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Article

Mites of the genus *Antennoseius* Berlese (Acari: Mesostigmata: Ascidae) from Iran

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Abstract

Three species of mites in the subgenus *Antennoseius* (*Antennoseius*) Berlese, 1916 associated with ground beetles (Coleoptera, Carabidae) are reported for the first time from Iran: *A*. (*A*.) *longisetus* Eidelberg, *A*. (*A*.) *sabulicola* Bregetova and *A*. (*A*.) *sharonovi* Eidelberg. These species and *A*. (*A*.) *masoviae* Sellnick, are diagnosed in detail. Idiosomal poroidotaxy and adenotaxy for the subgenus are illustrated. *A*. (*A*.) *vysotskajae* Sklyar is considered as junior synonym of *A*. (*A*.) *sharonovi*. A key to Iranian species of the genus is presented.

Key words: Mites, Parasitiformes, Ascinae, *Antennoseius*, Carabidae, Iran

Introduction

The Ascinae genus *Antennoseius* Berlese, 1916 includes about 60 described species, which are found in diverse habitats such as soil, litter, moss, meadows, fields, marshes, and bracket fungi, in the nests of rodents, birds and ants, on rodents, and under the elytra of ground beetles (Col.: Carabidae) (Ryke 1962; Karg 1965, 1993; Costa 1969; Bregetova 1977; Chelebiev 1984; Nikolsky 1988; Eidelberg 1989, 2000; Halliday *et al*. 1998; Beaulieu *et al*. 2008; Kazemi & Rajaei 2013). Lindquist & Walter (1989) investigated the feeding behavior of *Antennoseius* (*Vitzthumia*) *janus* Lindquist & Walter, 1989 and found that it can feed on a variety of nematodes and small arthropods like astigmatic mites and Collembola.

Lindquist & Moraza (2009) transferred three species of *Antennoseius* to the genus *Anystipalpus* Berlese because of their unique apomorphies (palp slender, elongated, about half as long as leg I, palptibia 2–3 times as long as palp-tarsus, sternal shield lacking lyrifissures *iv1*, *iv3*, and sometimes *iv2*, and tibia IV with nine setae, *pl-2* absent). The revision of other species currently included in *Antennoseius* may mean that more species will be transferred to *Anystipalpus* in the future. The remaining species are allocated to two subgenera based on the pretarsus of leg I bearing a pair of small to well-developed claws (subgenus *Vitzthumia* Thor, 1930) or leg I lacking pretarsus and claws (subgenus *Antennoseius*). The presence of sets *pl2* on tibia III of *Vitzthumia* is inconsistent.

The presence of two adult female morphs (phoretic and free-living morphs) in two species of the subgenus *Antennoseius* (*Vitzthumia*) has been demonstrated and described by Lindquist & Walter (1989) and Beaulieu *et al*. (2008), but such dimorphism has not been reported within the species lacking ambulacra on leg I.

So far, five species have been reported from Iran: *A*. (*A*.) *bacatus* Berlese, 1916 from soil, decayed plants, sheep manure and in nest of ants, *A*. (*A*.) *borrusicus* Selnick, 1945 from soil, *A*. (*A*.) *masoviae* Sellnick, 1943 from soil and litter, and associated with a scarab beetle, and *A*. (*V*.) *oudemansi* (Thor, 1930) from soil and litter, *A*. (*V*.) *kamalii* Moraza & Kazemi, 2009 associated with ground beetles (Jalaeian *et al*. 2004; Moraza & Kazemi 2009; Kazemi *et al*. 2011; Malek-Shahkouyi *et al*. 2011; Mehrzad *et al*. 2011; Kazemi & Rajaei 2013).

The purpose of this paper is to add three new records of *A*. (*Antennoseius*) species for the Iranian mite fauna and to present more morphological data for them, because their original descriptions lack some important details. Also, *A*. (*A*.) *vysotskajae* Sklyar is considered as junior synonym of *A*. (*A*.) *sharonovi* Eidelberg, and a key to Iranian mites of the genus *Antennoseius* is presented.

Materials and methods

Carabid beetles were captured in Mazandaran, North Khorasan and Razavi Khorasan Provinces, in north and north eastern Iran, using direct collecting under small stones or by light trap, and killed in 75% ethanol. Mites were removed from under the elytra of their hosts, cleared in Nesbitt's fluid and mounted as permanent slides using Hoyer's medium.

Measurements are given in micrometres (μm), as a range or a single average value. Podonotal and opisthonotal shield lengths were taken from their anterior to posterior margins in the mid-line, and their widths from the lateral margins at the level of dorsal setae *r2* and at level of setae *S1*. Lengths and widths of sternal shields were measured at the mid-line and the level of *st2*, respectively. Epigynal shield lengths and widths were taken from the anterior hyaline margin to the posterior round or blunt margin, and at the level of setae *st5*. Anal shield lengths were measured on their mid-line from anterior to posterior margins including cribrum, and their widths at the broadest point. Leg lengths were measured from the base of the coxa to the apex of tarsus (excluding pretarsus). Chelicera lengths were taken from the base of the second segment to the apex of the fixed digit, fixed digit lengths were taken from the dorsal lyrifissure to its tip, and that of the movable digit from the base to the apex. Subcapitulum lengths were measured from the base of seta *h3* to the basal margin of the subcapitulum, and their widths at the level of the capitular setae. Idiosomal setal notation follows that of Lindquist and Evans (1965) and leg and palpal setation follows that of Evans (1963, 1964). Notation of pore-like structures on the idiosomal integument follows that of Johnston and Moraza (1991), as modified from Athias-Henriot (1969). Abbreviations are as follows:

ACASI- Acarological Collection, Acarological Society of Iran, Faculty of Agriculture, University of Tehran, Karaj, Iran

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

MZUNAV- Museum of Zoology, University of Navarra, Pamplona, Spain

Results

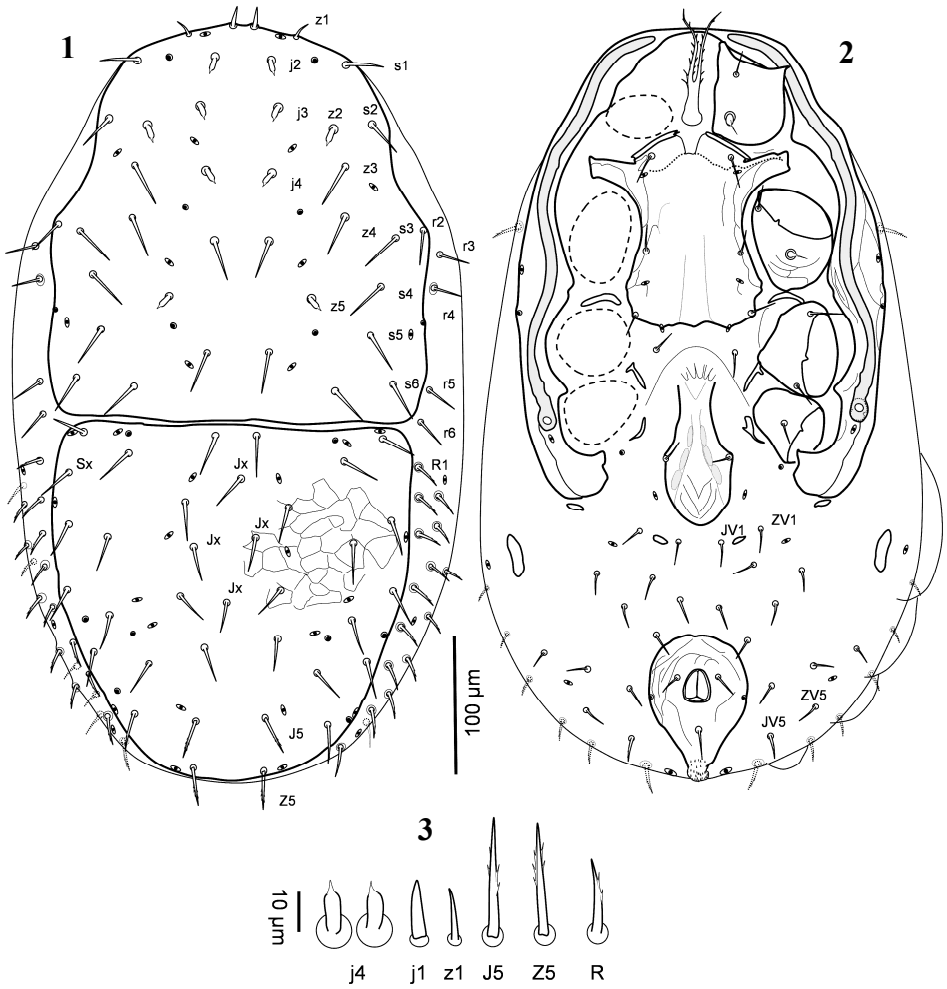
Antennoseius* (*A*.) *masoviae Sellnick, 1943 (Figs. 1–8)
Antennoseius (*A*.) *masoviae*.— Sellnick 1943: 201; Costa 1969: 219; Bregetova 1977: 230; Karg 1993: 305.

Adult female

Dorsal idiosoma (Fig. 1). Dorsal shields lineate-reticulate over entire surface, reticula more elongate between setae *J5* and *Z5*. Dorsolateral and opisthogastric surrounding soft integument finely striate. Podonotal shield 287–312 long, 268–297 wide, with 19 pairs of setae (*j1-j6*, *z1-z6*, *s1-s6*, *r2*), and 10 pairs of discernible pore-like structures (apparently four pairs of glandular pores and six pairs of lyrifissures). Setae *j1* spine-like and smooth (13–15), *z1* fine (15–16), setae *j2-j4*, *z2*, and *z5* smooth, short (12–14), strongly thickened with a short thin tip (Fig. 3), setae *j5*, *j6*, *z3*, *z4*, *z6*, *s1-s6* and *r2* needle-like and usually smooth (27–31). Opisthonotal shield 248–282 long, 254–286 wide, rounded posteriorly and very slightly concave between setae *Z5*, with 15 pairs of setae (*J1-J5*, *Z1-Z5*, *S1-S5*), three to six *Jx* setae, one or two setae *Sx* and 14 pairs of discernible pore-like structures (apparently three pairs of gland pores and 11 pairs of lyrifissures). Setae *J1-J3*, *Jx*, *Z1-Z5*, *S1-S5* needle-like and usually smooth, rarely with 1–2 small barbs, 25–30 long, *J5*, *Z4-Z5* and *S5* serrate (Fig. 3). Lateral soft integument with four pairs of lyrifissures and 32–33 pairs of setae, usually sparsely barbed, including setae *r3-r6* (20–23) and 28–29 pairs of setae *R* and *UR* (13–19) (Fig. 4).

Ventral idiosoma (Fig. 2). Tritosternum with a relatively short, sub-rectangular base (19–21 long, 13–14 wide medially) with two slender, sparsely pilose laciniae, 73–77 long free and fused basally for 19–20 μm. Presternal region with one pair of oblique narrow presternal strips fused to weakly sclerotized anterior margin of sternal shield. Sternal shield 126–134 long, 92–103 wide, fused to wide endopodal elements between coxae I and II, anterior margin of well sclerotized area of shield convex, posterior margin irregular, inconspicuously reticulate over entire surface, lateral reticulation more distinct, with pair of parallel longitudinal lines more discernible medially in posterior half of shield, with three pairs of fine smooth setae and three pairs of lyrifissures. Seta *st1* (30–33) on weakly sclerotized anterior region of shield, *st2* 25–27 and *st3* 27–29 long. Metasternal setae *st4* (18–20) smooth, inserted in soft cuticle. Endopodal platelets between coxae II-III and III-IV present and free. Epigynal shield finely reticulate, posteriorly rounded, 142–158 long, 49–56 wide at level of *st5* and 24–29 wide at narrowest width between coxae IV, epigynal setae *st5* on lateral margins of shield, 20–22 long. Paragenital lyrifissures on soft integument at level of posterior edge of peritrematal shields. Glands *gv2* present, axilar to coxae IV. Peritrematal and exopodal shields continuously fused together beside coxae II to IV, with a longitudinal line beyond the stigmata, anteriorly fused to dorsal shield, finely rounded posteriorly behind coxae IV, with one lyrifissure on post-stigmatic region of shield, one gland pore at anterior level of coxae III, and one lyrifissure near mid-level of coxae II, on lateral margin of shield. Peritremes long, extending from stigmata at mid-level of coxae IV to behind setae *z1*. Opisthogasteric soft integument bearing 12 pairs of ventral setae, 7–9 pairs smooth (12–16), others slightly thicker and barbed (19-28), and four pairs of lyrifissures on soft integument, of which one pair on minute platelets lateral to posterior edge of anal shield. Two pairs of metapodal platelets present, the smaller near the

posterior edge of the peritrematal shield and the larger, sub-oval, well removed from peritrematal-exopodal shield; one pair of postgenital platelets present between setae *Jv1-Zv1*. Anal shield lineate-reticulate, 114–122 long, 69–81 wide, with three fine and smooth circum-anal setae, post-anal seta (20–23) longer than para-anal setae (16–18), *gv3* on its lateral margin at posterior level of anus, anus located in anterior half of shield, cribrum well developed. Spermathecal structures unsclerotized.

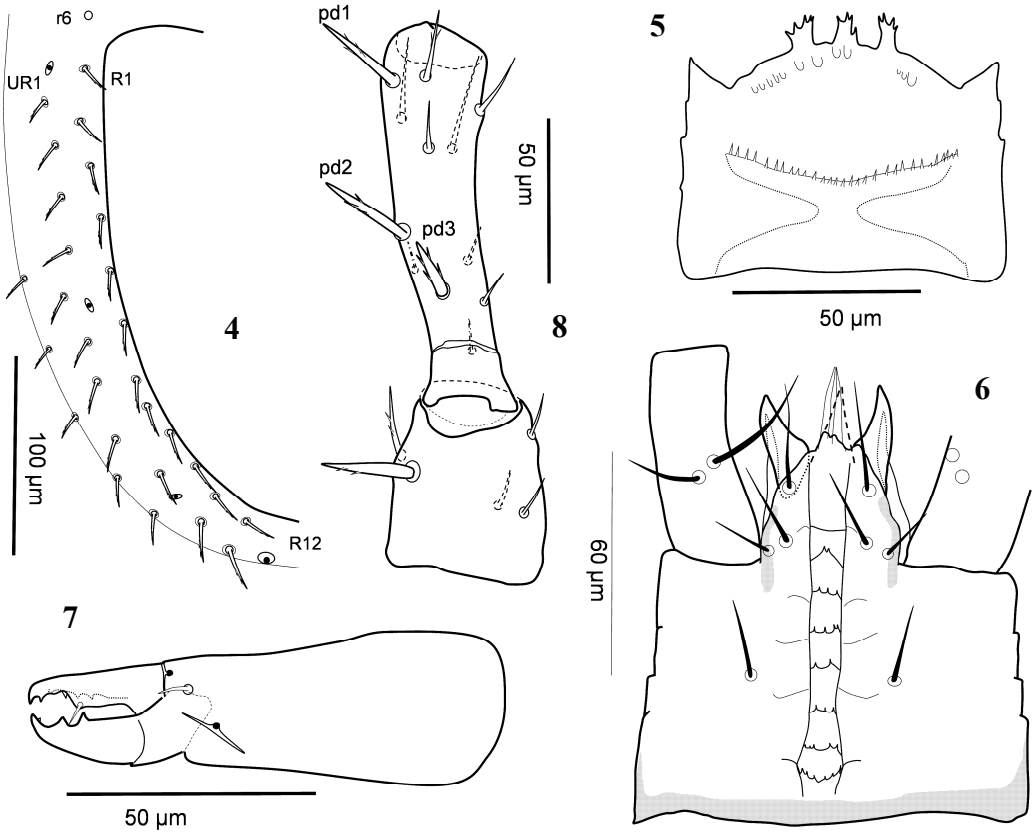


Figures 1–3. *Antennoseius* (*A*.) *masoviae*, adult female. 1. Dorsal idiosoma; 2. Ventral idiosoma; 3. Details of some dorsal idiosomal setae.

Gnathosoma. Anterior margin of gnathotectum with three denticulate outgrowths, dorsal surface with one transverse serrate line and a cup-like unsclerotized basal region (Fig. 5). Second segment of chelicera (Fig. 7) 96–103 long, 27–29 wide, without any conspicuous process along antiaxial surface, fixed digit 30–31 long, with a setiform pilus dentilis and an even row of four or five small teeth along distal masticatory edge and a fine tooth subapically, movable digit (35–38) bidentate, with a para-axial ridge leading to a ventral projection, without fimbriate arthrodial process at the base. Subcapitulum wider than long, ratio of width/length 1–1.2. Hypostomal and capitular setae smooth, *h1* 25–28, *h2* 15–16, *h3* 20–23 and *ca*. 22–23 long. Deutosternum with seven transverse rows of denticles, the basal row slightly wider and concave, with 5–7

denticles, second row with 3–5 denticles, anterior five rows with 2–4 denticles each. Labrum blade-like, shorter than corniculi. Corniculi horn-like, 26–28 long, somewhat shorter than internal malae. Palp 163–181 long, ratio of palp-tibia/tarsus length 1.45–1.54, dorsal setae on femur slightly barbed, palp apotele 2-tined.

Legs. Length of legs I-IV 480–527, 354–389, 340–358, 481–512, respectively. Coxal setae legs I-II-III-IV 2-2-2-1; trochanters 6-5-5-5; femora 2 3/1 2/2 2; 2 3/1 2/2 1; 1 2/1 1/0 1; 1 2/0 1/1 1; genua 2 3/1 3/2 2; 2 3/1 2/1 2; 2 2/1 2/1 1; 2 2/0 3/1 1; tibiae 2 3/1 3/2 2; 2 3/1 2/1 2; 2 1/1 2/1 1; 2 1/1 3/1 2; tarsi II-IV 3 3/2 1/1 3/2 3. Ventral posterior seta on coxae I and II swollen basally and abruptly narrowed to a thin tip; dorsal seta on trochanter I, and dorsal setae *pd1*, *pd2* and *pd3* on femur I thickened and serrate (Fig. 8).



Figures 4–8. *Antennoseius* (*A*.) *masoviae*, adult female. 4. Details of dorsal setae on soft cuticle; 5. Gnathotectum; 6. Subcapitulum; 7. Chelicera, lateral view; 8. Trochanter and femur I.

Material examined

Three adult females from North Eastern Iran, Khorasan Razavi Province, Sarakhs region (36º 18.549′ N; 60º 10.018′ E), altitude 858 m, ex *Calathus* (*Neocalathus*) *ambiguus* (Paykull, 1790), 26 April 2007, H. Hajiqanbar coll., deposited in ACISTE; one adult female from same locality and data deposited in MZUNAV; one female from North Eastern Iran, North Khorasan Province, Mane & Samalghan (37º 07′ N; 56º 04′ E), altitude 2,365 m , 30 July 2006, ex *Harpalus* (*Pseudoophonus*) *rufipes* (Degeer, 1774), H. Hajiqanbar coll., deposited in ACJAZUT; one adult female from same locality and data deposited in ACASI.

Distribution

The species has been recorded from Europe, Western Middle-East, former USSR and Iran, associated with Carabidae and Scarabaeidae (Coleoptera), and also in soil, litter and moss (Sellnick 1943; Costa 1969; Ryke 1962; Bregetova 1977; Karg 1993; Trach & Makarova 2008; Plumari 2008; Fenda & Kaluz 2009; Kazemi & Rajaei 2013).

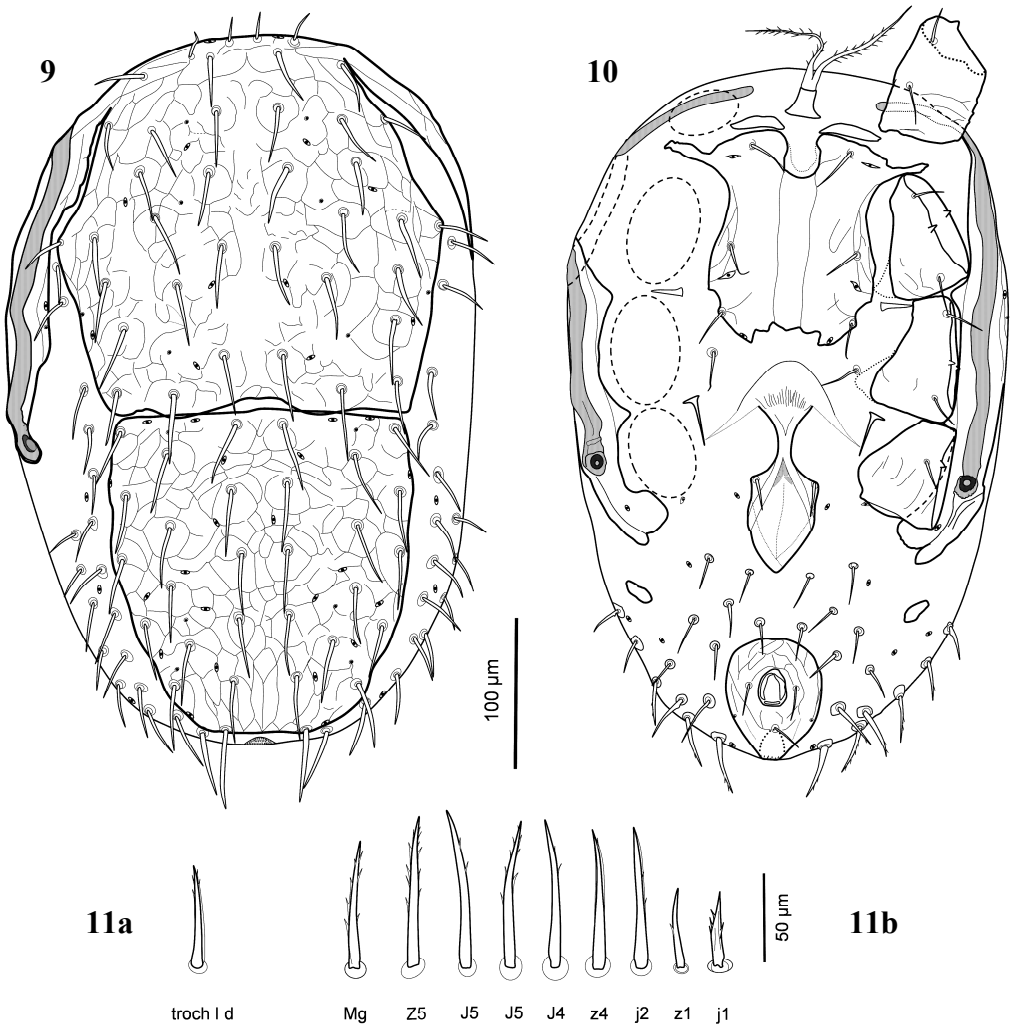
Antennoseius* (*A*.) *longisetus Eidelberg, 2000 (Figs. 9–14)
Antennoseius (*A*.) *longisetus*.— Eidelberg 2000: 1399.

Adult female

Dorsal idiosoma (Fig. 9). Dorsal shields conspicuously lineate-reticulate over their entire surface, reticula more elongate between setae *J5* and *Z5*, setae needle-like, usually with a very narrow hyaline strip especially near the tip, occasionally with a few minute barbs on the hyaline strips (Fig. 11b), *j1* and some posterior opisthonotal setae serrate (e.g. *J5*, *Z5* and *S5*), surrounding soft integument finely striate. Podonotal shield 215–237 long, 221–229 wide, posterior margin of shield irregular, with 19 pairs of setae, *j1*-*j6*, *z1*-*z6*, *s1*-*s6*, *r2*, of which *j1* and *z1* shortest (18–21), others 27–45 long, *j2*-*j3*, *z2*-*z4*, *s3*-*s5* as long as longitudinal intervals between their bases to following setae or slightly longer, remaining podonotal setae shorter than longitudinal intervals between their bases. Opisthonotal shield 191–213 long, 179–196 wide, rounded posteriorly and slightly concave between setae *Z5*, with 15 pairs of relatively stout needle-like setae *J1*-*J5*, *Z1*-*Z5*, *S1*-*S5* (40–46), most of them as long as or slightly longer than longitudinal intervals between their bases, only *Z4* 0.6–0.7 as long as longitudinal intervals between *Z4*/*Z5*. Adenotaxy and poroidotaxy normal for the subgenus. Surrounding dorsal soft integument bearing 12–15 pairs of setae, similar in shape to dorsal setae, 20–31 long, and three pairs of lyrifissures.

Ventral idiosoma (Fig. 10). Tritosternum with a short base, 15–17 long, widened at its base (20–22) and considerably narrower anteriorly (8–9), with two free pilose laciniae, length 76–79, fused for 7–8 μm basally. Presternal region with one pair of narrow, well sclerotized presternal platelets near anterior lobulate margin of sternal shield. Sternal shield 94–98 long from anterior median depression to posterior margin, 93–101 wide, anterolateral arms relatively narrow, fused to endopodal elements between coxae I and II, with three pairs of setae *st1* (28–30), *st2*-*st3* (22–23) and three pairs of lyrifissures, shield with a bow-shaped sclerotized invagination between setae *st1*and a faint pair of parallel longitudinal lines. Metasternal setae *st4* (24–27) fine and smooth, inserted on soft integument. Endopodal platelets between coxae II-III and III-IV narrow and free. Epigynal shield 127–129 long, 40–45 wide at level of *st5* and 9–10 at narrowest point, parallel for 26–30 past insertion of *st5*, and round to bluntly acuminate posteriorly, with a Λ-shape marking on its surface, *st5* (22–24) inserted on lateral margin of shield; *iv5* inserted on soft integument. Peritrematal-exopodal shields slightly continued past coxae IV, with a longitudinal line and one lyrifissure on post-stigmatic region of shield, a gland pore and lyrifissure inserted at anterior level of coxae III and posterior level of coxae II, respectively, on lateral margin of shield. Peritremes long, extending from stigmata at mid-level of coxae IV to anterior margin of coxae I, behind setae *z1*. Opisthogastric soft integument with five pairs of lyrifissures and six pairs of needle-like smooth setae *Jv1*-*Jv3*, *Zv1*-*Zv3* (22–25), setae *Jv4*-*Jv5*, *Zv4*-*Zv5* and 4–7 other ventral setae thicker and slightly barbed, 35–38 long. A pair of sub-oval metapodal platelets present, well removed from posterior edges of peritrematal shields.

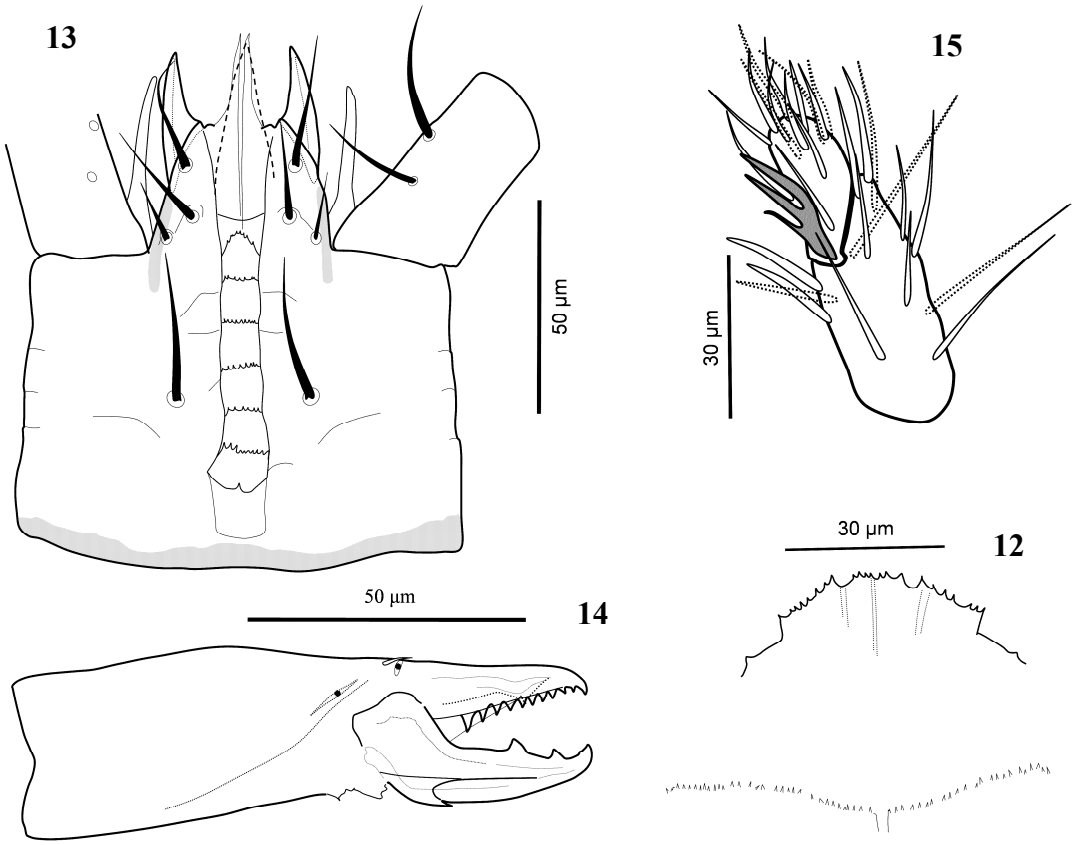
Anal shield 88–94 long, 57–67 wide, pear-shape, with reticulate-lineate surface and three sub-equal smooth circum-anal setae (18–22), anus located somewhat on anterior half of shield, cribrum well developed, *gv3* on lateral margins of shield at mid-level of post-anal seta and posterior margin of anus.



Figures 9–11. *Antennoseius* (*A*.) *longisetus*, adult female. 9. Dorsal idiosoma; 10. Ventral idiosoma; 11. a, Details of dorsal setae of trochanter I; b, Details of some dorsal and marginal setae.

Gnathosoma. Gnathotectum with three wide and short serrate anterior processes, with a transverse medially concave line of denticles posteriorly (Fig. 12). Labrum blade-like, narrow, not reaching to anterior end of corniculi. Subcapitulum length/width ratio 1.1–1.3 (Fig. 13). Internal malae narrow and slightly longer than corniculi. Corniculi horn-like, 41–42 long; salivary stylets sword-like. Deutosternal groove with seven rows of denticles, basal row widest, concave, with a median denticle or 7–8 minute denticles, apical row convex with 6–9 denticles, other rows transverse with 4–5 or 8–12 denticles per row. Hypostomal and capitular setae smooth, *h1* 31–33, *h2* 15–17, *h3* 29–31 and *ca*. 32–34 long. Second segment of chelicera (Fig. 14) 96–99 long, 27–30 wide, fixed digit 31–33 long, with 10 denticles, movable digit 36–39 long, bidentate, para-axial ridge and ventral projection present. Palp 182–187 long, all setae smooth, except very slightly

barbed dorsal setae on femur, ratio of palp-tibia/tarsus lengths ≈ 1.45, apotele 3-tined (Fig. 15).



Figures 12–15. *Antennoseius* (*A*.) *longisetus*, adult female. 12. Gnathotectum; 13. Palp tibia and tarsus; 14. Subcapitulum; 15. Chelicera, lateral view.

Legs. Leg chaetotaxy normal for the taxa. Length of legs I-IV 500–533, 364–367, 321–353, 465–476, respectively. Leg setae usually smooth, some dorsal and lateral setae sparsely barbed, dorsal seta of trochanter I (Fig. 11a) and three dorsal setae of femur I thicker and serrate, coxal setae simple.

Material examined

One adult female from North Iran, Mazandaran Province, Tirtash region (36º 43.167′ N; 53º 43.523′ E), altitude −21 m, 9 July 2007, ex *Idiomelas* (s. str.) *morio* (Ménétriés, 1832), Sh. Kazemi coll., deposited in ACISTE; one adult female from North Eastern Iran, Razavi Khorasan Province, Mashad County, 28 March 2006, H. Hajiqanbar coll., under elytra of an unknown species of Carabidae, deposited in MZUNAV; one adult female from same locality and data deposited in ACASI.

Distribution

The species was previously recorded as a phoretic form in Moldova, Ukraine, Kazakhstan and Tajikistan under elytra of *Calathus halensis* Schaller, 1783, *Poecilus cupreus* L., *Amara apricaria* (Paykull, 1790), *Curtonotus convexiusculus* (Marsham, 1802) and *Chlaenius flavicornis* Fischer von Waldheim, 1842, *Aganum* sp. (Eidelberg, 2000).

Antennoseius* (*A.*) *sharonovi Eidelberg, 1989 (Figs. 16–22)
Antennoseius (*A.*) *sharonovi*.— Eidelberg 1989: 76.

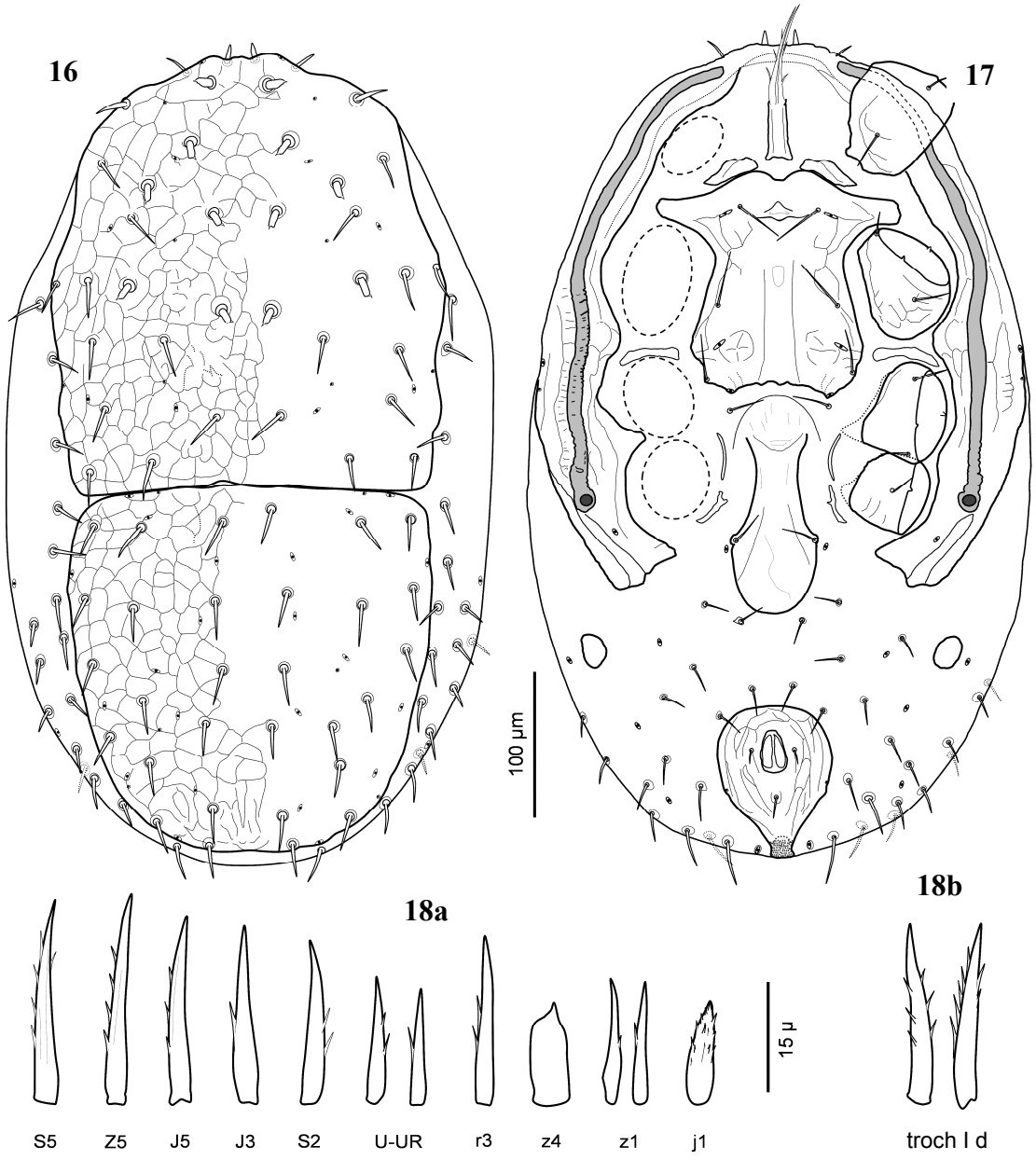
Adult female

Dorsal idiosoma (Fig. 16). Podonotal and opisthonotal shields lineate-reticulate, reticula more elongate between setae *J5* and *Z5*, surrounding soft integument finely striate. Podonotal shield 280–288 long, 264–267 wide, bearing 19 pairs of setae, *j1-j6*, *z1-z6*, *s1-s6*, *r2*, setae *j1* short (10–12), spine-like, with minute lateral spines (Fig. 18), *z1* (16-17) fine, with a small barb medially (Fig. 18), *j2-j5*, *z2* and *z4* strongly thickened at the base and short (13–15), abruptly pointed at the tip (Fig. 18), *r2* usually with two small barbs, other podonotal setae needle-like and smooth, 22–28 long. Opisthonotal shield 242–233 long, 236–239 wide, with 15 pairs uniform length setae: *J1-J5*, *Z1-Z5*, *S1-S5* and 0–2 *Px* setae, 22–28 long, mostly (except *J1-J2*, *Z1* and *S1*) with 1–3 small barbs, setae *J5*, *Z5* and *S5* serrate (Fig. 18). Adenotaxy and poroidotaxy normal for the taxa, except *idj5* not visible. Soft surrounding cuticle with two pairs of lyrifissures, *r3-r6* and 16 pairs of opisthonotal setae *R* and *UR*, 15–22 long, setae with 1–3 small barbs.

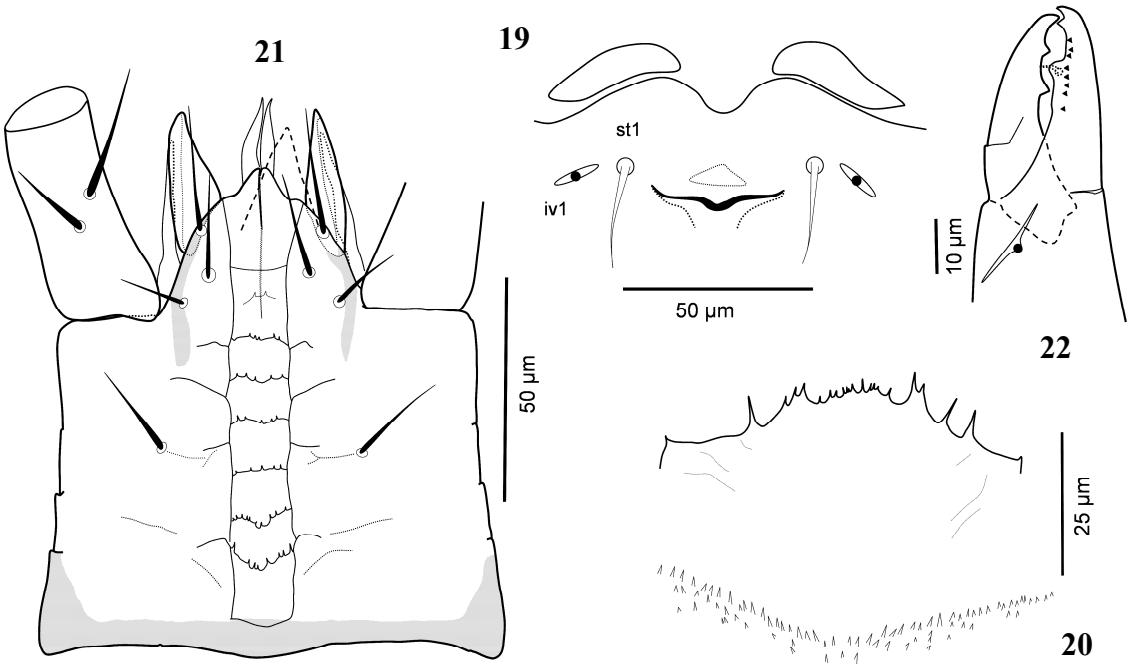
Ventral idiosoma (Fig. 17). Tritosternal base long and columnar, 34–37 long, 15–16 wide at mid-level, with a pair of sparsely pilose lacinia (68–73). Presternal shields well sclerotized. Sternal shield 133–136 long, 97–100 wide, with a brace-like and a sub-triangular line of ornamentation between setae *st1* (Fig. 19), lateral area of shield lineate-reticulate, anterior margin of shield undulating, posterior margin irregularly dentate, fused with wide endopodal elements between coxae I and II, free from endopodal elements between coxae II-III, bearing three pairs of smooth uniform setae, *st1* 29–30, *st2-st3* 26–27, and three pairs of lyrifissures. Setae *st4* (26) inserted in soft cuticle. Endopodal platelets between coxae II-III and III-IV present. Epigynal shield rounded posteriorly and very faintly reticulated, 142–145 long, 39 wide at level of epigynal setae, and 24–27 at narrowest point, with a pair of setae *st5* (21–22) on lateral margins. Peritrematal-exopodal shields wide, fused to podonotal shield anteriorly, continued posteriorly past coxae IV, with one lyrifissure and two parallel longitudinal lines in post-stigmatic region, densely reticulated with transversal striation laterally, with one gland pore on lateral margin at anterior level of coxae III and a lyrifissure between coxa II-III. Peritremes with sinusoidal margins, long, extending from stigmata at mid-level of coxae IV to behind setae *z1* anteriorly. Opisthogastric integument with one pair of sub-circular metapodal platelets, 11 pairs of setae (*Jv1-Jv5*, *Zv1-Zv5*, *Sv*), 7–8 pairs fine and smooth (18–22), others slightly longer (26–30) and thicker, *Jv4-Jv5* with a few barbs, *Zv5* serrate, and five pairs of lyrifissures, those behind level of anus situated on minute platelets. Anal shield pear-shaped, 106–114 long, 76–80 wide, with slightly convex anterior margin, surface with lineate-reticulate ornamentation, anus located on anterior half of shield, circum-anal setae fine and short, para-anal setae (14–15) shorter than post-anal seta (20–21) and inserted at mid-level of anus, *gv3* inserted in lateral margins of shield between posterior margin of anus and post-anal seta, cribrum narrow.

Gnathosoma. Gnathotectum slightly convex, with several (13–20) variably-sized denticles (Fig. 20). Subcapitulum width/length ratio 1.1–1.3 (Fig. 21). Labrum blade-like, its anterior edge not reaching tips of corniculi. Corniculi stout, 30–33 long; salivary stylets fine and blunt. Internal malae smooth, slightly longer than corniculi. Deutosternum with seven rows of denticles, first row concave with 8–10 denticles,

apical row convex with two denticles, other rows with 5–10 small denticles. Hypostomal setae smooth: *h1* 27–30, *h2* 13–14, *h3* 20–23, *ca*. 19–22 long. Second segment of chelicerae (Fig. 22) 105–108 long, 33–36 wide, fixed digit (34–37) with pilus dentilis and row of eight small teeth along apical masticatory edge, and one subapical tooth, movable digit (36–38) bidentate, para-axial ridge and ventral projection present, arthropodial process not fimbriated. Palp 190-194 long, palp-tibia/tarsus ratio *ca*. 1.6, all palp setae smooth, apotele 2-tined.



Figures 16–18. *Antennoseius* (*A*.) *sharonovi*, adult female. 16. Dorsal idiosoma; 17. Ventral idiosoma; 18. a, Details of some dorsal and marginal setae; b, Details of dorsal setae of trochanter I.



Figures 19–22. *Antennoseius* (*A*.) *sharonovi*, adult female. 19. Presternal and anterior region of sternal shields; 20. Gnathotectum; 21. Subcapitulum; 22. Chelicera, lateral view.

Legs. Length of legs I-IV 618–630, 392–406, 366–372 and 478–494, respectively. Leg chaetotaxy normal for the taxa. Coxal setae simple; dorsal seta on trochanter I slightly thickened, plumose; dorsal setae *pd1* and *pd2* on femur I slightly thickened, barbed.

Material examined

Two adult females from North Eastern Iran, North Khorasan Province, Mane & Samalghan (37º 07´ N; 56º 04´ E), altitude 2365 m, 30 July 2006, H. Hajiqanbar coll., ex *Harpalus* (*Pseudoophonus*) *rufipes* (Degeer, 1774), deposited in ACISTE; one adult female from same locality data deposited in MZUNAV; one adult female from same locality data deposited in ACJAZUT; one adult female from same locality data deposited in ACASI.

Distribution

Former USSR (Crimea and Moldova), associated with unknown species of ground beetles. Russian specimens have idiosoma with 481–655 long, 282–315 wide (Eidelberg 1989; Sklyar 1994).

Note

Sklyar (1994) described *A*. (*A*.) *vysotskajae* associated with unknown carabid beetles in Ukraine. The author did not mention the presence or absence of an ambulacrum on tarsus I, but all other features of the species were in a good agreement with *A*. (*A*.) *sharonovi*. Based on the personal communication of senior author (SHK) with Dr. Trach who has personally examined the type materials of *A*. (*A*.) *vysotskajae*,

the first legs lack ambulacra on tarsus I, so the latter species is considered as junior synonym of *A*. (*A*.) *sharonovi*.

Antennoseius* (*A*.) *sabulicola Bregetova, 1977 (Figs. 23–29)
Antennoseius (*A*.) *sabulicola*.— Bregetova 1977: 249.

Adult female

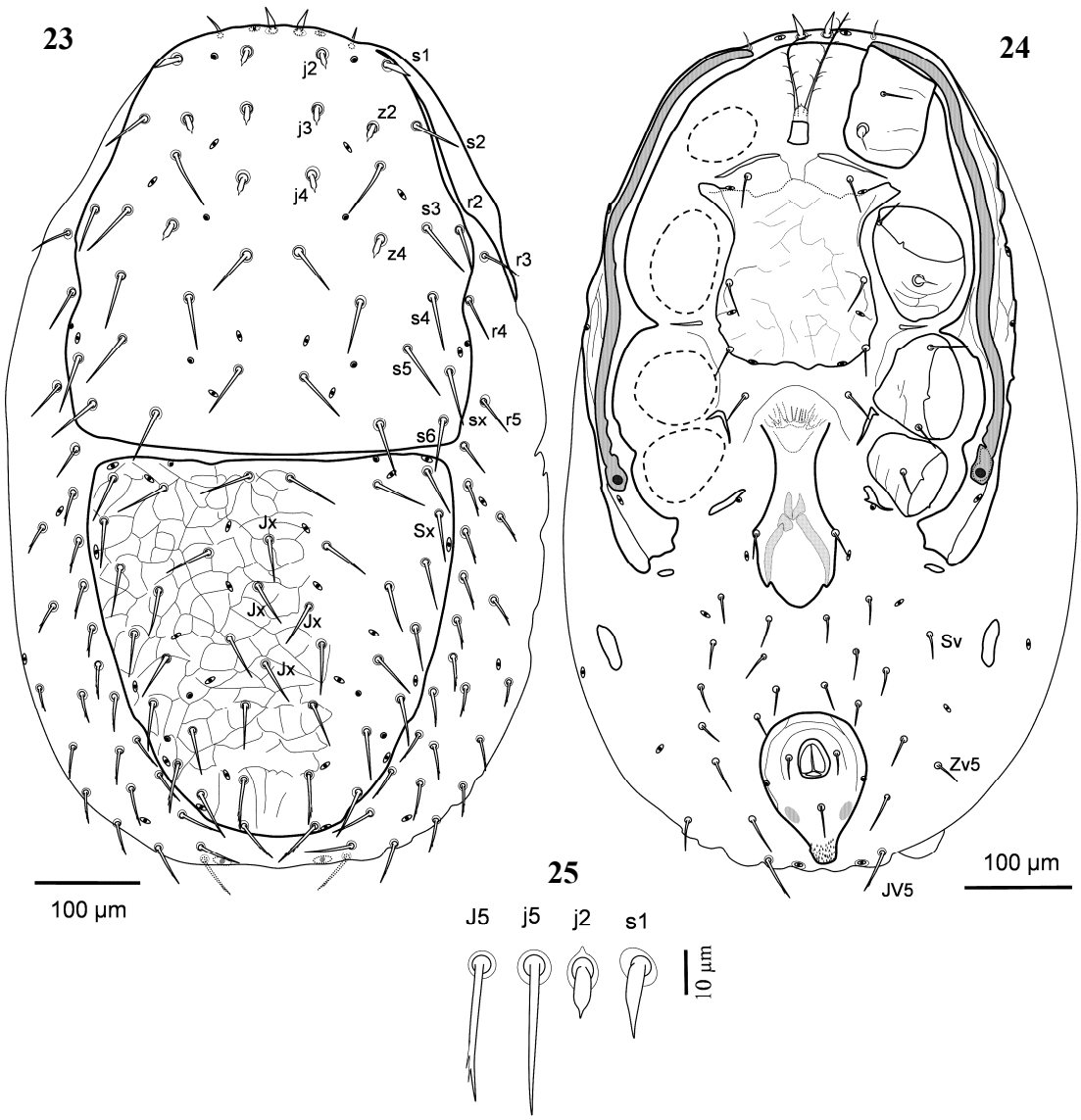
Dorsal idiosoma (Fig. 23). Dorsal shields lineate-reticulate over entire surface, reticula more elongate between setae *J5* and *Z5*, surrounding soft integument finely striate. Podonotal shield 267 long, 239 wide, with 20 pairs of setae (*j1-j6*, *z1-z6*, *s1-s6*, *sx*, *r2*), seta *j1* short and spine-like (13), *z1* fine (16), setae *j2-j4*, *z2*, *z4* and *s1* smooth, short (11–12 long, except *s1* 15–16 long), strongly thickened, with abruptly pointed tips (Fig. 25), setae *j5-j6*, *z3*, *z5-z6*, *s2-s6*, *sx* and *r2* smooth, 25–32 long. Opisthonotal shield 224 long, 221 wide, rounded posteriorly and slightly concave between setae *Z5*, with 15 pairs of setae in addition to 1–2 *Sx* and four unpaired setae *Jx*, opisthonotal setae needle-like, 27–32 long, posterior setae *S4-S5*, *J4*, *Z4* usually with one minute barb, *J5* and *Z5* slightly barbed, distance between bases of *Z5* nearly double distance between bases of *J1*. Dorsal adenotaxy and poroidotaxy normal for the taxa. Soft surrounding integument with *r3-r6* (23–26) and 20 pairs of opisthonotal setae *R* and *UR*, 17–26 long, and three pairs of lyrifissures.

Ventral idiosoma (Fig. 24). Tritosternal base columnar, short (17 long, 12 wide), with pair of sparsely pilose laciniae, free for 73 μm and basally fused for 8 μm. Presternal region with pair of oblique narrow presternal strips fused to weakly sclerotized anterior margin of sternal shield. Sternal shield 114 long, 92 wide, with lateral ornamentation lines and an inconspicuous reticulation, fused to wide endopodal elements between coxae I-II, posterior margin irregularly truncate, with three pairs of fine smooth setae, *st1* (21–22), *st2-st3* (18–19) and three pairs of lyrifissures, *st1* on weakly sclerotized anterior region of shield. Metasternal setae *st4* (16–17) on soft cuticle. Endopodal platelets between coxae II-III and III-IV free, narrow. Epigynal shield 135 long, 52 wide at level of *st5* and 24 at narrowest point, with a blunt posterior margin, setae *st5* (16–17) inserted on lateral margins of shield. Gland pores *gv2* present, axilar to coxae IV.

Peritrematal-exopodal shields fused anteriorly to podonotal shield. Opisthogastric integument with a pair of small platelets near posterior end of peritrematal shields, metapodal platelets sub-oval and larger, well removed from posterior end of peritrematal shields, and 11 pairs of ventral setae, *Jv1-Jv4* and *Zv1-Zv5* finer and smooth (17), and *Jv4-Jv5* sparsely barbed and longer (23). Anal shield striated anteriorly, 94 long, 66 wide, with three fine circum-anal setae, para-anal setae (14–15) shorter than post-anal seta (20), anus in anterior half of shield, cribrum well developed.

Gnathosoma. Anterior margin of gnathotectum convex, serrate, with three denticulate anterior projections, dorsal surface with one transverse serrated line (Fig. 26). Subcapitulum width/length ratio 1.15–1.3 (Fig. 27). Deutosternum with seven transverse rows of denticles, basal row concave, slightly widened and multidenticulate (5–6 denticles), anterior six rows with 1–5 relatively large denticles each. Corniculi (29–30) horn-like and stout, internal malae somewhat longer than corniculi. Second segment of chelicera 101–104 long, 27 wide, without conspicuous process on antiaxial surface, fixed digit (34) with pilus dentilis and row of five teeth along its apical masticatory edge, movable digit (37) bidentate, arthropodial process not fimbriate (Fig.

28). Palp 151 long, ratio of palp-tibia/tarsus length 1.7. Palp setae smooth, apotele 2-tined.

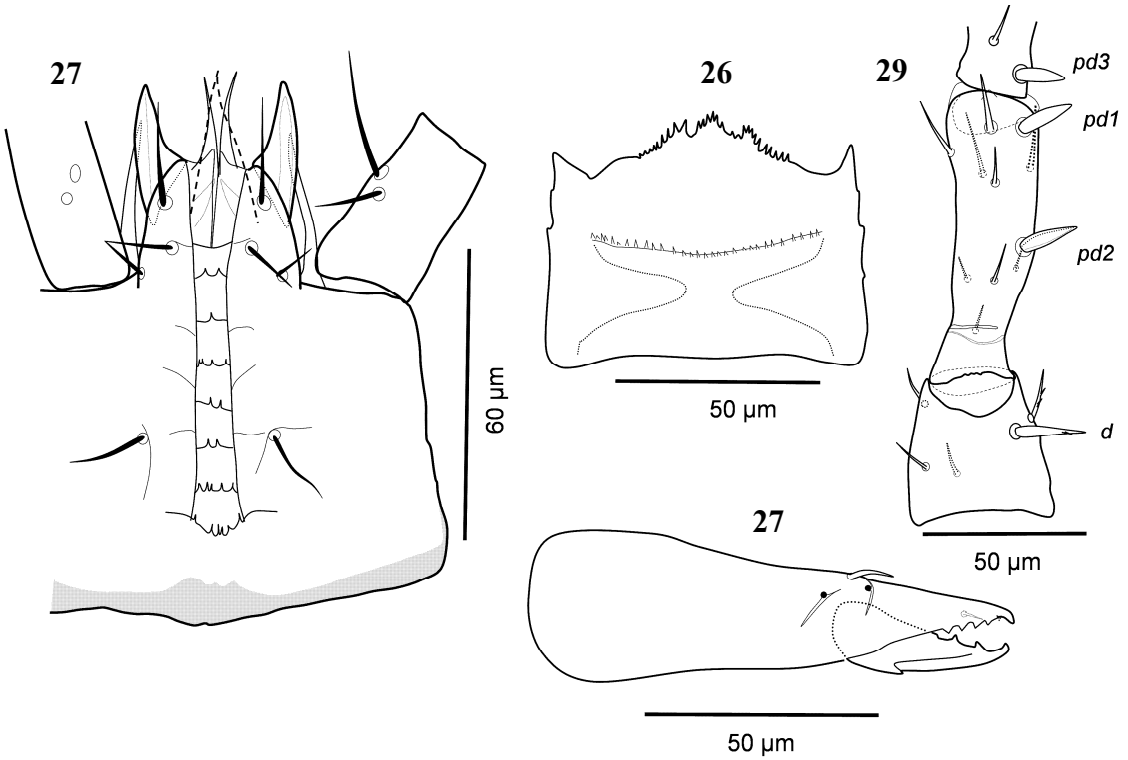


Figures 23–25. *Antennoseius* (*A*.) *sabulicola*, adult female. 23. Dorsal idiosoma; 24. Ventral idiosoma; 25. Details of some dorsal idiosomal setae.

Legs. Length of legs I-IV 427, 342, 301, 422, respectively. Leg chaetotaxy normal for the taxa. Dorsal seta on trochanter I thickened, spine-like, with one or two spines; dorsal setae *pd1* and *pd2* on femur I and *pd3* on genu I modified, thickened, spine-like (Fig. 29); *ad1* on femur I slightly thicker; coxal setae *pv* of legs I and II hypertrophied basally and pointed abruptly at tip.

Material examined

One adult female, from North Eastern Iran, Khorasan Razavi Province, Sarakhs region (36º 18.549´ N; 60º 10.018´ E), altitude 858 m, H. Hajiqanbar coll., ex *Cymindis* (*Eremocymindis*) *pallidula* Chaudoir, 1846, 26 April 2007, deposited in ACISTE.



Figures 26–29. *Antennoseius* (*A*.) *sabulicola*, adult female. 26. Gnathotectum; 27. Subcapitulum; 28. Chelicera, lateral view; 29. Leg I trochanter, femur and basal region of genu.

Distribution

The species was first recorded in Russia, Uzbekistan (Dzhar-Kurgan) in the desert under Saxaul trees (*Haloxylon* sp.). In the original description of this species (Bregetova 1977, p. 250, Fig. 163), the extra podonotal setae *sx* is not present; otherwise other characters are similar to the Russian specimens (Bregetova 1977).

Key to the Iranian species of the genus *Antennoseius*

1. Tarsi I without claws..... subgenus *Antennoseius* Berlese, 1916…..……..2
- Tarsi I with claws……..... subgenus *Vitzthumia* Thor, 1930 …… 7
2. Podonotal shield with some pairs of short robust modified setae.....3
- Podonotal shield without short robust modified setae.....5
3. Podonotal shield with six pairs of robust setae.....4
- Podonotal shield with five pairs of robust setae (*j2-j4*, *z2*, *z5*); Western Europe, Western Middle-East, Russia (Trans Carpathia), Iran……*A*. (*A*.) *masoviae*
4. Thickened setae: *j2-j4*, *z2*, *z4*, *s1*; setae *j1* spine-like, smooth; podonotal shield with 20 pairs of setae (1 pair *sx* present or absent); opisthonotal shield with four *Jx* setae; coxal setae *pv* on legs I and II enlarged basally; Uzbekistan, Iran… *A*. (*A*.) *sabulicola*
- Thickened setae: *j2-j5*, *z2*, *z4*; setae *j1* spine-like and serrate; podonotal shield with 19 pairs of setae; opisthonotal shield without unpaired setae *Jx*; coxal setae simple, not enlarged; Ukraine, Iran…….……..……..*A*. (*A*.) *sharonovi*

5. Palp apotele 2-tined; setae *j1* expanded, leaf-like and serrate; dorsal shield setae plumose or serrate, relatively short, their tips not reaching the bases of the following setae……...6
- Palp apotele 3-tined; setae *j1* spine-like, slightly thickened, never expanded and leaf-like; dorsal shield setae needle-like, smooth to sparsely barbed, relatively long, their tips mostly reaching or exceeding the bases of the following setae; sternal shield with a bow-shape invagination between setae *st1*; Russia, Iran..…….. *A*. (*A*.) *longisetus*

6. Opisthonotal shield with 3–4 unpaired setae *Jx*; opisthogastric integument with some plumose or serrate setae in addition to 4–6 smooth setae; Southern and Centre Europe, Western Middle-East, former USSR, Iran..... *A*. (*A*.) *bacatus*
- Opisthonotal shield without unpaired setae *Jx*; opisthogastric integument setae smooth; Centre Europe, former USSR, Iran……...…..*A*. (*A*.) *borussicus*

7. Dorsal and opisthogastric shields and surrounding soft cuticle covered with small granular tubercles; opisthonotal shield with 12–14 pairs of setae, one or two pairs of setae *S* absent; Northern Europe, Iran……..……...…...*A*. (*V*.) *oudemansi*
- Dorsal and opisthogastric shields generally finely reticulate and surrounding soft cuticle finely striate; opisthonotal shield with 15 pairs of setae; Iran… *A*. (*V*.) *kamalii*

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کنه‌های جنس *Antennoseius* Berlese (Acari: Mesostigmata: Ascidae) در ایران

شهروز کاظمی و ماریا لوردس مورازا

چکیده

سه گونه از کنه‌های زیرجنس *Antennoseius* (*Antennoseius*) Berlese, 1916 مرتبط با سوسک‌های خانوادهٔ کارابیده (Coleoptera, Carabidae) برای نخستین بار از ایران گزارش می‌شوند. ویژگی‌های موفولوژیک (ظاهری) این گونه‌ها به همراه گونهٔ *A.* (*A.*) *masoviae* Sellnick و وضعیت منافذ

غده‌ها و لیریفیشرها برای زیرجنس مذکور توصیف می‌شود. گونهٔ *A.* (*A.*) *vysotskajae* Sklyar به عنوان مترادف گونه *A.* (*A.*) *sharonovi* معرفی و کلیدی برای گونه‌های جنس در ایران ارایه می‌شود.

واژگان کلیدی: کنه‌ها، Parasitiformes، Ascinae، *Antennoseius*، Carabidae، ایران

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