly rounded (Fig. 15) with a row of delicate teeth at the bottom (Figs. 14, 15). Cheliceral fixed digit (Fig. 16) bears setaceous pilus dentilis, small subapical tooth near a row of fine proximally teeth, movable digit 49–55 long, bidentate with small sharp ventral projection as in Figure 16.

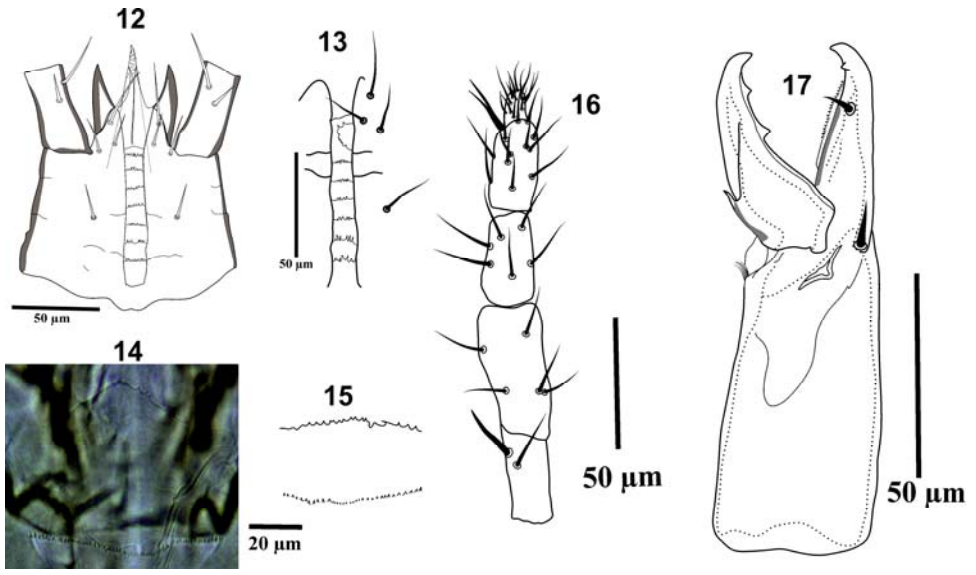
Palp (Fig. 17) – With simple setae, 276–281 long, palp tarsal claw two tines.

Legs (Figs. 18–21) – Leg I (Fig. 18) 606–616 μm: coxa (65–78), 0 0/1 0/1 0; trochanter (57–65) 1 0/1 1/2 1, dorsal seta (*pd*) on trochanter I spine-like, sparsely barbed; femur (112–117), 2 3/1 2/2 2, *ad1* and *pd1* short, thickened and spur-like, *pd2* spine-like and barbed; genu (104–107), 2 3/1 3/2 2, *pd2-3* small, thickened and spur-like; tibia (104–109), 2 3/1 3/2 2, *al1* spine-like, elbowed and thickened, *av1* and *pv1-2* slightly thickened; tarsus (148–156), with four long setae subapically and ambulacrum; **leg II** (Fig. 19) 419–437: coxa (39–49), 0 0/1 0/1 0; trochanter (52), 1 0/1 0/2 1; femur (83–86), 2 3/1 2/2 1, *ad1* and *pd1* slightly thickened and barbed; genu (68), 2 3/1 2/1 2; tibia (60–65), 2 2/1 2/1 2; tarsus (117); **leg III** (Fig. 20) 421–426: coxa (34–42), 0 0/1 0/1 0 trochanter (52–55), 1 1/1 0/1 1, *ad* slightly thickened and barbed; femur (83), 1 2/1 1/0 1, *ad1-2* barbed; genu (65), 2 2/1 2/1 1; tibia (62), 2 1/1 2/1 1; tarsus (122); **leg IV** (Fig. 21) 554–572: coxa (31–42), 0 0/1 0/0 0 trochanter (70–73),1 1/1 0/1 1; femur (109–120), 1 2/0 1/1/1; genu (91), 2 2/1 3/0 1; tibia (86–88), 2 1/1 3/1 2 tarsus (161–164). Coxa I lacks short and blunt setae; some of dorsal setae of legs with one or more barbs (Figs. 18–21). Tarsi II-IV 16-16-16 (3 2/2 2/2 3 + *mv* and *md*), plus two short apical seta-like processes (could be considered as the remnants of *ad1* and *pd1* at the base of stalks).

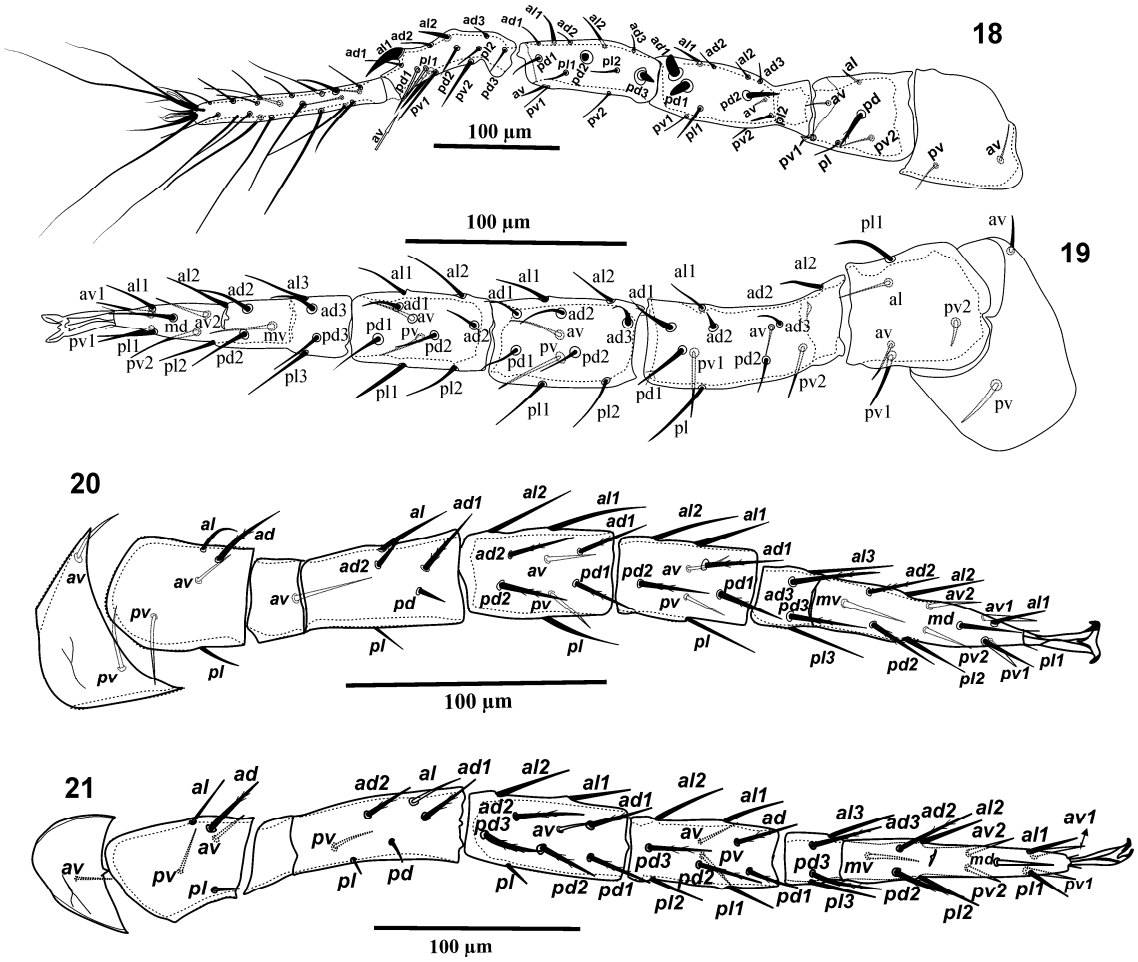
Adult male – unknown.

Etymology

This species is named in honor of Dr. Dariusz J. Gwiazdowicz (Poznan University of Life Sciences, Poland).



Figures 12–17. *Antennoseius gwiazdowiczi* Kavianpour & Nemati **sp. nov.** (female) – 12. Hypostome; 13. Variation of deutosternal groove; 14–15. Variation of epistome; 16. Chelicera; 17. Palp.



Figures 18–21. *Antennoseius gwiazdowiczi* Kavianpour & Nemati **sp. nov.** (female) – 18. Leg I; 19. Leg II; 20. Leg III. 21. Leg IV.

Remarks

Antennoseius (Antennoseius) gwiazdowiczi Kavianpour and Nemati **sp. nov.**, is similar to the *Antennoseius (Antennoseius) maltzevi* Eidelberg, 1994 but, it can be differentiated by the following characters. *Antennoseius gwiazdowiczi* Kavianpour & Nemati **sp. nov.**, lacks prominent presternal shields; anterior margin of sternal shield with conspicuous notch; coxae I-II with simple and normal *pv* seta; tibia I with *al1* as strongly thickened spin-like seta, *al2*, *av* and *pv1-2* are spine-like; seta *pd2* on femur I spine-like and barbed; some of dorsal setae on opisthonotum and especially on legs II-IV are sparsely barbed, while, *A. maltzevi* with a pair of well sclerotised presternal shields, anterior margin of sternal shield concave and without notch, coxae I-II with spine-like posterior seta, tibia I with simple setae; seta *pd2* on femur I spur-like and without barbs; all setae of dorsal shield except *Z5*, smooth and lack barbs. Moreover, all setae on leg III and leg IV are smooth and lack barbs (observation on type specimens of *A. maltzevi* in Poznan University of Life Sciences, Department of Forest Protection, Poznań, Poland by second author).

DISCUSSION

Some species of *Antennoseius* have two different types of females that include the phoretic and nonphoretic morphs. Due to the superficial similarities between *A. gwiazdowiczi* Kavianpour & Nemati **sp. nov.**, and *A. maltzevi* and because of this new species has collected from soil, there is probability that new species is nonphoretic morph of *A. maltzevi*. Lindquist and Walter (1988), recounted some characters for phoretic morph (smooth morph) and nonphoretic morph (granular morph): In granular morph: 1. A granulation or fine tuberculation extends over the sclerotized and unsclerotized cuticular surfaces of the body, excepting the podosomal venter; 2. On the dorsal shields of the body, coarser tubercles are arranged to form a reticulate pattern within which the fine tuberculation is evident; 3. The dorsal shield setae are conspicuously barbed and poorly tapered; 4. The posterior dorsal shield is truncated caudally and broadly emarginated on either side posterolaterally, so as to appear inversely subtrapezoidal; 5. The sternal shield, tough often notched on either side at the level of the second pair of sternal pores, is fully developed so as to bear three pairs of each sternal setae and pores; 6. The anal shield is densely tuberculate. In smooth morph: 1. The sclerotized surfaces of the body are smooth and lineate or reticulate and the unsclerotized cuticular surfaces are smooth and finely striate or plicate; 2. The dorsal shields of the body have a reticulate embossment of their otherwise smooth surfaces, without coarse or fine tuberculation; 3. The setae of the dorsal shields (except the more stout and pilose vertical pair *j1* are narrowly bicarinate but otherwise smooth and tapered apically; 4. The posterior dorsal shield is smoothly rounded posterolaterally and caudally, so appear semicircular; 5. The sternal shield is strongly emarginated or eroded on either side posterolaterally, leaving the third pairs of sternal setae and pores on soft cuticle; 6. The anal shield is lightly lineate-reticulate but otherwise smooth.

Beaulieu *et al.* (2008), stated the following characters for phoretic and nonphoretic morphs of *Antennoseius* as a fuller form. In phoretic morph: 1. Some setae in the *j* and z series are short and spur-like; 2. One or more spines or spur-like setae on coxa, trochanter, femur and genu of leg I; 3. Smooth shield and integument; 4. Smooth or sparsely barbed dorsal setae; 5. Rounded opisthonotal shield posteriorly; 6. Sternal shield so deeply eroded or notched posterolaterally that is does not capture setae st3. In nonphoretic morph: 1. Soft integument and dorsal, peritrematal and ventri-anal/anal shields granular; 2. Densely barbed dorsal setae; 3. Subtrapezoidal opisthonotal shield that is slightly concave posteriorly; 4. Sternal shield usually notched at the level of lyrifissures *stp2*.

According to the above explanations, *A. gwiazdowiczi* Kavianpour & Nemati **sp. nov.** has some characters such as: some setae in the *j* and *z* series are short and spur-like; one or more spines on trochanter, femur and genu of leg I (although there is not any spine on coxa I); the sclerotised and unsclerotised cuticular surfaces of the body are smooth; the setae of dorsal shields are smooth and

acuminate or sparsely barbed; the posterior dorsal shield is nearly rounded; the sternal shield leaving the third pairs of sternal setae and pores on soft cuticle. In addition, the spine-like bulge seta (*al1*) on the tibia I shows that this mite applies this part of tibia I for sticking to the body of insects. Sometimes posterior margin of sternal shield in the phoretic morph of this genus reveals diversity in shape and captures of *st3*, such as conditions which have been appeared in *A. gwiazdowiczi* Kavianpour & Nemati **sp. nov.** and *A. kamalii*. It seems that this diversity sometimes appears in phoretic morph species of this genus. As a result we offer that *A. gwiazdowiczi* Kavianpour & Nemati **sp. nov.** is a dispersant morph or a smooth form (phoretic on insects), although it has been collected from soil habitats.

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کنهٔ آسید جدید از جنس *Antennoseius* Berlese (Acari: Mesostigmata) از ایران

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چکیده

گونهٔ *Antennoseius* (*Antennoseius*) *gwiazdowiczi* Kavianpour & Nemati بر اساس ویژگی‌های ریخت‌شناختی کنه‌های ماده بالغ توصیف و در «مجله‌ی حشره‌شناسی ایران» منتشر شد. این مجله تنها به صورت الکترونیک و بدون بایگانی دایمی منتشر شده است و در حال حاضر در دسترس نیست. همچنین کار انجام شده در زوبانک ثبت نشده است. برای انتشار معتبر هر کار الکترونیک بر اساس قوانین بین‌المللی نامگذاری جانوری آن کار باید دارای چندین ویژگی از جمله ثبت در زوبانک باشد. به دلیل نبودن چنین شرایطی، این گونه در حال حاضر در دسترس نیست. به همین دلیل توصیف این گونه بر اساس ویژگی‌های ریخت‌شناختی کنه‌های ماده بالغ در اینجا ارایه شده است.

واژگان کلیدی: قوانین بین‌المللی نامگذاری جانوری، بالاراستهٔ Parasitiformes، ثبت، خاک، زوبانک.

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