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**A NEW SPECIES OF THE BRISTLETAIL GENUS *PETROBIELLUS*
SILVESTRI, 1943 (MICROCORYPHIA: MACHILIDAE,
PETROBIELLINAE) FROM KURIL ISLANDS**

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Summary. A new species *Petrobiellus iturupiensis* Kaplin, **sp. n.** is described from the coast of Iturup Island. Among the described congeners, this new species is most similar to *P. takunagae* Silvestri, 1943 but differs from latter in the structure of the eyes, ocelli, maxillary palps, urosternites and urocoxites, posterior angle of urosternites, and number of divisions in male parameres.

Key words: Petrobiellinae, taxonomy, new species, distribution, Russia, East Asia.

В. Г. Каплин. Новый вид щетинохвосток рода *Petrobiellus* Silvestri, 1943 (Microcoryphia: Machilidae, Petrobiellinae) с Курильских островов // Дальневосточный энтомолог. 2025. N 523. С. 16-24.

Резюме. Новый вид *Petrobiellus iturupiensis* Kaplin, **sp. n.** описан с побережья острова Итуруп. Среди описанных видов этого рода, новый вид наиболее близок к *P. takunagae* Silvestri, 1943, но отличается от него по строению глаз, глазков, нижнечелюстных щупиков, стернитов и кокситов брюшка, вершинному углу уростернитов и количеству члеников в парамерах самца.

INTRODUCTION

Recently, a few new species of the bristletail and silverfish were described from Russia and adjacent countries (Kaplin & Martynov, 2022, 2024; Kaplin, 2023) but the Russian fauna is not completely studied.

The East Asian genus *Petrobiellus* Silvestri, 1943 includes three described species: *P. takunagae* Silvestri, 1943 (= *P. curvistylis* Uchida, 1954) from Japan, *P. sachalinensis* Kaplin, 2020 from Sakhalin and *P. kusakini* Kaplin, 1980 from Simushir Island (Silvestri, 1943; Uchida, 1954; Kaplin, 1980, 2020).

All specimens of the new species were collected on the coast of Iturup Island under stones and were preserved in 96% ethanol. The holotype (male) and two paratypes (females) are mounted in Faure's solution on permanent microscope slides. The specimens studied are deposited in the collection of the All-Russian Institute of Plant Protection, St Petersburg–Pushkin (ARIPP).

TAXONOMY

Order Microcoryphia Verhoeff, 1904

Family Machilidae Grassi, 1888

Subfamily Petrobiellinae Kaplin, 1985

Genus *Petrobiellus* Silvestri, 1943

Petrobiellus iturupiensis Kaplin, sp. n.

<https://zoobank.org/NomenclaturalActs/30FB6761-0D7F-42E5-B0E8-8F71462BDF5B>

Figs 1–17

MATERIAL. Holotype – ♂, **Russia**: Kuril Islands, Iturup, 45°02' N, 147°37' E, coast of the island, under the stones, 31.VII 1997, leg. A. S. Lelej (ARIPP) (in slides). Paratypes – 2 ♀, same locality, data and collector as for holotype (in slides).

DESCRIPTION. Body length (not including antennae and caudal filament): male and female 9.5–10 mm. Body width: male and female 3.0–3.4 mm. Antennae are damaged. Cerci length: female 5.0–5.2 mm, male 6.0 mm. Ovipositor length: 3.5–4.4 mm.

General body color (in ethanol) whitish. Frons, gena, occiput, most part of clypeus, with the exception of its apex, scapus and pedicellus of antennae, labrum, mandibles, maxillae, first palpomere, bases and apices of 2nd–4th, bases of 5th and 6th palpomeres of maxillary palps; labium, with the exception of labial palps; legs, base of caudal filament with violet-brown pigment. Head is most pigmented. Antennae, maxillary and labial palps, legs, styli of legs and abdominal coxites without scales. Scales on body dorsal side, caudal filament and cerci are dark brown; on ventral side they are brown and uniformly colored.

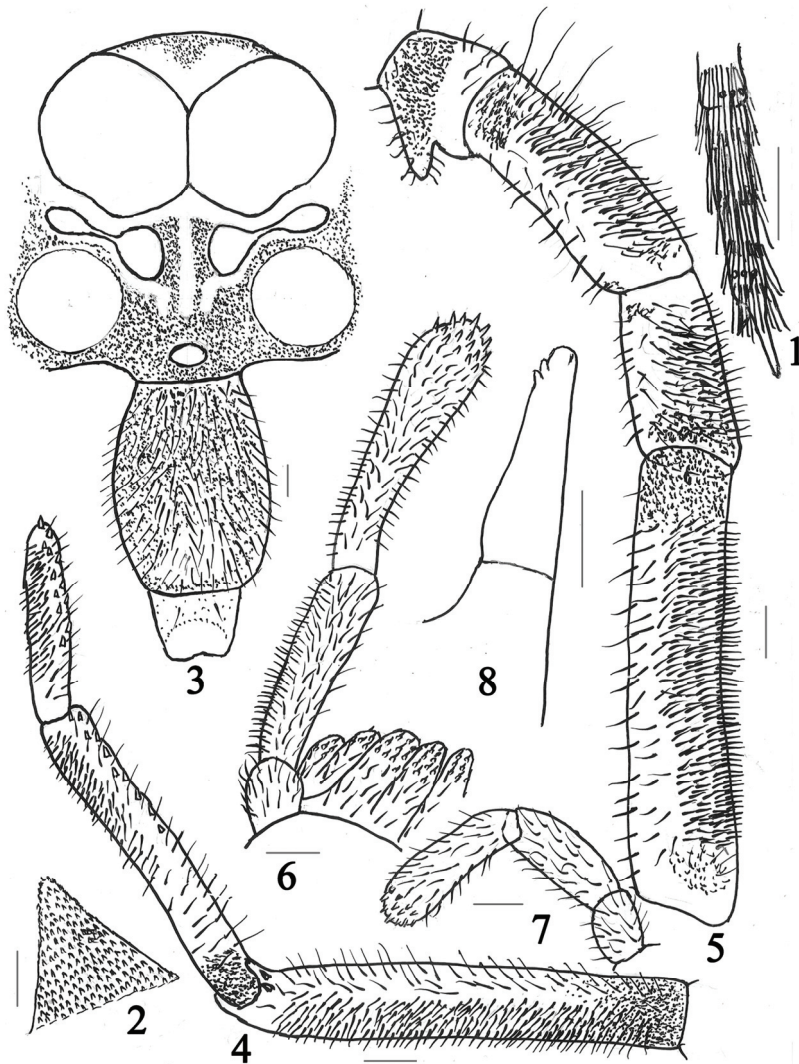
All annuli of antennal flagellum with one row of setae. Distal chains of flagellum are divided into 12–13 annuli. Clypeus of male and female with numerous thin long and medium-length setae.

Cercus approximately 0.50–0.53 (female), or about 0.63 (male) body length, including about 20–22 articles. Apex of cerci with one relatively long and other short lateral spikes (Fig. 1). About 16 distal articles of cerci with four rows of scales. All articles of cerci, excluding their apical article, also with 2–4 supporting hyaline spines. Epiproct at the base of caudal filament in male and female is triangular, its length is almost equal to its width (Fig. 2).

Compound eyes dark (in ethanol). Ratio of length to width of compound eye in male and females 1.09–1.10; ratio of length of contact line to length of eye about 0.43–0.45 in both sexes. Paired ocelli pistil-shaped, dark brown with inconspicuous white bordering; ratio of width to length of ocellus in male about 3.5, in female 2.9–3.0 (Fig. 3). Frons slightly swollen between the paired ocelli. Inner parts of the paired ocelli noticeably protruding forward. The distance between the inner margins of the paired ocelli is about 0.19–0.21, and between their outer margins 0.93–0.96 the total width of the compound eyes in both sexes.

Apical palpomere of maxillary palp 0.58–0.59 (male) or 0.80–0.81 (female) times as long as preceding one; ratio of lengths of 5th and 4th palpomeres 1.06–1.09 and 1.10–1.13, respectively (Figs 4, 5). Dorsal surface of 7th, 6th and 5th palpomeres of maxillary palp with 18–21, 14–16 and 3–4 (female) or 12, 9–10 and 2 (male) hyaline spines, respectively; relatively short and thickened in male. Ventral surface of 2nd–7th palpomeres of male maxillary palp with numerous dark, shortened setae, absent on female palps. Apex of 7th palpomere of maxillary palp rounded in male and pointed in female.

Apical palpomere of the labial palp noticeable (male) or slightly (female) curved inside. Ratio of its length to width about 3.7 (male) or 3.0 (female) (Figs 6, 7). Distal surface of this palpomere with 15–16 large sensory cones in both sexes. Mandibles with two (female) or three (male) distal teeth (Figs 8, 9).



Figs 1–8. *Petrobellus iturupiensis* Kaplin, **sp. n.**, holotype ♂ (1–6, 8) and paratype ♀ (7). 1 – apex of cercus; 2 – epiproct; 3 – compound eyes, frons, ocelli, antennal bases, clypeus and labrum; 4 – 5th–7th palpomeres of maxillary palp; 5 – 1st–4th palpomeres of maxillary palp; 6, 7 – labial palps; 8 – apex of mandible. Scale bars = 0.1 mm.

Table 1

Ratios of length to width of main leg segments of *Petrobiellus iturupiensis* sp. n.

Segments	Sex, pair of legs					
	Male			Female		
	fore	middle	hind	fore	middle	hind
Tarsus	6.6–6.7	6.7–6.8	9.4–9.5	6.3–6.4	6.7–6.8	8.6–8.7
Tibia	3.8–3.9	3.4–3.5	4.3–4.4	3.0–3.1	3.4–3.5	3.9–4.1
Femur	2.5–2.6	2.7–2.8	3.2–3.3	2.1–2.2	2.5–2.6	2.7–2.8

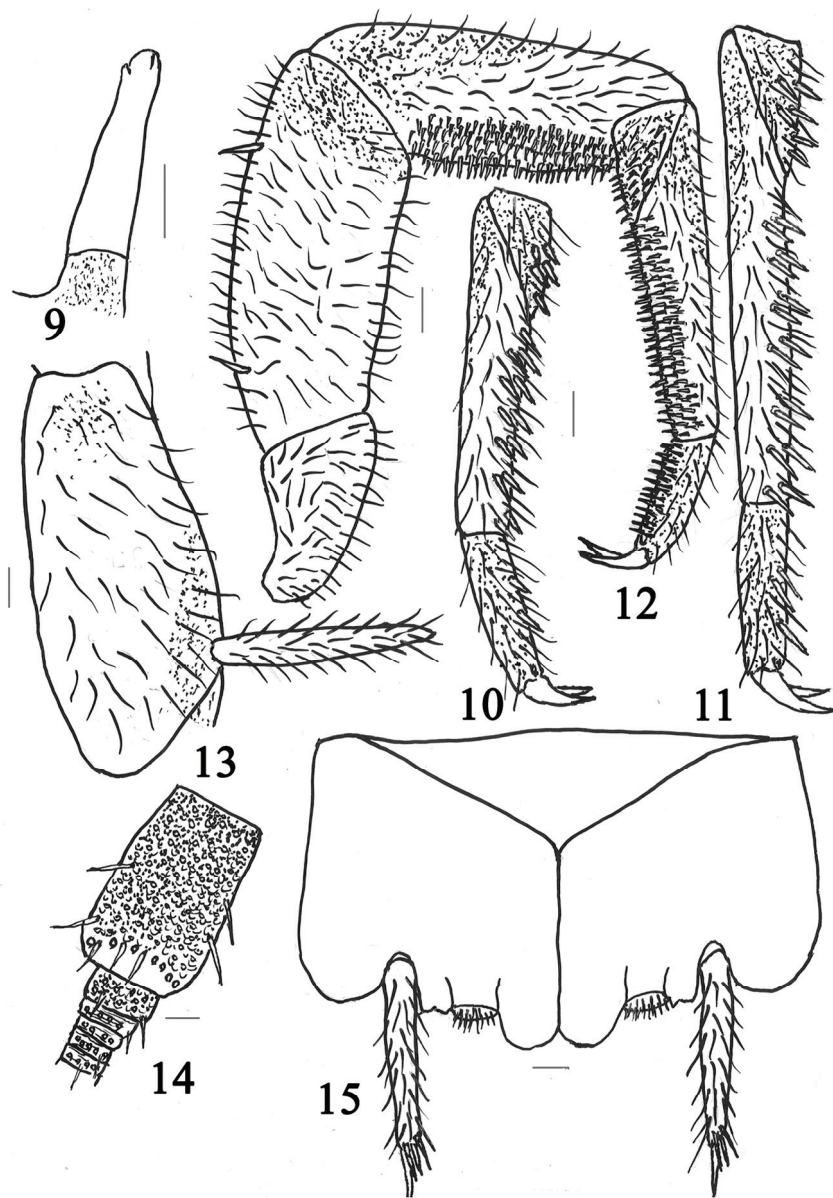
Femora of male and female slightly widened. Ratios of length to width of femur, tibia and tarsus as shown in Table 1. Fore legs, including tarsus, tibia, femur, trochanter and coxa, shorter than middle and hind legs, respectively, 1.05 and 1.16 times in male and 1.07 and 1.20 times in female. Ventral surface of tarsi of all legs in female, middle and hind legs in male; middle and hind tibiae and femora with thickened hyaline spine-like chaetae of medium length in both sexes (Table 2, Figs 10, 11). Ventral surface of fore tarsi and tibiae in male with numerous specialized, short and perpendicular to the surface needle-shaped setae (Fig. 12). Coxae of middle and hind legs with styli without apical supporting bristles (Fig. 13). Ratio of length of coxal styli to width of middle and hind coxae about 1.2–1.3 in both sexes. Ratio of length to width of basal article of antennae in male and females about 1.7 (Fig. 14).

Table 2

Number of hyaline spines on the legs of *Petrobiellus iturupiensis* sp. n.

Segments		Sex, pair of legs					
		Male			Female		
		fore	middle	hind	fore	middle	hind
Tarsomeres	1st	~15–25	4–6	5–7	3–4	3–4	4–5
	2nd	~70–80	12–14	13–15	8–9	10–11	12–14
	3rd	~20–30	2	3	0	0–1	2
Tibia		~80–90	9–11	9	2–3	5–9	8
Femur		0	0	0–1	0–1	1–2	1

In both sexes, urocoxites I and VI–VII with 1 + 1 eversible vesicles, but urocoxites II–V with 2 + 2 eversible vesicles. Posterior angle of urosternites II–VI approximately 116–118°, VII about 125–130°. Ratios of lengths of urosternites and urocoxites II–VIII in male and II–VII in female; urostyli (without apical spine) and urocoxites, also apical spines and urocoxites II–IX in both sexes as shown in Table 3. Inner posterior lobes of coxites VII of female protruding between eversible vesicles; ratio of length to width of these lobes about 1.1 (Fig. 15). Distal part on inside of apical spines saw-shaped in male and especially in female. Abdominal coxites IX of female with 1 + 1 outer and 5–7 + 5–7 inner sublateral hyaline macrochaetae. In both sexes, coxites of abdominal segments I–VIII, as well as abdominal and thoracic tergites without macrochaetes.



Figs 9–15. *Petrobellus iturupiensis* Kaplin, **sp. n.**, holotype ♂ (10–14) and paratype ♀ (9, 15). 9 – apex of mandible; 10 – middle tarsus; 11 – hind tarsus; 12 – tarsus, tibia, femur and trochanter of fore leg; 13 – hind coxa with stylus; 14 – scapus, pedicellus and four basal flagellomeres of antenna; 15 – urosternite and urocoxites VII. Scale bars = 0.1 mm.

Styli IX in male curved inward, significantly thickened and shortened, with elongated apical spines. On the surface of stylus there are about 70–75 evenly spaced, short and thickened, pigmented brown spines, the smallest in the basal inner part. Coxites IX of the male are narrowed, almost rectangular in the distal half, and widened bottle-shaped in the basal half. In the anterior part of the coxite near the stylus, they have 30–35 internally and externally 15–18 pigmented spines. In both the sexes, apices of stylus IX with 3–4 thickened and relatively long macrochaetes near the supporting spine. Male genitalia with one pair of large parameres on abdominal segment IX. Parameres with 1 + 5 divisions, slightly surpassing the apex of the penis (Figs 16, 17). The penis and parameres protrude significantly beyond the apices of abdominal coxites IX and reach the apices of their styli. The terminal article of the penis is short, curved downwards and then inward, near the apex is chitinized. A similar structure of coxites and styli of abdominal segment IX, as well as parameres, are described in the male *Petrobiellus takunagae* Silvestri 1943 (Sturm, Buch de Roca, 1993).

Table 3

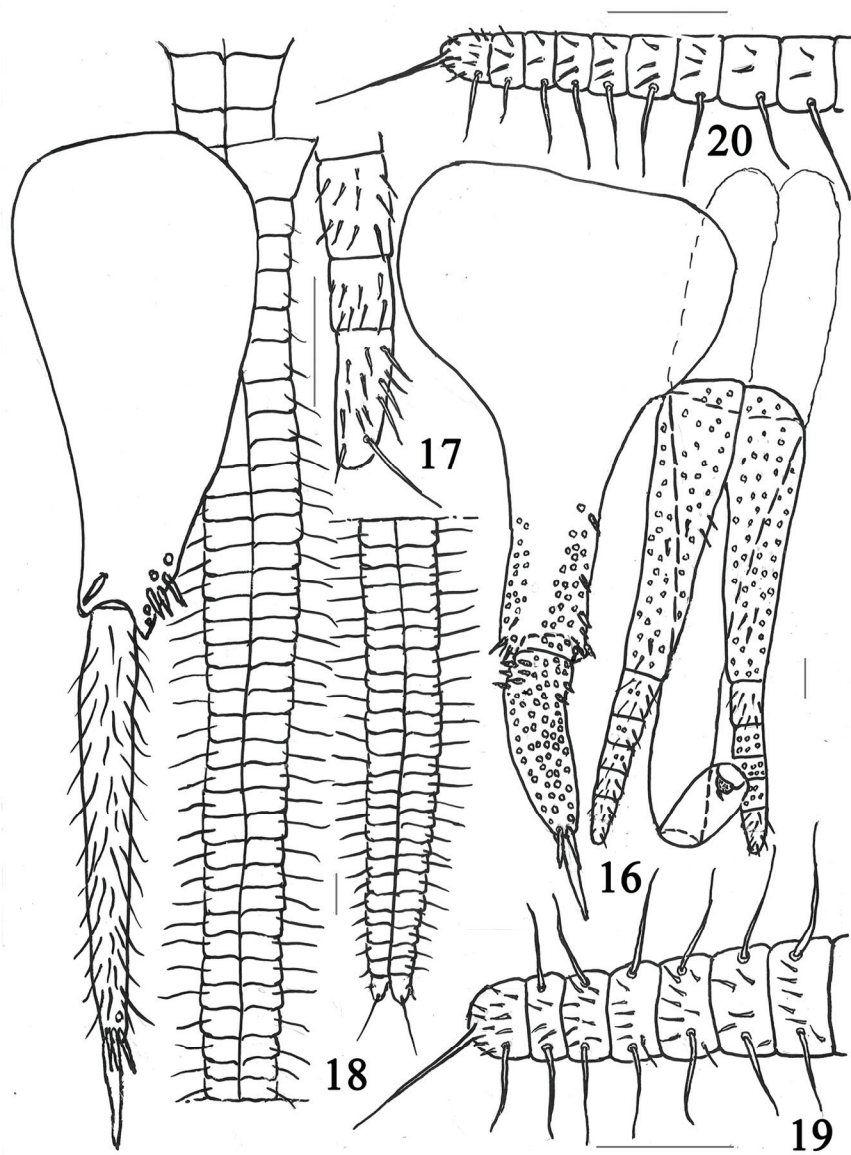
Ratios of lengths of abdominal sternites, coxites, styli and apical spines in *Petrobiellus iturupiensis* sp. n.

Abdominal segments	Urosternite / coxite		Stylus (not including apical spines) / coxite		Apical spine / stylus	
	male	female	male	female	male	female
II	0.59	0.62	0.94	0.89	0.29	0.28
III	0.58	0.64	0.94	0.88	0.28	0.30
IV	0.57	0.59	0.86	0.87	0.29	0.30
V	0.55	0.57	0.81	0.86	0.31	0.31
VI	0.54	0.56	0.80	0.77	0.31	0.33
VII	0.43	0.44	0.80	0.79	0.32	0.32
VIII	0.25	–	0.87	0.90	0.27	0.30
IX	–	–	0.45	0.87	0.45	0.25

Ovipositor slender, elongate, visibly surpassing apex of styli IX by about 1.5–2.5 mm, and is adapted for laying eggs in cracks on rocky surfaces. Anterior and posterior gonapophyses with approximately 60 and 62 divisions, respectively. Apical spines of gonapophyses as long as about 4 apical divisions combined. One and about four basal divisions of anterior and posterior gonapophyses, respectively, glabrous (Fig. 18). Distal divisions of anterior and posterior gonapophyses with 6–11 and 3–8 chaetae, respectively (not counting sensory setae and apical spines) (Figs 19, 20). Among them, the longest lateral setae are on the anterior gonapophyses.

DIFFERENTIAL DIAGNOSIS. Among the described species of the genus *Petrobiellus*, *P. iturupiensis* sp. n. most similar to *P. takunagae*. The main morphological differences between these species are given in Table 4.

Among the described species of the genus *Petrobiellus*, males are known only in *P. takunagae*. First of all, these species differ in the ratio of the length to width of compound eye; ratio of the width between paired ocelli and the total width of compound eyes; the width to the length of the paired ocellus; lengths of apical and preceding palpomeres of the maxillary palps, urosternites and urocoxites; posterior angle of urosternites; number of divisions in male parameres.



Figs 16–20. *Petrobellus iturupiensis* Kaplin, **sp. n.**, holotype ♂ (10–14) and paratype ♀ (9, 15). 16 – urocoxite IX, with parameres and penis of male; 17 – distal part of male paramere; 18 – urocoxite IX, with anterior gonapophyses; 19 – distal part of anterior gonapophyse; 20 – distal part of posterior gonapophyse. Scale bars = 0.1 mm.

Table 4

Main differences between *Petrobiellus takunagae* Silvestri, 1943 and *P. iturupiensis* sp. n.

Morphological characters		<i>P. takunagae</i>	<i>P. iturupiensis</i> sp. n.
Ratio length to width of compound eye		1.00–1.02	1.09–1.10
Ratios width between paired ocelli and total width of compound eyes		Less than 0.12	0.19–0.21
Ratio width to length of paired ocellus		3.3–3.4	3.5 (male) 2.9–3.0 (female)
Ratio of lengths of apical and preceding article of maxillary palps		0.55	0.58–0.59 (male), 0.80–0.81 (female)
Ratio of length of stylus to width of legs coxae		1.14	1.2–1.3
Ratio of lengths of urosternite and urocoxite	II	0.52	0.59–0.62
	VII	0.40	0.43–0.44
Posterior angle of urosternite II		108°	116–118°
Number of divisions in male parameres		1 + 4	1 + 5

ETYMOLOGY. The species name is derived from the toponym of Iturup Island where new species was collected.

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