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reproduction in any medium, provided the original author and source are credited.
Three new species and new records of *Pediculaster* (Acari: Pygmephoridae) from Western Siberia, Russia

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**Original research**

| Keywords | Pygmephoroidea; systematics; morphology; female dimorphism; larva; fauna |
|----------|--------------------------------------------------------------------------|
| Zoobank  | http://zoobank.org/D86736C3-28A9-427D-B243-41BF5C93465A                  |

**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.

**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 Pygmephoroidae 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: Pygmephorus 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 dorsum (Fig. 1A) – All dorsal shields with numerous small round dimples. Stigmata small, oval, one-chambered and associated with long tracheal trunks. All dorsal setae blunt-ended and barbed; trichobothria sc1 short, spherical. Cupules ia on tergite D and ih on tergite H very small, round. Lengths of dorsal setae: v1 29 (22–29), v2 30 (25–32), sc2 57 (43–58), c1 40 (29–40), c2 48 (35–52), d 43 (32–45), e 24 (17–24), f 45 (30–45), h1 37 (27–38), h2 14 (10–16). Distances between setae: v1–v1 10 (10–12), v2–v2 31 (26–32), sc2–sc2 46 (41–53), c1–c1 44 (33–49), c1–c2 30 (21–34), d–d 73 (52–78), e–f 21 (15–23), f–f 45 (32–51), h1–h1 51 (34–52), h1–h2 18 (14–19).

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: 1a 19 (15–19), 1b 26 (18–29), 1c 17 (14–17), 2a 43 (38–48), 2b 18 (4–19), 2c 16/20 (14–17), 3a 18 (14–20), 3b 16 (13–17), 3c 19 (14–21), 4a 16 (12–17), 4b 19 (15–22), 4c 18 (13–20), ps1 8 (5–8), ps2 26 (17–27), ps3 7 (4–9).
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', k, p'l', p'l'', p', p'', t'c', t'c'', f't', f't'', s, p', p'', 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 1 Pediculaster tjumeniensis sp. nov., phoretic female: A – dorsum of the body, B – venter of the body. Legs omitted.
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'', φ), Ta 6(1) (pl'', tc' , tc'', pv'', pv'', u', ω). 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 4 Pediculaster tjumeniensis sp. nov., non-phoretic female: A – dorsum of the body, B – venter of the body. Legs omitted.
Pediculaster tjumeniensis sp. nov., non-phoretic female: A – left leg I, dorsal aspect, B – left leg II, dorsal aspect.

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'', te', tc'', fi', fi'', s, pv', pv'', u', u'', o₁, o₂). 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 tibiotarsus 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'', te'', pv', pv'', u', u'', φ). 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'', pv', pv'', u', u'', φ). 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).
Figure 6 *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.

Gnathosoma (Figs 7, 8) – Length of gnathosomal capsule 27–30, width 31–34. Cheliceral setae cha short and thick, other gnathosomal setae smooth and pointed; setae chb absent. Dorsal median apodeme absent. Accessory setigenous structure distinctly shorter than palpal solenidion. Subcapitulum with two pairs of setae (m, n). Lengths of gnathosomal setae: cha 3–4, dFe 9–10, dGe 12–14, m 14–15, n 10–11. Pharyngeal pumps 2 and 3 as in female, php 1
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 ps1,3 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.
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', tc'', fl', fl'', s, pv', pv'', u', u'', φ₁). Lengths of solenidia φ₁ 7–9; solenidion ω₁ finger-shaped; solenidion φ₁ clavate. Setae (tc) eupathid-like; seta k of tibiotarsus 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', tc'', pv', pv'', u', u'', φ). 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', tc'', pv', pv'', u', u''). 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 *ps,* and setae 2a much longer than 2b. The new species can be distinguished from *P. sellnickianus* by having setae *c*2 clearly longer than setae *c*1 (setae *c*1 and *c*2 subequal in *P. sellnickianus*), by the presence of *ap5* (ap5 absent in *P. sellnickianus*), and setae e no more than twice longer than *h*2 (setae e more than 3 times longer than *h*2 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* about 4 times shorter than *f* *f* in *P. permagnus,* by solenidion 2 * distinctly longer than *h*2 (solenidia 2 and 1 subequal in *P. permagnus,* and much longer solenidion 2, which reaching far beyond the base of solenidion 1 (solenidion 2 much longer and not reaching base of solenidion 1 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: 4AAFFE22-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 *chh* blunt-ended, other gnathosomal setae pointed. Pulp tibiotarsus with well-developed blunt-tipped claw and tiny eupathid-like seta; palp ventrally with well-developed solenidion and mushroom-shaped accessory setigene 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: *cha* 6 (6), *chh* 8 (7–8), *dFe* 6 (6–8), *dGe* 7 (7–10), *m* 12 (12–13).

Idiosomal dorsum (Fig. 10A) — All dorsal shields with numerous small round dimples. Stig mata small, oval, one-chambered and associated with long tracheal trunks. Setae e and *h*2 smooth, other dorsal setae barbed; setae *h*3 pointed, other dorsal setae blunt-ended; trichobothria *sc* short, spherical. Cupules *ia* on tergite D and *ih* on tergite H very small, round. Lengths of dorsal setae: *v*1 22 (21–23), *v*2 21 (18–21), *sc*2 36 (36–40), *c*1 24 (24–29), *c*2 31 (31–39), *d* 29 (29–36), *e* 8 (8–13), *f* 31 (31–38), *h*1 29 (29–34), *h*2 5 (5–7). Distances between setae: *v*1–*v*1 8 (7–9), *v*2–*v*2 22 (21–22), *sc*2–*sc*2 31 (31–34), *c*1–*c*1 33 (33–39), *c*1–*c*2 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 *lb* pointed, other ventral setae blunt-ended; setae *ps,* barbed, over ventral setae smooth. Seta 2b on coxal fields II absent. Ap1, *ap2* and *ap3* well developed and joined with *appr;* *ap3* and *ap4* well developed and joined with *app;* *ap5* weaker sclerotized than other apodemes and joined with *app.* 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*1 10 (9–11), *lb* 13 (13–14), *lc* 9 (9), *la* 10 (10–12), *lca* 7 (6–8), *sa* 10 (10–12), *sb* 10 (10–11), *sc* 12 (12), *sa* 9 (9–10), *sb* 12 (11–14), *lca* 10 (10–12), *ps* 4 (4–5), *ps* 16 (14–16), *ps* 3 (3).

Legs (Figs 11, 12) — Leg setation: Tr 1 (*v*'), *Fe* 4 (d, *l*', *l*''), *te* 4 (l', *l*''), *Tv* 17 (4) (d, *l*', *l*''), *v*', *k*, *pl'*, *pl*', *p'*, *p*', *ic*', *ic*', *ft*', *ft*''), *s*, *pv*', *pv*', *o1*, *o2*, *h*1, *h*2). Tibiotarsus cylindrical, as wide as genu. Lengths of solenidia 1 (8–9), 2 (4, 3), 7 (7), *phi* 4 (4–5); all solenidia clavate. Setae (*p*), (*tc*) and (*ft*) eupathid-like; *seta d* of femur smooth, spatulate distally; *seta pl'* of tibiatic smooth and pointed; setae *v*' of trochanter and *k* of tibiartarsus smooth or with one barb and 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 10 Pediculaster bisetus sp. nov., phoretic female: A – dorsum of the body, B – venter of the body. Legs omitted.

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
Figure 12 Pediculaster bisetus sp. nov., phoretic female: A – right leg III, dorsal aspect, B – right leg IV, dorsal aspect.

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 v₁ and v₂ 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: B386E53C-F601-46F5-A384-38011767AB4F

(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; palps 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 oesophagus and far separated from php 1. Lengths of gnathosomal setae: *cha* 7, *chb* 11, *dFe* 8, *dGe* 15, *m* 17.

Idiosomal dorsum (Fig. 13A) — All dorsal shields with numerous small round dimples. Stigmata small, oval, one-chambered and associated with long tracheal trunks. All dorsal setae blunt-ended; setae *h* smooth, other dorsal setae barbed; trichobothria *sc* short, spherical. Cupules *ia* on tergite D and *ib* on tergite H very small, round. Tergites C, D, and EF with porous areas as illustrated. Lengths of dorsal setae: *v*1 25, *v*2 24, *sc*2 46, *c*1 32, *c*2 39, *d* 35, *e* 22, *f* 38, *h*1 36, *h*2 6. Distances between setae: *v*1–*v*1 11, *v*2–*v*2 26, *sc*2–*sc*2 35, *c*1–*c*1 36, *c*1–*c*2 25, *d–d* 50, *e–f* 14, *f–f* 43, *h*1–*h*1 37, *h*1–*h*2 13.

Idiosomal venter (Fig. 13B) — Ventral plates with numerous small round setae. Setae 1b, 1c, 2b, 3c, 4b, and 4c pointed, other ventral setae blunt-ended; setae *ps*5 barbed, other ventral setae smooth; setae 2b much longer than other ventral setae; setae *ps*5 situated distinctly anteriad *ps*1. 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 indistinct. Lengths of ventral setae: *la* 10, 1b 14, 1c 12, 2a 12, 2b 73, 2c 13, 3a 16, 3b 13, 3c 20, 4a 12, 4b 21, 4c 19, *ps*1 7, *ps*2 7, *ps*3 27.

Legs (Figs 14, 15) — Leg I (Fig. 14A). 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*′, *p*′, *p*′, *tc*′, *fi*′, *s*, *pv*′, *pv*′, *ω*1, *ω*2, *φ*1, *φ*2). Tibiotarsus cylindrical, slightly wider than genu. Lengths of solenidia *ω*1 21, *ω*2 11, *φ*1, *φ*2 6; solenidion *φ*1 clavate, other solenidia finger-shaped. Setae (*p*′, *tc*′) and (*f*′) 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; seta *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 (d, l′, *v*′), *Ge* 3 (l′, l′′, *v*′), *Tita* 4(1) (d, l′, *v*′, *v*′, *φ*), Ta 6(1) (*pl*′, *tc*′, *tc*′, *pv*′, *pv*′, *u*, *ω*). 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 (d, *v*′), *Ge* 2 (l′, *v*′), *Tita* 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 weakly clavate, situated in depression. Seta *tc*′ of tarsus smooth and pointed; setae *v*′ of femur and *u*′ of tarsus blunt-ended and barbed, other leg setae pointed and barbed. Leg IV (Fig. 15B). Leg setation: *Tr* 1 (*v*′), *Fe* 2 (d, *v*′), *Ge* 1 (*v*′), *Tita* 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 pointed and barbed.

Non-phoretic female, male and larva unknown.
**Figure 13** *Pediculaster rarus sp. nov.*, phoretic female: A – dorsum of the body, B – venter of the body. Legs omitted.

**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*3 distinctly longer than *ps*2, setae *v*1 and *v*2 subequal, and setae *2h* much longer than *2a*. The new species can be distinguished from the latter in having setae *sc*2, *c*2, *f*, and *h*1 blunt-ended (setae *sc*2, *c*2, *f*, and *h*1 pointed in *P. chistyakovi*), by setae *ps*2 situated distinctly anteriad *ps*1 (setae *ps*2 and *ps*1 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*).
Pediculaster rarus sp. nov., phoretic female: A – left leg III, dorsal aspect, B – left leg IV, dorsal aspect.

Pediculaster dudinski Khaustov, 2011

Pediculaster dudinski Khaustov, 2011, 265, Figs 1–5.

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. dudinski* from Asia and Russia.

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

*Pediculaster camerikae* Khaustov, 2008b, 166, Figs 25–29.

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.

**Material examined** — Four phoretic females, Russia, Kurgan prov., Zverinogolovskiy distr., vicinity of settl. Ukrainets, 54°24’N 64°49’E, in cow dung, 20.09.2019, A.A. Khaustov leg.

**Pediculaster montanus** Khaustov, 2008

*Pediculaster montanus* Khaustov, 2008b, 162, Figs 13–24.

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.

**Material examined** — 30 phoretic females, 2 males, Russia, Kurgan prov., Zverinogolovskiy distr., vicinity of settl. Ukrainets, 54°24’N 64°49’E, in cow dung, 20.09.2019, A.A. Khaustov leg.

**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 similarly 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 (*n* present). The presence of subcapitular setae *n* is unknown in all described pygme-phoroid 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*.

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