

New ‘oligopseudocellar’ *Protaphorura* species (Collembola: Onychiuridae) from East Palaeartic

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Abstract

Four new species of the genus *Protaphorura* (*P. dorzhievi* sp. n., *P. buryatica* sp. n., *P. dzherga* sp. n., and *P. uniparis* sp. n.) with reduced number (0–1–2) of pseudocelli on the thoracic tergites are described from Buryatia (Russia, East Siberia). *P. jacutica* Martynova, 1976 is redescribed based on type and newly collected material. The key to Asiatic species with pseudocellar formula 0–1–2 on thorax is given.

Keywords Buryatia | Transbaikalia | springtails | key to species | pseudocelli

1. Introduction

In the course of our study of Collembola of Transbaikalia, a rich fauna of Onychiuridae was found. Together with Isotomidae this family dominates in the region and includes several undescribed species. This paper is the third contribution to the understanding of the Onychiuridae fauna of Transbaikalia (Babenko et al. 2011, Gulgenova & Potapov 2012). The highest diversity was found in *Protaphorura* Absolon, 1901, the genus which is widely distributed in the Holarctic. Twenty five species have been found so far in our material from Buryatia, which is considerably more when compared to other similar sized European regions like Scandinavia (17 species) (Fjellberg 1998) and Ukraine (14 species) (Kaprus' et al. 2004). Comparison with the Siberian areas is less justified since they refer to smaller territories: 7 species are known in Putorana Plateau (N Siberia), 11 from Wrangel Island (NE Far East of Russia) and 15 from Dolgii Island (NE European part of Russia) (Babenko 2010). Five species in our material show an uncommonly reduced number of pseudocelli on the second thoracic tergite: at whole they have 0, 1, 2 pairs of pseudocelli on

Th. 1, 2, 3, respectively. The present paper is devoted to the redescription of one of these species and the description of four as new. Types of the new species are deposited in the collections of the Department of Zoology and Ecology, Moscow State Pedagogical University (MSPU) and of the Department of Zoology and Ecology, Buryat State University (BSU).

Abbreviations: **Abd. 1–6** – abdominal segments, **Ant. 1–4** – antennal segments, **AIIO** – antennal organ on Ant.3, **AS** – anal spines on Abd. 6, **BSU** – Buryat State University, **d₀** – unpaired axial chaeta on front of head, **f : F ratio** – ratio between distances f and F (described in the text below), **m₀, p₀** – unpaired axial chaetae on tergites, **M, s chaetae** – submedial posterior macro- and microchaeta on Abd. 5, **ma-, mm-, mp-rows** – chaetae of manubrial field on sternum of Abd. 4 (nomenclature is followed after Weiner 1996 and Babenko & Kaprus', in press), **ms** – microsensillum, **MSPU** – Moscow State Pedagogical University, **PAO** – postantennal organ, **pso** – pseudocellus(i), **psx** – parapseudocellus(i), **Th. 1–3** – thoracic segments, **s'-chaeta** – additional microchaeta on Abd. 1–3 (= p₄) and Abd. 5 located in front of submedial pso, **VT** – ventral tube.

2. 'Oligopseudocellar' species of the genus *Protaphorura*

As a rule, in the genus *Protaphorura* at least two pairs of pseudocelli on each second and third thoracic tergites are observed, so the species with formulas '0–2–2', '0–2–3', and '0–3–3' on Th. 1–3 are the most common. Only nine forms were described so far having fewer pseudocelli: *P. stiriaca* (Stach, 1946) (32/001/23232); *P. pseudostiriaca* (Loksa, 1964) (32/001/12132); *P. januarii* (Weiner, 1977) (32/011/23232), *P. fistania* Thibaud & Peja, 1994 (33/012/33233), *P. christiani* Pomorski, Leithner & Bruckner, 2003 (33/012/33333), *P. jacutica* (Martynova, 1976) (33/01–22/33342), *P. tolai* Pomorski & Kaprus', 2007 (43/012/33343), *P. changbaiensis* Sun, Zhang & Wu, 2013 (32/012/33232), and *P. minima* Sun, Zhang & Wu, 2013 (33/012/33332). The first five of these were described from Europe (Pomorski et al. 2003), while the other four were described from Asia. The erection of a new group for all mentioned species would be possible, although their relatedness is unknown. Like in other groups such as '*octopunctata*', '*nemorata*', '*armata*' auct., these species probably lost some pseudocelli independently, at least European and Asiatic congeners. We propose to call these species as 'oligopseudocellar' *Protaphorura* that reflects the general tendency to loose pseudocelli not only on thorax but also on abdomen. All four new species from Transbaikalia share 0–1–2 pseudocelli on thorax, absence of chaeta s' on Abd. 1–3 and 5, and nearby position of submedial pseudocelli on Abd. 1–2. Three of them (*P. dorzhievi* sp. n., *P. dzherga* sp. n., and *P. uniparis* sp. n.) show 4 papillae in the antennal organ on the third antennal segment that is rare in the genus. One species (*P. uniparis* sp. n.) shares four postantennal pseudocelli with *P. tolai* and thus formally belongs to the '*octopunctata*' group, while other species somewhat resemble other Asiatic species such as *P. jacutica*, *P. minima*, and *P. changbaiensis*. The posterior pair of furcal setulae is absent in *P. uniparis* sp. n. However, if present its position varies: this pair is either located close to the anterior pair of setulae, i.e. well in front of ma-row (*P. dorzhievi* sp. n., *P. dzherga* sp. n., and *P. uniparis* sp. n.) or moved to the posterior position, i.e. slightly behind ma-row (*P. jacutica*). The position of the posterior pair of furcal setulae can be described with a ratio between distances *f* and *F* as shown in Figs 7, 15, 22, and 33.

Four new species considerably expand the 'oligopseudocellar' group and we assume that the forms with reduced number of pseudocelli on the thorax are more common in Asia than in Europe.

3. Descriptions of new species

Protaphorura dorzhievi sp. n. (Figs 1–7)

Material: Holotype ♀, Russia, SE Buryatia, Zaganskiy Range, near Shibertuy, 50°82564'N, 107°87927'E, 772 m alt., moss under willow, 21.VIII.2011, leg. A. Gulgenova, L. Vanyavina (MSPU). Paratypes 2 ♀, 1 ♂, in the same place as for holotype; 1 ♀, 3 ♂, at the same locality, litter of spruce mossy relict forest (MSPU, BSU).

Other material: Russia, SE Buryatia, Zaganskiy Range, near Shibertuy, 50°79364'N, 107°87653'E, 725 m alt., litter of spruce mossy relict forest (123 specimens); Zaganskiy Range, 50°92844'N, 107°92084'E, 1055 m alt., litter of herbaceous aspen forest with birch, 21.VIII.2011 (26 specimens); at the same locality, larch forest with *Pyrola*, 21.VIII.2011 (16 specimens), leg. A. Gulgenova and L. Vanyavina.

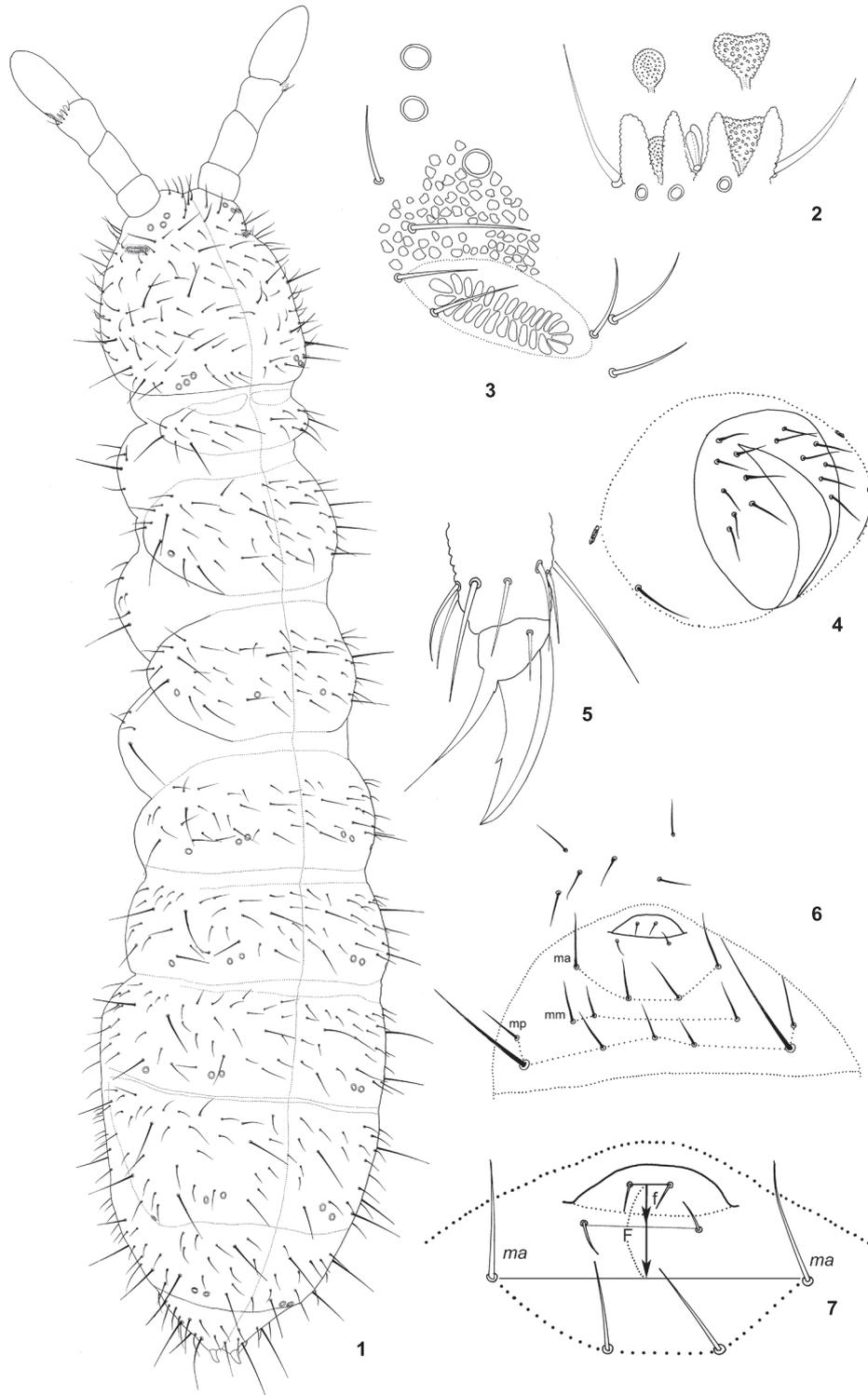
NW Buryatia, Barguzinskiy Range, ca 5–10 km W Barguzin, upper flow of Bol'shoi Chevyrkuy River, peat bog (*Sphagnum*), ~ 1700 m alt.; subalpine belt, under *Juniperus*, ~ 1650 m alt.; subalpine belt, under *Pinus sibirica*, ~ 1600 m alt.; subalpine belt, under *Badan*, mosses and lichens on wind erosion areas, ~ 1400 m alt., all collected on 20.VIII.2008 (17 specimens), leg. M. Potapov, A. Gulgenova.

Irkutskaya Oblast', W Khamar-Daban Range, Cherskogo Peak, lichen-moss tundra with crowberry (*Empetrum*), silt, northern slope, 2100 m alt.; above Serdtse Lake, southern slope, *Sphagnum* near spring, ~ 2000 m alt.; southern slope, tundra, lichens, ~ 1950 m alt.; subalpine belt, under *Rhododendron*, under *Pinus sibirica*, ~ 1830 m alt.; ~ 1 km from meteorological station, taiga belt, peat bog, *Sphagnum*, 1372 m alt., 26.VIII.2008; W Khamar-Daban Range, Slyudyanka River, taiga belt, litter of birch forest not far from Slyudyanka, ~ 500 m alt., 29.VIII.2008 (58 specimens), leg. M. Potapov.

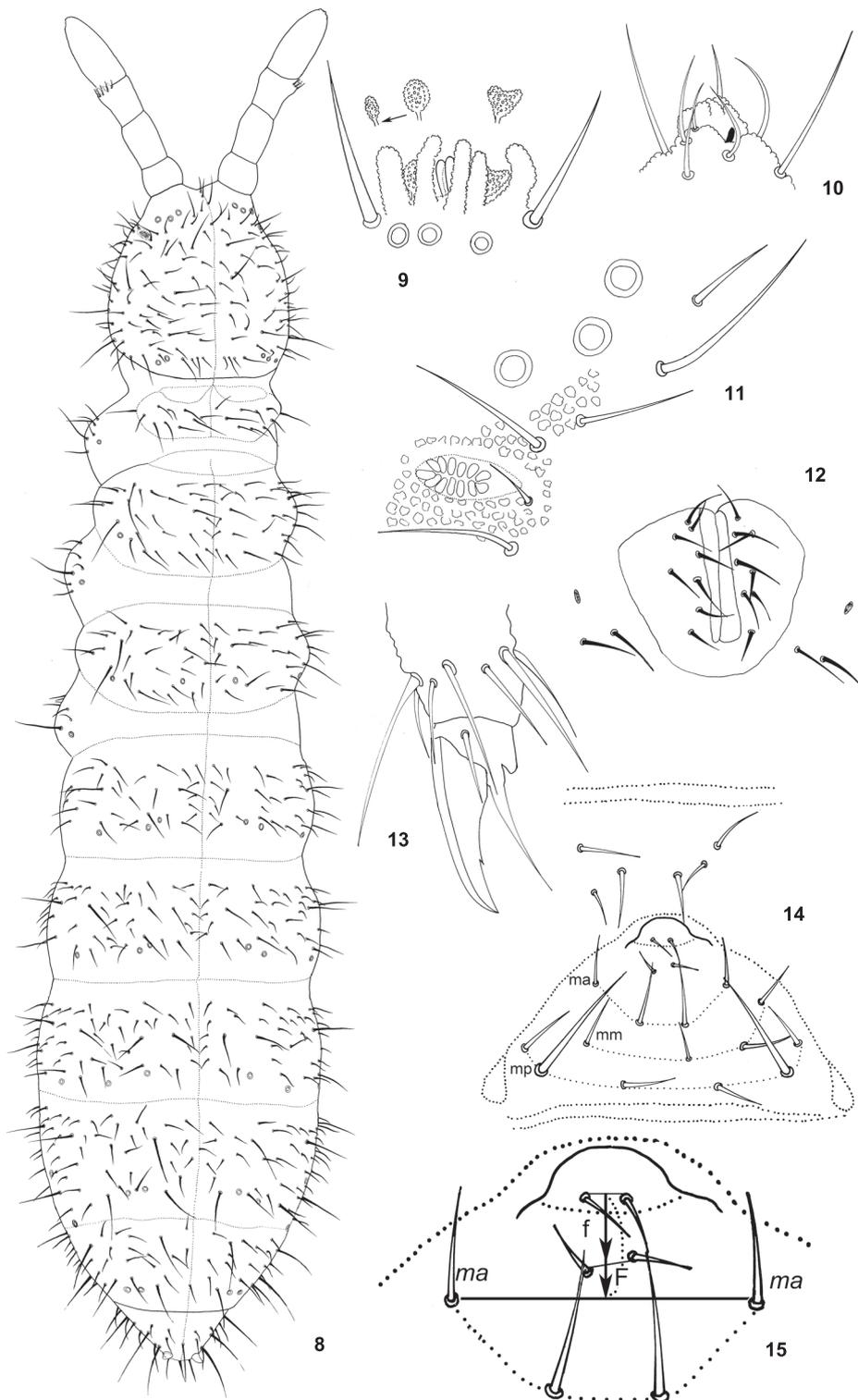
Vicinity of Ulan-Ude, ca 20 km of highway Ulan-Ude - Gremyachinsk, mixed taiga forest on pass, southern slope, 24.IX.2012., leg. N. Nefed'yeva.

Description. Colour in alcohol white. Length without antennae: 1.05–1.1 mm (♂), 1.35–1.45 mm (♀). Body shape thickened in posterior half, with not large anal spines set on distinct papillae (Fig. 1). Antennae approximately as long as head. Granulation more or less uniform, distinct. Ant. 4 with subapical organite. Microsensillum on Ant. 4 in latero-external position, ca 1/3 length from the base. Ant. 3 with microsensillum slightly below AIII. AIII built of 5 guard chaetae, 2 sensory rods and 2 sensory clubs, of which one large heart-shaped strongly granular, second less spherical with a finer granularity, and 4 papillae (Fig. 2). Labial palp as common for the genus. PAO consists of 20–29 simple vesicles (Fig. 3).

Pso formula dorsally 33/012/33332 (one specimen from Irkutskaya Oblast' with 4 pso at the base of antennae on one side). Ventral side of body and subcoxa 1 of all legs without pso. Formula of psx ventrally 1/000/11000, all subcoxa 1 with 1 psx. Submedial pso on Abd. 1–2 set in nearby position.



Figures 1–7. *Protaphorura dorzhievi* sp. n. Dorsal chaetotaxy and pso distribution (1), sensorial elements of AO (2), PAO and adjacent pso (3), ventral tube (4), distal part of leg 3 (5), furcal area (6), furcal fold (7).



Figures 8–15. *Protaphorura buryatica* sp. n. Dorsal chaetotaxy and pso distribution (8), sensorial elements of AO (9), apical part of antenna (10), PAO and adjacent pso (11), ventral tube (12), distal part of tibiotarsi of leg 3 (13), furcal area (14), furcal fold (15).

Dorsal chaetotaxy more or less symmetrical, well differentiated into macro- and microchaetae (Fig. 1). Sensilla weakly marked. Th. 2–3 with ms laterally. Th. 1 usually with 9–11 chaetae, large specimens with 11 chaetae. Abd. 1–3 and Abd. 5 without chaetae. Ratio M/s on Abd. 5 = 2.5–2.8. Abd. 5 with p_0 chaeta. Abd. 4 with one medial chaeta. Straight lines passing through bases of short dorsal chaetae parallel on Abd. 6. Th. 1, 2, 3 with 1+1, 1+1, 1+1 ventral chaetae, respectively. Ventral tube with 8–10 + 8–10 chaetae and 1+1 chaetae at base (one specimen with 2+2 chaetae) (Fig. 4). Furca reduced to cuticular pocket with 2+2 furcal setulae, of which anterior pair (1+1) located on cuticular fold, posterior pair located behind, ratio f : F as 0.3–0.4 (Figs 6, 7). Furcal area with three manubrial rows of chaetae behind cuticular fold: ma-row with 4 chaetae, mm-row with 2–3 chaetae, and mp-row with 6–7 chaetae. Chaetae of mm-row usually situated more laterally (without medial chaetae).

Claws with denticle. Empodial appendage without basal lamella, about as long as inner edge of the claw. Distal whorl on tibiotarsi with 11 chaetae (Fig. 5). AS 0.4–0.6 as long as inner edge of claw. Male ventral organ absent.

Diagnosis. *P. dorzhievi* sp. n. mostly resembles *P. dzherga* sp. n. and differs by dorsal and ventral pseudocellar formula. Other differentiated characters are given in Table 1 and the key.

Distribution and ecology. *P. dorzhievi* sp. n. is widespread in Buryatia (Selenga midlands, Khamar-Daban Range, southern part of Barguzin Range) and occurs from tundra to different types of forests and shrub communities.

Etymology. The species is dedicated to Dr Zydypzhap Zayatievich Dorzhiev (Ulan-Ude) who made a significant contribution to the development of ornithology in the region. He is an initiator of the study of Collembola in Buryatia.

Protaphorura buryatica sp. n. (Figs 8–15)

Material: Holotype ♂, Russia, Buryatia, Vitim plateau, Eravna Basin, ~15 km from Sosnovo-Ozerskoye, soil of saline meadow, 26.VIII.2008, leg. A. Gulgenova (MSPU). Paratypes 4 ♀, 5 ♂, the same place as holotype (MSPU).

Other material: the same place as holotype (177 specimens).

Description. Color in alcohol white. Length without antennae: 1.25–1.3 mm (♂), 1.3–1.4 mm (♀). Body shape cylindrical, with not large anal spines set on distinct papillae (Fig. 8). Antennae approximately as long as head. Granulation more or less uniform, distinct. Ant. 4 with subapical organite. Tip of antenna with cauliflower like papilla (Fig. 10). Microsensillum on Ant. 4 in latero-external position, ca 1/3 length from the base. Ant. 3

Table 1. Main diagnostic features of the ‘oligopseudocellar’ species of *Protaphorura* from East Palaearctic.

character	<i>P. buryatica</i> sp. n.	<i>P. dzherga</i> sp. n.	<i>P. dorzhievi</i> sp. n.	<i>P. jacutica</i> Martynova 1976	<i>P. tolai</i> Pomorski et Kaprus' 2007	<i>P. uniparis</i> sp. n.	<i>P. minima</i> Sun et al., 2013	<i>P. changbaiensis</i> Sun et al., 2013
Dorsal pso formula	32/012/33342	33/012/33342	33/012/33332	33/01– 22/3334(3)2	43/012/332– 343	43/012/33353	33/012/33332	32/012/33232
Ventral pso formula	11/–	01/–	00/–	10/–	10/–	00/–	0/–	1(0)0/–
Number of pso on subcoxa 1 of leg 1–3	111	000	000	000	000	000	000	100
Ventral psx formula	0/000/10010	0/000/11000	1/000/11000	1/000/10000	1/000/10000	1/000/11000	00/000/100000	00/000/100000
Number of papillae in AO	5	4	4	5	5	4	5	5
Number of vesicles in PAO	12–13	19–20	20–29	30–40	36–40	22–28	21–26	28–34
Number of setae on furcal area	2+2	2+2	2+2	2+2	2+2	1+1	2+2	2+2
Number of ventral setae on Th. 1–3	1+1, 2+2, 2+2	1+1, 1+1, 1+1	1+1, 1+1, 1+1	1+1, 2+2, 2+2	1+1, 2+2, 2+2	1+1, 1+1, 1+1	1+1, 1+1, 1+1	1+1, 1+1, 2+2
Number of setae at base of VT	2+2	1+1	1+1	2+2	2+2	1+1	1+1	2+2
Ratio f : F	0.5–0.6	0.5–0.6	0.3–0.4	1.2–1.8	?	–	?	?
Male ventral organ on Abd. 6	–	–	–	–	–	–	+	–

with microsensillum slightly below AIIIO. AIIIO 5 guard chaetae, 2 sensory rods and 2 sensory clubs, one larger, heart-shaped, second lesser, spherical, varies, sometimes almost twice smaller and rod-like, and 5 papillae (Fig. 9). PAO small, consists of 12–13 simple vesicles (Fig. 11).

Pso formula dorsally 32/012/33342 (few specimens with pso formula 33/012/33342 on one side), ventrally 11/000/00000. All subcoxa 1 with 1 pso. Formula of psx ventrally 0/000/10010, all subcoxa 1 with 1 psx. Submedial pso on Abd. 1–2 set in nearby position.

Dorsal chaetotaxy usually with some asymmetry, well differentiated into macro- and microchaetae (Fig. 8). Sensilla weakly marked. Th. 2–3 with ms laterally. Th. 1 usually with 9–11 chaetae in adult specimens. Abd. 1–3, 5 without chaeta s'. Ratio M/s on Abd. 5=1.4–1.6. Abd. 5 usually with p_0 chaeta. On Abd. 5 straight lines passing through bases of short dorsal chaetae parallel. Th. 1, 2, 3 with 1+1, 2+2, 2+2 ventral chaetae, respectively. VT with 8–10 + 8–10 chaetae and 2+2 chaetae at base (Fig. 12). Furca reduced to cuticular pocket with 2+2 furcal setulae, anterior pair (1+1) of setulae located on cuticular fold, posterior pair located well behind fold, ration f : F as 0.5–0.6 (Figs 14, 15). Furcal area with three manubrial rows of chaetae behind cuticular fold: ma-row with 4 chaetae, mm-row with 2–4 chaetae and mp-row with 6 chaetae. Chaetae mm-row usually situated more laterally (medial chaetae absent).

Claws with denticle. Empodial appendage without basal lamella, as long as inner edge of the claw (Fig. 13). Distal whorl on tibiotarsi with 11 chaetae. AS 0.45–0.55 as long as inner edge of claw. Male ventral organ absent.

Diagnosis. The species is well defined due to the many rare features: very small PAO (12–13 vesicles), cauliflower-like papilla at the tip of antenna, small sensory clubs in AIIIO, presence of pseudocelli on all subcoxa 1. 5 papillae in AIIIO, number of ventral chaetae on thorax and at base of VT are shared with *P. jacutica*. *P. buryatica* sp. n. is somewhat similar to *P. changbaiensis* (NE China) by 5 papillae in AIIIO and two posterior pso on dorsal side of head, these two species mainly differ in general formula of pso on body and subcoxa. Cauliflower like papilla on tip of antenna as in *P. merita* Kaprus' & Pomorski, 2008 (S Siberia: Tuva). The reduction of sensory structures in AIIIO and PAO possibly reflects halophilic habitat in which *P. buryatica* sp. n. lives.

Distribution and ecology. The species is known only from one locality of Eravna Basin. Inhabits saline meadows.

Etymology. The new species was named after the Republic of Buryatia.

Protaphorura dzherga sp. n. (Figs 16–22)

Material: Holotype ♀, Buryatia, Dzherginsky Nature Reserve, upper flow of Barguzin River, at the confluence of the Turakina creek to the Barguzin river, left bank of the creek, steep rocky southern slope with *Kobresia*, *Thymus*, lichens, 1115 m alt., 55.34122N, 111.49935E, 10.IX.2012, leg. M. Potapov, A. Gulgenova (MSPU). Paratypes 7 ♀, 4 ♂, the same place as for holotype (MSPU, BGU).

Other material: the same place as for holotype (10 specimens).

Description. Color in alcohol white. Length without antennae: 0.9–1.0 mm (♂), 1.0–1.1 mm (♀). Body shape cylindrical, with not large anal spines set on distinct papillae (Fig. 16). Antennae approximately as long as head. Granulation more or less uniform, distinct. Ant. 4 with subapical organite. Microsensillum on Ant. 4 in latero-external position, ca 1/3 length from the base. Ant. 3 with microsensillum slightly below AIIIO. AIIIO built of 5 guard chaetae, 2 sensory rods and 2 subequal sensory clubs, one granular, heart-shaped, second spherical, and 4 papillae (Fig. 17). PAO consists of 19–20 simple vesicles (Fig. 18).

Pso formula dorsally 33/012/33342; ventrally 1/000/00000, all subcoxa 1 without pseudocelli. Ventral pso on head located laterally. Formula of psx ventrally: 0/000/11000, all subcoxa 1 with 1 psx. Submedial pso on Abd. 1–2 set in nearby position.

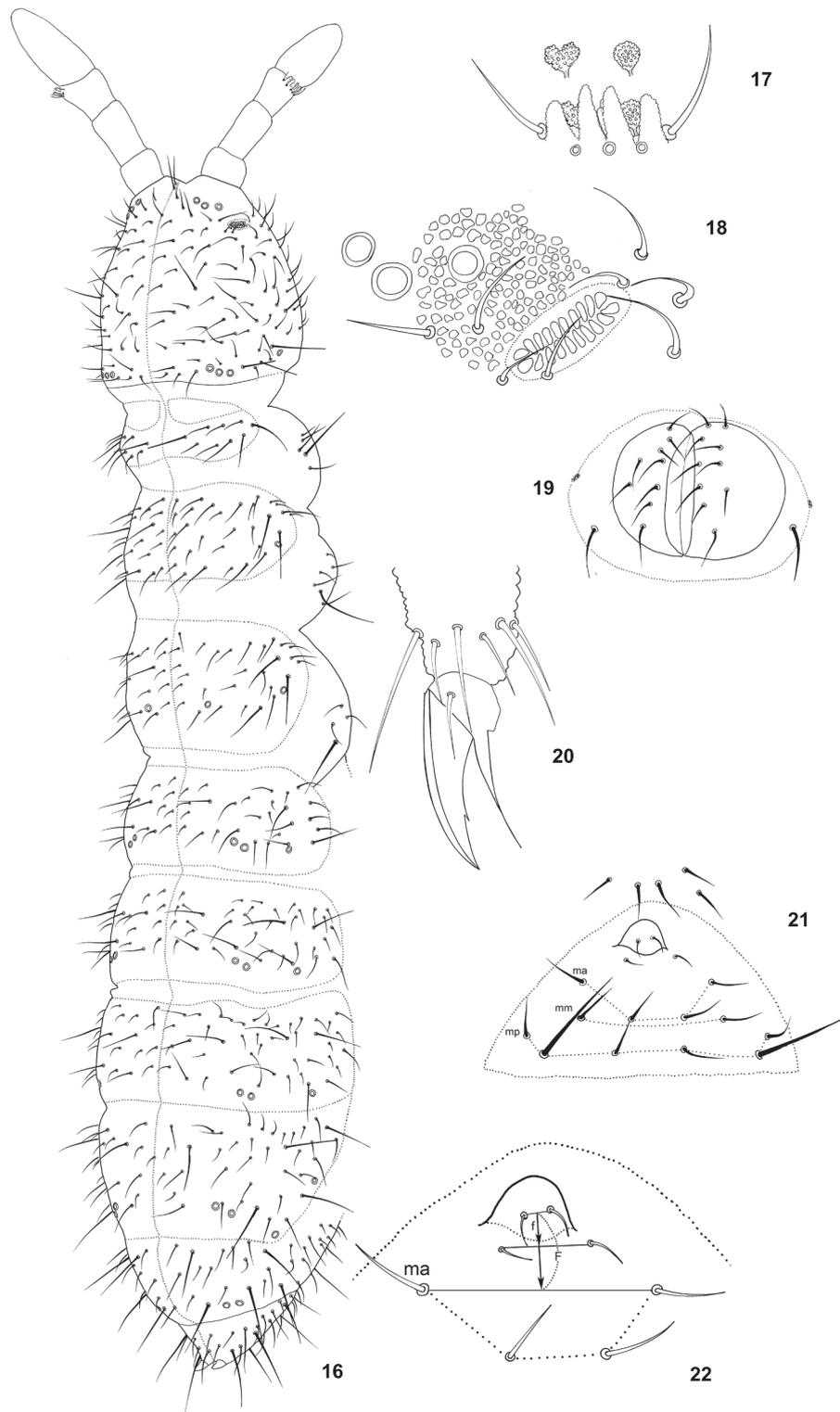
Dorsal chaetotaxy more or less symmetrical, well differentiated into macro- and microchaetae (Fig. 16). Sensilla weakly marked. Th. 2–3 with ms laterally. Th. 1 usually with 9–10 chaetae in adult specimens. Abd. 1–3 and 5 without chaeta s'. Ratio M/s on Abd. 5 = 2.2–2.7. Abd. 5 usually with p_0 chaeta. Abd. 4 with one medial chaeta. Straight lines passing through bases of short dorsal chaetae parallel. Th. 1, 2, 3 with 1+1; 1+1; 1+1 ventral chaetae, respectively. VT with 9–10 + 9–10 chaetae and 1+1 chaetae at base (Fig. 19). Furca reduced to cuticular pocket with 2+2 furcal setulae, of which 1+1 anterior setulae located on cuticular fold, posterior 1+1 setulae located behind ration f : F as 0.5–0.6 (Figs 21, 22). Furcal area with three manubrial rows of chaetae behind cuticular fold: ma-row with 4 chaetae, mm-row with 2–3 chaetae and mp-row with 6 chaetae. Chaetae of mm-row usually situated more laterally (no medial chaetae).

Claws with denticle. Empodial appendage without basal lamella, as long as inner edge of the claw (Fig. 20). Distal whorl on tibiotarsi with 11 chaetae. AS 0.5–0.6 as long as inner edge of the claw. Male ventral organ absent.

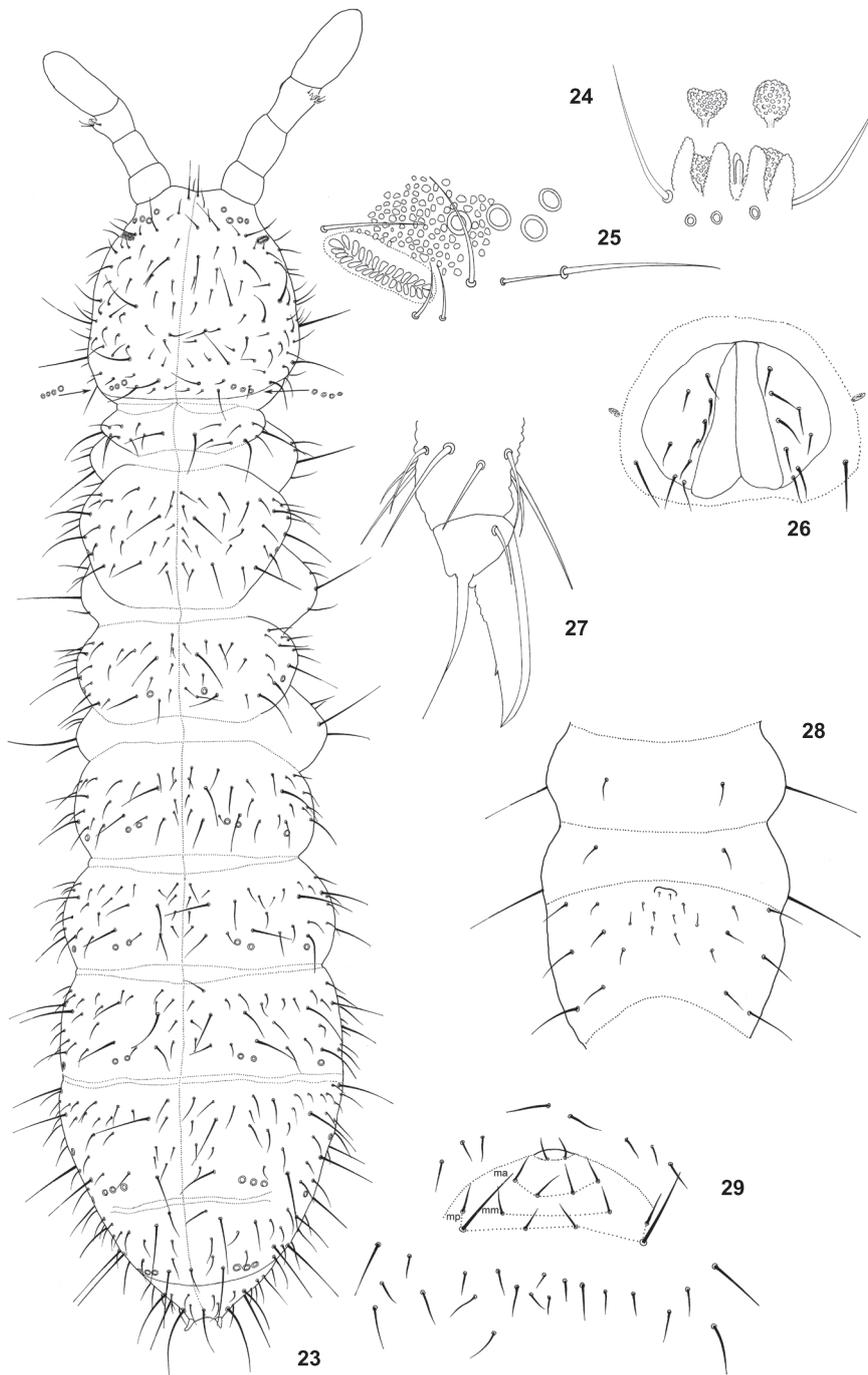
Diagnosis. *P. dzherga* shares many features with *P. dorzhievi* and differs in smaller size, more pso on abdomen and head, and fewer vesicles in PAO (see table).

Distribution and ecology. The species is known from type locality (N Buryatia: Dzherginsky Nature Reserve), where it was recorded only on dry steppe slope.

Etymology. The new species was named after the Dzherginsky Nature Reserve where it was collected.



Figures 16–22. *Protaphorura dzherga* sp. n. Dorsal chaetotaxy and pso distribution (16), sensorial elements of AO (17), PAO and adjacent pso (18), ventral tube (19), distal part of tibiotarsi of leg 3 (20), furcal area (21), furcal fold (22).



Figures 23–29. *Protaphorura uniparis* sp. n. Dorsal chaetotaxy and pso distribution (23), sensorial elements of AO (24), PAO and adjacent pso (25), ventral tube (26), distal part of tibiotarsi of leg 3 (27), Abd. 2–4 in first instar, ventral view (28), furcal area (29).

***Protaphorura uniparis* sp. n.** (Figs 23–29)

Material: Holotype ♂, Buryatia, Vitim plateau, Konda Basin, ~10 km from Telemba, Birhasan River, Mailla, grassy larch forest, litter, 04.X.2009, leg. A. Gulgenova (MSPU).

Paratypes 2 ♀, 2 ♂, 2 juv. (04.X.2009), 1 ♀, 1 ♂ (10.IX.2008), the same place as for holotype (MSPU, BSU).

Other material: the same place as for holotype, 06.VII.2008 (11 specimens), 10.IX.2008 (229 specimens), 30.V.2009 (52 specimens), 09.VII.2009 (30 specimens), 23.VIII.2009 (30 specimens), 04.X.2009 (93 specimens); larch forest with *Betula nana*, 09.VII.2009 (1 specimen); bushes of *Betula nana* with *Carex* and *Pentaphylloides fruticosa*, 06.VII.2008 (2 specimens), 09.VII.2009 (1 specimen); larch forest with *Rhododendron dauricum* on elevation, 23.VIII.2009 (4 specimens), leg. A. Gulgenova; Buryatia, Vitim plateau, Eravna Basin, vicinities of Sosnovo-Ozerskoye, steppe with *Leontopodium*, *Kobresia* and *Festuca*, 10.VII.2009 (1 specimen), 20.VIII.2009 (1 specimen), leg. A. Gulgenova.

Description. Color in alcohol white. Length without antennae: 1.05–1.1 mm (♂), 1.1–1.3 mm (♀). Body shape slightly thickened in posterior half, with not large anal spines set on distinct papillae (Fig. 23). Antennae approximately as long as head. Granulation more or less uniform, distinct. Ant. 4 with subapical organite. Microsensillum on Ant. 4 in latero-external position, ca 1/3 length from the base. Ant. 3 with microsensillum slightly below AIIIIO. AIIIIO built of 5 guard chaetae, 2 sensory rods and 2 sensory clubs, of which one granular, heart-shaped, second slightly spherical, and 4 papillae (Fig. 24). PAO consists of 22–28 simple vesicles (Fig. 25).

Pso formula dorsally 43/012/33353 (specimens with 44/012/33353 and 43/012/33343 pso on one side found). Ventral side of body and subcoxa 1 of all legs without pso. Formula of psx ventrally 1/000/11000, all subcoxa 1 with 1 psx. Submedial pso on Abd. 1–2 set in nearby position. Second pso at base of antennae slightly moved shifted downwards.

Dorsal chaetotaxy more or less symmetrical, well differentiated into macro- and microchaetae (Fig. 23). Sensilla weakly marked. Th. 2–3 with ms laterally. Th. 1 with 9 chaetae. Abd. 1–3 and Abd. 5 without chaetae. Ratio M/s on Abd. 5 = 2.7–2.9. Abd. 5 with p₀ seta. Medial chaeta on Abd. 4 present or absent. Straight lines passing through bases of short chaetae parallel. Th. 1, 2, 3 with 1+1, 1+1, 1+1 ventral chaetae, respectively. VT with 7–9 + 7–9 chaetae and 1+1 chaetae at base (Fig. 26). Furca reduced to small cuticular pocket with 1+1 setulae (one pair of furcal chaetae also seen at first stage) (Figs 28, 29). Furcal area with three manubrial rows of chaetae behind cuticular fold: ma-row with 4 chaetae, mm-row with 2 chaetae, mp-row with 6 chaetae.

Claws with denticle. Empodial appendage without basal lamella, as long as inner edge of the claw (Fig. 27). Distal whorl of chaetae on tibiotarsi with 11 chaetae. AS

0.45–0.5 as long as inner edge of the claw. Male ventral organ absent.

Diagnosis. *P. uniparis* sp. n. readily differs from other species described in this paper by 4 pso at base of antenna, 5 pso on Abd. 4, and only one pair of furcal setulae. 4 postantennal pso and one pair of pso on Th. 2 are shared with *P. tolai* (E Siberia: Yakutia) but other characters are different (see table). An exceptional character of the new species is the presence of only pair of furcal setulae that is shared only with *Protaphorura stogovi* Pomorski, 1993 (N European part of Russia).

Distribution and ecology. The species is known from several localities of Vitim plateau (NE Buryatia), it inhabits different types of larch forests, bushes of *Betula nana*, and cryoarid steppes.

Etymology. Refers to one pair of setulae located on a cuticular fold.

***Protaphorura jacutica* Martynova 1976**

(Figs 30–34)

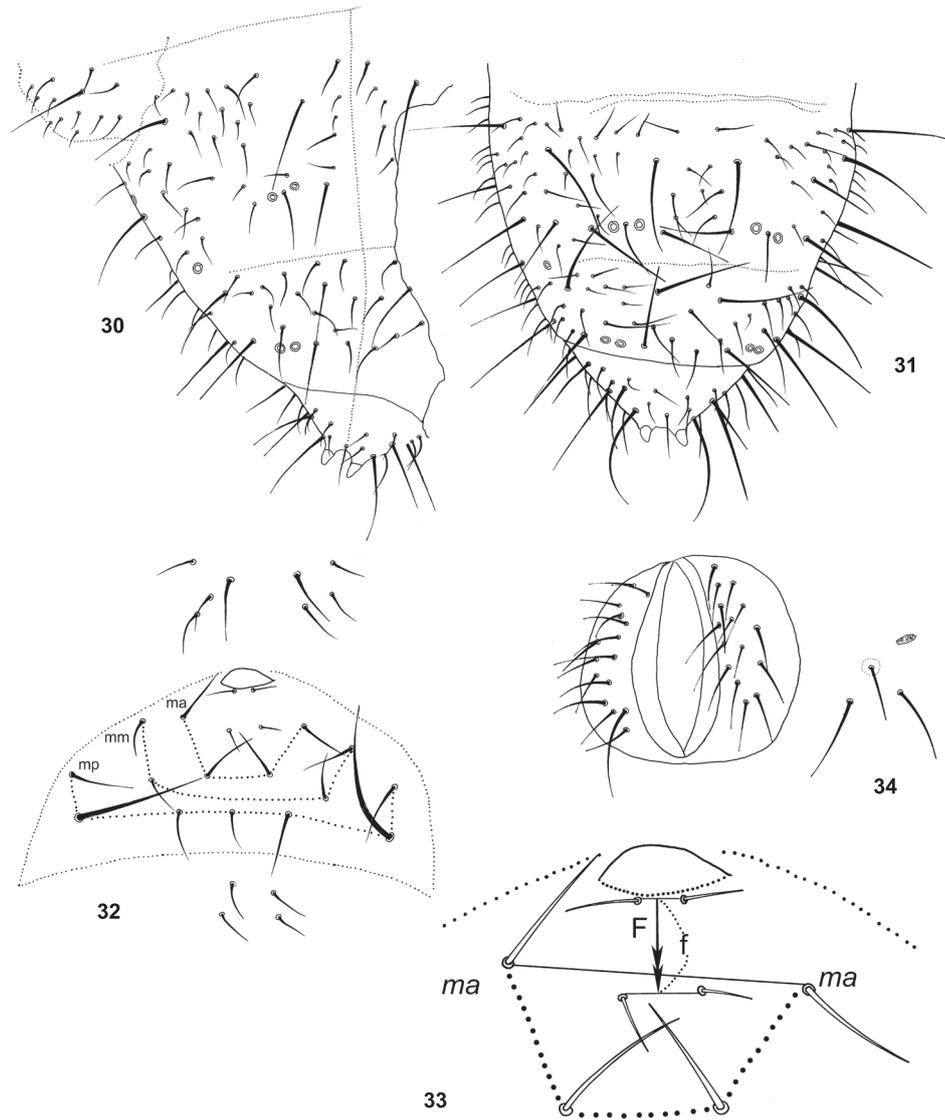
Type material: Paratypes 3 ♀, 1 ♂, Russia, Yakutia, the valley of river Nera, near the farm ‘Balagannakh’, 28.IX.1973, leg. D. Berman.

Other material examined: Buryatia, Dzerginsky Nature Reserve, upper flow of Barguzin River, Balan-Tamur Ridge, northern slope, 1673 m alt., 55.36296N, 111.54709E, subalpine belt, coniferous litter, 09.IX.2012 (20 specimens), leg. M. Potapov, A. Gulgenova; at the confluence of Turakina creek to the Barguzin river, left bank of the creek, 1115 m alt., 55.34122N, 111.49935E, southern slope with *Kobresia*, *Thymus*, and lichens, 10.IX.2012 (9 specimens), leg. M. Potapov, A. Gulgenova; larch forest in the valley between Amut Lake and upper flow of Angidzhan River, ~1400 m alt., 11.IX.2012 (3 specimens), leg. I. Kudryashov.

Taxonomical remarks. Pso formula of *P. jacutica* was dorsally described as 33/01–22/33333, 3 and 3 pso were noted for Abd. 4 and Abd. 5 due to wrong interpretation of position of posterior pso of Abd. 4 (Fig. 16 in Martynova 1976). In fact, the species shows pso formula 33/01–22/3334(3)2 with 4 and 2 pso on Abd. 4 and 5 (Fig. 30, 31). In our material specimens mostly show pso formula 33/012/33342, in population from Balan-Tamur pso formula 33/012/33332 was seen (Fig. 31). VT with 10–15 + 10–15 chaetae and 2 + 2 (rarely 3) chaetae at base (Fig. 34).

Furcal area with three manubrial rows of chaetae behind cuticular fold: ma-row with 4 chaetae, mm-row with 3–4 chaetae, mp-row with 6–7 chaetae. Usually chaetae of mm-row situated more laterally (Fig. 32). Furcal area with two pairs of furcal setae, second pair located far to the back, f : F ratio as 1.2–1.8 (Fig. 33) (see also table).

Distribution and ecology. Probably widely distributed in East Palaearctic. In Buryatia it was found only in N Buryatia (Dzherginsky reserve).



Figures 30–34. *Protaphorura jacutica*. Dorsal chaetotaxy and pso distribution on Abd. 4–6 in paratype (30) and a specimen from Dzerginsky NR (31), furcal area (32), furcal fold (33), ventral tube (34).

4. Key to the ‘oligopseudocellar’ *Protaphorura* species of East Palearctic

1. Subcoxae1 of all legs with pso..... *P. buryatica* sp. n.
- Subcoxae1 of all legs without pso 2
- Subcoxae1 of legs 1,2,3 with 1,0,0 pso, dorsal pso formula 32/012/33232, AO with 5 papillae ..
..... *P. changbaiensis* Sun, Zhang, Wu, 2013
2. 4 pso at base of antenna..... 3
- 3 pso at base of antenna..... 4
3. AIIIO with 5 papillae, dorsal pso formula 43/012/332–343, with ventral pso on head
..... *P. tolai* Pomorski et Kaprus’, 2007
- AIIIO with 4 papillae, dorsal pso formula 43/012/33353, without ventral pso on head *P. uniparis* sp. n.

4. AIII0 with 5 papillae..... 5
 – AO with 4 papillae 6
5. Without ventral pso on head, dorsal pso formula 33/012/33332, with male ventral organ on Abd. 6
 *P. minima* Sun, Zhang, Wu, 2013
 – With ventral pso on head, dorsal pso formula 33/01–22/3334(3)2, without male ventral organ
 *P. jacutica* Martynova 1976
6. With ventral pso on head in lateral position, dorsal pso formula 33/012/33342 *P. dzherga* sp. n.
 – Without ventral pso on head, dorsal pso formula 33/012/33332 *P. dorzhievi* sp. n.

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