

TWO NEW GENERA AND TWO NEW SPECIES OF PYGMEPHORIDAE (ACARI: HETEROSTIGMATA), REDIAGNOSIS OF THE GENERA *DIROPTES* AND *SEVASTIANOVELLA*, AND A REDESCRIPTION OF *SEVASTIANOVELLA LACIDUS* FROM WESTERN SIBERIA, RUSSIA

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ABSTRACT: Two new monotypic genera are described: *Pseudositeroptes trachi* gen. and sp. n. and *Neodiroptes sibiriensis* gen. and sp. n. (Acari: Prostigmata: Pygmephoridae), collected under the thin bark of a rotting birch twig lying on the ground in Western Siberia, Russia. A female of *Sevastianovella lacidus* (Livshits, Mitrofanov and Sharonov) is redescribed based on the type material and a specimen from Western Siberia. The genera *Sevastianovella* Livshits, Mitrofanov and Sharonov and *Diroptes* Kaliszewski are rediagnosed. Species *Diroptes bohemicus* (Mahunka, 1967) comb. n., *D. albidus* (Livshits *et al.*, 1988) comb. n., *D. digitariae* (Flechtmann, 1971) comb. n., *D. spinisetus* (Livshits *et al.*, 1988) comb. n. and *D. tauricus* (Khaustov and Khaustov, 2022) comb. n. are removed from *Sevastianovella*. A key to the genera of Pygmephoridae with a 5-segmented leg I in females is provided.

KEY WORDS: Pygmephoridae, Siteroptinae, systematics, new taxa, key

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INTRODUCTION

The cosmopolitan family Pygmephoridae (Acari: Heterostigmata) is characterized by the second largest species diversity in the superfamily Pygmephoridae (Acari: Heterostigmata); it includes 33 described genera and more than 300 species (Khaustov 2019). All pygmephorid mites are probably fungivorous; they generally inhabit soil, forest litter, and rotting materials. Many species are associated with various insects and utilize them for phoresy. Yet, representatives of the genus *Pygmephorus* Kramer, 1877 are associated with small mammals and their nests (Kaliszewski *et al.* 1995; Khaustov *et al.* 2019). Some pygmephorid genera are characterized by the presence of two different forms of females: phoretic and non-phoretic, which differ considerably in terms of their morphology. The phenomenon of female dimorphism is well described in the genus *Pediculaster* Vitzthum (see Camerik *et al.* 2006). Dimorphic females are also known among the genus *Bochkovlaster* Khaustov, 2019 and in a poorly described genus *Pediculitopsis* Mahunka, 1970. Most likely, female dimorphism is also present in the genus *Metasiteroptes* Cross, 1965, because mites of the genus *Brasilopsis* Mahunka, 1975 are very similar to *Metasiteroptes*, differing only in having a fused tibia and tarsus I, and in the shape of seta *d* of femur I, which are typical differences between phoretic and non-phoretic females in a closely related *Pediculaster* genus. All cases of female dimorphism have been recorded only in the subfamily Pedicu-

lasterinae sensu Mahunka (1970a). The subfamily Siteroptinae includes free-living pygmephorid mites with a 5-segmented leg I in females. Mahunka (1970b) elevated subfamily Siteroptinae to the family rank. Livshits *et al.* (1986) revised the family Siteroptidae and also included in it non-phoretic females of *Pediculaster* (subfamily *Pediculasterinae* sensu Mahunka 1970a). Lindquist (1986) synonymized Siteroptinae under Pygmephoridae. Khaustov (2019) provided the latest key to the genera of Pygmephoridae.

During the study of heterostigmatic mites in Western Siberia, Russia, we found two new remarkable monotypic genera of Pygmephoridae, collected from under the thin bark of a rotting birch twig lying on the ground. The examination of the type species—*Sevastianovella lacidus* (Livshits, Mitrofanov and Sharonov, 1988)—has revealed a unique combination of characters that was considerably different from the other species of the genus. Therefore, we redescribed and rediagnosed the genus *Sevastianovella*. The genus *Diroptes* Kaliszewski, 1988—previously considered a junior synonym of *Sevastianovella* (Khaustov and Khaustov 2022)—has also been rediagnosed and is considered by us a valid genus. A key to the genera of Pygmephoridae with a 5-segmented leg I in females is also provided.

MATERIALS AND METHODS

The mites were collected directly from the rotting twigs of birch (*Betula pendula*), using a tiny

needle, or extracted from the soil samples using Berlese funnels. All collected mites were cleared in lactic acid and mounted in Hoyer's medium. We have also examined the type materials of *Sevastianoviella lacidus*, deposited in the collection of the Museum of Zoology, University of Tyumen, Russia. The terminology of the idiosoma and legs follows that of Lindquist (1986); the nomenclature of subcapitular setae and the designation of cheliceral setae follow those of Grandjean (1944, 1947), respectively. The systematics of Pygmephoroida follows that of Khaustov (2004, 2008). All measurements are given in micrometers (μm). The range of measurements for the paratypes is provided in parentheses, next to the measurement for the holotype. For leg chaetotaxy, the number of solenidia is given in parentheses. The mite morphology was studied using a Carl Zeiss AxioImager A2 (Carl Zeiss, Germany) compound microscope with phase contrast and differential interference contrast (DIC) optical systems. Photomicrographs were taken with an AxioCam ICc5 (Carl Zeiss, Germany) digital camera.

Abbreviations: ap1–ap5—apodemes 1–5, appr—prosternal apodeme, appo—poststernal apodeme, apsej—sejugal apodeme, ass—accessory setigenous structure, Tr—trochanter, Fe—femur, Ge—genu, Ti—tibia, Ta—tarsus.

SYSTEMATICS

Family **Pygmephoridae** Cross, 1965

Genus ***Pseudositeroptes* gen. n.**

Type species: *Pseudositeroptes trachi* sp. n.

Description. *Female.* Body weakly sclerotized, elongate. Gnathosomal capsule of about equal length and width, prognathous, dorsally with two pairs of cheliceral setae (*cha*, *chb*) and postpalpal setae (*pp*); palps prominent, with two pairs of setae (*dFe*, *dGe*); tibial claw distinct; palpal solenidion (ω) well developed, *ass* large, mushroom-like. Palp tibiotarsus with two distal setiform structures. Subcapitular setae (*m*) and alveolar pits (*n*) present. Cheliceral stylets and their levers very small. Pharyngeal pumps tripartite, situated on long and thin oesophagus; pump 1 bow-shaped, far separated from pump 2, pumps 2 and 3 oval, situated close to each other. Prodorsum with three pairs of setae (*v1*, *v2*, *sc2*), one pair of clavate trichobothria (*sc1*) and one pair of elongate stigmata. Tracheal trunks well developed, long. Tergite C with two pairs of setae (*c1*, *c2*); tergite D with one pair of setae (*d*);

tergite EF with one pair of setae (*f*); tergite H with two pairs of setae (*h1*, *h2*); cupules *ia*, *im* and *ih* on tergites D, EF and H, respectively. Coxisternal fields I and II with two pairs of setae each (*1a*, *1b* and *2a*, *2b*), setae *1b* not modified; coxisternal fields III with three pairs of setae (*3a*, *3b*, *3c*); coxisternal fields IV with one pair of setae (*4b*); posterior sternal (metasternal) plate with distinct transverse furrow posteriad setae *3b*. Pseudanal segment with three pairs of setae (*ps1*–*3*). Apodemes ap1 well developed, ap2 well developed, joined with well-developed appr; apsej poorly developed, only laterally; secondary transverse apodeme absent; ap3 well developed; appo strongly reduced, ap4 well developed, not fused with appo; ap5 very small, located near trochanter IV. Posterior margin of posterior sternal plate evenly rounded. Sporothecae absent. Genital sclerites poorly sclerotized and grouped close to each other. Leg I 5-segmented, with cylindrical tarsus. Tarsal claw simple. Legs II–IV each with one pair of simple hooked claws and elongate empodium. Solenidia on tibiae I–III erect; solenidion on tibia IV vestigial, situated in depression. Femora III and IV divided into basitelson and telofemur. Leg setation: leg I: Tr 1 (*v'*), Fe 4 (*d*, *l'*, *l''*, *v''*), Ge 3 (*l'*, *l''*, *v'*), Ti 6(2) (*d*, *l'*, *l''*, *v'*, *v''*, *k*, ϕ 1, ϕ 2), Ta 12(2) (*tc'*, *tc''*, *p'*, *p''*, *ft'*, *ft''*, *pv'*, *pv''*, *pl'*, *pl''*, *u'*, *u''*, ω 1, ω 2); leg II: Tr 1 (*v'*), Fe 3 (*d*, *l'*, *v''*), Ge 1 (*l'*), Ti 4(1) (*d*, *l'*, *v'*, *v''*, ϕ), Ta 4(1) (*tc'*, *tc''*, *u'*, *u''*, ω); leg III: Tr 1 (*v'*), Fe 2 (*d*, *v'*), Ge 1 (*l'*), Ti 4(1) (*d*, *l'*, *v'*, *v''*, ϕ), Ta 4 (*tc'*, *tc''*, *u'*, *u''*); leg IV: Tr 1 (*v'*), Fe 2 (*d*, *v'*), Ge 1 (*v'*), Ti 3(1) (*d*, *v'*, *v''*, ϕ), Ta 6 (*pl''*, *tc'*, *tc''*, *u'*, *pv'*, *pv''*). Setae *s* on tarsus I, *v''* on genu I, *v'*, *l''* on genu II, *v'* on genu III, *l'* on tibia IV, *pl''*, *pv'* and *pv''* on tarsi III and IV absent.

Male and *larva* unknown.

Species included. The genus *Pseudositeroptes* includes one species, *P. trachi* sp. n.

Distribution and habitat. *P. trachi* sp. n. inhabits rotting wood and bark of birch trees in Western Siberia, Russia.

Differential diagnosis. Females of the new genus are most similar to the genera *Siteroptes* Amerling, 1861 and *Krczaldania* Sasa, 1961 in having a 5-segmented leg I, the presence of postpalpal setae, and the absence of setae *e*. The new genus differs from both closely related genera in having the posterior sternal plate divided by a transverse furrow (vs. entire in *Siteroptes* and *Krczaldania*) and in the absence of setae *s* on tarsus I, *v'* on genu III, and *pl''*, *pv'* and *pv''* on tarsi III and IV (vs. present in *Siteroptes* and *Krczaldania*).

Etymology. The name of the new genus is a combination of *pseudo* (Greek for “false”) and *Siteroptes*, the name of the closest related genus.

***Pseudositeroptes trachi* sp.n.**

(Figs. 1–6)

Description. *Female.* Length of idiosoma 330 (315), width 125 (125–130).

Idiosomal dorsum (Figs. 1A, 5A, 6A, B). Stigmata located anteromesad setae *v1* (Fig. 6A). All dorsal sclerites with numerous small and hardly discernible puncta. Setae *sc2*, *c2* and *h2* pointed, other dorsal setae weakly blunt-tipped; setae *c2* and *h2* smooth, other dorsal setae weakly barbed; setae *h2* very long. Trichobothria with short stem, clavate, with rounded apex. Lengths of dorsal setae: *v1* 23 (21, 29), *v2* 28 (29, 30), *sc2* 55 (50, 53), *c1* 16 (16,

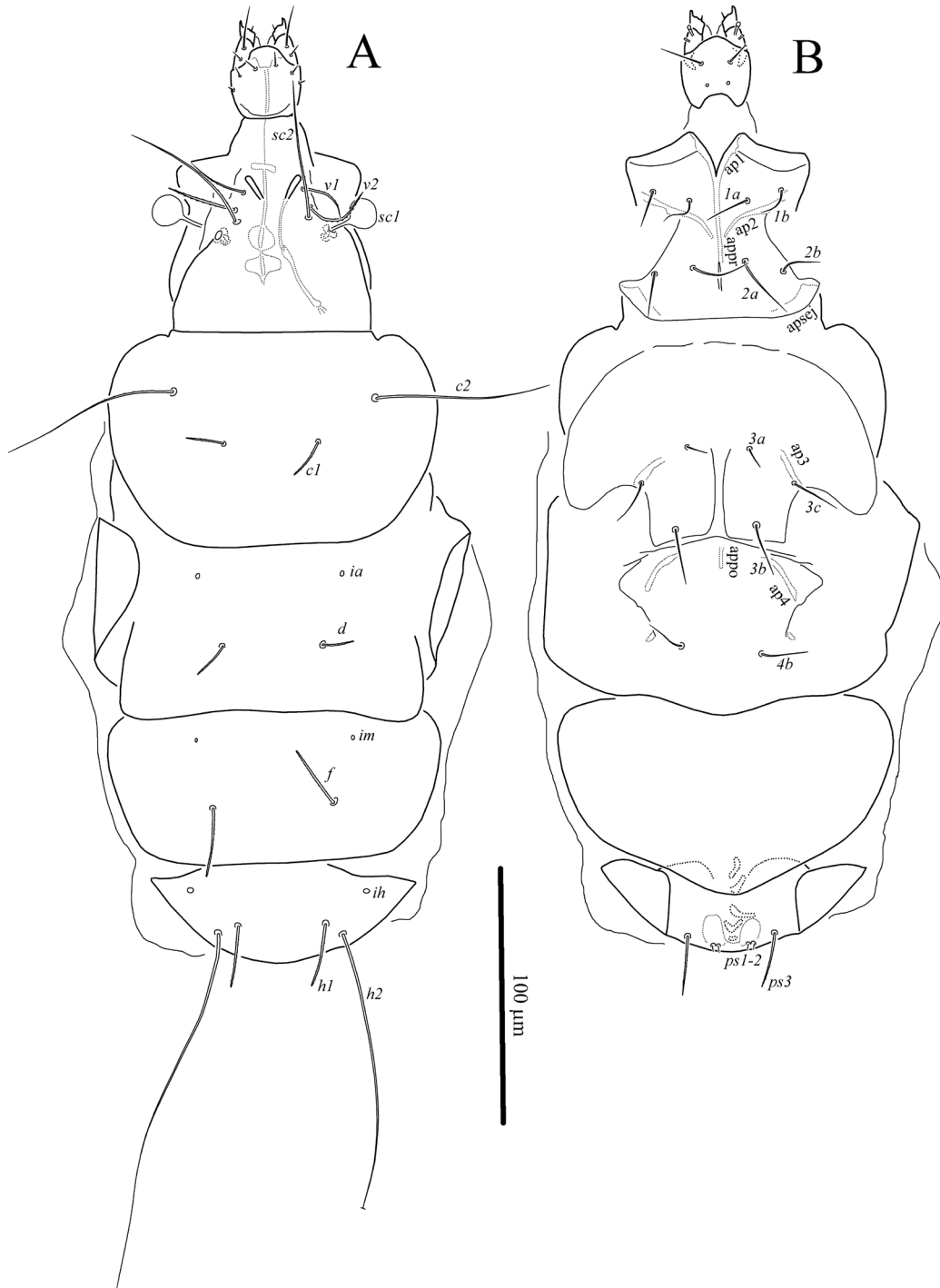


Fig. 1. *Pseudositeroptes trachi* gen. and sp.n., female: A—dorsum of body; B—venter of body. Legs omitted.

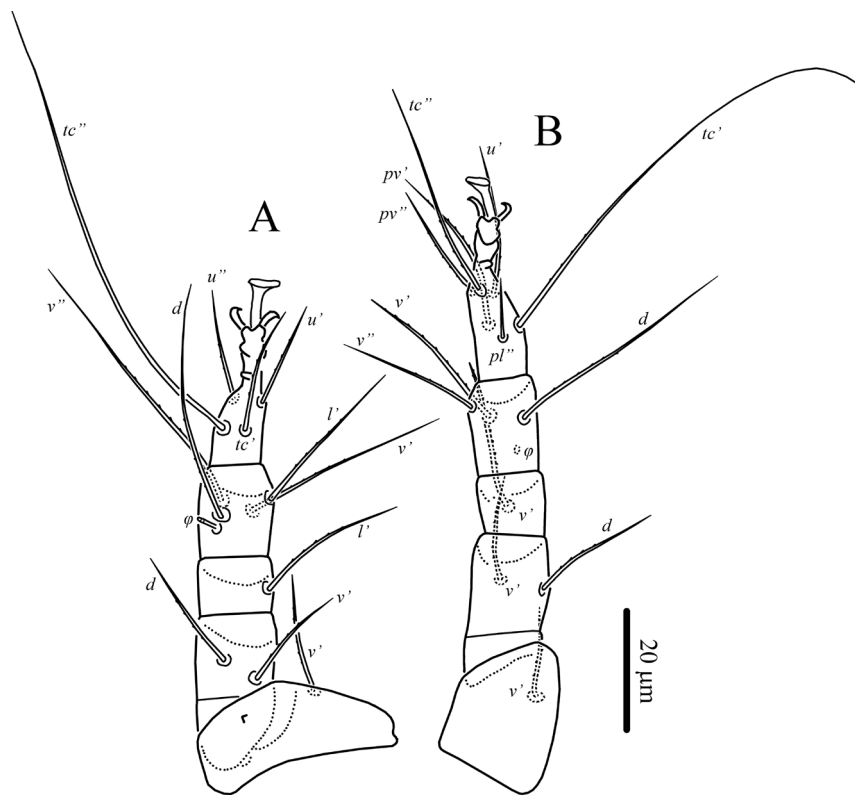


Fig. 4. *Pseudositeroptes trachi* gen. and sp.n., female: A—left leg III, dorsal aspect; B—left leg IV, dorsal aspect.

solenidia $\omega 2$ and $\phi 2$ baculiform. Setae l' of femur, k , (u), pl'' , pv'' and eupathidia (fi), (tc), (p) of tarsus smooth, other setae weakly barbed; seta k of tibia and eupathidia of tarsus blunt-tipped, other leg setae pointed. Leg II (Fig. 3B). Solenidion $\omega 6$ (5) digitiform, solenidion $\phi 3$ (3, 4) weakly clavate. Setae l' of femur, tc'' and (u) of tarsus smooth, other leg setae weakly barbed; all leg setae pointed. Leg III (Fig. 4A). Solenidion $\phi 3$ (3) weakly clavate. Seta tc'' of tarsus smooth, other leg setae weakly barbed; all leg setae pointed. Leg IV (Fig. 4B). Seta pl'' of tarsus smooth, other setae weakly barbed; all leg setae pointed.

Type material. Female holotype, slide ZISP T-Pygm-017: Russia, Tyumenskaya Oblast, Yarkovsky Rayon, 57°32'16.2"N 67°05'51.4"E, under the thin bark of a rotting birch twig lying on the ground, 10 July 2019, coll. V.M. Salavatulin (sample) and V.A. Mashkov (mites); paratypes: 2 females, same data.

Type deposition. The holotype is deposited in the acarological collection of the Zoological Institute of the Russian Academy of Sciences (Saint Petersburg, Russia); other paratypes are deposited in the mite collection of the Museum of Zoology at the University of Tyumen (Tyumen, Russia).

Etymology. The new species is named after the Ukrainian acarologist Viacheslav Trach, who died so early.

Genus ***Neodiroptes* gen.n.**

Type species: *Neodiroptes sibiriensis* sp.n.

Description. *Female.* Body weakly sclerotized, elongate. Gnathosomal capsule of about equal length and width, prognathous, dorsally with two pairs of cheliceral setae (cha , chb) and postpalpal setae (pp); palps prominent, with two pairs of setae (dFe , dGe); tibial claw distinct; palpal solenidion (ω) well developed, accessory setigenous structure (ass) large, mushroom-like. Palp tibiotarsus with one distal setiform structure. Subcapitular setae (m) and alveolar pits (n) present. Cheliceral stylets and their levers very small. Pharyngeal pumps tripartite, situated on long and thin oesophagus; pump 1 bow-shaped, far separated from pump 2, pumps 2 and 3 oval, situated close to each other. Prodorsum with three pairs of setae ($v1$, $v2$, $sc2$), one pair of clavate trichobothria ($sc1$) and one pair of oval stigmata. Tracheal trunks well developed, long. Tergite C with two pairs of setae ($c1$, $c2$); tergite D with one pair of setae (d); tergite EF with two pairs of setae (e , f); tergite H with two pairs of setae ($h1$, $h2$);

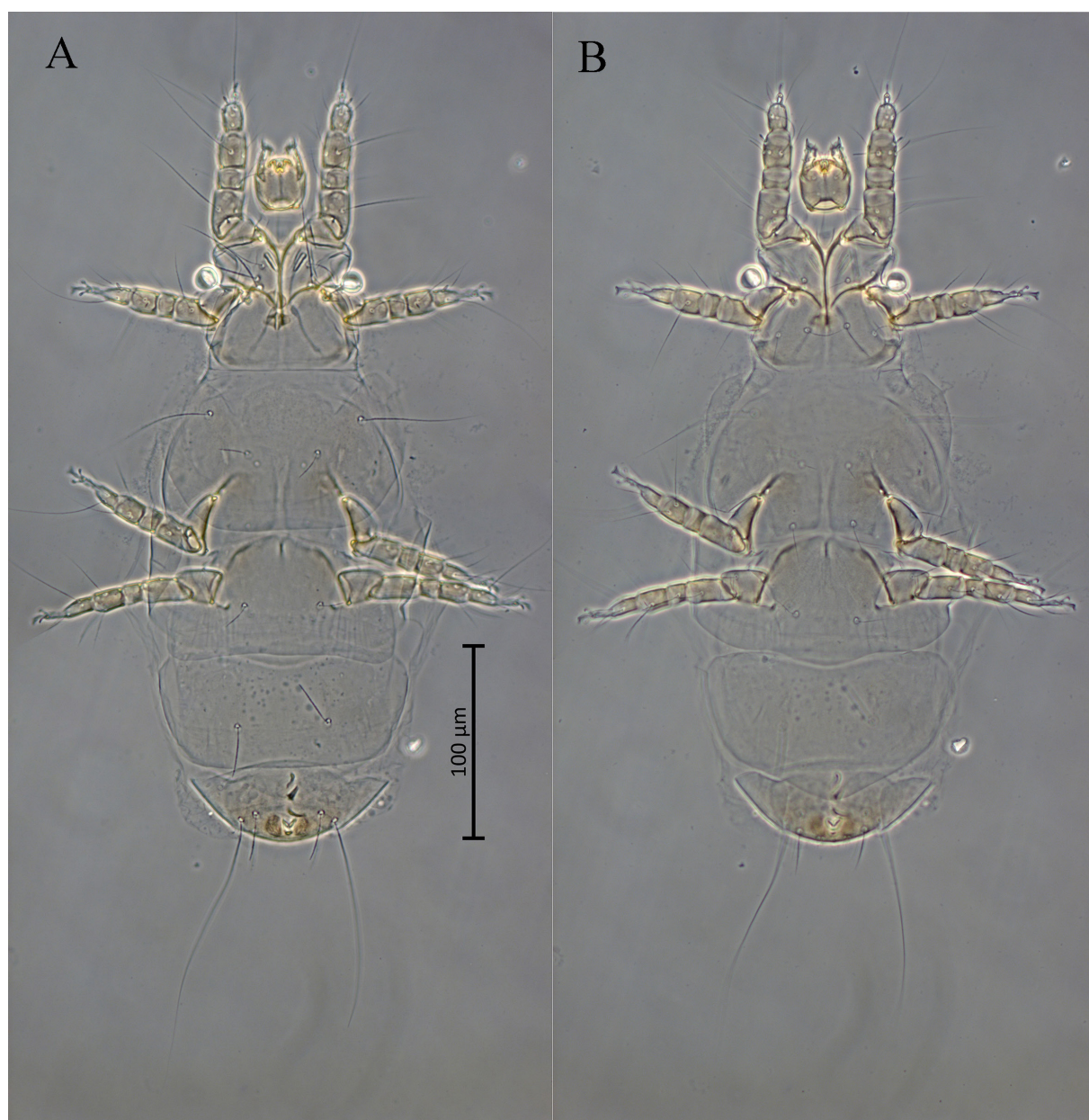


Fig. 5. Phase contrast micrographs of *Pseudositeroptes trachi* gen. and sp.n., female (holotype): A—general view dorsally; B—general view ventrally.

cupules *ia* and *ih* on tergites D and H, respectively; cupules *im* absent. Coxisternal fields I and II with two pairs of setae each (*1a*, *1b* and *2a*, *2b*), setae *1b* not modified; coxisternal fields III with three pairs of setae (*3a*, *3b*, *3c*); coxisternal fields IV without setae; posterior sternal (metasternal) plate without transverse furrow. Pseudanal segment with three pairs of setae (*ps1*–*3*). Apodemes *ap1* well developed, *aapodemes ap2* well developed, joined with well-developed *appr*; *apsej* poorly developed only laterally; secondary transverse apodeme absent; *ap3* well developed; *appo* strongly reduced, *ap4* well developed, not fused with *appo*; *ap5* very

small, located near trochanter IV. Posterior margin of posterior sternal plate evenly rounded. Sporothecae absent. Genital sclerites poorly sclerotized and grouped close to each other. Leg I 5-segmented, with cylindrical tarsus. Tarsal claw simple. Legs II–IV each with one pair of simple hooked claws and elongate empodium. Solenidia on tibiae I–III erect; solenidion on tibia IV vestigial, situated in depression. Femora III and IV divided into basi- and telofemur. Leg setation: leg I; Tr 1 (*v'*), Fe 4 (*d*, *l'*, *l''*, *v''*), Ge 3 (*l'*, *l''*, *v'*), Ti 6(2) (*d*, *l'*, *l''*, *v'*, *v''*, *k*, $\phi 1$, $\phi 2$), Ta 12(2) (*tc'*, *tc''*, *p'*, *p''*, *ft'*, *ft''*, *pv'*, *pv''*, *pl'*, *pl''*, *u'*, *u''*, $\omega 1$, $\omega 2$); leg II: Tr 1 (*v'*), Fe

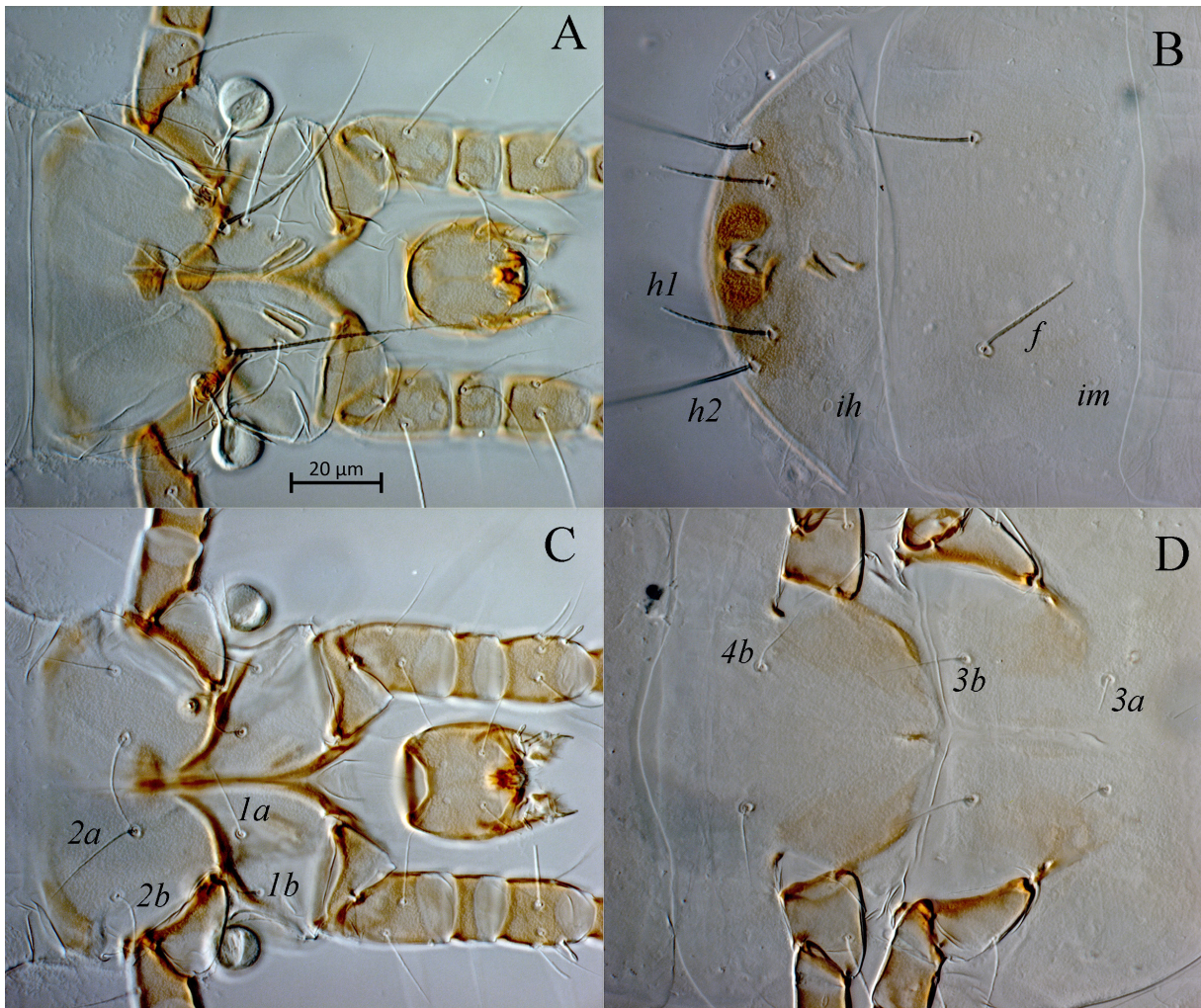


Fig. 6. DIC micrographs of *Pseudositeroptes trachi* gen. and sp.n., female (holotype): A—proterosoma, dorsal aspect; B—opisthosoma, dorsal aspect; C—proterosoma, ventral aspect; D—metapodosoma, ventral aspect.

3 (*d, l', v''*), Ge 0, Ti 4(1) (*d, l', v', v'', φ*), Ta 4(1) (*tc', tc'', u', u'', ω*); leg III: Tr 1 (*v'*), Fe 2 (*d, v'*), Ge 0, Ti 4(1) (*d, l', v', v'', φ*), Ta 4 (*tc', tc'', u', u''*); leg IV: Tr 0, Fe 2 (*d, v'*), Ge 1 (*v'*), Ti 3(1) (*d, v', v'', φ*), Ta 6 (*pl'', tc', tc'', u', pv', pv''*). Setae *s* on tarsus I; *v''* on genu I; *v', l', l''* on genu II; *l', v'* on genu III; *v'* on trochanter IV; *l'* on tibia IV; *pl'', pv'* and *pv''* on tarsi III and IV absent.

Larva. Gnathosomal capsule as in female, except absence of setae *pp*. Prodorsum with four pairs of setae (*v1, v2, sc1, sc2*). Stigmata and tracheae absent. Tergite C divided into three parts, unpaired median with setae *c1* and paired lateral with setae *c2*; tergite D with one pair of setae (*d*); tergite EF with two pairs of setae (*e, f*); tergite H with two pairs of setae (*h1, h2*); cupules *ia* and *ih* on tergites D and H, respectively; cupules *im* absent. Coxisternal fields I and II with two pairs of setae each (*1a, 1b* and *2a, 2b*), coxisternal fields

III with two pairs of setae (*3a, 3b*). Pseudanal segment with three pairs of setae (*ps1–3*). Anterior and posterior sternal plates separated medially. Only ap2 well developed. Tarsus I with a pair of simple claws and without empodium; claws and empodium on tarsi II and III as in female. Leg chaetotaxy similar to that of female except following: trochanters I–III without setae; tibia and tarsus I with one solenidion ($\phi 1, \omega 1$); setae *p'* and *p''* on tarsus I absent.

Male unknown.

Species included. The genus *Neodiroptes* includes one species, *N. sibiriensis* sp.n.

Distribution and habitat. *N. sibiriensis* sp.n. inhabits rotting wood and bark of hard wood tree species in Western Siberia.

Differential diagnosis. Females of the new genus are most similar to the genera *Sevastianovella* Livshits, Mitrofanov and Sharonov, 1986 and

Diroptes Kaliszewski, 1988 in having a 5-segmented leg I, as well as in the presence of postpalpal setae and setae *e*. The new genus differs from both closely related genera in the absence of setae on coxisternal fields IV (vs. at least one pair of setae present in *Diroptes* and three pairs in *Sevastianovella*). The new genus also differs in the absence of setae *s* on tarsus I; *l'*, *v'* on genua II and III; *pl''*, and *pv'* and *pv''* on tarsi II and III (vs. present in *Diroptes* and *Sevastianovella*). The new genus is also similar to *Pseudositeroptes* gen. n. in the absence of setae *v''* on genu I, *s* on tarsus I, *l''*, *v'* on genu II, *v'* on genu III, *l'* on tibia IV, and *pl''*, *pv'* and *pv''* on tarsi II and III. It is also similar to *Pseudositeroptes* gen. n. in the absence of setae *4a* and *4c*, the presence of two pairs of setae on each of the coxisternal fields I and II, and a strongly reduced poststernal apodeme. The new genus differs sufficiently from *Pseudositeroptes* in having an entire poststernal plate (vs. divided into two parts by a transverse furrow in *Pseudositeroptes*), absence of setae *4b* (vs. present in *Pseudositeroptes*), presence of setae *e* (vs. absent in *Pseudositeroptes*) and a complete absence of setae on genua II and III (vs. one seta present on each genua, II and III in *Pseudositeroptes*).

Etymology. The name of the new genus is a combination of Greek *neo* (meaning “new”) and *Diroptes*, the name of the closest related genus.

***Neodiroptes sibiriensis* sp. n.**

(Figs. 7–13)

Description. *Female* (Figs. 7–11). Length of idiosoma 240 (220–320), width 98 (98–135).

Idiosomal dorsum (Figs. 7A, 10A, 11A). Stigmata located anteriorly to setae *v1* (Fig. 11A). All dorsal sclerites with numerous small and hardly discernible puncta. Setae *sc2*, *c2*, *f* and *h2* pointed, other dorsal setae weakly blunt-tipped; setae *v2* lanceolate (Fig. 11A); setae *v1*, *c1*, *d* and *e* smooth, other dorsal setae weakly barbed. Trichobothria with short stem, clavate, with rounded apex. Lengths of dorsal setae: *v1* 15 (14–17), *v2* 21 (21–26), *sc2* 67 (64–76), *c1* 18 (18–22), *c2* 58 (57–75), *d* 12 (12–20), *e* 6 (6–8), *f* 36 (36–48), *h1* 27 (27–31), *h2* 43 (43–66). Distances between setae: *v1*–*v1* 16 (16–21), *v2*–*v2* 26 (24–30), *sc2*–*sc2* 24 (21–28), *c1*–*c1* 33 (33–41), *c1*–*c2* 23 (23–32), *c2*–*c2* 69 (69–88), *d*–*d* 36 (36–50), *e*–*f* 4 (3–6), *f*–*f* 38 (38–58), *e*–*e* 46 (46–68), *h1*–*h1* 28 (26–36), *h1*–*h2* 7 (7–12), *h2*–*h2* 41 (39–57).

Idiosomal venter (Figs. 7B, 10 B, 11B–D). All ventral plates with numerous small and hardly discernible puncta. Setae *ps3* blunt-tipped and weakly barbed; over ventral setae pointed and smooth. Posterior margin of aggenital plate evenly rounded. One specimen without setae *3c* (Fig. 11D). Lengths of ventral setae: *1a* 12 (12–15), *1b* 9 (7–12), *2a* 15 (15–21), *2b* 6 (6–7), *3a* 9 (9–14), *3b* 15 (13–23), *3c* 11 (11–19), *ps1*–*2* 4 (4–5), *ps3* 18 (18–26).

Gnathosoma. Length of gnathosoma 22 (21–27), width 22 (21–29). Dorsal median apodeme absent. All gnathosomal setae smooth; setae *cha*, *chb*, *dFe* and *pp* weakly blunt-tipped, other gnathosomal setae pointed. Lengths of gnathosomal setae: *m* 14 (14–18), *cha* 5 (5–6), *chb* 7 (7–10), *dFe* 5 (5–6), *dGe* 12 (12–15). Pharyngeal pumps as in *Pseudositeroptes trachi*.

Legs (Figs 8, 9). Leg I (Fig. 8A). Lengths of solenidia $\omega 1$ 5 (5–6), $\omega 2$ 2 (2–3), $\phi 1$ 4 (4–5), $\phi 2$ 3 (2–3); solenidium $\omega 1$ digitiform, solenidia $\omega 2$, $\phi 1$ and $\phi 2$ clavate. Setae *d* of femur and tibia, as well as *l'* of genu weakly barbed, other leg setae smooth; seta *k* of tibia and eupathidia of tarsus blunt-tipped, other leg setae pointed. Leg II (Fig. 8B). Solenidium ω 5 (5–6) digitiform, solenidium ϕ 2 (2–3) weakly clavate. All leg setae pointed and smooth. Leg III (Fig. 9A). Solenidium ϕ 2 (2–3) weakly clavate. All leg setae pointed and smooth. Leg IV (Fig. 9B). All leg setae pointed and smooth.

Larva (Figs. 12, 13). Length of idiosoma 180–195, width 94–105.

Idiosomal dorsum (Fig. 12A). All dorsal shields smooth. Setae *f*, *h1*, and *h2* barbed, other dorsal setae smooth; setae *v1*, *v2*, *sc1*, *c1*, *d* and *e* weakly blunt-tipped, other dorsal setae pointed. Lengths of dorsal setae: *v1* 4–6, *v2* 5–6, *sc1* 12–13, *sc2* 53–56, *c1* 10–12, *c2* 34–35, *d* 13–15, *e* 7–8, *f* 47–50, *h1* 46–51, *h2* 68–73. Distances between setae: *v1*–*v1* 14–17, *v2*–*v2* 40–42, *sc1*–*sc1* 32–36, *sc2*–*sc2* 33–36, *c1*–*c1* 40–45, *d*–*d* 50–56, *e*–*f* 6–8, *f*–*f* 46–49, *h1*–*h1* 26–28.

Idiosomal venter (Fig. 12B). All ventral plates smooth and pointed. Lengths of ventral setae: *1a* 6–8, *1b* 4–6, *2a* 7–8, *2b* 5, *3a* 7–8, *3b* 8–9, *ps1* 8–11, *ps2* 33–35, *ps3* 7–8.

Gnathosoma. Length of gnathosoma 20–23, width 22–23. Dorsal median apodeme absent. All gnathosomal setae smooth; setae *chb* with slightly widened tips; setae *cha* and *dFe* weakly blunt-tipped, other gnathosomal setae pointed. Lengths of gnathosomal setae: *m* 11–13, *cha* 4–5, *chb* 3–4, *dFe* 4–5, *dGe* 11–12.

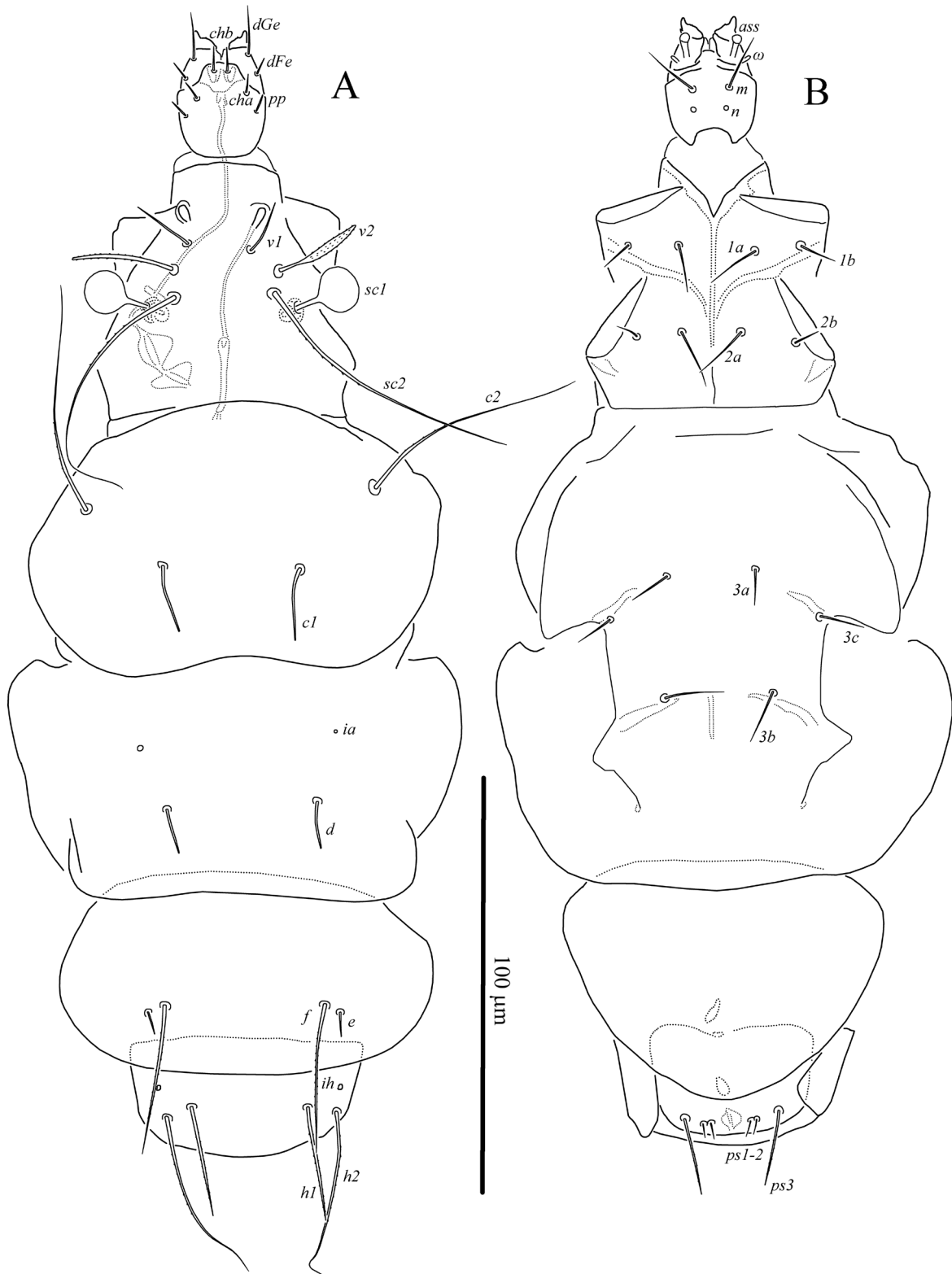


Fig. 7. *Neodiropetes sibiriensis* gen. and sp.n., female: A—dorsum of body; B—venter of body. Legs omitted.

Legs (Fig. 13). Leg I (Fig. 13A). Lengths of solenidia $\omega 1$ 4–5, $\phi 1$ 4; solenidion $\omega 1$ digitiform, solenidion $\phi 1$ clavate. Seta *d* of tibia weakly barbed, other leg setae smooth; seta *k* of tibia and

eupathidia (*tc*) and (*ft*) of tarsus blunt-tipped, other leg setae pointed. Leg II (Fig. 13B). Solenidion ω 4 digitiform, solenidion ϕ 2–3 weakly clavate. All leg setae pointed and smooth. Leg III (Fig.

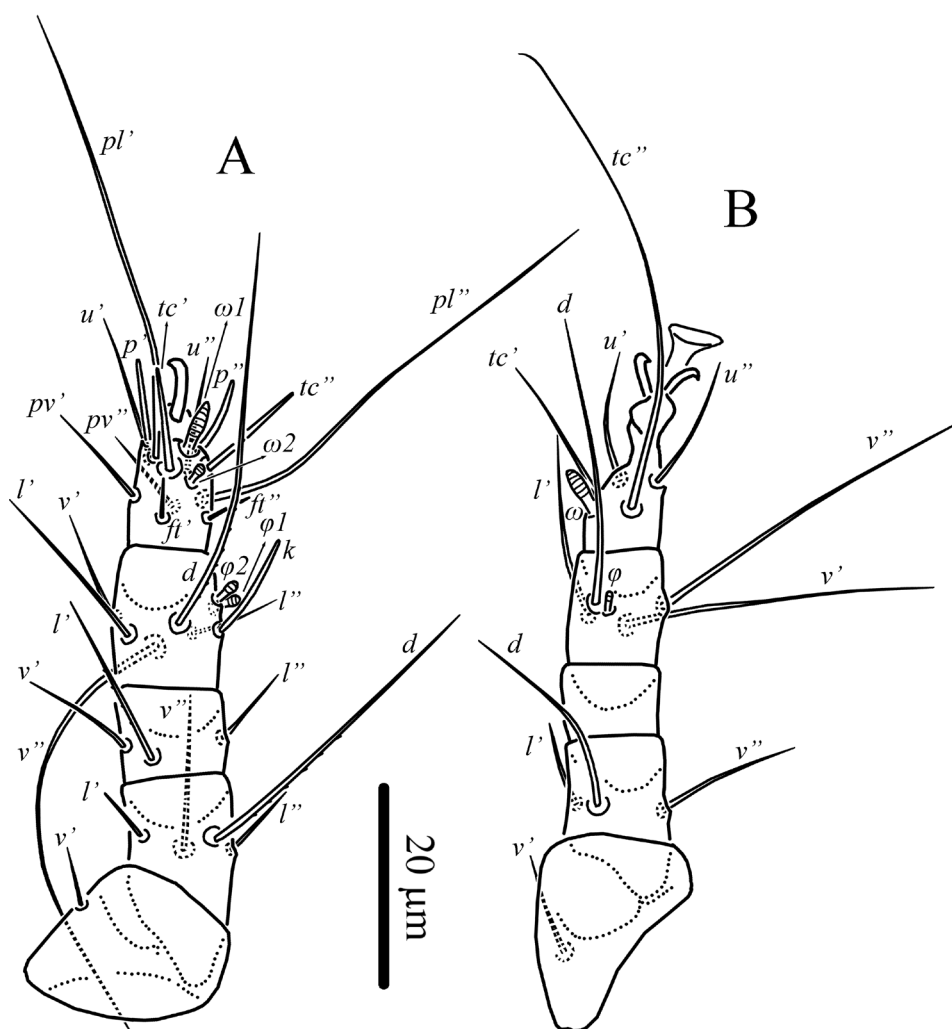


Fig. 8. *Neodiroptes sibiriensis* gen. and sp.n., female: A—right leg I, dorsal aspect; B—right leg II, dorsal aspect.

13C). Solenidion ϕ 2 weakly clavate. All leg setae pointed and smooth.

Male unknown.

Type material. Female holotype, slide ZISP T-Pygm-018, Russia, Tyumenskaya Oblast, Yarkovsky Rayon, 57°32'16.2"N 67°05'51.4"E, under the thin bark of a rotting birch twig lying on the ground, 10 July 2019, coll. V.M. Salavatulin (sample) and V.A. Mashkov (mites); paratypes: 3 females, 5 larvae, same data; one female, Russia, city of Tyumen, 57°09'29.3"N 65°35'51.1"E, under thin bark of a rotting branch of *Salix* sp., 11 August 2024, coll. V.A. Khaustov; 2 females, 1 larva, Russia, Tyumenskaya Oblast, vicinity of Lake Kuchak, 57°20'13.7"N 66°02'41.4"E, under the thin bark of a rotting birch twig lying on the ground, 8 October 2021, coll. V.A. Khaustov.

Type deposition. The holotype and one female paratype are deposited in the acarological collection

of the Zoological Institute of the Russian Academy of Sciences (Saint Petersburg, Russia); other paratypes are deposited in the mite collection of the Museum of Zoology at the University of Tyumen (Tyumen, Russia).

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

Genus ***Sevastianoviella*** Livshits, Mitrofanov and Sharonov, 1986

Type species: *Sevastianoviella lacidus* Livshits Mitrofanov and Sharonov, in litt., by original designation.

Description. *Female.* Body weakly sclerotized, oval. Gnathosomal capsule of about equal length and width, prognathous, dorsally with two pairs of cheliceral setae (*cha*, *chb*) and postpalpal setae (*pp*); palps prominent, with two pairs of setae (*dFe*,

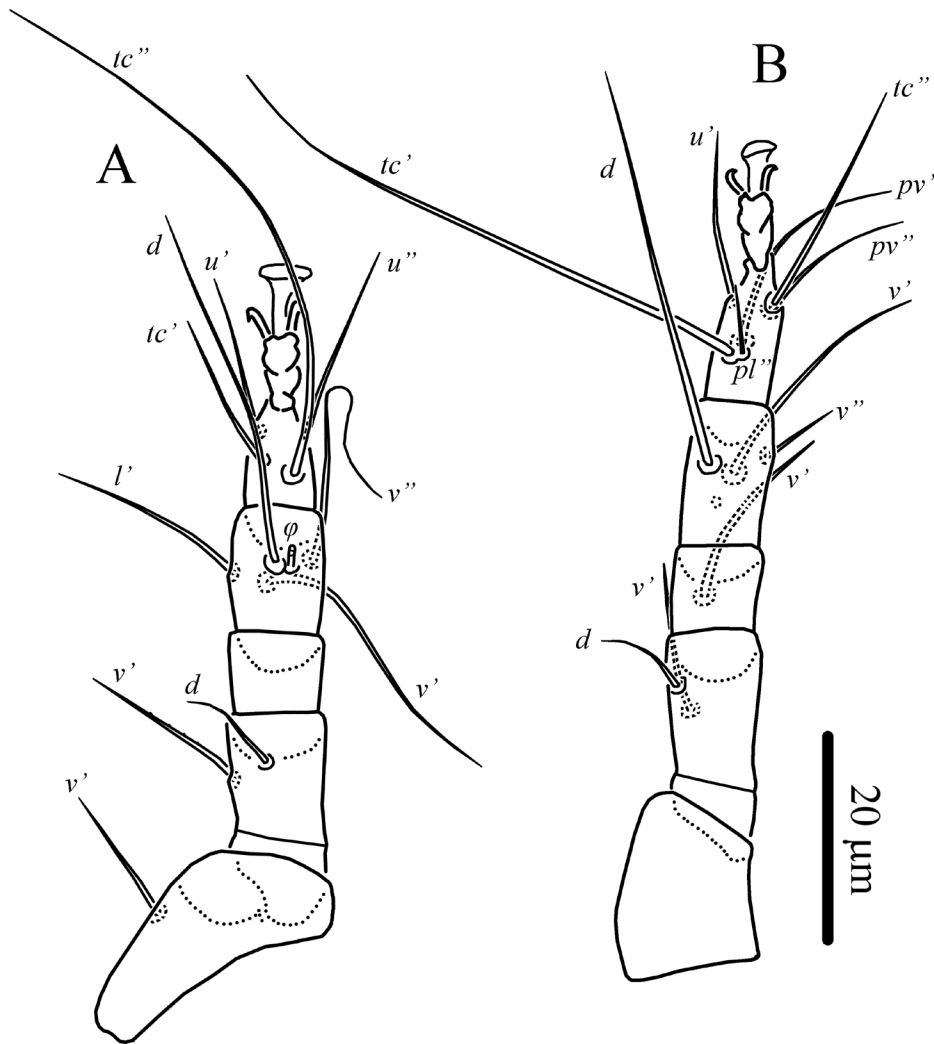


Fig. 9. *Neodiropetes sibiriensis* gen. and sp.n., female: A—right leg III, dorsal aspect; B—right leg IV, dorsal aspect.

dGe); tibial claw distinct; palpal solenidion (ω) well developed, accessory setigenous structure (*ass*) large, mushroom-like. Palp tibiotarsus with one distal tiny setiform structure. Subcapitular setae (*m*) present; alveolar pits (*n*) absent. Cheliceral stylets and their levers very small. Pharyngeal pumps indistinct in examined material. Prodorsum with three pairs of setae (*v1*, *v2*, *sc2*), one pair of clavate trichobothria (*sc1*) and one pair of distinctly elongate stigmata situated on short elevation. Tracheal trunks well developed, long. Tergite C with two pairs of setae (*c1*, *c2*); tergite D with one pair of setae (*d*); tergite EF with two pairs of setae (*e*, *f*); tergite H with two pairs of setae (*h1*, *h2*); cupules *ia*, *im* and *ih* on tergites D, EF and H, respectively. Coxisternal fields I and II with two pairs of setae each (*1a*, *1b* and *2a*, *2b*), setae *1b* bifurcated; coxisternal fields III and IV each with three pairs of setae (*3a*, *3b*, *3c* and *4a*, *4b*, *4c*);

posterior sternal (metasternal) plate without transverse furrow. Pseudanal segment with one pair of setae (*ps3*). Apodemes *ap1* well developed, *ap2* well developed, joined with well-developed *appr*; sejugal apodeme poorly developed only laterally; secondary transverse apodeme absent; *ap3* well developed and not fused with well-developed *appo*, *ap4* well developed, fused with *appo*; apodemes 5 very small, located near trochanter IV. Posterior margin of posterior sternal plate weakly concave. Sporothecae absent. Genital sclerites poorly sclerotized and grouped close to each other. Leg I 5-segmented, with conical tarsus. Tarsal claw simple. Legs II–IV each with one pair of simple hooked claws and elongate empodium. Solenidia on tibiae I–III erect; solenidion on tibia IV vestigial, situated in depression; solenidion ω on tarsus II situated in distal part. Femora III and IV divided into basi- and telofemur. Leg setation: leg I; Tr 1

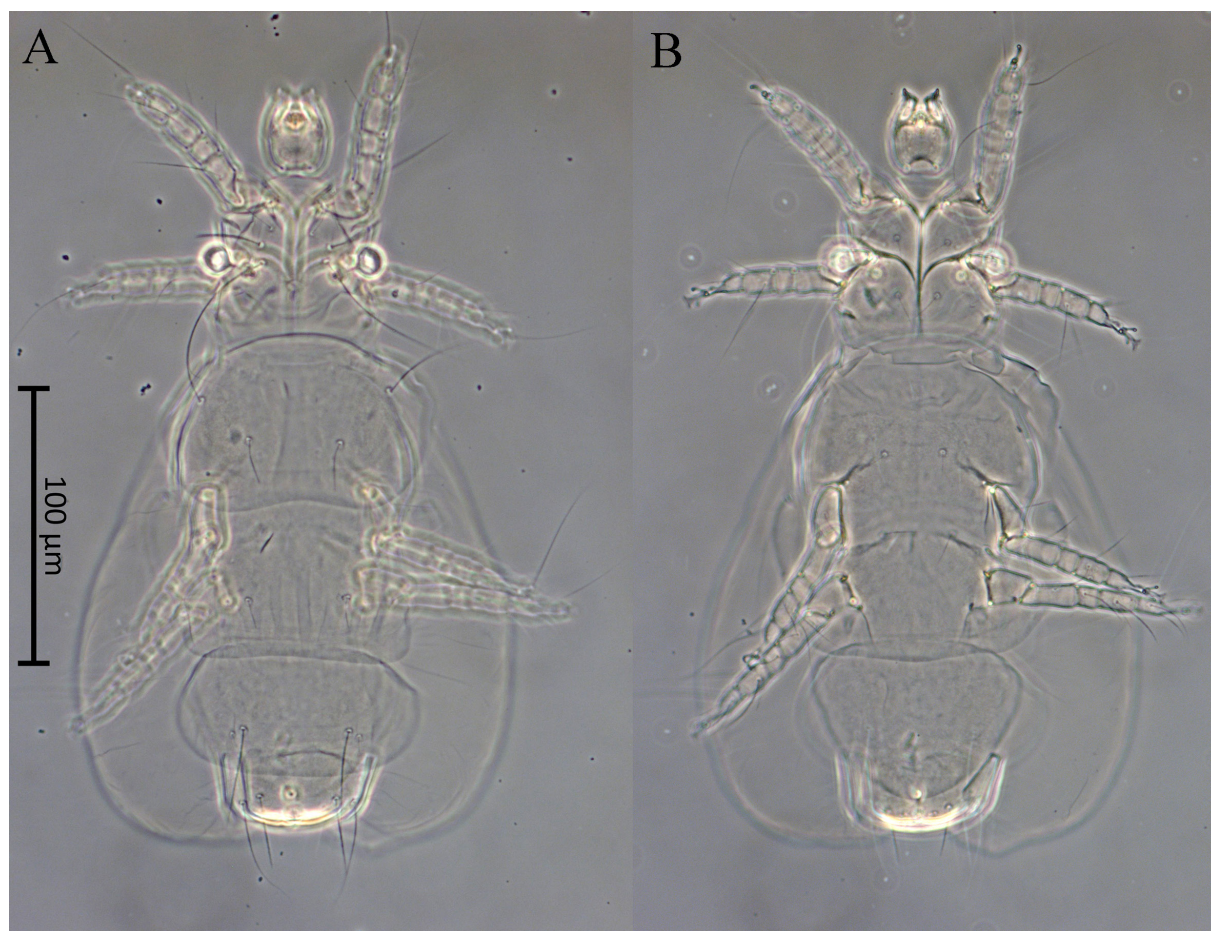


Fig. 10. Phase contrast micrographs of *Neodiroptes sibiriensis* gen. and sp.n., female: A—general view dorsally; B—general view ventrally.

(v'), Fe 4 (d, l', l'', v''), Ge 4 (l', l'', v', v''), Ti 6(2) ($d, l', l'', v', v'', k, \phi 1, \phi 2$), Ta 11(2) ($tc', tc'', p', p'', pv', pv'', pl', pl'', u', u'', s, \omega 1, \omega 2$); leg II: Tr 1 (v'), Fe 3 (d, l', v''), Ge 3 (l', l'', v'), Ti 4(1) (d, l', v', v'', ϕ), Ta 7(1) ($tc', tc'', pl'', pv', pv'', u', u'', \omega$); leg III: Tr 1 (v'), Fe 2 (d, v'), Ge 2 (l', v'), Ti 4(1) (d, l', v', v'', ϕ), Ta 7 ($tc', tc'', pl'', pv', pv'', u', u''$); leg IV: Tr 0, Fe 2 (d, v'), Ge 1 (v'), Ti 4(1) (d, l', v', v'', ϕ), Ta 6 ($pl'', tc', tc'', u', pv', pv''$). Setae ft' and ft'' on tarsus I and v' on trochanter IV absent.

Male and larva unknown.

Species included. The genus *Sevastianovella* includes one species, *S. lacidus* (Livshits, Mitrofanov and Sharonov, 1988).

Distribution and habitat. *S. lacidus* inhabits soil and forest litter in the Palearctic.

Remarks. Livshits *et al.* (1986) included in the genus *Sevastianovella* seven species grouped into two subgenera: *S. (s.str.) lacidus* (type species), *S. (s.str.) bohemicus* (Mahunka, 1963), *S. (s.str.) stellifer* (Zaki, 1983), *S. (s.str.) albidus* (Livshits,

Mitrofanov and Sharonov, 1988), *S. (s.str.) vetus* (Rack, 1965), *S. (Siteroptulus) spinisetus* (Livshits, Mitrofanov and Sharonov, 1988) and *S. (Siteroptulus) digitariae* (Flechtmann, 1971). Khaustov and Khaustov (2022) described *Sevastianovella taurica* and noted that the subgenus *Siteroptulus* insufficiently differs from the nominative subgenus. Khaustov (2015) synonymized the genus *Diroptes* Kaliszewski, 1988 under *Sevastianovella* because the genus *Sevastianovella* includes the type species of the genus *Diroptes*. The examination of the type material, as well as of a *Sevastianoviella lacidus* specimen from Western Siberia has revealed that this species sufficiently differs from the other representatives of the genus in having the following unique combination of characters in females: 1) stigmata situated on distinct prodorsal elevation; 2) only one pair of pseudanal setae present; 3) setae $4c$ absent; 4) tarsus I conical and lacking setae ft' and ft'' ; 5) solenidion ω on tarsus II situated distally. In other species of the genus *Sevastianoviella*, stigmata not situated on elevation; three pairs

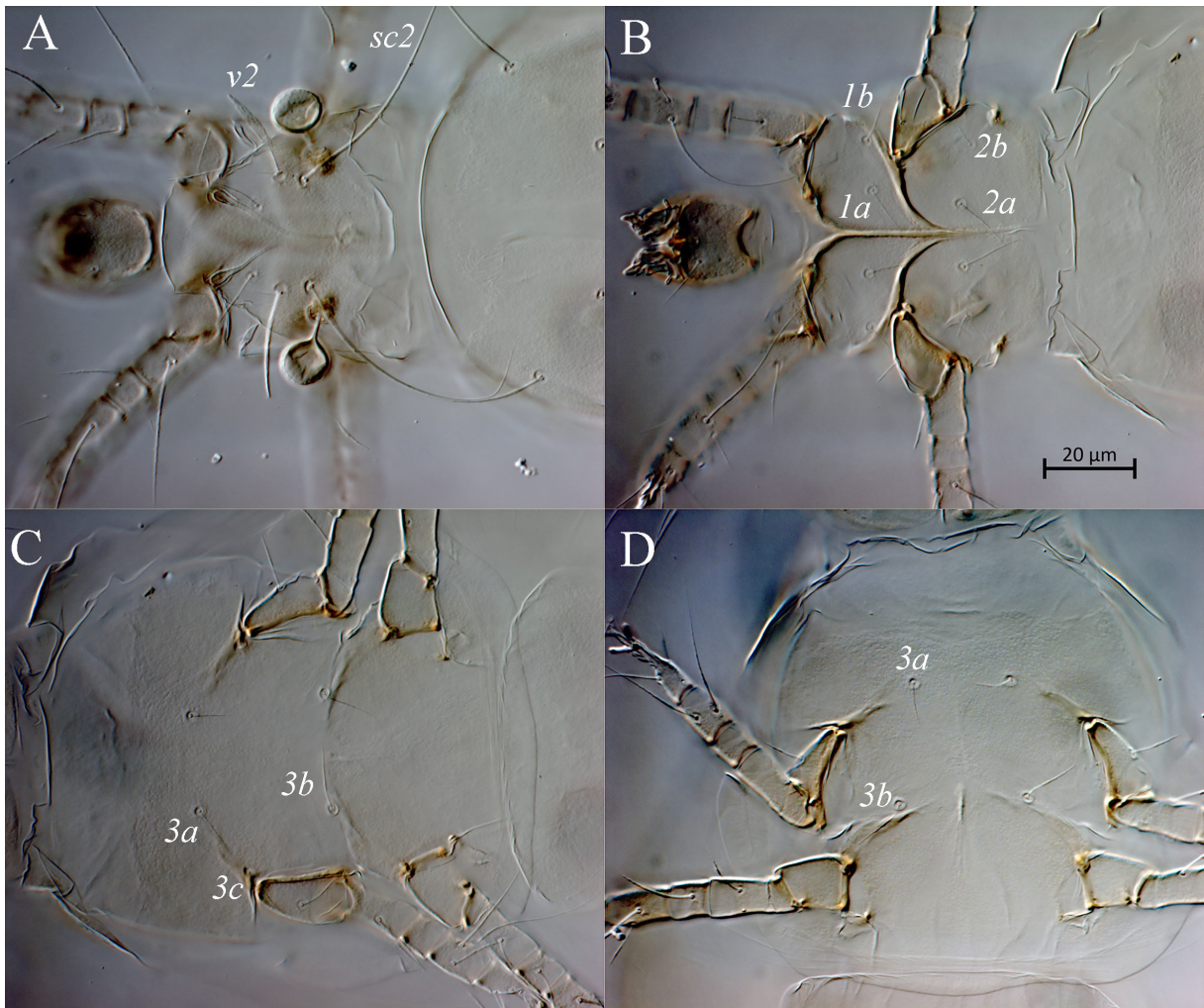


Fig. 11. DIC micrographs of *Neodiroptes sibiriensis* gen. and sp.n., female: A—proterosoma, dorsal aspect; B—proterosoma, ventral aspect; C, D—metapodosoma, ventral aspect.

of pseudanal setae; setae *4c* absent; tarsus I cylindrical, with setae *ft'* and *ft''*; and solenidion ω on tarsus II situated basally. In our opinion, the genus *Sevastianovella* includes only one species (*S. lacidus*), while the other species should be moved to the genus *Diroptes*, with a modified diagnosis (see below). The original description of *S. lacidus* lacks many important taxonomic characters, such as gnathosomal and leg chaetotaxy, measurements of idiosomal setae, etc. Herein, we provide a redescription of this species.

***Sevastianovella lacidus* (Livshits, Mitrofanov and Sharonov, 1988)**

Sevastianovella lacidus in. litt.:

Livshits *et al.* 1986, 20

Siteroptes lacidus: Livshits *et al.* 1988, 1318

(Figs. 14–17)

Description. *Female* (holotype measured). Length of idiosoma 230, width 135.

Idiosomal dorsum (Figs. 14A, 17A). Stigmata located between setae *v1*. All dorsal sclerites with numerous small puncta. Setae *h2* pointed, other dorsal setae blunt-tipped; setae *v2* smooth, other dorsal setae strongly barbed. Trichobothria with short stem, clavate, with rounded apex. Lengths of dorsal setae: *v1* 29, *v2* 11, *sc2* 70, *c1* 65, *c2* 55, *d* 67, *e* 30, *f* 62, *h1* 37, *h2* 37. Distances between setae: *v1*–*v1* 25, *v2*–*v2* 34, *sc2*–*sc2* 26, *c1*–*c1* 41, *c1*–*c2* 26, *c2*–*c2* 86, *d*–*d* 61, *e*–*f* 14, *f*–*f* 38, *e*–*e* 66, *h1*–*h1* 11, *h1*–*h2* 15, *h2*–*h2* 41.

Idiosomal venter (Figs. 14B, 17B). All ventral plates with numerous small puncta. Setae *1b* bifurcated with pointed tips; other ventral setae weakly blunt-tipped; all ventral setae smooth; setae *ps1* represented by alveolar pits. Posterior margin of

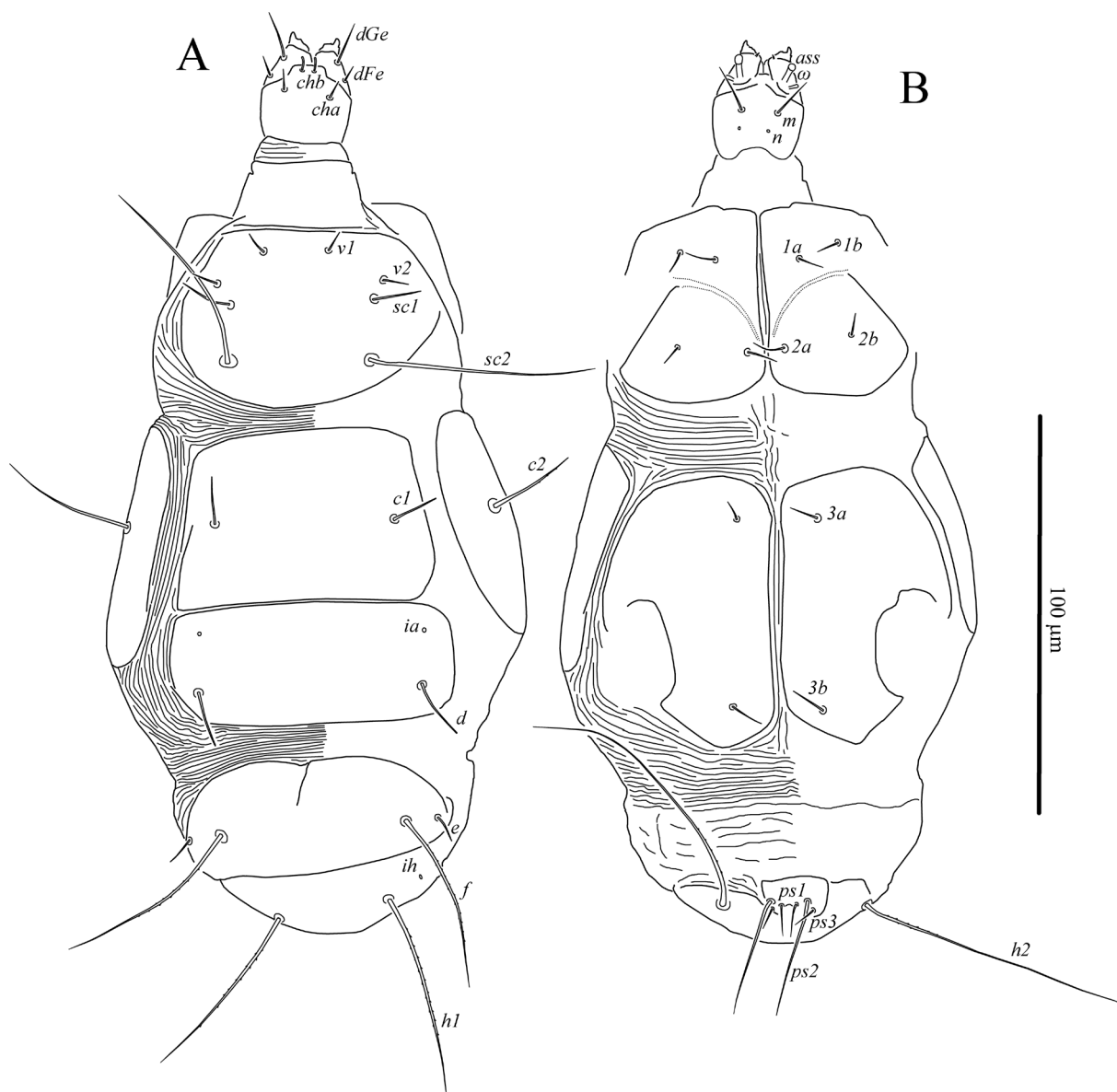


Fig. 12. *Neodiroptes sibiriensis* gen. and sp.n., larva: A—dorsum of body; B—venter of body. Legs omitted.

aggenital plate evenly rounded. Lengths of ventral setae: *1a* 13, *1b* 15, *2a* 12, *2b* 10, *3a* 12, *3b* 9, *3c* 13, *4a* 11, *4b* 15, *4c11 ps3* 9.

Gnathosoma. Length of gnathosoma 33, width 27. Dorsal median apodeme absent. All gnathosomal setae smooth; setae *cha*, *chb*, *dFe*, and *pp* weakly blunt-tipped, other gnathosomal setae pointed. Lengths of gnathosomal setae: *m* 14, *cha* 8, *chb* 7, *dFe* 8, *dGe* 11, *pp* 5.

Legs (Figs. 15, 16). Leg I (Fig. 15A). Lengths of solenidia $\omega 1$ 7, $\omega 2$ 5, $\phi 1$ 4, $\phi 2$ 3; solenidia $\omega 1$ and $\omega 2$ digitiform, solenidia $\phi 1$ and $\phi 2$ clavate. Seta *v'* of trochanter and eupathidia (*p*) and (*tc*) smooth, other setae barbed; seta *k* of tibia with few weak

barbs; setae *d*, *l'* of femur, *k* of tibia and eupathidia of tarsus blunt-tipped, other leg setae pointed. Leg II (Fig. 15B). Solenidium ω 8 digitiform, situated anteriad seta *u'*, solenidium ϕ 4 weakly clavate. Setae *v'* of trochanter and *tc''* of tarsus smooth, other leg setae barbed; setae *v'* of trochanter, *d*, *l''* and *l'''* of femur blunt-tipped, other leg setae pointed. Leg III (Fig. 16A). Solenidium ϕ 3 weakly clavate. Setae *v'* of trochanter and *tc''* of tarsus smooth, other leg setae barbed; setae *v'* of trochanter, *d* and *v'* of femur blunt-tipped, other leg setae pointed. Leg IV (Fig. 16B). All leg setae barbed; setae *d* and *v'* of femur blunt-tipped, other leg setae pointed.

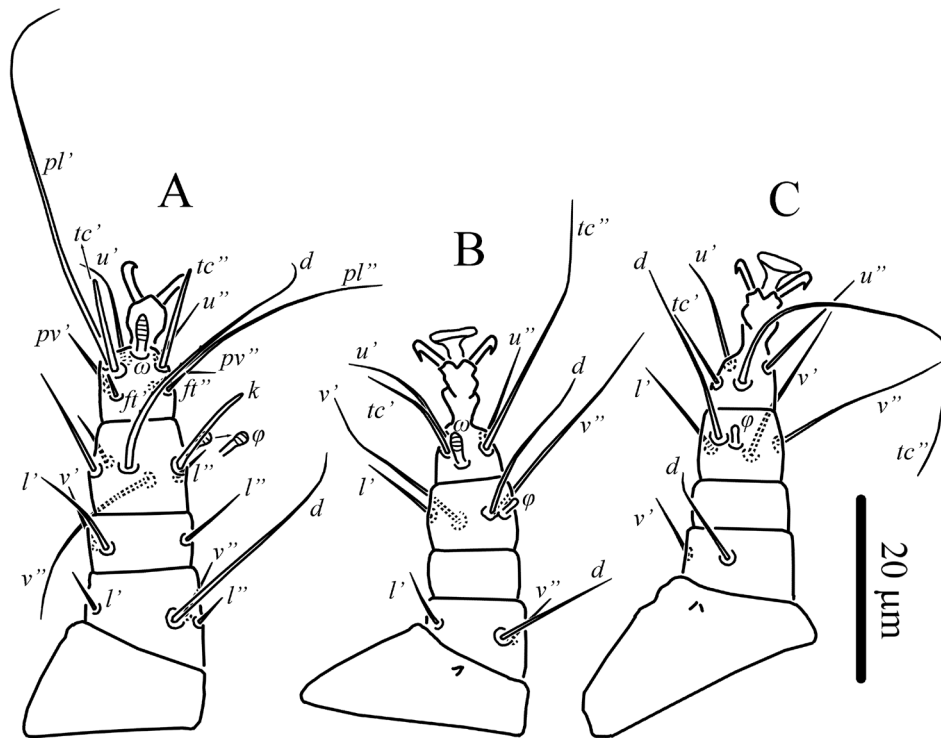


Fig. 13. *Neodiropetes sibiriensis* gen. and sp.n., larva: A-C—right legs I–III, respectively, dorsal aspect.

Male and larva unknown.

Material examined. Female holotype, slide 186/3: Russia, Crimea, Nikita Botanical Gardens, litter under *Quercus pubescens*, 9 January 1973, coll. Vasilyeva; 1 female, Russia, Tyumenskaya Oblast, city of Tyumen, Zatyumensky Park, 57°09'49.9"N 65°27'24.0"E, in forest litter under a birch tree, 13 October 2014, coll. A. A. Khaustov.

Genus ***Diropetes*** Kaliszewski, 1988

Type species: ***Siteroptes vetus*** Rack, 1965, by original designation.

Description. *Female.* Body weakly sclerotized, oval. Gnathosomal capsule of about equal length and width, prognathous, dorsally with two pair of cheliceral setae (*cha*, *chb*) and postpalpal setae (*pp*); palps prominent, with two pairs of setae (*dFe*, *dGe*); tibial claw distinct; palpal solenidion (ω) well developed, accessory setigenous structure (*ass*) large, mushroom-like. Palp tibiotarsus with one distal tiny setiform structure. Subcapitular setae (*m*) and alveolar pits (*n*) present. Cheliceral stylets and their levers very small. Prodorsum with three pairs of setae (*v1*, *v2*, *sc2*), one pair of clavate trichobothria (*sc1*) and one pair of usually elongate stigmata situated on short elevation. Tracheal trunks well developed, long. Tergite C with two

pairs of setae (*c1*, *c2*); tergite D with one pair of setae (*d*); tergite EF with two pairs of setae (*e*, *f*); tergite H with two pairs of setae (*h1*, *h2*); cupules *ia*, *im* and *ih* on tergites D, EF and H, respectively. Coxisternal fields I and II with two pairs of setae each (*1a*, *1b* and *2a*, *2b*), setae *1b* usually bifurcated; coxisternal fields III with three pairs of setae (*3a*, *3b*, *3c*); coxisternal fields IV with one or two pairs of setae (*4a* or *4a*, *4b*), setae *4c* absent; posterior sternal (metasternal) plate without transverse furrow. Pseudanal segment with three pairs of setae (*ps1*–*3*). Apodemes *ap1* well developed, *ap2* well developed, joined with well-developed *appr*; sejugal apodeme poorly developed only laterally; secondary transverse apodeme absent; *ap3* well developed and usually fused with well-developed *appo*, *ap4* well developed, fused with *appo*; *ap5* very small, located near trochanter IV. Posterior margin of posterior sternal plate usually weakly concave. Sporothecae absent. Leg I 5-segmented, with cylindrical tarsus. Tarsal claw simple. Legs II–IV each with one pair of simple hooked claws and elongate empodium. Solenidia on tibiae I–III erect; solenidion on tibia IV usually vestigial, situated in depression; solenidion ω on tarsus II situated in basal part. Femora III and IV divided into basi- and telofemur. Leg setation: leg I; Tr 1 (*v'*),

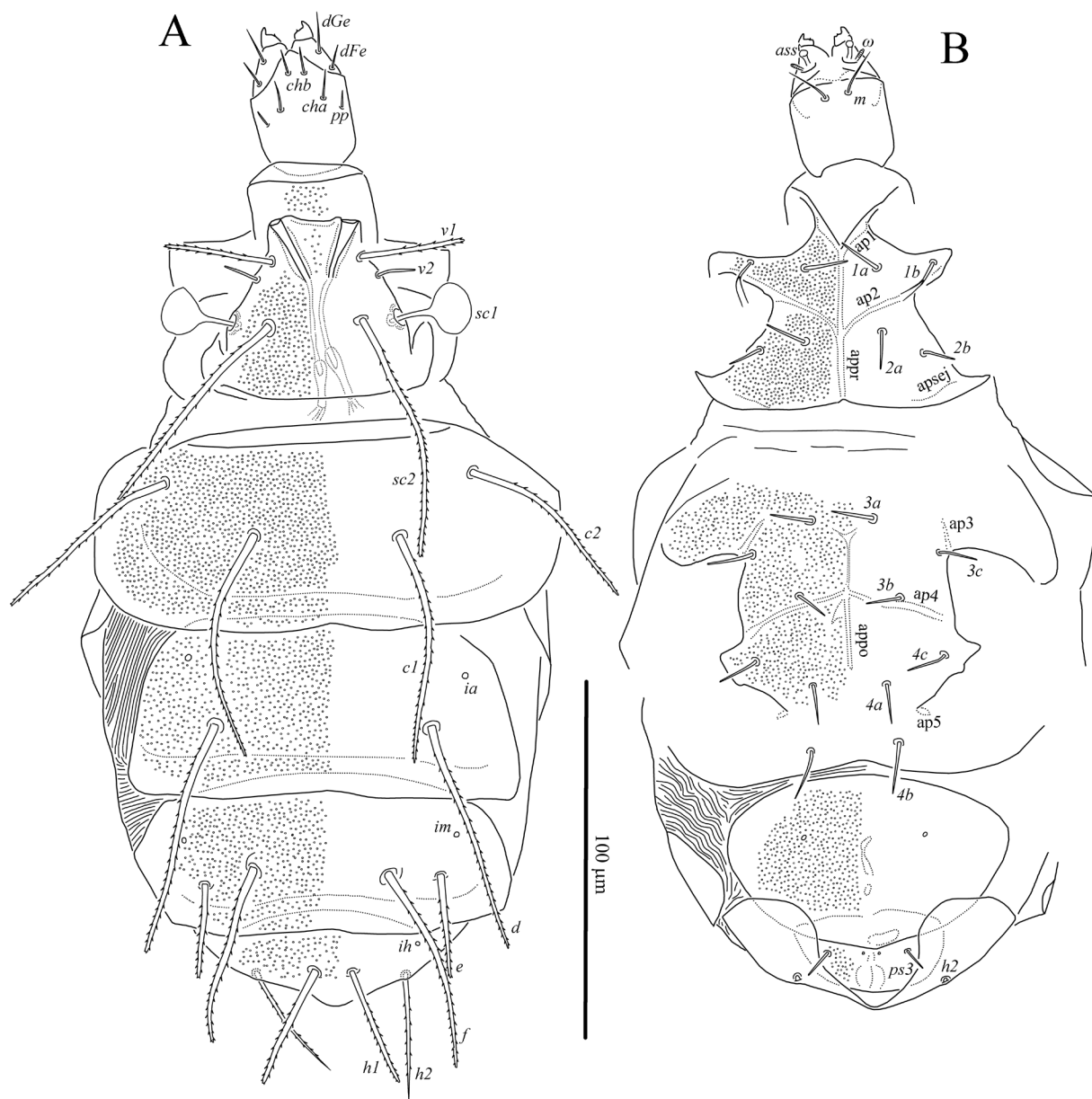


Fig. 14. *Sevestianovella lacidus* (Livshits, Mitrofanov and Sharonov, 1988), female (holotype): A—dorsum of body; B—venter of body. Legs omitted.

Fe 4 (d, l', l'', v''), Ge 3 or 4 (l', l'', v', v'' ; seta v'' sometimes absent), Ti 6(2) ($d, l', l'', v', v'', k, \phi 1, \phi 2$), Ta 13(2) ($ft', ft'', tc', tc'', p', p'', pv', pv'', pl', pl'', u', u'', s, \omega 1, \omega 2$); leg II: Tr 1 (v'), Fe 3 (d, l', v''), Ge 2 or 3 (l', l'', v' ; seta l'' often absent), Ti 4(1) (d, l', v', v'', ϕ), Ta 7(1) ($tc', tc'', pl'', pv', pv'', u', u'', \omega$); leg III: Tr 1 (v'), Fe 2 (d, v'), Ge 2 (l', v'), Ti 4(1) (d, l', v', v'', ϕ), Ta 7 ($tc', tc'', pl'', pv', pv'', u', u''$); leg IV: Tr 0-1 (v'), Fe 2 (d, v'), Ge 1 (v'), Ti 3-4(1) (d, l', v', v'', ϕ ; seta l' sometimes absent), Ta 6 ($pl'', tc', tc'', u', pv', pv''$).

Male and larva as described by Khaustov and Khaustov (2022).

Species included. The genus *Diroptes* comprises seven species: *D. vetus* (Rack, 1965); *D. bohemicus* (Mahunka, 1967) comb.n.; *D. stellifer* (Zaki, 1983); *D. albidus* (Livshits *et al.*, 1988) comb.n.; *D. digitariae* (Flechtmann, 1971) comb.n.; *D. spinisetus* (Livshits *et al.*, 1988) comb.n.; and *D. tauricus* (Khaustov and Khaustov, 2022) comb.n.

Distribution and habitat. Mites of the genus *Diroptes* are distributed mostly in the Palearctic; *D. digitariae* is described from Brazil. *Diroptes* species inhabit soil, forest litter or rotting wood.

Remarks. Kaliszewski (1988) has also included in the genus *Diroptes* the following species:

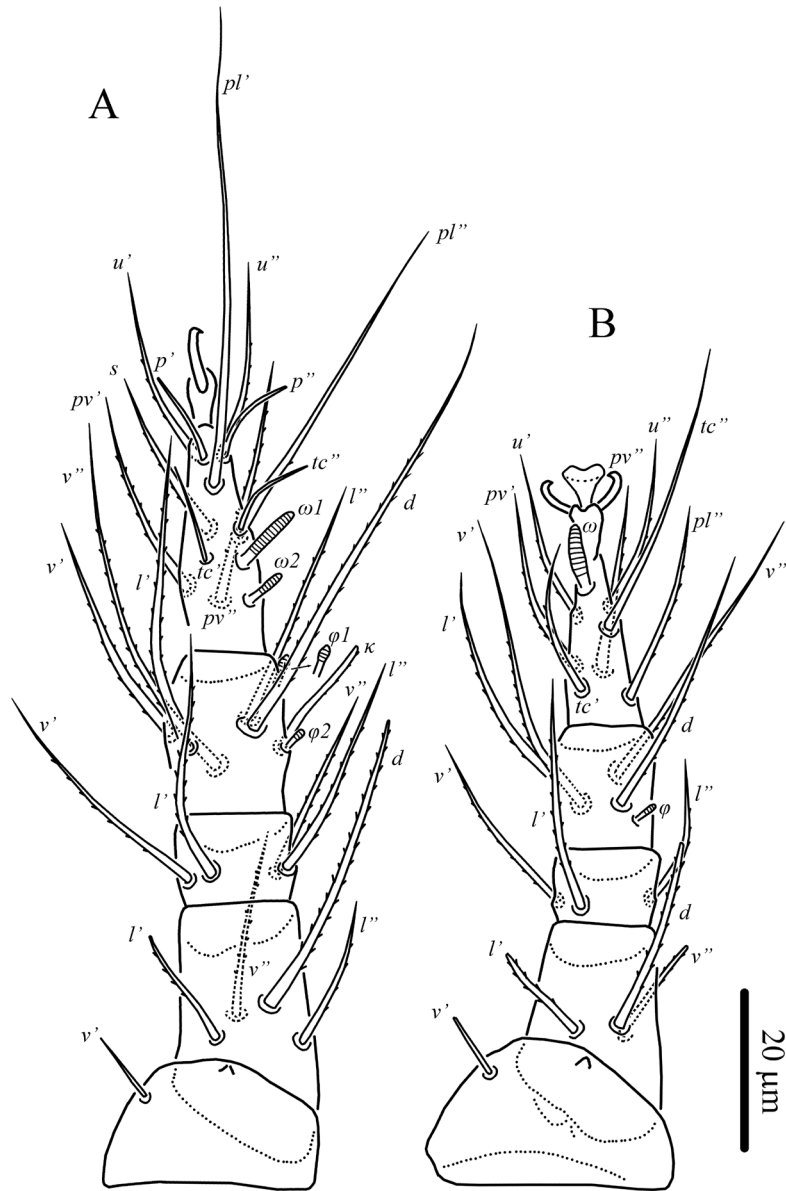


Fig. 15. *Sevastianovella lacidus* (Livshits, Mitrofanov and Sharonov, 1988), female (holotype): A—right leg I, dorsal aspect; B—right leg II, dorsal aspect.

D. longisetosus (Mahunka, 1970), *D. kaszabi* (Mahunka, 1969) and *D. stigmatus* (Mahunka, 1979). Khaustov (2012) moved *D. longisetosus* to the genus *Krczaldania* Sasa, 1961; other species are currently placed in the genus *Neositeroptes* Livshits, Mitrofanov and Sharonov, 1986. We have moved the species previously placed in the genus *Sevastianovella* (except *S. lacidus*) to the genus *Diropetes*.

Key to the genera of Pygmephoridae with a 5-segmented leg I in females (based on females, after Khaustov 2019)

1. Setae *e* absent 2

— Setae *e* present 6
 2. Prodorsum with one or three pairs of simple setae (excl. trichobothria) 3
 — Prodorsum with two pairs of simple setae (excl. trichobothria) *Parasiteroptes* Livshits, Mitrofanov and Sharonov, 1986
 3. Prodorsum with three pairs of simple setae (excl. trichobothria) 4
 — Prodorsum with one pair of simple setae (excl. trichobothria) *Pediculitopsis* Mahunka, 1970 (non-phoretic form)
 4. Tarsi II and III with 6–7 setae 5
 — Tarsi II and III with four setae
 *Pseudositeroptes* gen.n.

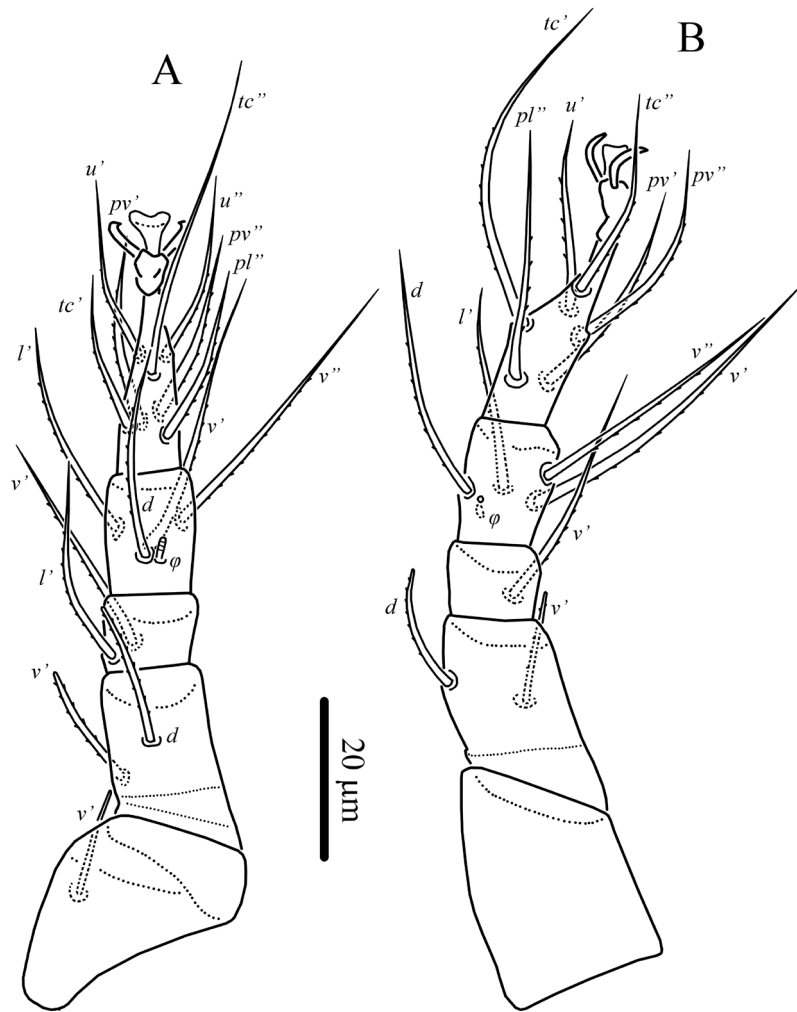


Fig. 16. *Sevestianovella lacidus* (Livshits, Mitrofanov and Sharonov, 1988), female (holotype): A—right leg III, dorsal aspect; B—right leg IV, dorsal aspect.

- | | |
|---|---|
| <p>5. Setae 4a present, 4c absent, body oval
 <i>Krczaldania</i> Sasa, 1961
 — Setae 4a absent, 4c present, body fusiform
 <i>Siteroptes</i> Amerling, 1861</p> <p>6. Setae h2 absent 7
 — Setae h2 present 8</p> <p>7. Body fusiform, genua II and III with one seta
 each; tarsi II and III with six setae each
 <i>Metasiteroptes</i> Cross, 1965
 — Body oval, genu II with three setae, genu III
 with two setae; tarsi II and III with seven setae each
 <i>Bochkovlaster</i> Khaustov, 2019
 (non-phoretic form)</p> <p>8. Prodorsum with three pairs of simple setae (excl.
 trichobothria) 9
 — Prodorsum with two pairs of simple setae (excl.
 trichobothria) <i>Ultra-</i>
 <i>siteroptes</i> Livshits, Mitrofanov and Sharonov, 1986</p> | <p>9. Postpalpal setae present, setae 1b usually bifurcate,
 coxisternal fields II with two pairs of setae ..
 10
 — Postpalpal setae absent, setae 1b not bifurcate,
 coxisternal fields II usually with three pairs of setae
 <i>Pediculaster</i> Vitzthum, 1931
 (non-phoretic form)</p> <p>10. Coxisternal fields I with two pairs of setae
 11
 — Coxisternal fields I with three pairs of setae
 <i>Neositeroptes</i> Livshits, Mitrofanov and Sharonov, 1986</p> <p>11. Tarsi II and III with seven setae each; genua II
 and III with setae 12
 — Tarsi II and III with four setae each; genua II
 and III without setae <i>Neodiroptes</i> gen. n.</p> <p>12. Setae 4c present; tarsus I with 11 setae (<i>ft'</i> and
 <i>ft''</i> absent); solenidion ω on tarsus II situated dis-</p> |
|---|---|

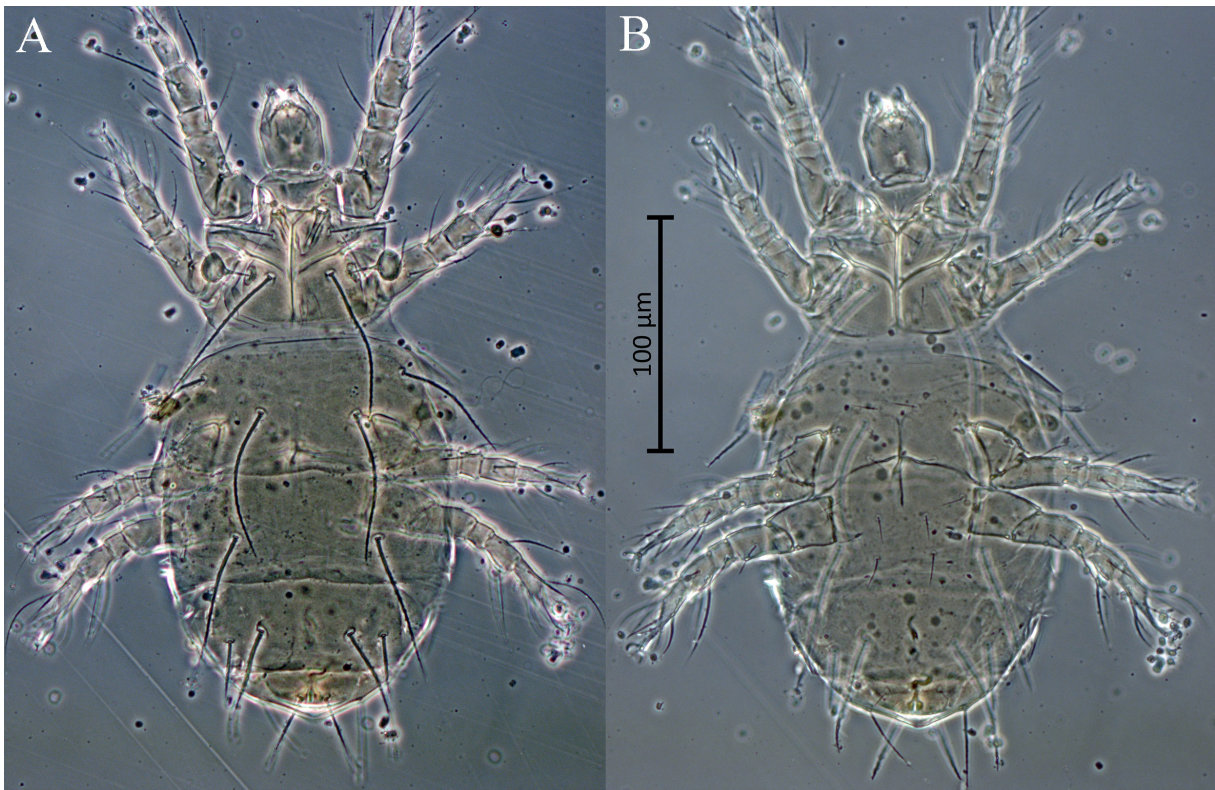


Fig. 17. Phase contrast micrographs of *Sevastianovella lacidus* (Livshits, Mitrofanov and Sharonov, 1988), female (holotype): A—general view dorsally; B—general view ventrally.

tally *Sevastianovella* Livshits, Mitrofanov and Sharonov, 1986
 — Setae *4c* absent; tarsus I with 13 setae; solenidion ω on tarsus II situated basally
 *Diroptes* Kaliszewski, 1988

DISCUSSION

Two new monotypic genera described in this article are characterized by unique and strongly reduced leg chaetotaxy, which is unknown in other pygmephorid genera with a 5-segmented leg I in females. Both genera lack setae *s* on tarsus I; *l''*, *v'* on genu II; *v'* on genu III; *l'* on tibia IV; and *pl''*, *pv'* and *pv''* on tarsi III and IV. Additionally, both genera lack setae *4a* and *4c* and a strongly reduced poststernal apodeme. The ecology of both genera is also similar. Undoubtedly, they are closely related, but still clearly separated. The number of setae on legs was previously used in the taxonomy of Pygmephoridae with a 5-segmented leg I in females (subfamily Siteroptinae) only in the diagnosis of the genus *Diroptes*; while other genera were created based only on the characters of the idiosoma (Livshits *et al.* 1986; Kaliszewski 1988). Leg chaetotaxy (especially tarsal chaeto-

taxy) is usually stable within one genus. For example, all species of the largest pygmephorid genus *Pediculaster* have the same leg chaetotaxy. Unfortunately, most of the Siteroptinae species are incompletely described and their correct leg chaetotaxy is known only for a few species. The redescription of previously described, as well as the description of new species, will provide more information that can be used in the further division of Siteroptinae species into genera. For example, the genus *Siteroptes* is probably paraphyletic because it includes different groups of species, characterized by the presence or absence of spermatheca, different locations of spermatheca, different leg chaetotaxy, and different life cycles (Suski 1973).

ACKNOWLEDGEMENTS

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