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Myrmecophilous pygmephoroid mites (Acari: Pygmephoroidea) associated with *Lasius fuliginosus* (Hymenoptera: Formicidae) in Western Siberia, Russia

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ABSTRACT

Eleven species of pygmephoroid mites (Acari: Pygmephoroidea: Neopygmephoridae, Scutacaridae, Microdispidae) are recorded from the ant *Lasius fuliginosus* (Latreille, 1798) from Western Siberia, Russia. Two of them, *Petalomium fuliginosum* **sp. nov**. (Acari: Neopygmephoridae) and *Imparipes fuliginosophilus* **sp. nov**. (Acari: Scutacaridae) are described as new for science. *Unguidispus contematosus* Sevastianov, 1981 (Acari: Microdispidae) is recorded for the first time from Russia and redescribed. *Imparipes sevastianovi* Khaustov, 2008, *Imparipes brevibasis* (Sevastianov, 1983) and *Scutacarus flexisetus* Karafiat, 1959 arte also recorded for the first time from Russia.

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Introduction

The superfamily Pygmephoroidea Cross, 1965 includes four families: Pygmephoridae Cross, 1965; Neopygmephoridae Cross, 1965; Microdispidae Cross, 1965; and Scutacaridae Oudemans, 1916 and more than 1200 species (Zhang et al. 2011). Probably all pygmephoroid mites are fungivorous (Khaustov 2008), but some species of the family Microdispidae might be parasitoids of insects (Kaliszewski et al. 1995). Many pygmephoroid mites are associated with various insects and utilize them for phoresy (Kaliszewski et al. 1995). Members of Pygmephoridae, the early derivative family of Pygmephoroidea, are usually phoretic on Coleoptera and Diptera (Rahiminejad et al. 2015a), while Neopygmephoridae, Microdispidae and Scutacaridae, which form a monophyletic group of derived pygmephoroid mites, are mainly phoretic on Hymenoptera, especially on various ants (Ebermann 1988; Ebermann and Moser 2008; Khaustov 2008, 2014a, 2014b; Ebermann et al. 2013; Rahiminejad et al. 2015b). The pygmephoroid mites associated with particular species of ants are poorly studied. There is only one comprehensive study of pygmephoroid mites associated with the red imported fire ant, *Solenopsis invicta* Buren, 1972 (Ebermann and Moser 2008; Khaustov and Moser 2008). *Lasius fuliginosus* (Laterille, 1798) is an Amphipalaearctic species, distributed in Europe, Caucasus, south part of Western Siberia, northern Kazakhstan, Russian part of Far East, north-eastern China, Korea and Japan (Czechowski et al. 2002). Sevastianov (1965) studied mite community and seasonal dynamics of mites associated with *L. fuliginosus* in Western Ukraine. He recorded 13 species of pygmephoroid mites, four of which, *Imparipes hystricinus* Berlese, 1903; *Scutacarus subterraneus* (Oudemans, 1913); *Scutacarus gratus* Karafiat, 1959; and *Scutacarus flexisetus* Karafiat, 1959 were identified. In other publications, three species of Neopygmephoridae, *Petalomium formicarum* (Berlese, 1903), *Petalomium podolicus* (Sevastianov, 1967), *Petalomium scyphicus* (Sevastianov, 1967); six species of Scutacaridae, *Archidispus intermissus* (Karafiat, 1959), *Imparipes brevibasis* (Sevastianov, 1983), *Imparipes robustus* Karafiat, 1959, *Imparipes sevastianovi* Khaustov, 2008, *Sc. flexisetus, Sc. gratus*; and one of Microdispidae, *Unguidispus contematosus* Sevastianov, 1981, were recorded as associates of this ant from Austria, Germany and Ukraine (Karafiat 1959; Sevastianov 1967, 1981, 1983; Ebermann 1980; Khaustov 2008).

The aim of this paper is to describe two new species, redescribe *U. contematosus* and further provide new records of pygmephoroid mites associated with *L. fuliginosus* from Western Siberia, Russia.

Materials and methods

Ants were collected from two nests of *L. fuliginosus* in Tyumen and Kurgan provinces of Russia, and placed in vials with 96% alcohol. Thereafter, alcohol sediments from the vials were inspected for phoretic mites. Mites from ant nests were collected using Berlese funnels. All collected mites were mounted in Hoyer's medium. For scanning electron microscopy (SEM), alive ants were extracted from nests using an aspirator, placed into a refrigerator and frozen at a temperature of −25°C; after that, ants with phoretic mites were selected and scanned without dusting. The terminology of idiosoma and legs follows Lindquist (1986); the nomenclature of subcapitular setae and the designation of cheliceral setae follow Grandjean (1944, 1947), respectively. The system of Pygmephoroidea follows Khaustov (2004, 2008). All measurements are given in micrometres (μm) for the holotype and five paratypes (in parentheses). For leg chaetotaxy, the number of solenidia is given in parentheses. The holotypes and most paratypes of the new species are deposited in the acarological collection of the Tyumen State University Museum of Zoology, Tyumen, Russia (TUMZ); two paratypes of each new species are deposited in the acarological collection of Zoological Institute of RAS, St. Petersburg, Russia (ZISP). SEM photographs were made with the aid of a JEOL–JSM-6510LV SEM.

Systematics

Family Neopygmephoridae Cross, 1965

Genus *Petalomium* Cross, 1965

Type species: *Parapygmephorus* (*Petalomium*) *krczali* Cross, 1965, by original designation.

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Petalomium fuliginosum sp. nov.

(Figures 1–4)

Description

Female (Figures 1–4). Body weakly sclerotized. Length of idiosoma 235 (240–300), width 170 (170–210).). Gnathosomal capsule oval, its length 25 (27–29), width 26 (28–30). Dorsally with two pairs of smooth, pointed subequal cheliceral setae (*cha, chb*). Setae *cha* 12 (13), *chb* 12 (14). Dorsal median apodeme well developed. Pair of needle-like postpalpal setae (*pp*) situated anteriorly to setae *cha*. Ventral gnathosoma with one pair of smooth, pointed subcapitular setae *m* 12 (13) and one pair of oval pits situated posteromedially to bases of *m*. Palps freely articulated to gnathosomal capsule, with smooth, pointed setae *dFe* and *dGe* dorsolaterally, setae *dGe* slightly longer than *dFe*. Ventrally with small accessory setigenous structure (*ass*) and small solenidion. Palps terminated with small claw. Pharyngeal pumps (Figure 2) transversely striated. Pharyngeal pump I small, situated inside gnathosomal capsule; pharyngeal pump II large, about three times longer than oval pharyngeal pump III.

Idiosomal dorsum (Figure 1A). Only posterior part of prodorsum covered by anterior margin of tergite C, with two pairs of setae (v_2, sc_2), one pair of clavate and weakly barbed trichobothria (sc_1) with attenuate apex and one pair of round stigmata with transverse slit-like opening. All dorsal plates smooth. Setae v_2 smooth, other dorsal setae distinctly barbed; Setae sc_2, *e, f* and h_1 blunt-ended, other dorsal setae pointed. Posterior margin of tergite C weakly concave; posterior margin of tergite H weakly undulate. Cupules *ia* on tergite D and *ih* on tergite H small, round, difficult to discern. Lengths of dorsal setae: v_2 6 (6–8), sc_2 36 (34–41), c_1 77 (75–82), c_2 91 (92–100), *d* 84 (80–85), *e* 36 (33–41), *f* 85 (79–92), h_1 76 (82–86), h_2 58 (55–64). Distances between setae: v_2–v_2 50 (49–58), sc_2–sc_2 50 (49–58), c_1–c_1 65 (69–84), c_1–c_2 34 (34–40), *d*–*d* 72 (74–87), *e*–*f* 15 (14–18), *f*–*f* 67 (71–88), h_1–h_1 38 (39–54), h_1–h_2 16 (17–21).

Idiosomal venter (Figure 1B). All ventral plates smooth. Setae 3*a*, 3*b* and 4*a* smooth, with distinctly widened basal part and pointed apex; setae ps_2 and ps_3 smooth, other ventral setae sparsely barbed. Setae 1*b* not bifurcate. Apodemes 1 (ap1) well developed and joined with prosternal apodeme (appr); apodemes 2 (ap2) weakly developed, thin, not joined with appr, prosternal and sejugal (apsej) apodemes well developed; apodemes 3 (ap3) well developed, straight. Apodemes 4 (ap4) well sclerotized, long and joined with poststernal apodeme (appo); apodemes 5 absent. Posterior margin of posterior sternal plate convex in middle part. Posterior margin of aggenital plate rounded. Anterior genital sclerite (ags) bell-like, posterior genital sclerite (pgs) triangular, median genital sclerite (mgs) well sclerotized, oval, situated near pgs. Lengths of ventral setae: 1*a* 38 (37–40), 1*b* 31 (32–33), 2*a* 49 (47–50), 2*b* 26 (28–32), 3*a* 29 (30–33), 3*b* 31 (32–36), 3*c* 35 (37–39), 4*a* 35 (36–38), 4*b* 52 (53–55), 4*c* 44 (43–47), ps_1 33 (33–38), ps_2 17 (18–20), ps_3 16 (16–18).

Legs (Figures 3, 4). Leg I (Figure 3A) distinctly shorter and thinner than leg II. Setal formula: 1–3–4–16(4). Tibiotarsus not thickened, cylindrical, with terminal claw situated on distinct pretarsus, tip of its claw thin, attenuate. Lengths of solenidia ω_1 12 (12) > ω_2 3 (4) < φ_1 7 (7–8) = φ_2 7 (7); φ_2 weakly clavate, φ_1 clavate, ω_2 peg-like, ω_1 finger-shaped. Tibiotarsus without pinnaculum. Seta *d* of femur broadened, slightly curved at the tip. Seta *l′* of femur blunt-ended, smooth, other leg setae (except eupathidia) sparsely barbed. Leg II (Figure 3B). Setal formula: 1–3–3–4(1)–6(1). Tarsus with sickle-like, padded claws and large flipper-like empodium. Solenidion ω 10(10–11), finger-shaped, solenidion φ 4 (4–5) weakly clavate. All leg setae sparsely barbed; seta *v′* of genu blunt-ended. Leg III (Figure 4A) similar in shape and length with leg II. Setal formula: 1–2–2–4(1)–6. Claws and empodium of same shape as on tarsus II. Solenidion φ 4 (4–5) weakly clavate. All leg setae pointed and sparsely barbed. Leg IV (Figure 4B). Setal formula: 1–2–1–4(1)–6. Tarsus long and thin, pretarsus short, with two small simple claws and small empodium. Solenidion φ 8 (9–11) weakly clavate. Seta *v″* of tibia blunt-ended, other leg setae pointed.

Male and *larva* unknown.

Type material

Female holotype, slide No. AK060915, Russia, Tyumen Province, Tyumen district, vicinity of Tyumen, 57°13′48.3″N 65°27′39.7″E, on ants *L. fuliginosus*, 6 September 2015, coll. A.A. Khaustov;

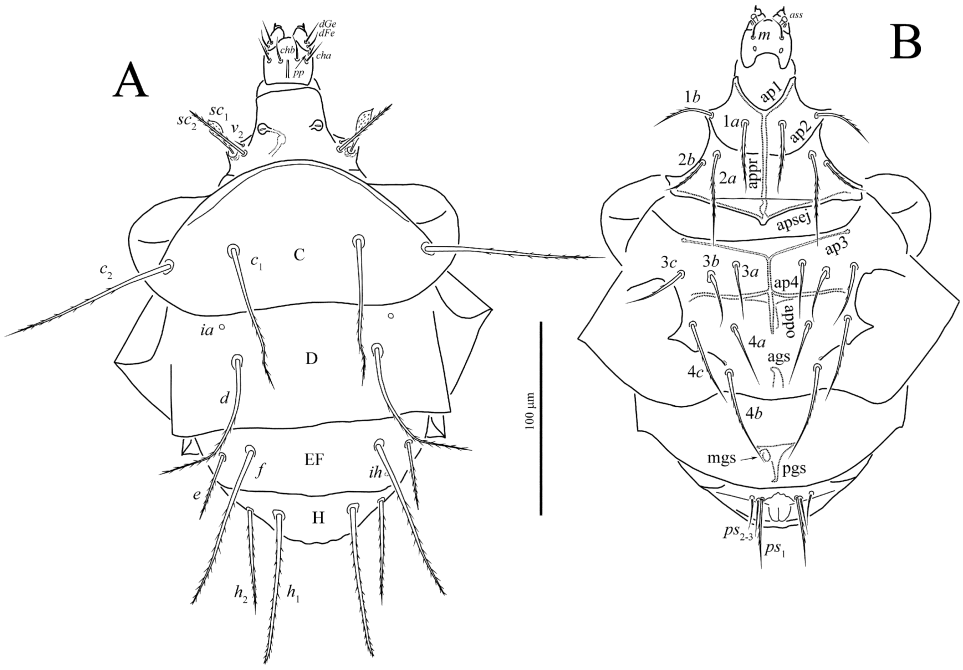

Figure 1. *Petalomium fuliginosum* **sp. nov.**, female: (A) idiosomal dorsum, (B) idiosomal venter.

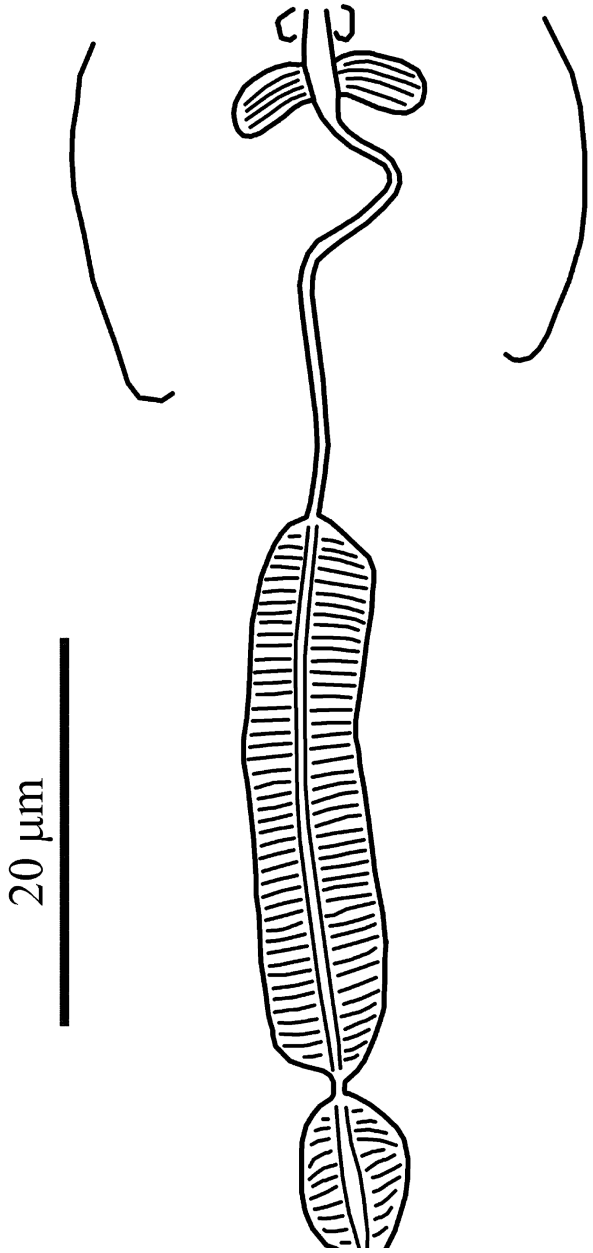

Figure 2. *Petalomium fuliginosum* **sp. nov.**, female: pharyngeal pumps.

paratypes: 3 females, Russia, Kurgan Province, Zverinogolovskiy district, vicinity of settlement Ukrainets, 54°24′11.6″N 64° 49′08.6″E, on ants *L. fuliginosus*, 13 September 2015, coll. A.A. Khaustov, A.V. Tolstikov.

Differential diagnosis

The new species is most similar to *Petalomium aggtelekiensis* Mahunka, 1977 described from Hungary (Mahunka 1977a) by the absence of pinnaculum on tibiotarsus I, thickened basally and smooth setae 3*a*, 3*b*, 4*a* and very short solenidion ω_2. It differs from *Pe. aggtelekiensis* by position of solenidion φ_2 on the same level as φ_1 (vs. solenidion φ_2 situated distinctly anteriorly to φ_1, in the middle between solenidia φ_1 and ω_1 in *Pe. aggtelekiensis*). It also differs by subequal setae ps_2 and ps_3 (vs. ps_2 more than two times longer than ps_3 in *Pe. aggtelekiensis*).

Etymology

The name of new species referring to association with host ant species, *L. fuliginosus*.

Petalomium carelitschensis (Sevastianov, 1967)

Pygmephorus carelitschensis Sevastianov, 1967, p. 356, Figure 3.
Petalomium carelitschensis: Mahunka 1971, p. 274, Figure 1.

This species was described from the Ukraine on ants *Myrmica ruginodis* Nylander and from Byelorussia on ants *Lasius niger* (Sevastianov, 1967). It was also recorded from Hungary (Mahunka 1981), Korea (Mahunka 1971), Switzerland (Mahunka 1977), and Japan (Kurosa 1980). Khaustov (2005) reported it from Russia (Crimea) on ants *Lasius flavus* (Fabricius, 1781) and *L. alienus* (Forster, 1850).

Material examined

One female, Russia, Tyumen Province, Tyumen district, vicinity of Tyumen, 57°13′48.3″N 65°27′39.7″E, on ants *L. fuliginosus*, 6 September 2015, coll. A.A. Khaustov; 1 female, Russia, Kurgan Province, Zverinogolovskiy district, vicinity of settlement Ukrainets, 54°24′11.6″N 64°49′08.6″E, on ants *L. fuliginosus*, 13 September 2015, coll. A.A. Khaustov, A.V. Tolstikov.

Petalomium podolicus (Sevastianov, 1967)

Pygmephorus podolicus Sevastianov, 1967, p. 359, Figure 9.
Petalomium podolicus Mahunka, 1970, p. 318, Figures 8–12.

This species was described from Ukraine from ants *Myrmica rubra* Linnaeus, 1758, *Myrmica ruginodis* Nylander, 1846, *L. fuliginosus* and *Formica rufa* Linnaeus, 1758 (Sevastianov 1967). It was also reported from middle Volga region of Russia (Sevastianov 1978). This species also known from Hungary from *Formica* sp. (Mahunka 1970, 1986) and Switzerland from *Lasius niger* (Mahunka 1977).

This is a new record for the fauna of Asian part of Russia.

Material examined

One female, Russia, Tyumen Province, Tyumen district, vicinity of Tyumen, 57°13′48.3″N 65°27′39.7″E, on ants *L. fuliginosus*, 6 September 2015, coll. A.A. Khaustov; 1 female, Russia, Kurgan Province, Zverinogolovskiy district, vicinity of settlement Ukrainets, 54°24′11.6″N 64°49′08.6″E, on ants *L. fuliginosus*, 13 September 2015, coll. A.A. Khaustov, A.V. Tolstikov.

Family Microdispidae Cross, 1965

Genus *Unguidispus* Mahunka, 1970

Type species: *Unguidispus stammeri* Mahanka, 1970, by original designation.

Unguidispus contematosus Sevastianov, 1981 (Figures 5–8, 13, 14)

Unguidispus contematosus Sevastianov, 1981, p. 29, Figure 6.

Redescription

Female. Length of idiosoma 155–190, width 105–110.

Gnathosoma (Figure 6). Gnathosomal capsule beak-like, about 1.5 times longer than its width. Dorsally with two pairs of smooth and pointed setae (*cha, chb*); *cha* (11) slightly longer than *chb* (9). Postpalpal setae (*pp*) about as long as setae *chb*, situated anterolaterally to bases of setae *cha*. Dorsal median apodeme absent. Ventral gnathosoma with one pair of long subcapitular setae *m* (15–16) and pair of oval pits situated posterolaterally to bases of *m*. Palps with subequal setae *dFe* and *dGe* dorsolaterally. Palps anteromedially with translucent horn-like projection. Tibial claw vestigial. Palps ventrally with tube-like accessory setigenous structure; palpal solenidion not evident. Pharyngeal pumps (Figure 6B) grouped together; pharyngeal pump 1 small, striated, butterfly-like; pharyngeal pump 2 large, subrectangular, distinctly striated; pharyngeal pump 3 vestigial, not striated. Oesophagus with delicate transverse striation.

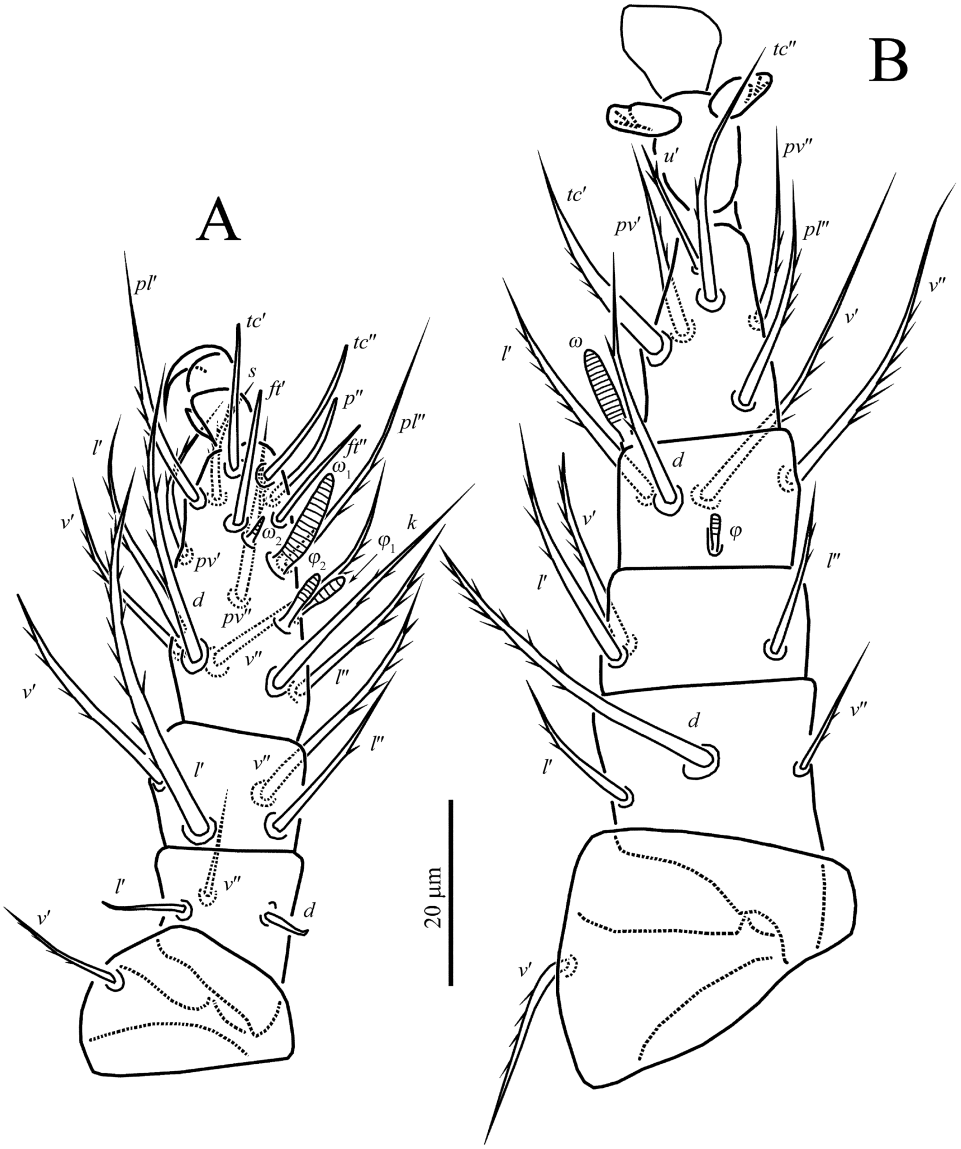

Figure 3. *Petalomium fuliginosum* **sp. nov.**, female: (A) leg I in dorsal view, (B) leg II in dorsal view.

Idiosomal dorsum (Figure 5A). Prodorsum in alive specimens completely covered by anterior margin of tergite C (Figures14A, B), in specimens mounted on slides main part of prodorsum not covered (Figure 5A), with one pair of smooth and needle-like setae sc_2, one pair of clavate and weakly barbed trichobothria sc_1 with slightly pointed apex, and one pair of large round stigmata (Figure 6A). All dorsal shields well scleritized, smooth. Dorsal setae c_1, c_2, *d* and *f* distinctly thickened, blunt-ended, with large barbs (Figure 14D); setae *e*, h_1 and h_2 sparsely barbed, pointed; Posterior margin of tergite C straight; posterior margin of tergite H with tongue-like elongation medially. Cupules *ia* on tergite D and *ih* on tergite H small, round. Lateral shields covering lateral parts of tergite D smooth. Pair of oblique ridges connected to bases of setae *e* present. Lengths of dorsal setae: sc_2 6, c_1 20–22, c_2 21–23, *d* 20–23, *e* 25–27, *f* 18–22, h_1 19–21, h_2 19–22. Distances between setae: sc_2–sc_2 30–35, c_1–c_1 33–38, c_1–c_2 15–18, *d*–*d* 34–43, *e*–*f* 14–15, *f*–*f* 25–30, h_1–h_1 12–16, h_1–h_2 14–15.

Idiosomal venter (Figures 5B, 14C). All ventral plates smooth. All ventral setae pointed, setae 1*b*, 2*b*, 3*a* and 3*b* smooth, other ventral setae with few barbs. Ap1 absent; appr well developed and joined with short ap2 and well developed apsej; ap3 well sclerotized, not fused with appo; ap4 well sclerotized and long, apodemes 5 absent. Posterior margin of posterior sternal plate slightly convex in middle part. Posterior margin of aggenital plate rounded. Anterior genital sclerite (ags) bell-like, posterior genital sclerite (pgs) very small, triangular. Lengths of ventral setae: 1*a* 25–28, 1*b* 14–15, 2*a* 31–33, 2*b* 21–23, 3*a* 21–22, 3*b* 22–23, 3*c* 22–23, 4*a* 20–26, 4*b* 38–43, 4*c* 25–27, ps_1 18–21, ps_3 14–15.

Legs (Figures 7, 8). Leg I (Figure 7A) distinctly shorter and thinner than leg II. Setal formula: 1–3–4–15(4). Tibiotarsus not thickened, with well-developed terminal claw situated on distinct pretarsus, tip of the claw thin. Length of solenidia ω_1 6–7 > ω_2 3 < φ_1 4 > φ_2 3; ω_1 finger-shaped with attenuate apex, φ_2 and ω_2 baculiform, φ_1 clavate, setae *u* fused into structure opposing to tarsal claw. Seta *s* absent. Seta *l′* of genu thickened, blunt-ended, with large barbs; setae *d* and *l′* of femur smooth, blunt-ended; setae *v′* of trochanter, *v″* of femur, (*pv*) of tibiotarsus smooth and pointed; other leg setae (excluding eupathidia) sparsely barbed. Eupathidia (*tc*) situated on short pinnaculum. Leg II (Figure 7B). Setal formula: 1–3–3–4(1)–6(1). Tarsus with sickle-like, padded claws and

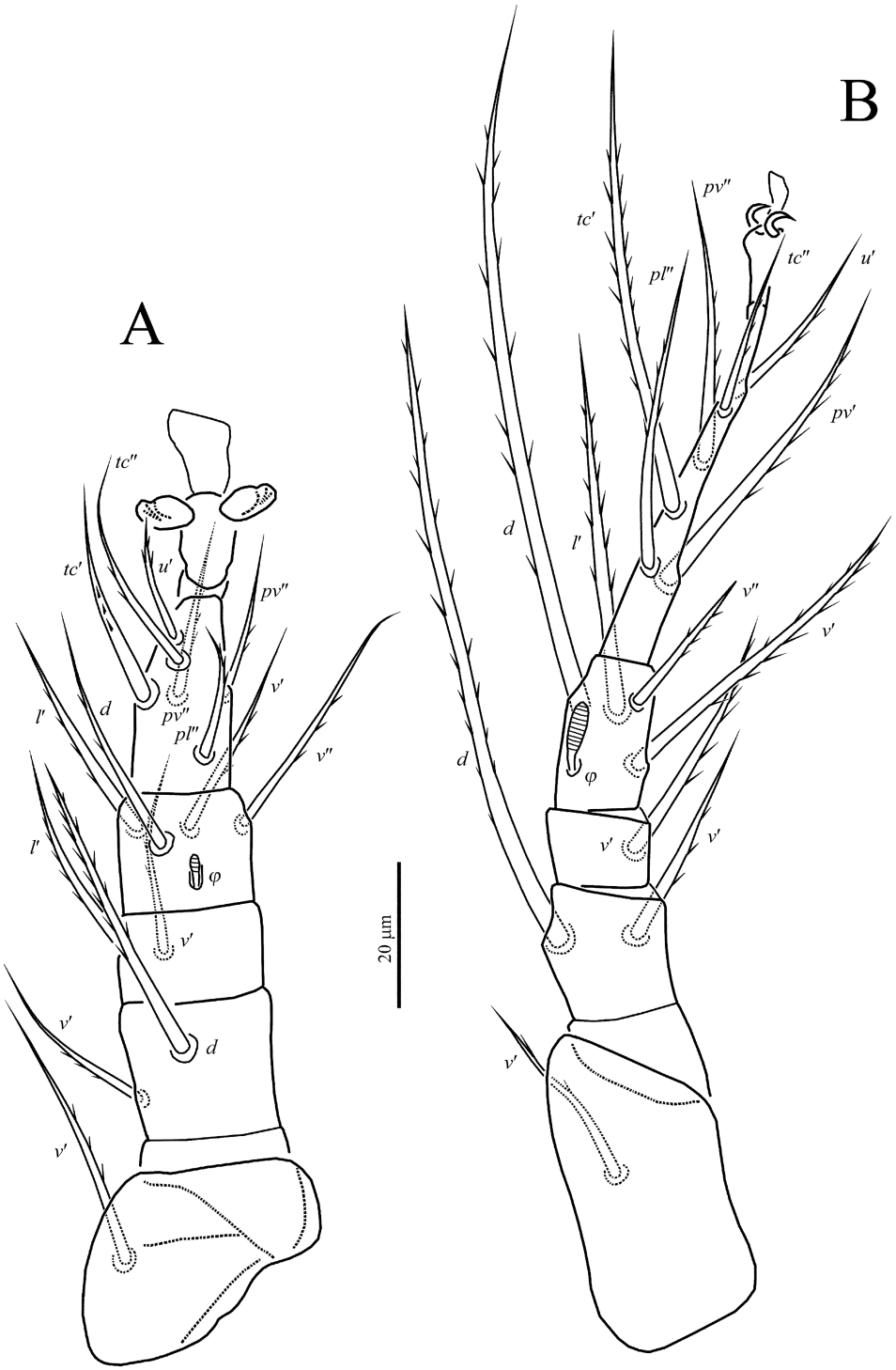

Figure 4. *Petalomium fuliginosum* **sp. nov.**, female: (A) leg III in dorsal view, (B) leg IV in dorsal view.

large flipper-like empodium. Solenidion *ω* (5–6), finger-shaped with attenuate apex, solenidion *φ* (3) weakly clavate. Seta *d* of femur distinctly blunt-ended, with several thick barbs; other leg setae pointed; setae *v″* of femur, *d* of tibia and *u′* of tarsus smooth, other leg setae sparsely barbed. Leg III (Figure 8A). Setal formula: 1–2–2–4(1)–6. Claws of same shape as on tarsus II. Solenidion *φ* (3) weakly clavate. Seta *d* of femur distinctly blunt-ended, with several thick barbs; other leg setae pointed; seta *u′* of tarsus smooth, other leg setae sparsely barbed. Leg IV (Figure 8B). Setal formula: 1–2–1–4(1)–6. Tarsus long and thin, pretarsus short, with two small simple claws and small empodium. Solenidion *φ* 5–6, baculiform. Seta *d* of femur distinctly thickened, blunt-ended, with large barbs. Seta *tc″* smooth, other leg setae barbed and pointed.

Male and *larva* unknown.

Material examined

One female paratype, Ukraine, Khmelnitsk Province, vicinity of settlement Chemerovtsy, in the nest of ant *L. fuliginosus*, 23 July 1963, coll. V.D. Sevastianov; 44 females, Russia, Tyumen Province, Tyumen district, vicinity of Tyumen, 57°13′48.3″N 65°27′39.7″E, on ants *L. fuliginosus*, 6 September 2015, coll. A.A. Khaustov; 9 females, Russia, Kurgan Province, Zverinogolovskiy district, vicinity of settlement Ukrainets, 54°24′11.6″N 64°49′08.6″E, on ants *L. fuliginosus*, 13 September 2015, coll. A.A. Khaustov, A.V. Tolstikov.

Distribution and hosts

This species was described from Western Ukraine from the nest of ants *L. fuliginosus* (Sevastianov, 1981).

This is a new record for the fauna of Russia.

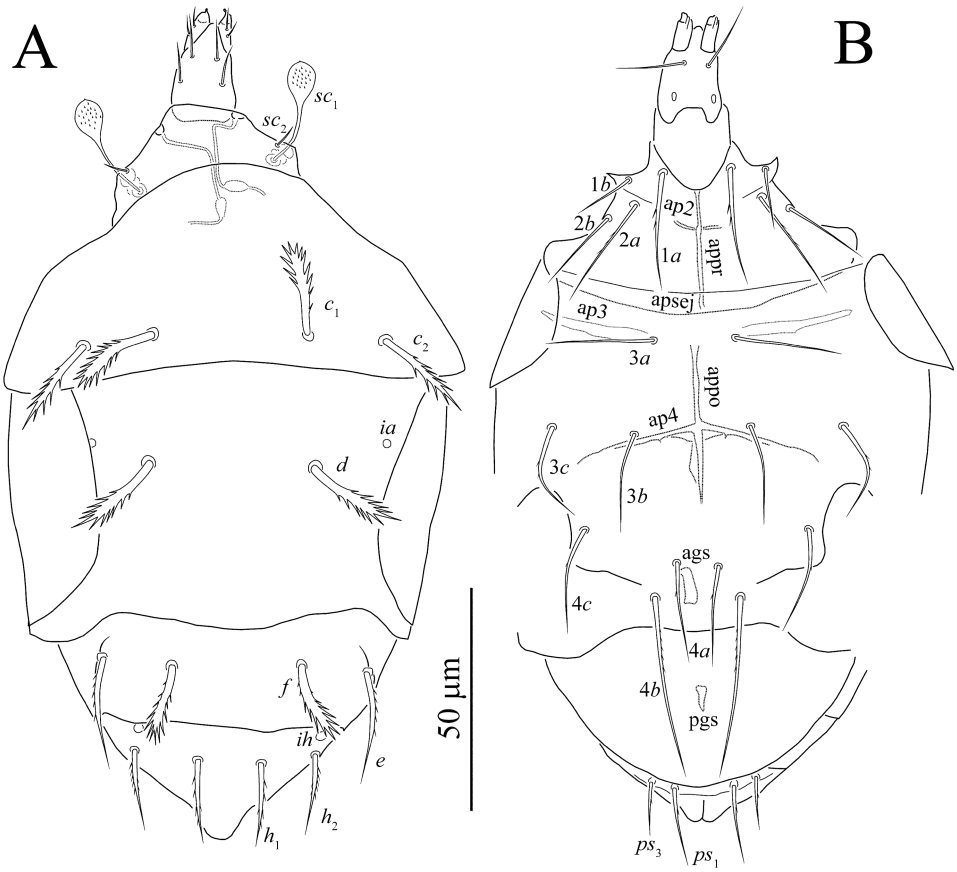

Figure 5. *Unguidispus contematosus* Sevastianov, 1981, female: (A) idiosomal dorsum, (B) idiosomal venter.

Phoresy

Examination of alive workers of *L. fuliginosus* carrying phoretic *U. contematosus* revealed specific sites of mite localization on the ant body. Usually females of *U. contematosus* attached to ants on lateral surfaces of ant thorax near the coxae of legs I (Figure 13). I found up to two females of *U. contematosus* per one ant.

Remarks

The original description of *U. contematosus* of Sevastianov (1981) is incomplete; thus, I prepared a redescription of this species. The present redescription of *U. contematosus* is based mainly on material from Western Siberia. The female paratype available for this study is found in bad condition, yet sufficient to prove its identity with material from Western Siberia.

Family Scutacaridae Oudemans, 1916
Genus *Imparipes* Berlese, 1903

Type species: *Imparipes hystricinus* Berlese, 1903, by original designation.

***Imparipes fuliginosophilus* sp. nov.**
(Figures 9–12)

Description

Female. Length of idiosoma 205 (185–210), width 180 (175–195). Gnathosoma (Figure 9): gnathosomal capsule oval, with well-developed dorsal median apodeme, dorsally with two pairs of pointed setae (*cha, chb*) and one pair of minute post-palpal setae (*pp*), situated anterolaterally to bases of setae *cha*; setae *chb* 18 (18–19) sparsely barbed, longer than smooth *cha* 13 (12–13). Palps dorsolaterally with subequal setae *dFe* and *dGe*. Palps ventrally with large mushroom-like accessory setigenous structure (*ass*) and well-developed solenidion. Palps terminated with small tibial claw. Gnathosomal venter with one pair of pointed subcapitular setae *m* 11 (10–11) and pair of round pits situated posteriorly to bases of setae *m*. Gnathosomal capsule without rough microsculpture. All pharyngeal pumps grouped together (Figure 10), transversely striated. Pharyngeal pump 1 butterfly-like, pharyngeal pump 2 large, subrectangular, pharyngeal pump 3 oval, subequal to pharyngeal pump 1.

Idiosomal dorsum (Figures 9A, 10). Prodorsum completely covered by tergite C, with two pairs of smooth setae v_2 7 (6–8) and sc_2 16 (14–16), one pair of smooth capitate trichobothria (Figure 10), and one pair of elongate stigmata associated with long tracheal trunks. Setae sc_2 characteristically curved. Lateral propodosomal spine well developed. All dorsal shields smooth. Setae *d* and *f* thicker than other dorsal setae, pubescent (densely barbed), blunt-ended; other dorsal setae sparsely barbed and pointed. Cupules *ia* on tergite D and *ih* on tergite H large, round. Pair of small pore-like structures situated posteromedially to setae c_1 on tergite C, anteromedially to setae *d* on tergite D, anteromedially and anterolaterally to setae *f* on tergite EF. Bases of setae c_2 associated with long alveolar canal. Lengths of dorsal setae: c_1 48 (44–50), c_2 50 (48–55), *d* 84 (83–88), *e* 50 (47–53), *f* 70 (68–73), h_1 72 (66–86), h_2 44 (42–47). Distances between setae: c_1–c_1 57 (51–57), c_1-c_2 40 (34–40), *d*–*d* 110 (105–110), *e*–*f* 41 (40–42), *f*–*f* 47 (45–49), h_1–h_1 34 (30–34), h_1–h_2 30 (29–31).

Idiosomal venter (Figure 9B). All ventral plates smooth. Ap1 well developed and joined with appr, ap2 v-shaped, joined with appr; apsej well developed and joined with appr. Secondary transverse apodeme (sta) present, thin. Ap3 thick, diffuse, ap4 short, joined with appo. Apodemes 5 (ap5) situated between base of legs IV and setae 4*b*. Setae 2*b* distinctly thickened, smooth, blunt-ended, setae ps_2 smooth; other ventral setae distinctly barbed. Ags bell-like, pgs large, triangular. Posterior margin of aggenital plate rounded. Lengths of ventral setae: 1*a* 40 (40–42), 1*b* 25 (23–26),

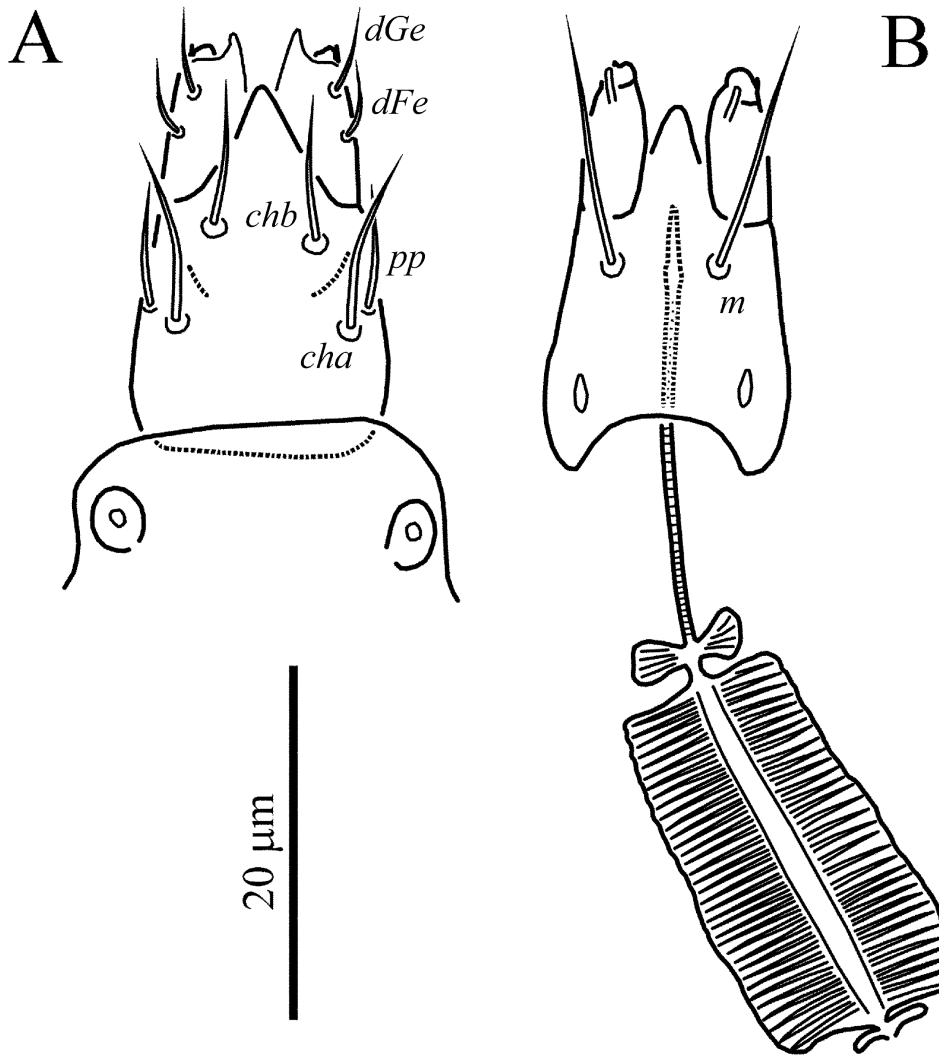

Figure 6. *Unguidispus contematosus* Sevastianov, 1981, female: (A) gnathosoma and anterior part of prodorsum in dorsal view, (B) gnathosoma and pharymgeal pumps in ventral view.

2*a* 41 (39–45), 2*b* 23 (23–24), 3*a* 43 (41–44), 3*b* 51 (50–53), 3*c* 42 (41–43), 4*a* 41 (40–43), 4*b* 54 (52–55), 4*c* 55 (50–56), ps_1 41 (39–42), ps_2 8 (7–9), ps_3 41 (36–43).

Legs (Figures 11, 12). Leg I (Figure 11A). Leg setation: 1–3-4-16 (4). Tibiotarsus with large tarsal claw, tapering on its end. Seta *k* blunt-ended, smooth; eupathidia *tc*″ and *ft*″ situated on long pinnaculum. Lengths of solenidia: ω_1 9 (8–9) > ω_2 4 (4–5) < φ_1 6 (6–7) < φ_2 7 (6–7); ω_2 and φ_2 baculiform, φ_1 clavate, ω_1 finger-shaped. Seta *d* of femur thickened and pointed. Seta *l*′ of femur blunt-ended and smooth. Setae *v*′ of trochanter and *v*″ of femur smooth and pointed; setae *l*′ and *l*″ of genu blunt-ended and barbed; other leg setae (excluding eupathidia) sparsely barbed and pointed. Leg II (Figure 11B). Leg setation: 1–3-3-4(1)-6(1). Tarsus with large padded claws and well-developed flipper-like empodium. Solenidion *ω* 8 (9–9) finger-shaped, solenidion *φ* 4 (3–4) weakly clavate. Seta *l*′ of femur smooth, pointed; other leg setae sparsely barbed, pointed. Leg III (Figure 12A). Leg setation: 1–2-2-4(1)-6. Claws of same shape as on tarsus II. Solenidion *φ* 4 (3–4) weakly clavate. Seta *v*′ of femur smooth, pointed; other leg setae sparsely barbed, pointed. Leg IV (Figure 12B). Leg chaetotaxy: 1–2-1-3-6. Setae *pl*″ and *u*′ of tarsus short, smooth, pointed; other leg setae pointed and distinctly barbed. Seta *u*′ 9 (9–10) reaching to tip of tarsus IV. Pretarsus IV long and thin, with short simple claws and empodium. Solenidion *φ* 6 (5–6) baculiform. Length of tarsus IV 32 (31–33), pretarsus IV 28 (27–31). Trochanter IV with distiventral spine-like elongation.

Male and *larva* unknown.

Type material

Female holotype, slide No. AK060915/1, Russia, Tyumen Province, Tyumen district, vicinity of Tyumen, 57°13′48.3″N 65°27′39.7″E, on ants *L. fuliginosus*, 6 September 2015, coll. A.A. Khaustov; paratypes: 55 females, same data; 87 females, Russia, Kurgan Province, Zverinogolovskiy district, vicinity of settlement Ukrainets, 54°24′11.6″N 64°49′08.6″E, on ants *L. fuliginosus*, 13 September 2015, coll. A.A. Khaustov, A.V. Tolstikov.

Differential diagnosis

The new species is most similar to *Imparipes lasii* Khaustov, 2008 by the presence of setae *f* more densely barbed than h_1. It differs from *I. lasii* by setae *d* also more densely barbed than h_1 and longer than h_1 (vs. *d* sparsely barbed and shorter than h_1 in *I. lasii*). It also differs by straight setae *f* (vs. characteristically curved in *I. lasii*).

Etymology

The name of a new species refers to association with ant *L. fuliginosus*.

Imparipes brevibasis (Sevastianov, 1983)

Scutacarus brevibasis Sevastianov, 1983, p. 1495, Figures 10–12.
Imparipes (*Imparipes*) *brevibasis*: Khaustov 2008, p. 93, Figure 55.
This species was described from Ukraine from ants *L. fuliginosus* (Sevastianov 1983).

This is a new record for the fauna of Russia.

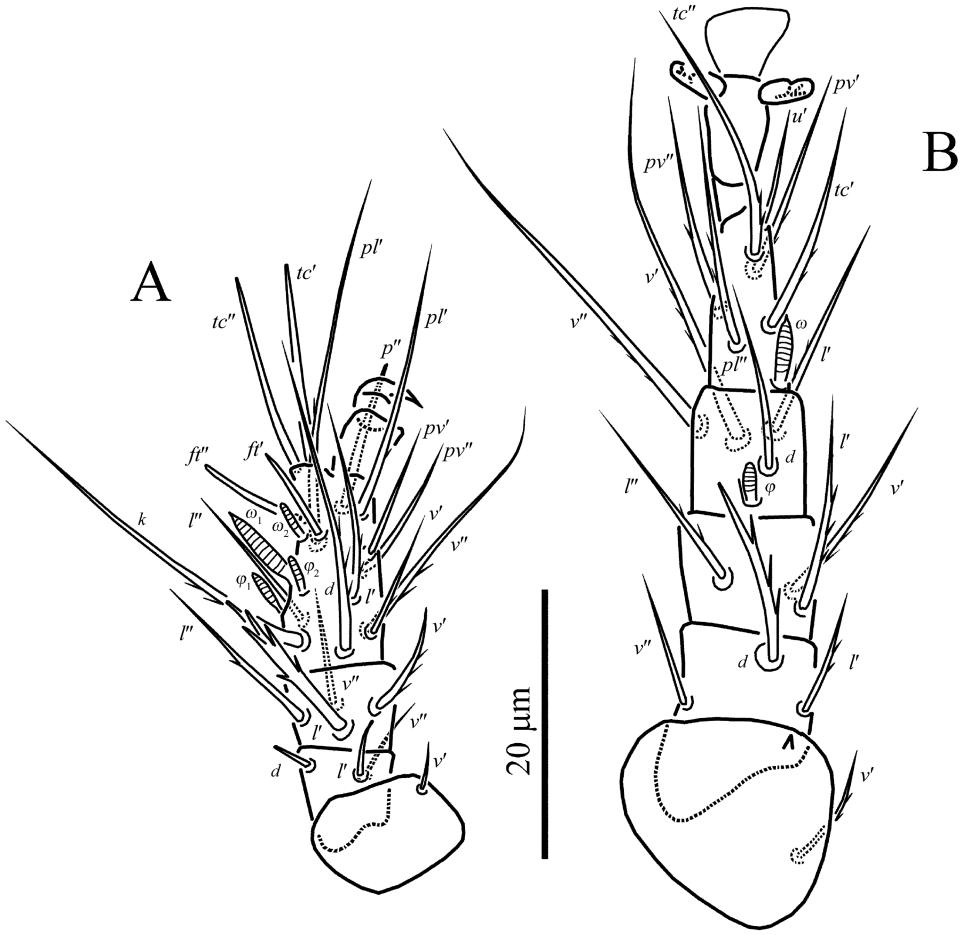

Figure 7. *Unguidispus contematosus* Sevastianov, 1981, female: (A) leg I in dorsal view, (B) leg II in dorsal view.

Material examined

Two females, Russia, Kurgan Province, Zverinogolovskiy district, vicinity of settlement Ukrainets, 54°24′11.6″N 64° 49′08.6″E, on ants *L. fuliginosus*, 13 September 2015, coll. A. A. Khaustov, A.V. Tolstikov; 228 females, .Russia, Tyumen Province, Tyumen district, vicinity of Tyumen, 57°13′48.3″N 65°27′39.7″E, on ants *L. fuliginosus*, 6 September 2015, coll. A.A. Khaustov.

Imparipes obsoletus Rack, 1966

Imparipes (*Imparipes*) *obsoletus* Rack, 1966, p. 99, Figures 5–7.
Imparipes (*Imparipes*) *hystricinus degenerans*: Paoli 1911, p. 259, Figures 57, 58, 60, misidentification

This species was described from Germany (Rack 1966). Ebermann (1979) recorded it from Austria from the nests of *Lasius flavus* and *L. niger*. Mahunka (1977b) recorded it from Switzerland from the ant *Lasius umbratus* Nylander, 1846. It was also recorded from France (Mahunka 1972), Hungary (Mahunka 1981, 1986), Ukraine (Sevastianov 1978; Sklyar and Sevastianov 1997) and the USA. (Delfinado et al. 1976). Khaustov (2008) reported it from the Ukraine and from Russia (Crimea) on ants *Lasius flavus, L. umbratus, L. alienus* and *Messor* sp.

This is a new phoretic host for *Imparipes obsoletus*.

Material examined

One female, Russia, Tyumen Province, Tyumen district, vicinity of Tyumen, 57°13′48.3″N 65°27′39.7″E, on ants *L. fuliginosus*, 6 September 2015, coll. A.A. Khaustov.

Imparipes sevastianovi Khaustov, 2008

Imparipes (*Imparipes*) *sevastianovi* Khaustov, 2008, p. 150, Figure 98.

This species was described from Ukraine from ants *L. fuliginosus* (Khaustov 2008).

This is a new record for the fauna of Russia.

Material examined

Twenty females, Russia, Tyumen Province, Tyumen district, vicinity of Tyumen, 57°13′48.3″N 65°27′39.7″E, on ants *L. fuliginosus*, 6 September 2015, coll. A.A. Khaustov; 15 females, Russia, Kurgan Province, Zverinogolovskiy district, vicinity of settlement Ukrainets, 54°24′11.6″N 64°49′08.6″E, on ants *L. fuliginosus*, 13 September 2015, coll. A.A. Khaustov, A.V. Tolstikov.

Genus *Scutacarus* Gros, 1845

Type species: *Scutacarus femoris* Gros, 1845, by monotypy.

Scutacarus flexisetus Karafiat, 1959

Scutacarus flexisetus Karafiat, 1959, p. 692, Figure 35.

This species was described from Germany from ant *L. fuliginosus* (Karafiat 1959). It was also recorded from Austria (Ebermann 1980) from the nest of *L. fuliginosus*; from Japan (Kurosa 1980) and Ukraine (Sevastianov 1978).

This is a new record for the fauna of Russia.

Material examined

One hundred twenty six females, Russia, Tyumen Province, Tyumen district, vicinity of Tyumen, 57°13′48.3″N 65°27′39.7″E, on ants *L. fuliginosus*, 6 September 2015, coll. A.A. Khaustov; 89

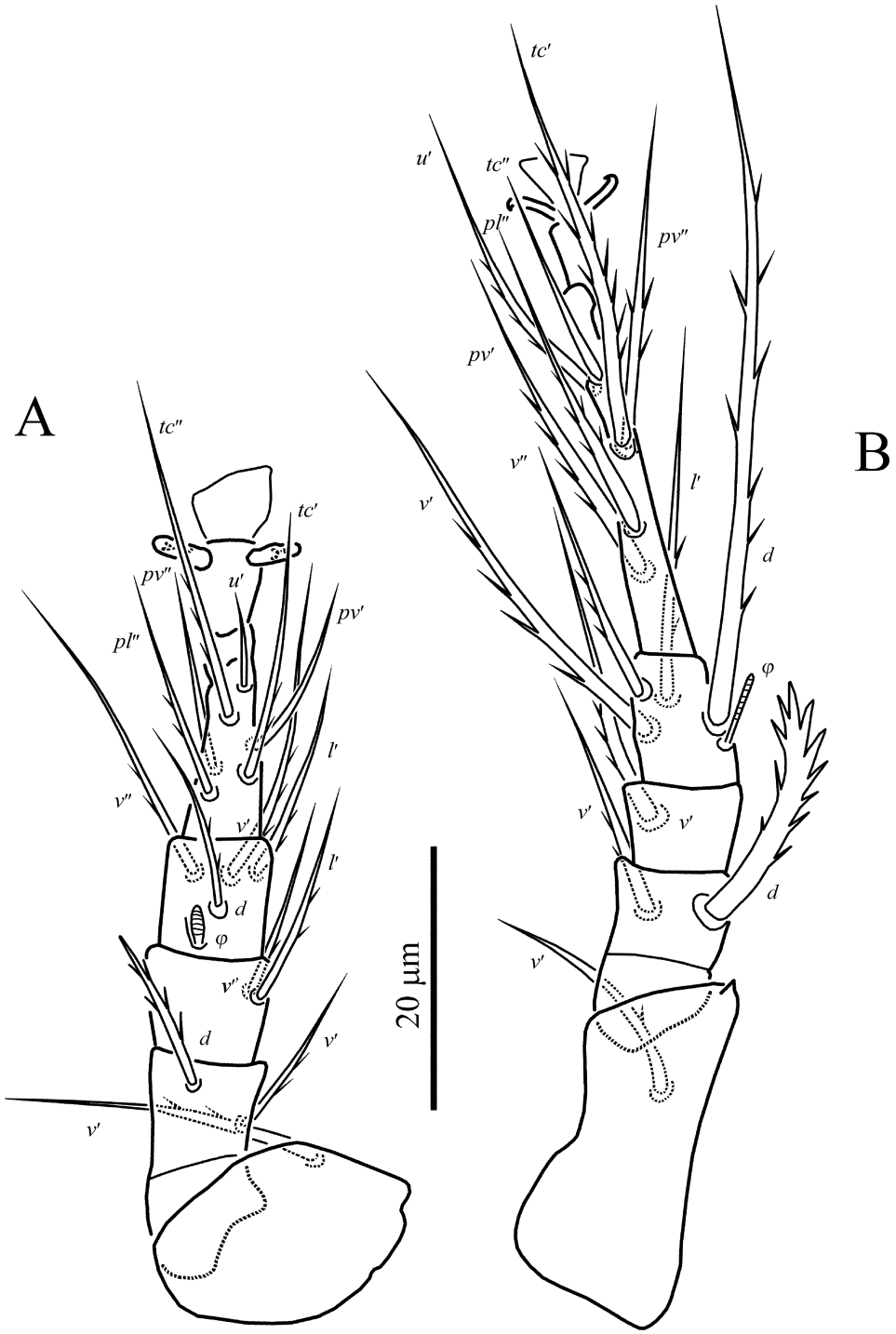

Figure 8. *Unguidispus contematosus* Sevastianov, 1981, female: (A) leg III in dorsal view, (B) leg IV in dorsal view.

females, Russia, Kurgan Province, Zverinogolovskiy district, vicinity of settlement Ukrainets, 54°24′11.6″N 64°49′08.6″E, on ants *L. fuliginosus*, 13 September 2015, coll. A.A. Khaustov, A.V. Tolstikov.

Scutacarus longisetus (Berlese, 1904)

Disparipes longisetus Berlese, 1904, p. 11.
Disparipes longisetus: Paoli 1911, p. 238, Figures 25, 26.
Scutacarus longisetus: Karafiat 1959, p. 696.

This species was described from Italy (Berlese 1904; Paoli 1911) from ants *Lasius flavus*. Ebermann (1979) recorded it from Austria from the nest of *Lasius niger* (Linnaeus, 1758). Mahunka (1977b) recorded it from Switzerland from ants *Lasius umbratus* and *Myrmica laevinodis*. It was also recorded from Bulgaria (Dobrev 1992), Hungary (Mahunka 1981, 1986), Slovenia (Mahunka 1975), Ukraine (Sevastianov 1978). Khaustov (2008) reported it from Ukraine and Russia (Crimea) on ants *Lasius flavus, L. alienus* and *Tetramorium caespitum* Linnaeus, 1758.

This is a new phoretic host for *Sc. longisetus*.

Material examined

Two females, Russia, Kurgan Province, Zverinogolovskiy district, vicinity of settlement Ukrainets, 54°24′11.6″N 64°49′08.6″E, on ants *L. fuliginosus*, 13 September 2015, coll. A.A. Khaustov, A.V. Tolstikov.

Scutacarus subterraneus (Oudemans, 1913)

Disparipes subterraneus Oudemans, 1913, p. 10.
Scutacarus subterraneus Štorkán, 1936, p. 28.

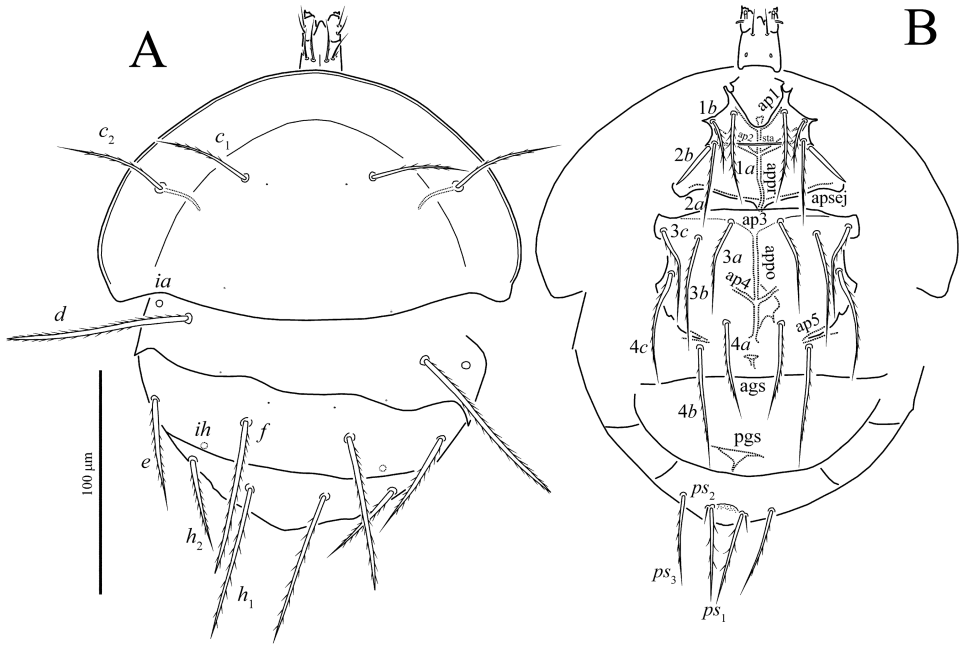

Figure 9. *Imparipes fuliginosophilus* **sp. nov.**, female: (A) idiosomal dorsum, (B) idiosomal venter.

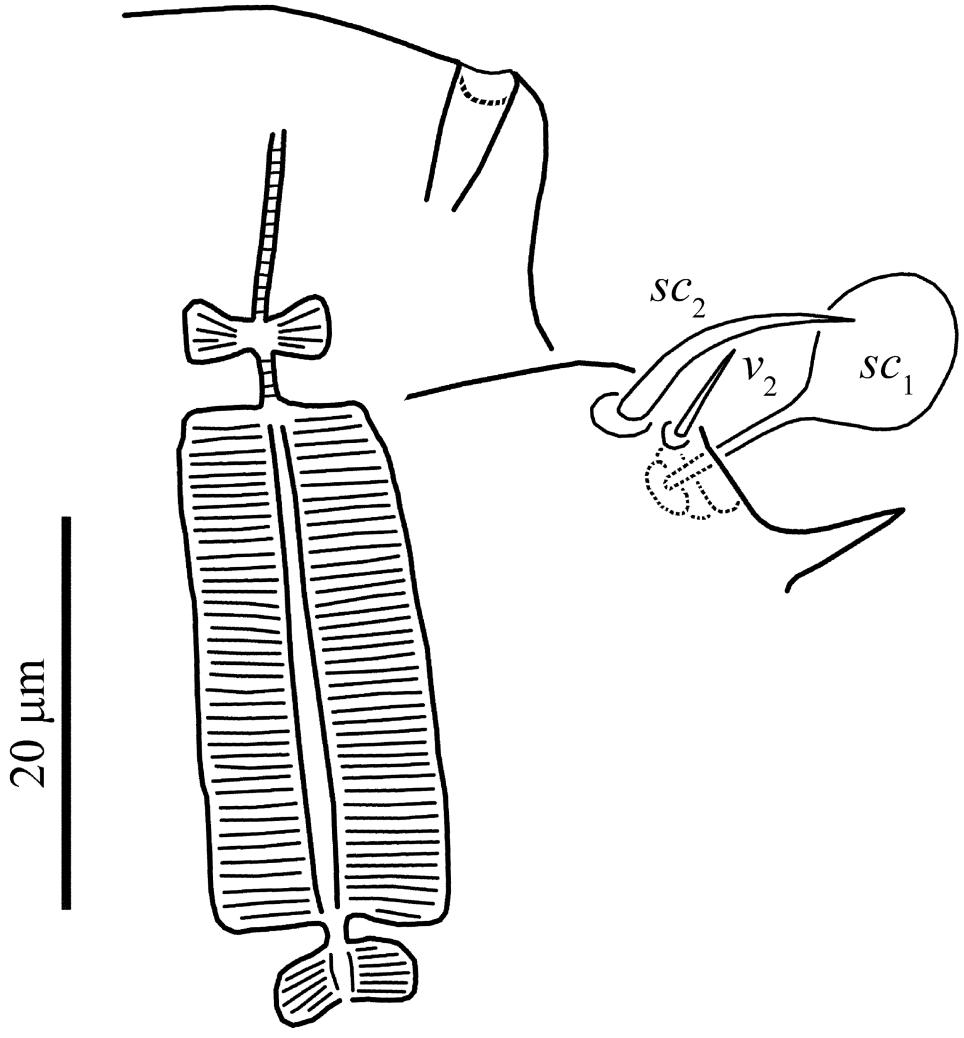

Figure 10. *Imparipes fuliginosophilus* **sp. nov.**, female: right part of prodorsum and pharyngeal pumps in dorsal view.

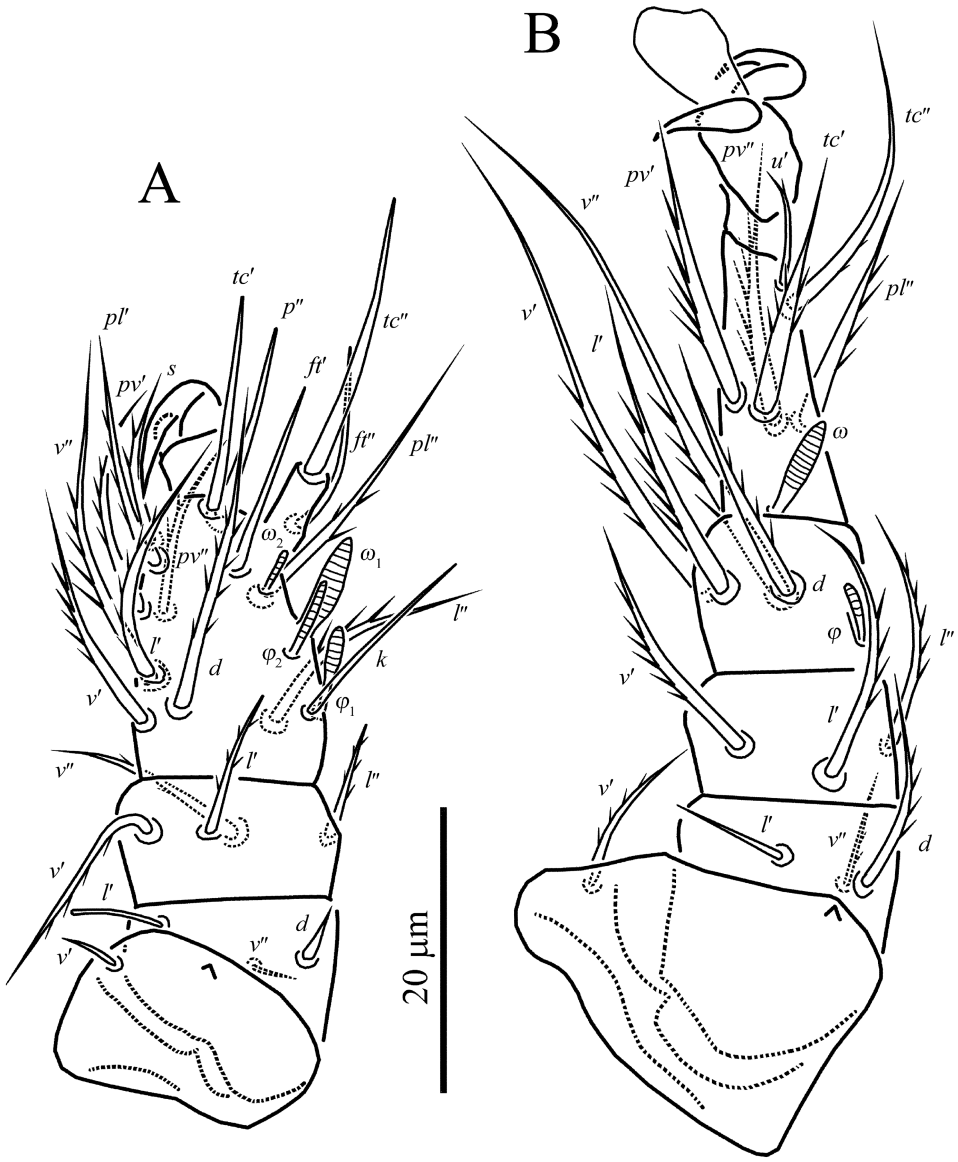

Figure 11. *Imparipes fuliginosophilus* **sp. nov.**, female: (A) leg I in dorsal view, (B) leg II in dorsal view.

This species known from the Netherlands, Austria, Germany, Poland, Hungary, Lithuania and Ukraine (Oudemans 1913; Ebermann 1979; Khaustov 2008). Khaustov (2008) reported it from Crimea, Central and Northern European Russia from soil, forest litter and from ants of the genus *Lasius*.

This is a new record for the fauna of Asian part of Russia.

Material examined

Four females, Russia, Tyumen Province, Tyumen district, vicinity of Tyumen, 57°13′48.3″N 65°27′39.7″E, on ants *L. fuliginosus*, 6 September 2015, coll. A.A. Khaustov; 3 females, Russia, Kurgan Province, Zverinogolovskiy district, vicinity of settlement Ukrainets, 54°24′11.6″N 64°49′08.6″E, on ants *L. fuliginosus*, 13 September 2015, coll. A.A. Khaustov, A.V. Tolstikov.

Discussion

Morphology of Unguidispus contematosus

During the study of morphology of *U. contematosus* I revealed the absence of seta *s* on tibiotarsus I. Khaustov (2014b) proposed the diagnosis of the genus *Unguidispus* in which he mentioned presence of seta *s* as generic level character. Because of the absence of seta *s* on tibiotarsus I in *U. contematosus*, this character should be excluded from the generic diagnosis of the genus *Unguidispus*. Such reduction of seta *s* of tibiotarsus I is well known in many genera of Microdispidae, but variability of this character within one genus has never been reported.

Pygmephoroid mite community associated with Lasius fuliginosus

Mite community associated with *L. fuliginosus* is highly specific. Among 11 species of pygmephoroid mites associated with ant *L. fuliginosus* in Western Siberia, six species (*Petalomium fuliginosum* **sp. nov.**, *U. contematosus, Imparipes fuliginosophilus* **sp. nov.**, *I. brevibasis, I. sevastianovi* and *Sc. flexisetus*) are known only from *L. fuliginosus. Petalomium carelitschensis* and *Pe. podolicus* are associated with wide range of ants. *Imparipes obsoletus*, *Sc. longisetus* and *Sc. subterraneus* are specialized for phoresy on various species of the ant genus *Lasius* (Khaustov 2008). Sevastianov (1965) reported 13 species of pygmephoroid mites associated with *L. fuliginosus* in Western Ukraine. He recorded *I. hystricinus* as associate of this ant. My examination of several slides of mites identified by Sevastianov as *I. hystricinus* revealed that in fact they represent *I. sevastianovi* and *Imparipes fuliginosophilus* **sp. nov**. Thus association of *I. hystricinus* with *L. fuliginosus* is a result of incorrect identification of *Imparipes* mites.

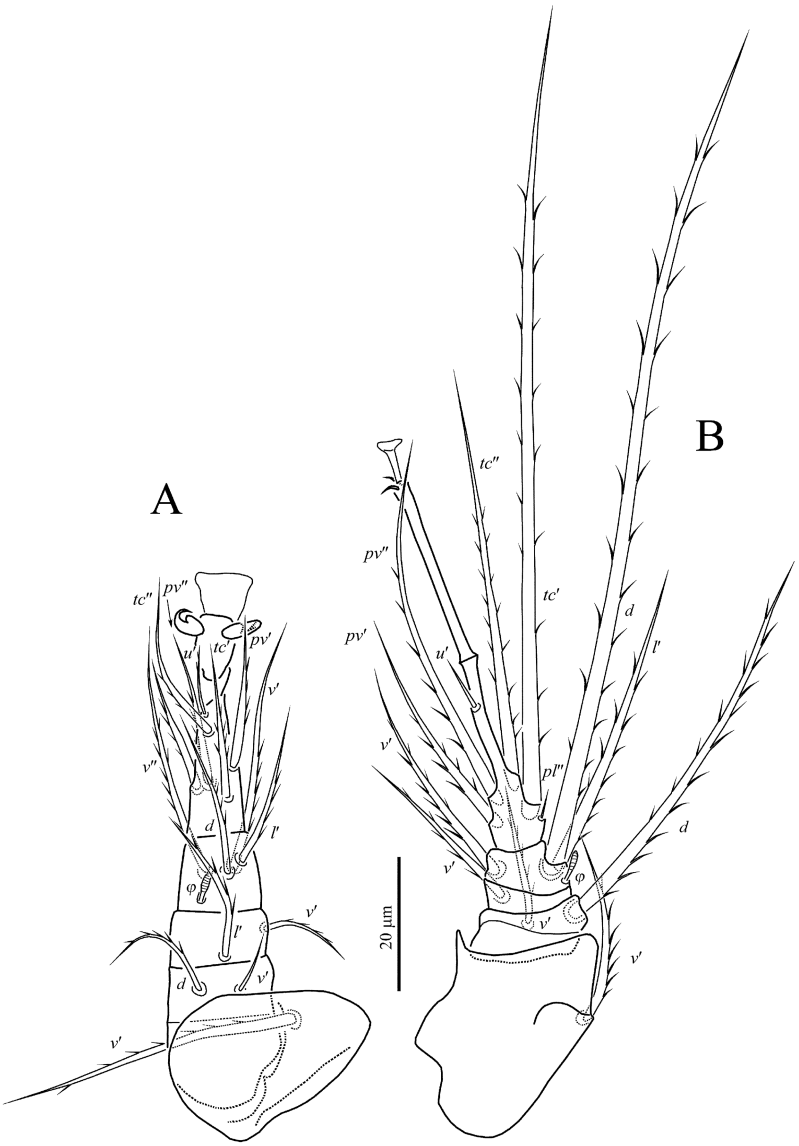

Figure 12. *Imparipes fuliginosophilus* **sp. nov.**, female: (A) leg III in dorsal view, (B) leg IV in dorsal view.

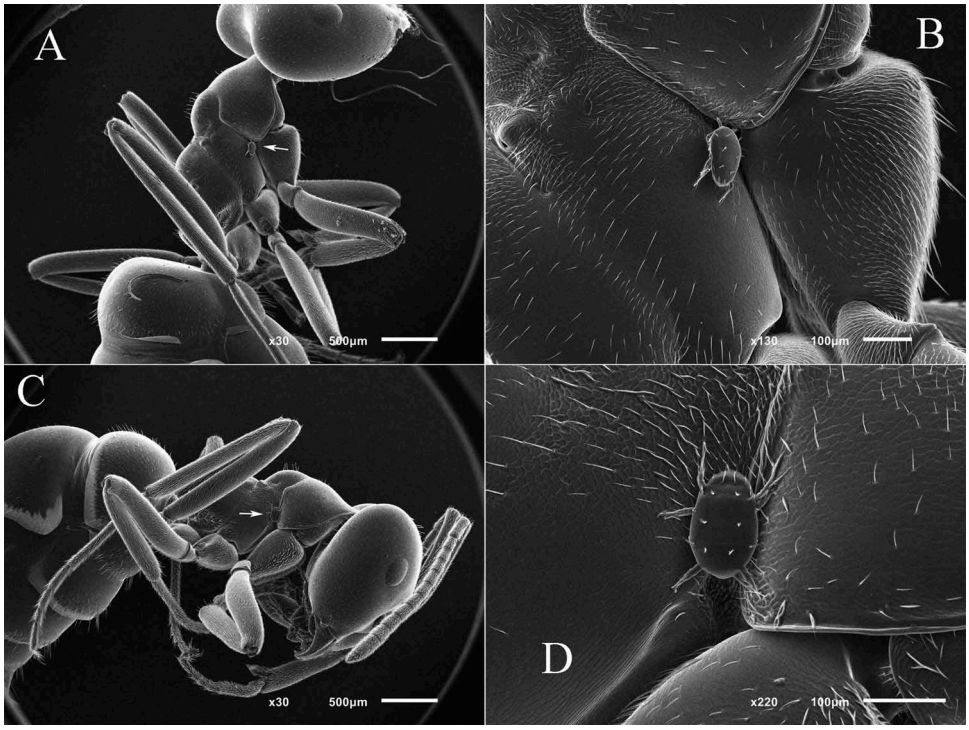

Figure 13. SEM photographs of females of *Unguidispus contematosus* on workers of *Lasius fuliginosus*: (A, C) general view, (B, D) detailed view.

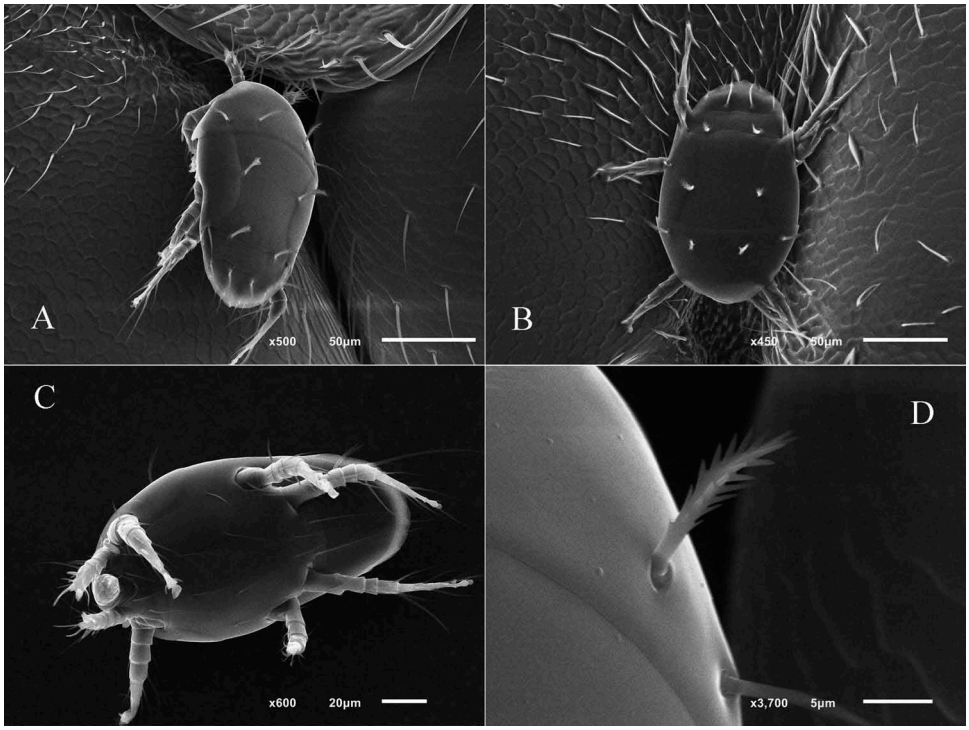

Figure 14. SEM photographs of females of *Unguidispus contematosus*: (A, B) dorsal view, (C) ventral view, (D) seta c_1.

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