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Previous volumes (2010-2018): 250 € / year (4 issues)
Acarologia, CBGP, CS 30016, 34988 MONTFERRIER-sur-LEZ Cedex, France
ISSN 0044-586X (print), ISSN 2107-7207 (electronic)

The digitalization of Acarologia papers prior to 2000 was supported by Agropolis Fondation under the reference ID 1500-024 through the « Investissements d’avenir » programme (Labex Agro: ANR-10-LABX-0001-01)

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Three new species and new records of *Pediculaster* (Acari: Pygmephoridae) from Western Siberia, Russia

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**ABSTRACT**

Three new species of *Pediculaster*: *P. tjumeniensis* sp. nov., *P. bisetus* sp. nov., and *P. rarus* sp. nov. are described from rotting wood in Western Siberia. *P. tjumeniensis* is described based on phoretic and non-phoretic females and larva; *P. bisetus* and *P. rarus* are described based on phoretic females only. *Pediculaster camerikae* Khaustov, 2008, *P. montanus* Khaustov, 2008, and *P. dudinskyi* Khaustov, 2011 are recorded for the first time from Asia, the latter species is also recorded for the first time from Russia. Unusual character states of *P. tjumeniensis* larva are discussed.

**Keywords** Pygmephoroidea; systematics; morphology; female dimorphism; larva; fauna

**Zoobank** http://zoobank.org/D86736C3-28A9-427D-B243-41BF5C93465A

**Introduction**

The genus *Pediculaster* Vitzthum, 1931 (Acari: Pygmephoroida) is one of the largest in the family Pygmephoridae and comprises more than 100 described species in the world fauna (Khaustov et al. 2014; Khaustov 2015). *Pediculaster*-mites are fungivorous and inhabit a great variety of habitats, e.g. soil, litter, mosses, dung, nest material, decaying organic material (Camerik and Kheradmand 2010). Several species are considered as pests of mushrooms in commercial mushroom-houses (Cross and Kaliszewski 1988). Mites of the genus *Pediculaster* are characterized by the presence of two morphologically different forms of females: non-phoretic or “normal” and phoretic (Camerik et al. 2006; Martin 1978). Most *Pediculaster* species are phoretic on various Diptera, especially associated with cattle dung (Camerik 2010). Little is known about *Pediculaster* mites inhabiting rotting wood and forest litter. Only few species were described from rotting wood: *P. fusarii* (Smiley and Moser, 1976) collected from the galleries of bark beetles from USA (Smiley and Moser 1976), *P. dudinskyi* Khaustov, 2011 collected from a tree hole from Ukraine (Khaustov 2011), *P. ermilovi* Khaustov, 2015 and *P. lignarius* Khaustov, 2015 collected from rotting wood in Western Siberia (Khaustov 2015). Khaustov (2015) reviewed mites of the genus *Pediculaster* of Russia and provided the key to phoretic females of Palaearctic species. Only two species, *P. ermilovi* and *P. lignarius* have been described and recorded from Western Siberia so far.

During the study of heterostigmatic mites of Western Siberia, three new species of *Pediculaster* were found in the samples of rotting wood. Moreover, three species, *P. dudinskyi* Khaustov, 2011, *P. camerikae* Khaustov, 2008b, and *P. montanus* Khaustov, 2008b were recorded from the Asia for the first time.

**Materials and methods**

Mites were collected from samples taken from decaying trees and cow dung, using Berlese funnels. They were posteriorly cleared in lactic acid and mounted in Hoyer’s medium. The
terminology for 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 Pygmephoroidea follows that of Khaustov (2004, 2008a). 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. Mite morphology was studied using a Carl Zeiss AxioImager A2 compound microscope with phase contrast and DIC illumination. Photomicrographs were taken with Hitachi KP-HD20A digital camera.

Abbreviations: **ap1-ap5** apodemes 1-5, **appr** prosternal apodeme, **appo** poststernal apodeme, **apsej** sejugal apodeme, **Tr** trochanter, **Fe** femur, **Ge** genu, **Ti** tibia, **Ta** tarsus, **TITa** tibiotarsus, **ass** accessory setigenous structure, **sol** solenidion, **ags** anterior genital sclerite, **pgs** posterior genital sclerite, **mgs** median genital sclerite, **php 1-3** pharyngeal pumps 1-3.

**Systematics**

**Family Pygmephoridae Cross, 1965**

**Genus Pediculaster Vitzthum, 1931**

Type species: *Pygmeophorus mesembrinae* Canestrini, 1881, by original designation.

**Pediculaster tjumeniensis** sp. nov.

Zoobank: 9C126801-3491-4277-8757-9C9AE42FB5BD

(Figs 1–9A)

**Description**

**Phoretic female** (Figs 1–3, 9A) — Length of idiosoma 265 (200–305), width 140 (105–160).

Gnathosoma (Figs 1, 9A) – Length of gnathosomal capsule 26 (23–27), width 29 (28–32). Dorsal median apodeme weakly developed. All gnathosomal setae pointed; setae *cha*, *chb* and *dFe* with few very small barbs, other gnathosomal setae smooth. Palp tibiotarsus with well-developed blunt-tipped claw and tiny eupathid-like seta; palps ventrally with well-developed solenidion and mushroom-shaped accessory setigenous structure. *Php 1* small, bow-shaped, located inside gnathosomal capsule; *php 2* and *3* oval (Fig. 9A), situated close to each other on long oesophagus and far separated from *php 1*. Lengths of gnathosomal setae: *cha* 10 (8–12), *chb* 14 (10–15), *dFe* 13 (9–13), *dGe* 18 (12–18), *m* 16 (11–16).


Idiosomal venter (Fig. 1B) – Ventral plates with numerous small round dimples. Setae *1b* and *2a* pointed; other ventral setae blunt-ended; setae *ps1* and *ps3* smooth, over ventral setae weakly barbed; setae *2a* much longer than other ventral setae; in one specimen left seta *2c* abnormally long and pointed. Ap1, ap2 and apsej well developed and joined with appr; ap3 and ap4 well developed and joined with appo; ap5 weaker sclerotized than other apodemes and joined with appo. Posterior margin of poststernal plate evenly rounded, without median lobe. Anterior and posterior genital sclerites long and narrow; median genital sclerite small, oval. Lengths of ventral setae: *ia* 19 (15–19), *ib* 26 (18–29), *ic* 17 (14–17), *ia* 43 (38–48), *ib* 18 (4–19), *ic* 16/20 (14–17), *ia* 18 (14–20), *ib* 16 (13–17), *ic* 19 (14–21), *ia* 16 (12–17), *ib* 19 (15–22), *ic* 18 (13–20), *ps1* 8 (5–8), *ps2* 26 (17–27), *ps3* 7 (4–9).
Figure 1  *Pediculaster tjumeniensis* sp. nov., phoretic female: A – dorsum of the body, B – venter of the body. Legs omitted.

Legs (Figs 2, 3) – Leg I (Fig. 2A). Leg setation: Tr 1 (v’), Fe 4 (d, l’, l”, v”), Ge 4 (l’, l”, v’, v”), TiTa 17(4) (d, l’, l”, v’, v”, k, pl’, pl”, p’, p”, tc’, tc”, ft’, ft”, s, pv’, pv”, ω1, ω2, φ1, φ2). Tibiotarsus slightly thickened, distinctly wider than genu. Lengths of solenidia ω1 14 (11–14), ω2 11 (9–11), φ1 9 (7–9), φ2 9 (8–10); solenidion φ1 slightly clavate, other solenidia finger-shaped. Setae (p), (tc) and (ft) eupathid-like; seta d of femur smooth, spatulate distally; seta k of tibiotarsus smooth and weakly blunt-ended; setae l’ of femur and (l) of genu blunt-ended and barbed; other leg setae (except eupathidia) pointed and barbed. Leg II (Fig.
Figure 2 Pediculaster tjumeniensis sp. nov., phoretic female: A – left leg I, dorsal aspect, B – left leg II, dorsal aspect.

2B). Leg setation: Tr 1 (v’), Fe 3 (d, l’, v’), Ge 3 (l’, l”, v’), Ti 4(1) (d, l’, v”, v”, φ), Ta 6(1) (pl”, tc’, tc”, pv”, pv”, u’, φ). Solenidia ω 9 (7–9) and φ 5 (4–5) finger-shaped. Tarsal claws with thickened basal half; empodium long and narrow, with widened tip. All leg setae barbed; setae d, l’ of femur and u’ of tarsus blunt-ended, other leg setae pointed. Leg III (Fig. 3A). Leg setation: Tr 1 (v’), F2 3 (d, v’), Ge 2 (l’, v’), Ti 4(1) (d, l’, v”, v”, φ), Ta 6 (pl”, tc’, tc”, pv”, pv”, u”). Claws and empodium as on tarsus II. Solenidion φ 4 (3–4) weakly clavate. All leg setae barbed; setae d, v’ of femur and l’ of genu blunt-ended, other leg setae pointed. Leg IV (Fig. 3B). Leg setation: Tr 1 (v’), Fe 2 (d, v’), Ge 1 (v’), Ti 4(1) (d, l’, v”, v”, φ), Ta 6 (pl”, tc’, tc”, pv”, pv”, u”). Claws simple, hooked, empodium narrower than on tarsi II and III. Solenidion φ 3 (2–3) rod-like. All leg setae barbed; seta v’ of femur blunt-ended, other leg setae pointed.

Non-phoretic female (Figs 4–6) — Length of idiosoma 240–300, width 125–150.

Gnathosoma (Fig. 4) – Length of gnathosomal capsule 27–31, width 33–38. Gnathosoma and pharyngeal pumps in general as in phoretic female, but cheliceral setae and seta dFe smooth. Lengths of gnathosomal setae: cha 9–11, chb 14–15, dFe 13–14, dGe 15–16, m 17–19.
Idiosomal dorsum (Fig. 4A) – as in phoretic female, but dorsal sclerites weaker sclerotized and dimples smaller, difficult to discern. Lengths of dorsal setae: \( v_1 \) 19–23, \( v_2 \) 19–24, \( sc_2 \) 37–44, \( c_1 \) 26–31, \( c_2 \) 39–44, \( d \) 28–36, \( e \) 15–20, \( f \) 27–39, \( h_1 \) 23–33, \( h_2 \) 6–8. Distances between setae: \( v_1–v_1 \) 11–12, \( v_2–v_2 \) 28–32, \( sc_2–sc_2 \) 29–33, \( c_1–c_1 \) 40–45, \( c_1–c_2 \) 25–34, \( d–d \) 61–70, \( e–f \) 16–18, \( f–f \) 42–45, \( h_1–h_1 \) 45–49, \( h_1–h_2 \) 14–15.

Idiosomal venter (Fig. 4B) – similar to that of phoretic female, but plates weaker sclerotized and dimples smaller; setae \( 2a \) normally not very long and blunt-ended, and only in one specimen left seta \( 2a \) long and pointed and similar to that of phoretic female. Apsej indistinct; ap5 stronger.

Figure 3 Pediculaster tjumeniensis sp. nov., phoretic female: A – left leg III, dorsal aspect, B – left leg IV, dorsal aspect.
Figure 4  *Pediculaster tjumeniensis* sp. nov., non-phoretic female: A – dorsum of the body, B – venter of the body. Legs omitted.
sclerotized than in phoretic female. Lengths of ventral setae: 1a 13–15, 1b 13–18, 1c 11–15, 2a 14–33, 2b 12–16, 2c 10–13, 3a 14–18, 3b 13–17, 3c 14–18, 4a 12–15, 4b 13–18, 4c 14–15, ps1 6, ps2 17–22, ps3 4–5.

Legs (Figs 5, 6) – Leg I (Fig. 5A). Tibia and tarsus separated. Tarsal claw simple, hooked. Leg setation: Tr 1 (v'), Fe 4 (d, l', l'', v''), Ge 4 (l', l'', v', v''), Ti (6)(2) (d, l', l'', v', v'', k, φ1, φ2), Ta 13(2) (pl', pl'', p', p'', tc', tc'', ft', ft'', s, pv', pv'', u', u'', ω1, ω2). Lengths of solenidia ω1 16–19, ω2 13–15, φ1 6–8, φ2 10–11; solenidion φ1 clavate, other solenidia finger-shaped. Setae (p), (tc) and (ft) eupathid-like; seta k of tibiartarsus smooth and weakly blunt-ended; other leg setae (except eupathidia) pointed and barbed. Leg II (Fig. 5B). Leg setation: Tr 1 (v'), Fe 3 (d, l', v''), Ge 3 (l', l'', v'), Ti 4(1) (d, l', v', v'', φ), Ta 7(1) (pl'', tc', tc'', pv', pv'', u', u'', ω). Solenidia ω 11–12 and φ 8–9 finger-shaped. Tarsal claws simple, hooked; empodium short and wide. All leg setae barbed; seta l' of femur blunt-ended, other leg setae pointed. Leg III (Fig. 6A). Leg setation: Tr 1 (v'), Fe 2 (d, v'), Ge 2 (l', v'), Ti 4(1) (d, l', v', v'', φ), Ta 7 (pl'', tc', tc'', pv', pv'', u', u'', ω). Claws and empodium as on tarsus II. Solenidion φ 6–7 finger-shaped. All leg setae barbed; seta v' of femur blunt-ended, other leg setae pointed. Leg IV (Fig. 6B).
Pediculaster tjumeniensis sp. nov., non-phoretic female: A – left leg III, dorsal aspect, B – left leg IV, dorsal aspect.

Leg setation: Tr 1 (v’), Fe 2 (d, v’), Ge 1 (v’), Ti 4(1) (d, l’, v’, v”, φ), Ta 6 (pl”, tc”, tc”, pv”, pv”, u’). Claws and empodium as on tarsi II and III. Solenidion φ 3–4 rod-like. All leg setae barbed; seta v’ of femur blunt-ended, other leg setae pointed.

Larva (Figs 7, 8) — Length of idiosoma 195–215, width 105–115.

Figure 7 *Pediculaster tjumeniensis* sp. nov., larva: A – dorsum of the body, B – venter of the body. Legs omitted.
small, bow-shaped and situated on the short distance from php 2 inside propodosoma.

Idiosomal dorsum (Fig. 7A) – Prodorsum with one trapezium-shaped shield with four pairs of setae; tergite C divided into three plates, one median with one pair of setae c₁ and two laterals with setae c₂; tergites D, EF and H with same number of setae as in females. All dorsal setae strongly barbed; setae h₁ and h₂ pointed, other dorsal setae blunt-ended. Tergites D and H with small round cupules ia and ih, respectively. All dorsal shields with small round dimples. Lengths of dorsal setae: v₁ 14–18, v₂ 12–16, sc₁ 21–29, sc₂ 30–35, c₁ 23–26, c₂ 25–31, d 25–33, e 18–23, f 29–35, h₁ 28–35, h₂ 59–63. Distances between setae: v₁–v₁ 9–11, v₂–v₂ 41–45, sc₁–sc₁ 28–29, sc₂–sc₂ 49–53, c₁–c₁ 40–42, d–d 43, e–f 11–12, f–f 33–34, h₁–h₁ 12–14, h₁–h₂ 10–11.

Idiosomal venter (Fig. 7B) – Coxal fields I–III separated medially and with two pairs of setae each. Ap₁, ap2 and ap3 well developed; other apodemes absent. All ventral setae barbed; setae ps₁,₂,₃ pointed, other ventral setae blunt-ended. Lengths of ventral setae: 1a 11–13, 1b 11–13, 2a 12–13, 2b 12–14, 3a 15–20, 3b 12–16, ps₁ 14–16, ps₂ 17–20, ps₃ 18–20.

Legs (Fig. 8) – Leg I (Fig. 8A). Tarsus with two simple hooked claws; empodium absent.
Figure 9  DIC micrographs of pharyngeal pumps II and III of phoretic females: A – Pediculaster tjumeniensis sp. nov., B – Pediculaster bisetus sp. nov.

Leg setation: Tr 0, Fe 4 (d, l’, l”, v’), Ge 4 (l’, l”, v’, v”), Ti (6)(1) (d, l’, l”, v’, v”, k, φ1), Ta 11(1) (pl”, pl”, tc”, fc”, ft”, s, pv”, pv”, u”, u”, φ1). Lengths of solenidia ω1 10–14, φ1 7–9; solenidion ω1 finger-shaped; solenidion φ1 clavate. Setae (tc) eupathid-like; seta k of tibiotarsi smooth and weakly blunt-ended; setae l’ of femur and v’ of genu blunt-ended and barbed, other leg setae (except eupathidia) pointed and barbed. Leg II (Fig. 8B). Leg setation: Tr 0, Fe 3 (d, l’, v”), Ge 3 (l’, l”, v’), Ti 4(1) (d, l’, v’, v”, φ), Ta 7(1) (pl”, tc”, fc”, pv”, pv”, u”, u”, ω). Solenidia ω 8–10 and φ 4–5 finger-shaped. Tarsal claws simple, hooked; empodium short and wide. Seta l’ of femur smooth and blunt-ended; seta v’ of genu barbed and blunt-ended, other leg setae pointed and barbed. Leg III (Fig. 8C). Leg setation: Tr 0, F2 3 (d, v’), Ge 2 (l’, v’), Ti 4 (d, l’, v’, v”), Ta 7 (pl”, tc”, fc”, pv”, pv”, u”, u”, ω). Claws and empodium as on tarsus II. Solenidion φ absent. Seta pl” of tarsus spine-shaped, smooth; setae d, v’ of femur and l’ of genu blunt-ended and barbed, other leg setae pointed and barbed. Femur not divided into basi- and telofemur.

Male unknown.

Type material — Phoretic female holotype slide ZISP T-Pygm-004: Russia, Tyumen Province, Tyumen, “Zatyumenskiy park”, 57°09’ N, 65°26’ E, in the rotting log of birch, 21 April 2019, A.A. Khaustov leg. Paratypes: 7 phoretic females, same data as holotype; 4 phoretic and 4 non-phoretic females, same locality and collector, 10 July 2019; 2 phoretic females and 7 larvae, same locality and collector, 26 April 2019.

Type deposition — The holotype and 4 phoretic females paratypes are deposited in the collection of the Zoological Institute of RAS, Saint Petersburg, Russia; other paratypes are deposited in the mite collection of the Tyumen State University Museum of Zoology, Tyumen, Russia.

Etymology — The name of the new species refers to its distribution in Tyumen city, the capital of Tyumen Province, Russia.
Differential diagnosis — Phoretic female of the new species is most similar to *P. sellnickianus* (Rack, 1964) and *P. limosinae* Samsinak, 1984 (not separable morphologically from *P. sellnickianus*) by the presence of three pairs of setae on coxal fields I and II, setae *ps* longer than *pfs*, and setae *2a* much longer than *2b*. The new species can be distinguished from *P. sellnickianus* by having setae *c2* clearly longer than *c1* (setae *c1* and *c2* subequal in *P. sellnickianus*), by the presence of *ap5* (ap5 absent in *P. sellnickianus*), and setae *e* no more than twice longer than *h* (setae *e* more than 3 times longer than *h* in *P. sellnickianus*). Non-phoretic female of the new species is most similar to *P. permagnus* (Rack, 1971) but can be distinguished from it by longer distance between setae *e* and *f*, which less than 3 times shorter than distance *f*-*f* (e-*f* about 4 times shorter than *f*-*f* in *P. permagnus*), by solenidion *φ2* distinctly longer than *φ1* (solenidia *φ2* and *φ1* subequal in *P. permagnus*), and by much longer solenidion *ω1*, which reaching far beyond the base of solenidion *ω1* (solenidion *ω2*, much shorter and not reaching base of solenidion *ω1* in *P. permagnus*). Larva of the new species can be distinguished from all described larvae of *Pediculaster* by the presence of setae *n* on subcapitulum (setae *n* absent in all described larvae of *Pediculaster*).

*Pediculaster bisetus* sp. nov.

Zoobank: 4AFFE22-DG6F-40FD-B423-D666234F4DD3

(Figs 9B–12)

**Description**

**Phoretic female** (Figs 9B–12) — Length of idiosoma 210 (210–240), width 96 (105–115). Gnathosoma (Figs 9B, 10) – Length of gnathosomal capsule 20 (20–21), width 21 (22–24). Dorsal median apodeme weakly developed. All gnathosomal setae smooth; setae *cha* and *chb* blunt-ended, other gnathosomal setae pointed. Pulp tibiotarsus with well-developed blunt-tipped claw and tiny eupathid-like seta; palps ventrally with well-developed solenidion and mushroom-shaped accessory setigeneus structure. Php 1 small, bow-shaped, located inside gnathosomal capsule; php 2 oval, php 3 with lateral “wings” (Fig. 9B), both pumps situated close to each other on long oesophagus and far separated from php 1. Lengths of gnathosomal setae: *ca* 6 (6), *chb* 8 (7–8), df *Fe* 6 (6–8), df *Ge* 7 (7–10), *m* 12 (12–13).

Idiosomal dorsum (Fig. 10A) – All dorsal shields with numerous small round dimples. Stigmata small, oval, one-chambered and associated with long tracheal trunks. Setae *e* and *h* smooth, other dorsal setae pointed; setae *h*2 pointed, other dorsal setae blunt-ended; trichobothria *sc*1 short, spherical. Cupules *ia* on tergite D and *ih* on tergite H very small, round. Lengths of dorsal setae: *v1* 22 (21–23), *v2* 21 (18–21), *sc*2 36 (36–40), *c1* 24 (24–29), *c2* 31 (31–39), *d* 29 (29–36), *e* 8 (8–13), *f* 31 (31–38), *h* 29 (29–34), *h*2 5 (5–7). Distances between setae: *v1*–*v1* 8 (7–9), *v2*–*v2* 22 (21–22), *sc*2–*sc*2 31 (31–34), *c1*–*c1* 33 (33–39), *c1*–*c2* 20 (20–23), *d*–*d* 49 (49–61), *e*–*f* 6 (5–7), *f*–*f* 49 (49–59), *h*1–*h*1 44 (44–53), *h*1–*h*2 5 (5–8).

Idiosomal venter (Fig. 10B) – Ventral plates with numerous small round dimples. Setae *h*2 pointed, other ventral setae blunt-ended; setae *ps*2 barred, over ventral setae smooth. Setae *2b* on coxal fields II absent. Ap1, ap2 and apsej well developed and joined with appr; ap3 and ap4 well developed and joined with appo; ap5 weaker sclerotized than other apodemes and joined with appo. Posterior margin of poststernal plate with weak median lobe. Anterior and posterior genital sclerites long and narrow; median genital sclerite small, oval. Lengths of ventral setae: *l*a 10 (9–11), *lb* 13 (13–14), *lc* 9 (9), *la* 10 (10–12), *lb* 7 (6–8), *sa* 10 (10–12), *sb* 10 (10–11), *sc* 12 (12), *sa* 9 (9–10), *sb* 12 (11–14), *sc* 10 (10–12), *ps*1 4 (4–5), *ps*2 16 (14–16), *ps*3 3 (3).

Legs (Figs 11, 12) – Leg setation: Tr 1 (v’), *Fe* 4 (*d’, l’, l’’, v”), *Ge* 4 (*l’, l’’, v’, v”), TiTa 17 (4) (*d’, l’, l’”, v”, k, pl’, pl”, p’, p”, t’, t”, c”, t’’, f, f’, f”, s, pv”, pv”, *ω1*, *ω2*, *φ1*, *φ2*). Tibiotarsus cylindrical, as wide as genu. Lengths of solenidia *ω1* 8 (8–9), *ω2* 4 (4), *φ1* 7 (7), *φ2* 4 (4–5); all solenidia clavate. Setae (*p*), (*tc*) and (*ft*) eupathid-like; seta *d* of femur smooth, patulate distally; seta *pl’* of tibiotarsus smooth and pointed; setae *v’* of trochanter and *k* of tibiotarsus smooth or with one barb and blunt-ended; setae *l* of femur and (*l*) of genu blunt-ended and barred; other leg setae (except eupathidia) pointed and barred. Leg II (Fig. 11B) — Length of coxal shield 27 (27–30), length of idiosoma 209 (205–210), width 93 (94–98).
11B). Leg setation: Tr 1 (v'), Fe 3 (d, l', v''), Ge 3 (l', l'', v'), Ti 4 (d, l', v', v''), Ta 6(1) (pl'', tc', tc'', pv', pv'', u', ω). Solenidion ω 5 (5) clavate, solenidion φ absent, but pore-like structure situated on its typical insertion point. Tarsal claws with thickened basal half; empodium long and narrow, with widened tip. Setae v' of trochanter and l' of femur smooth and blunt-ended; setae d of femur and u' of tarsus blunt-ended and barbed, other leg setae pointed. Leg III (Fig.
Figure 11 *Pediculaster bisetus* sp. nov., phoretic female: A – right leg I, dorsal aspect, B – right leg II, dorsal aspect.

12A). Leg setation: Tr 1 (v'), F2 3 (d, v'), Ge 2 (l', v'), Ti 4 (d, l', v', v''), Ta 6 (pl'', tc', tc'', pv', pv'', u'). Claws and empodium as on tarsus II. Solenidion φ absent, but pore-like structure situated on its typical insertion point. All leg setae barbed; setae v' of trochanter, d, v' of femur and u' of tarsus blunt-ended, other leg setae pointed. Leg IV (Fig. 12B). Leg setation: Tr 0, Fe 2 (d, v'), Ge 1 (v'), Ti 4 (d, l', v', v''), Ta 6 (pl'', tc', tc'', pv', pv'', u'). Claws simple, hooked, empodium as on tarsi II and III. Solenidion φ absent, but pore-like structure situated on its typical insertion point. All leg setae barbed; setae d and v' of femur blunt-ended, other leg setae pointed.

Non-phoretic female, male and larva unknown.

**Type material** — Phoretic female holotype slide ZISP T-Pygm-005: Russia, Tyumen Province, Tyumen, “Zatyumenskiy park”, 57°09' N, 65°26' E, in the rotting log of birch, 29 September 2019, A.A. Khaustov leg. Paratypes: 11 phoretic females, same data as holotype.

**Type deposition** — The holotype and 2 phoretic female paratypes are deposited in the
collection of the Zoological Institute of RAS, Saint Petersburg, Russia; other paratypes are deposited in the mite collection of the Tyumen State University Museum of Zoology, Tyumen, Russia.

**Etymology** — The name of the new species is a combination of two Latin words *bi* meaning two and *seta* meaning bristle and refers to presence of two pairs of setae on coxal fields II.

**Differential diagnosis** — The new species is most similar to *P. athiasae* (Wicht, 1970) by the presence of three pairs of setae on coxal fields I, two pairs of setae on coxal fields II, subequal setae $v_1$ and $v_2$ and well-developed ap5. The new species can be distinguished from the latter in having one-chambered stigmata (two-chambered in *P. athiasae*), by smooth setae e (setae e barbed in *P. athiasae*), by the absence of seta on trochanter IV (trochanter IV with seta...
in *P. athiasae*), and distinctly shorter dorsal body setae (dorsal body setae distinctly longer in *P. athiasae*).

**Pediculaster rarus** sp. nov.

Zoobank: B3B6E53C-F601-46F5-A3B4-38011767AB4F

(Figs 13–15)

**Description**

**Phoretic female** (Figs 13–15) — Length of idiosoma 280, width 130.

Gnathosoma (Fig. 13) – Length of gnathosomal capsule 25, width 29. Dorsal median apodeme well developed. All gnathosomal setae smooth; setae *cha* blunt-ended, other gnathosomal setae pointed. Palp tibiotarsus with well-developed blunt-tipped claw and tiny eupathid-like seta; palp ventrally with well-developed solenidion and mushroom-shaped accessory setigenous structure. Php 1 small, bow-shaped, located distinctly outside gnathosomal capsule; php 2 and php 3 oval, situated close to each other on long oesophageal and far separated from php 1. Lengths of gnathosomal setae: *cha* 7, *chb* 11, *dFe* 8, *dGe* 15, *m* 17.


Idiosomal venter (Fig. 13B) – Ventral plates with numerous small round dimples. Setae 1b, 1c, 2b, 3c, 4b, and 4c pointed, other ventral setae blunt-ended; setae *ps1* barbed, other ventral setae smooth; setae 2b much longer than other ventral setae; setae *ps2* situated distinctly anteriad *ps1*. Ap1, ap2 and apsej well developed and joined with appr; ap3 and ap4 well developed and joined with appo; ap5 weaker sclerotized than other apodemones and joined with appo. Posterior margin of poststernal plate evenly rounded, without median lobe. Anterior and posterior genital sclerites long and narrow; median genital sclerite indistinct. Lengths of ventral setae: *a1* 10, *b1* 14, *c1* 12, *d2* 12, *e2* 73, *f2* 13, *a3* 16, *b3* 13, *c3* 20, *a4* 12, *b4* 21, *c4* 19, *ps1* 7, *ps2* 5, *ps3* 27.

Legs (Figs 14, 15) – Leg I (Fig. 14A). Leg setation: *Tr* 1 (*v*), *Fe* 4 (*d1*, *l1*, *l1’, *v’*), *Ge* 4 (*l1’, *l1’, *v’*, *v’*), *TiTa* 17(*v’*). Tarsus 2 (*d1*, *l1’, *l1’, *v’*, *v’*, *k*, *pl*1, *pl*2, *p’*, *p*’*, *tc’*, *tc*’*, *ft’*, *ft*’*, *s*, *pv*, *pv*’*, *ω1*, *ω2*, *φ1*, *φ2*). Tibiotarsus cylindrical, slightly wider than genu. Lengths of solenidia ω1 21, *ω2* 11, *φ1* 7, *φ2* 6; solenidion *φ1* elavate, other solenidia finger-shaped. Setae (*φ*), (*tc*) and (*ft*) eupathid-like; eupathidium *p’* very short (Fig. 14A’); seta *d* of femur smooth, spatulate distally; setae *v’* of trochanter and *pl’* of tibiotarsus smooth and pointed; setae *k* of tibiotarsus smooth and weakly blunt-ended; other leg setae (except eupathidia) pointed and barbed. Leg II (Fig. 11B). Leg setation: *Tr* 1 (*v’*), *Fe* 3 (*d1*, *l1’, *v’*), *Ge* 3 (*l1’, *l1’, *v’*), *Ti* 4(*l’*, *l’*, *v’*, *v’*, *φ*), *Ta* 6(*pl’*, *tc’*, *tc’*, *pv*, *pv*’*, *ω*). Claws and empodium as on tarsi I and II. Solenidion *ω* 10 finger-shaped, solenidion *φ* 3 weakly clavate, situated in depression. Tarsal claws with thickened basal half; empodium long and narrow, with widened tip. Setae *v’* of trochanter and *tc’* of tarsus smooth and pointed; setae *u*’ of tarsus blunt-ended and barbed, other leg setae pointed and barbed. Leg III (Fig. 15A). Leg setation: *Tr* 1 (*v’*), *Fe* 2 (*d1*, *v’*), *Ge* 2 (*l1’, *v’*), *Ti* 4(*l’*, *l’*, *v’*, *v’*, *φ*), *Ta* 6(*pl’*, *tc’*, *tc’*, *pv’, *pv’*, *ω*), *Claws* and *empodium* as on tarsi II and III. Solenidion *ω* absent, but pore-like structure situated on its typical insertion point. All leg setae pointed and barbed.

Non-phoretic female, male and larva unknown.
**Type material** — Phoretic female holotype slide ZISP T-Pygm-006: Russia, Tyumen Province, Tyumen district, vicinity of lake Kuchak, 57°21′N, 66°03′E, in rotting stamp, 26
Figure 14  *Pediculaster rarus* sp. nov., phoretic female: A – left leg I, dorsal aspect, B – left leg II, dorsal aspect.

September 2018, A.A. Khaustov leg.

**Type deposition** — The holotype is deposited in the collection of the Zoological Institute of RAS, Saint Petersburg, Russia.

**Etymology** — The name of the new species is derived from Latin *rarus* meaning *rare* and refers to its rareness.

**Remark** — The new species is described based on single specimen. However, it is in good condition and very well differs from closely related species. All attempts to collect additional specimens were unsuccessful.

**Differential diagnosis** — The new species is most similar to *P. chistyakovi* Khaustov and Ermilov, 2008 by the presence of three pairs of setae on coxal fields I and II, setae *ps*<sub>3</sub> distinctly longer than *ps*<sub>2</sub>, setae *v*<sub>1</sub> and *v*<sub>2</sub> subequal, and setae 2<sub>b</sub> much longer than 2<sub>a</sub>. The new species can be distinguished from the latter in having setae sc<sub>2</sub>, c<sub>2</sub>, f, and h<sub>1</sub> blunt-ended (setae sc<sub>2</sub>, c<sub>2</sub>, f, and h<sub>1</sub> pointed in *P. chistyakovi*), by setae *ps*<sub>2</sub> situated distinctly anteriad *ps*<sub>1</sub> (setae *ps*<sub>2</sub> and *ps*<sub>1</sub> situated on the same level in *P. chistyakovi*), by much shorter setae *d* on femur and tibia IV which not exceed beyond tip of tarsus (setae *d* on femur and tibia IV very long and exceed beyond tip of tarsus in *P. chistyakovi*), and by the presence of ap5 (ap5 absent in *P. chistyakovi*).
Figure 15 *Pediculaster rarus* sp. nov., phoretic female: A – left leg III, dorsal aspect, B – left leg IV, dorsal aspect.

**Pediculaster dudinskyi** Khaustov, 2011


Phoretic female of this species was described from a tree hole of poplar in Western Ukraine (Khaustov 2011).

This is the first record of *P. dudinskyi* from Asia and Russia.

**Material examined** — One phoretic female, Russia, Tyumen Province, Tyumen, “Zatymenskiy park”, 57°09’ N, 65°26’ E, in the rotting log of birch, 26 April 2019, A.A. Khaustov leg.
Pediculaster camerikae Khaustov, 2008

Phoretic female of this species was described from the cow dung in Crimea (Khaustov 2008b). This is the first record of *P. camerikae* from Asia.


Pediculaster montanus Khaustov, 2008

Phoretic female and male of this species were described from the cow dung in Crimea (Khaustov 2008b). This is the first record of *P. montanus* from Asia.


**Discussion**

Larval stage is currently described only for five species of *Pediculaster*: *P. fusarii* (Smiley and Moser, 1976), *P. mesembrinae* (Canestrini, 1881), *P. morelliae* Rack, 1974, *P. permagnus* (Rack, 1971), and *P. pseudomanicatus* Camerik, 2001 (Smiley and Moser 1978; Martin 1978; Camerik 2001; Camerik *et al.* 2006). All described larvae are very similar morphologically and differ mainly by the lengths of setae and number of cheliceral setae (*setae chb* present or absent). The description of larva in *P. tjumeniensis* sp. nov. revealed several unusual characters. The most remarkable is the presence of two pairs of subcapitular setae (*setae n* present). The presence of subcapitular setae *n* is unknown in all described pygmephoroid mites, including available descriptions of larval stages. Occasionally, the abnormal seta *n* was recorded in adult female of scutacarid mite *Pygmodispus latisternus* Paoli (Khaustov 2008a). In larva of *P. tjumeniensis* sp. nov. subcapitular setae *n* present in all seven studied larvae and undoubtedly is not abnormal. The presence of this plesiomorphic character is most likely a result of an evolutionary reversion rather than retention. Other unusual characters found in *P. tjumeniensis* sp. nov. larvae are the absence of the solenidion on tibia III and spiniform seta *pl” on tarsus III. These characters could be used in the future not only for separation of species but probably also for creating of species-groups or subgenera in the genus *Pediculaster*.

**Acknowledgements**

The author thanks to Mr. Latyntsev R.V. (Tyumen State University, Russia) for the help in logistics.

**References**


