



Pseudokiefferiella ferringtoni sp. nov. (Diptera: Chironomidae: Diamesinae) from North America

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In this article I continue to publish the data obtained as a result of the revision of the subfamily Diamesinae, namely of the genus *Pseudokiefferiella* Zavřel, 1941. As we noted earlier (Makarchenko & Semenchko 2023), before the start of molecular genetic study this genus was considered as monotypic, that is, with one species of *Ps. parva* (Edwards) in Holarctic region (Ashe & O'Connor 2009). According to work of Stur and Ekrem (2020), as well as the results of our research and data of GenBank, there are at least 6 species in the genus *Pseudokiefferiella* that are well separated by DNA barcoding, while adult males poorly differ morphologically. However, species of this genus can be successfully identified by the morphological structures of the pupa, if it is associated with a male imago. As confirmation of this, below is provided a description of *Pseudokiefferiella ferringtoni* sp. nov. from North America based on the adult male and pupa, in which the originality of a new species is corroborated by the morphological structures of the pupa.

Materials and methods

The adult males and pupae of *Ps. ferringtoni* sp. nov. were slide-mounted in either Canada balsam or Euparal. The morphological terminology and abbreviations used below generally follow Sæther (1980). For some structures of the hypopygium, however, the terminology of Hansen & Cook (1976) and Oliver (1989) is used. The photographs were taken using an Axio Lab.A1 (Karl Zeiss) microscope with an AxioCam ERc5s digital camera and an Olympus SZX16 stereomicroscope with an Olympus DP74 digital camera, and then stacked using Helicon Focus software. The final illustrations were post-processed for contrast and brightness using Adobe® Photoshop® software.

The holotype and some paratypes of the new species are deposited in the Federal Scientific Center of the East Asia Terrestrial Biodiversity, Far East Branch of the Russian Academy of Sciences, Vladivostok, Russia (FSCEATB FEB RAS). Some paratypes are deposited at the Department of Entomology, University of Minnesota, St. Paul, MN, USA (DEUM).

Taxonomy

Pseudokiefferiella ferringtoni Makarchenko, sp. nov.

<http://zoobank.org/NomenclaturalActs/E646D6B2-FF8F-4A73-85F3-4DF989DE9AB8>

(Figs. 1–18)

Type material. Holotype, adult male, *U.S.A.*, Wyoming, Park County, 31 mile N and 21 mile W of Cody City, 44° 57' 43" N, 109° 24' 07" W, alt. 3228 a.s.l., sweeping above small spring area at dusk, water temperature 3 C, 13.VIII.1969, leg D. Hansen. Paratypes: 8 adult males, 12 pupal exuviae, 2 larvae, the same data as holotype, except Park County, Beartooth Pass region, sweeping over spring/tiny, alt. 3233 m a.s.l., 02.IX.2017, leg. D. Hansen.

Derivatio nominis. The species is named in honour and memory of American chironomidologist Dr. Leonard C. Ferrington, Jr. (1948–2021).

Description

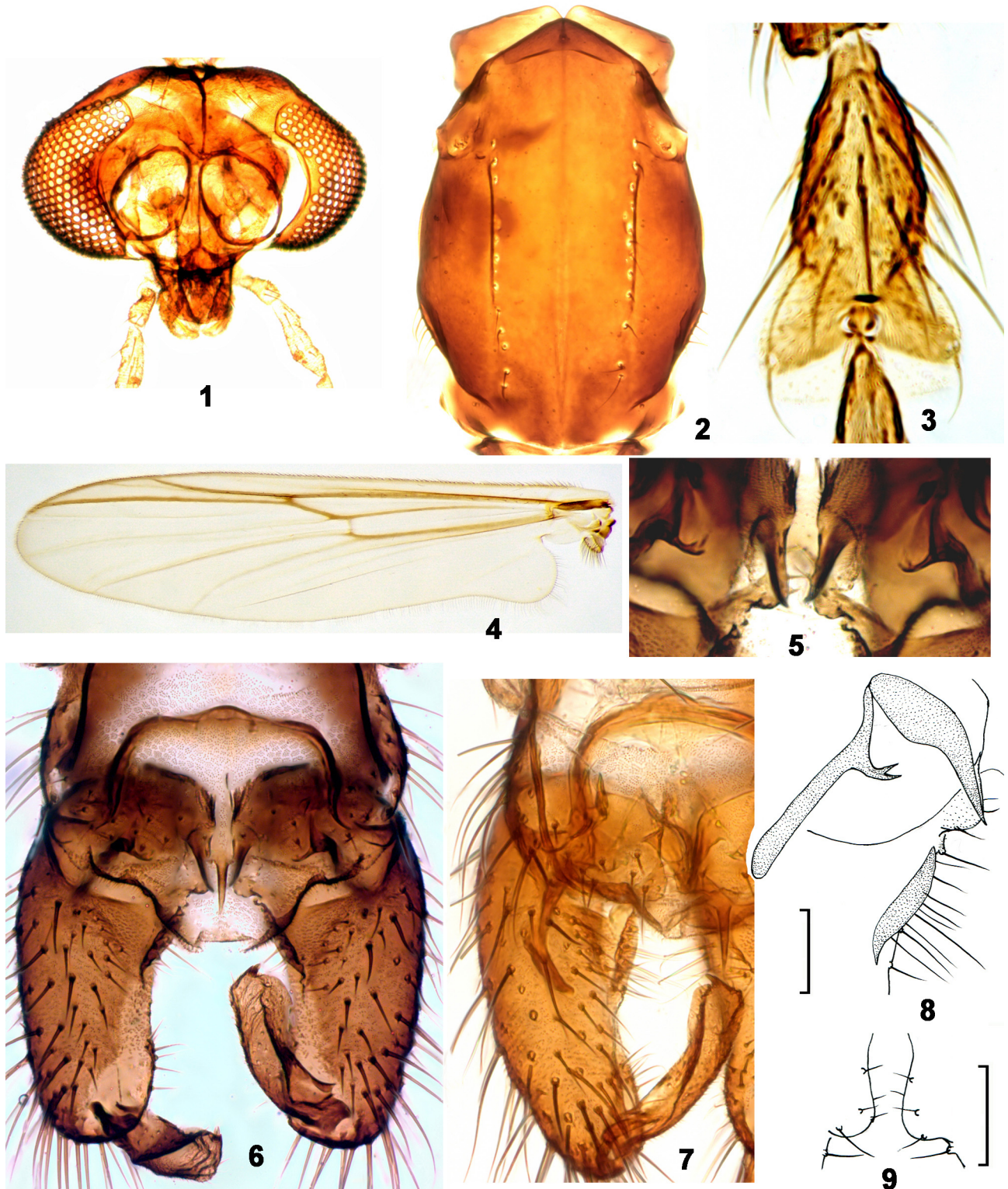
Adult male (n = 5, except when otherwise stated).

Coloration. Brown, dark brown. Antennae brownish grey. Wings grayish.

Head (Fig. 1). Eyes pubescent, slightly elongate dorsomedially. Temporal setae including 5–6 verticals and 5–8 preoculars. Clypeus with 2–3 setae, 44–60 µm long. Antenna with 13 flagellomeres and well developed plume of setae;

maximal length of these setae on flagellomeres 200–220 μm ; terminal flagellomere with 1 subapical seta, 40–52 μm long; pedicel with 1 setae, 52–56 μm long. AR 1.23–1.31. Palpomere length (μm): 40–56, 68–96, 128–172, 136–180, 168–236. Palpomere 3 in distal part with sensilla capitata with diameter 14–16 μm . Head width/palpal length 0.91–1.10.

Thorax (Fig. 2). Antepronotum with 2–5 ventrolateral setae. Dorsocentrals 10–13, prealars 4–6. Scutellum with 12–20 setae.



FIGURES 1–9. Adult male of *Pseudokiefferiella ferringtoni* sp. nov. 1, head; 2, antepronotum and mesonotum; 3, ta_4 ; 4, wing; 5, 8, aedeagal lobes, phallapodeme and basal plate of gonocoxite; 6, hypopygium of holotype in dorsal view; 7, hypopygium of paratype in dorsal view; 9, basal plate of gonocoxite. Scale bar: 50 μm .

TABLE 1. Lengths (in μm) and proportions of leg segments of *Pseudokiefferiella ferringtoni* sp. nov., male (n=5)

	fc	ti	ta ₁	ta ₂	ta ₃	ta ₄	ta ₅	LR	BV	SV	BR
P ₁	951–1115	1164–1410	787–943	377–467	213–262	82–98	115–164	0.66–0.68	3.26–3.73	2.60–2.73	1.5–2.2
P ₂	968–1230	1050–1640	508–607	295–344	180–230	82–98	115–148	0.48	3.67–3.89	3.97–4.11	2.0–2.7
P ₃	1132–1443	1279–1640	705–886	410–508	213–246	82–115	115–164	0.52–0.55	3.80–3.84	3.42–3.54	2.2–2.9

Wing (Fig. 4). Length 2.64–3.12 mm, width 0.64–0.80 mm. Anal lobe developed and rounded. Squama with 27–38 setae, 108–120 μm long. R₂₊₃ reduced and visible only in basal part. R and R₁ with 12–15 setae, R₄₊₅ with 2–6 setae in distal part. RM/MCu 2.6–2.8.

Legs. Spur of front tibia 56–80 μm long. Spurs of mid tibia 48–68 μm and 56–82 μm long. Spurs of hind tibia 44–68 μm and 90–96 μm long. Hind tibial comb with 12–14 setae. Ta₄ cardioform (Fig. 3). Length (μm) and proportions of leg segments are as in Table 1.

Hypopygium (Figs. 5–10). Tergite IX with 8–15 setae from one side, 28–40 μm long and with anal point, 56–64 μm long, distally hair-like (Figs 6–7, 10). Laterosternite IX with 6–11 setae, 80–88 μm long. Transverse sternopodeme consisting of a narrow arch 168–172 μm long, with expansion in middle. Aedeagal lobe 76–88 μm long, dilated in the basal half and wedge-shaped distally (Figs. 5, 8); phallapodeme 84–120 μm long, with short lateral fork-shaped branch (Fig. 8). Gonocoxite 272–304 μm long, basal plate below narrow, dark and bare collar-shaped, above with a rounded lobelike projection, which is covered with some short setae (Figs. 8–9). Gonostylus, 144–148 μm long, with long crista dorsalis; apex with short macroseta, 8 μm long (Figs 6–7, 10); HR 1.84–2.11.

Pupa (n=5, except when otherwise stated). Total length ca 6–6.7 mm. Exuviae transparent white, or yellowish.

Cephalothorax. Frontal apotoma with 2 setae, 202–224 μm long. Thorax in anterodorsal part smooth or slightly wrinkled. Thoracic horn brownish yellow, clawlike, 136–168 μm long, 24–96 μm wide at the base. Precorneal setae lengths (μm): Pc₁—88–140, Pc₂—200–208, Pc₃—108–128. Pc₁ and Pc₃ weak and pale, Pc₂ strong and brown (Figs. 11–13). Sometimes Pc₂ divided into branches (Fig. 14). Near precorneals dark thorn is located (Fig. 11). Anteprotonotum with 2 median seta, 220–244 μm long and 144–176 μm long. Dorsocentral setae length (μm): Dc₁ 100–164, Dc₂ 80–84, Dc₃ 138–140.

Abdomen. Apophyses distinct. Tergite I with shagreen posteriorly. Tergite II with shagreen in anterior third, tergites III–VIII almost completely covered in shagreen. Sternites without shagreen. Tergites I–VIII with posterior transverse row of strong, brown or dark brown elongated spines, maximum length 72–88 μm and width 32–48 μm . Number of these spines on tergites I–VIII accordingly—17–23 : 16–26 : 14–20 : 16–18 : 12–18 : 12–17 : 11–14 : 7–8 (Figs. 15–16). Sternites without posterior transverse row of spines. Segment I with 2 pairs of lateral setae in posterolateral corner. Segments II–VIII with 4 pairs of lateral setae, length of L₁–L₄ (in μm) accordingly—196–292 : 260–280 : 144–208 : 120–188. Lateral setae on segment VIII shifted to posterolateral corner. Segments II–VIII with spine-like process in posterolateral corner, ca 40 μm long. Anal lobe 426–492 μm long (female) (Fig. 17) and 459 μm long (male) (Fig. 18), with pointed triangular apical tubercle, 36–44 μm long, and with 3 anal macrosetae 280–288 μm long, slightly curved in distal part. Male genital sac slightly extending beyond anal lobe (Fig. 18).

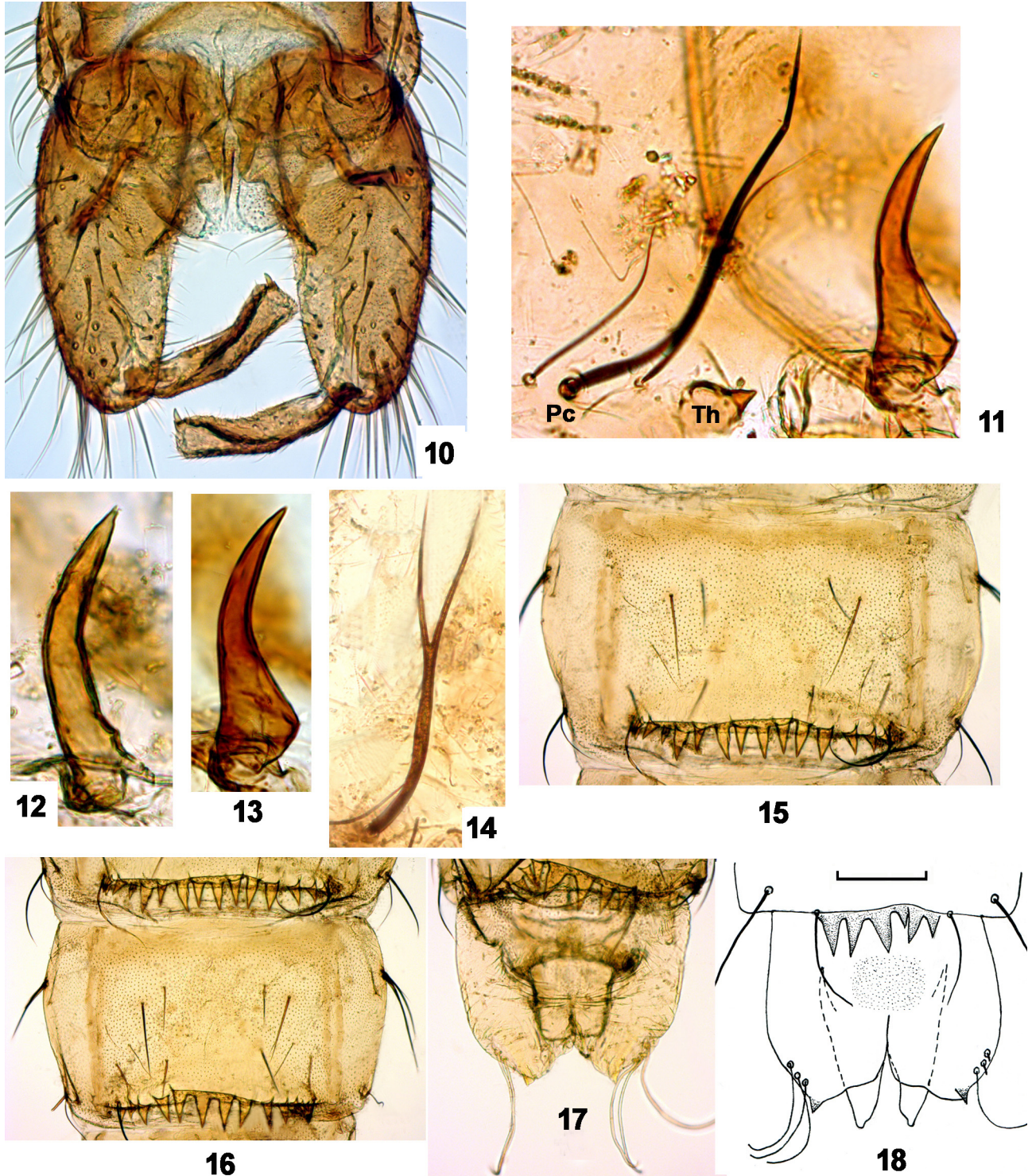
Larva unknown.

Diagnosis. Wing length 2.64–3.12 mm AR 1.23–1.31. Dorsocentrals 10–13, prealars 4–6, scutellars 12–20. LR₁ 0.66–0.68, BV₁ 3.26–3.73, SV₁ 2.60–2.73. Anal point 56–64 μm long, distally hair-like. Aedeagal lobe dilated in the basal half and wedge-shaped distally. Phallapodeme with short lateral fork-shaped branch. Basal plate of gonocoxite below narrow, dark and bare collar-shaped, above with a rounded lobelike projection, which is covered with some short setae. Gonostylus with long crista dorsalis. HR 1.84–2.11. Pupa with brownish yellow, clawlike thoracic horn, 136–168 μm long. Pc₁ and Pc₃ weak and pale, Pc₂ strong and brown. A dark thorn is located near precorneals. Tergites I–VIII with posterior transverse row of strong, brown or dark brown elongated spines, maximum length 72–88 μm . Segment I with 2 pairs of lateral setae in posterolateral corner. Segments II–VIII with 4 pairs long brown lateral setae. Anal lobe with 3 anal macrosetae, slightly curved in distal part; apical tubercle pointed. Male genital sac slightly extending beyond anal lobe.

Remarks. The new species is closely related to all members of the genus *Pseudokiefferiella* described by morphology of adult male or adult female and pupa—*Ps. parva* (Edwards), *Ps. matafonovi* Makarchenko et Semenchenko and *Ps. silinka* Makarchenko et Semenchenko (Edwards 1932; Zavřel 1941; Wülker 1959; Serra-Tosio 1971; Makarchenko & Semenchenko 2023), but can be distinguished from them by the structure of the hypopygium, namely the shape of the aedeagal lobe, phallapodeme and basal plate of the gonocoxite. Also, like the last two species, the male of *Ps. ferringtoni*

sp. nov. lacks rounded-triangular protrusion on gonocoxite in dorsolateral at the base of the gonostylus, which is present in the *Ps. parva* (Serra-Tosio, 1971). The pupa of the new species differs from all known species by the claw-shaped form of the thoracic horn and the presence of dark thorn which located near precorneal setae, as well as some other features listed in Table 2. It is most closely related to the pupa given by Langton (2023) from North America as *Pseudokiefferiella* NA1. However, it is impossible to compare the pupae of these species in more detail due to the very vague description of the latter.

Distribution. Known only from the type locality in Beartooth Pass region of Park County (U.S.A., Wyoming).



FIGURES 10–18. Adult male (10) and pupa (11–18) of *Pseudokiefferiella ferringtoni* sp. nov. 10, hypopygium of paratype in dorsal view; 11, precorneals (Pc), thorn (Th) and thoracic horn; 12–13, thoracic horn; 14, Pc₂; 15, tergite V; 16, tergite VII; 17, anal segment of female; 18, anal segment of male. Scale bar: 200 µm.

TABLE 2. Comparison of some pupal characters of *Pseudokiefferiella ferringtoni* sp. nov., *Ps. parva* (Edwards), *Ps. matafonovi* Makarchenko et Semenchenko, and *Pseudokiefferiella* NA1 Langton

Characters	<i>Ps. ferringtoni</i> sp. nov. (n=5)	<i>Ps. parva</i> (n=2) Serra-Tosio 1971, Langton 2023	<i>Ps. matafonovi</i> (n=4) Makarchenko & Semenchenko 2023	<i>Pseudokiefferiella</i> NA1 (n=4) Langton 2023
Thoracic horn	Clawlike, 136–168 µm long	Setaceous, 100–319 µm long	Absent	Clawlike, 140–160 µm long
Dark thorn in precorneal setae area	Present	Absent	Absent	Absent
Posterior transverse row of strong elongated spines	On tergites I–VIII	On tergites II–VIII	On tergites II–VIII	On tergites II–VIII
Posterior spines length / width, µm	77–88 / 32–48	Ca 60 /-	72–80 / 20–24	80 /-
Number of lateral setae on segments II–VII	4	3	3	4
Length of Pc ₁ –Pc ₃ , µm	88–140, 200–208, 108–128	50, 200, 50	48–60, 180–256, 56–104	110–145, 208–240, 150–200

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