

NEW DATA ON THE FAUNA OF STIGMAEIDAE (ACARI: PROSTIGMATA) OF THE ALTAI REPUBLIC, RUSSIA

Alexander A. Khaustov

X-BIO Institute, Tyumen State University, Tyumen, Russia

*corresponding author; e-mail: alex1973khaustov@gmail.com

ABSTRACT: During the 2021–2022 study of predatory mites of the Altai Republic (Russia), six additional species of the family Stigmaeidae (Acari: Prostigmata) have been recorded, of which *Stigmaeus neosolidus* sp.n. and *S. altaicus* sp.n. are new to science. *Eustigmaeus lacunus* and *Ledermuelleriopsis ariyai* have been recorded from Russia for the first time and redescribed based on the materials from the Altai. *Eustigmaeus collarti* and *Stigmaeus fusus* have been recorded from the Altai Republic for the first time.

KEY WORDS: Acarina, Raphignathoidea, systematics, morphology, new species, Altai Mountains

DOI: 10.21684/0132-8077-2022-30-2-181-210

INTRODUCTION

The mite family Stigmaeidae (Acari: Prostigmata) is the largest in the superfamily Raphignathoidea and currently includes about 640 species of 33 valid genera (Fan *et al.* 2016, 2019; Beron 2020; Khaustov 2022). Most stigmaeid mites are free-living predators of various small arthropods. Some *Eustigmaeus* species feed on mosses, while several *Stigmaeus* and *Eustigmaeus* species are parasites of sand flies (Diptera: Psychodidae). Species of the genera *Zetzelia* and *Agistemus* are probably the second most important group of plant mite predators (after the Phytoseiidae) (Gerson *et al.* 2003).

Previously, 13 species of Stigmaeidae have been reported from the Altai Republic, Russia, namely: *Stigmaeus akimovi* Khaustov, 2021, *S. delaramae* Khanjani, 2014, *S. longipilis* (Canestrini, 1889), *S. purpurascens* Summers, 1962, *S. sphagneti* (Hull, 1918), *Mediolata pini* Canestrini, 1889, *M. uspenskii* Kuznetsov and Sizova, 1978, *Eustigmaeus aciodophilus* (Wood, 1972), *E. parvisetus* (Chaudhri, 1965), *E. rhodomelus* (C.L. Koch, 1841), *E. segnis* (C.L. Koch, 1836), *E. summersi* Khaustov, 2021 and *Cheylostigmaeus* sp. (Khaustov 2021a).

During the expeditions to the Altai in the summers of 2021 and 2022, I found six more species of Stigmaeidae, including two new species. The aim of this paper is to describe these new species, to redescribe poorly known species and to provide new records of Stigmaeidae from the Altai Republic, Russia.

MATERIALS AND METHODS

Samples of soil, forest litter and mosses were collected in the Altai Mountains (Altai Republic, Russia) from different altitudes (400–2,500 m a.s.l.). The mites were collected from the samples 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 for the holotype and the paratypes (in parentheses), as well as ranges of measurements for the redescribed species are given in micrometers (µm). 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 objectives. Photomicrographs were taken with an AxioCam ICc5 (Carl Zeiss, Germany) digital camera.

SYSTEMATICS

Family **Stigmaeidae Oudemans, 1931**

Genus ***Stigmaeus* Koch, 1836**

Type species: *Stigmaeus cruentus* Koch, 1836, by subsequent designation by Berlese (1910).

***Stigmaeus neosolidus* sp.n.**

(Figs. 1–4, 9A)

Description. *Female* (Figs. 1–4, 9A). Idiosoma ovate. Length of idiosoma 405 (395–450), maximum width 315 (290–340).

Idiosomal dorsum (Figs. 1A, 9A). Central shield with three pairs of setae *cl*, *dl* and *el*; median zonal and intercalary shields paired; in two specimens intercalary shields fused (Fig. 9A). All shields with distinct subcuticular reticulation and dorsal dimples. Postocular bodies poorly visible. Ocelli absent. Striation anterolaterad prodorsal shield without microtubercles. Setae *sci* blunt-

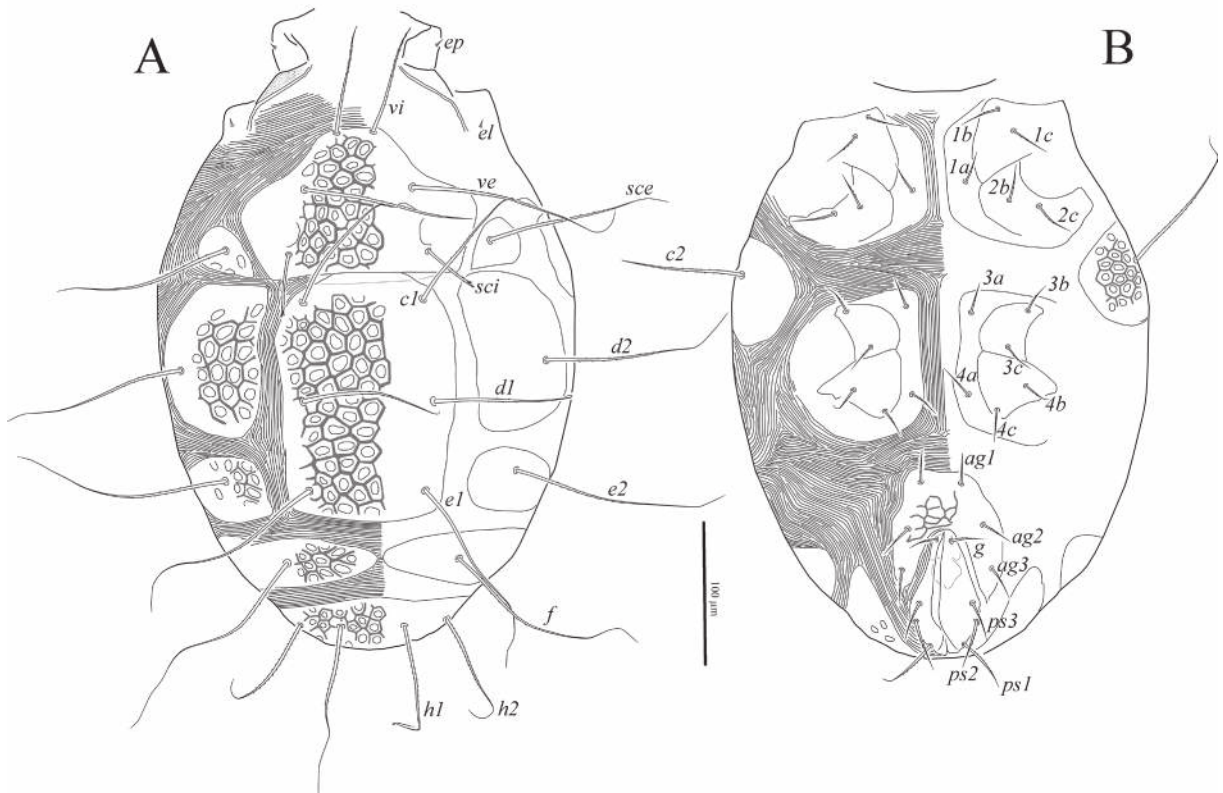


Fig. 1. *Stigmaeus neosolidus* sp.n., female: A—dorsum of idiosoma; B—venter of idiosoma.

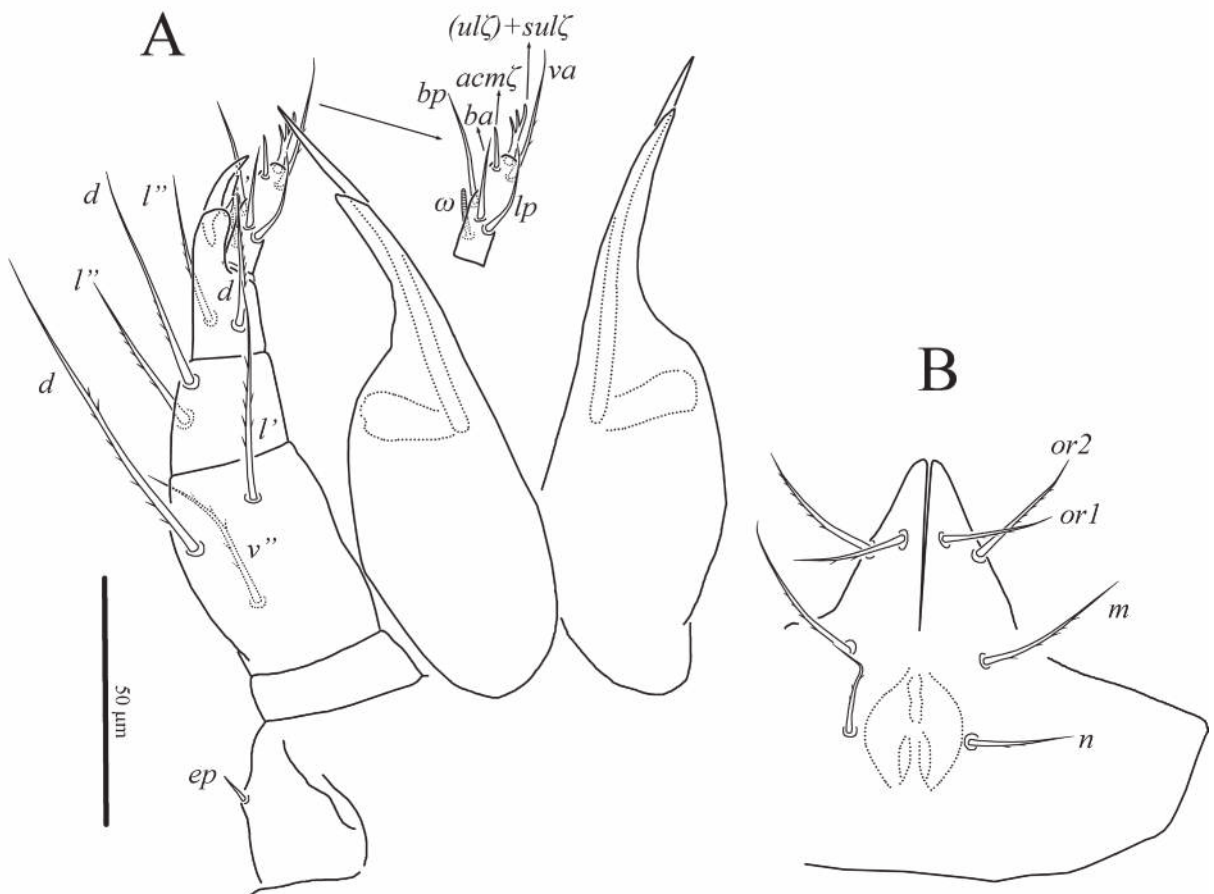


Fig. 2. *Stigmaeus neosolidus* sp.n., female: A—gnathosoma, dorsal aspect; B—subcapitulum.

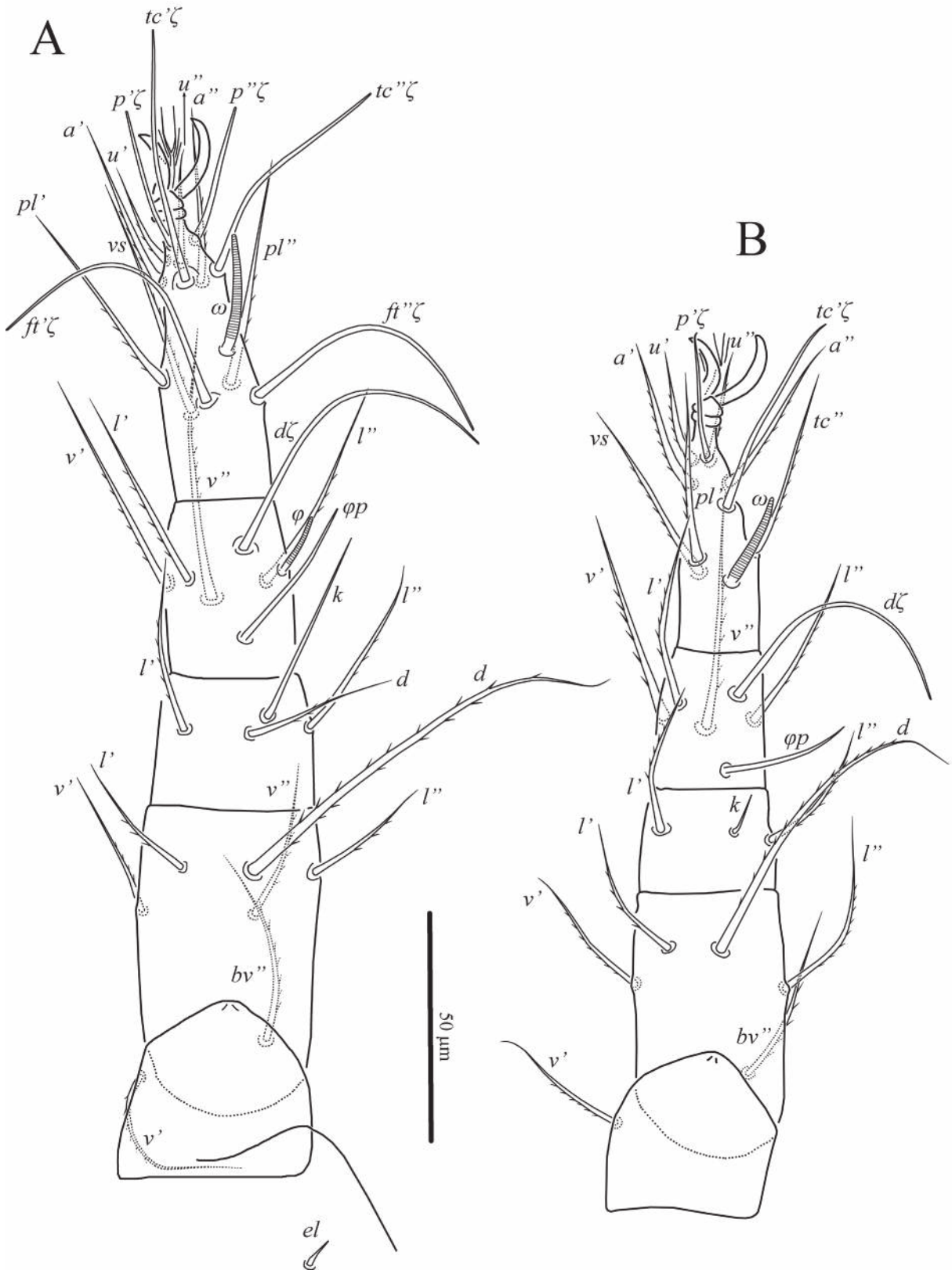


Fig. 3. *Stigmaeus neosolidus* sp.n., female: A—right leg I, dorsal aspect; B—right leg II, dorsal aspect.

tipped, slightly bifurcate in some specimens, barbed in distal half; other dorsal setae weakly barbed, long, flexible, with very thin pointed tips. Cupules

not evident. Setae *psl* located ventrally. Lengths of dorsal setae: *vi* 100 (82–100), *ve* 155 (150–160), *sci* 43 (42–45), *sce* 140 (125–140), *cl* 125 (120–

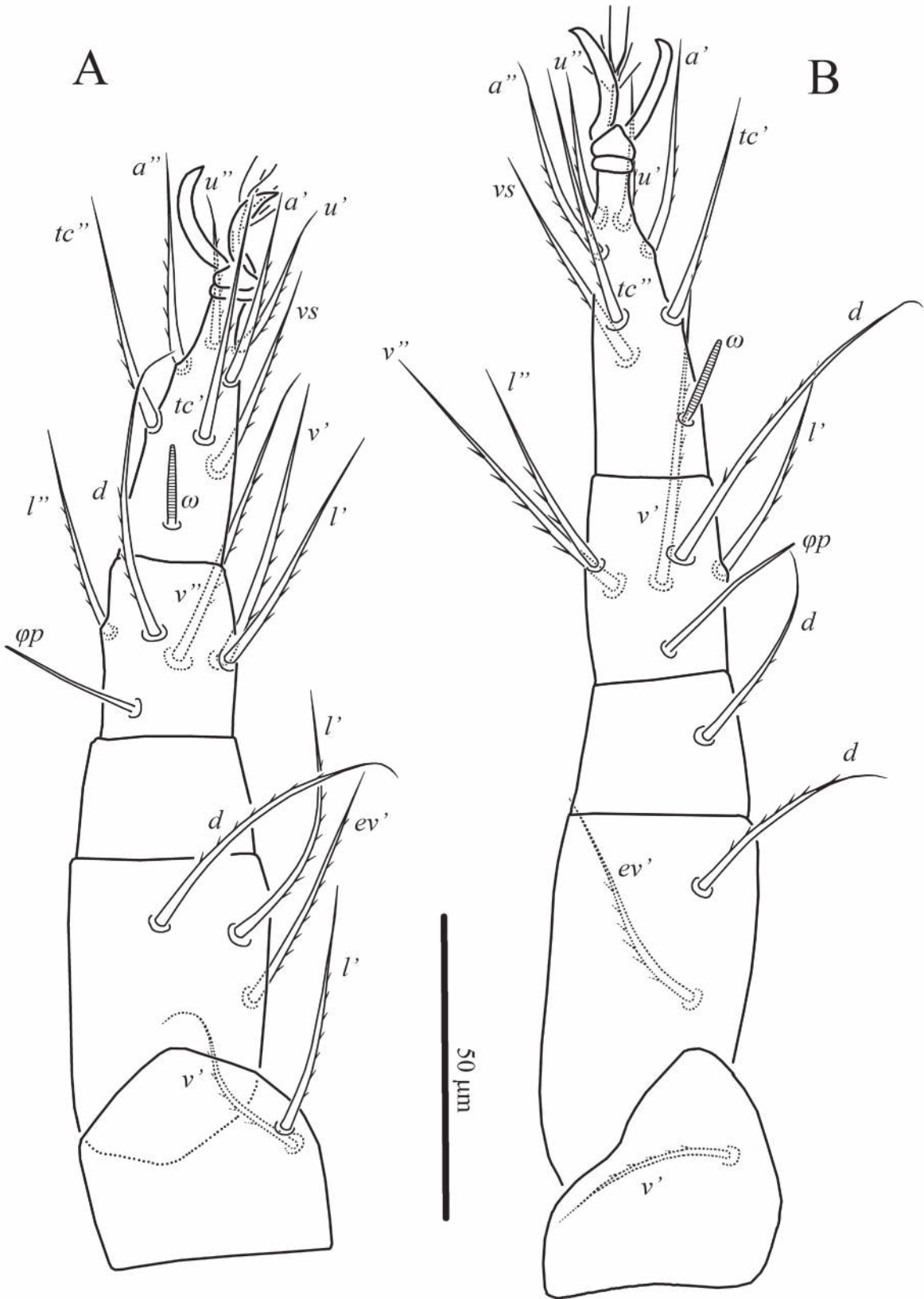


Fig. 4. *Stigmaeus neosolidus* sp.n., female: A—left leg III, dorsal aspect; B—left leg IV, dorsal aspect.

125), *c2* 120 (110–120), *d1* 145 (110–145), *d2* 130 (125–135), *e1* 160 (150–160), *e2* 160 (145–160), *f160* (150–160), *h1* 105 (105–125), *h2* 87 (85–95).

Idiosomal venter (Fig. 1B). Aggenital plate with weak subcuticular reticulation. All ventral setae pointed and weakly barbed. Aggenital plate

with three pairs of aggenital setae; one pair of genital setae. Lengths of ventral setae: *1a* 28 (27–27), *1b* 29 (27–29), *1c* 34 (30–34), *2b* 30 (29–31), *2c* 32 (32–34), *3a* 27 (26–28), *3b* 27 (24–27), *3c* 28 (24–28), *4a* 25 (24–26), *4b* 24 (23–25), *4c* 26 (24–26), *ag1* 23 (22–24), *ag2* 24 (23–26), *ag3* 27 (26–29), *g* 21 (21–24), *ps1* 45 (42–46), *ps2* 35 (34–37), *ps3* 31 (30–32).

Gnathosoma (Fig. 2). Tibial claw large, slightly shorter than palptarsus. Setae *l'* on palpal tibia short, spiniform. All setae of femur, genu and tibia pointed. All setae of femur, genu and tibia and seta *va* of tarsus 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 ω). Palpal supracoxal setae (*ep*) thin, almost setiform, with slightly rounded tip. Rostrum of subcapitulum relatively long. All subcapitular setae pointed and barbed. Basal part of subcapitulum without distinct reticulation, smooth. Lengths of subcapitular setae: *m* 34 (33–35), *n* 24 (22–25), *or1* 26 (23–26), *or2* 29 (28–31). Length of palps 120 (115–120); length of cheliceral stylets 77 (76–78), length of tarsal solenidion ω 10 (9–10).

Legs (Figs. 3, 4). Lengths of legs: I 215 (195–220), II 180 (175–185), III 170 (165–175), IV 195 (185–200). Leg segments without distinct reticulation. Empodial raylets with pointed tips. Leg I (Fig. 3A). Coxae I posterodorsally with short setiform 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* ζ , *l'*, *l''*, *v'*, *v''*, ϕ , $\phi\phi$), 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 pointed and sparsely barbed; Seta *d* of genu slightly shorter than seta *k* 45 (41–48). Solenidion ω 26 (15–26) digitiform; solenidion ϕ 13 (9–13) baculiform, $\phi\phi$ 34 (23–34) attenuate, with rounded tip. Leg II (Fig. 3B). Leg setation: Tr 1 (*v'*), Fe 5 (*d*, *l'*, *l''*, *v'*, *bv''*), Ge 3 (*l'*, *l''*, *k*), Ti 5(1) (*d* ζ , *l'*, *l''*, *v'*, *v''*, $\phi\phi$), 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 pointed and sparsely barbed. Solenidion ω 22 (21–22) digitiform; solenidion $\phi\phi$ 32 (29–32) attenuate, with rounded tip. Seta *k* 11 (9–11). Seta *d* of genu absent. Leg III (Fig. 4A). Leg setation: Tr 2 (*v'*, *l'*), Fe 3 (*d*, *l'*, *ev'*), Ge 0, Ti 5(1) (*d*, *l'*, *l''*, *v'*, *v''*, $\phi\phi$), Ta 7(1) (*tc'*, *tc''*, *u'*, *u''*, *a'*, *a''*, *vs*, ω). Solenidion ω 13 (13) digitiform; solenidion $\phi\phi$ 26

(23–26) attenuate, with rounded tip. All setae pointed and sparsely barbed. Leg IV (Fig. 4B). Leg setation: Tr 1 (*v'*), Fe 2 (*d*, *ev'*), Ge 1 (*d*), Ti 5(1) (*d*, *l'*, *l''*, *v'*, *v''*, $\phi\phi$), Ta 7(1) (*tc'*, *tc''*, *u'*, *u''*, *a'*, *a''*, *vs*, ω). Solenidion ω 14 (14) digitiform; solenidion $\phi\phi$ 26 (25–27) attenuate, with rounded tip. All setae pointed and sparsely barbed.

Male and Immatures unknown.

Type material. Female holotype, slide № ZISP T-St-007, Ust-Koksa District, 50°17'00.4"N 85°30'03.4"E, 1,000 m a.s.l., in litter under *Picea obovata*, 12 June 2022, coll. A. A. Khaustov; paratypes: 5 females, same data.

Type deposition. The holotype and three paratypes are deposited in the collection of the Zoological Institute of RAS, Saint Petersburg, Russia; other paratypes are deposited in the collection of the Tyumen State University Museum of Zoology, Tyumen, Russia.

Etymology. The name of the new species is a combination of two words: Greek *neos*, meaning “new”, and *solidus*, the specific epithet of the closest species.

Differential diagnosis. The new species is most similar to *S. solidus* Kuznetsov, 1977 in having three pairs of setae on the central hysterosomal shield, a similar shape of the dorsal idiosomal setae, absence of ocelli and in the dorsal shields being clearly reticulated. The new species differs from *S. solidus* in setae *hl* having very thin pointed tips (vs. almost brush-like distally in *S. solidus*); three setae on genu I (seta *d* absent) (vs. four setae in *S. solidus*); and in the absence of seta *d* on genu III (vs. present in *S. solidus*).

Stigmaeus altaicus sp.n.

(Figs. 5–8, 9B–D)

Description. *Female* (Figs. 5–8, 9B–D). Idiosoma ovate. Length of idiosoma 450 (395–450), maximum width 325 (275–325).

Idiosomal dorsum (Figs. 5A, 9A). Central shield with three pairs of setae *cl*, *dl* and *el*; median zonal and intercalary shields paired. All shields with distinct subcuticular reticulation and dorsal dimples. Postocular bodies poorly visible as small diffuse area with tiny puncta (Fig. 9C). Ocelli absent. Striation anterolaterad prodorsal plate without microtubercles. Setae *c2* attenuate and pointed; setae *vi* weakly blunt-tipped and sparsely barbed; other dorsal setae stiff, with widened brush-like distal part (Figs. 9C, D); one specimen with setae *sci* attenuate and pointed

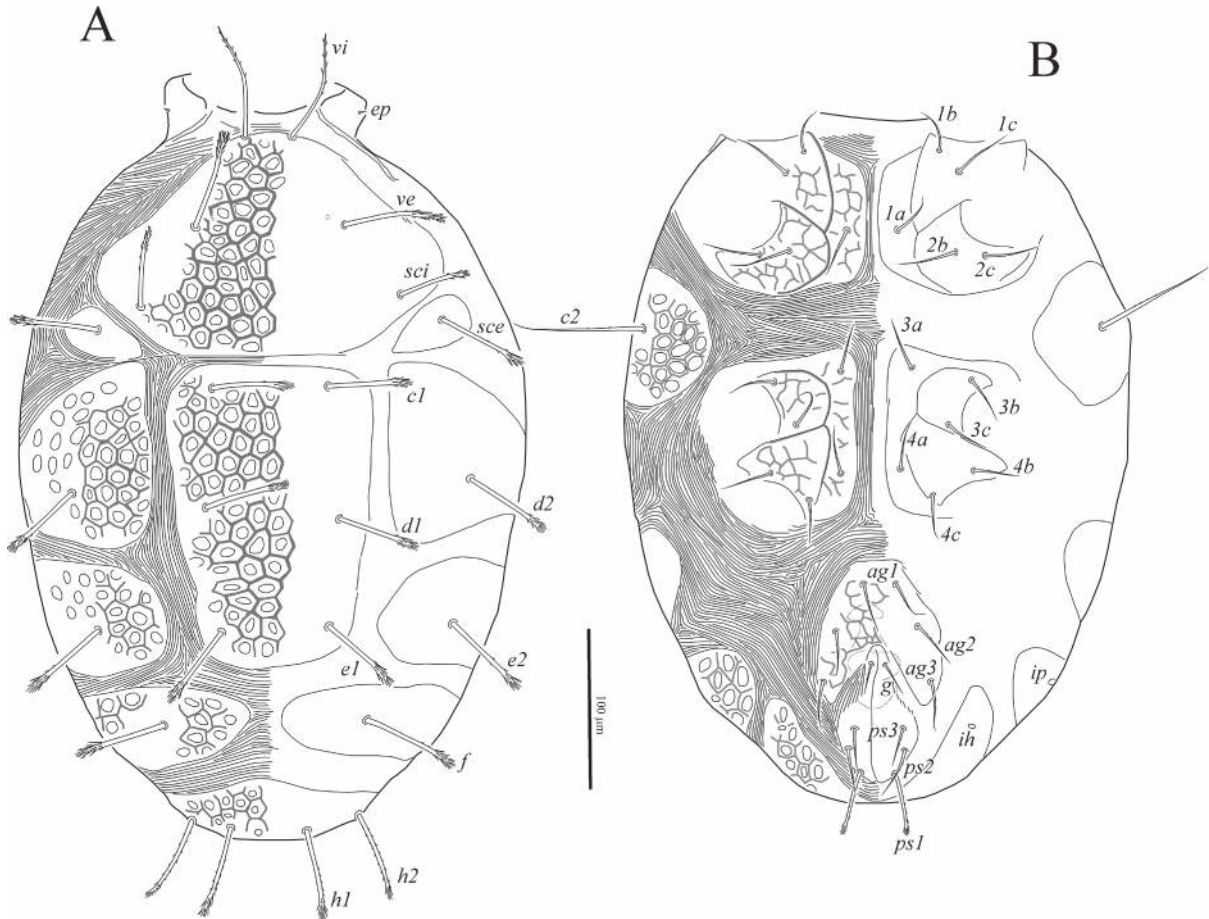


Fig. 5. *Stigmaeus altaicus* sp.n., female: A—dorsum of idiosoma; B—venter of idiosoma.

(Fig. 9B). Cupules *ip* and *ih* poorly visible on ventrolateral parts of intercalary and suranal shields, respectively. Setae *ps1* located ventrally. Lengths of dorsal setae: *vi* 73 (68–73), *ve* 67 (69–16760), *sci* 48 (47–48), *sce* 56 (56–83), *c1* 54 (48–58), *c2* 83 (80–84), *d1* 54 (49–56), *d2* 59 (49–59), *e1* 56 (49–58), *e2* 60 (52–60), *f* 60 (56–61), *h1* 60 (54–61), *h2* 59 (50–59).

Idiosomal venter (Fig. 5B). Aggenital, endopodal and coxisternal plates I–IV with distinct subcuticular reticulation. Setae *ps1* brush-like distally, other ventral setae pointed and weakly barbed. Aggenital plate with three pairs of aggenital setae; one pair of genital setae. Lengths of ventral setae: *1a* 33 (29–34), *1b* 30 (30–33), *1c* 40 (36–44), *2b* 41 (36–42), *2c* 37 (30–39), *3a* 32 (30–32), *3b* 31 (27–34), *3c* 34 (25–34), *4a* 32 (28–32), *4b* 32 (29–32), *4c* 28 (26–28), *ag1* 32 (27–32), *ag2* 32 (29–35), *ag3* 34 (26–34), *g* 21 (19–21), *ps1* 41 (36–41), *ps2* 34 (28–34), *ps3* 27 (23–29).

Gnathosoma (Fig. 6). Tibial claw large, as long as palptarsus. Setae *l'* on palpal tibia short spiniform. All setae of femur, genu and tibia pointed.

All setae of femur, genu and tibia and seta *va* of tarsus 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 *ω*). Palpal supracoxal setae (*ep*) short, spiniform. Rostrum of subcapitulum relatively long. All subcapitular setae pointed; setae *or1* smooth, other subcapitular setae barbed. Basal part of subcapitulum with weak reticulation. Lengths of subcapitular setae: *m* 33 (29–36), *n* 28 (24–32), *or1* 22 (20–22), *or2* 34 (29–34). Length of palps 115 (105–115); length of cheliceral stylets 70 (62–70), length of tarsal solenidion *ω* 9 (9–10).

Legs (Figs. 7, 8). Lengths of legs: I 225 (205–225), II 200 (175–200), III 190 (175–200), IV 220 (200–220). Leg segments without distinct reticulation. Empodial raylets with pointed tips. Leg I (Fig. 7A). 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_ζ, 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,*

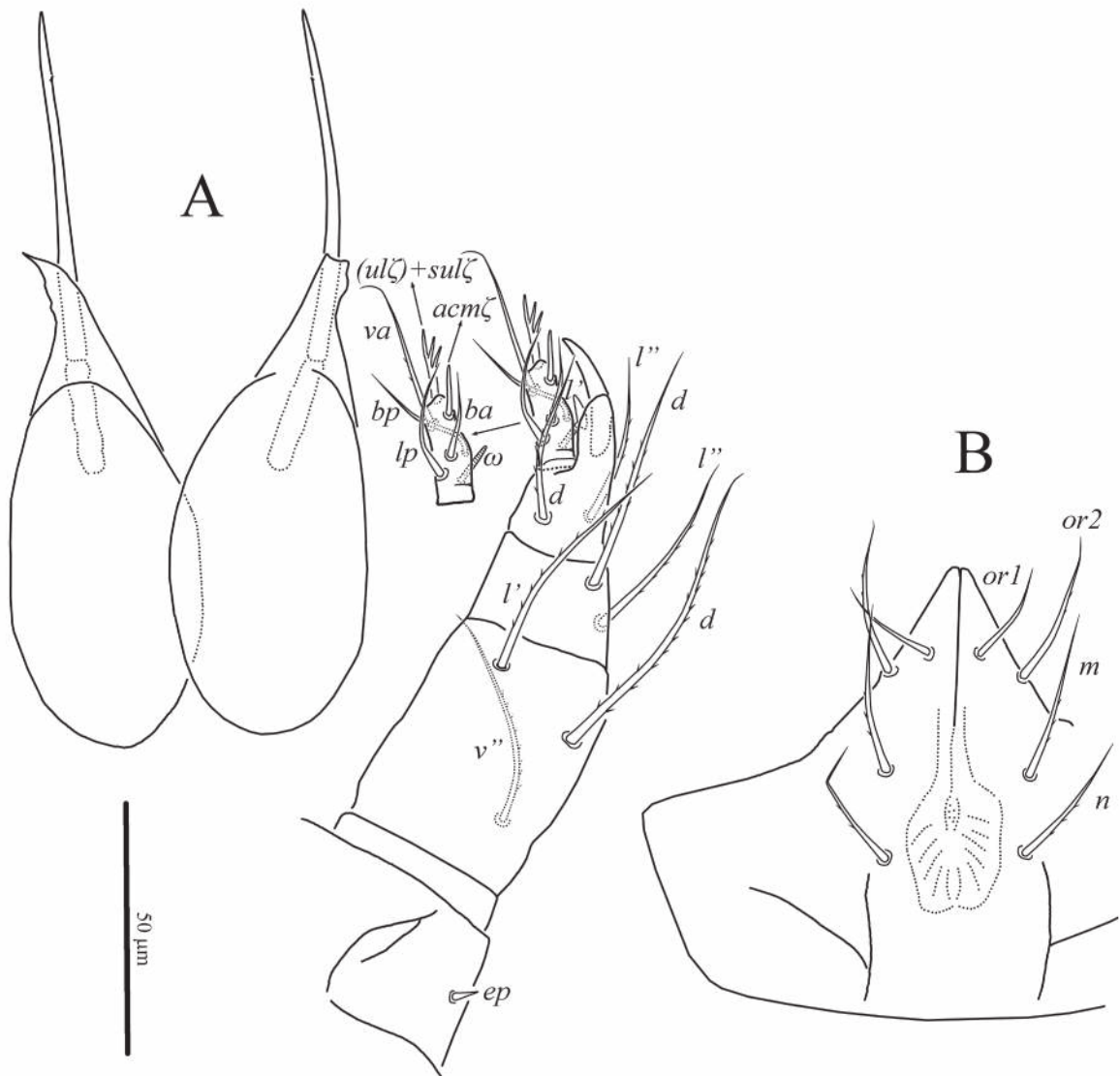


Fig. 6. *Stigmaeus altaicus* sp.n., female: A—gnathosoma, dorsal aspect; B—subcapitulum.

ω). Setae *k* of genu, *d* of tibia and (*p*), (*tc*), (*ft*) of tarsus smooth, blunt-tipped, eupathid-like; other setae sparsely barbed; seta *d* of femur with brush-like distal part, other setae pointed; seta *d* of genu slightly shorter than seta *k* 57 (47–58). Solenidion ω 29 (27–29) digitiform; solenidion ϕ 13 (11–13) baculiform, ϕp 32 (26–32) attenuate, with rounded tip. Leg II (Fig. 7B). Leg setation: Tr 1 (*v'*), Fe 5 (*d*, *l'*, *l''*, *v'*, *bv''*), Ge 4 (*d*, *l'*, *l''*, *k*), Ti 5(1) (*d* ζ , *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 sparsely barbed; seta *d* of femur weakly blunt-tipped, other setae pointed. Solenidion ω 27 (23–27) digitiform; solenidion ϕp 28 (21–28) attenuate, with rounded tip. Seta *k* 8 (7–11). Leg III (Fig. 8A). 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 14 (12–15) digitiform; solenidion ϕp 22 (16–22) attenuate, with rounded tip. All setae pointed and sparsely barbed. Leg IV (Fig. 8B). 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 14 (11–14) digitiform; solenidion ϕp 25 (18–25) attenuate, with rounded tip. All setae pointed and sparsely barbed.

Male and Immatures unknown.

Type material. Female holotype, slide № ZISP T-St-008, Kosh-Agach District, 49°57'35.0"N 88°43'05.0"E, 1,765 m a.s.l., in wet grassy soil near a small lake, 15 July 2021, coll. A.A. Khaustov; paratypes: 3 females, Kosh-Agach District, 50°03'15.0"N 88°26'15.0"E, 1,765 m a.s.l., in wet

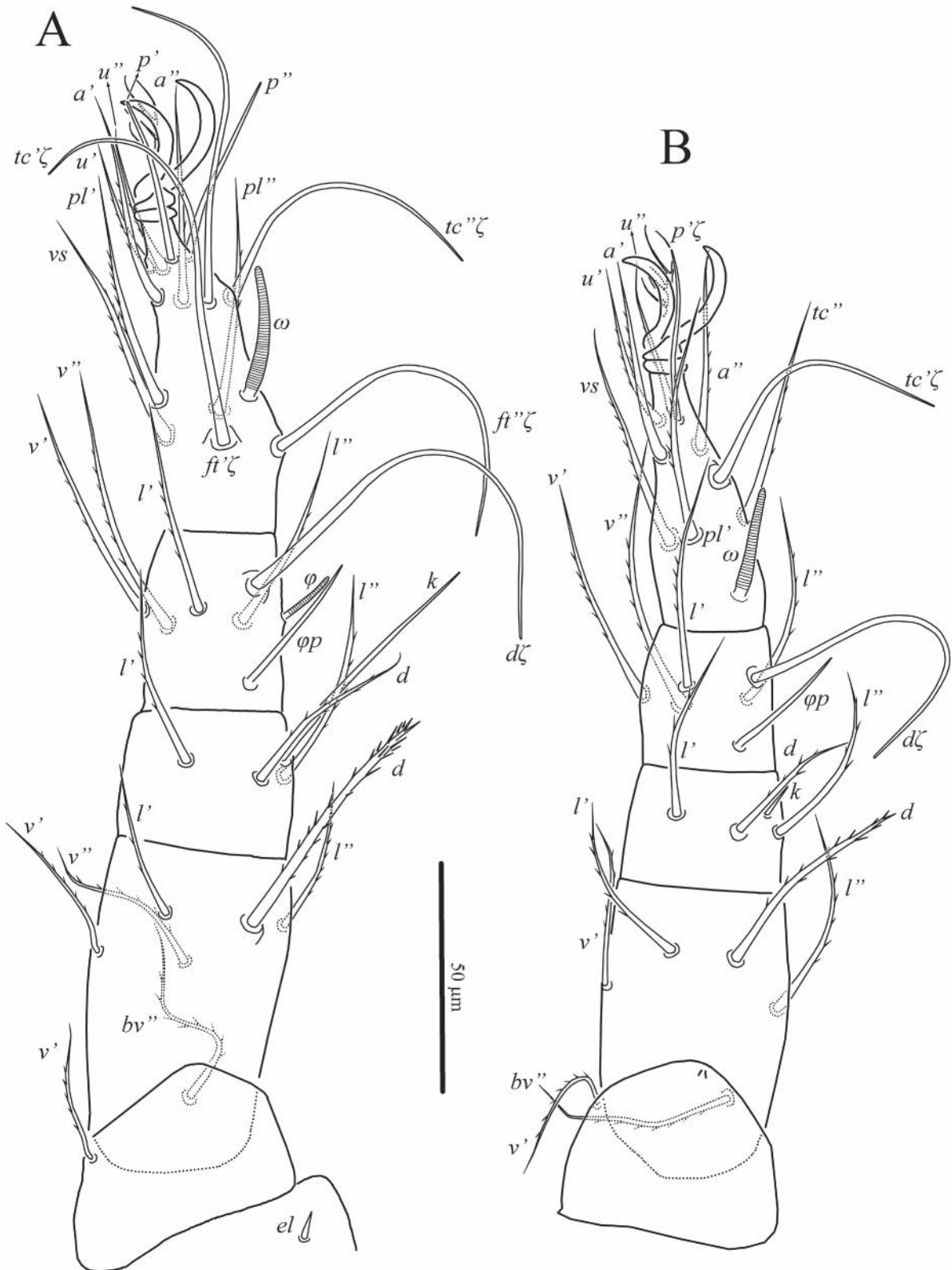


Fig. 7. *Stigmaeus altaicus* sp.n., female: A—right leg I, dorsal aspect; B—right leg II, dorsal aspect.

grassy soil near the Chuya River, 15 July 2021, coll. A.A. Khaustov.

Type deposition. The holotype is deposited in the collection of the Zoological Institute of RAS, Saint Petersburg, Russia; all paratypes are depos-

ited in the collection of the Tyumen State University Museum of Zoology, Tyumen, Russia.

Etymology. The name of the new species refers to its geographical distribution in the Altai Mountains.

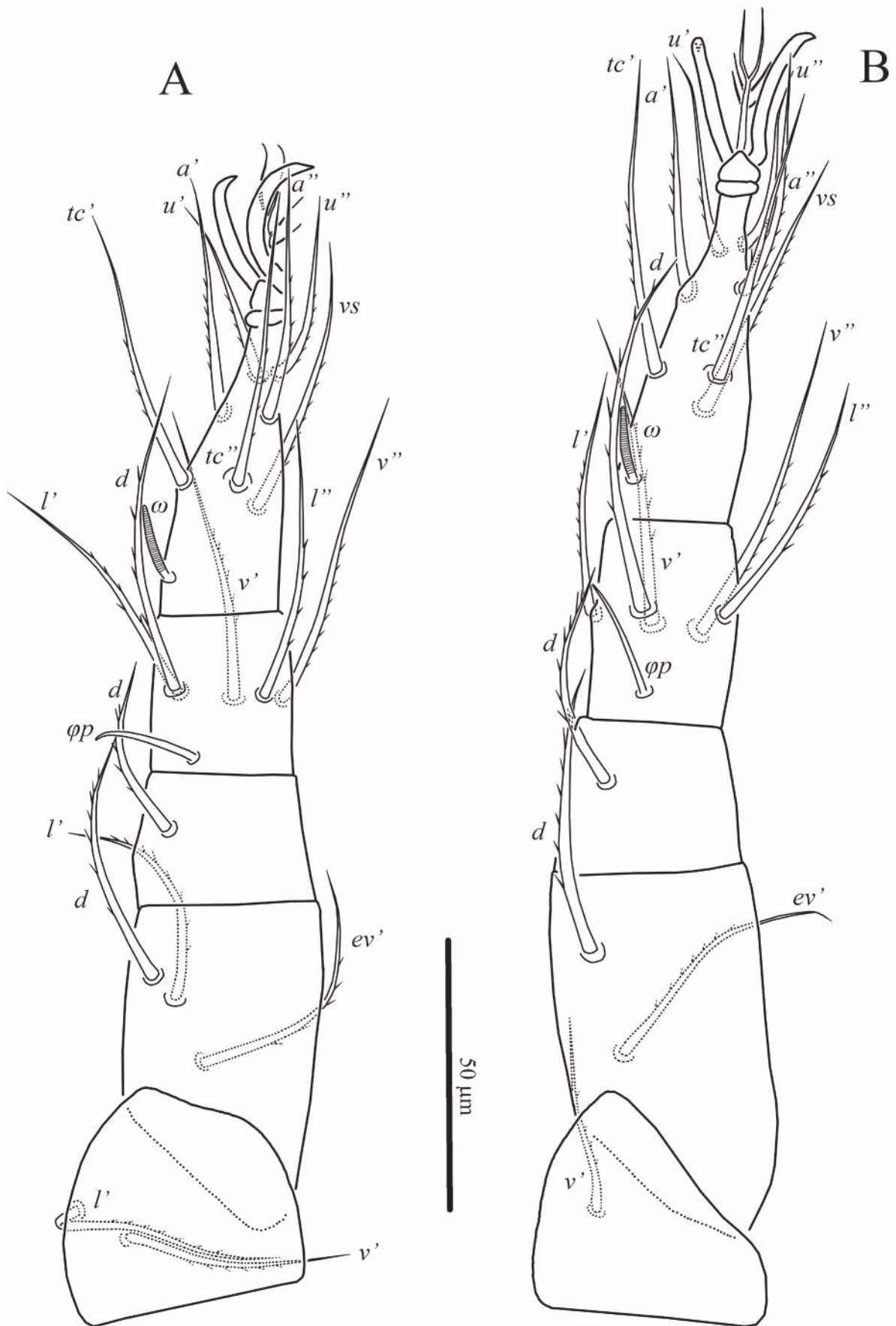


Fig. 8. *Stigmaeus altaicus* sp.n., female: A—right leg III, dorsal aspect; B—right leg IV, dorsal aspect.

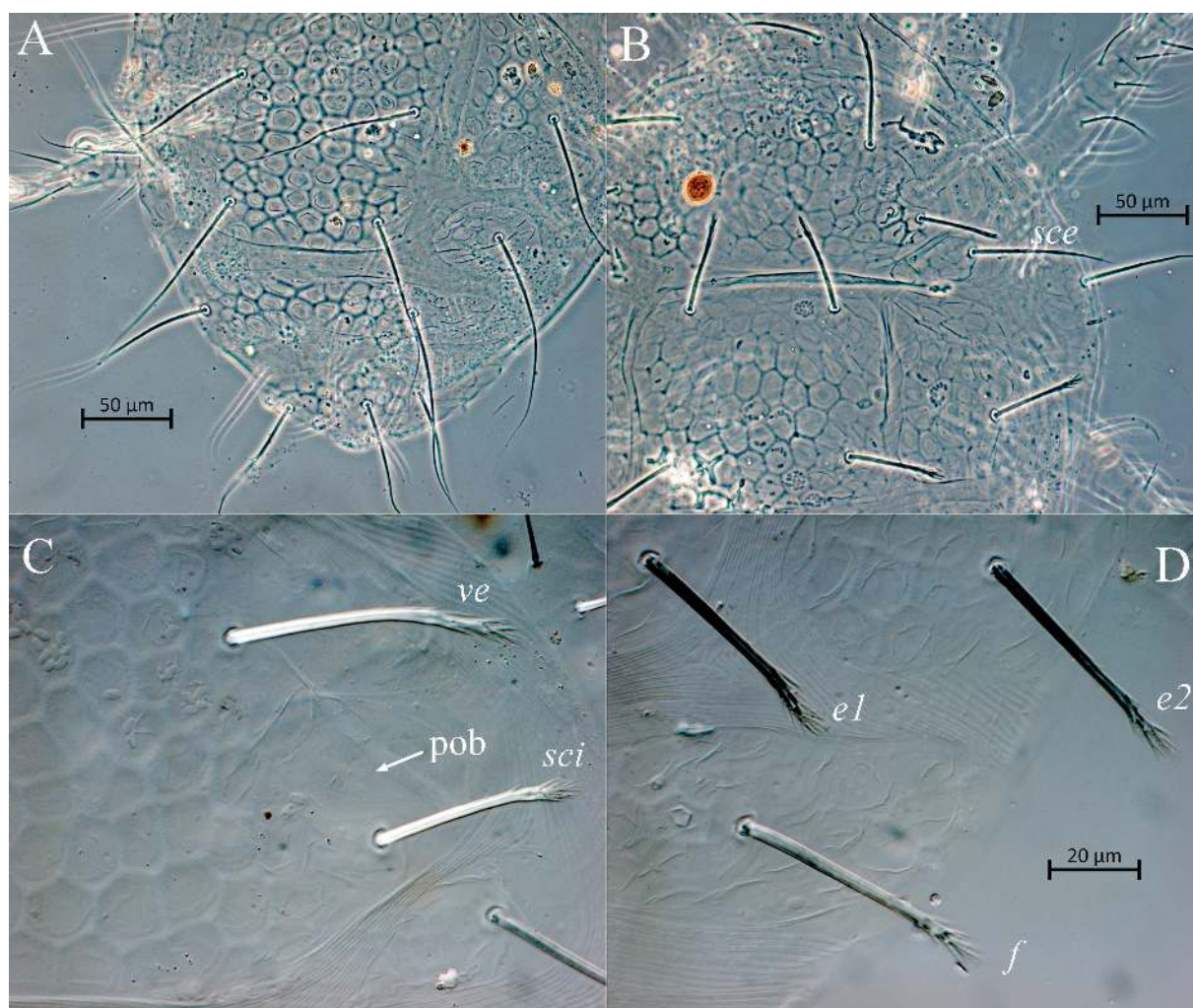


Fig. 9. Phase contrast (A, B) and DIC (C, D) photomicrographs of females of *Stigmaeus neosolidus* sp.n. (A) and *S. altaicus* sp.n. (B–D): A—hysterosoma, dorsal aspect; B—podosoma, dorsal aspect; C—lateral part of prodorsal shield: pob—postocular body; D—setae *e1*, *e2* and *f*.

Differential diagnosis. The new species is most similar to *S. scaber* Summers, 1962, *S. tianmuensis* Hu and Liang, 1995 and *S. grandis* Khaustov, Ueckermann and Theron, 2017 in having three pairs of setae on the central hysterosomal shield, a similar shape of the dorsal idiosomal setae, absence of ocelli and in the dorsal shields being clearly reticulated. The new species differs from *S. tianmuensis* in having four setae on genu I (vs. three in *S. tianmuensis*) and pointed attenuate setae *c2* (vs. *c2* blunt, distinctly barbed in the distal part in *S. tianmuensis*). The new species differs from *S. scaber* in having distinctly shorter dorsal idiosomal setae, setae *ve* distinctly brush-like distally (vs. pointed in *S. scaber*), dorsal hysterosomal setae distinctly widened and brush-like distally (vs. not widened, sparsely barbed in *S. scaber*) and in seta *l'* on palptibia being short and spiniform (vs.

almost setiform, elongate or bifurcate in *S. scaber*). The new species differs from *S. grandis* in setae *ve* being distinctly brush-like distally (vs. pointed in *S. grandis*) and setae *c2* being pointed (vs. brush-like distally in *S. grandis*).

Stigmaeus fusus Summers, 1962

Stigmaeus fusus, Summers, 1962: 512

This species was described from the USA (Summers 1962). It was also recorded from Poland (Laniecki *et al.* 2021) and from the Tyumen Region of Russia (Khaustov 2021b).

This article presents the first record of *S. fusus* from the Altai Republic.

Material examined. Two females, Kosh-Agach District, 49°57'35.0"N 88°43'05.0"E, 1,765 m a.s.l., in wet grassy soil near a small lake, 15 July 2021, coll. A.A. Khaustov.

Genus *Ledermuelleriopsis* Willmann, 1953

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

Ledermuelleriopsis ariyai Khanjani, Mohammadi, Chiasi, Izadi and Mirmoayedi, 2012

Ledermuelleriopsis ariyai Khanjani *et al.*, 2012: 564 (Figs. 10–14)

Redescription. *Female* (Figs. 10–14). Idiosoma elongate-ovate. Length of idiosoma 285, maximum width 175.

Idiosomal dorsum (Figs. 10A, 14A, C, D). All dorsal shields poorly sclerotized, with hardly visible dimples in lateral parts, without vacuoles

(Figs. 14 C, D). Prodorsal shield with four pairs of setae: *vi*, *ve*, *sci*, and *sce* (Fig. 14C). Ocelli present. Postocular bodies absent. Hysterosomal dorsum with three shields; anterior shield with three pairs of setae: *c1*, *d1*, and *d2*; second hysterosomal shield with three pairs of setae: *f*, *e1*, and *e2*; and suranal shield with two pairs of setae: *h1* and *h2*. Interscutal striae smooth. All dorsal setae short, barbed; baculiform. Cupules not evident. Lengths of dorsal setae: *vi* 12, *ve* 19, *sci* 13, *sce* 15, *c1* 15, *c2* 21, *d1* 12, *d2* 13, *e1* 15, *e2* 14, *f* 21, *h1* 16, *h2* 19.

Idiosomal venter (Figs. 10B, 14B). All ventral plates smooth. Endopodal plates I–II and III–IV fused medially; endopodal plates III–IV with large oval finely punctate area located between setae *3a* and *4a*. Three pairs of aggenital setae. Setae *ps1*

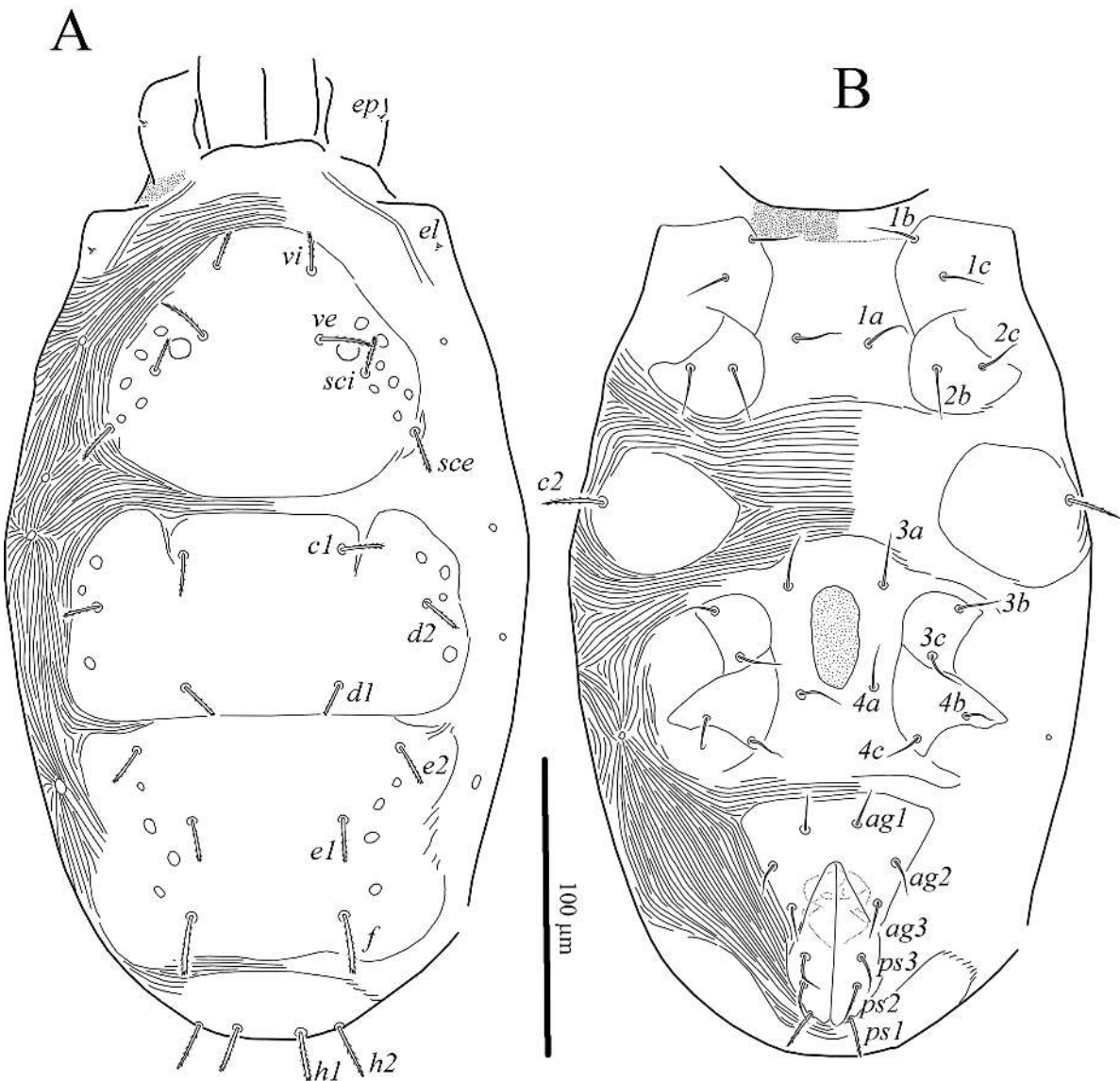


Fig. 10. *Ledermuelleriopsis ariyai* Khanjani *et al.*, 2012, female: A—dorsum of idiosoma; B—venter of idiosoma.

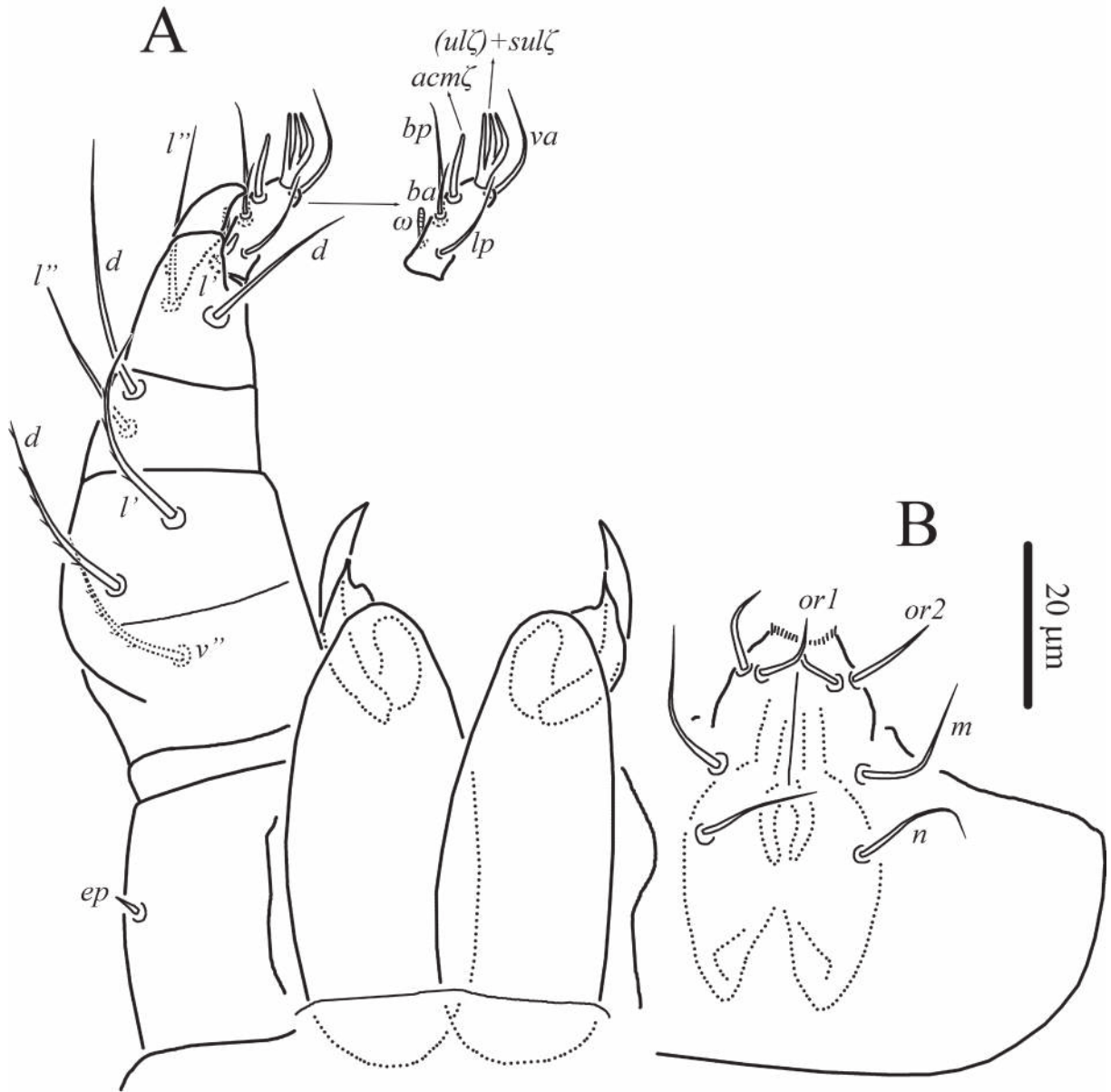


Fig. 11. *Ledermuelleriopsis ariyai* Khanjani *et al.*, 2012, female: A—gnathosoma, dorsal aspect; B—subcapitulum.

baculiform, barbed; setae *ps2* and *ps3* pointed and weakly barbed; other ventral setae smooth. Lengths of ventral setae: *1a* 15, *1b* 18, *1c* 14, *2b* 20, *2c* 16, *3a* 19, *3b* 15, *3c* 14, *4a* 15, *4b* 15, *4c* 13, *agl* 12, *ag2* 12, *ag3* 13, *ps1* 15, *ps2* 16, *ps3* 14.

Gnathosoma (Fig. 11). Tibial claw about as long as palptarsus. Setae *l'* on palpal tibia short, spiniform. Distal eupathidia (*ul*) and *sul* fused only near base. All setae of femur, genu and tibia pointed. All setae of femur weakly barbed, other palpal setae smooth. Number of setae on palpal segments: Tr 0, Fe 2 (*d*, *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 ω). Palpal supracoxal setae (*ep*)

short, spine-like. Rostrum of subcapitulum relatively long, distally, with row of very short projections. All subcapitular setae smooth and pointed. Lengths of subcapitular setae: *m* 18, *n* 15, *or1* 10, *or2* 11. Length of palps 80; length of cheliceral stylets 28, length of tarsal solenidion ω 5.

Legs (Figs. 12, 13). Lengths of legs: I 145, II 110, III 110, IV 130. Empodial raylets with widened tips. Leg I (Fig. 12A). Coxae I posterodorsally, with short spine-like 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 , *pl'*, *pl''*, *u'*, *u''*, *a'*, *a''*, *vs*, ω). Setae *k* of genu and (*p*), (*tc*), (*ft*)

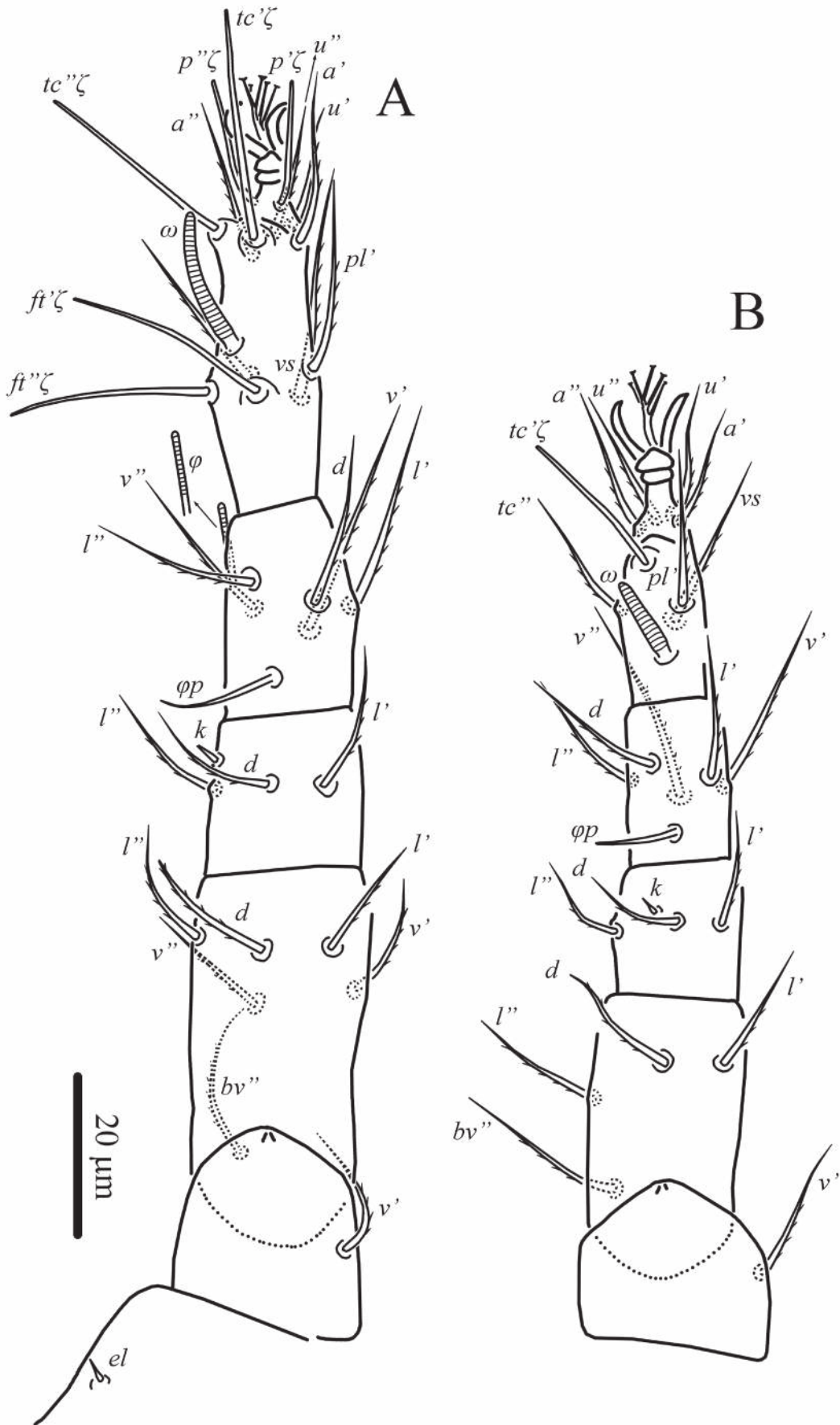


Fig. 12. *Ledermuelleriopsis ariyai* Khanjani *et al.*, 2012, female: A—left leg I, dorsal aspect; B—left leg II, dorsal aspect.

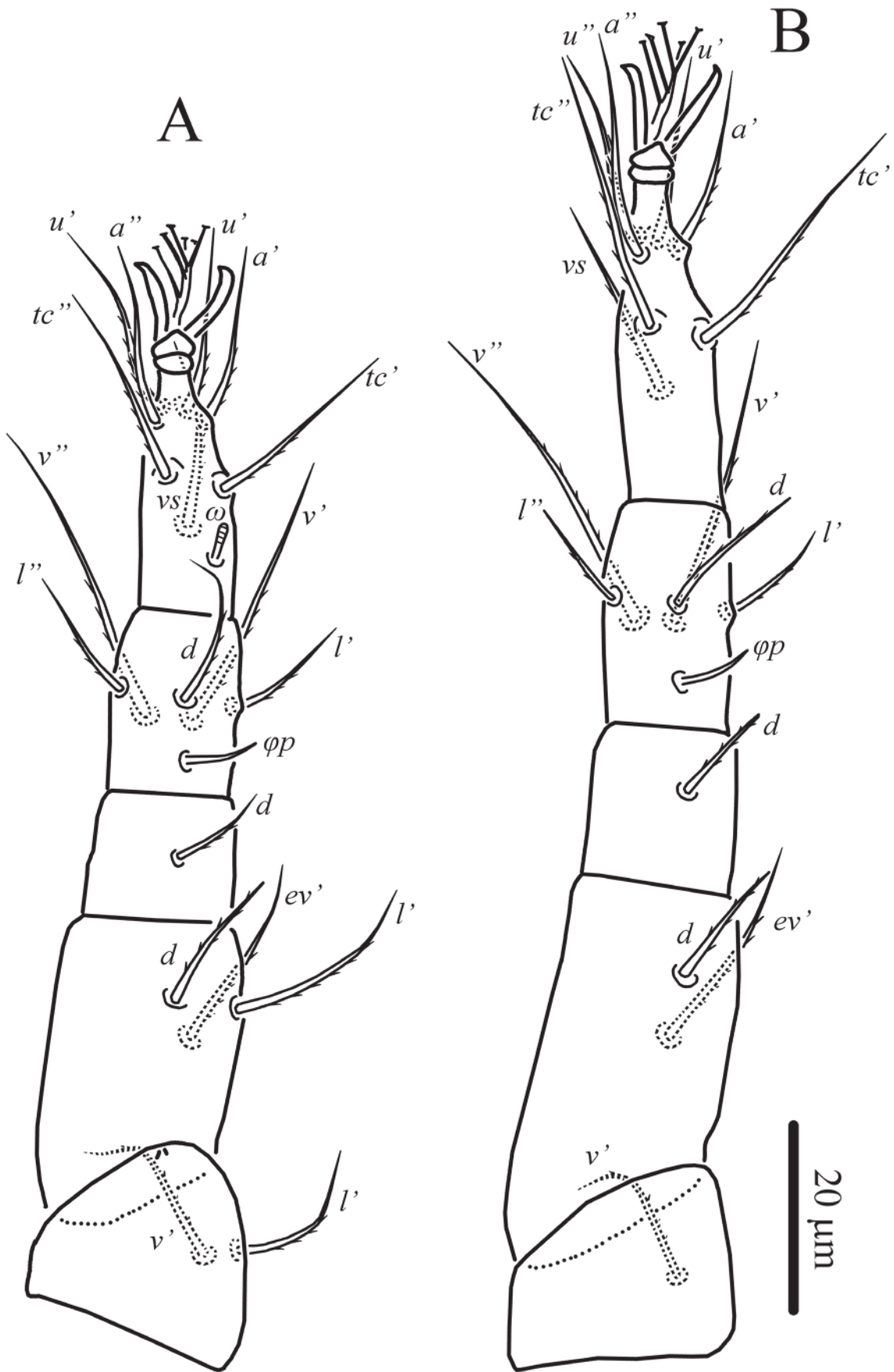


Fig. 13. *Ledermuelleriopsis ariyai* Khanjani *et al.*, 2012, female: A—left leg III, dorsal aspect; B—left leg IV, dorsal aspect.

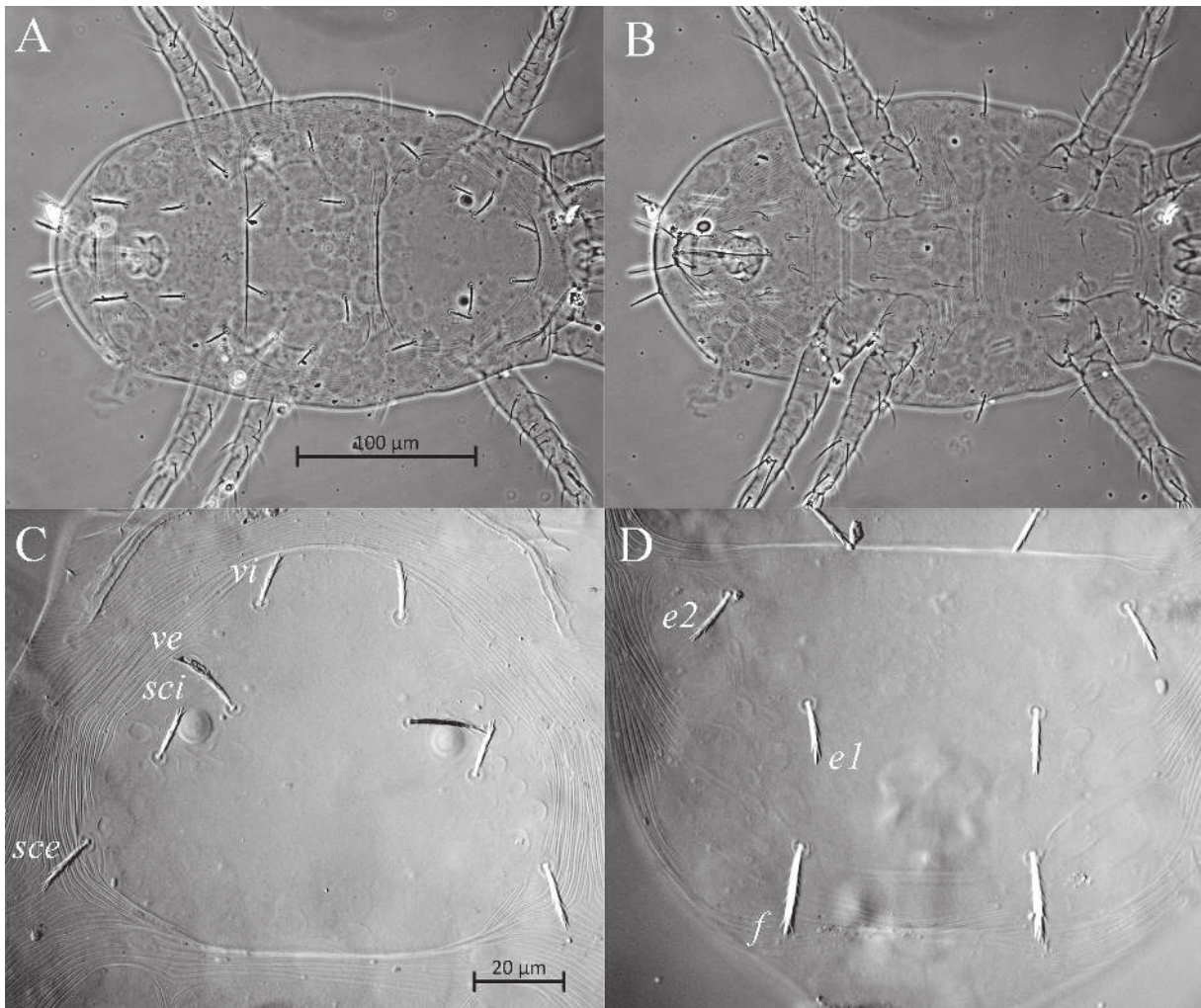


Fig. 14. Phase contrast (A, B) and DIC (C, D) photomicrographs of female of *Ledermuelleriopsis ariyai* Khanjani *et al.*, 2012: A—dorsum of idiosoma; B—venter of idiosoma; C—prodorsal shield; D—hysterosoma, dorsal aspect.

of tarsus smooth, blunt-tipped, eupathid-like; other setae sparsely barbed; seta *d* of femur blunt-tipped, other setae pointed. Seta *k* 3 spine-like. Solenidion ω 17 digitiform; solenidion ϕ baculiform, solenidion $\phi\phi$ 14 attenuate, with rounded tip. Leg II (Fig. 12B). 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''*, $\phi\phi$), Ta 8(1) (*tc'*, *tc''*, *u'*, *u''*, *a'*, *a''*, *pl'*, *vs*, ω). Setae *k* of genu, *tc'* of tarsus smooth, blunt-tipped, eupathid-like, other setae barbed and pointed; seta *d* of femur weakly blunt-tipped. Solenidion ω 10 digitiform; solenidion $\phi\phi$ 10 attenuate, with rounded tip. Seta *k* 3 spine-like. Leg III (Fig. 13A). Leg setation: Tr 2 (*l'*, *v'*), Fe 3 (*d*, *l'*, *ev'*), Ge 1 (*d*), Ti 5(1) (*d*, *l'*, *l''*, *v'*, *v''*, $\phi\phi$), Ta 7(1) (*tc'*, *tc''*, *u'*, *u''*, *a'*, *a''*, *vs*, ω). Solenidion ω 4 digitiform; solenidion $\phi\phi$ 8 attenuate, with rounded tip. All setae barbed. Seta *d* of femur weakly blunt-tipped, other setae pointed. Leg IV (Fig. 13B).

Leg setation: Tr 1 (*v'*), Fe 2 (*d*, *ev'*), Ge 1 (*d*), Ti 5(1) (*d*, *l'*, *l''*, *v'*, *v''*, $\phi\phi$), Ta 7 (*tc'*, *tc''*, *u'*, *u''*, *a'*, *a''*, *vs*). Solenidion ω absent; solenidion $\phi\phi$ 8 attenuate, with rounded tip. All setae barbed; setae *d* of femur and genu weakly blunt-tipped, other setae pointed.

Male and Immatures unknown.

Material examined. One female, Kosh-Agach District, 50°10'05.7"N 88°11'37.0"E, 1,680 m a.s.l., in dry steppe soil, 13 June 2022, coll. A.A. Khaustov.

Remarks. This species was described from Iran (Khanjani *et al.* 2012). This is the first record of *L. ariyai* from Russia. The single available female from Russia differs from the original description of *L. ariyai* in the presence of poorly visible dimples on the lateral parts of the dorsal shields (*vs.* only on the prodorsal shield in the original description) and in the presence of a large,

finely punctate area on endopodal plates III–IV (vs. absent in the original description). Both of these characters are difficult to discern in poorly sclerotized mites and most likely were missed in the original description.

Genus *Eustigmaeus* Berlese, 1910

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

Eustigmaeus lacunus (Summers, 1957)

Ledermuelleria lacuna Summers, 1957: 53

Eustigmaeus lacuna: Wood, 1973: 82

Eustigmaeus lacunus: Fan *et al.*, 2016: 74

(Figs. 15–30)

Description. *Female* (Figs. 15–18, 21A–D). Idiosoma broadly-ovate. Length of idiosoma 415–460, maximum width 355–395.

Idiosomal dorsum (Figs. 15A, 21A, B). Prodorsal and hysterosomal shields almost completely covering dorsal idiosoma. Dorsal idio-

somal setae baculiform, weakly barbed, with rounded tips; their tips without distinct hyaline sheaths. Dorsal shields with distinct round dimples and tiny puncta (Fig. 21A, B); lateral parts of dorsal shields weaker sclerotized than central parts and with weak subcuticular reticulation. Ocelli present. Suranal shield located ventrally. Two pairs of callosities present; major callosity slightly larger than minor one and located on prodorsal shield anterolaterad setae *sce*; minor callosity located on hysterosomal shield posterolaterad setae *d2*. Cupules not evident. Lengths of dorsal setae: *vi* 47–49, *ve* 59–68, *sci* 35–39, *sce* 45–51, *c1* 44–48, *c2* 32–35, *d1* 44–49, *d2* 43–45, *e1* 47–53, *e2* 38–45, *f* 55–57, *h1* 47–51, *h2* 40–48.

Idiosomal venter (Figs. 15B, 21D). Three pairs of aggenital setae. Aggenital and endopodal plates with distinct subcuticular reticulation; coxal fields I–IV punctate (Fig. 21D). All ventral setae pointed; setae *ps1* and *ps3* weakly barbed, other ventral

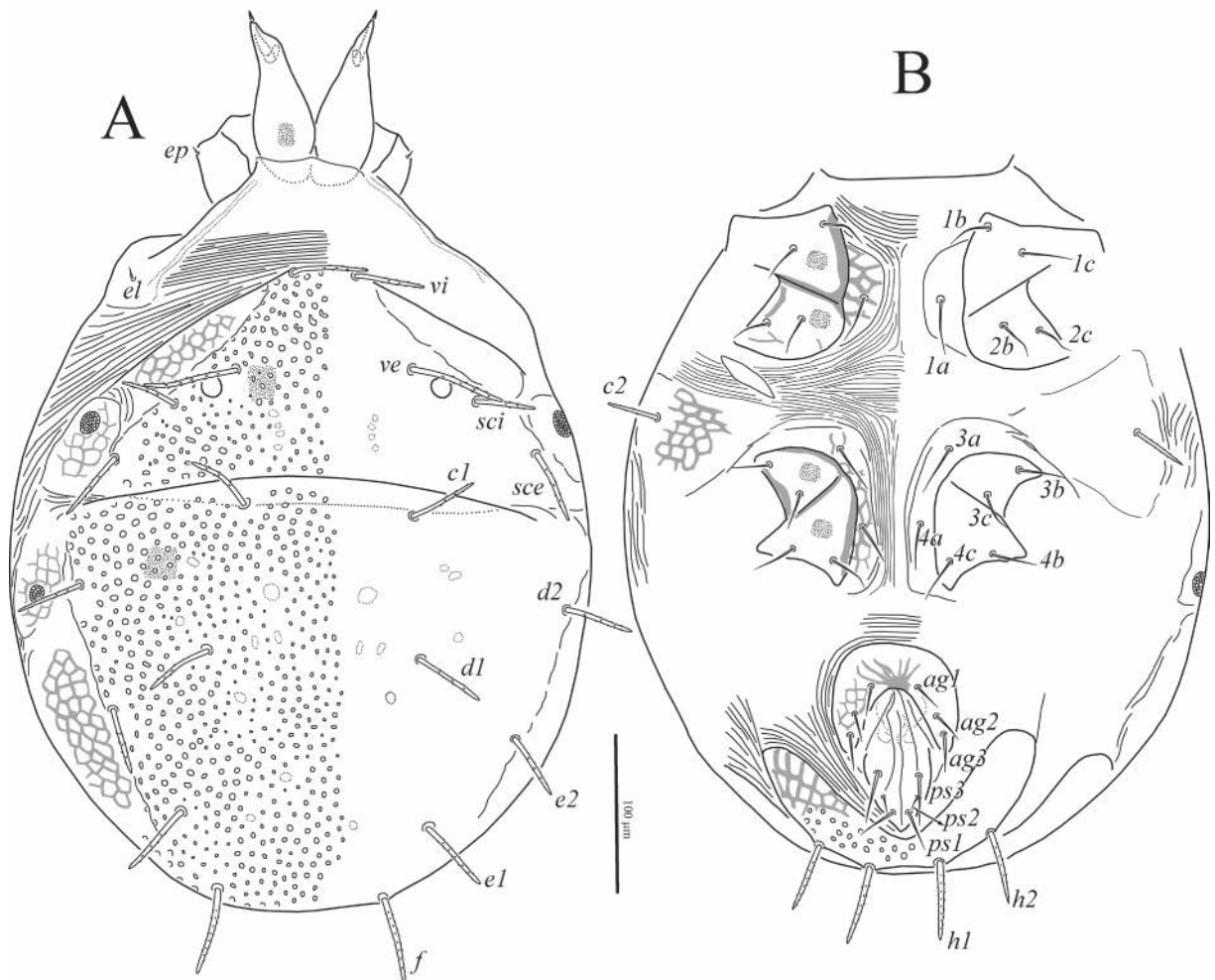


Fig. 15. *Eustigmaeus lacunus* (Summers, 1957), female: A—dorsum of idiosoma; B—venter of idiosoma.

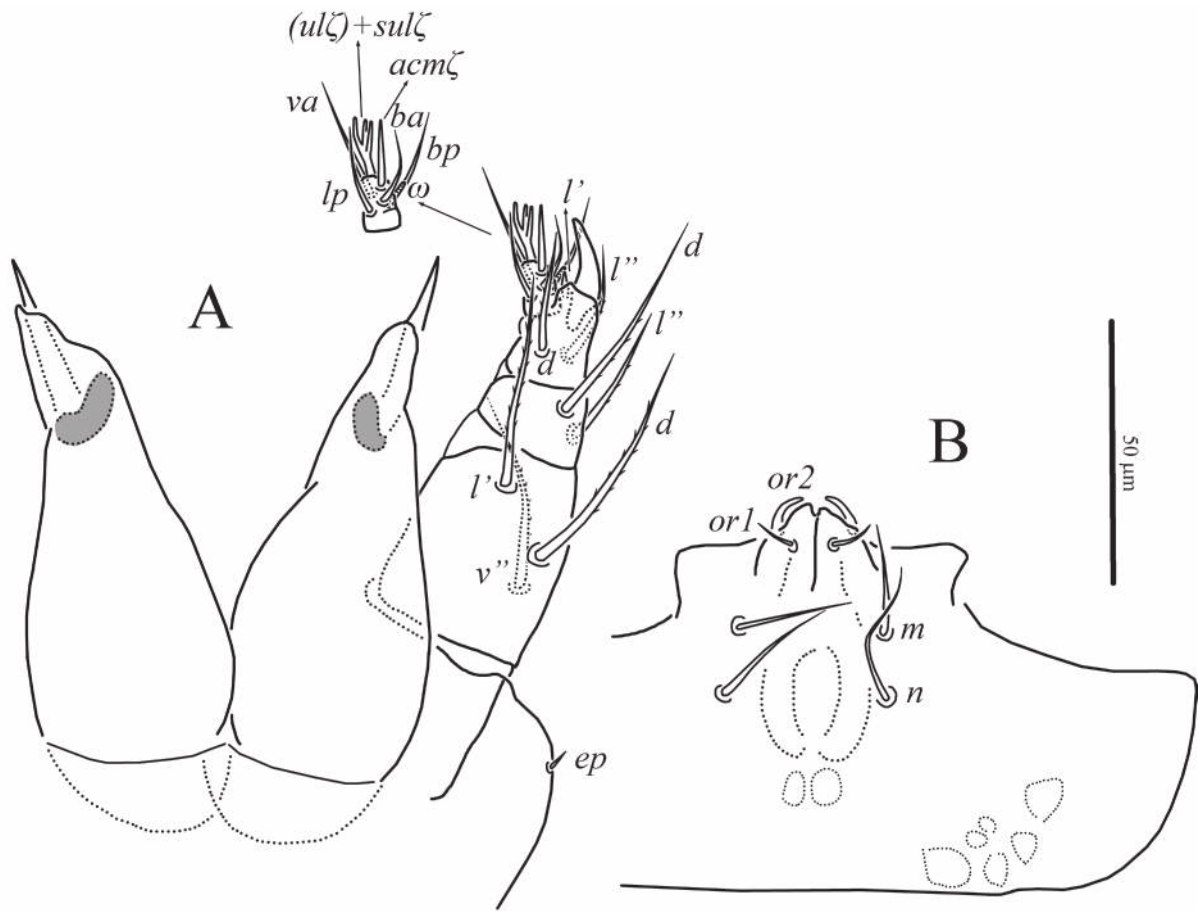


Fig. 16. *Eustigmaeus lacunus* (Summers, 1957), female: A—gnathosoma, dorsal aspect; B—subcapitulum.

setae smooth; setae *ps2* more than twice shorter than *ps1* and *ps3*. Lengths of ventral setae: *1a* 34–36, *1b* 30–33, *1c* 27–29, *2b* 25–28, *2c* 23–25, *3a* 35–37, *3b* 26–32, *3c* 26–28, *4a* 31–32, *4b* 28–32, *4c* 27–30, *ag1* 20–21, *ag2* 21–23, *ag3* 24–25, *ps1* 26–29, *ps2* 11–15, *ps3* 30–32.

Gnathosoma (Fig. 16) in non-flattened specimens usually partly or completely covered by anterior part of prodorsal shield. Tibial claw large, distinctly longer than palptarsus. Setae *l'* on palpal tibia short, spiniform, with rounded tip. All setae of femur, genu and tibia barbed; other setae of palptarsus smooth; all palpal setae (except tarsal eupathidia) pointed. 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 *ω*). Palpal supracoxal setae (*ep*) slightly thickened, with rounded tip. Rostrum of subcapitulum very short and wide (Fig. 21C). Subcapitular setae *or1* distinctly thickened and blunt-tipped, other setae pointed; all subcapitular setae smooth. Basal part of subcapitulum with densely distributed puncta

(Fig. 21C). Lengths of subcapitular setae: *m* 21–22, *n* 25–27, *or1* 8–10, *or2* 8–11; length of palps 83–87; length of cheliceral stylets 32–34; length of tarsal solenidion *ω* 7–8.

Legs (Figs. 17, 18). Lengths of legs: I 230–245, II 190–200, III 195–205, IV 220–235. Leg segments without distinct reticulation. Empodial raylets with distinctly widened tips. Leg I (Fig. 17A). 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(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, *d* and *l'* of genu blunt-tipped, other setae pointed. Seta *k* 20–21. Solenidion *ω* 28–30 digitiform; solenidion *φ* 10–11 baculiform, *φp* 32–34 attenuate, with rounded tip. Leg II (Fig. 17B). 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 barbed; setae *d* of femur and genu blunt-tipped, other setae pointed. Solenidion ω 15–16 digitiform; solenidion ϕp 23–25 attenuate,

with rounded tip. Seta *k* 7–8. Leg III (Fig. 18A). 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''*,

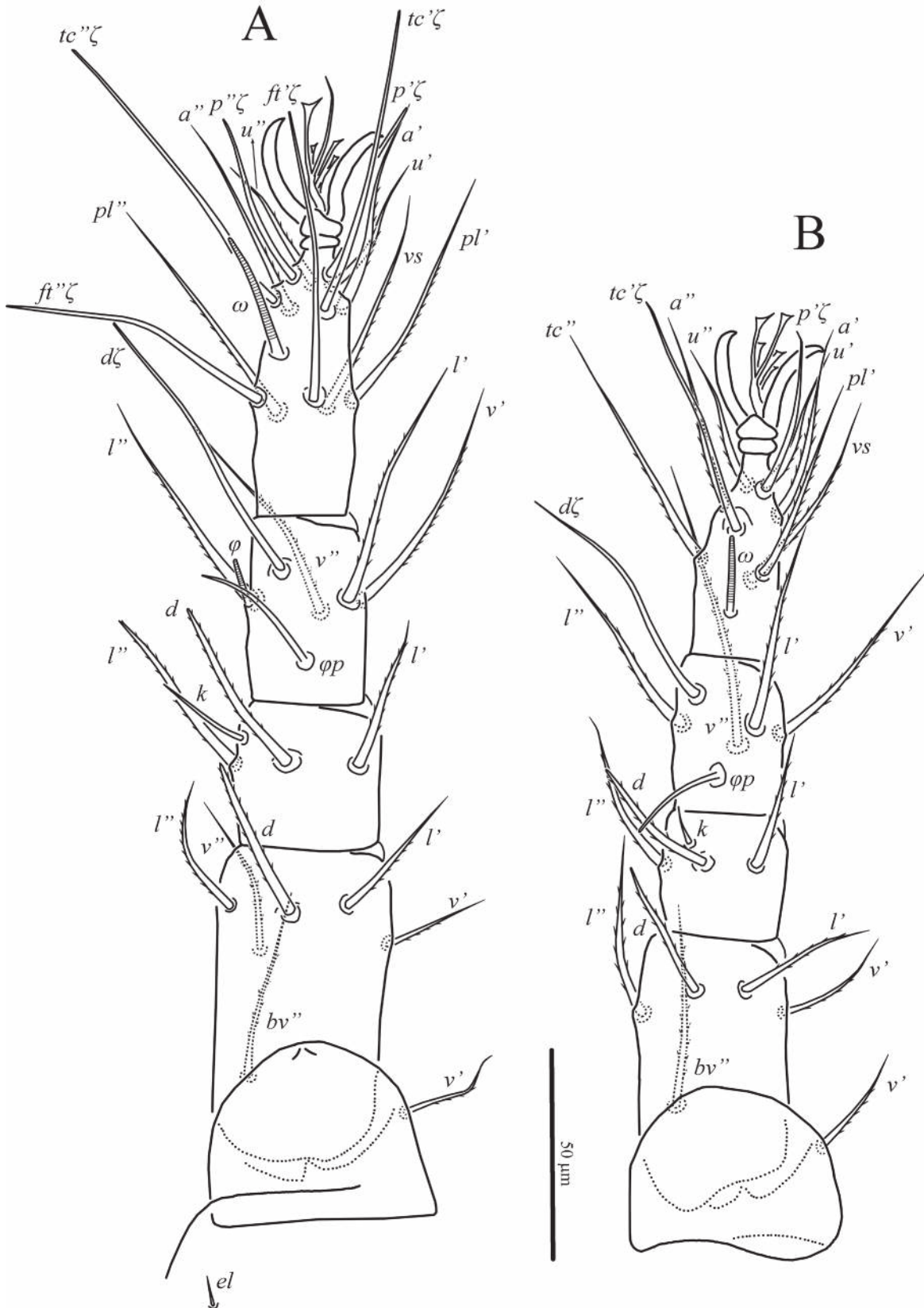


Fig. 17. *Eustigmaeus lacunus* (Summers, 1957), female: A—left leg I, dorsal aspect; B—left leg II, dorsal aspect.

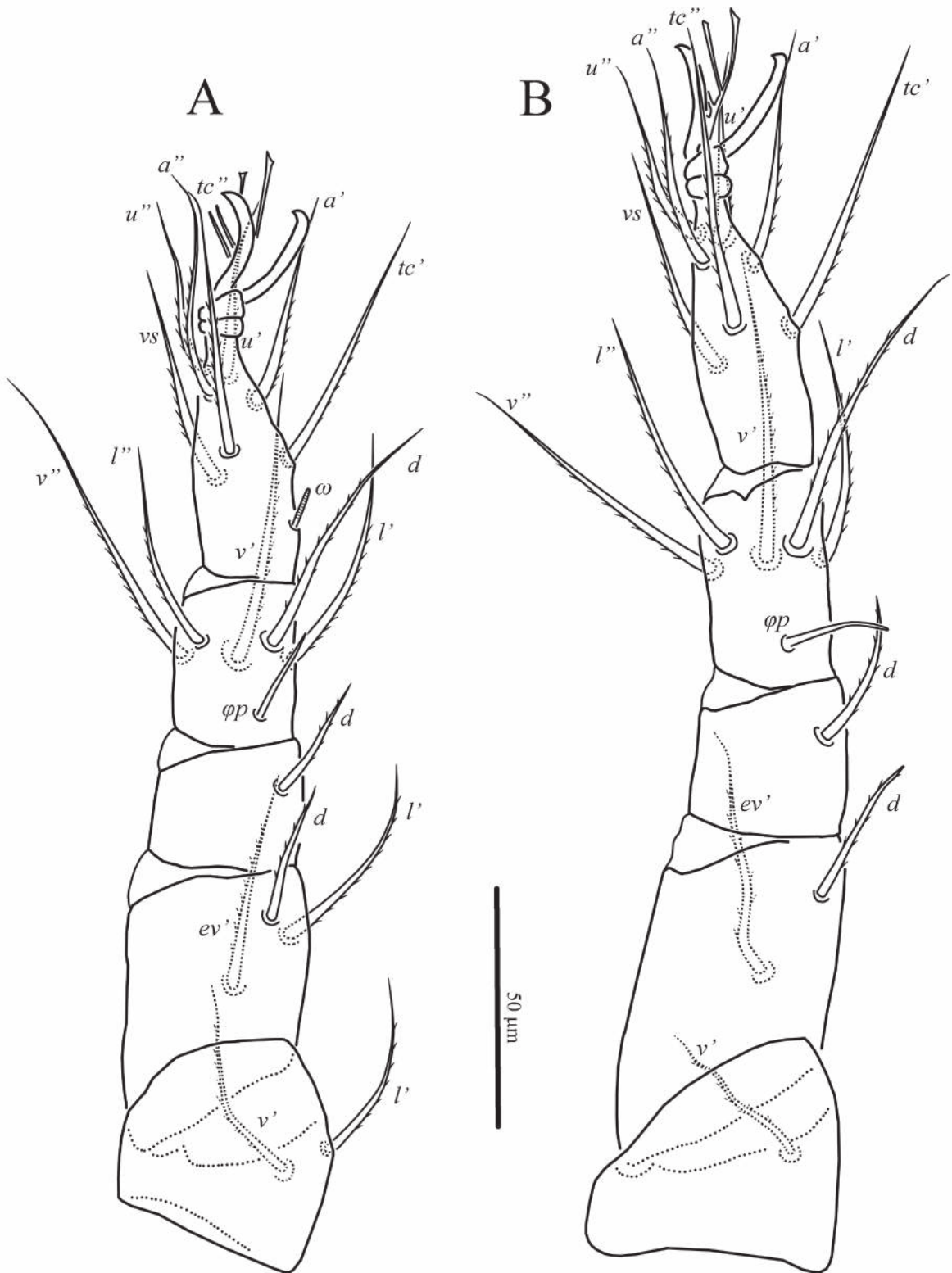


Fig. 18. *Eustigmaeus lacunus* (Summers, 1957), female: A—left leg III, dorsal aspect; B—left leg IV, dorsal aspect.

a' , a'' , vs , ω). Solenidion ω 9–10 digitiform; solenidion ϕp 19–20 attenuate, with rounded tip. All setae barbed; seta d of genu weakly blunt-tipped, other 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'' , ϕp), Ta 7 (tc' , tc'' , u' , u'' , a' , a'' , vs). Solenidion ω absent; solenidion ϕp 20–21 attenuate, with rounded tip. All setae weakly barbed; setae d of femur and genu weakly blunt-tipped, other setae pointed.

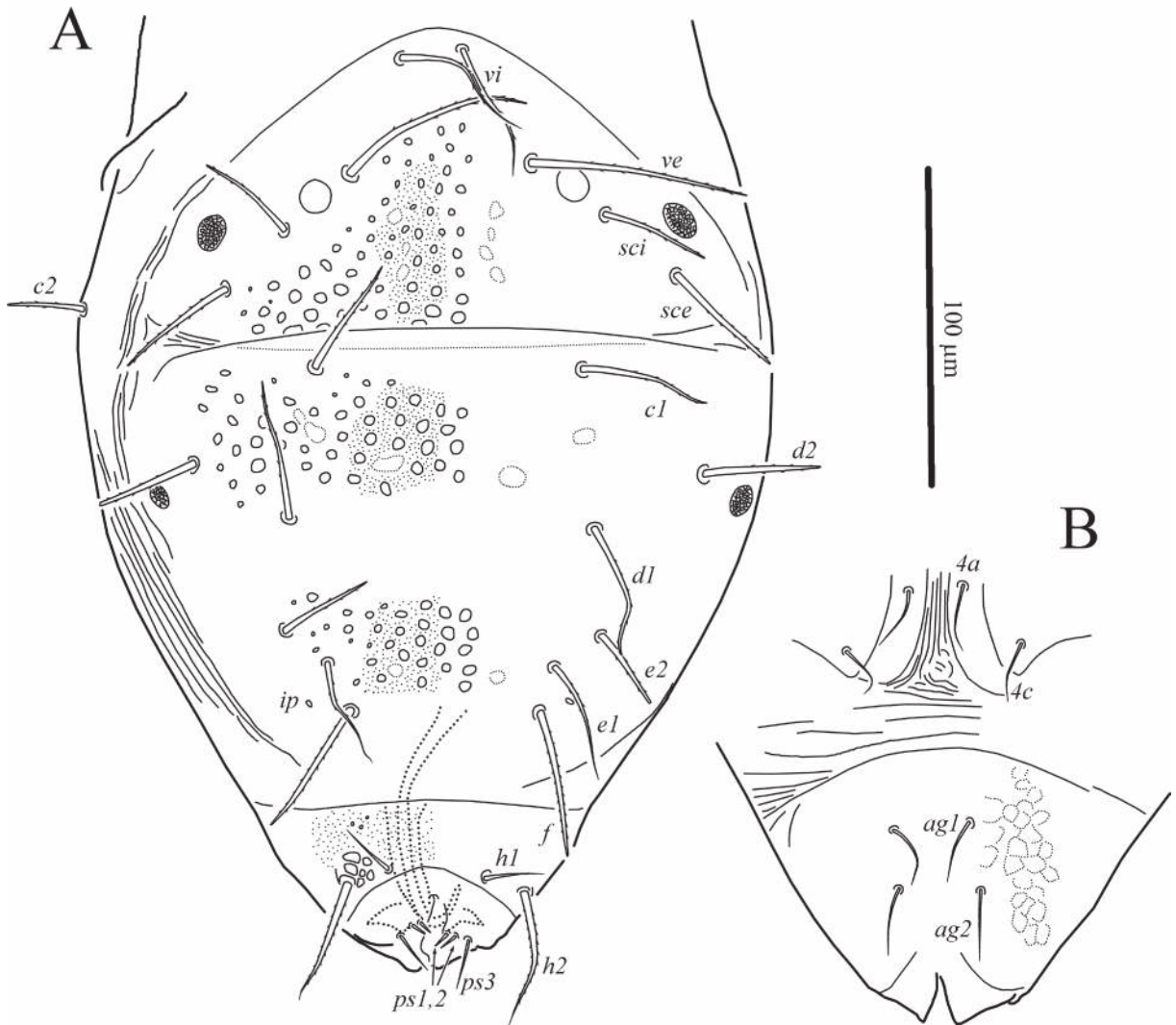


Fig. 19. *Eustigmaeus lacunus* (Summers, 1957), male: A—dorsum of idiosoma; B—venter of opisthosoma.

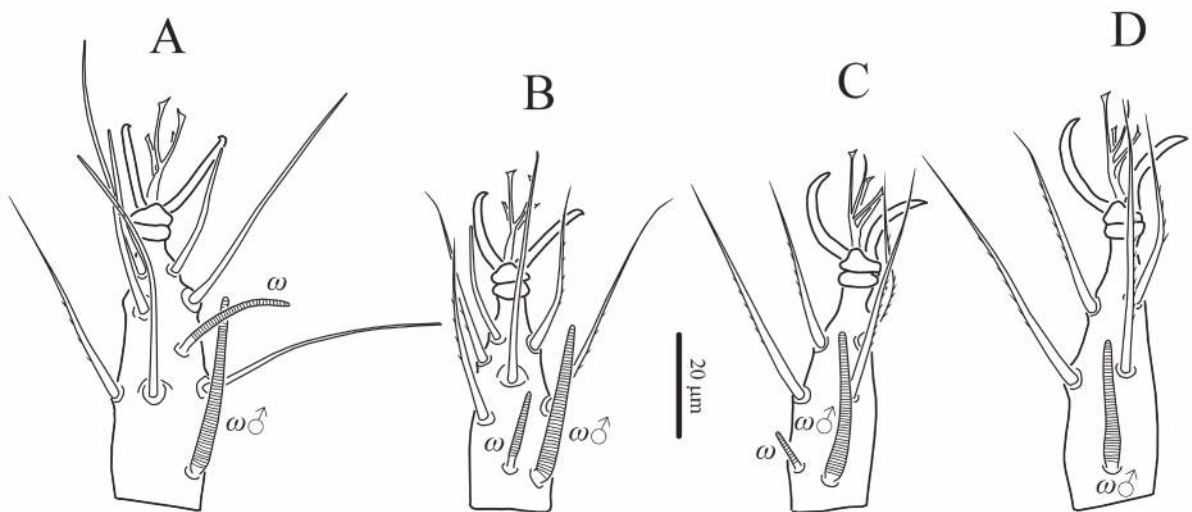


Fig. 20. *Eustigmaeus lacunus* (Summers, 1957), male: A–D—tarsi I–IV, respectively, dorsal aspect. Ventral setae not illustrated.

Male (Figs. 19, 20, 21E, F). Length of idiosoma 315–330, width 210–215.

Idiosomal dorsum (Figs. 19A, 21E, F). Podosoma as in female. All dorsal shields with distinct dimples and tiny puncta. Setae *ps1–3* located dorsally; setae *ps1–2* small, spiniform, setae *ps3* and *h1* pointed and smooth; setae *h2* densely barbed and pointed; setae *e1* weakly barbed and pointed. Aedeagus well sclerotized, long, narrow and curved. Lengths of dorsal setae: *vi* 27–30, *ve* 30–36, *sci* 20–21, *sce* 16–18, *c1* 20, *c2* 12–14, *d1* 19–20, *d2* 14–15, *e1* 28–36, *e2* 5–7, *f* 30–48, *h1* 14–16, *h2* 30–40.

Idiosomal venter (Fig. 19B). Opisthosomal venter with two pairs of smooth and pointed aggenital setae located on large, weakly reticulated aggenital plate; podosomal venter as in female. Lengths of ventral setae: *1a* 23–27, *1b* 24–25, *1c* 22–24, *2b* 23–24, *2c* 20–22, *3a* 29–30, *3b* 24–25, *3c* 23–24, *4a* 21–22, *4b* 24–25, *4c* 21–22, *agl* 19–20, *ag2* 19–21, *ps1* 4–5, *ps2* 5–6, *ps3* 14–15.

Gnathosoma as in female. Lengths of subcapitular setae: *m* 19–20, *n* 22–25, *or1* 8–9, *or2* 8–9; length of palps 67–70; length of palpal solenidion ω 7; length of cheliceral stylets 27–29.

Legs (Fig. 20). Legs as in female, except presence of well-developed male solenidia on tarsi I–IV. Lengths of legs: I 185–205, II 155–165, III 160–170, IV 190–205. Lengths of solenidia and setae *k*: ω I 24–26, $\omega^{\text{♂}}$ I 35–43, ϕ I 9–10, ϕ pI 29–31, *k*I 13–20, ω II 15–16, $\omega^{\text{♂}}$ II 31–42, ϕ pII 19–22, *k*II 8–9, ω III 6–8, $\omega^{\text{♂}}$ III 30–37, ϕ pIII 18–21, $\omega^{\text{♂}}$ IV 24–32, ϕ pIV 17–20.

Larva (Figs. 22–24). Length of idiosoma 170–180, maximum width 145–160.

Idiosomal dorsum (Fig. 22A). Dorsal shields smooth. Prodorsal shield with three pairs of setae (*vi*, *ve*, *sci*); setae *sce* located on separate small shield. Hysterosoma with four shields: unpaired with setae *c1* and *d1*, small, paired with setae *d2* and unpaired with setae *e1* and *e2*; setae *f* located ventrally on separate shield. All dorsal setae baculiform and barbed. Major callosity present anterolaterad setae *sce*. Minor callosity absent. Setae *h1* and *h2* located ventrally, both pointed and barbed. Lengths of dorsal setae: *vi* 30–31, *ve* 42–43, *sci* 21–22, *sce* 27–30, *c1* 27–28, *c2* 21–22, *d1* 27–29, *d2* 26–29, *e1* 28–29, *e2* 23–24, *f* 27–28, *h1* 38–39, *h2* 21–22.

Idiosomal venter (Fig. 22B). Setae *ps1–3* very short, spiniform, other ventral setae smooth and pointed. Lengths of ventral setae: *1a* 16–17, *1b* 19–20, *3a* 17–18, *ps1* 2, *ps2* 1, *ps3* 2.

Gnathosoma (Fig. 23) in general similar to that of female, except absence of subcapitular setae *m* and *n*; palpfemur without seta *v''*, palpgenu without seta *l''*, tarsal seta *acm* not eupathid-like and tarsus with only two fused eupathidia (*ul ζ*). Number of setae on palpal segments: Tr 0, Fe 2 (*d*, *l'*), Ge 1 (*d*), Ti 3 (*d*, *l'*, *l''*), Ta 7(1) (fused eupathidia *ul'* and *ul''*, *acm*, *ba*, *bp*, *lp*, 1 solenidion ω). Lengths of subcapitular setae: *or1* 7, *or2* 7; length of palps 48–56; length of cheliceral stylets 22–24; length of tarsal solenidion ω 4.

Legs (Fig. 24). Lengths of legs: I 110, II 98–105, III 100–105. Leg I (Fig. 24A). Leg setation: Tr 0, Fe 4 (*d*, *l'*, *l''*, *bv''*), Ge 3 (*l'*, *l''*, *k*), Ti 5(2) (*d*, *l'*, *l''*, *v'*, *v''*, ϕ , ϕ p), Ta 13(1) (*p' ζ* , *p'' ζ* , *tc'*, *tc''*, *ft'*, *ft''*, *u'*, *u''*, *a'*, *a''*, *pl'*, *pl''*, *vs*, ω). Setae *k* of genu and (*p*) of tarsus smooth, blunt-tipped, eupathid-like; setae (*tc*) smooth, other setae sparsely barbed; setae *d*, *l'*, *l''* of femur, *l'* and *l''* of genu blunt-tipped, other setae pointed. Seta *k* 9–10. Solenidion ω 12–13 digitiform; solenidion ϕ 6–7 baculiform, ϕ p 12–13 attenuate, with rounded tip. Leg II (Fig. 24B). Leg setation: Tr 0, Fe 4 (*d*, *l'*, *l''*, *bv''*), Ge 3 (*l'*, *l''*, *k*), Ti 5(1) (*d*, *l'*, *l''*, *v'*, *v''*, ϕ p), Ta 9(1) (*p' ζ* , *tc'*, *tc''*, *u'*, *u''*, *a'*, *a''*, *pl'*, *vs*, ω). Setae *k* of genu and *p'* of tarsus smooth, blunt-tipped, eupathid-like, seta *tc'* of tarsus smooth and pointed, other setae barbed; setae *d*, *l'*, *l''* of femur and *l'* of genu blunt-tipped, other setae pointed. Solenidion ω 7 digitiform; solenidion ϕ p 9 attenuate, with rounded tip. Seta *k* 4. Leg III (Fig. 24C). Leg setation: Tr 0, Fe 3 (*d*, *l'*, *ev'*), Ge 0, Ti 5(1) (*d*, *l'*, *l''*, *v'*, *v''*, ϕ p), Ta 7(1) (*tc'*, *tc''*, *u'*, *u''*, *a'*, *a''*, *vs*, ω). Solenidion ω 4 weakly clavate; solenidion ϕ p 6–8 attenuate, with rounded tip. All setae barbed and pointed.

Protonymph (Figs. 25–28). Length of idiosoma 205–230, maximum width 170–180.

Idiosomal dorsum (Fig. 25A). Dorsal shields smooth. Prodorsal shield with three pairs of setae (*vi*, *ve*, *sci*); setae *sce* located on separate small shield. Hysterosoma with three shields: large, unpaired with setae *c1*, *d1*, *e1*, *e2* and *f*; and small, paired with setae *d2*. All dorsal setae baculiform and barbed, except pointed *h2*. Major callosity present anterolaterad setae *sce*. Minor callosity located posterolaterad setae *d2*. Setae *h1* and *h2* located ventrally. Lengths of dorsal setae: *vi* 29–32, *ve* 39–44, *sci* 21–24, *sce* 28–32, *c1* 27–30, *c2* 20–23, *d1* 29–32, *d2* 25–29, *e1* 29–36, *e2* 24–27, *f* 32–35, *h1* 24–28, *h2* 21–23.

Idiosomal venter (Fig. 25B). Setae *ps2* very short, spiniform, other ventral setae smooth and pointed. One pair of aggenital setae. Lengths of ventral setae: *1a* 18–19, *1b* 16–18, *1c* 13–14, *2b*

14, *2c* 11, *3a* 18–20, *3b* 12–13, *3c* 13–14, *ag1* 12–13, *ps1* 5–7, *ps2* 2–3, *ps3* 6–8.

Gnathosoma (Fig. 26) in general similar to that of female, except absence of subcapitular setae *n*.

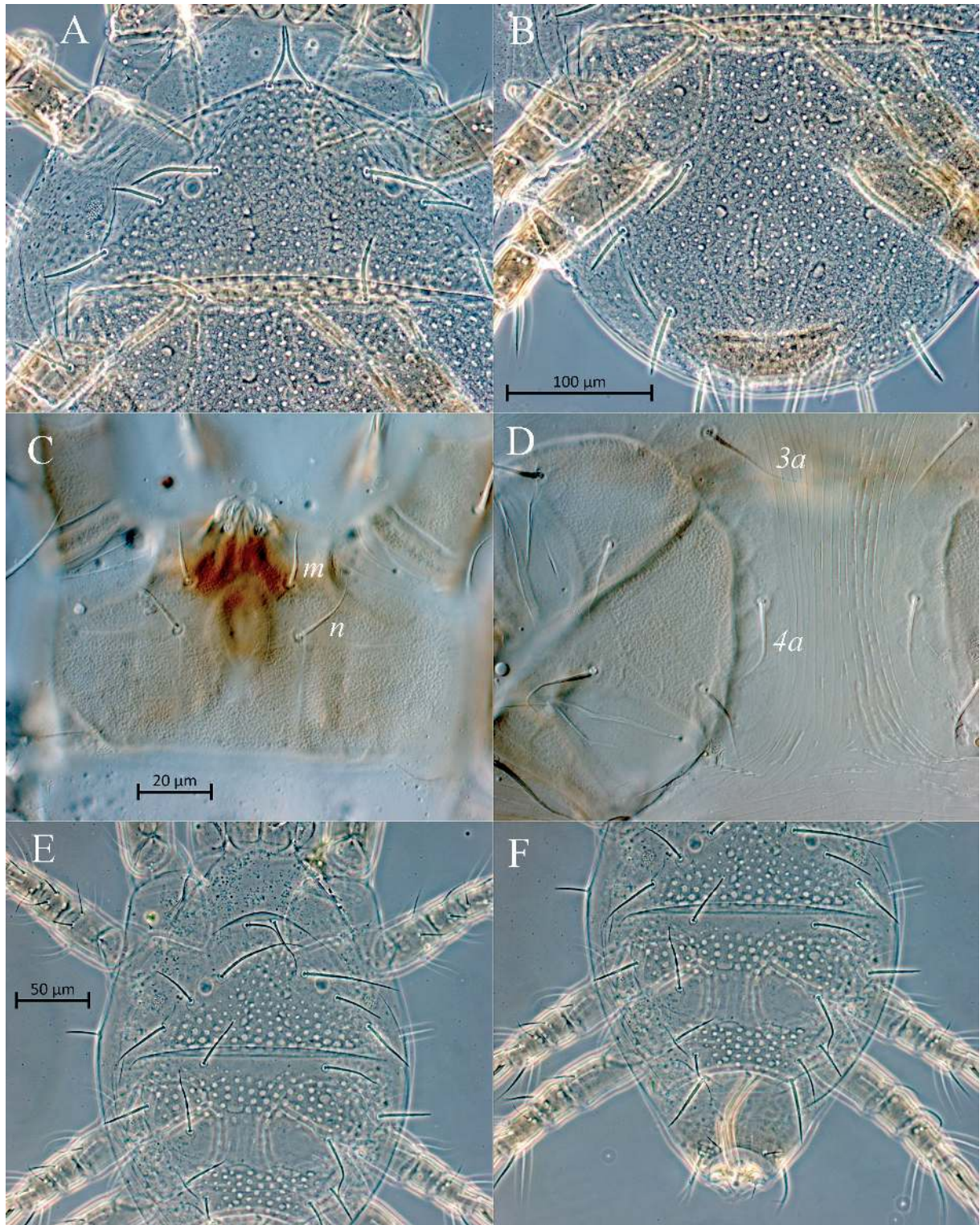


Fig. 21. Phase contrast (A, B, E, F) and DIC (C, D) photomicrographs of female (A–D) and male (E, F) of *Eustigmaeus lacunus* (Summers, 1957): A—dorsum of podosoma; B—dorsum of hysterosoma; C—subcapitulum; D—metapodosoma, ventral aspect; E—podosoma, dorsal aspect; F—hysterosoma, dorsal aspect.

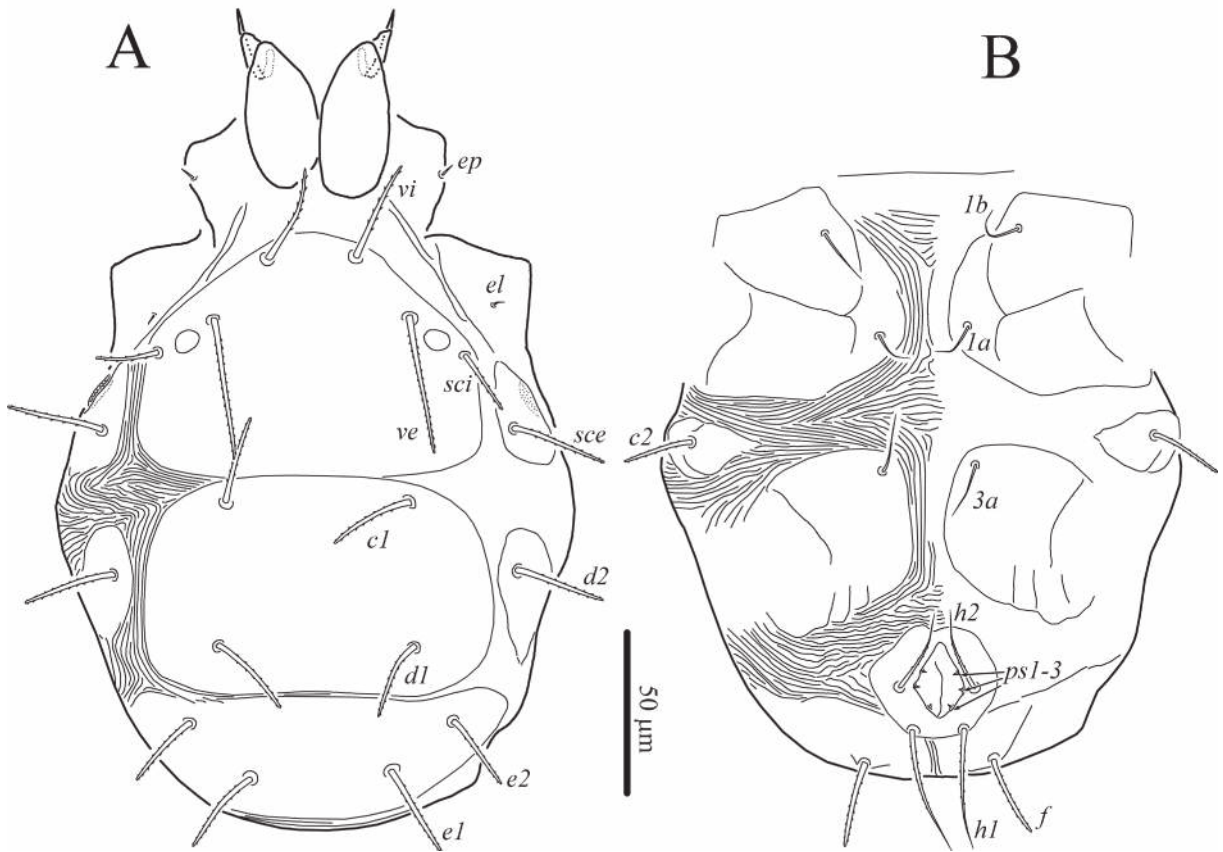


Fig. 22. *Eustigmaeus lacunus* (Summers, 1957), larva: A—dorsum of idiosoma; B—venter of idiosoma.

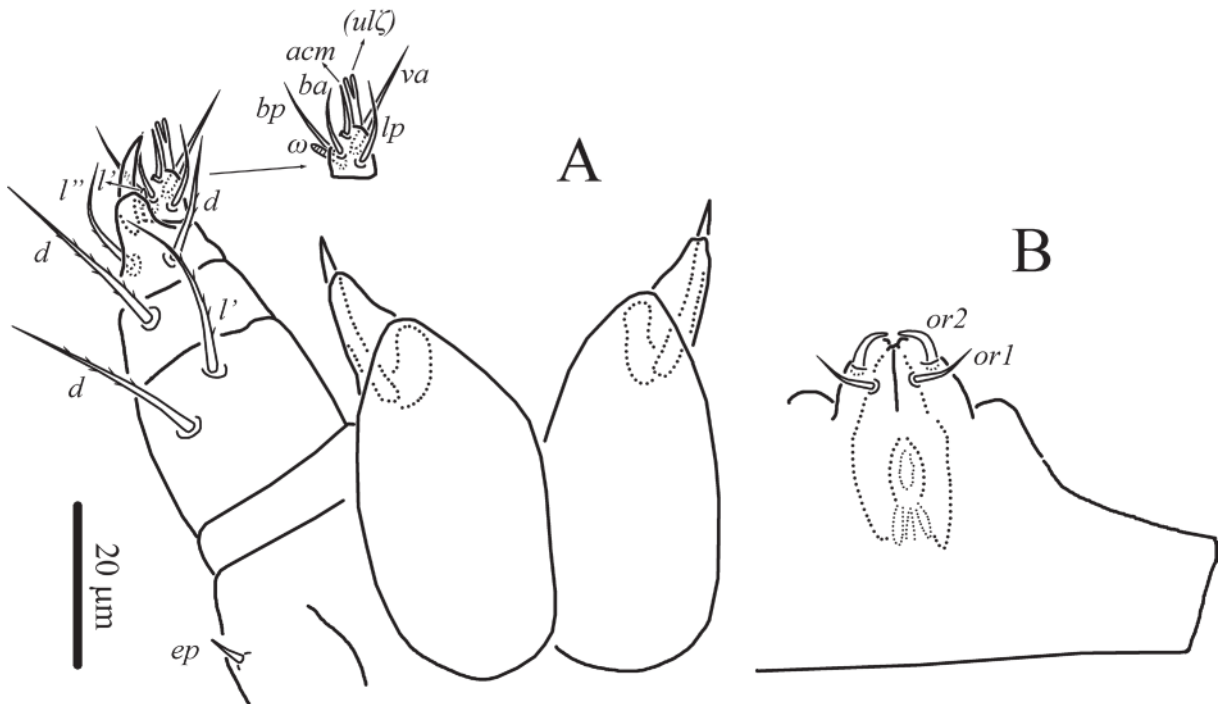


Fig. 23. *Eustigmaeus lacunus* (Summers, 1957), larva: A—gnathosoma, dorsal aspect; B—subcapitulum.

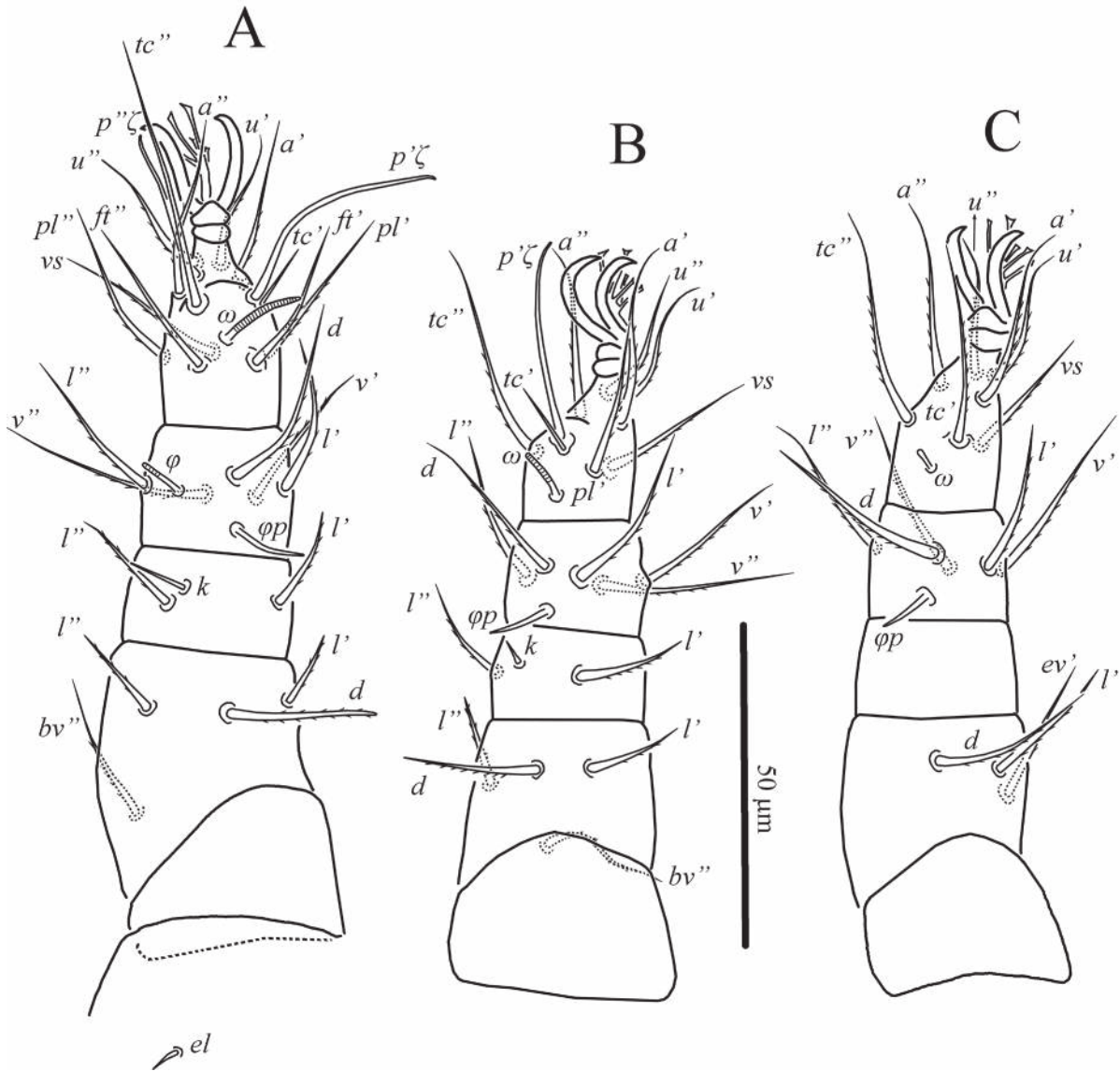


Fig. 24. *Eustigmaeus lacunus* (Summers, 1957), larva: A–C—left legs I–III, respectively, dorsal aspect.

Lengths of subcapitular setae: *m* 14–15, *or1* 7–8, *or2* 7; length of palps 49–52; length of cheliceral stylets 23–24; length of tarsal solenidium ω 5.

Legs (Figs. 27–28). Lengths of legs: I 120–130, II 95–105, III 100–105, IV 105. Leg I (Fig. 27A). Leg setation: Tr 0, Fe 4 (*d*, *l'*, *l''*, *bv''*), Ge 4 (*d*, *l'*, *l''*, *k*), Ti 5(2) (*d* ζ , *l'*, *l''*, *v'*, *v''*, ϕ , ϕp), Ta 13(1) (*p'* ζ , *p''* ζ , *tc'* ζ , *tc''* ζ , *ft'*, *ft''*, *u'*, *u''*, *a'*, *a''*, *pl'*, *pl''*, *vs*, ω). Setae *k* of genu, *d* of tibia, and (*p*), (*tc*) of tarsus smooth, blunt-tipped, eupathid-like; other setae sparsely barbed; setae *d* of femur and genu blunt-tipped, other setae pointed. Seta *k* 11–14. Solenidium ω 15 digitiform; solenidium ϕ 7 baculi-form, ϕp 17–18 attenuate, with rounded tip. Leg II (Fig. 27B). Leg setation: Tr 0, Fe 4 (*d*, *l'*, *l''*, *bv''*),

Ge 3 (*l'*, *l''*, *k*), Ti 5(1) (*d*, *l'*, *l''*, *v'*, *v''*, ϕp), Ta 9(1) (*p'* ζ , *tc'* ζ , *tc''*, *u'*, *u''*, *a'*, *a''*, *pl'*, *vs*, ω). Setae *k* of genu and *p'*, *tc'* of tarsus smooth, blunt-tipped, eupathid-like, other setae barbed and pointed. Solenidium ω 8–9 digitiform; solenidium ϕp 12 attenuate, with rounded tip. Seta *k* 4–6. Leg III (Fig. 28A). Leg setation: Tr 1 (*l'*), Fe 3 (*d*, *l'*, *ev'*), Ge 0, Ti 5(1) (*d*, *l'*, *l''*, *v'*, *v''*, ϕp), Ta 7(1) (*tc'*, *tc''*, *u'*, *u''*, *a'*, *a''*, *vs*, ω). Solenidium ω 4–5 weakly clavate; solenidium ϕp 10–11 attenuate, with rounded tip. All setae barbed and pointed. Leg IV (Fig. 28B). Leg setation: Tr 0, Fe 1 (*ev'*), Ge 0, Ti 5(1) (*d*, *l'*, *l''*, *v'*, *v''*, ϕp), Ta 6 (*tc'*, *tc''*, *u'*, *u''*, *a'*, *a''*). Solenidium ϕp 6–8 attenuate, with rounded tip. All setae barbed and pointed.

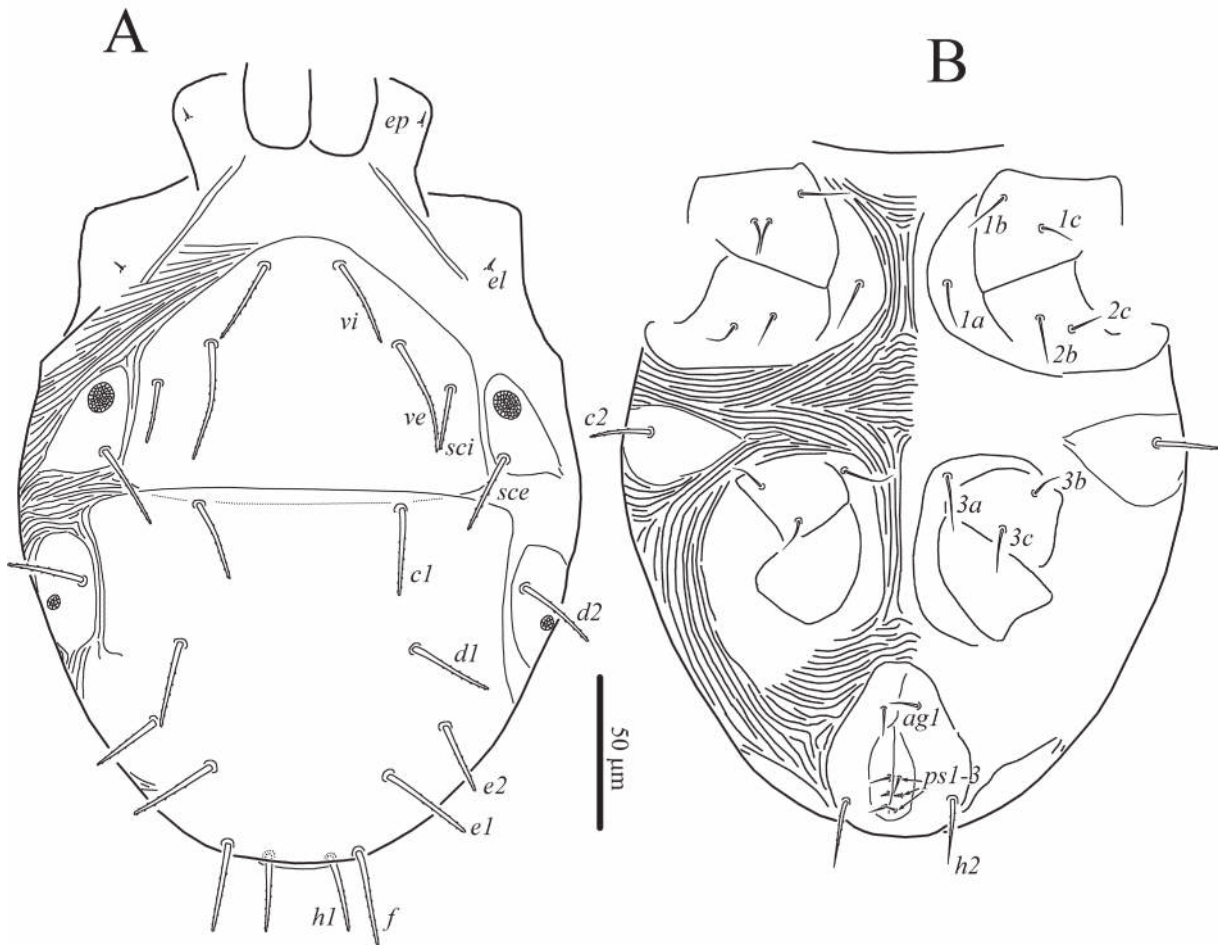


Fig. 25. *Eustigmaeus lacunus* (Summers, 1957), protonymph: A—dorsum of idiosoma; B—venter of idiosoma.

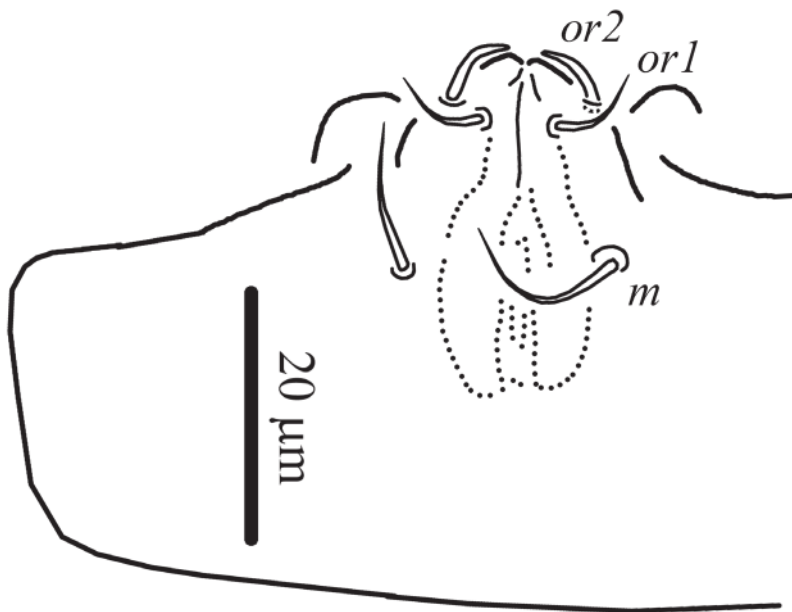


Fig. 26. *Eustigmaeus lacunus* (Summers, 1957), protonymph: subcapitulum.

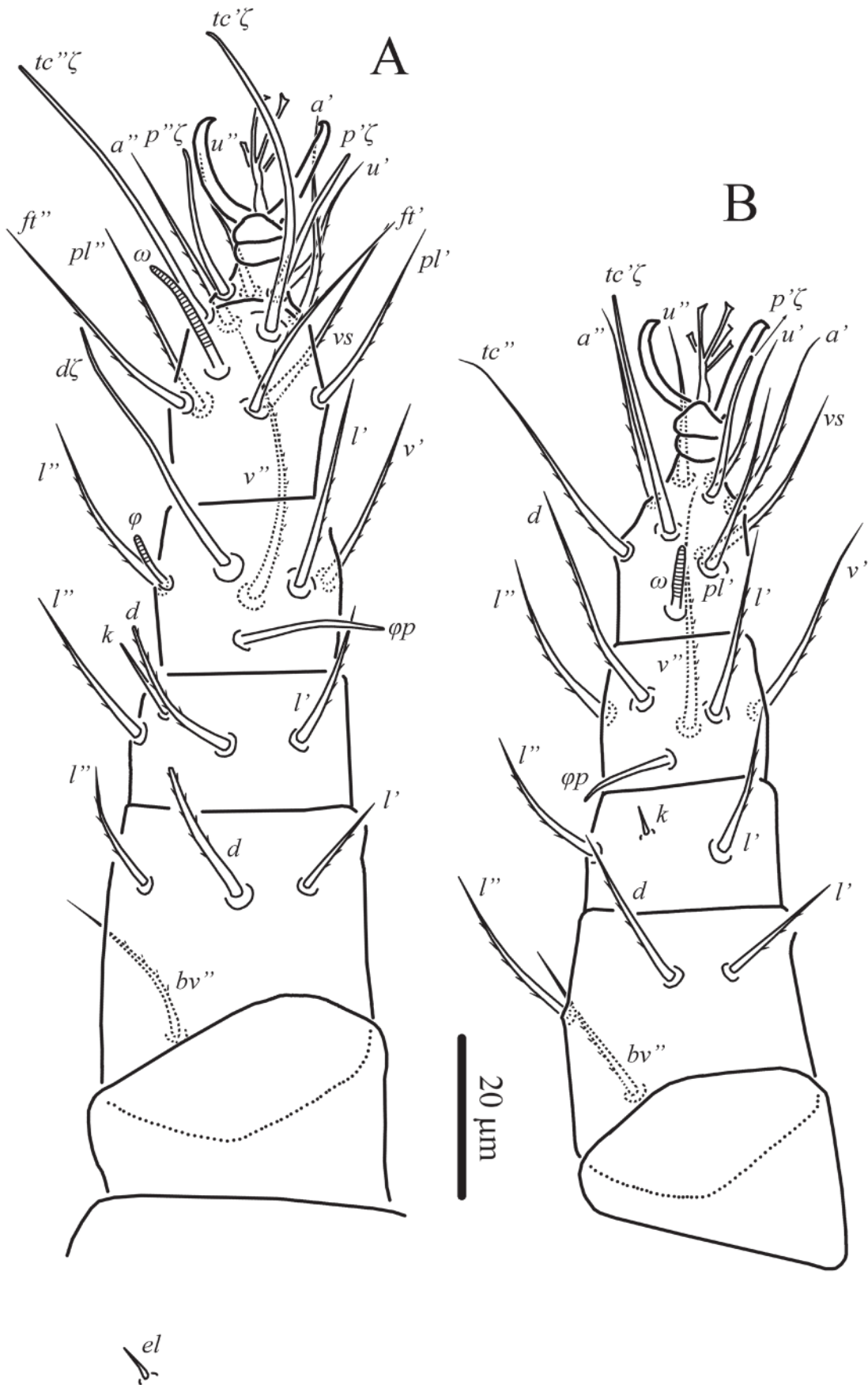


Fig. 27. *Eustigmaeus lacunus* (Summers, 1957), protonymph: A—left leg I, dorsal aspect; B—left leg II, dorsal aspect.

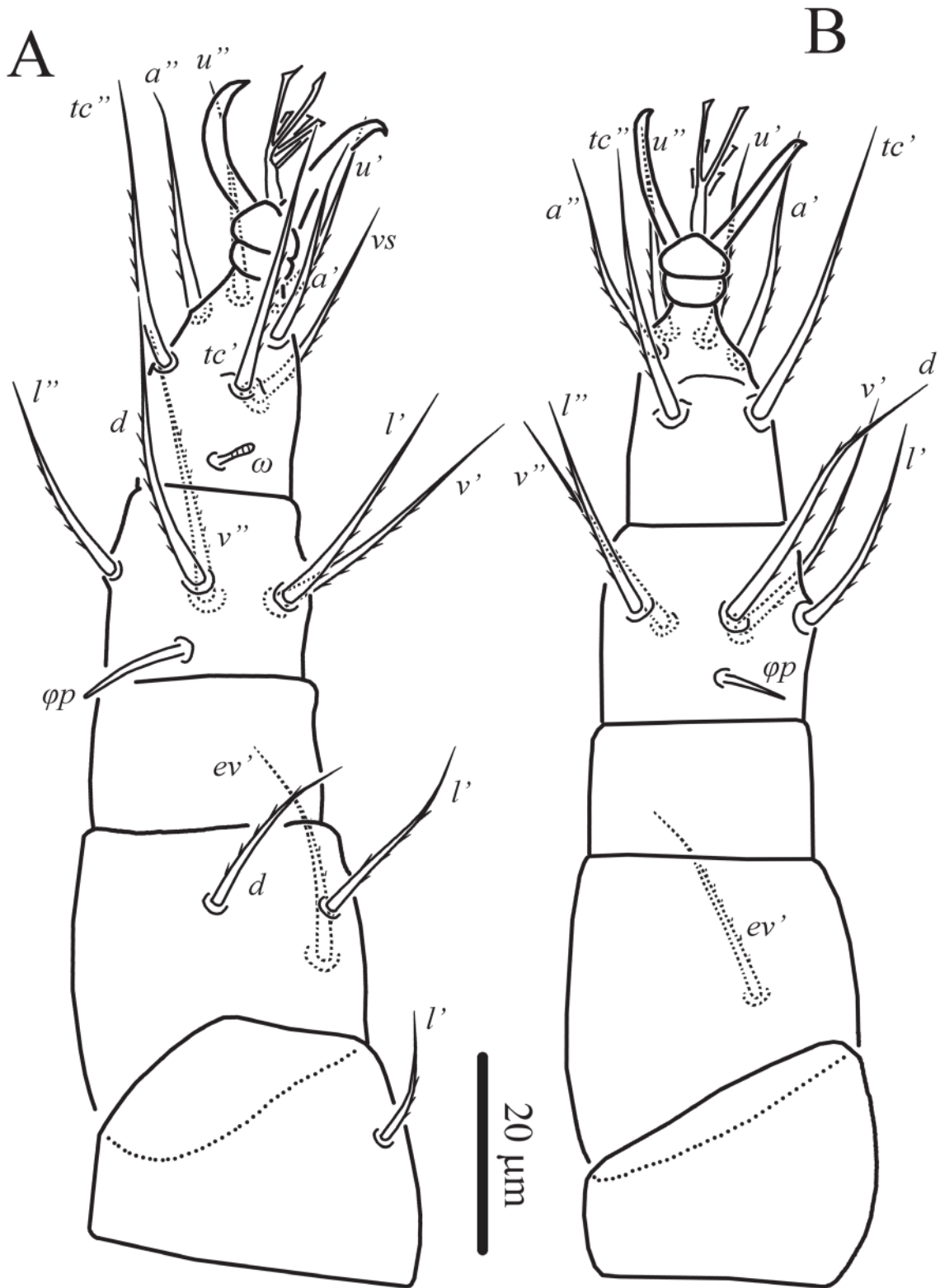


Fig. 28. *Eustigmaeus lacunus* (Summers, 1957), protonymph: A—left leg III, dorsal aspect; B—left leg IV, dorsal aspect.

Deutonymph (Figs. 29, 30). Length of idiosoma 315, maximum width 240.

Idiosomal dorsum (Fig. 29). Dorsal shields with dimples; other characters as in protonymph. Lengths

of dorsal setae: *vi* 37, *ve* 47, *sci* 27, *sce* 32, *c1* 33, *c2* 24, *d1* 35, *d2* 31, *e1* 38, *e2* 30, *f* 41, *h1* 35, *h2* 27.

Idiosomal venter as in female. Lengths of ventral setae: *1a* 22, *1b* 18, *1c* 19, *2b* 16, *2c* 14, *3a* 23,

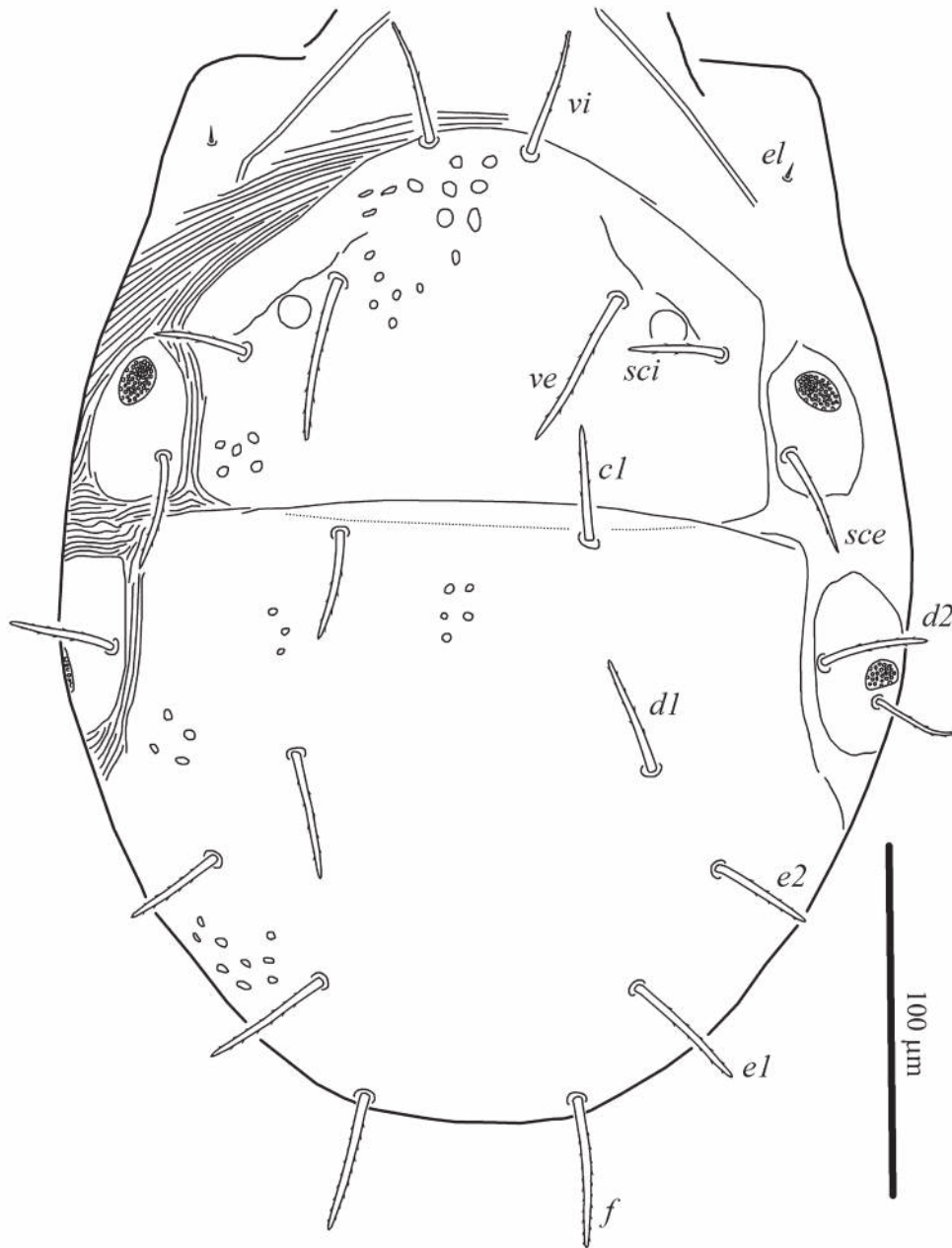


Fig. 29. *Eustigmaeus lacunus* (Summers, 1957), deutonymph: dorsum of idiosoma.

3b 21, 3c 17, 4a 20, 4b 15, 4c 15, ag1 13, ag2 15, ag3 15, ps1 13, ps2 7, ps3 18.

Gnathosoma as in female. Lengths of subcapitular setae: *m* 16, *n* 18, *or1* 10, *or2* 9; length of palps 58; length of cheliceral stylets 28; length of tarsal solenidion ω 6.

Legs (Fig. 30). Lengths of legs: I 165, II 140, III 140, IV 155. Leg I as in female. Seta *k* 17, solenidion ω 19; solenidion φ 8, φp 20. Leg II (Fig. 30A). Leg setation: Tr 1 (*v'*), Fe 4 (*d, l', l'', bv''*), Ge 3 (*l', l'', k*), Ti 5(1) (*d $\zeta, l', l'', v', v'', \varphi p$*), Ta 9(1) (*p' $\zeta, tc'\zeta, tc''$* , *u', u'', a', a'', pl', vs, \omega*).

Solenidion ω 6, solenidion φp 14. Leg IV (Fig. 30B). Leg setation: Tr 0, Fe 2 (*d, ev'*), Ge 0, Ti 5(1) (*d, l', l'', v', v'', \varphi p*), Ta 7 (*tc', tc'', u', u'', a', a'', vs*). Solenidion φp 13.

Material examined. 22 females, 9 males, 1 DN, 5 PN, 12 larvae, Kosh-Agach District, 49°30'51.8"N 88°10'57.6"E, 2,450 m a.s.l., in moss, mountain tundra, 14 June 2022, coll. A.A. Khaustov.

Remarks. This species was described from California, USA (Summers 1957), based on a deutonymph. Later, adults of this species were

described, also from California (Summers and Price, 1961). Dönel and Doğan (2011) redescribed this species based on the materials from Turkey. However, Turkish specimens considerably differ from the description of Summers and Price (1961) in having major and minor callosities located close to each other, on striated cuticle laterad humeral plate; and in the presence of solenidion on tarsus IV. Undoubtedly, Turkish specimens are not conspecific with *E. lacunus* and are rather most likely conspecific with *E. ottavii* (Berlese, 1910), accord-

ing to the redescription of this species by Stathakis *et al.* (2016). Therefore, *E. lacunus* should be excluded from the Turkish fauna.

This is the first record of *E. lacunus* from the Palaearctic and from Russia. Specimens from the Altai agree well with the original descriptions (Summers 1957; Summers and Price 1961), especially in having unusually small major and minor callosities located on the lateral parts of the dorsal shields, in the absence of solenidion on tarsus IV, and in setae *ps2* being unusually short.

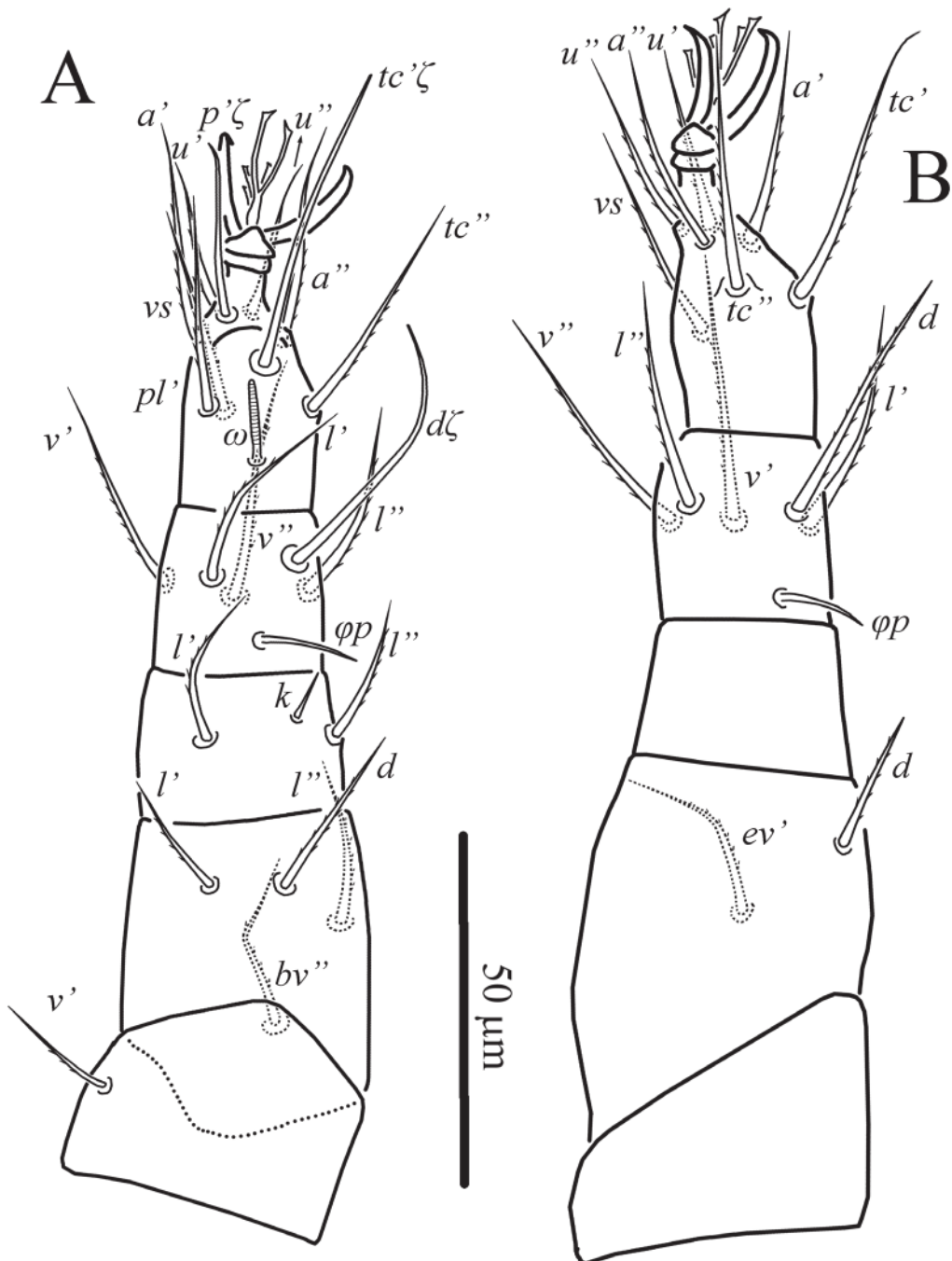


Fig. 30. *Eustigmaeus lacunus* (Summers, 1957), deutonymph: A—right leg II, dorsal aspect; B—left leg IV, dorsal aspect.

Eustigmaeus collarti* (Cooreman, 1955)Caligonus collarti* Cooreman, 1955: 163*Ledermuelleria collarti* (Cooreman):

Summers and Price 1961: 369

Eustigmaeus collarti (Cooreman):

Wood 1973: 82

This hygrophilous species was described from mosses in France (Cooreman 1955). It was also recorded and redescribed from Turkey (Doğan 2006) and from the Tyumen Region of Russia (Khaustov and Tolstikov 2014). This article presents the first record of *E. collarti* from the Altai Republic.

Material examined. Five females, Kosh-Agach District, 49°57'35.0"N 88°43'05.0"E, 1,765 m a.s.l., in wet grassy soil, near a small lake, 15 July 2021, coll. A. A. Khaustov.

ACKNOWLEDGEMENTS

This research was supported by the Russian Science Foundation, grant № 20-64-47015.

REFERENCES

- Beron, P. 2020. *Acarorum catalogus VII: Trombidiformes, Prostigmata, Raphignathoidea* (Fam. Barbutiidae, Caligonellidae, Camerobiidae, Cryptognathidae, Dasythyreidae, Dytiscacaridae, Eupalopsellidae, Homocaligidae, Mecognathidae, Raphignathidae, Stigmaeidae, Xenocaligonellidae). Pensoft, National Museum of Natural History, Sofia, Bulgarian Academy of Sciences, Sofia. 306 pp.
- Cooreman, J. 1955. Notes sui quelques Acariens des Alpes françaises, *Mémoires Société royale d'entomologie de Belgique*, 27: 162–170.
- Doğan, S. 2006. A hygrophilic mite species: *Eustigmaeus collarti* (Cooreman 1955) (Acari, Stigmaeidae). *Journal of Arts and Sciences*, 6: 87–96.
- Dönel, G. and Doğan, S. 2011. The stigmaeid mites (Acari: Stigmaeidae) of Kelkit Valley (Turkey). *Zootaxa*, 2942: 1–56.
- Fan, Q.-H., Flechtmann C.H.W. and De Moraes, G.J. 2016. Annotated catalogue of Stigmaeidae (Acari: Prostigmata), with a pictorial key to genera. *Zootaxa*, 4176: 1–199.
- Fan, Q.-H., Flechtmann C.H.W. and De Moraes, G.J. 2019. Emendations and updates to “Annotated catalogue of Stigmaeidae (Acari: Prostigmata), with a pictorial key to genera”. *Zootaxa*, 4647: 88–103.
- Gerson, U., Smiley, R.L. and Ochoa, R. 2003. *Mites (Acari) for Pest Control*. Blackwell Science, 540 pp.
- Grandjean, F. 1939. Les segments postlarvaires de l'hysterosoma chez les oribates (Acariens). *Bulletin Société Zoology France*, 64: 273–284.
- Grandjean, F. 1944. Observations sure les Acariens de la famille des Stigmaeidae. *Archives des Sciences Physiques et Naturelles*, 26: 103–131.
- Grandjean, F. 1946. Au sujet de l'organe de Claparède, des eupathides multiples et des taenidies mandibulaires chez les Acariens actinochitineux. *Archives des Sciences Physiques et Naturelles*, 28: 63–87.
- Kethley, J.B. 1990. Acarina: Prostigmata (Actinedida). In: D.L. Dindal (Ed.). *Soil Biology Guide*. Wiley, New York, pp. 667–756.
- Khanjani, M., Mohammadi, E., Ghiasi, M., Izadi, H. and Mirmoayedi, A. 2012. Two new species of the genus *Ledermuelleriopsis* Willmann (Acari: Prostigmata: Stigmaeidae) from western and southern Iran. *International Journal of Acarology*, 38(7), 564–570.
- Khaustov, A.A. 2021a. Contribution to the Stigmaeidae (Acari: Prostigmata) fauna of the Altai Republic, Russia. *Acarina*, 29(1): 43–66.
- Khaustov, A.A. 2021b. A new species and a new record of *Stigmaeus* (Acari: Prostigmata: Stigmaeidae) from Western Siberia, Russia. *International Journal of Acarology*, 47(3): 248–261.
- Khaustov, A.A. 2022. Review of the *Mediolata* (Acari: Stigmaeidae) of Russia. *Acarina*, 30(1): 29–56.
- Khaustov, A.A. and Tolstikov, A.V. 2014. A new species and new records of the genus *Eustigmaeus* (Acari: Prostigmata: Stigmaeidae) from Western Siberia. *Zootaxa*, 3861(6): 531–553.
- Laniecki, R., Kaźmierski, A., Małol, J., Laniecka, I. and Magowski W. 2021. Know your campus: salient research potential of prostigmatic soil mite fauna (Acariformes: Prostigmata, Endeostigmata) within university campus area. *Acarologia*, 61(3): 650–663.
- Stathakis, Th.I., Kapaxidi, E.V. and Papadoulis G.Th. 2016. The genus *Eustigmaeus* Berlese (Acari: Stigmaeidae) from Greece. *Zootaxa*, 4191: 1–102.
- Summers, F.M. 1957. American species of *Ledermuelleria* and *Ledermuelleriopsis*, with a note on new synonymy in *Neognathus* (Acarina, Stigmaeidae, Caligonellidae). *Proceedings of the Entomological Society of Washington*, 59: 49–60.
- Summers, F.M. 1962. The genus *Stigmaeus* (Acarina: Stigmaeidae). *Hilgardia*, 33: 491–537.
- Summers, F.M. and Price, D.W. 1961. New and re-described species of *Ledermuelleria* from North America (Acarina: Stigmaeidae). *Hilgardia*, 31: 369–382.
- Wood, T.G. 1973. Revision of Stigmaeidae (Acari: Prostigmata) in the Berlese Collection. *Acarologia*, 15(1): 76–95.