

Mites of the family Scutacaridae (Acari: Pygmephoidea) associated with *Formica fusca* L. (Hymenoptera: Formicidae) from Western Siberia, Russia

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ABSTRACT — Six species of scutacarid mites (Acari: Pygmephoidea: Scutacaridae) are newly recorded phoretic on ants *Formica fusca* Linnaeus, 1758 (Hymenoptera: Formicidae) in Tyumen Province, Western Siberia, Russia. One of these species, *Scutacarus karafati n. sp.* is described as new for science. *Scutacarus pilatus* Khaustov, 2008, *S. rotundus* (Berlese, 1903) and *S. atypicus* (Karafiat, 1959) are recorded for the first time in Russia. *Scutacarus rotundus* is redescribed based on material from Western Siberia.

KEYWORDS — Acari; Heterostigmata; Pygmephoidea; *Scutacarus*; *Imparipes*; systematics; ants; phoresy

INTRODUCTION

The cosmopolitan family Scutacaridae is the largest in the superfamily Pygmephoidea and includes 24 genera and more than 800 species (Zhang *et al.* 2011). Probably all scutacarid mites are fungivorous (Khaustov 2008). Many scutacarid mites are phoretic on various ants (Ebermann and Moser 2008; Khaustov 2008; Ebermann *et al.* 2013), but scutacarid mites associated with particular species of ants are poorly studied. There is only one comprehensive study of scutacarid mites associated with the red imported fire ant, *Solenopsis invicta* Buren, 1972 (Ebermann and Moser 2008). *Formica fusca* Linnaeus, 1758 is a common Palaearctic ant species. Previously three species of scutacarid mites, *Scutacarus rotundus* (Berlese, 1903), *S. silvestri* (Berlese, 1903) and *S. stammeri* Karafiat, 1959 were recorded as associates of this ant (Berlese 1903; Karafiat 1959). The aim of this paper is to describe a new species

and further provide five new records of scutacarid mites associated with *Formica fusca* from Western Siberia.

MATERIALS AND METHODS

Ants were collected in vials with 96 % alcohol and the sediments from the vials were inspected for phoretic mites. All collected mites were mounted in Hoyer's medium. The terminology of idiosoma and legs follows that of Lindquist (1986); the nomenclature of subcapitular setae and the designation of cheliceral setae follow that of Grandjean (1944, 1947), respectively. The system of Pygmephoidea follows that of Khaustov (2004, 2008). All measurements are given in micrometers (μm) for the holotype and paratypes (in parentheses). For leg chaetotaxy the number of solenidia is given in parentheses. Scanning electron micrograph was made with the aid of JEOL – JSM-6510LV SEM microscope. The

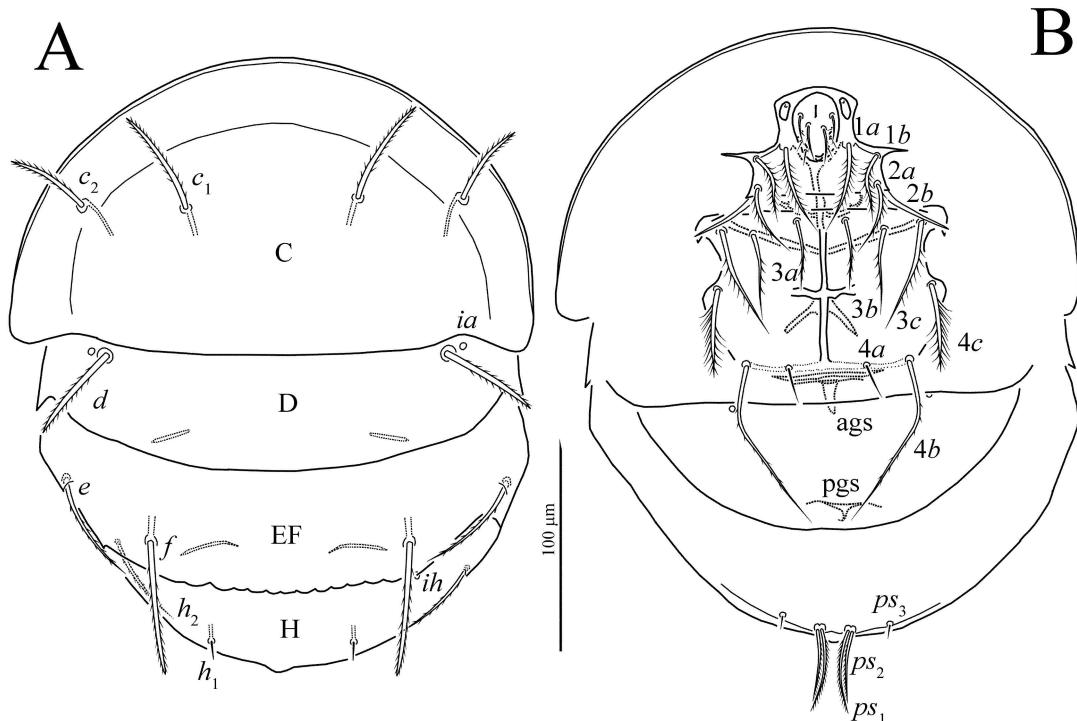


FIGURE 1: *Scutacarus karafiati* Khaustov n. sp., female: A – idiosomal dorsum, B – idiosomal venter.

holotypes and most paratypes of new species are deposited in the mite collection of the Tyumen State University Museum of Zoology, Tyumen, Russia; two paratypes of new species are deposited in the acarological collection of the Zoological Institute of RAS, St. Petersburg, Russia.

RESULTS

Systematics

Family Scutacaridae Oudemans, 1916

Genus *Scutacarus* Gros, 1845

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

Scutacarus karafiati n. sp.

(Figures 1-3)

Description

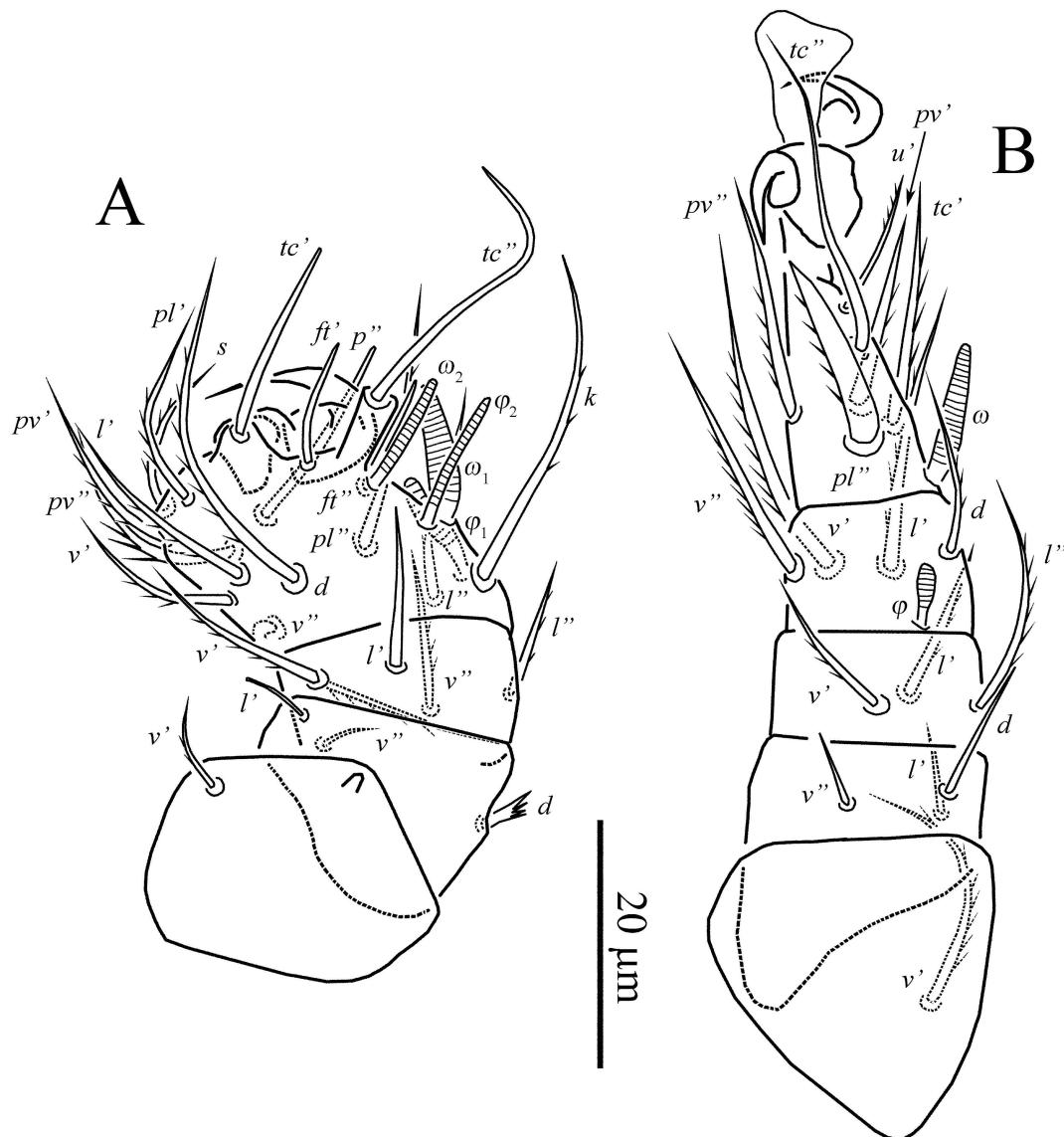
Female — Length of idiosoma 230 (215 – 230), width 200 (190 – 200).

Gnathosoma — Gnathosomal capsule short, oval, with well developed dorsal median apodeme,

dorsally with two pairs of weakly barbed and pointed setae (*cha*, *chb*) and one pair of postpalpal setae (*pp*), situated anterolaterally to bases of setae *cha*. Palps dorsolaterally with subequal setae *dFe* and *dGe*. Ventral surface of gnathosoma not visible.

Idiosomal dorsum (Figure 1A) — Prodorsum completely covered by tergite C, with two pairs of smooth needle-like setae *v₂* and *sc₂*, one pair of barbed capitate trichobothria, and one pair of oval stigmata. All dorsal shields with numerous small dimples. Cupules *ia* on tergite D and *ih* on tergite H large, round. Setae *c₁*, *c₂*, *d* and *f* thick, blunt-ended and distinctly barbed; setae *e* and *h₂* pointed, curved medially and sparsely barbed; setae *h₁* needle-like, smooth. Posterior margin of tergite EF undulate. Lengths of dorsal setae: *c₁* 42 (40 – 42), *c₂* 34 (31 – 34), *d* 39 (37 – 39), *e* 46 (43 – 46), *f* 52 (48 – 52), *h₁* 8 (7 – 8), *h₂* 37 (35 – 37). Distances between setae: *c₁-c₁* 65 (64 – 65), *d-d* 130 (125 – 130), *f-f* 98 (90 – 98), *h₁-h₁* 54 (50 – 54).

Idiosomal venter (Figure 1B) — All ventral plates with numerous small dimples. Apodemes

FIGURE 2: *Scutacarus karafati* Khaustov n. sp., female: A – leg I in dorsal view, B – leg II in dorsal view.

1 (ap1) well-developed and joined with prosternal apodeme (appr), apodemes 2 (ap2) w-like, joined with appr; sejugal apodeme (apsej) well developed and joined with appr. Secondary transverse apodeme well developed. Apodemes 3 (ap3) weakly developed, diffuse, apodemes 4 (ap4) short, joined with poststernal apodeme (appo). Apodemes 5 fused with appo, diffuse. Setae 2b slightly thickened, smooth, blunt-ended, setae 4a

smooth, situated on the same level as 4b and reaching slightly beyond posterior margin of poststernal plate, setae ps_3 short and smooth. Setae 4c thickened and heavily barbed. Other ventral setae sparsely barbed. Distance 4a – 4a about 1.5 times longer than 4a – 4b. Anterior genital sclerite tongue-like, posterior genital sclerite triangular. Length of ventral setae: 1a 37 (34 – 37), 1b 30 (26 – 30), 2a 30 (29 – 32), 2b 30 (28 – 30), 3a 28 (26 – 29), 3b 34 (31 – 35), 3c 44

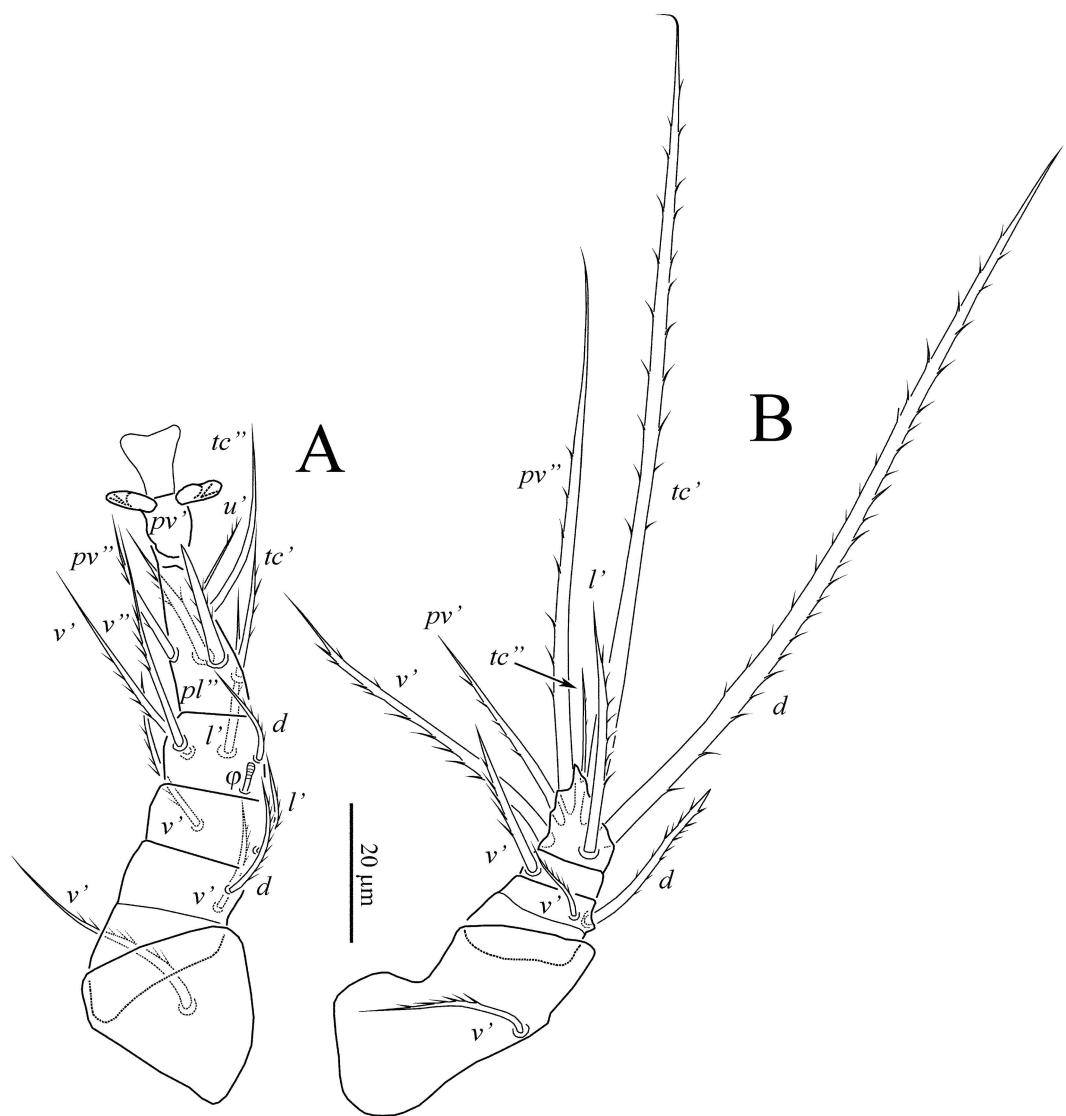


FIGURE 3: *Scutacarus karafati* Khaustov n. sp., female: A – leg III in dorsal view, B – leg IV in ventral view.

(40 – 45), 4a 15 (15 – 16), 4b 70 (66 – 71), 4c 37 (33 – 37), ps₁ 33 (29 – 33), ps₂ 29 (26 – 29), ps₃ 6 (4 – 6).

Legs (Figures 2, 3) — Leg I (Figure 2A). Leg chaetotaxy: Tr-1, Fe-3, Ge-4, TiTa-16(4). Tibiotarsus with large tarsal claw, pointed distally. Seta *k* barbed, pointed, eupathidion *tc*" situated on long pinnaculum. Lengths of solenidia: ω_1 13 (12 – 13) > ω_2 11 (10 – 11) > φ_1 10 (9 – 10) < φ_2 11 (10 – 11); ω_2 and φ_2 baculiform, φ_1 clavate, ω_1 finger-shaped. Seta *dFe* flattened, with several large barbs. Setae *l'* of femur blunt-ended and smooth. Leg II (Figure 2B). Leg chaetotaxy: Tr-1, Fe-3, Ge-3, Ti-4(1), Ta-6(1). Tarsus with large padded claws and well-developed flipper-like empodium. Solenidion ω 12 (11 – 12) finger-shaped, solenidion φ weakly clavate. Setae *pl*" spine-like, barbed, *u'* blunt-ended and barbed in distal half. Leg III (Figure 3A). Leg chaetotaxy: Tr-1, Fe-2, Ge-2, Ti-4(1), Ta-6. Claws of same shape as on tarsus II. Solenidion φ weakly clavate. Setae *pl*" spine-like, barbed, *u'* blunt-ended and barbed in distal half. Leg IV (Figure 3B). Leg chaetotaxy: Tr-1, Fe-2, Ge-1, TiTa-7. Setae *d* of femur blunt-ended. Tibiotarsus short, only slightly longer than its width. Setae *tc*" shorter than *pv*'.

Male and larva unknown.

Type material — Female holotype, slide AK130914, Russia, Tyumen Province, Tyumen region, vicinity of Tyumen, 57°13'43.6" N, 65°28'28.4" E, on ants *Formica fusca* Linnaeus, 13 September 2014, coll. A.A. Khaustov. Paratypes: 3 females, same data; 6 females, Russia, Tyumen Province, Uvat region, vicinity of settlement Demyanka, 59°31'35" N, 69°57'47" E, on ants *Formica fusca*, 22 August 2014, coll. V.A. Stolbov.

Etymology — The new species is named after Helmut Karafiat, a German acarologist, for his contribution to the study of European scutacarid mites.

Differential diagnosis — The new species is most similar to *S. rotundus* (Berlese, 1903) by thick and distinctly barbed setae *c₁*, *c₂*, *d*, *f*, curved and pointed *e* and *h₂*, and very short *h₁*. It differs from *S. rotundus* by setae *f* less than 1.5 times longer than *d* (*f* about two times longer than *d* in *S. rotundus*), setae *h₁* needle-like and smooth (sparsely barbed and characteristically curved medially in *S. rotundus*), setae *tc*" of tibiotarsus IV shorter than *pv*' (*tc*"

much longer than *pv*' in *S. rotundus*), setae *4c* distinctly thickened, heavily barbed and not reaching beyond posterior margin of poststernal plate (setae *4c* not thickened, sparsely barbed and reaching far beyond posterior margin of poststernal plate in *S. rotundus*), solenidia ω_2 and φ_2 subequal (solenidion ω_2 longer than φ_2 in *S. rotundus*).

Scutacarus rotundus (Berlese, 1903) (Figures 4-6)

Disparipes silvestri var. rotundus Berlese, 1903, p. 23.
Disparipes rotundus: Paoli 1911, p. 240, Figs. 27, 28.
Scutacarus rotundus: Karafiat 1959, p. 696.

Redescription

Female — Length of idiosoma 230 – 260, width 205 – 230.

Gnathosoma — as in *S. karafati* n. sp.

Idiosomal dorsum (Figures 4A, 6) — Prodorsum completely covered by tergite C, with two pairs of smooth needle-like setae *v₂* and *sc₂*, one pair of barbed capitate trichobothria, and one pair of oval stigmata. All dorsal shields with numerous small dimples. Cupules *ia* on tergite D and *ih* on tergite H large, round. Setae *c₁*, *c₂*, *d* and *f* thick, blunt-ended and distinctly barbed; setae *e* and *h₂* pointed, curved medially and sparsely barbed; setae *h₁* sparsely barbed and curved medially. Posterior margin of tergite EF weakly undulate. Lengths of dorsal setae: *c₁* 39 – 41, *c₂* 39 – 41, *d* 43 – 45, *e* 55 – 57, *f* 76 – 87, *h₁* 14 – 15, *h₂* 47 – 53. Distances between setae: *c₁ – c₁* 59 – 63, *d – d* 120 – 135, *f – f* 88 – 100, *h₁ – h₁* 61 – 63.

Idiosomal venter (Figure 4B) — All ventral plates with numerous small dimples. Ap1 well-developed and joined with appr, ap2 w-like, joined with appr; apsej well developed and joined with appr. Secondary transverse apodeme well developed. Ap3 weakly developed, diffuse, ap4 short, joined with appo. Ap5 diffuse, fused with appo. Setae *2b* slightly thickened, smooth, blunt-ended, setae *4a* smooth, situated on the same level as *4b* and reaching distinctly beyond posterior margin of poststernal plate, setae *ps₃* short and smooth, other ventral setae sparsely barbed. Distance *4a – 4a* equal

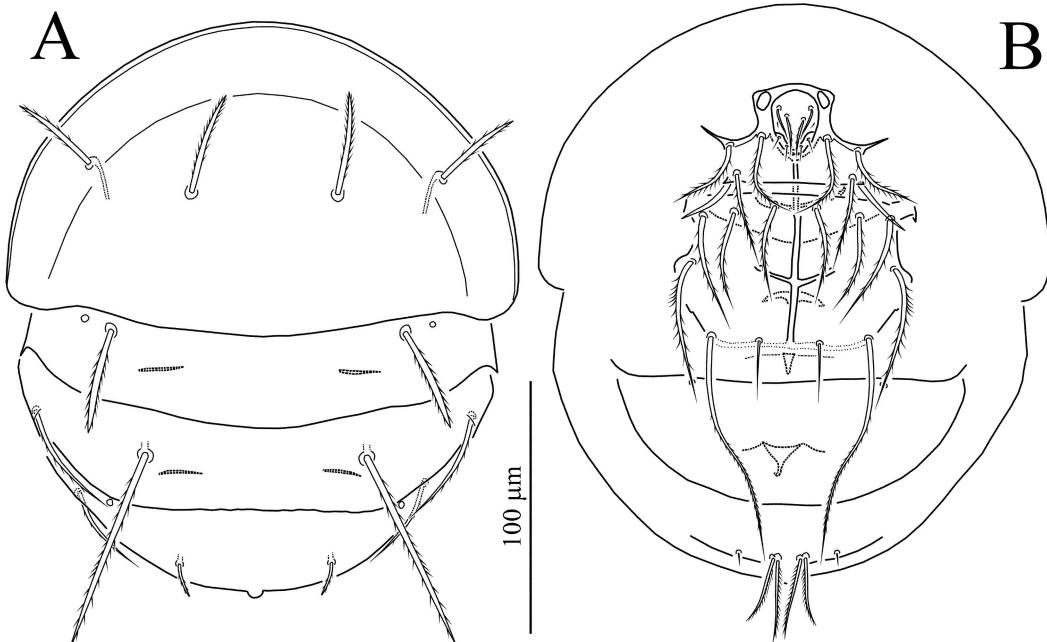


FIGURE 4: *Scutacarus rotundus* (Berlese, 1903), female: A – idiosomal dorsum, B – idiosomal venter.

to 4a – 4b. Anterior genital sclerite tongue-like, posterior genital sclerite triangular. Lengths of ventral setae: 1a 41 – 44, 1b 36 – 41, 2a 34 – 37, 2b 25 – 28, 3a 41 – 42, 3b 44 – 47, 3c 49 – 53, 4a 23 – 27, 4b 93 – 115, 4c 62 – 67, ps₁ 31 – 36, ps₂ 27 – 30, ps₃ 6 – 7.

Legs (Figure 5) — Shape and setation of leg I similar to that of *S. karafiati n. sp.* Lengths of solenidia: ω_1 12 > ω_2 8 – 9 > φ_1 9 – 10 < φ_2 6 – 7; ω_2 and φ_2 baculiform, φ_1 clavate, ω_1 finger-shaped (Figure 5A). Seta *dFe* flattened, with several large barbs. Setae *l'* of femur blunt-ended and smooth. Leg II as in *S. karafiati n. sp.* Solenidion ω 11 finger-shaped, solenidion φ weakly clavate. Setae *pl''* spine-like, barbed, *u'* blunt-ended and barbed in distal half. Leg III as in *S. karafiati n. sp.* Solenidion φ weakly clavate. Setae *pl''* spine-like, barbed, *u'* blunt-ended and barbed in distal half. Leg IV (Figure 5B). Leg chaetotaxy as in *S. karafiati n. sp.* Setae *d* of femur blunt-ended. Tibiotarsus short, only slightly longer than its width. Setae *tc''* distinctly longer than *pv'*.

Male and larva unknown.

Material examined — Four females, Russia, Tyumen Province, vicinity of Tyumen, 57°13'43.6" N, 65°28'28.4" E, on ants *Formica fusca*, 13 Septem-

ber 2014, coll. A.A. Khaustov; 2 females, Russia, Tyumen Province, Uvat region, vicinity of settlement Demyanka, 59°31'35" N, 69°57'47" E, on ants *Formica fusca*, 22 August 2014, coll. V.A. Stolbov; 3 females, Russia, Tyumen Province, Tyumen region, vicinity of Tyumen, 57°04'03" N, 65°04'12" E, on ants *Formica fusca*, 17 August 2014, coll. A.A. Khaustov.

Remarks — This species was originally described from Italy (Berlese 1903) from ants *Formica fusca*. It was also recorded from Germany from *Formica fusca* and *Lasius niger* (Linnaeus, 1758) (Karafiat 1959); Austria from *Formica rufa* L., 1761 (Mahunka 1970); Hungary (Mahunka and Zaki 1984) and Ukraine (Sebastianov 1978). This is a new record for the fauna of Russia.

Paoli (1911) studied specimens of *S. rotundus* in Berlese collection and provided redescription and illustrations of this species. Mahunka (1980) studied the type material of pygmephoroid mites in the Berlese collection and found out that the slide with a type specimen of *S. rotundus* was in a very bad condition. The other slide belonging to the type series of *S. rotundus* contained specimens of *S. silvestri* Berlese, 1903 and *S. stammeri* Karafiat, 1959.



FIGURE 5: *Scutacarus rotundus* (Berlese, 1903), female: A – solenidia of tibiotarsus I, B – leg IV in ventral view.

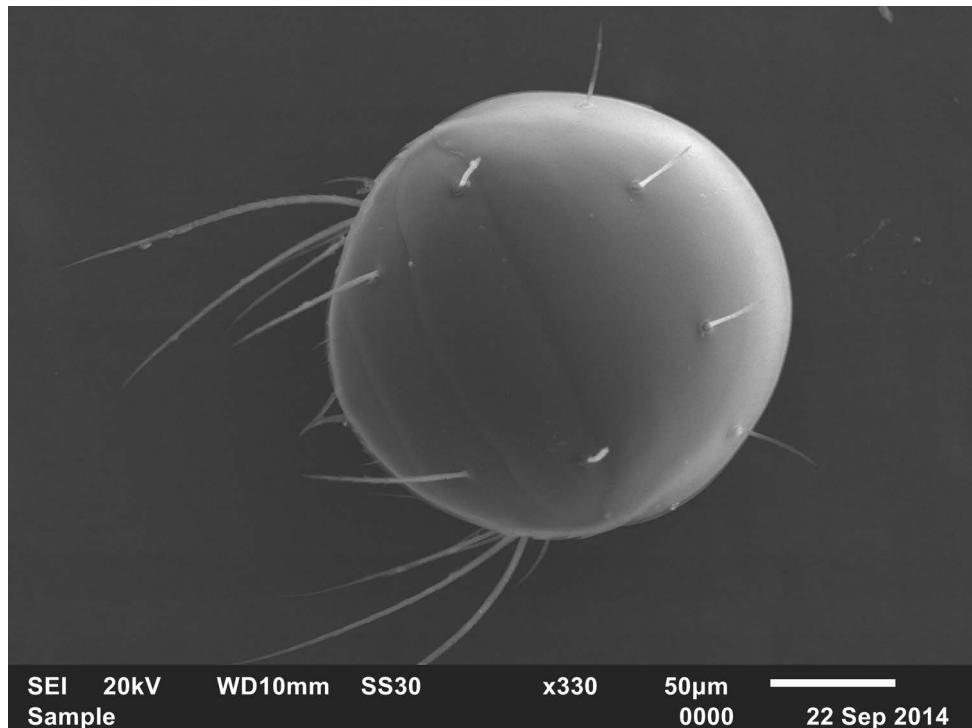


FIGURE 6: Scanning electron micrograph of *Scutacarus rotundus* (Berlese, 1903), female: dorsum.

Mahunka (1980) supposed that *S. stammeri* is a potential synonym of *S. rotundus*. Specimens from Western Siberia identified by me as *S. rotundus* completely fit to illustrations and description of *S. rotundus* provided by Paoli (1911) and clearly differ from *S. stammeri*.

***Scutacarus atypicus* (Karafiat, 1959)**

Imparipes (Telodispus) atypicus Karafiat, 1959, p. 678, Fig. 23.

Scutacarus atypicus: Ebermann 1980, p. 145, Figs. 1-8.

This species was described from Germany from ant *Formica rufa* L., 1761 (Karafiat 1959). Ebermann (1980) recorded it from Austria from the nest of ant *Myrmica ruginodis* Nylander, 1846, redescribed it and transferred from the genus *Imparipes* to *Scutacarus*. Khaustov (2008) reported it from Western Ukraine from forest litter. This is a new record for the fauna of Russia.

Material examined — Four females, Russia, Tyumen Province, Tyumen region, vicinity of Tyumen,

57°13'43.6" N, 65°28'28.4" E, on ants *Formica fusca*, 13 September 2014, coll. A.A. Khaustov.

***Scutacarus pilatus* Khaustov, 2008**

Scutacarus pilatus Khaustov, 2008, p. 233, Fig. 160.

This species was described from Eastern Ukraine from ant nest of *Formica rufa* (Khaustov 2008). This is a new record for the fauna of Russia.

Material examined — Two females, Russia, Tyumen Province, Tyumen region, vicinity of Tyumen, 57°13'43.6" N, 65°28'28.4" E, on ants *Formica fusca*, 13 September 2014, coll. A.A. Khaustov; 4 females, Russia, Tyumen Province, Tyumen region, vicinity of Tyumen, 57°04'03" N, 65°04'12" E, on ants *Formica fusca*, 17 August 2014, coll. A.A. Khaustov.

Genus *Imparipes* Berlese, 1903

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

Imparipes (Imparipes) robustus Karafiat, 1959

Imparipes (Imparipes) robustus Karafiat, 1959, p. 674, Fig. 20.

This species was described from Germany from moss and ant *Lasius fuliginosus* (Latreille, 1798) (Karafiat 1959). It was also reported from Czech Republic from ant *Formica rufa* (Mahunka 1967); Mongolia from litter under birch (Mahunka 1965); France (Mahunka 1972a); Hungary (Mahunka 1972b); Bulgaria from ant nest (Dobrev 1992); Austria (Ebermann 1980); Japan (Kurosa 1980); Ukraine and Russia (Sebastianov 1978; Khaustov 2008). Khaustov (2008) recorded phoresy of *I. robustus* on ants *Formica cunicularia* Latreille, 1798, *F. gagates* Latreille, 1798, *Camponotus aethiops* (Latreille, 1798) and *Tetramorium caespitum* (Linnaeus, 1758).

Material examined — Two females, Russia, Tyumen Province, vicinity of Tyumen, 57°04'03" N, 65°04'12" E, on ants *Formica fusca*, 17 August 2014, coll. A.A. Khaustov.

Imparipes (Imparipes) nescius Khaustov, 2008

Imparipes (Imparipes) nescius Khaustov, 2008, p. 135, Fig. 87.

This species was described from Eastern Ukraine from anthill of *Formica rufa* and Russia (Crimean peninsula) from ant *Formica pratensis* Retzius, 1783 (Khaustov 2008). This is the first record for the Asian part of Russia.

Material examined — One female, Russia, Tyumen Province, Tyumen region, vicinity of Tyumen, 57°13'43.6" N, 65°28'28.4" E, on ants *Formica fusca*, 13 September 2014, coll. A.A. Khaustov; 2 females, Russia, Tyumen Province, Tyumen region, vicinity of Tyumen, 57°04'03"N, 65°04'12"E, on ants *Formica fusca*, 17 August 2014, coll. A.A. Khaustov.

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