

## A NEW SPECIES AND NEW RECORDS OF STIGMAEIDAE (ACARI: PROSTIGMATA) FROM WESTERN SIBERIA

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**ABSTRACT:** During a study of predatory mites in Western Siberia, a new species, *Stigmaeus amphibius* sp.n. (Acari: Stigmaeidae), was collected from wet soil near a lake. *Eryngiopus hamedanicus* Khanjani, Mohammadi and Nazari, 2014, *Eustigmaeus bisetalis* (Doğan, 2004) comb.n. (from *Ledermuelleriopsis*), *E. vacuus* Doğan, 2005, *Ledermuelleriopsis rizeiensis* Doğan, 2004 and *L. plumosa* Willmann, 1951 are recorded from Russia for the first time. Females of *Eustigmaeus bisetalis* and *Ledermuelleriopsis rizeiensis* are redescribed based on materials from Western Siberia.

**KEY WORDS:** Acarina, Raphignathoidea, systematics, morphology, Russia.

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### INTRODUCTION

The mite family Stigmaeidae (Acari: Prostigmata) is the largest in the superfamily Raphignathoidea and currently includes more than 635 species distributed across 33 valid genera (Fan *et al.* 2016, 2019; Beron 2020; Khaustov 2021a). Most stigmaeid mites are free-living predators of various small arthropods; some species of *Eustigmaeus* feed on mosses; and several species of *Stigmaeus* and *Eustigmaeus* are parasites of sand flies (Diptera: Psychodidae). Species from the genera *Zetzelia* and *Agistemus* are probably the second most important group of plant mite predators (after the Phytoseiidae) (Gerson *et al.* 2003).

Stigmaeidae of Western Siberia are currently under intensive study, mostly from Tyumen and Kurgan Oblasts, as well as from the Altai (Khaustov 2020, 2021a, b). Until now, 31 species of Stigmaeidae have been recorded in Western Siberia, namely: *Cheyllostigmaeus* sp., *Eustigmaeus acidophilus* (Wood, 1972), *E. collarti* (Cooreman, 1955), *E. ottavii* (Berlese, 1910), *E. parvisetus* (Chaudhri, 1965), *E. pinnatus* (Kuznetsov, 1977), *E. rhodomelus* (C.L. Koch, 1841), *E. signis* (C.L. Koch, 1836), *E. summersi* Khaustov, 2021, *E. tjumeniensis* Khaustov and Tolstikov, 2014, *Mediolata pini* Canestrini, 1889, *M. uspenskii* Kuznetsov and Sizova, 1978, *Stigmaeus akimovi* Khaustov, 2021, *S. corticeus* Kuznetsov and Wainstein, 1977, *S. delaramae* Khanjani, 2014, *S. dignus* Kuznetsov, 1978, *S. fimus* Doğan, Doğan and Erman, 2017, *S. fusus* Summers, 1962, *S. harsitensis* Doğan, Doğan and Erman, 2017, *S. livshitzii* Kuznetsov, 1977, *S. longipilis* (Canestrini, 1889), *S. mitrofanovi* Khaustov, 2014, *S. mollibus* Khaustov, 2016, *S. pilatus* Kuznetsov, 1978, *S. purpurascens* Summers, 1962, *S. scrobiculatus* Khaustov,

2021, *S. silvestris* Khaustov, 2014, *S. sphagneti* (Hull, 1918), *S. tolstikovi* Khaustov, 2015, *S. uzunolukensis* Özçelik and Doğan, 2011, *Villersia jamaliensis* (Khaustov, 2014) (Khaustov and Tolstikov 2014; Khaustov 2014; 2015, 2016, 2019, 2020, 2021a, b; Khaustov and Abramov 2017).

The present study of stigmaeid mites of Western Siberia reveals one new species and five new records. Three species—*Eryngiopus hamedanicus* Khanjani, Mohammadi and Nazari, 2014, *Eustigmaeus bisetalis* (Doğan, 2004) comb.n. and *Ledermuelleriopsis rizeiensis* Doğan, 2004—are redescribed based on materials from Western Siberia.

### MATERIALS AND METHODS

The mites were collected from various habitats using Berlese funnels and mounted in Hoyer's medium. In the description below, the palpal, idiosomal and leg setations follow Grandjean (1939, 1944, 1946). The nomenclature of prodorsal setae follows Kethley (1990). The nomenclature of the idiosomal shields follows that of Summers (1962). All measurements are given in micrometers (µm), for the holotype first, followed by the ranges of measurements for the paratypes (in parentheses). In the descriptions of leg setation, the number of solenidia is given in parentheses. Mite morphology was studied using a Carl Zeiss AxioImager A2 compound microscope with a phase contrast and DIC illumination.

### SYSTEMATICS

Family **Stigmaeidae Oudemans, 1931**

Genus ***Stigmaeus* Koch, 1836**

Type species: *Stigmaeus cruentus* Koch, 1836, by subsequent designation.

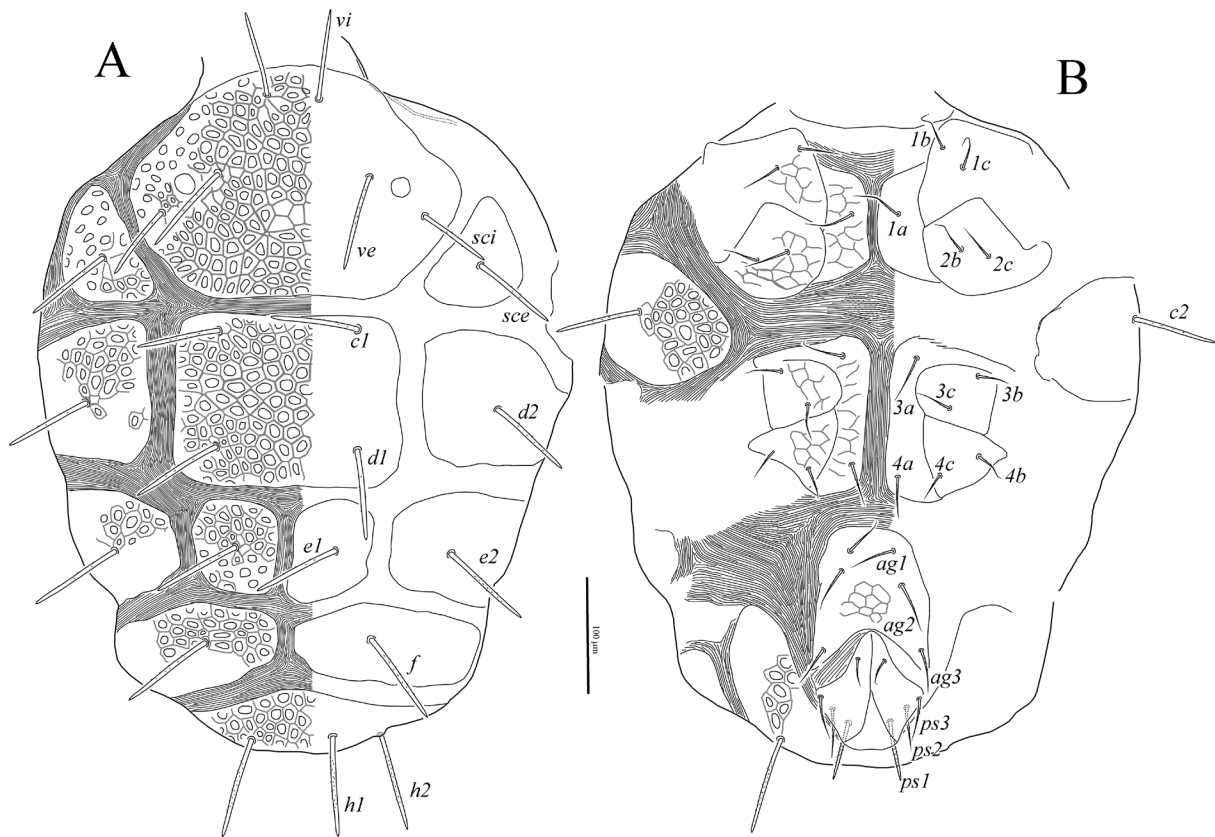


Fig. 1. *Stigmaeus amphibius* sp.n., female: A—dorsum of idiosoma, B—venter of idiosoma.

***Stigmaeus amphibius* sp.n.**

(Figs. 1–6)

**Description. Female** (Figs. 1–4). Length of idiosoma 600 (540), width 460 (430).

**Idiosomal dorsum** (Fig. 1A). Idiosoma broadly oval. Central shield almost rectangular, wider than long, with two pairs of setae *c1* and *d1*; median zonal and intercalary shields paired. All shields with distinct subcuticular reticulation with shallow dorsal dimples. Postocular bodies absent. Ocelli present. Striation anterolaterod prodorsal shield without microtubercles. All dorsal setae similar in length and shape, baculiform, with rounded tips, weakly barbed, with very weak hyaline sheaths. Setae *ps1* located ventrally. Lengths of dorsal setae: *vi* 79 (72), *ve* 84 (92), *sci* 67 (63), *sce* 78 (81), *c1* 74 (80), *c2* 75 (76), *d1* 79 (81), *d2* 77 (84), *e1* 78 (83), *e2* 85 (86), *f* 85 (89), *h1* 88 (90), *h2* 85 (83).

**Idiosomal venter** (Fig. 1B). All ventral plates with well developed subcuticular reticulation. Setae *ps1* blunt-tipped, similar to dorsal setae, other ventral setae pointed and weakly barbed. Aggenital plate with 3 pairs of aggenital setae; 1 pair of genital setae. Striation in the middle between anterior and posterior endopodal plates and poste-

riod leg IV with microtubercles. Lengths of ventral setae: *1a* 44 (46), *1b* 38 (43), *1c* 39 (43), *2b* 42 (44), *2c* 33 (35), *3a* 45 (51), *3b* 32 (33), *3c* 30 (34), *4a* 38 (40), *4b* 27 (31), *4c* 28 (32), *ag1* 38 (40), *ag2* 43 (42), *ag3* 36 (38), *g* 25 (29), *ps1* 52 (49), *ps2* 39 (42), *ps3* 46 (45).

**Gnathosoma** (Fig. 2). Palpal segments reticulated. Tibial claw large, about as long as palptarsus. Setae *l'* on palpal tibia short spiniform. All setae of femur, genu and tibia, and seta *va* of palptarsus pointed and weakly barbed, other setae of palptarsus smooth. Number of setae on palpal segments: Tr 0, Fe 3 (*d, l', v''*), Ge 2 (*d, l''*), Ti 3 (*d, l', l''*), Ta 8(1) (fused eupathidia *ul', ul'', sul*, eupathidion *acm, ba, bp, lp*, 1 solenidion  $\omega$ ). Palpal supracoxal setae (*ep*) short, spiniform. Rostrum of subcapitulum (Fig. 2B) relatively long. All subcapitular setae pointed; *or1* smooth, other subcapitular setae weakly barbed. Basal part of subcapitulum with distinct reticulation. Lengths of subcapitular setae: *m* 52 (53), *n* 33 (38), *or1* 37 (38), *or2* 55 (56). Length of cheliceral stylets 120 (125); length of palps 180 (190); length of palpal solenidion  $\omega$  12 (12).

**Legs** (Figs. 3, 4). Tips of empodial raylets not widened. Leg segments with distinct reticulation. Lengths of legs: I 315 (315), II 265 (265), III 255

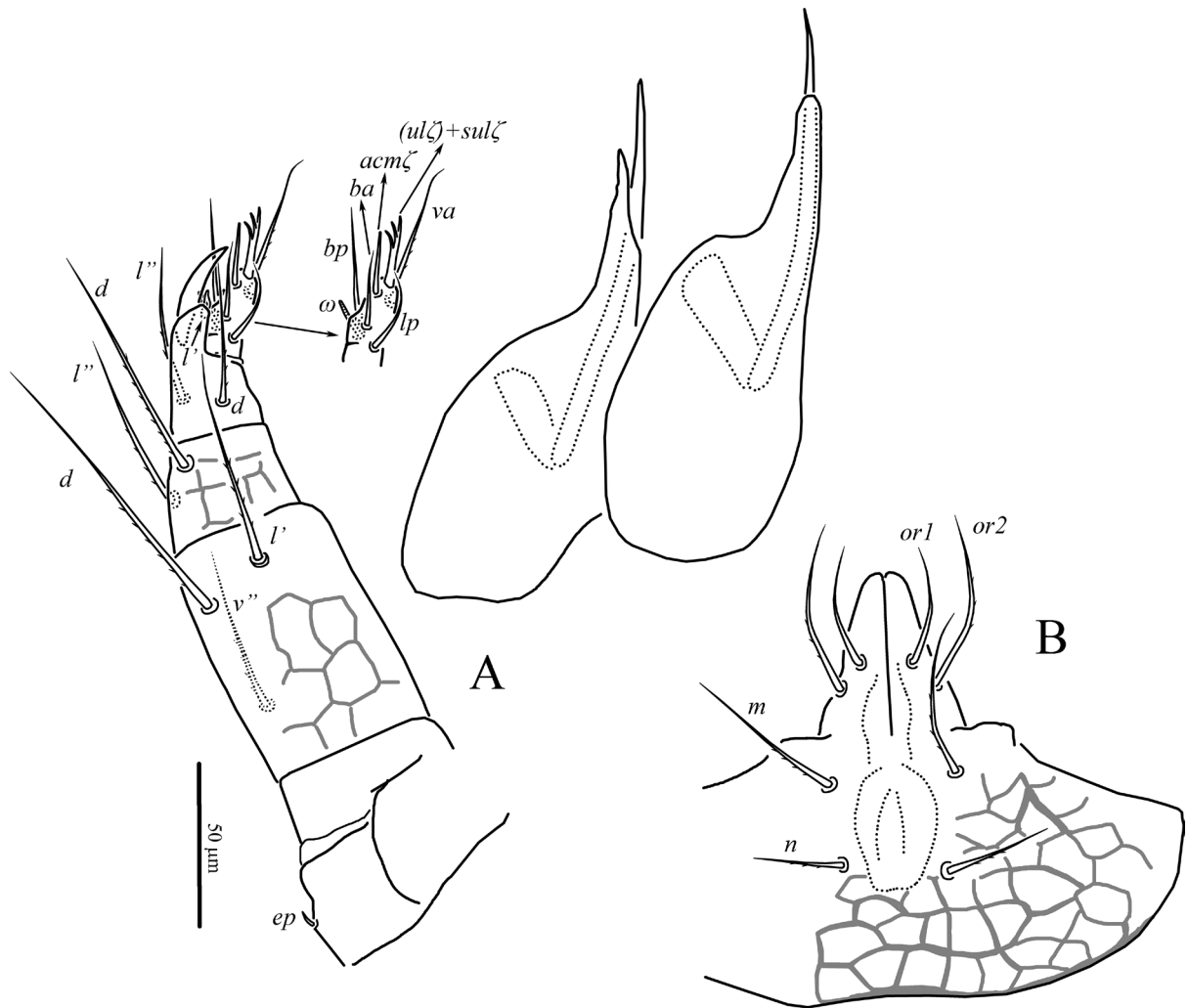


Fig. 2. *Stigmaeus amphibius* sp.n., female: A—gnathosoma, dorsal aspect, B—subcapitulum.

(260), IV 300 (280). Leg I (Fig. 3A). Coxae I posterodorsally with short spiniform leg supracoxal setae (*el*). Leg setation: Tr 1 (*v'*), Fe 6 (*d, l', l'', v', v'', bv''*), Ge 4 (*d, l', l'', k*), Ti 5(2) (*dζ, l', l'', v', v'', φ, φp*), Ta 13(1) (*p'ζ, p''ζ, tc'ζ, tc''ζ, ft'ζ, ft''ζ, u', u'', a', a'', pl', pl'', vs, ω*). Setae *k* of genu, *d* of tibia and (*p*), (*tc*), (*ft*) of tarsus smooth, blunt-tipped, eupathid-like; other setae sparsely barbed; setae *d* of femur and genu weakly blunt-tipped, other setae pointed. Seta *d* of genu almost twice longer than seta *k* 32 (34). Solenidion *ω* 33 (33) digitiform; solenidion *φ* 18 (16) baculiform, *φp* 40 (42) attenuate, with rounded tip. Leg II (Fig. 3B). Leg setation: Tr 1 (*v'*), Fe 5 (*d, l', l'', v', bv''*), Ge 4 (*d, l', l'', k*), Ti 5(1) (*dζ, l', l'', v', v'', φp*), Ta 9(1) (*p'ζ, tc'ζ, tc'', u', u'', a', a'', pl', vs, ω*). Setae *k* of genu, *d* of tibia, *p'* and *tc'* of tarsus smooth, blunt-tipped, eupathid-like, other setae weakly barbed; setae *d* of femur and genu weakly blunt-tipped, other setae pointed. Solenidion *ω* 34 (28) digiti-

form; solenidion *φp* 34 (37) attenuate, with rounded tip. Seta *k* short 16 (17), more than twice shorter than setae *d* of genu. Leg III (Fig. 4A). Leg setation: Tr 2 (*v', l'*), Fe 3 (*d, l', ev'*), Ge 1 (*d*), Ti 5(1) (*d, l', l'', v', v'', φp*), Ta 7(1) (*tc', tc'', u', u'', a', a'', vs, ω*). Solenidion *ω* 19 (19) digitiform; solenidion *φp* 34 (32) attenuate, with rounded tip. All setae weakly barbed; setae *d* of genu and tibia weakly blunt-tipped, other setae pointed. Leg IV (Fig. 4B). Leg setation: Tr 1 (*v'*), Fe 2 (*d, ev'*), Ge 1 (*d*), Ti 5(1) (*d, l', l'', v', v'', φp*), Ta 7(1) (*tc', tc'', u', u'', a', a'', vs, ω*). Solenidion *ω* 19 (19) digitiform; solenidion *φp* 33 (32) attenuate, with rounded tip. All setae weakly barbed; setae *d* of genu and tibia weakly blunt-tipped, other setae pointed.

**Male** (Figs. 5, 6). Length of idiosoma 470, width 325.

*Idiosomal dorsum* (Fig. 5A). Central and marginal shields fused, with three pairs of setae *cl*, *dl* and *d2*; median zonal, lateral zonal and intercalary

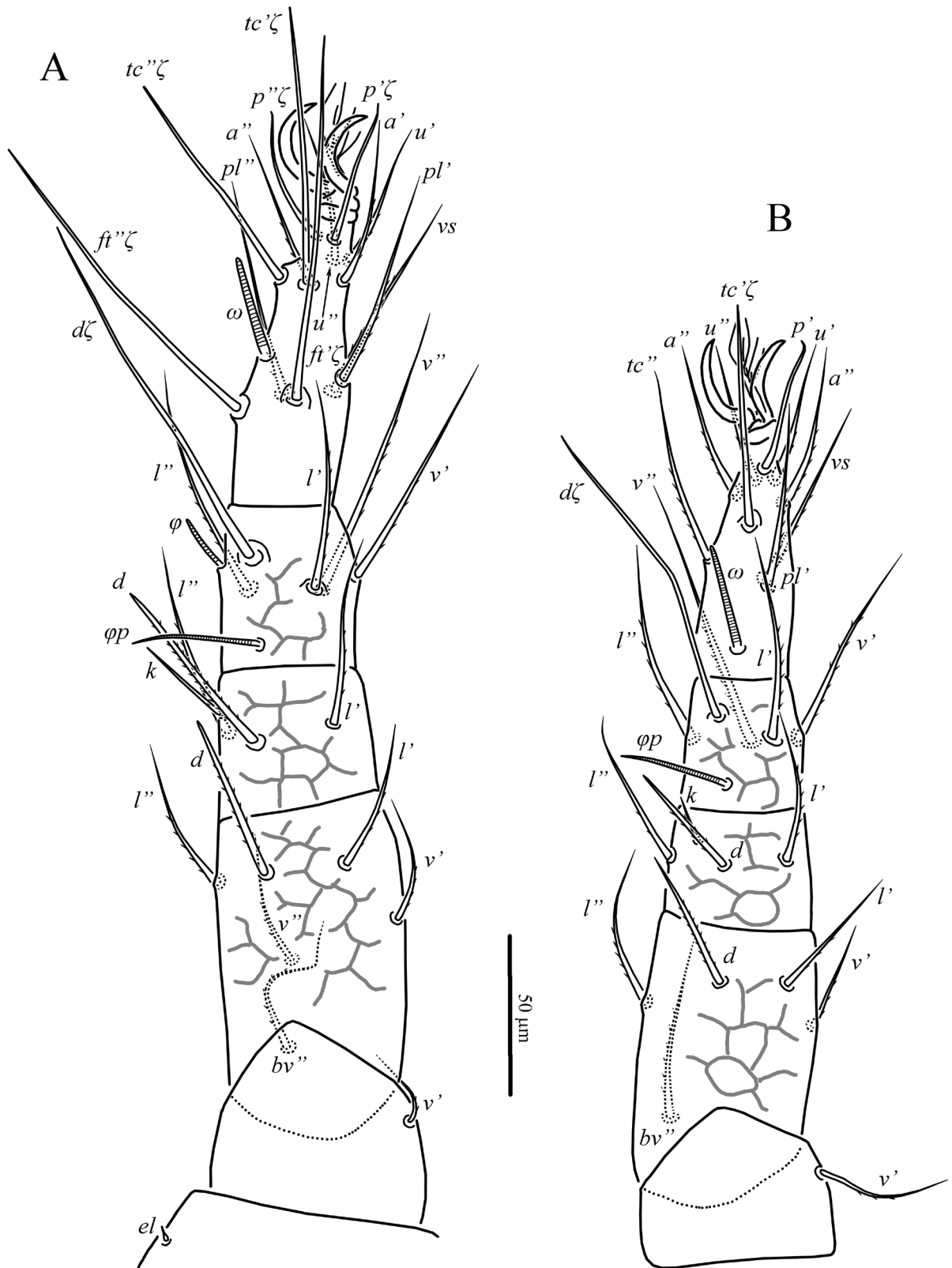


Fig. 3. *Stigmaeus amphibijs* sp.n., female: A—left leg I, dorsal aspect, B—left leg II, dorsal aspect.

shields fused, with three pairs of setae *e1*, *e2*, and *f*. All dorsal shields with distinct subcuticular reticulation and poorly visible dimples. Dorsal setae similar to female; setae *ps1*–*2* very short, spiniform,

smooth; seta *ps3* smooth and pointed. Aedeagus long and narrow. Lengths of dorsal setae: *vi* 60, *ve* 66, *sci* 52, *sce* 68, *c1* 59, *c2* 67, *d1* 64, *d2* 67, *e1* 37, *e2* 72, *f70*, *h1* 29, *h2* 68, *ps1* 9, *ps2* 10, *ps3* 18.

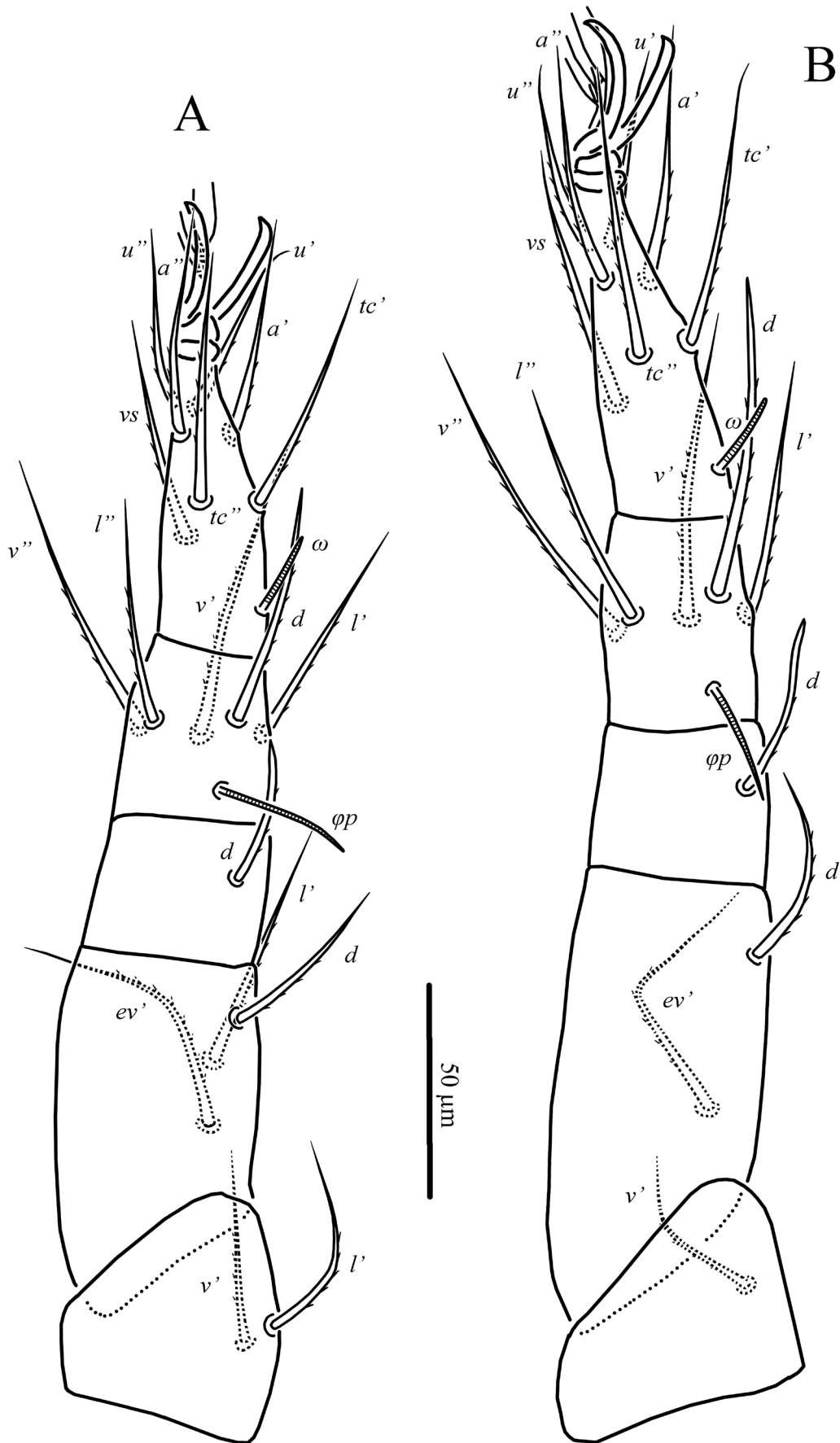


Fig. 4. *Stigmaeus amphibius* sp.n., female: A—left leg III, dorsal aspect, B—left leg IV, dorsal aspect.

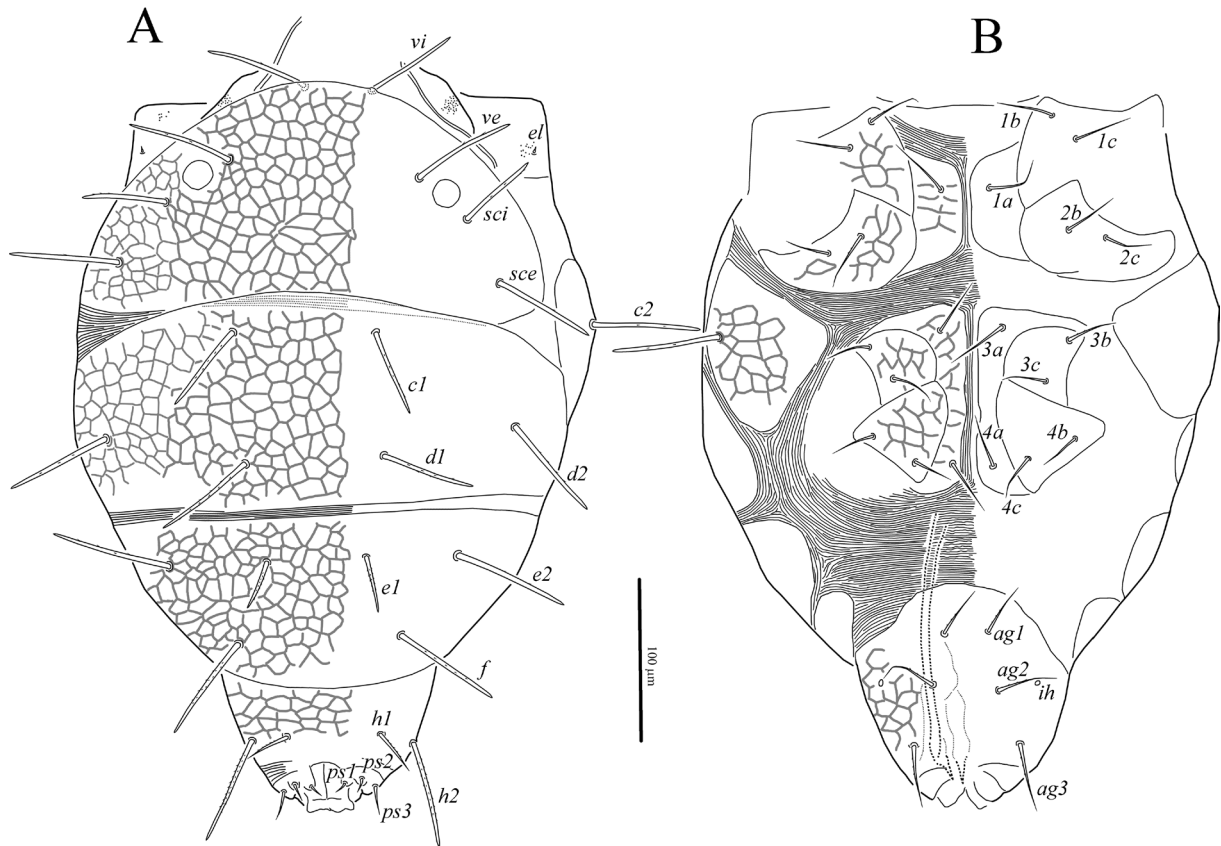


Fig. 5. *Stigmaeus amphibius* sp.n., male: A—dorsum of idiosoma, B—venter of idiosoma.

*Idiosomal venter* (Fig. 5B). All ventral plates with subcuticular reticulation. All ventral setae pointed and weakly barbed, sometimes barbs poorly visible. Aggenital plate with three pairs of aggenital setae; cupuli *ih* located laterad setae *ag2*. Length of ventral setae: *1a* 40, *1b* 36, *1c* 38, *2b* 37, *2c* 27, *3a* 40, *3b* 28, *3c* 28, *4a* 37, *4b* 23, *4c* 29, *ag1* 36, *ag2* 36, *ag3* 38.

*Gnathosoma* as in female. Length of subcapitular setae: *m* 52, *n* 30, *or1* 33, *or2* 48. Length of cheliceral stylets 100; length of palp 155; length of palpal solenidion  $\omega$  9.

*Legs* (Fig. 6). Setation of legs as in female, except presence of male solenidia on tarsi I–IV (Fig. 6A–D). Lengths of legs: I 305, II 235, III 230, IV 255. Length of solenidia and setae *k*:  $\omega$ I 28,  $\omega$ I♂ 65,  $\phi$ I 15,  $\phi$ PI 37, *k*I 24,  $\omega$ II 43,  $\omega$ II♂ 63,  $\phi$ PII 30, *k*II 13,  $\omega$ III 15,  $\omega$ III♂ 62,  $\phi$ PIII 26,  $\omega$ IV 15,  $\omega$ IV♂ 62,  $\phi$ PIV 27.

**Immatures** unknown.

**Type material.** Female holotype, slide № ZISP T-St-005, Russia, city of Tyumen, Gagarin Park, in wet grassy soil near a small lake, 57°10'17.0"N 65°36'25.1"E, 4 June 2021, coll. A.A. Khaustov. Paratypes: 1 female, 2 males, same data as holotype; 2 males, same locality, 30 May 2021.

**Type deposition.** The holotype and one male paratype are deposited in the collection of the Zoological Institute of the Russian Academy of Sciences (RAS), St. Petersburg, Russia, other paratypes are deposited in the collection of the Museum of Zoology, Tyumen State University, Tyumen, Russia.

**Etymology.** The name of the new species is derived from Greek ἀμφίβιος meaning *amphibious* and refers to the species' semiaquatic habitat.

**Differential diagnosis.** Female of the new species is most similar to *S. corticeus* Kuznetsov and Wainstein, 1977 in the presence of ocelli, central hysterosomal shield with two pairs of setae, same leg and palpal setation. The new species differs from *S. corticeus* in: baculiform dorsal setae with rounded tips and with weak hyaline sheaths (vs. baculiform dorsal setae with several distinct barbs on the distal part in *S. corticeus*); rectangular (vs. pentagonal in *S. corticeus*) central hysterosomal shield; and the absence (vs. presence in *S. corticeus*) of postocular bodies.

Genus *Eryngiopus* Summers, 1964

Type species: *Eryngiopus gracilis* Summers, 1964, by original designation.

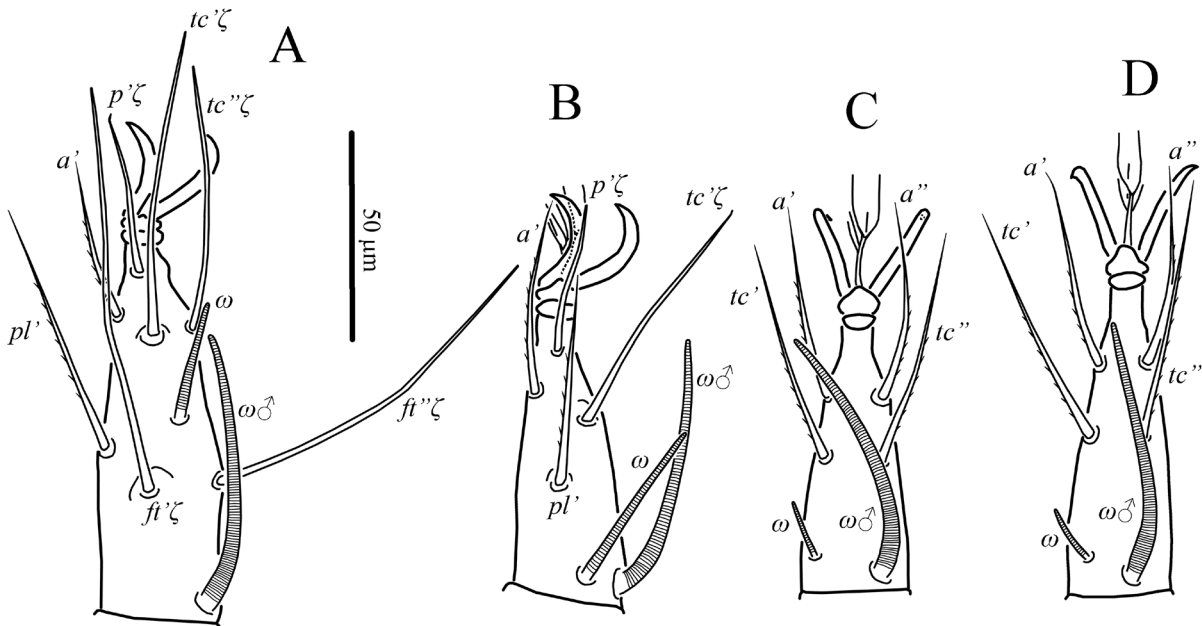


Fig. 6. *Stigmaeus amphibius* sp.n., male: A-D—tarsi I–IV, respectively (ventral setae not illustrated).

***Eryngiopus hamedanicus* Khanjani,  
Mohammadi and Nazari, 2014**

(Figs. 7–10)

*Eryngiopus hamedanicus* Khanjani, Mohammadi and Nazari, 2014: 130.

**Redescription. Female** (Figs. 7–10). Length of idiosoma 330, width 180.

*Idiosomal dorsum* (Fig. 7A). Idiosoma elongate, oval. Prodorsum with four pairs of setae (*vi*, *ve*, *sci*, *sce*); prodorsal shield poorly developed, with two pairs of setae (*vi*, *ve*) and with delicate longitudinal stria in the middle and posterior parts. Ocelli present. Soft cuticle posteriad gnathosoma and legs I and II with microtubercles. All dorsal setae weakly barbed and weakly blunt-tipped. Setae *ps1* located dorsally. Hysterosoma with one pair of elongate shields between setae *cl* and *dl*, and one pair of platelets between setae *dl* and *el*; suranal shield with setae *hl* and *h2*. Lengths of dorsal setae: *vi* 17, *ve* 15, *sci* 18, *sce* 24, *cl* 15, *c2* 33, *dl* 15, *d2* 16, *el* 13, *e2* 11, *f17*, *hl* 20, *h2* 28, *ps1* 20.

*Idiosomal venter* (Fig. 7B). Setae *ps2* weakly barbed and weakly blunt-tipped, other ventral setae pointed and smooth. Aggenital plate with two pairs of aggenital setae (*ag2*, *ag3*); setae *ag1* situated on soft cuticle; one pair of genital setae. Soft cuticle posteriad gnathosoma and laterad bases of legs I–II and III–IV with microtubercles. Endopodal plates absent. Length of ventral setae: *1a* 28, *1b* 22, *1c* 19, *2c* 26, *3a* 27, *3b* 24, *3c* 16, *4a* 24, *4c* 15, *ag1* 15, *ag2* 16, *ag3* 21, *g* 14, *ps2* 19, *ps3* 21.

*Gnathosoma* (Fig. 8). Tibial claw large, about as long as palptarsus. Setae *l'* on palpal tibia slightly thickened and blunt-tipped. All palpal setae smooth; terminal eupathidia (*sul*, *ul'*, *ul''*) fused in basal half, with 3 distinct prongs. Number of setae on palpal segments: Tr 0, Fe 3 (*d*, *l'*, *v''*), Ge 1 (*l''*), Ti 3 (*d*, *l'*, *l''*), Ta 8(1) (fused eupathidia *ul'*, *ul''*, *sul*, eupathidion *acm*, *ba*, *bp*, *lp*, 1 solenidion  $\omega$ ). Palpal supracoxal setae (*ep*) short, slightly thickened basally. Rostrum of subcapitulum (Fig. 8B) relatively long and wide. All subcapitular setae pointed and smooth; setae *m* and *n* situated in transverse row. Lengths of subcapitular setae: *m* 19, *n* 29, *or1* 9, *or2* 10. Length of cheliceral stylets 27; length of palps 58; length of palpal solenidion  $\omega$  3.

*Legs* (Figs. 9, 10). Empodial raylets with widened tips. Lengths of legs: I 150, II 110, III 110, IV 135. Leg I (Fig. 9A). Coxae I posterodorsally with short leg supracoxal setae (*el*). Leg setation: Tr 1 (*v'*), Fe 6 (*d*, *l'*, *l''*, *v'*, *v''*, *bv''*), Ge 4 (*d*, *l'*, *l''*, *k*), Ti 5(1) (*d* $\zeta$ , *l'*, *l''*, *v'*, *v''*,  $\phi p$ ), Ta 13(1) (*p'* $\zeta$ , *p''* $\zeta$ , *tc'* $\zeta$ , *tc''* $\zeta$ , *ft'* $\zeta$ , *ft''* $\zeta$ , *u'*, *u''*, *a'*, *a''*, *pl'*, *pl''*, *vs*,  $\omega$ ). Setae *k* of genu, *d* of tibia and (*p*), (*tc*), (*ft*) of tarsus smooth, blunt-tipped, eupathid-like; setae (*a*) and (*u*) of tarsus smooth and pointed, other setae sparsely barbed; setae *d* of femur blunt-tipped, other setae pointed. Seta *d* of genu more than 3 times longer than seta *k* 4. Solenidion  $\omega$  11 digitiform; solenidion  $\phi p$  18 attenuate, with rounded tip. Leg II (Fig. 9B). Leg setation: Tr 1 (*v'*), Fe 4 (*d*, *l'*, *l''*, *bv''*), Ge 1 (*l'*), Ti 5(1) (*d*, *l'*, *l''*, *v'*, *v''*,  $\phi p$ ), Ta 9(1) (*p'* $\zeta$ , *tc'* $\zeta$ , *tc''*, *u'*, *u''*, *a'*, *a''*, *pl'*, *vs*,  $\omega$ ). Setae

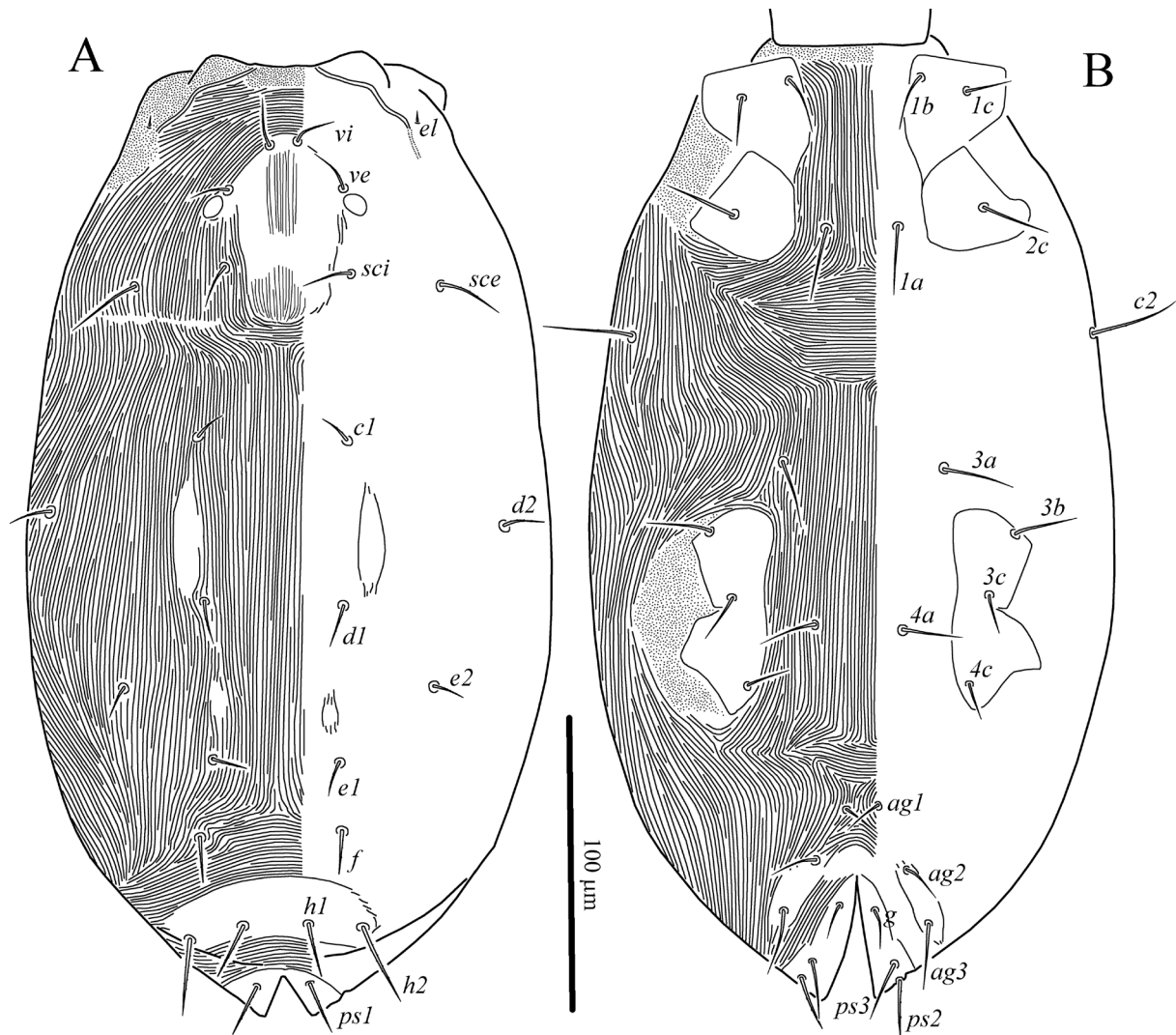


Fig. 7. *Eryngiopus hamedanicus* Khanjani, Mohammadi and Nazari, 2014, female: A—dorsum of idiosoma, B—venter of idiosoma.

*p'* and *tc'* of tarsus eupathid-like; setae (*a*) and (*u*) of tarsus smooth and pointed, other setae weakly barbed and pointed. Solenidium  $\omega$  12 digitiform; solenidium  $\phi p$  14 attenuate, with rounded tip. Seta *k* absent. Leg III (Fig. 10A). Leg setation: Tr 1 (*v'*), Fe 2 (*d*, *ev'*), Ge 0, Ti 5(1) (*d*, *l'*, *l''*, *v'*, *v''*,  $\phi p$ ), Ta 7(1) (*tc'*, *tc''*, *u'*, *u''*, *a'*, *a''*, *vs*,  $\omega$ ). Solenidium  $\omega$  3 peg-like; solenidium  $\phi p$  11 attenuate, with rounded tip. All setae pointed; setae *d* of tibia, (*tc*) and (*u*) of tarsus smooth, other leg setae weakly barbed. Leg IV (Fig. 10B). Leg setation: Tr 1 (*v'*), Fe 2 (*d*, *ev'*), Ge 0, Ti 5(1) (*d*, *l'*, *l''*, *v'*, *v''*,  $\phi p$ ), Ta 7(1) (*tc'*, *tc''*, *u'*, *u''*, *a'*, *a''*, *vs*,  $\omega$ ). Solenidium  $\omega$  3 peg-like; solenidium  $\phi p$  12 attenuate, with rounded tip. All setae pointed; setae *d* of tibia, (*tc*) and (*u*) of tarsus smooth, other leg setae weakly barbed.

**Male and immatures unknown.**

**Material examined.** 1 female, Russia, Tyumen Oblast, Berdyuzhsky District, vicinity of Lake

Solenoe in soil, 55°42'35.0"N, 68°42'49.0"E, 12 October 2020, coll. A.A. Khaustov.

**Remarks.** This species was described from Iran (Khanjani *et al.* 2014). The specimen from Western Siberia slightly differs from the original description in having delicate striation on prodorsal shield, one pair of platelets between setae *d1* and *e1* and three prongs on fused palpal terminal eupathidia (vs. two in the original description). However, these characters are very difficult to discern because of their very small size; therefore, they were probably missed in the original description.

This is the first record of *E. hamedanicus* from Russia.

**Genus *Ledermuelleriopsis* Willmann, 1953**

Type species: *Ledermuelleriopsis triscutata* Willmann, 1951, by subsequent designation.



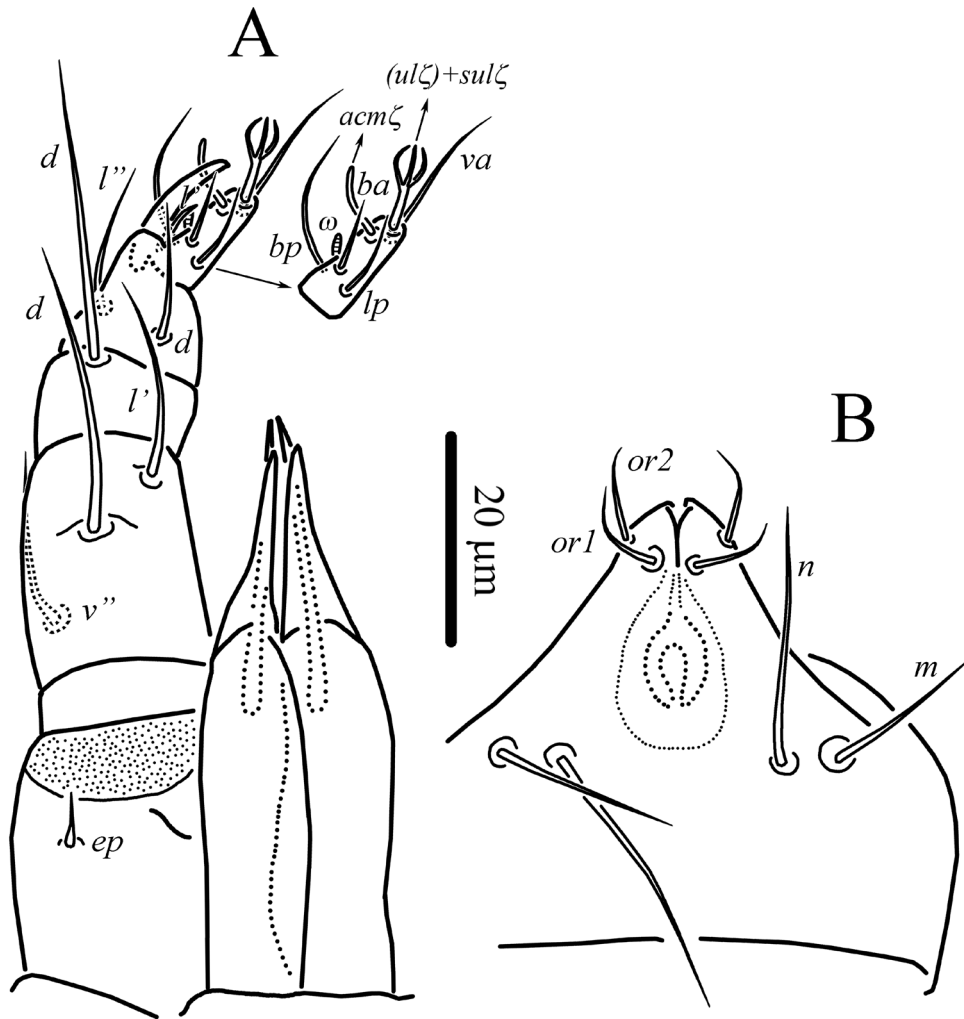


Fig. 8. *Eryngiopus hamedanicus* Khanjani, Mohammadi and Nazari, 2014, female: A—gnathosoma, dorsal aspect, B—subcapitulum.

***Ledermuelleriopsis rizeiensis* Doğan, 2004**

(Figs. 11–14)

*Ledermuelleriopsis rizeiensis* Doğan, 2004a: 255.

**Redescription. Female** (Figs. 11–14). Body broadly oval. Length of idiosoma 355–375, width 255–280.

*Idiosomal dorsum* (Fig. 11A). Idiosoma almost completely covered by dorsal shields; hysterosoma covered by two large shields with setae *c1*, *d1*, *d2* and *e1*, *e2*, *f*, respectively, and small suranal shield with setae *h1* and *h2* usually located ventrally. All shields with distinct subcuticular reticulation and deep dimples; each reticulation cell with few small puncta. Ocelli present. Postocular bodies absent. All dorsal setae distinctly barbed, slightly widened distally. Lengths of dorsal setae: *vi* 22–24, *ve* 22–23, *sci* 17–20, *sce* 20–21, *c1* 18–20, *c2* 22–23, *d1* 16–17, *d2* 17–18, *e1* 19–20, *e2* 17–19, *f* 30–34, *h1* 30–32, *h2* 27–28.

*Idiosomal venter* (Fig. 11B). All ventral plates with weak subcuticular reticulation. Endopodal plates fused medially; posterior endopodal plate with weak oval area posteromesad setae *3a*. Setae *ps1* blunt-tipped, other ventral setae pointed; setae *ps1–ps3* barbed, other ventral setae smooth or with very small barbs. Aggenital plate with 3 pairs of aggenital setae. Lengths of ventral setae: *1a* 19–20, *1b* 21–22, *1c* 17–18, *2b* 18–20, *2c* 16–18, *3a* 19–20, *3b* 16–18, *3c* 14–15, *4a* 17–18, *4b* 14–15, *4c* 14–15, *ag1* 14–15, *ag2* 14–15, *ag3* 15–17, *ps1* 18–19, *ps2* 18–19, *ps3* 17–18.

*Gnathosoma* (Fig. 12). Tibial claw large, thick, with rounded tip, about as long as palptarsus. Setae *l'* on palpal tibia short, thick, spiniform. Setae *d* and *l'* of femur strongly barbed and blunt-tipped, sometimes almost pointed; setae *v''* of femur, *d*, *l''* of genu, *d*, *l''* of tibia and *va* of tarsus weakly barbed, other palpal setae smooth. Terminal eupathidia of palptarsus fused only basally. Number

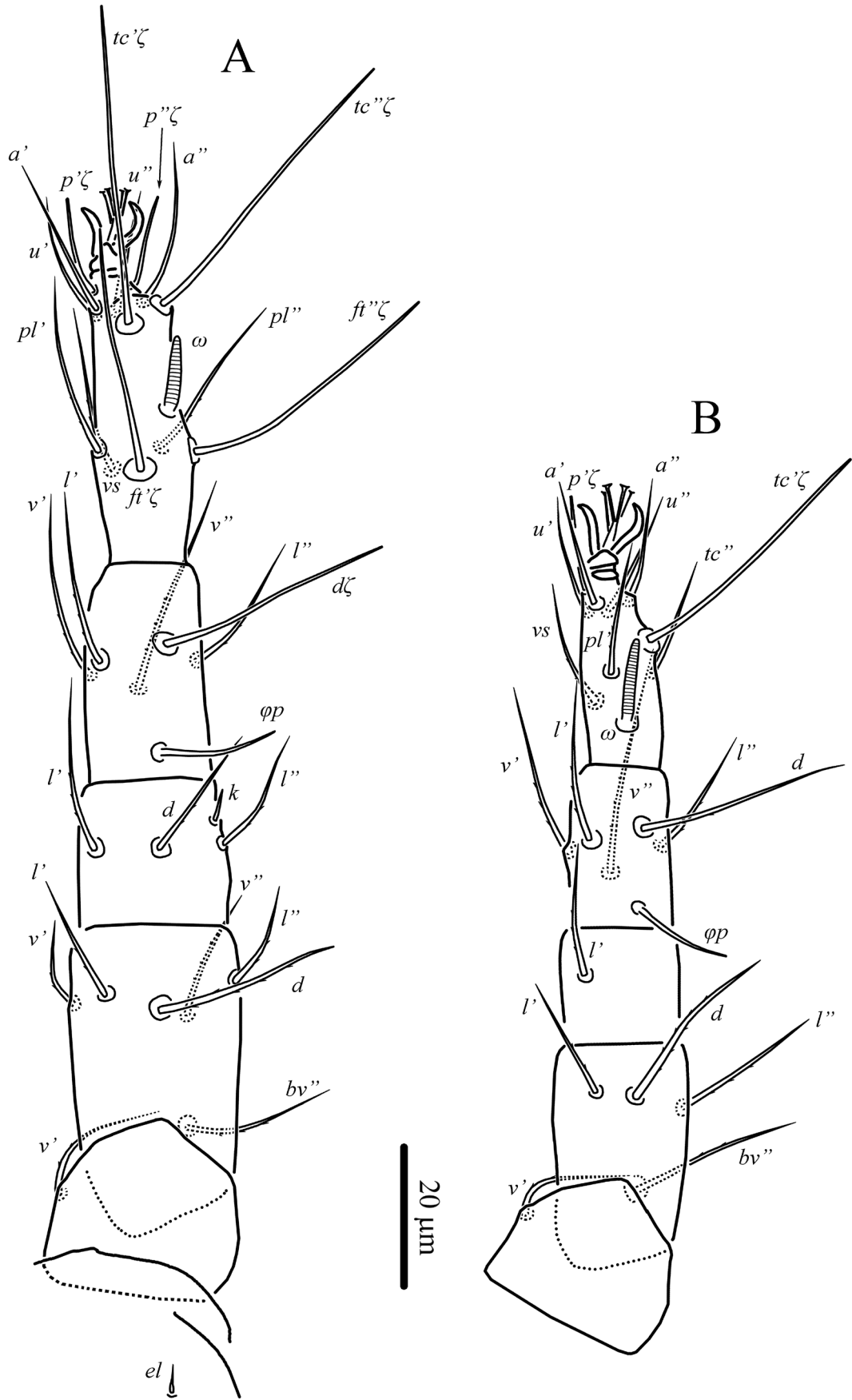


Fig. 9. *Eryngiopus hamedanicus* Khanjani, Mohammadi and Nazari, 2014, female: A—right leg I, dorsal aspect, B—right leg II, dorsal aspect.

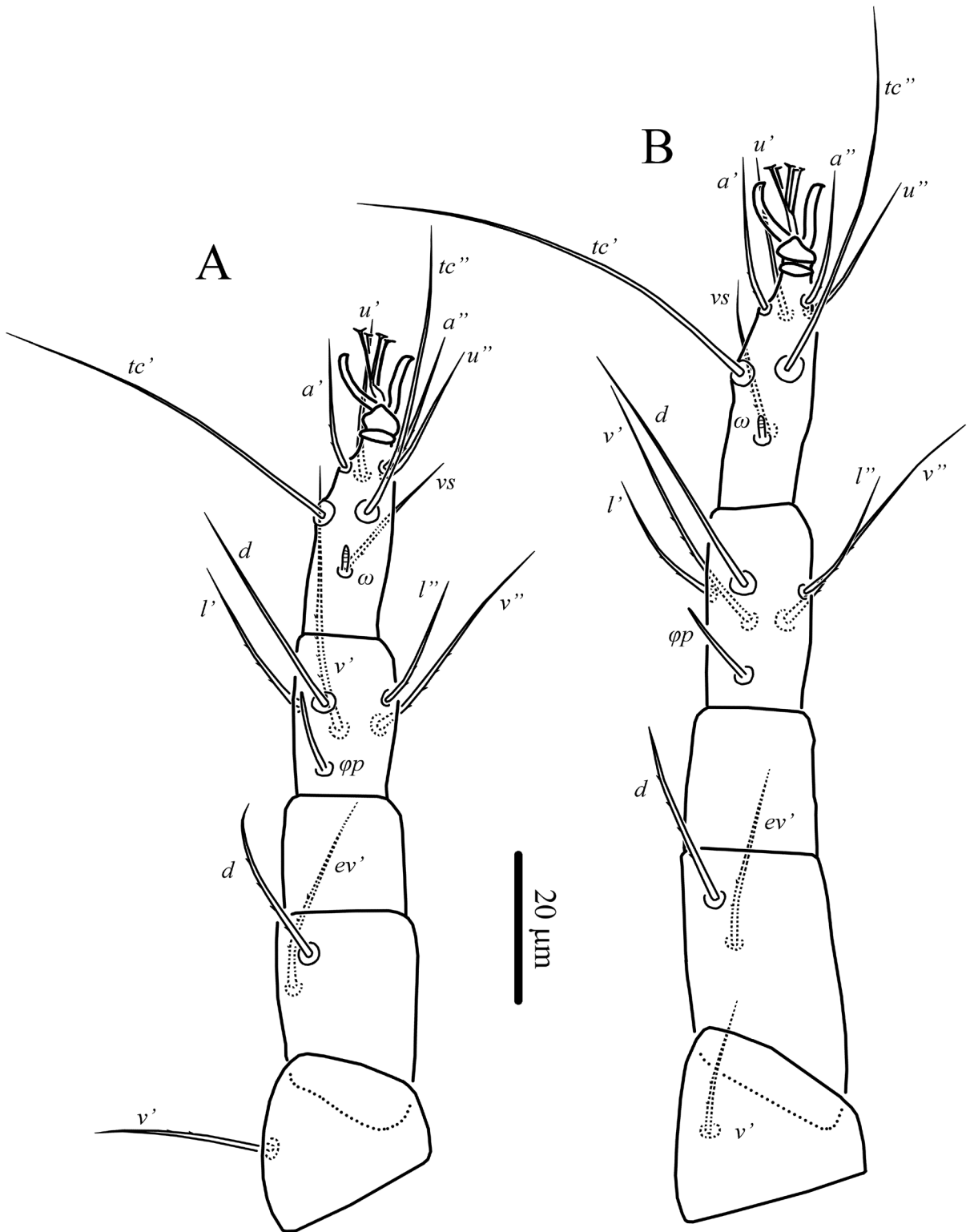


Fig. 10. *Eryngiopus hamedanicus* Khanjani, Mohammadi and Nazari, 2014, female: A—right leg III, dorsal aspect, B—right leg IV, dorsal aspect.

of setae on palpal segments as in *S. amphibius*. Palpal supracoxal setae (*ep*) short, spiniform, located dorsally. Rostrum of subcapitulum (Fig. 12B) short and wide, its distal end with row of tiny projections. All subcapitular setae smooth and

pointed. Basal part of subcapitulum without distinct reticulation, with tiny puncta. Length of subcapitular setae: *m* 22–23, *n* 14–15, *or1* 14–15, *or2* 14–15. Length of cheliceral stylets 35–37, length of palp 90–95, length of palpal solenidion  $\omega$  6–8.

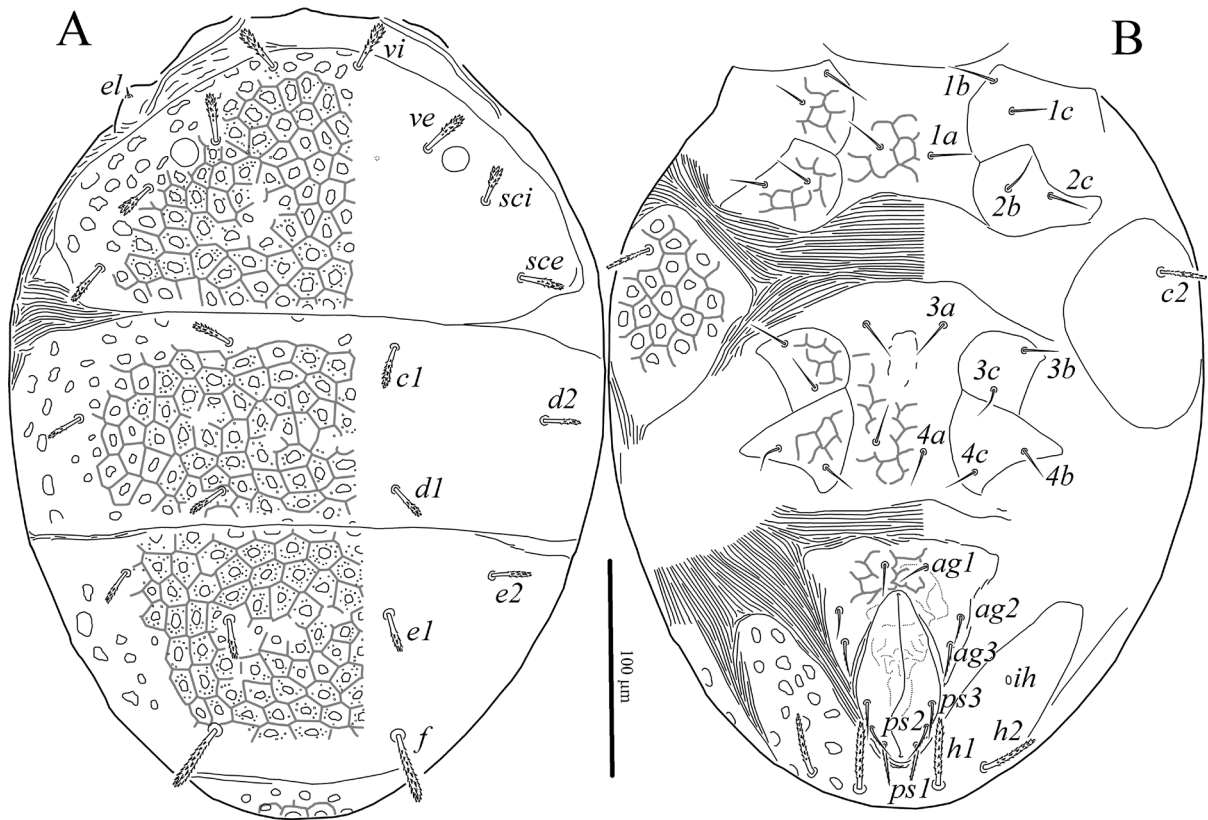


Fig. 11. *Ledermuelleriopsis rizeiensis* Doğan, 2004, female: A—dorsum of idiosoma, B—venter of idiosoma.

**Legs** (Figs. 13, 14). Empodial raylets widened distally. Leg segments without distinct reticulation. Lengths of legs: I 155–160, II 135–149, III 135–140, IV 155–160. Leg I (Fig. 13A). Coxae I posterodorsally with short spiniform leg supracoxal setae (*el*). Leg setation: Tr 1 (*v'*), Fe 6 (*d, l', l'', v', v'', bv''*), Ge 4 (*d, l', l'', k*), Ti 5(2) (*d, l', l'', v', v'', φ, φp*), Ta 13(1) (*p'ζ, p''ζ, tc'ζ, tc''ζ, ft'ζ, ft''ζ, u', u'', a', a'', pl', pl'', vs, ω*). Setae *k* of genu and (*p*), (*tc*), (*ft*) of tarsus smooth, blunt-tipped, eupathid-like; other setae barbed; setae *d* of femur, genu and tibia strongly barbed and widened, similar to dorsal idiosomal setae; setae *l''* of femur, (*l*) of genu and tibia blunt-tipped, other setae pointed. Seta *d* of genu almost three times longer than seta *k* 6. Solenidion *ω* 16–18 digitiform; solenidion *φ* 8–10 baculiform; *φp* 16–18 attenuate, with rounded tip. Leg II (Fig. 13B). Leg setation: Tr 1 (*v'*), Fe 4 (*d, l', l'', bv''*), Ge 4 (*d, l', l'', k*), Ti 5(1) (*d, l', l'', v', v'', φp*), Ta 8(1) (*tc'ζ, tc'', u', u'', a', a'', pl', vs, ω*). Seta *tc'* of tarsus eupathid-like; setae *d* of femur, genu and tibia strongly barbed and widened, similar to dorsal idiosomal setae; setae *l''* of femur, (*l*) of genu and tibia blunt-tipped, other setae pointed and weakly barbed. Solenidion *ω* 9–12 digitiform; solenidion *φp* 13–15 attenuate, with rounded tip.

Seta *d* of genu almost four times longer than seta *k* 4. Leg III (Fig. 14A). Leg setation: Tr 2 (*l', v'*), Fe 3 (*d, l', ev'*), Ge 1 (*d*), Ti 5(1) (*d, l', l'', v', v'', φp*), Ta 7(1) (*tc', tc'', u', u'', a', a'', vs, ω*). Solenidion *ω* 4–5 peg-like; solenidion *φp* 8–10 attenuate, with rounded tip. All leg setae barbed. Setae *d* of genu and tibia widened and strongly barbed; setae *l'* of trochanter, *d, l'* of femur, and (*l*) of tibia blunt-tipped, other leg setae pointed. Leg IV (Fig. 14B). Leg setation: Tr 1 (*v'*), Fe 2 (*d, ev'*), Ge 1 (*d*), Ti 5(1) (*d, l', l'', v', v'', φp*), Ta 7 (*tc', tc'', u', u'', a', a'', vs*). Solenidion *ω* absent. Solenidion *φp* 8–9 attenuate, with rounded tip. All leg setae barbed. Setae *d* of femur, genu and tibia widened and strongly barbed; setae (*l*) of tibia blunt-tipped, other leg setae pointed.

**Male and immatures** not available.

**Material examined.** 6 females, Russia, Khanty-Mansi Autonomous Okrug, Oktyabrsky District, 61°46'10.2"N, 65°59'09.7"E, in moss, 9 June 2021, coll. A. Bolshakov; 2 females, Tyumen Oblast, Nizhnetavdinsky District, vicinities of Lake Kuchak, 57°19'29.8"N, 66°02'27.8"E, in moss, 23 September 2021, coll. A.A. Khaustov.

**Remarks.** This species was described from Turkey (Doğan 2004a) based on females. In the

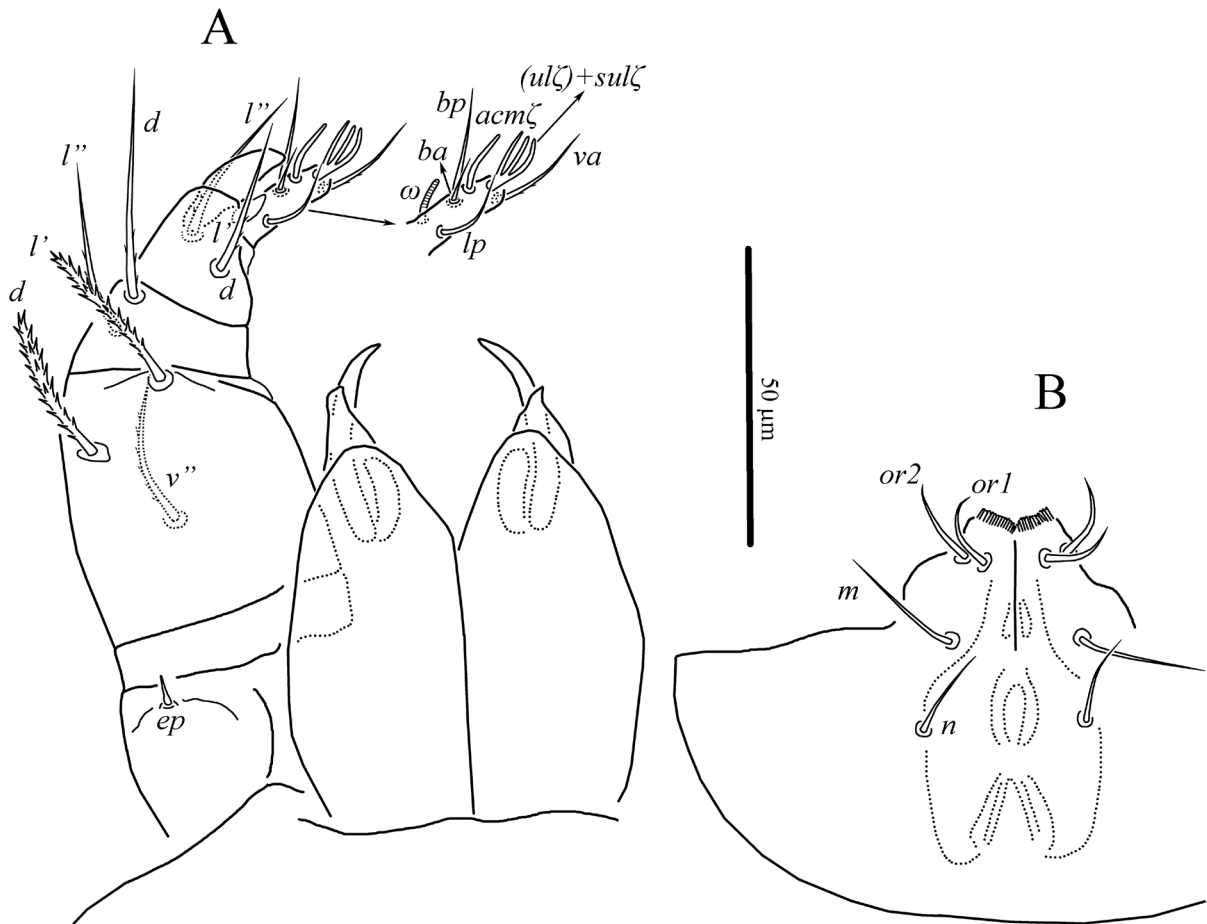


Fig. 12. *Ledermuelleriopsis rizeiensis* Doğan, 2004, female: A—gnathosoma, dorsal aspect, B—subcapitulum.

original description, the author mentioned 10 setae (including solenidion) on tarsus II and did not describe deep dimples on dorsal shields. Later, Dilkaraoğlu *et al.* (2016) corrected the number of setae on tarsus II (8 setae plus solenidion) and described males, as well as the deutonymph stage. Salih Doğan (personal communication) confirmed the presence of deep dimples on the dorsal shields in the females of this species.

***Ledermuelleriopsis plumosa*  
Willmann, 1951**

*Ledermuelleriopsis plumosus* Willmann, 1951: 140.

*Ledermuelleriopsis plumosa* Summers, 1957: 54.

This species was described from Austria, from a meadow (Willmann 1951). It was also recorded from Iran, Israel, Italy, Poland, Slovakia, Sweden, Switzerland, Turkey and the USA (Beron 2020). Fan *et al.* (2003) redescribed female of *L. plumosa*. This is the first record of *L. plumosa* from Russia.

**Material examined.** 4 females, Russia: Tyumen Oblast, Nizhnetavdinsky District, vicinities

of Lake Kuchak, 57°20'31.0"N, 66°03'49.7"E, in soil on a meadow, 23 September 2021, coll. A.A. Khaustov.

**Genus *Eustigmaeus* Berlese, 1910**

Type species: *Stigmaeus kermesinus* Koch, 1841, by original designation.

***Eustigmaeus bisetalis*  
(Doğan, 2004) comb.n.**

(Figs. 15–18)

*Ledermuelleriopsis bisetalis* Doğan, 2004b: 456.

**Redescription. Female** (Figs. 15–18). Body broadly oval. Length of idiosoma 295–315, width 230–235.

*Idiosomal dorsum* (Fig. 15A). Idiosoma almost completely covered by dorsal shields; hysterosoma covered by two shields with setae *c1*, *d1*, *d2*, *e1*, *e2*, *f*, and suranal with setae *h1* and *h2* usually located ventrally. Central hysterosomal shield with deep lateral incisions at level of setae *e2*. All shields with distinct puncta; subcuticular reticulation usually not visible, sometimes with poorly developed

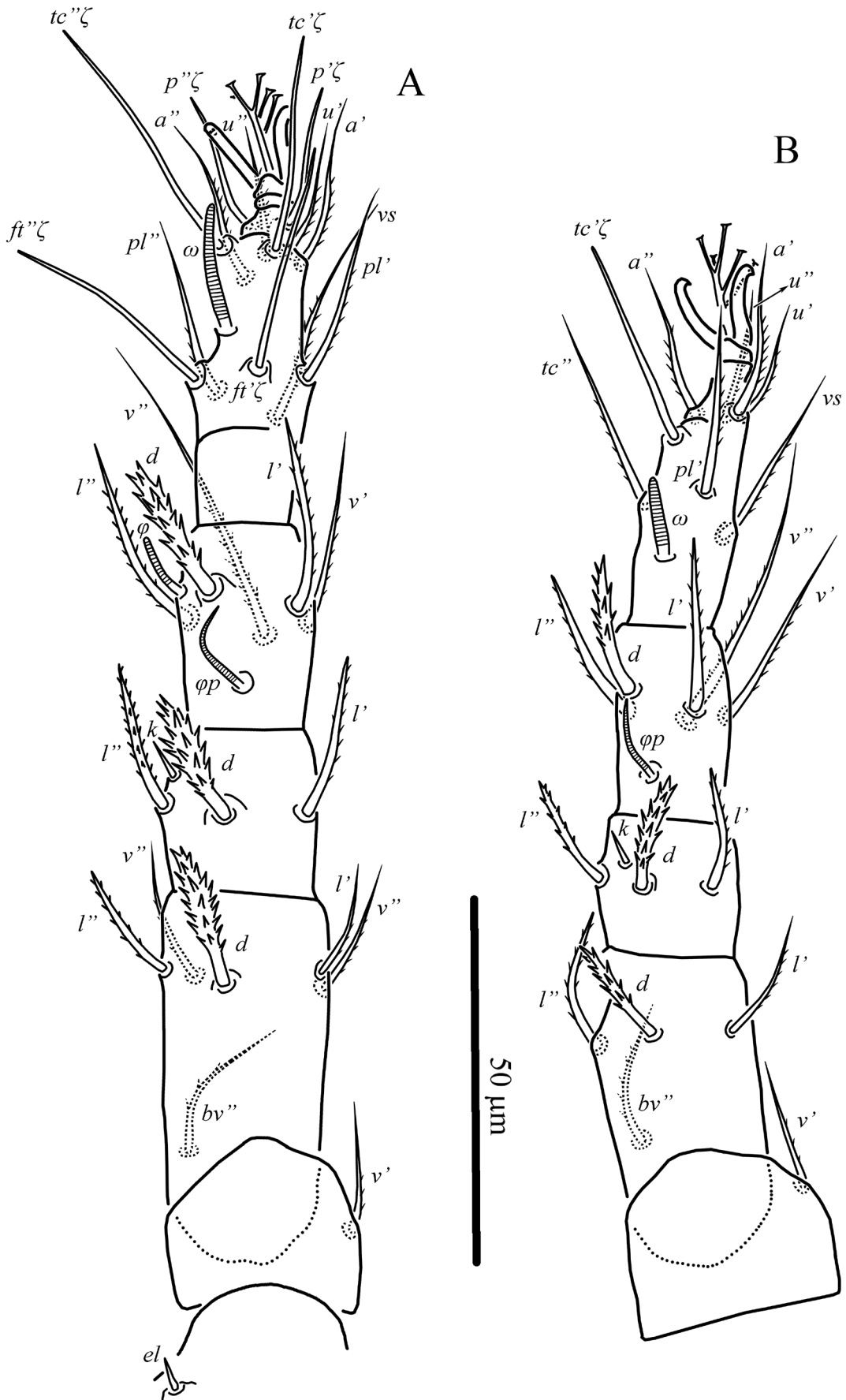


Fig. 13. *Ledermuelleriopsis rizeiensis* Doğan, 2004, female: A—left leg I, dorsal aspect, B—left leg II, dorsal aspect.

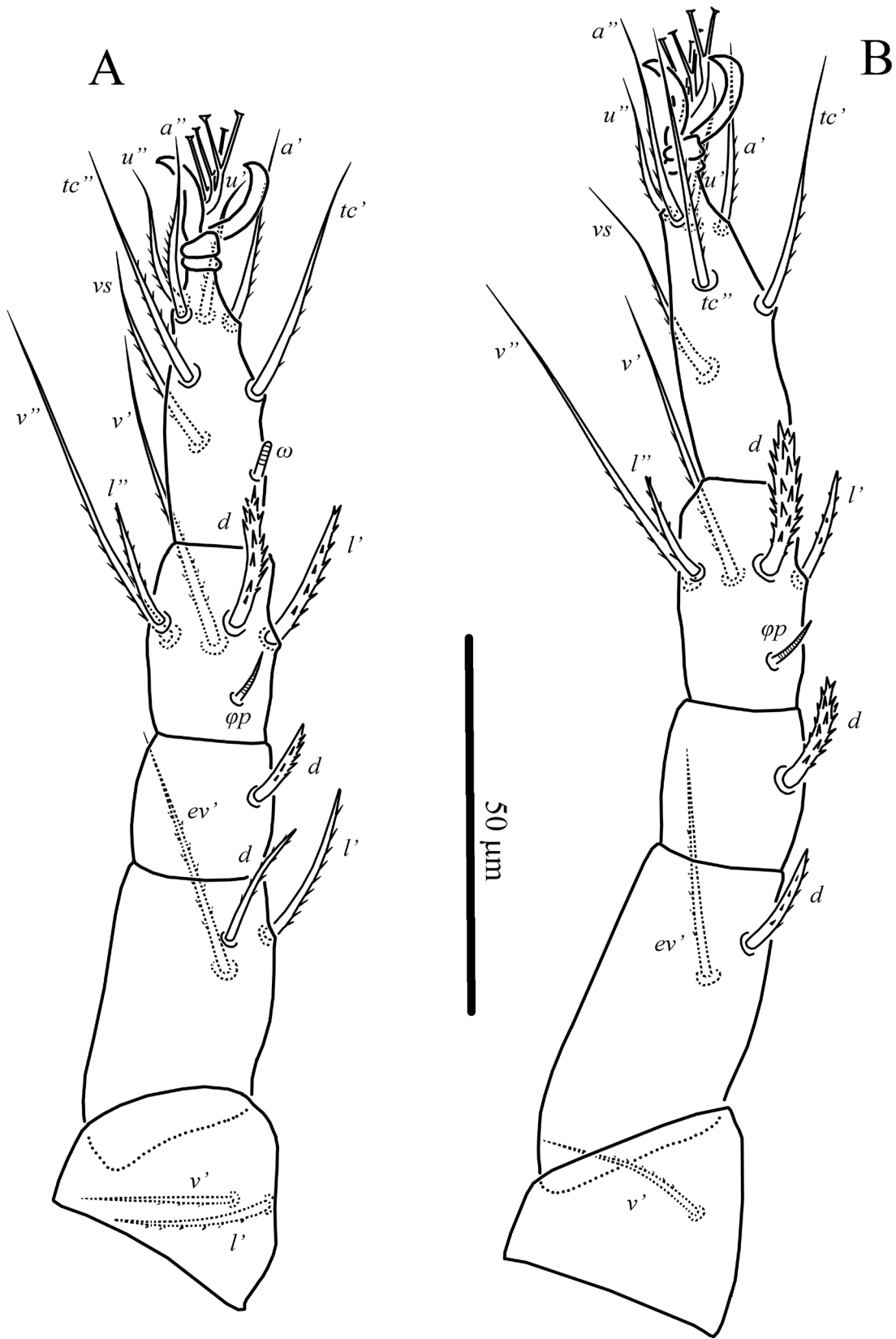


Fig. 14. *Ledermuelleriopsis rizeiensis* Doğan, 2004, female: A—left leg III, dorsal aspect, B—left leg IV, dorsal aspect.

reticulation. Ocelli present. Postocular bodies absent. Dorsal setae *vi*, *f*, *hl* and *h2* distinctly barbed, slightly widened distally, other dorsal setae needle-

like smooth or weakly barbed and blunt-tipped. Lengths of dorsal setae: *vi* 17–19, *ve* 17–19, *sci* 12–13, *sce* 15–16, *cl* 13–14, *c2* 19–20, *dl* 11–12,

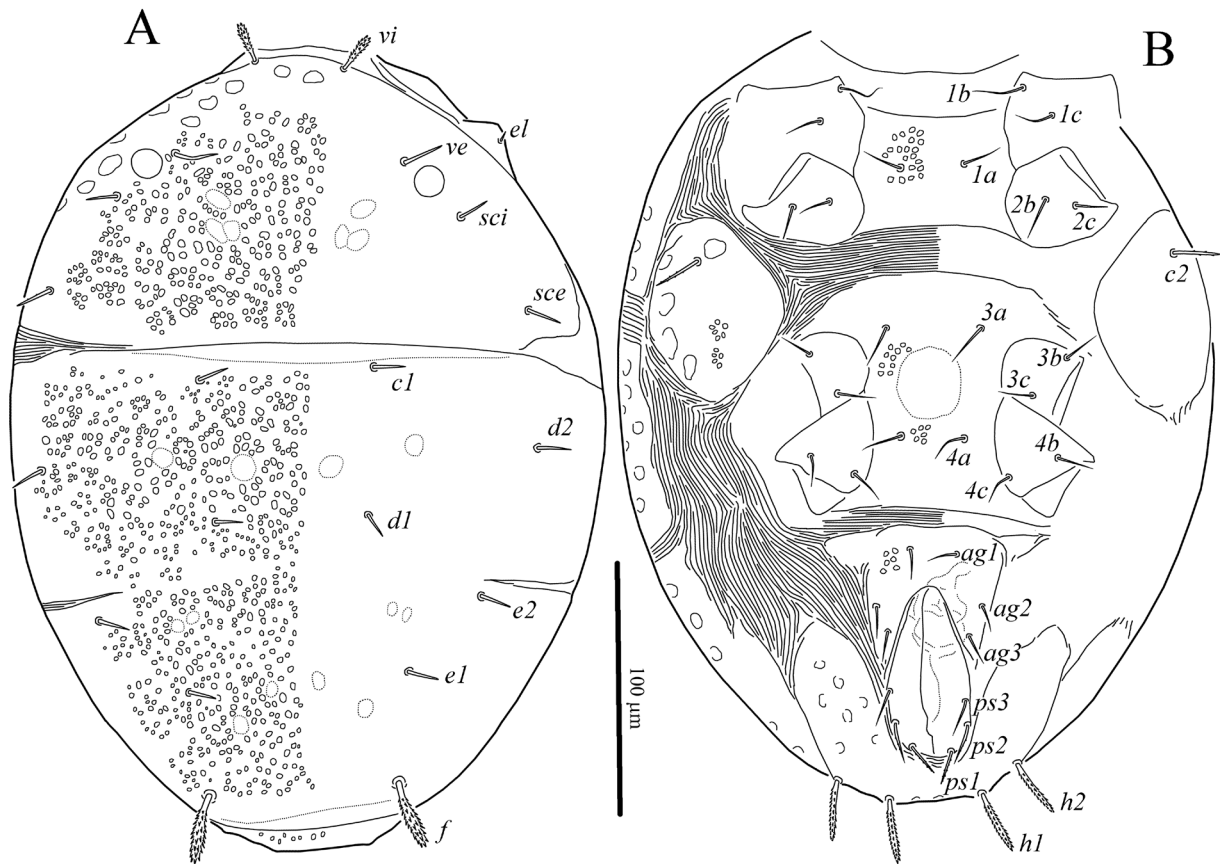


Fig. 15. *Eustigmaeus bisetalis* (Doğan, 2004), female: A—dorsum of idiosoma, B—venter of idiosoma.

*d2* 12–13, *e1* 11–13, *e2* 12–13, *f* 28–30, *h1* 26–27, *h2* 23–25.

**Idiosomal venter** (Fig. 15B). All ventral plates with weak puncta. Endopodal plates fused medially; posterior endopodal plate with weak oval area posteromesad setae *3a*. Setae *ps1* blunt-tipped, other ventral setae pointed; setae *ps1*–*ps2* barbed, other ventral setae smooth or with very small barbs. Aggenital plate with 3 pairs of aggenital setae. Lengths of ventral setae: *1a* 18–20, *1b* 21–22, *1c* 14–16, *2b* 16–17, *2c* 15–16, *3a* 17–20, *3b* 14–15, *3c* 15–16, *4a* 16–19, *4b* 14–15, *4c* 14–15, *ag1* 12–13, *ag2* 12–13, *ag3* 13–14, *ps1* 15–16, *ps2* 16–20, *ps3* 15–16.

**Gnathosoma** (Fig. 16). Tibial claw large, thick, with rounded tip, about as long as palptarsus. Setae *l'* on palpal tibia short, thick, spiniform. Setae *d* and *l'* of femur strongly barbed and weakly blunt-tipped, sometimes almost pointed; setae *v''* of femur, *d*, *l''* of genu, *d*, *l''* of tibia and *va* of tarsus weakly barbed, other palpal setae smooth. Terminal eupathidia of palptarsus fused only basally. Number of setae on palpal segments as in *S. amphibius*. Palpal supracoxal setae (*ep*) short, spiniform, located dorsally. Rostrum of subcapitulum (Fig. 16B)

short and wide, its distal end with row of tiny projections. All subcapitular setae smooth and pointed. Basal part of subcapitulum without distinct reticulation, with tiny puncta. Lengths of subcapitular setae: *m* 21–24, *n* 14–15, *or1* 12–13, *or2* 14–15. Length of cheliceral stylets 29–30, length of palp 85–89, length of palpal solenidion  $\omega$  6–7.

**Legs** (Figs. 17, 18). Empodial raylets widened distally. Leg segments without distinct reticulation. Lengths of legs: I 145–150, II 125–130, III 120–125, IV 135–140. Leg I (Fig. 17A). Coxae I posterodorsally with short spiniform leg supracoxal setae (*el*). Leg setation: Tr 1 (*v'*), Fe 6 (*d*, *l'*, *l''*, *v'*, *v''*, *bv''*), Ge 4 (*d*, *l'*, *l''*, *k*), Ti 5(2) (*d*, *l'*, *l''*, *v'*, *v''*,  $\varphi$ ,  $\varphi p$ ), Ta 13(1) (*p'* $\zeta$ , *p''* $\zeta$ , *tc'* $\zeta$ , *tc''* $\zeta$ , *ft'* $\zeta$ , *ft''* $\zeta$ , *u'*, *u''*, *a'*, *a''*, *pl'*, *pl''*, *vs*,  $\omega$ ). Setae *k* of genu and (*p*), (*tc*), (*ft*) of tarsus smooth, blunt-tipped, eupathid-like; other setae barbed; setae *d*, *l''* of femur, *d*, (*l*) of genu and tibia blunt-tipped, other setae pointed. Seta *d* of genu almost three times longer than seta *k* 6. Solenidion  $\omega$  18–19 digitiform; solenidion  $\varphi$  8–9 baculiform;  $\varphi p$  16–18 attenuate, with rounded tip. Leg II (Fig. 17B). Leg setation: Tr 1 (*v'*), Fe 4 (*d*, *l'*, *l''*, *bv''*), Ge 4 (*d*, *l'*, *l''*, *k*), Ti 5(1) (*d*, *l'*, *l''*, *v'*, *v''*,  $\varphi p$ ), Ta 9(1) (*p'* $\zeta$ , *tc'* $\zeta$ , *tc''*, *u'*, *u''*, *a'*, *a''*,



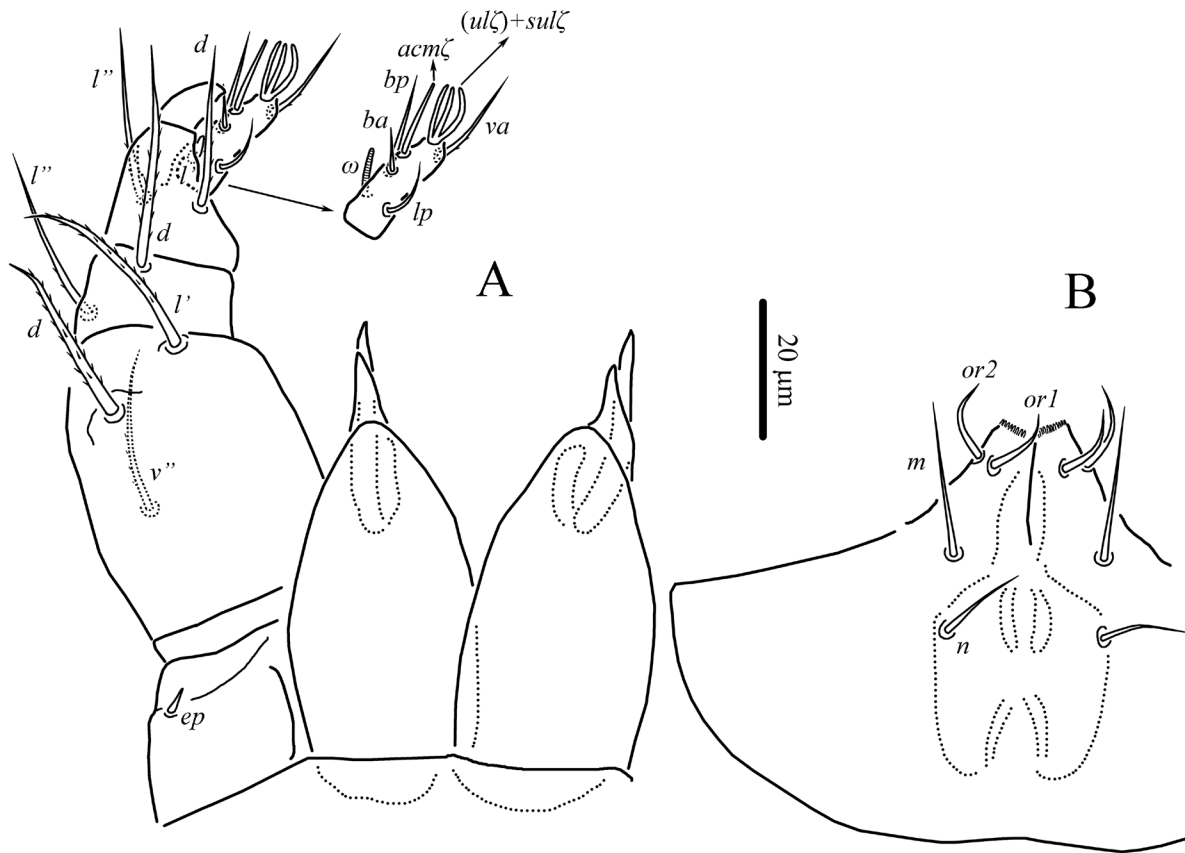


Fig. 16. *Eustigmaeus bisetalis* (Doğan, 2004), female: A—gnathosoma, dorsal aspect, B—subcapitulum.

*pl'*, *vs*,  $\omega$ ). Setae *p'* and *tc'* of tarsus eupathid-like, smooth and blunt-tipped, other setae barbed; setae *d*, *l''* of femur, *d*, (*l*) of genu and tibia blunt-tipped, seta *l'* of femur weakly blunt-tipped, other setae pointed. Solenidion  $\omega$  10–12 digitiform; solenidion  $\phi p$  13–15 attenuate, with rounded tip. Seta *d* of genu almost three times longer than seta *k* 5. Leg III (Fig. 18A). Leg setation: Tr 2 (*l'*, *v'*), Fe 3 (*d*, *l'*, *ev'*), Ge 1 (*d*), Ti 5(1) (*d*, *l'*, *l''*, *v'*, *v''*,  $\phi p$ ), Ta 7(1) (*tc'*, *tc''*, *u'*, *u''*, *a'*, *a''*, *vs*,  $\omega$ ). Solenidion  $\omega$  4–5 peg-like; solenidion  $\phi p$  9–10 attenuate, with rounded tip. All leg setae barbed. Setae *l'* of trochanter, *d*, *l'* of femur, *d*, (*l*) of tibia blunt-tipped, other leg setae pointed. Leg IV (Fig. 18B). Leg setation: Tr 1 (*v'*), Fe 2 (*d*, *ev'*), Ge 1 (*d*), Ti 5(1) (*d*, *l'*, *l''*, *v'*, *v''*,  $\phi p$ ), Ta 7 (*tc'*, *tc''*, *u'*, *u''*, *a'*, *a''*, *vs*). Solenidion  $\omega$  absent. Solenidion  $\phi p$  7–9 attenuate, with rounded tip. All leg setae barbed. Setae *d* of femur, *d* of genu, *d*, (*l*) of tibia blunt-tipped, other leg setae pointed.

**Male and immatures** not available.

**Material examined.** 2 females, Russia, Novosibirsk Oblast, settlement of Ustyantsevo, 55°17'55.3"N, 77°57'27.0"E; 1 female, Novosibirsk Oblast, 55°18'19.4"N, 77°33'12.2"E, in soil;

2 females, Tyumen Oblast, Nizhnetavdinsky District, vicinities of Lake Kuchak, 57°19'29.8"N, 66°02'27.8"E, in moss, 23 September 2021, coll. A.A. Khaustov.

**Remarks.** This species was described from Turkey (Doğan 2004b) in the genus *Ledermuelleriopsis*. However, the only character separating the genera *Eustigmaeus* and *Ledermuelleriopsis* is the number of dorsal shields on hysterosoma. In *Eustigmaeus*, hysterosoma with a large shield, with setae *c1*, *d1*, *d2*, *e1*, *e2*, and *f*; while in *Ledermuelleriopsis*, two dorsal shields with setae *c1*, *d1*, *d2* and *e1*, *e2*, *f*, respectively (Fan *et al.* 2016). *Eustigmaeus bisetalis* is unique in having deep lateral incisions reaching the level of the bases of setae *e2*, however, its central hysterosomal shield is not separated into two shields. Based on this character, I consider this species a member of the genus *Eustigmaeus*.

This is the first record of *E. bisetalis* from Russia.

***Eustigmaeus vacuus* Doğan, 2005**

*Eustigmaeus vacuus* Doğan, 2005: 858.

This species was described from Turkey (Doğan 2005) and redescribed from Greece (Sta-

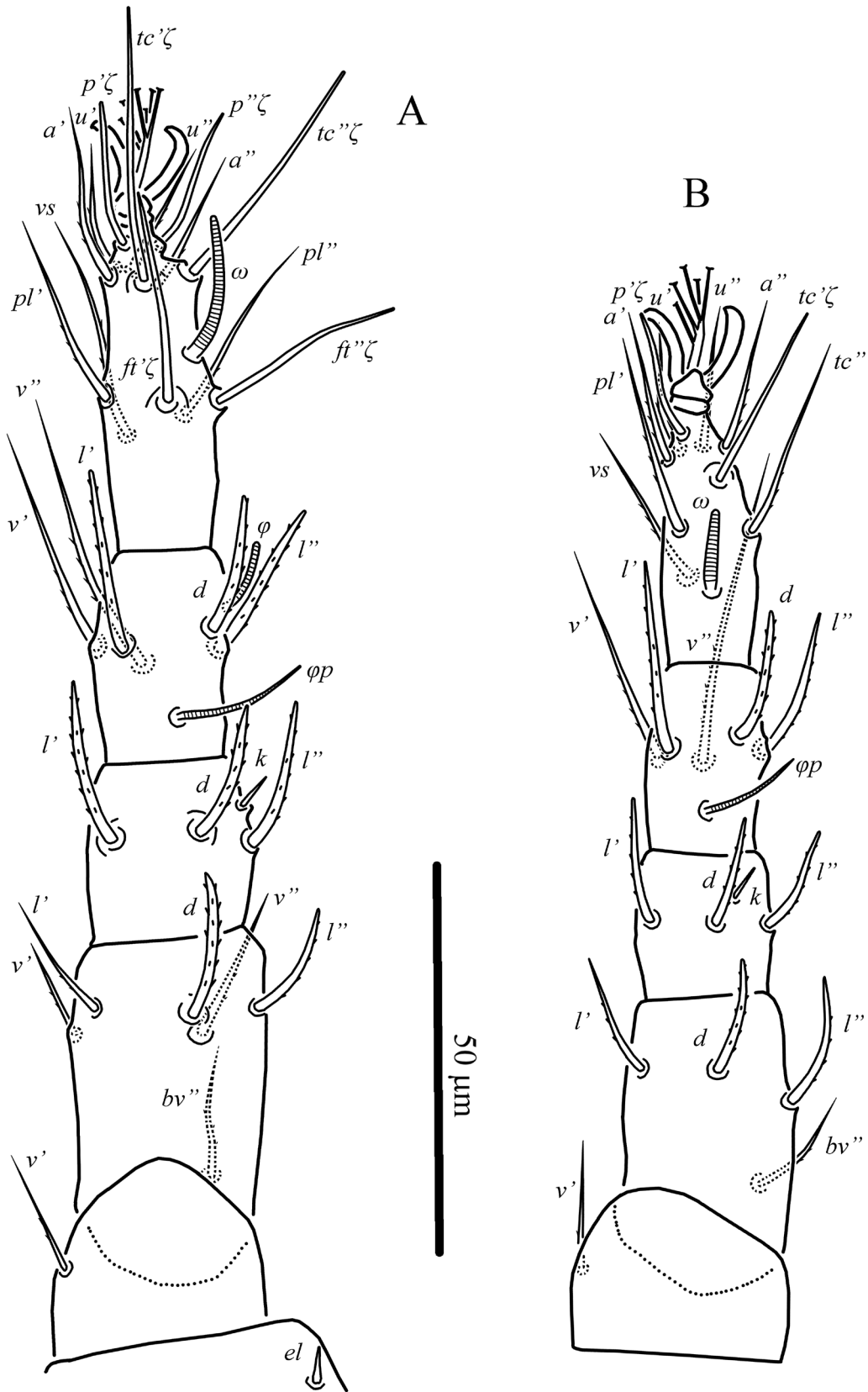


Fig. 17. *Eustigmaeus bisetalis* (Doğan, 2004), female: A—right leg I, dorsal aspect, B—right leg II, dorsal aspect.

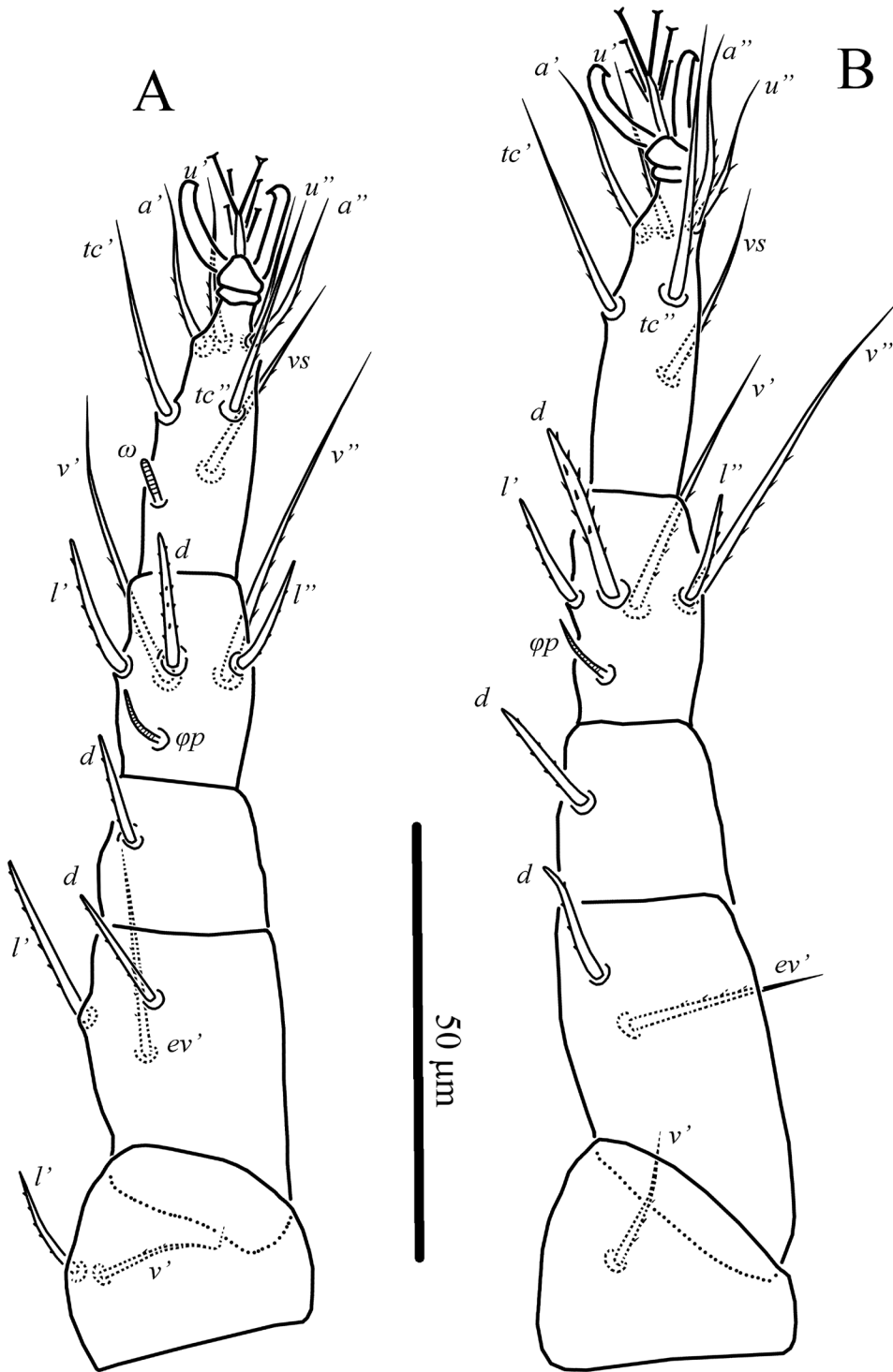


Fig. 18. *Eustigmaeus bisetalis* (Doğan, 2004), female: A—right leg III, dorsal aspect, B—right leg IV, dorsal aspect.

thakis *et al.* 2016). This is the first record of *E. vacuus* from Russia.

**Material examined.** 10 females, Russia: Kurgan Oblast, Zverinogolovskiy District, vicinity of the settlement of Zverinogolovskoe, 54°26'28.7"N, 64°51'21.9"E, in grassy soil, 12 April 2021, coll. A.A. Khaustov.

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