



New species of the non-biting midges of Tribe Chironomini (Diptera, Chironomidae) from the Bolshekhokhtsky Reserve (Russia, Khabarovsk Territory)

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Abstract

Three new species of non-biting midges of the tribe Chironomini, *Polypedilum* (s. str.) *odyrensis* **sp.n.**, *Polypedilum* (s. str.) *servatum* **sp.n.**, *Robackia lukini* **sp.n.**, are described on the morphology of imago males collected on the streams of the Bolshekhokhtsky Nature.

Key words: Diptera, Chironominae, new species, *Polypedilum*, *Robackia*, taxonomy, morphology

Introduction

The nature reserve "Bolshekhokhtsky" is located in the southern part of the Khabarovsk Territory on the right bank of the Ussuri River at its confluence into the Amur River within the mountain range of Bolshoy Khekhtsir. In the south, the border of the reserve is the Chirka River, in the west—the Ussuri River. The northern boundary runs along the foot of the Big Khekhtsir. The watercourses of the northern macro-slope of the Greater Khekhir mountain range of up to 15 km (Bykov, Polovinka, Sosninsky, Geologovsky and other streams) flow into the Amur Channel; southern—a length of 10 to 20 km (the rivers Odir, Pylka, Tsypa, Belaya Rechka, Golden Creek and others) are tributaries of the Chirka River. From the western part of the ridge, the reserve is washed by the Ussuri River, into which a series of streams ranging in length from 2 to 4 km flows (Engineer, Kurkunikha, Sinyuginsky, Dvorovy, Golovina and others). Soils of watercourses are represented by stones, a different-sized pebble with an admixture of sand, single gravel, detritus, clay and silt (Makhinov 2011).

The first information on the fauna of the Chironomids of the reserve "Bolshekhokhtsky" is presented in the work of N.M. Yavorskaia and M.A. Makarchenko (Yavorskaya, Makarchenko 2009), where 64 species from 4 subfamilies were indicated. Later, an addition to the fauna of the subfamily Chironominae was published and six rare species were indicated (Yavorskaya 2010, 2015). Based on a study of original material collected over the last seven years, as well as previously published data, the Chironomid fauna of the Bolshekhokhtsky Nature Reserve is represented by 182 species from 70 genera belonging to 5 subfamilies (Makarchenko *et al.* 2017). In this article we present illustrated descriptions of four new species of non-biting midges of tribe Chironomini on the morphology of imago males collected on the streams of the Bolshekhokhtsky Nature.

Material and methods

The imaginal materials for this article were collected by N.M. Yavorskaya (Institute of Water and Ecological Problems, FEB RAS) in the period from 2009 to 2016 years on the watercourses and reservoirs of the Bolshekhokhtsky Reserve. The imago was harvested by an entomological net and processed according to conventional methods. In the descriptions of species used the terminology and abbreviations of Sæther (1980).

Holotype and paratypes are deposited in the Museum of the Federal Scientific Center for Biodiversity of the terrestrial biota of East Asia Far Eastern Branch of the Russian Academy of Sciences (Vladivostok).

Results

Family Chironomidae Newman, 1834

Subfamily Chironominae Newman, 1834

Tribe Chironomini Zavřel, 1917

Genus *Polypedilum*, 1912

Polypedilum (s. str.) *odyrensis* sp.n.

(Figs 1–4, 11–15)

Type material. Holotype: 1 male, Russia, Khabarovsk Territory, Bolshekhokhtsyrsky Nature Reserve, basin of the Chirka River, Odyr River, 19.VI.2016, leg. N.M. Yavorskaya. Paratype: 1 male, same data, 19.VI.2016, leg. N.M. Yavorskaya.

Derivatio nominis. The species name is from the type locality, Odyr River, and the Latin suffix—*ensis* denoting locality.

Diagnostic characters. The new species has the following combination of characters: wing length 1.7–1.8 mm, without spots and setae on the surface; thorax and abdomen brown, halteres and legs yellowish; AR 0.93–1.04; humerals 3–4; anal point long and narrow; superior volsella straight, bearing 1 lateral seta in apical half and 2–3 basal setae and cover with rare microtrichia; gonostylus massive, short and wide, slightly expanded in the apical third; HR 0.97–1.2.

Description. *Adult male* (n=2). Total length 2.8–3.0 mm. Wing length 1.7–1.8 mm. Total length/wing length 1.6–1.7.

Coloration is brown. Antenna, thorax and abdomen brown; halteres and legs yellowish.

Head. Head width 400–432 µm. Frontal tubercles absent. Antenna 880–928 µm long. Ultimate flagellomere 424–472 µm long. AR 0.93–1.04. Verticals 10–11. Clypeus with 15–17 setae. Lengths of last 4 palpomeres (in µm) of maxillary palp: 44–51; 99–105; 126–133; 176–200.

Thorax. Anteprenotals 0, acrostichals 16–17, humerals 3–4, dorsocentrals 13–16, prealars 4–6, supraalars 0. Scutellum with 16–18 setae.

Wing. Width 0.53–0.57 mm. Veins R with 25–28, R₁ 15–17 setae, R₄₊₅ with 34 setae. Squama with 10 setae; brachiolum with 1–2 setae. VR 1.23.

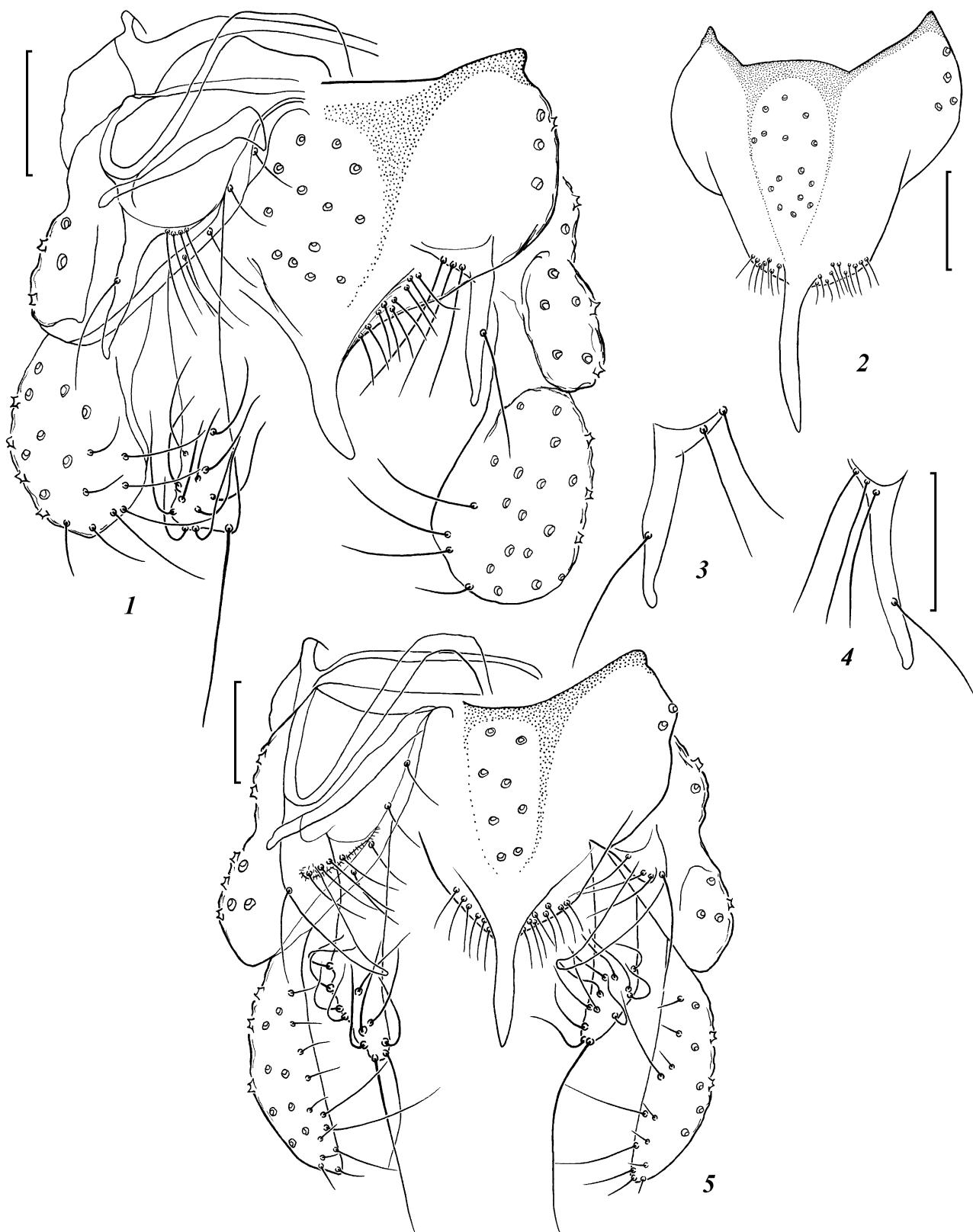
Legs. Scale of fore tibia elongated or with apical spur 22 µm long (Figs 11–12). Spurs of middle and hind tibia 44 µm long. Lengths and proportions of legs as in Table 1.

Hypopygium (Figs 1–4, 13–15). Tergite IX with 13–17 median setae. Laterosternite IX with 3–5 setae. Anal point long and narrow (92 µm and 10 µm respectively), with 10–15 lateral setae at the base. Gonocoxite 102–109 µm long, with 6 inner setae. Phallapodeme 92 µm. Transverse sternapodeme 51–68 µm long. Superior volsella straight and narrow 65–75 µm long, apical part 51–61 µm long, the base height 10 µm and width 20–24 µm, with 2–3 basal setae and cover with rare microtrichia, and 1 lateral seta located in apical half; RSVo 0.63–0.73. Inferior volsella 119–122 µm long, with 11–14 setae. Gonostylus short and wide (85–112 µm and 61 µm respectively), slightly expanded in the apical third, the inner margin with 1 short apical seta and 3–4 longest subapical setae. HR 0.97–1.2.

Female, pupa and larva unknown.

Remarks. *Polypedilum* (s. str.) *odyrensis* sp.n. is unique in *Polypedilum* genus in the shape of the gonostylus. This type of gonostylus is often seen in *Chironomus* and *Kiefferulus*, also sometimes in *Axarus*, *Lipiniella*, *Endochironomus* complex and *Stictochironomus* complex. Thirteen-segmented antenna, the anteprenotal lobes narrowed dorsally and medially narrowly separated, the combs of mid and hind tibia separates and one of the combs with a long spur, tergite VIII tapered basally to testify the species is the member of genus *Polypedilum*. The adult males of *P.* (s. str.) *odyrensis* sp.n. are very different from all known species of the subgenus *Polypedilum* by the original structure of gonostylus—massive, wide and short.

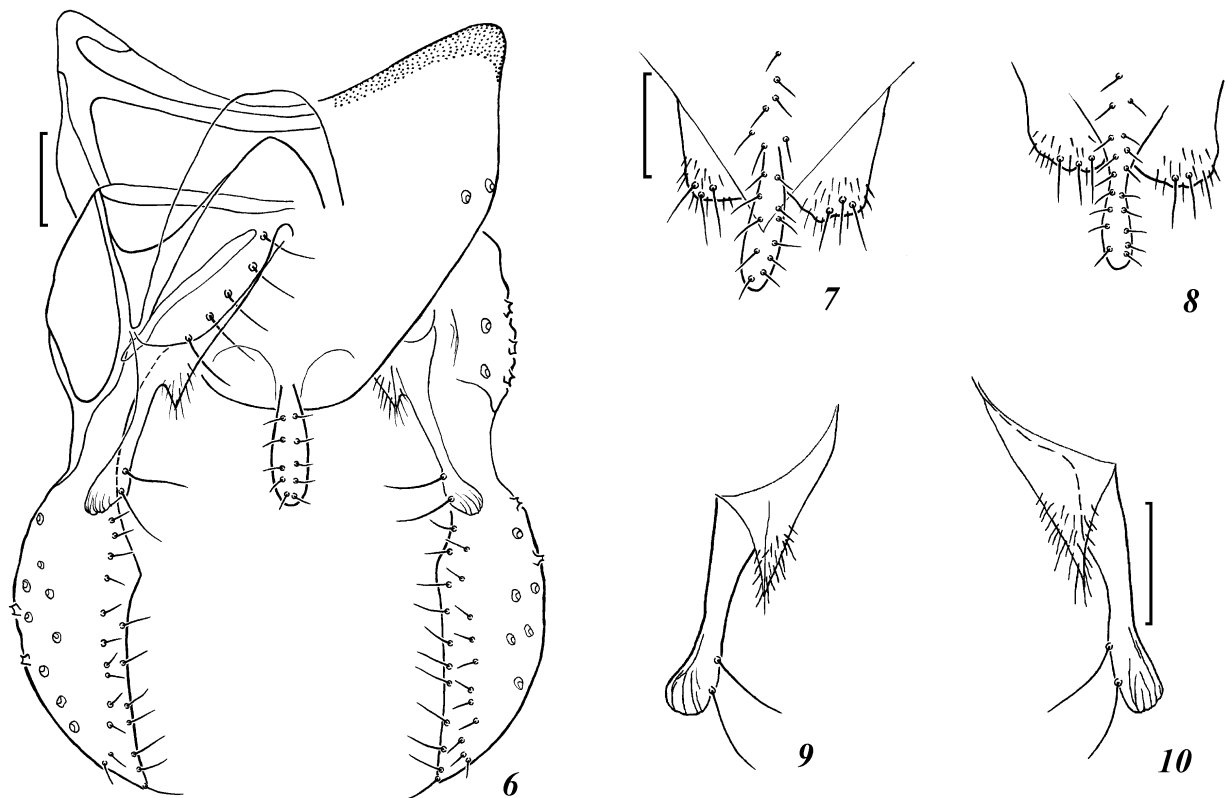
Distribution. Known only from the typical habitat—Bolshekhokhtsirsky Nature Reserve (Khabarovsk Territory).



FIGURES 1–5. Details of hypopygium structure of the male of *Polypedilum* (s. str.) *odyrensis* **sp.n.** (1–4) and *Polypedilum* (s. str.) *servatum* **sp.n.** (5). 1, 5—dorsal view of hypopygium; 2—tergite IX and anal point in dorsal view; 3, 4—superior volsella in dorsal view. Scale bars 50 µm.

TABLE 1. Lengths (in μm) and proportion of legs *Polypedilum* (s. str.) *odyrensis* sp.n.

P	fe	ti	ta ₁	ta ₂	ta ₃	ta ₄	ta ₅	LR	SV	BV	BR
P ₁	735	588	—	—	—	—	—	—	—	—	—
P ₂	861	756–777	378	252–263	210	116	84	0.50	4.28–4.33	3.15	4.13–4.38
P ₃	924	840	588	357	294	168	105	0.70	3.0	3.0–3.02	6.25

**FIGURES 6–10.** Details of hypopygium structure of the male of *Robackia lukini* sp.n. 6—dorsal view of hypopygium; 7, 8—posterior margin of tergite IX and anal point in dorsal view; 9, 10—superior and inferior volsellae in dorsal view. Scale bars 50 μm .***Polypedilum* (s. str.) *servatum* sp.n.**

(Figs 5, 16–19)

Type material. Holotype: 1 male, Russia, Khabarovsk Territory, Bolshekhlekhtsyrsky Nature Reserve, basin of the Chirka River, Golovina Stream, 13.VI.2015, leg. N.M. Yavorskaya.

Derivatio nominis. The species name is from Latin adjective *servatum* = reserved, referring to the place of collection of the type materials.

Diagnostic characters. The new species has the following combination of characteristics: wing length 1.9 mm, without spots and setae on the surface; mesonotal stripes and postnotum dark brown, ground color of thorax brown, scutellum, halteres, abdomen and legs yellowish; AR 1.45; humerals 5; anal point spear-shaped; superior volsella inwardly curved near of the base, bearing 1 lateral seta near the base, 4 basal setae and covered with microtrichia; gonostylus slightly widened in the middle, the inner margin is slightly concave; HR 1.17.

Description. *Adult male* (n=1). Total length 3.5 mm. Wing length 1.9 mm. Total length/wing length 1.89.

Coloration is brown. Antenna, mesonotal stripes and postnotum dark brown; ground color of thorax brown; scutellum, halteres, abdomen and legs yellowish.

Head. Head width 464 μm . Frontal tubercles absent. Antenna 1134 μm long. Ultimate flagellomere 672 μm long. AR 1.45. Verticals 12/14. Clypeus with 12 setae. Lengths of last 4 palpomeres (in μm) of maxillary palp: 48; 88; 120; lost.

Thorax. Antepronotals 0, acrostichals 21, humerals 5, dorsocentrals 14, prealars 6, supraalars 0. Scutellum with 16 setae.

Wing. Width 0.57 mm. Veins R with 17/20, R₁ 15/18 setae, R₄₊₅ with 28/30 setae. Squama with 13 setae; brachiolum with 1 seta. VR 1.3.

Legs. Scale of fore tibia elongated-pointed (Fig. 16). Spurs of middle and hind tibia 44 µm long. Lengths and proportions of legs as in Table 2.

TABLE 2. Lengths (in µm) and proportion of legs *Polypedilum* (s. str.) *servatum* **sp.n.**

P	fe	ti	ta ₁	ta ₂	ta ₃	ta ₄	ta ₅	LR	SV	BV	BR
P ₁	840	609	—	—	—	—	—	—	—	—	—
P ₂	966	819	462	273	210	137	95	0.56	3.86	3.15	4.38
P ₃	987	945	—	—	—	—	—	—	—	—	—

Hypopygium (Fig. 5, 17–19). Tergite IX with 8 median setae. Laterosternite IX with 2–3 setae. Anal point spear-shaped, 65 µm long, 12 µm wide, with 10/14 lateral setae at the base. Gonocoxite 143 µm long, with 4/5 inner setae. Transverse sternapodeme 37 µm long. The basal portion of the superior volsella 24 µm long and 27 µm wide, with 4 basal setae and covered with microtrichia, and 1 lateral seta located near the base; apical part of the superior volsella 61 µm long; RSVo 2.6. Inferior volsella 112 µm long, with 15/17 strong setae. Gonostylus 122 µm long and 37 µm wide, slightly widened in the middle, the inner margin is slightly concave and has 1 apical seta and 3/4 subapical setae. HR 1.17.

Female, pupa and larva unknown.

Remarks. The adult male of *P.* (s. str.) *servatum* **sp.n.** is most similar to *P.* (s. str.) *tochibicolor* Niitsuma, 1991, in the structure of hypopygium and morphometric parameters, but differs from latter *P.* (s. str.) *tochibicolor* Niitsuma by the color of thorax (scutellum and halteres yellowish), the form of anal point (spear-shaped) and the basal setae of the superior volsella located in the distal half or almost the entire length. While in the males *P.* (s. str.) *tochibicolor* has dark brown thorax including halteres, anal point narrow, parallel-sided, basal setae on superior volsella situated in distal third. Adult male of *P.* (s. str.) *servatum* **sp.n.** in form of anal point very similar to two Chinese species—*P.* (s. str.) *adustalum* Zhang, Wang, 2017 and *P.* (s. str.) *constrictum* Zhang, Wang, 2017, but differs from the latter by a combination of the characters that are given in the Table 3.

Distribution. Known only from the typical habitat—Bolshekhkhtsirsky Nature Reserve (Khabarovsk Territory).

Genus *Robackia* Sæther, 1977

Robackia lukini **sp.n.**

(Figs 6–10, 20–23)

Type material. Holotype: 1 male, Russia, Khabarovsk Territory, Bolshekhkhtsirsky Nature Reserve, Amurskaya Channel, Sosninsky Stream, 7.VIII.2008, leg. N.M. Yavorskaya. Paratypes: 1 male, some data as holotype; 2 males, some data as holotypes, Bykov Stream, 15.VII.2007, leg. N.M. Yavorskaya.

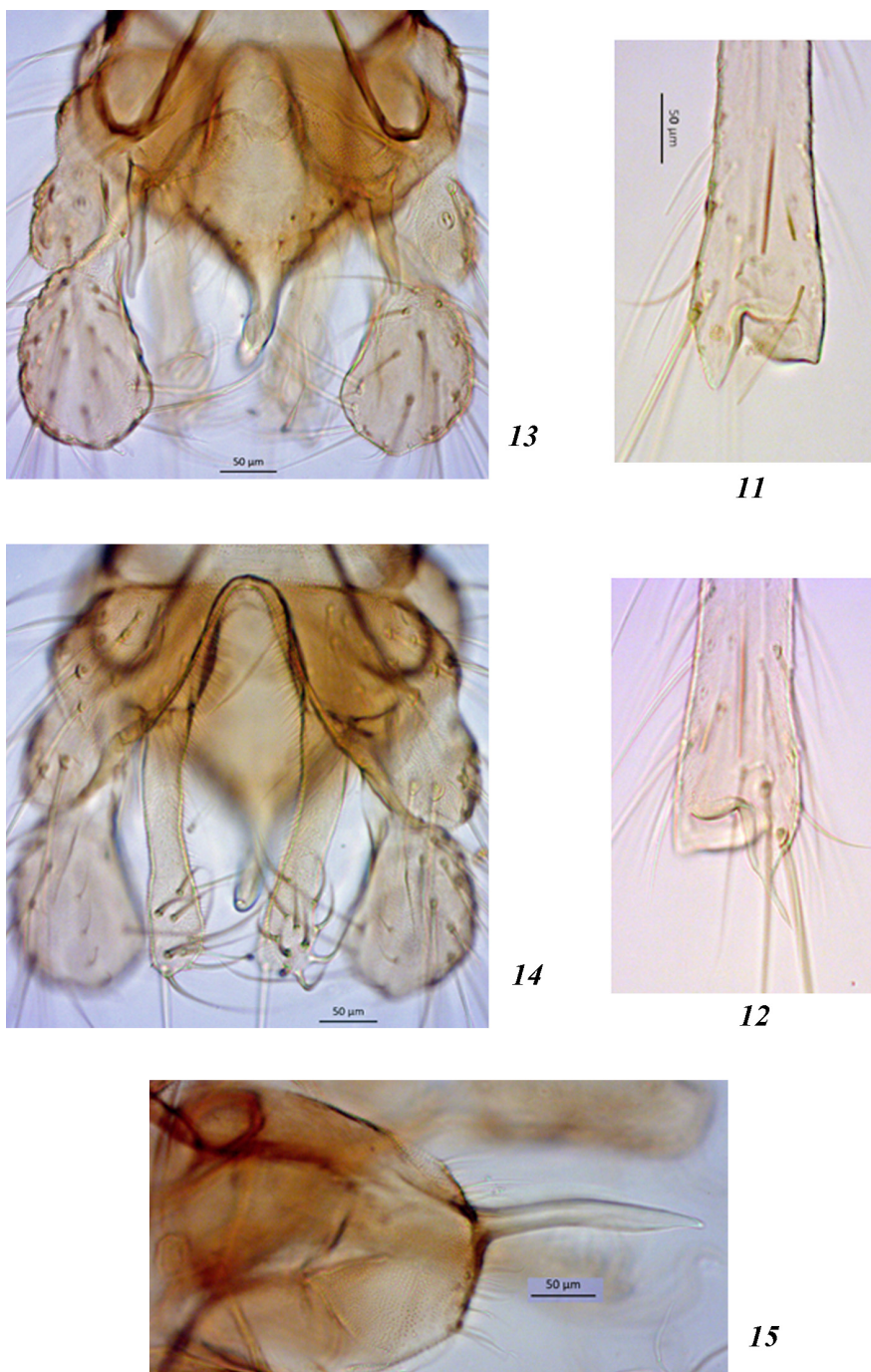
Derivatio nominis. The new species is named in honor of Alexander Lukin, the gamekeeper of the Bolshekhkhtsirsky Nature Reserve, which provided a great help in collecting the material.

Diagnostic characters. The species can be separated from other species of genus *Robackia* by the following combination of features: superior volsella 95–105 µm long, with 2 preapical setae and slightly widened membranous apex; inferior volsella elongated triangular form and densely covered with microtrichia; gonostylus knife-like, with slightly concave inner margin and protrusion in the proximal third.

Description. *Adult males* (n=4). Total length 4.6–4.8 mm. Wing length 1.92–1.95 mm. Total length/wing length 2.36–2.50.

Coloration. Flagellomere dark brown, basal segment brownish yellow; ground color of thorax and scutellum yellowish; mesonotal stripes yellowish brown; postnotum and abdomen brown; fore legs brown, sometimes

median part of fe, preapical part of ti and proximal part of ta₁ yellowish; middle and hind legs yellowish, ta_{1–5} gradually darken towards the end.

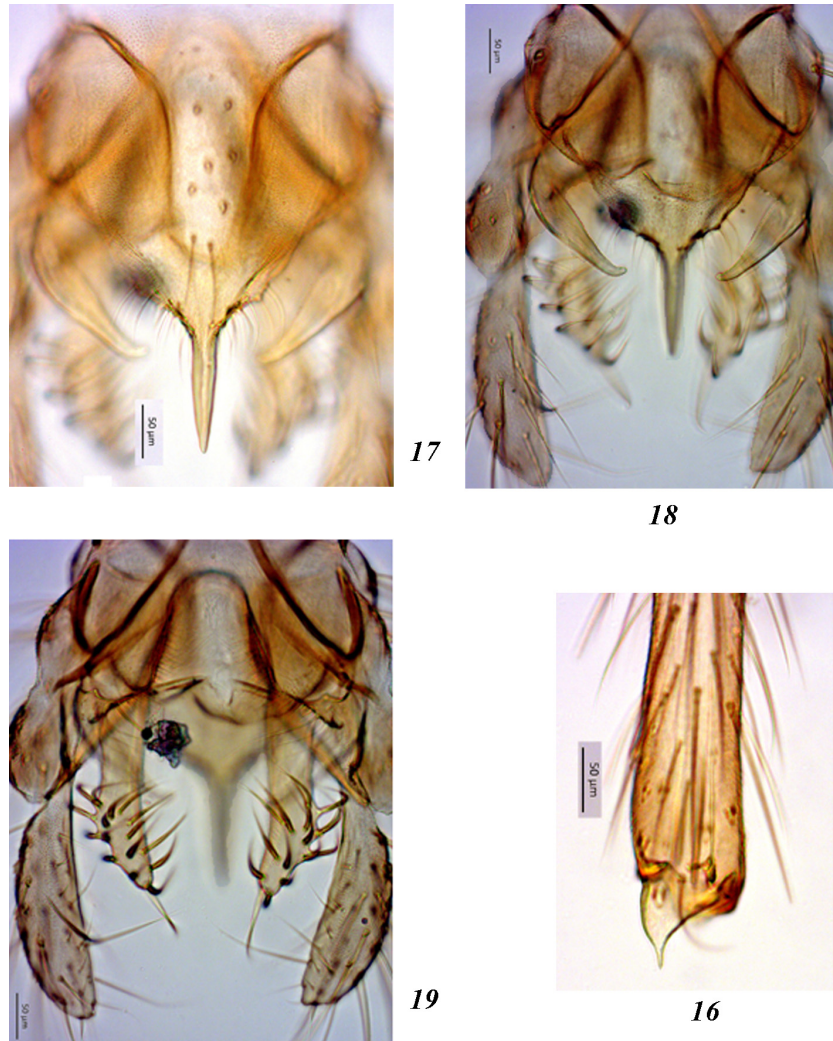


FIGURES 11–15. The male of *Polypedilum* (s. str.) *odyrensis* **sp.n.** 11–12—apex of fore tibia; 13–14—hypopygium; 15—tergite IX and anal point. Scale bars 50 µm.

Head. Head width 632 µm. Frontal tubercles absent. Antenna 1218–1323 µm long. Ultimate flagellomere 840–945 µm long. AR 2.20–2.75. Verticals 12–20. Clypeus with 12–17 setae. Maxillary palp 632–704 µm long, lengths of last 4 palpomeres (in µm): 64; 168–192; 152–160; 248–288. HW/PL 0.96–1.00; A1/P1 1.93–2.02.

Thorax. Anteprenotals 1–4, acrostichals 10–17, dorsocentrals 8–13, prealars 4–5, supraalars 1. Scutellum with 11–12 setae.

Wing. Width 0.5–0.6 mm. Veins R with 4–6, R₁ without setae, R₄₊₅ with 1–2 setae. Squama with 12–16 setae; brachiolum with 2–3 setae. VR 1.09–1.12.



FIGURES 16–19. The male of *Polypedilum* (s. str.) *servatum* **sp.n.** 16—apex of fore tibia; 17–19—hypopygium. Scale bars 50 µm.

TABLE 3. Comparative morphometric characteristics of adult males of the genus *Polypedilum* Kieffer

Characters/species	<i>P.</i> (s. str.) <i>tochibicolor</i> Niitsuma, 1991	<i>P.</i> (s. str.) <i>adustalum</i> Zhang & Wang, 2017	<i>P.</i> (s. str.) <i>constrictum</i> Zhang & Wang, 2017	<i>P.</i> (s. str.) <i>servatum</i> sp.n.
Total length, mm	2.5–3.2	5.15	2.83–3.65	3.5
Wing length, mm	1.7–2.3	2.55	1.70–2.27	1.9
AR	1.40–1.52	0.96	0.83–0.94	1.45
LR _{p1}	1.58–1.66	1.74	1.89–1.97	—
Ac	19–23	17	15–18	21
Dc	19–23	21 including 4 humerals	18–28 including 4–6 humerals	14 + 5 humerals
Pa	4–5	6	5–6	6
Scts	13–16	32	13–23	16
Squama	14–21	38	27–32	13
Anal point	almost parallel-sided	constricted from distal ¼ to apex	constricted from distal 1/3 to apex	constricted from distal 1/3 to apex
Location of lateral setae on SVo	near the base	in the middle	in the middle	near the base
HR	~1.0	1.0	0.79–0.83	1.17

Legs. Spurs of middle tibia 27–31 μm , of hind tibia 27–34 μm long. Lengths and proportions of legs as in Table 4.

TABLE 4. Lengths (in μm) and proportion of legs *Robackia lukini* sp.n.

P	fe	ti	ta ₁	ta ₂	ta ₃	ta ₄	ta ₅	LR	SV	BV	BR
P ₁	840–945	567–630	1134–1155	630–672	441–462	347–357	179–189	1.83–2.00	1.24–1.36	1.58–1.70	2.00–2.56
P ₂	756–840	735–756	420–462	210–252	147–168	84–95	63–84	0.56–0.61	3.32–3.80	3.40–4.00	2.67–2.73
P ₃	798–861	945–1008	672–693	336–357	252	147	95–105	0.67–0.73	2.55–2.69	2.85–3.04	3.93–4.17

Hypopygium (Figs 6–10, 20–23). Tergite IX without median setae. Laterosternite IX with 2–4 setae. Anal point 54–68 μm long, 17–24 μm wide, expanded in the apical 1/3, with 12–15 short dorso-lateral setae, sometimes they are also located at the base of the anal point; the projections at the base of the anal point are covered with long microtrichia and bear 3–4 setae. Gonocoxite 102–136 μm long, with 4–6 inner setae. Transverse sternapodeme 51–68 μm long. Phallapodeme 102–119 μm long. Superior volsella length 95–105 μm , with 2 preapical setae (length 24–34 μm), located at a distance of 7–17 μm from each other, microtrichia absent; the membranous apex is slightly widened. Inferior volsella in the form of an elongated triangular lobe densely covered with microtrichia. Gonostylus knife-like, 211–228 μm long and 71–75 μm wide; the inner margin is slightly concave and has a protrusion in the proximal third, with 1 apical seta and 6 inner setae. HR 0.48–0.65.

Female, pupa and larva unknown.

Remarks. The new species is very different from all known species of the genus *Robackia* Sæther, 1977 by the original structure of hypopygium, namely, by the presence of a membrane-like apical lobe on the superior volsella, by the triangular shape of the inferior volsella and the knife-shaped form of the gonostylus.

Distribution. Known only from the typical habitat—Bolshekhkhtsirsky Nature Reserve (Khabarovsk Territory).

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