Zootaxa 5323 (1): 001–026
https://www.mapress.com/zt/

Article

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

https://doi.org/10.11646/zootaxa.5323.1.1
http://zoobank.org/urn:lsid:zoobank.org:pub:AABE0C7B-9A90-4CF9-9707-936FF912853D

Review of subfamily Prodiamesinae (Diptera: Chironomidae) from the Russian Far East and bordering territory

EUGENYI A. MAKARCHENKO[1,2*] & ALEXANDER A. SEMENCHENKO[1,3]
[1]*Federal Scientific Center of the East Asia Terrestrial Biodiversity, Far East Branch of the Russian Academy of Sciences, 100 let Vladivostoku 159, 690022 Vladivostok, Russia*
[2] *makarchenko@biosoil.ru; http://orcid.org/0000-0003-2765-8729*
[3] *semenchenko_alexander@mail.ru; https://orcid.org/0000-0001-7207-9529*
[*]*Corresponding author*

Abstract

Based on material from the Russian Far East and Eastern Siberia, a revision of the chironomids of the subfamily Prodiamesinae was carried out. A new species *Monodiamesa fontinalis* **sp. nov.**, is here described, ten species from four genera—*Monodiamesa bathyphila* Kieffer, *M. kamora* Makarchenko et Yavorskaya, *M. improvisa* Makarchenko, *M. nitida* Kieffer, *Odontomesa fulva* Kieffer, *Prodiamesa levanidovae* Makarchenko, *Propsilocerus amurensis* Makarchenko, *P. jacuticus* (Zvereva), *P. paradoxus* Lundström and *P. taimyrus* Zelentzov are redescribed with varying degrees of completeness. *Propsilocerus taimyrus* Zelentzov, 2000 is proposed as senior synonym of *P. saetheri* Wang, Liu et Paasivirta, 2007**.** DNA barcoding of four species, *M. fontinalis* **sp. nov.,** *M. bathyphila, P. olivacea* Meigen and *P. akamusi* (Tokunaga) was provided. Species delimitation and phylogenetic relationships using COI DNA barcodes confirms the species validity of *M. fontinalis* **sp. nov.**

Key words: Diptera, Chironomidae, Prodiamesinae, review, taxonomy, DNA barcoding, Far East, East Siberia

Introduction

In recent years following Cranston *et al.* (2012) and the transfer of the genus *Propsilocerus* Kieffer from the subfamily Orthocladiinae to the subfamily Prodiamesinae, attention to the taxonomy and systematics of Prodiamesinae has increased and several interesting papers have been published (Yu *et al.* 2020; Baranov 2021; Han *et al.* 2021; Shi *et al.* 2021). As a result, the subfamily Prodiamesinae is now represented by 35 species belonging to 5 genera—*Compteromesa* Sæther (3 species), *Monodiamesa* Kieffer (14 species), *Odontomesa* Pagast (3 species), *Prodiamesa* Kieffer (6 species) and *Propsilocerus* Kieffer (9 species) (Ashe & O'Connor 2009, 2012; Han *et al.* 2021; Shi *et al.* 2021).

During the revision of the subfamily Prodiamesinae of the Russian Far East and bordering territory of East Siberia we identified 5 species of the genus *Monodiamesa* (*M. bathyphila* Kieffer, *M. fontinalis* **sp. nov.**, *M. kamora* Makarchenko et Yavorskaya, *M. improvisa* Makarchenko and *M. nitida* Kieffer), 1 species of *Odontomesa* (*O. fulva* Kieffer), 2 species of *Prodiamesa* (*P. levanidovae* Makarchenko and *P. olivacea* Meigen) and 5 species of *Propsilocerus* (*P. akamusi* Tokunaga, *P. amurensis* Makarchenko, *P. jacuticus* (Zvereva), *P. paradoxus* Lundström and *P. taimyrus* Zelentzov)). Unfortunately descriptions of some of them are insufficient and a redescription is needed.

Below we provide an illustrated description of adult male with barcoding data of *M. fontinalis* **sp. nov.** from Amur River basin, as well as redescriptions of males of *M. bathyphila*, *M. kamora*, *M. improvisa*, *P. levanidovae*, *P. amurensis*, *P. jacuticus*, *P. paradoxus* and *P. taimyrus* from the Russian Far East and East Siberia. For some of these species information on DNA barcoding is given, for others only taxonomic notes are added.

DNA sequences of the mitochondrial cytochrome c oxidase subunit I gene (COI) were used to species delimitation (both tree and distances based) with an attempt to a phylogeny reconstruction. The use of DNA barcoding for chironomids of subfamily Prodiamesinae has proved its worth for species identification and species boundary

Accepted by B. Rossaro: 28 Jun. 2023; published: 31 Jul. 2023

analysis (Makarchenko *et al.* 2018, Han *et al.* 2021). Here, we validate new species *M. fontinalis* **sp. nov.** based on DNA barcodes and also add molecular data for other Prodiamesinae from Russian Far East—*M. bathyphila, P. olivacea* and *P. akamusi*. Phylogenetic tree of all available Prodiamesinae (except *Odontomesa*) using Bayesian inference was provided.

Materials and methods

The adults of chironomids were preserved in 96% ethanol for DNA-analysis and in 70% ethanol for further study of morphology. It should be noted that only adult males were used for the morphological study, whereas in some cases pupae and larvae were used for the DNA barcoding.

The material was slide-mounted in polyvinyl lactophenol. The terminology follows Sæther (1980). The photographs were taken using an Axio Lab.A1 (Karl Zeiss) microscope with an AxioCam ERc5s digital camera, and then stacked using Helicon Focus software. The final illustrations were post-processed for contrast and brightness using Adobe® Photoshop® software.

Total genomic DNA was extracted using DNeasy Blood and Tissue kit (Qiagen, Hilden, Germany) followed the manufacturer's instructions. We amplified mitochondrial protein coding gene cytochrome c oxidase 1 (COI) using the polymerase chain reaction (PCR). For primers, reaction protocols, cycle programs used for amplification and purification of PCR products, species delimitation approaches and phylogenetic analysis see Makarchenko *et al*. (2023). The best models for the first, second and third codon position of COI was SYM+G (Zharkikh 1994), HKY+I (Hasegawa *et al.* 1985) and GTR+G (Tavare 1986) respectively.

For the phylogenetic reconstruction we mined from GenBank and BOLD system database DNA barcodes of Prodiamesinae including *Monodiamesa*, *Prodiamesa* and *Propsilocerus*. We used 1–2 sequences from each available BIN BOLD numbers of available Prodiamesinae. For species of interest *P. olivacea* and *P. akamusi* we used one sequence from each available country of specimen collection. The obtained sequences have been deposited in GenBank under numbers OQ469501-OQ469521.

Holotype and paratypes of the new species, as well as all other material, 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).

Taxonomy

Monodiamesa fontinalis Makarchenko et Semenchenko, sp. nov.

http://zoobank.org/NomenclaturalActs/0F1A8DAF-C37A-46EB-9F0F-415F08589B7E
(Figs. 1–2, 4, 6)

Type material. Holotype: adult male, ***Russia:*** Russian Far East, Jewish Autonomous Region, Obluchie District, Fedotkin Spring of Bidzhan River basin (Amur River basin), 48.644139 N, 131.621685 E, 5.IV.2014, leg. E. Makarchenko. Paratypes: 1 adult male, the same data as holotype; 3 larvae of fourth instar, the same data as holotype, except Kolgaevskyi Spring, 48.645945 N, 131.622981 E, 8.IV.2014, leg. E. Makarchenko.

Derivatio nominis. The name of the new species comes from the Latin *fontinalis*, which means spring.

Description

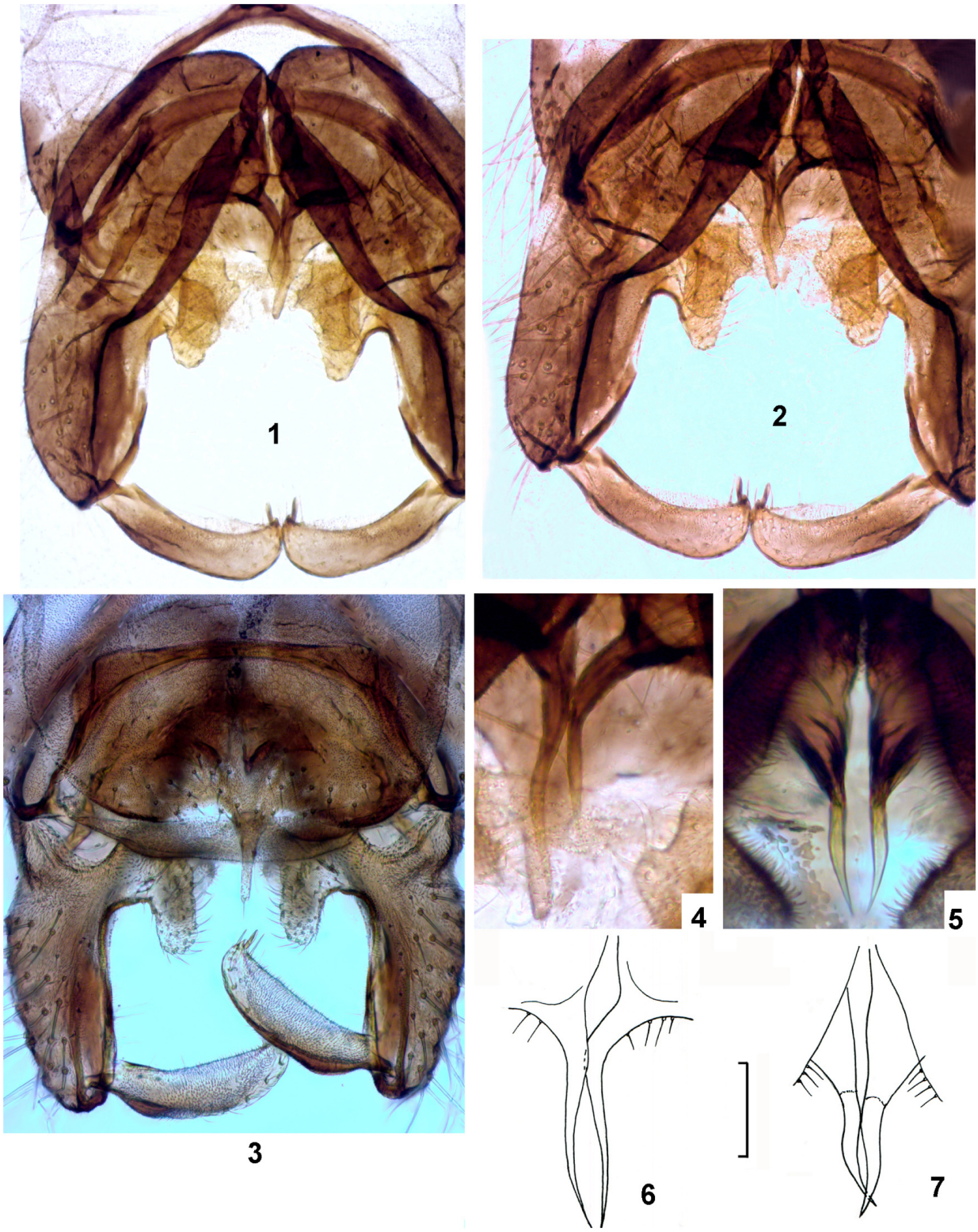
Adult male (n = 1). Total length 6.4 mm. Total length/wing length 1.57.

Coloration. Head, thorax, legs, and abdomen brown to dark brown; antennae light brown; wings greyish.

Head. Eyes bare, with long parallel-sided dorsomedial extention. Temporal setae including 4 coronals, 8–14 preoculars, 14–22 verticals, and 7–11 postorbitals. Clypeus with 23–24 setae. Antenna with 13 flagellomeres and developed plume; terminal flagellomere without subapical setae; AR 2.0. Palpomeres lengths (in µm): 60; 100; 184; 180; 212. Palpomeres 1–5 length/head width 0.83.

Thorax. Antepronotum with 5–6 lateral setae. Acrostichals absent, dorsocentrals 13, prealars 7, scutellars *ca* 60.

Wing. Length 4.08 mm, width 0.92 mm. R and R_1 with 10; R_{4+5} with 1 seta in distal part. Costa extension 115 µm long. RM length/MCu length 1.22–1.3. Anal lobe developed, outline rounded. Squama with 32 setae 105–150 µm long. VR 1.03.



FIGURES 1–7. Adult males of *Monodiamesa fontinalis* **sp. nov. (1–2, 4, 6)** and *M. bathyphila* Kieffer **(3, 5, 7). 1, 3,** hypopygium in dorsal view; **2,** hypopygium in ventral view; **4–7,** median volsellae. Scale bar is 50 µm.

Legs. Spur of fore tibia 96 µm long; spurs of mid tibia 72 µm and 60 µm; of hind tibia 96 µm and 72 µm long. Hind tibial comb with 12 setae. Lengths and proportions of leg segments as in Table 1.

Hypopygium (Figs. 1–2, 4, 6). Tergite IX with 14–16 setae (from one side), 20–28 µm long and anal point 64–68 µm long, which with apical seta 20–24 µm long (Fig. 1). Laterosternite IX with 9–14 setae. Gonostylus 168–176 µm long, covered with short setae, with megaseta 20 µm long and 1–2 setae nearest, 20–24 µm long (Figs.

1–2). Gonocoxite 436–440 µm long, shape of superior and inferior volsellae as in Figs 1–2, 4, 6. Length of superior volsella 84–96 µm, inferior volsella 88–100 µm. Median volsella 116–120 µm long, without pedestal for seta, in basal part with 3–4 setae (Figs.4, 6). HR 2.5–2.6.

TABLE 1. Lengths (in µm) and proportions of leg segments of *Monodiamesa fontinalis* **sp. nov.** (n=1).

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV
P_1	1378	1673	1378	672	492	344	230	0.82	2.55	2.21
P_2	1427	1574	771	459	361	279	197	0.49	2.91	3.89
P_3	1480	1800	1080	640	492	295	230	0.60	2.63	3.04

Pupa unknown.

Larva can be separated from *M. bathyphila* only by molecular data.

Diagnosis. Male of *M. fontinalis* **sp. nov.** is very closely related to *M. bathyphila* from which it differs only in a few characters, namely, indexes of the antennae and legs (AR 2.0, LR_1 0.82), fewer dorsocentrals (13), longer Superior volsella (84–96 µm) and Median volsella (116–120 µm), Median volsella without pedestal for seta (Table 2). In male *M. bathyphila* AR 2.76–3.34, LR_1 0.74–0.77, dorsocentrals 18–22, Superior volsella 40–60 µm long, Median volsella 60–112 µm long and with pedestal (Figs. 5, 7, Table 2).

Distribution. Known only from type locality in Amur River basin and from South Korea (see below in part on DNA barcoding).

TABLE 2. Comparison of adult males characters of *Monodiamesa fontinalis* **sp. nov.** and *M. bathyphila* Kieffer.

Characters	*M. fontinalis* **sp. nov.** (n=2)	*M. bathyphila* Kieffer (n=5), our data
Total length, mm	6.4	5.7–6.2
Wing length, mm	4.1	4.5–4.7
TL/WL	1.57	1.25–1.35
AR	2.0	2.76–3.34
Clypeals	8	9–10
Dorsocentrals	13	18–22
Prealars	7	6–8
Scutellars	*ca* 40	30–32
Squamal setae	32	39–47
LR1	0.82	0.74–0.77
LR_2	0.49	0.45–0.47
LR3	0.60	0.51–0.54
BV1	2.55	2.56–2.67
BV2	2.91	2.99–3.03
BV3	2.63	2.73–2.79
SV1	2.21	2.31–2.45
SV2	3.89	3.96–4.15
SV3	3.04	3.29–3.52
Tergite IX, number of setae	28–32	33–39
Anal point length, ìm	64–68	56–92
SVo length, ìm	84–96	40–60
MVo length, ìm	116–120	60–112
MVo	without pedestal	on pedestal
IVo length, ìm	88–100	72–92
Gonocoxite length, ìm	436–440	432–541
Gonostylus length, ìm	168–176	176–200
HR	2.5–2.6	2.45–2.71

***Monodiamesa bathyphila* (Kieffer)**
(Figs. 3, 5, 7)

Prodiamesa bathyphila Kieffer, 1918: 102; Thienemann 1919: 210, 214. Tshernovskij 1949: 107; Pankratova 1970: 109;
Prodiamesa chuzenigra Sasa, 1989:151.
Prodiamesa kamidefea Sasa et Hirabayashi, 1993: 379.
Monodiamesa bathyphila (Kieffer); Goetghebuer 1939: 3; Pagast 1947: 501; Brundin 1952: 48; Sæther 1973: 675; Pinder 1978: 45; Makarchenko 1985: 102, 2006: 279, 480, 622; Langton & Pinder 2007: 62; Ashe & O'Connor 2009: 323.

Material examined. ***Russia:*** 2 adult males, Russian Far East, Chukotka Autonomous Okrug, Anadyr District, Seutakan Lake, 48.645945 N, 131.622981 E, 13.07.1976, 24.07.1976, leg. E. Makarchenko; 2 adult males, Republic of Sakha (Yakutia), Momsky district, Bolshoy Darpir Lake, 64.188542 N, 148.044258 E, 5.08.2018, leg. E. Khamenkova; 1 adult male, Republic of Sakha (Yakutia), Momsky district, Malyi Darpir Lake, 64.072464 N, 148.039544 E, 8.08.2018, leg. E. Khamenkova; 2 adult males, Magadan Region, Susumansky District, Malyk Lake, 63.488711 N, 147.852803 E, 26.07.2020, leg. E. Khamenkova.

Comments. Some variation is added based on the males from the Russian Far East.

Description

Adult male (n = 5). Total length 5.2–6.8 mm. Total length/wing length 1.22–1.37.

Coloration. Head, thorax, legs, and abdomen brown to dark brown; antennae brown; wings grayish.

Head. Eyes bare, with long parallel-sided dorsomedial extention. Temporal setae including 4 coronals, 8–10 preoculars, 8 verticals. Clypeus round-rectangular, with 6–9 setae. Antenna with 13 flagellomeres and developed plume; terminal flagellomere without subapical setae; AR 2.5–3.34. Palpomeres lengths (in µm): 60–68; 78–92; 135–154; 139–160; 164–210. Palpomeres 1–5 length/head width 0.64–0.98.

Thorax. Antepronotum with 4–16 lateral setae. Acrostichals absent, dorsocentrals 14–22, prealars 5–8, scutellars 26–32.

Wing. Length 4.1–4.72 mm, width 0.9–1.28 mm. R and R_1 with 9–15; R_{4+5} with 0–5 seta in distal part. RM length/MCu length 1.0–2.0. Anal lobe developed, outline rounded. Squama with 26–47 setae; VR 0.94.

Legs. Spur of fore tibia 112–124 µm long; spurs of mid tibia 88–104 µm and 82–104 µm; of hind tibia 104–124 µm and 68–96 µm long. Hind tibial comb absent or not separate from other setae. Lengths and proportions of leg segments as in Table 3.

TABLE 3. Lengths (in µm) and proportions of leg segments of *Monodiamesa bathyphila* Kieffer, male (n=5).

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5
P_1	1312–1378	1656–1787	1230–1369	607–672	451–525	279–344	230–246
P_2	1410–1525	1640–1804	771–820	476–492	344–394	230–262	213–230
P_3	1560–1600	1960–2080	100–1120	623–689	476–541	262–279	262–246

continued.

	LR	BV	SV	BR
P_1	0.74–0.77	2.56–2.67	2.31–2.45	3.1–4.2
P_2	0.45–0.47	2.99–3.03	3.96–4.15	2.5–2.8
P_3	0.51–0.54	2.73–2.79	3.29–3.52	3.6–3.8

Hypopygium (Figs. 3, 5, 7). Tergite IX with 33–39 setae, 20–28 µm long and anal point 56–92 µm long, which with apical seta 20–28 µm long; 6 setae located in basal part of anal point. Laterosternite IX with 11 setae. Gonostylus 176–200 µm long, covered with short setae, megaseta 16–20 µm long and 1–2 setae nearest, 20–24 µm long. Gonocoxite 432–541 µm long, shape of superior and inferior volsellae as in Figs. 3, 5, 7. Length of superior volsella 40–60 µm, inferior volsella 72–92 µm. Median volsella on pedestal, 60–112 µm long, in basal part with 3–4 setae. HR 2.45–2.71.

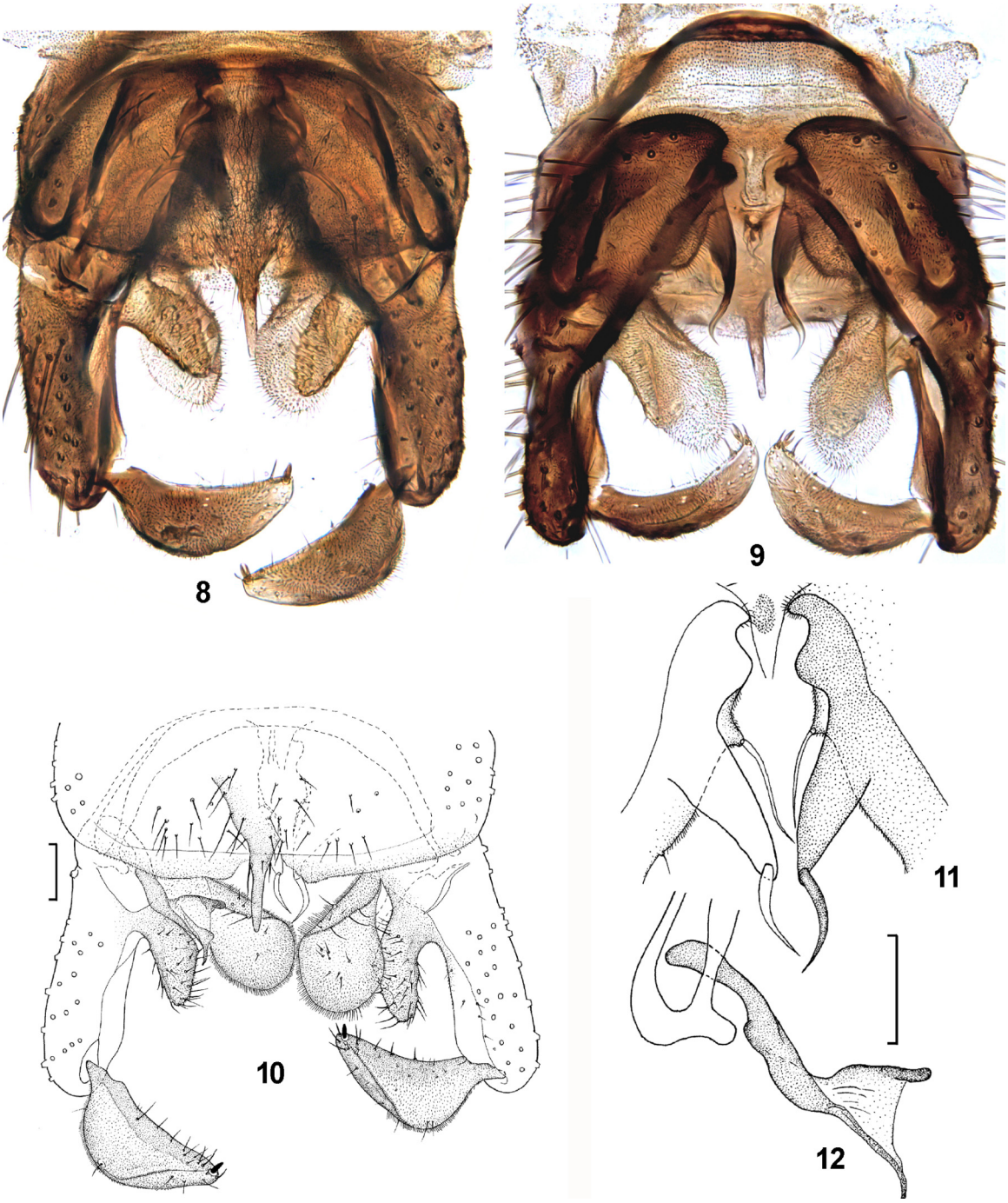
Pupa and ***larva*** described in detail by Thienemann (1919), Pagast (1947), Tshernovskij (1949), Pankratova (1970), Saether (1973) and Makarchenko (1985). Larva can be separated from *M. fontinalis* **sp. nov.** only by molecular data.

Distribution. Holarctic arctoalpine species, lives in oligo- and mesotrophic lakes (Sæther 1979).

Monodiamesa kamora **Makarchenko et Yavorskaya**
(Figs. 8–12)

Monodiamesa kamora Makarchenko et Yavorskaya, 2008: 175; Ashe & O'Connor 2009: 324; Makarchenko *et al.* 2018: 3.

Material examined. ***Russia:*** 1 adult male (holotype), Russian Far East, Khabarovsk Territory, Nikolayevsk District, left bank of Amur River, Kamora River in environs of the city Nikolaevsk-on-Amur, 24.VI 2007, leg. N. Yavorskaya; 58 adult males, the same data except Amurskyi District, Bolon Nature Reserve, Simmi River near cordon Cheremshinaya, 25.V 2016, leg. N. Yavorskaya; 18 adult males, the same river near cordon Kirpu, 49.507283 N, 136.033228 E, 25.V 2016, leg. N. Yavorskaya; 6 adult males, the same river near cordon Vakhtar, 26.V 2016, leg. N. Yavorskaya; 24 adult males, the same Nature Reserve, Selgon River, 26.V 2016, leg. N. Yavorskaya.



FIGURES 8–12. Adult male of *Monodiamesa kamora* Makarchenko et Yavorskaya. **8, 10,** hypopygium in dorsal view; **9,** hypopygium in ventral view; **11,** median volsellae and basal setae; **12,** phallapodeme and aedeagal lobe. Scale bars are 50 µm.

Comments. The male of this species is described in detail from Amur River basin of the Russian Far East (Makarchenko & Yavorskaya 2008; Makarchenko *et al.* 2018) and therefore below we give only brief diagnosis.

Description

Adult male. Total length 3.9–5.1 mm. Temporal setae including 2–4 verticals and 6–7 postorbitals. Clypeus with 15–16 setae. Head width/palpal length 1.–1.31. Antenna with 13 flagellomeres, AR 1.75–2.08. Acrostichals absent, dorsocentrals 18–23 (in 1–2 rows), prealars 8, supraalars 1. Scutellum with 41–55 setae. Wing length 3.04–3.16 mm. Anal lobe well developed, roundish and projected forward. LR_1 0.67–0.72, BV_1 2.56–2.65, SV_1 2.49–2.65.

Hypopygium (Figs. 8–12). Tergite IX with anal point 72–88 µm long and with 46–49 setae, some of that situated in basal part of anal point (Figs 8–10); laterosternite IX with 12–13 setae. Gonostylus in middle outer part prominent, 152–156 µm long, with megaseta 64 µm long and 1–2 setae nearest 80 µm long (Fig. 8). Gonocoxite 356–368 µm long, shape of superior and inferior volsellae as in Figs 8–10. Length of superior volsella 92–104 µm, inferior volsella 124–132 µm. Median volsella setae-like, slightly curved 40–44 µm long and situated on dark-brown pedestal 84–104 µm long. Near of median volsella in anterio-ventral part situated seta 52–60 µm long on small tubercle (Fig. 11). Phallapodeme with aedeagal lobe as in Fig. 12.

Pupa and ***larvae*** unknown.

Distribution. Known only from Amur River basin of the Russian Far East.

Monodiamesa improvisa Makarchenko

(Figs. 13–14)

Monodiamesa improvisa Makarchenko, 1984: 99, 1985: 104, 2006: 279; Ashe & O'Connor 2009: 324.

Material examined. ***Russia:*** 2 adult males (holotype and paratype), Russian Far East, Primorye Territory, Ussuri River (Amur River basin) near Lesozavodsk City, 45.459681 N, 133.393526 E, 23.VI.1983, leg. V.Bogatov and M. Tiunov.

Comments. This species was described by 2 adult males in Russian and slides were not in good condition. We found it expedient to make the redescription in English and, if possible, as detailed as the material allowed.

Description

Adult male (n = 1). Total length 5.0 mm. Total length/wing length 1.7.

Coloration. Light brown, with a yellowish tint; palpomeres brownish grey; postnotum brown; wings grayish; legs brownish yellow.

Head. Eyes bare, with long parallel-sided dorsomedial extention. Temporal setae including 4 coronals, and 7 verticals. Clypeus trapezoidal, with 10 setae. Antenna with 13 flagellomeres and developed plume; AR 1.9–2.0. Palpomeres lengths (in µm): 41; 65; 145; 145; 200. Palpomeres 1–5 length/head width 0.83.

Thorax. Antepronotum with 7 lateral setae. Acrostichals absent, dorsocentrals 14, prealars 7, supraalars 1, scutellars 9 (in 1 row).

Wing. Length 2.8 mm, width 1.6 mm. R and R_1 with 12–16; R_{4+5} with 0–2 setae in distal part. RM length/MCu length 1.78. Anal lobe developed, outline rounded. Squama with 33 setae in 1–2 rows.

Legs. Spur of fore tibia 75 µm long; spurs of mid tibia 55 µm and 50 µm; of hind tibia 80 µm and 50 µm long. Hind tibial comb with 11 setae. Lengths and proportions of leg segments as in Table 4.

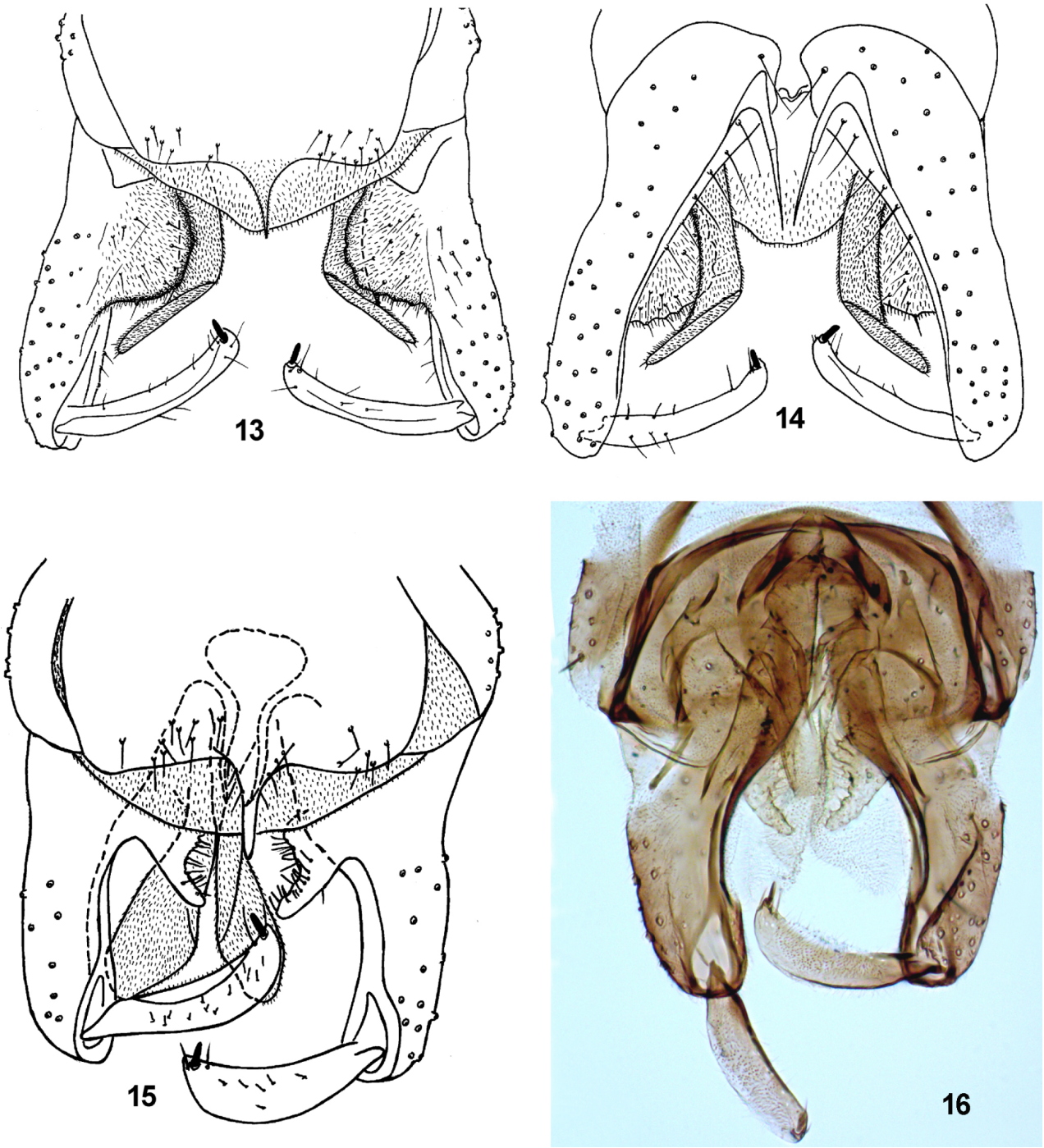
TABLE 4. Lengths (in µm) and proportions of leg segments of *Monodiamesa improvisa* Makarchenko (n=1).

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV
P_1	958	1184	995	479	391	277	189	0.84	2.36	2.15
P_2	970	970	542	290	227	164	151	0.56	2.98	3.58
P_3	995	1235	718	403	315	176	164	0.58	2.79	3.11

Hypopygium (Figs. 13–14). Tergite IX with 19–20 short setae and short anal point, which at the base without setae and without apical seta (Fig. 13). Laterosternite IX with 6–7 setae. Gonostylus narrow, only slightly curved, with large megasetae and 2 long setae near to it, rarely covered with short setae. Gonocoxite with large rounded superior volsella covered with short setae. Inferior volsella narrow, slightly longer than gonostylus and slightly curved distally outward. Median volsella setiform, on pedestal (Fig. 14). HR 2.2.

Pupa and ***larva*** unknown.

Distribution. Known only from Ussuri River of Amur River basin.



FIGURES 13–16. Adult males of *Monodiamesa improvisa* Makarchenko **(13–14)** and *M. nitida* Kieffer **(15–16). 13, 15,** hypopygium in dorsal view; **14, 16,** hypopygium in ventral view.

Monodiamesa nitida **(Kieffer)**

(Figs. 15–16)

Prodiamesa nitida Kieffer, 1918: 102, 1919: 133; Pagast 1947: 500.

Monodiamesa nitida (Kieffer); Goetghebuer 1939: 4; Brundin 1952: 51; Sæther 1973: 675; Makarchenko 1985: 103, 2006: 279; Ashe & O'Connor 2009: 324; Krasheninnikov & Bogomolova 2017: 86.

Material examined. ***Russia:*** 1 adult male, Russian Far East, Magadan Region, Tenkinskyi District, Sibit-Tyellakh Village, Olen Stream, Kolyma River basin, 61.947262 N, 149.613585 E, 1.VII.1977, leg. E. Makarchenko. 1 adult male, the same data, except Ozernyi Stream, 25.VIII.1977, leg. E. Makarchenko; 2 adult male, Sakhalin Island, Noglicki District, Rybnoye Lake, about 3 km from Val Village, 52.356233 N, 143.002979 E, 4.VIII.2003, leg. E. Makarchenko; 5 adult males, Sakhalin Island, Okha District, Ossoi River (Chaivo Bay basin), 19.VIII.2001, leg. T. Tiunova.

Comments. Some variation is added based on the males from the Russian Far East.

Description

Adult male (n = 4). Total length 3.6–4.0 mm. Total length/wing length 0.92–1.44.

Coloration. Brown to dark brown,

Head. Eyes bare, with long parallel-sided dorsomedial extention. Temporal setae including 4 coronals, 8 verticals and 5–6 postorbitals. Clypeus with 8 setae. Antenna with 13 flagellomeres and developed plume; AR 1.5–2.1. Palpomeres lengths (in µm): 41; 76–101; 147–172; 126–155; 176–185. Palpomeres 1–5 length/head width 0.90–0.96.

Thorax. Antepronotum with 5 lateral setae. Acrostichals absent, dorsocentrals 9–11, prealars 6, scutellars *ca* 20.

Wing. Length 2.7–3.9 mm, width 0.7–0.73 mm. R and R_1 with 9–12; R_{4+5} with 2 setae in distal part. RM length/MCu length 0.95. Anal lobe developed, outline rounded. Squama with 27–32 setae.

Legs. Spur of fore tibia 75 µm long; spurs of mid tibia 55 µm and 50 µm; of hind tibia 80 µm and 50 µm long. Hind tibial comb with 11–14 setae. Lengths and proportions of leg segments as in Table 5.

TABLE 5. Lengths (in µm) and proportions of leg segments of *Monodiamesa nitida* (Kieffer), male (n=2).

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5
P_1	951–1148	1181–1476	902–1230	459–590	312–410	230–279	180
P_2	1017–1246	1115–1394	476–607	312–394	246–312	164–213	164–180
P_3	1050–1410	1230–1614	722–951	410–541	312–410	197–238	164–205

continued.

	LR	BV	SV	BR
P_1	0.76–0.83	2.57–2.64	2.13–2.36	2.8
P_2	0.43–0.44	2.33–2.94	4.35–4.48	2.1
P_3	0.59	2.77–2.85	3.16–3.18	2.3

Hypopygium (Figs. 15–16). Tergite IX with anal point, 60–76 µm long, in basal part with 6–11 short setae. Laterosternite IX with 7–11 setae. Gonostylus 116–148 µm long, slightly curved and covered with short setae, with megaseta 16–20 µm long and 1–2 setae nearest, 14–20 µm long. Gonocoxite 328–344 µm long. Superior volsella 60–96 µm long, with a wide basal part and narrow distal part. Median volsella seta-like on pedestal, 80–100 µm long, pedestal length 32–36 µm. Inferior volsella 196–200 µm, 1.3–1.5 times as long as gonostylus, but not reaching distal apex of gonocoxite. HR 2.22–2.53.

Distribution. Known from Europe, North Ural (Pechora River) and Russian Far East (Chukotka, Kolyma River basin, Kurile and Sakhalin Islands). Inhabitant of oligotrophic lakes.

Odontomesa fulva **(Kieffer)**

(Figs. 17–19)

Prodiamesa fulva Kieffer, 1919: 132.
Monodiamesa fulva (Kieffer) Kieffer, 1922: 287.
Prodiamesa nigripalpes Goetghebuer, 1922: 52.
Prodiamesa flabellata Kieffer in Zavrel 1926: 279; Tshernovskij 1949: 109.
Cryptochironomus polysetica Botnariuc & Cure, 1956: 259.

Orthocladiinae gen.? 1. *dospactica* Dimitrov, 1963: 13.
Odontomesa fulva fulva Sæther, 1986: 18.
Odontomesa fulva nearctica Sæther, 1986: 20.
Odontomesa fulva (Kieffer), Pagast 1947: 503, 541, 587; Shilova 1966: 239; Pankratova 1970: 112; Makarchenko, 1985: 105, 2006: 279; Ashe & O' Connor 2009: 326; Liu *et al* 2016: 136

Material examined. ***Russia:*** 2 adult males, 3 mature pupae (males), 2 larvae, Russian Far East, Sakhalin Island, Noglicki District, Askasai River, 18.VIII.2021, leg. T. Tiunova.

Comments. This species is rare in the Russian Far East, and in our material there were only two adult males, on the basis of which we make a brief redescription.

Description

Adult male (n = 2). Total length 3.5–4.2 mm. Total length/wing length 1.32–1.58.

Coloration. Brownish brown, wings grayish, legs grayish brown.

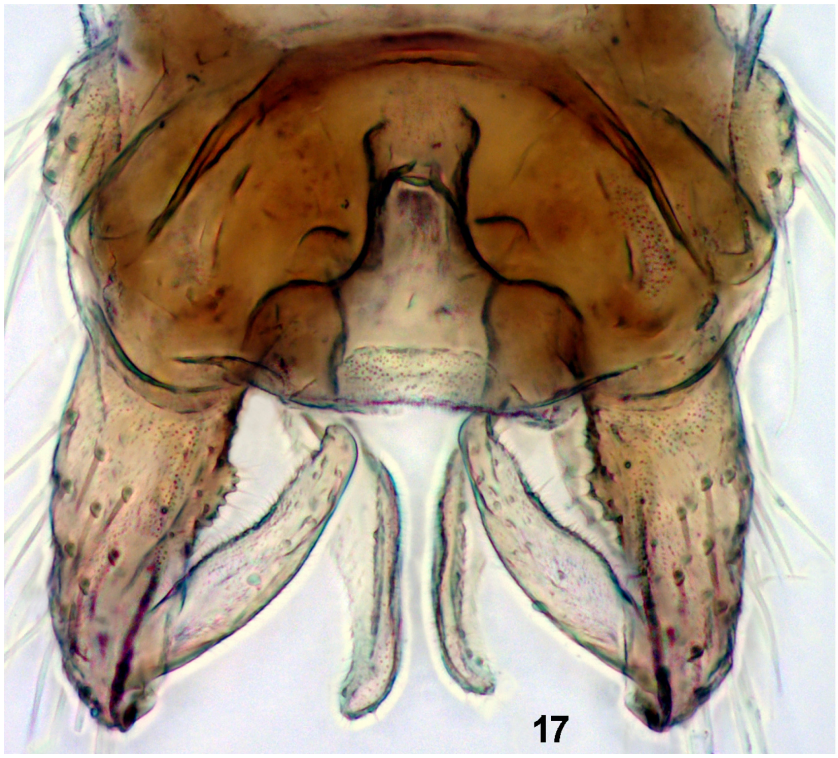
Head. Eyes bare, with long parallel-sided dorsomedial extention. Temporal setae including 9–12 verticals and 6–8 postorbitals. Clypeus with 15 setae. Antenna with 13 flagellomeres and developed plume; AR 1.3–1.4. Palpomeres lengths (in µm): 64; 80; 130; 147; 227; apex of third palpomere with strong, sclerotized tooth. Palpomeres 1–5 length/head width 0.90.

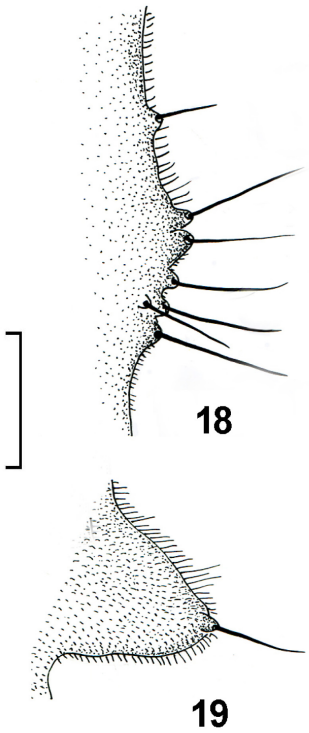
Thorax. Antepronotum with 4 lateral setae. Acrostichals absent, dorsocentrals 16–18, prealars 3, scutellars 28.

Wing. Length 2.7 mm, width 0.7 mm. R and R_1 with 22; R_{4+5} with 2 setae in distal part. RM length/MCu length 2.0. Anal lobe developed. Squama with 32 setae in 1–2 rows..

Legs. BR_{1-3} 1.9–2.0, LR_1 0.85, LR_2 0.44, LR_3 0.53, BV_1 2.49, BV_2 3.11, BV_3 2.48, SV_1 2.14, SV_2 4.62, SV_3 3.5. Hind tibial comb with 13 setae. ta_4 on all legs is longer than ta_5.

Hypopygium (Figs. 17–19). Tergite IX with 18–20 setae, 12–18 µm long and anal point in the form of small tubercle. Laterosternite IX with 6–8 setae, 48–64 µm long. Gonostylus 100–120 µm long, slightly curved and covered with short setae, with megaseta 12–16 µm long and 1–2 setae nearest, 15–16 µm long. Gonocoxite 290–240 µm long; inferior volsella flat and lobe-like, 100–150 µm long 1.0–1.3 times as long as gonostylus (Fig. 17). Superior volsella as small projection, with 1 seta 16–20 µm long (Fig. 19). Median volsella as in Fig. 18, with 5–7 setae. HR 2.0–2.2.





FIGURES 17–19. Adult male of *Odontomesa fulva* (Kieffer). **17,** hypopygium in dorsal view; **18,** median volsella; **19,** superior volsella.

Pupa and ***larva*** are described in detail by Thienamann (1944), Pagast (1947), Shilova (1966) and Pankratova (1970).

Distribution. Widespread Holarctic species. In the Russian Far East is known for certain only from Sakhalin Island and Kamchatka Peninsula.

Prodiamesa levanidovae **Makarchenko**

(Figs. 20–27)

Prodiamesa levanidovae Makarchenko, 1982: 305–307, 1985: 99, 2006: 280, 482, 623; Kobayashi & Endo 2008: 57; Ashe & O'Connor 2009: 328.
Prodiamesa otukii Sasa *et* Tanaka, 2000: 43.
Prodiamesa toneheia Sasa *et* Tanaka, 2000: 42.
Prodiamesa nagaii Sasa *et* Kawai, 1985: 13.

Material examined. ***Russia:*** 4 adult males (holotype and paratypes), 5 pupae, 5 larvae, Russian Far East, Jewish Autonomous Region, Obluchie District, Teploye Lake of Bira River basin (Amur River basin), 13–15.V.1955, leg. I. Levanidova; 4 adult males, the same as previous region, Bolshoi Spring of Bidzhan River basin (Amur River basin), 48.643185 N, 131.605183 E, 8.IV.2014, leg. E. Makarchenko.

Comments. Descriptions of the male, pupa and larva were given by Makarchenko (1982, 1985, 2006) but in Russian as well as the structure of the male hypopygium and some other features were not considered in great detail. Therefore, we decided to make a more detailed redescription of the adult male.

Description

Adult male (n = 5). Total length 4.8–5.4 mm. Total length/wing length 1.19–1.46.

Coloration. Head, thorax, legs, and abdomen brown to dark brown; antennae light brown; wings greyish.

Head. Eyes bare, with long parallel-sided dorsomedial extention (Fig. 17). Temporal setae 14–15, including 4–5 verticals, and 9–10 postorbitals. Clypeus with 12–16 setae. Antenna with 13 flagellomeres and developed plume; terminal flagellomere with subapical setae, 50–52 µm long; AR 1.8–2.07. Palpomeres lengths (in µm): 24–60; 92–108; 144–156; 124–156; 176–210. Palpomeres 1–5 length/head width 1.03–1.28.

Thorax. Antepronotum with 6–9 lateral setae. Acrostichals absent, dorsocentrals 28–31(in 2 rows) (Fig. 18), prealars 8–11, scutellars 43–47.

Wing. Length 3.64–4.04 mm, width 0.94–1.0 mm. R and R_1 with 11–22; R_{4+5} with 1–2 setae in distal part. Costa extension 80 µm long. RM length/MCu length 1.1–1.7. Anal lobe developed, outline rounded. Squama with 22–32 setae 126–155 µm long. VR 0.97–1.0.

Legs. Spur of fore tibia 80–100 µm long; spurs of mid tibia 42–52 µm and 42–48 µm; of hind tibia 96–97 µm and 42–48 µm long. Hind tibial comb with 12–14 setae. Lengths and proportions of leg segments as in Table 6.

TABLE 6. Lengths (in µm) and proportions of leg segments of *Prodiamesa levanidovae* Makarchenko, male (n=4).

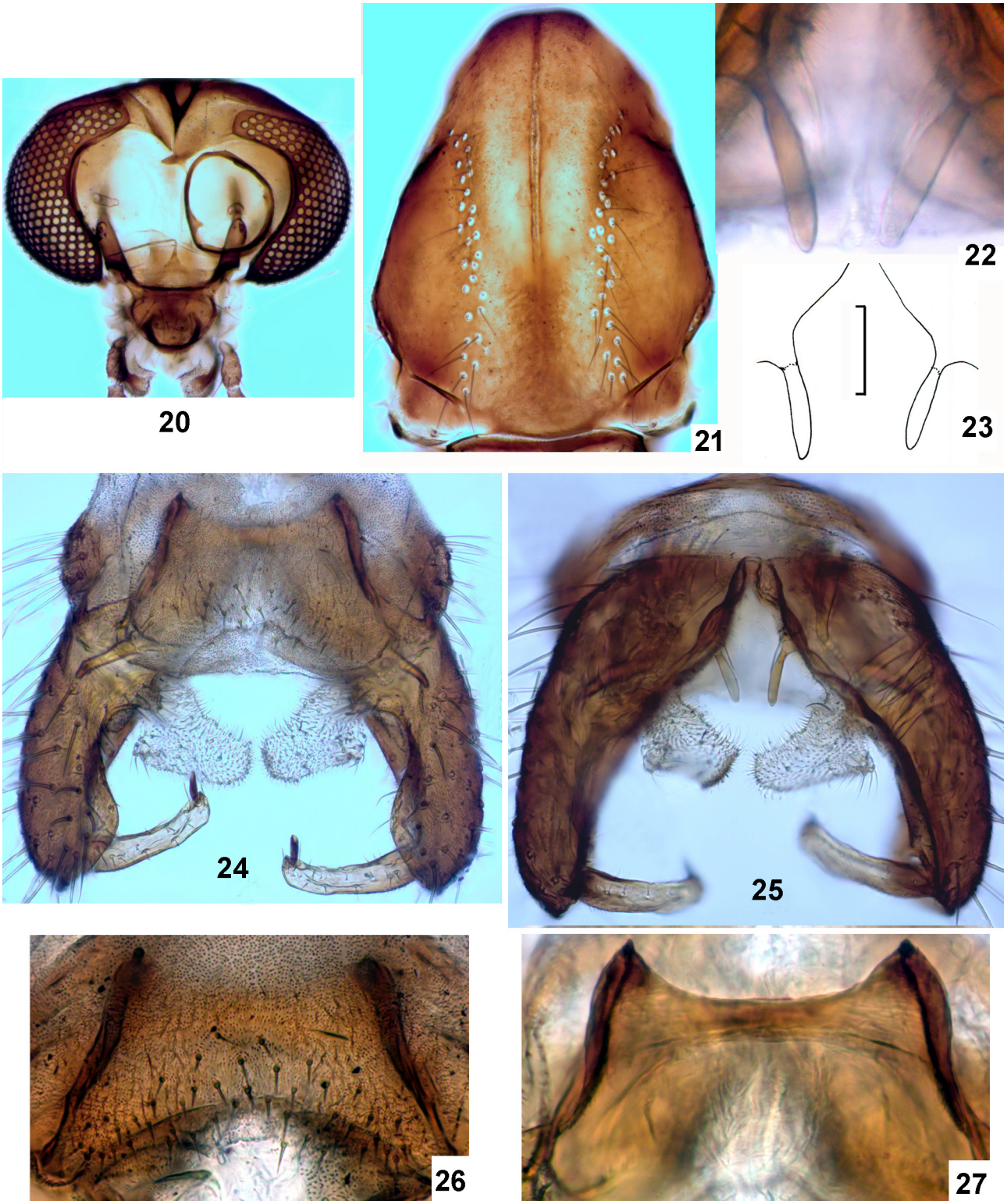
	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5
P_1	1275–1296	1411–1492	1173–1230	595–623	442–443	303–306	197–204
P_2	1326–1410	1324–1427	663–722	374–410	295–426	197–213	170–180
P_3	1377–1492	1700–1804	901–968	561–607	459–476	262–263	197–204

continued.

	LR	BV	SV	BR
P_1	0.80–0.83	2.45–2.57	2.27–2.33	3.5–7.5
P_2	0.48–0.50	2.86–3.39	4.0–4.05	2.7–3.3
P_3	0.53–0.54	2.71–2.82	3.39–3.42	3.9–4.2

Hypopygium (Figs. 19–24). Tergite IX without anal point, with 43–52 setae, 16–42 µm long and concave posterior edge (Fig. 23). Laterosternite IX with 7–9 setae, 100–148 µm long (Fig. 21). Gonostylus 136–148 µm long, slightly curved in the distal part, covered with short setae and with megaseta 29–32 µm long and 1–2 setae nearest,

16–21 µm long. Gonocoxite 328 µm long, shape of inferior volsellae as in Figs 21–22. Length of inferior volsella 100–108 µm. Median volsella yellowish and lanceolate (Figs. 19–20), 40–64 µm long. Transverse sternapodeme trapeciedal, with slightly concave outer edge (Fig. 24), 180–190 µm long, 24–28 µm wide. Phallapodeme 104 µm long. HR 3.0.



FIGURES 20–27. Adult male of *Prodiamesa levanidovae* Makarchenko. **20,** head; **21,** mesonotum; **22–23,** median volsellae; **24,** hypopygium in dorsal view; **25,** hypopygium in ventral view; **26,** tergite IX; **27,** transverse sternapodeme. Scale bar is 50 µm.

Pupa and ***larva*** were described in detail by Makarchenko (1982, 1985, 2006).

Distribution. Known from the Russian Far East (Amur River basin, Sakhalin Island), Japan (Honshu Island) (Kobayashi & Endo2008) and China (Ninghia Province) (Wang 2000).

Prodiamesa olivacea Meigen

Prodiamesa olivacea Meigen, 1818: 29; Goetghebuer 1939: 2; Thinemann 1944: 625; Pagast 1947: 497–499, 540–54; Tshernovskij 1949: 107; Brundin 1952: 51, 1956: 65; Albu 1967: 24; Pankratova 1970: 108; Saether 1977: 74, 1983: 143; Makarchenko 1985: 98, 2006: 280, 482, 623; Makarchenko & Makarchenko: 1999: 241; Linevich *et al.* 2002: 65; Langton & Pinder 2007: 26; Ashe & O'Connor 2009: 328.

Material examined. ***Russia:*** 1 adult male, Russian Far East, Jewish Autonomous Region, Obluchie District, Teploye Lake of Bira River basin (Amur River basin), N 48º38'409'', E 131º37'217'', 5.VI. 2014, leg. E. Makarchenko; 2 adult males, Khabarovsk Territory, Nanaisky District, Anyuisky National Park, Pihtsa River (tributary of Gassi Lake), Amur River basin, N 48.47.804, E 136.47.027, 22.V 2019, leg. N. Yavorskaya; 1 adult male, Russia, Republic of Khakassia, Askizsky District, bank of a Zimnyi Stream,53°25'05.6"N 89°45'25.6"E, 1.VIII.2020, leg. S. Dragan.

Comments. The species is described in detail by three stages of development from different regions of the Holarctic. Specimens from the Russian Far East and Eastern Siberia fit well with the available descriptions, and therefore we decided not to redescribe it. Below we provide data only on DNA barcoding.

Distribution. Widespread Holarctic species.

Propsilocerus akamusi (Tokunaga)

Spaniotoma (*Orthocladius*) *akamusi* Tokunaga, 1938: 317.
Orthocladius akamusi Tokunaga 1950: 1563.
Chaetocladius sexpapilosus Yan & Ye, 1977: 194.
Tokunagayusurika akamusi Sasa 1978: 94.
Propsilocerus akamusi Saether & Wang in Guo 1995: 580; Sæther & Wang 1996: 459; Petrova *et al.* 2003: 41; Kiknadze *et al.* 2007: 34 (karyotype); Ashe & O'Connor 2012: 501.

Material examined. ***Russia:*** 2 larvae, Russia, Trans-Baikal Territory, Uletovsky District, Arey Lake, 230 km south-west of the Chita City, area of the recreation center Crystal50.99802 N, 111.25694 E, 20.12.2019, leg. P. Matafonov; 4 larvae, Russia, Trans-Baikal Territory, Chita City, Kenon Lake, 52.030147 N, 113.380136 E*,* 11.03.2021, *leg. P. Matafonov.*

Comments. Unfortunately, in our material there are no adult males of this species, only larvae. Therefore, we do not give a redescription of the male from the Russian Far East, but present barcoding data below.

Distribution. Japan, China, South Korea, East Siberia (Baikal Lake basin, Trans-Baikal Territory), Russian Far East (Amur River basin).

Propsilocerus amurensis Makarchenko et Makarchenko
(Figs. 28–34)

Propsilocerus amurensis Makarchenko et Makarchenko, 2009: 261; Ashe & O'Connor 2012: 501.

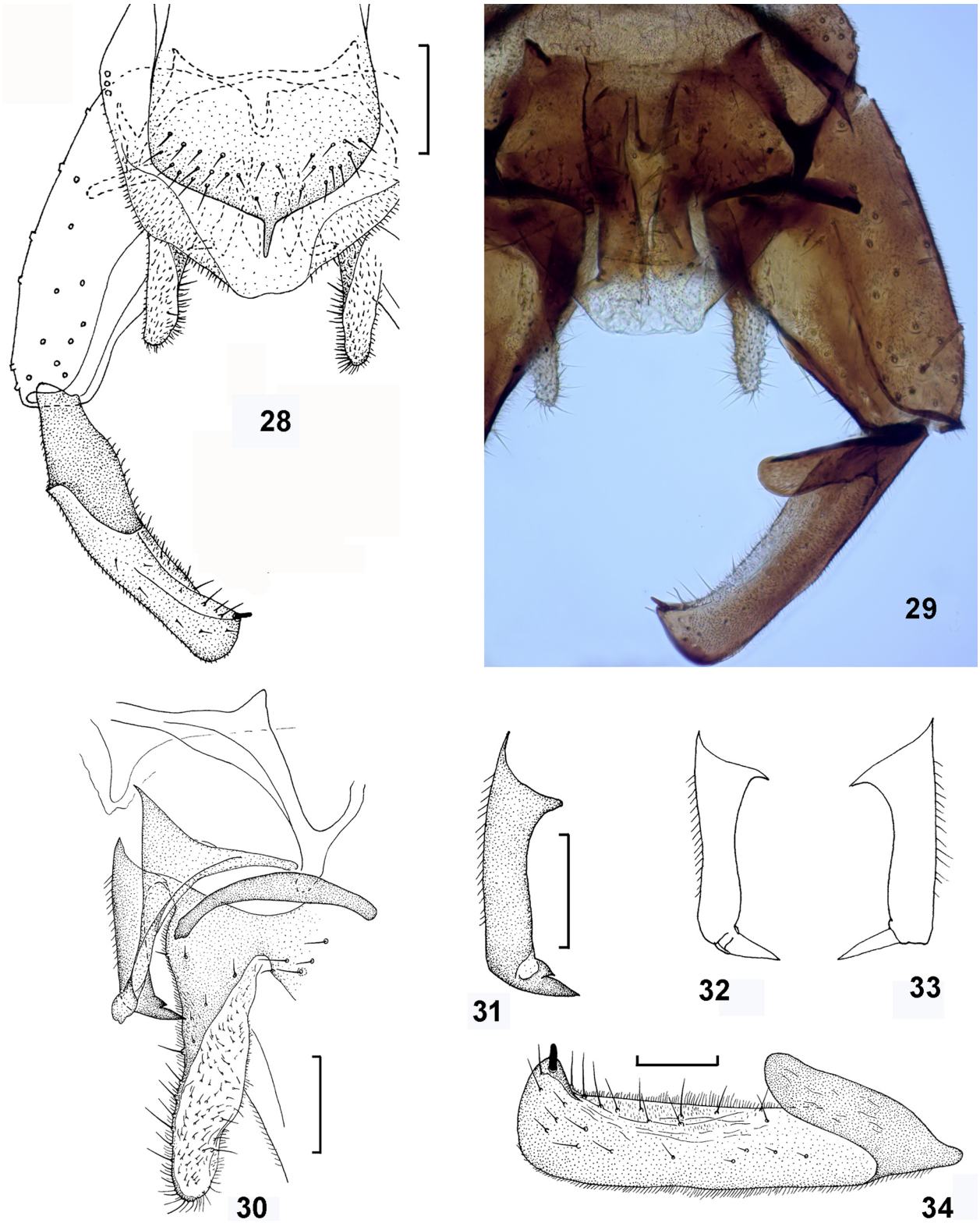
Material examined. ***Russia:*** 4 adult males (holotype and paratypes), Russian Far East, Khabarovsk Territory, Amursky District, mouth of Kharpi River (Amur River basin), 49.685000 N, 135.624722 E, 3.V.2008, leg. N. Yavorskaya.

Comments. The male of this species is described in detail from Amur River basin of the Russian Far East (Makarchenko & Makarchenko 2009) and therefore below we give only brief diagnosis.

Description

Adult male. Total length 5.4–5.5 mm. Temporal setae absent. Clypeus with 36–45 setae. Head width/palpal

length 1.22. AR 2.5–2.6. Acrostichals absent, dorsocentrals 11–13 in 1 row, prealars 3–4, supraalars 0–1. Scutellum with 10–12 setae. Wing length 3.15–3.25 mm. Anal lobe strongly projecting. Squama with 38–45 setae. LR_1 0.74–0.76, BV_1 2.18–2.40, SV_1 2.41–2.51.



FIGURES 28–34. Adult male of *Propsilocerus amurensis* Makarchenko et Makarchenko. **28–29,** hypopygium in dorsal view; **30,** superior, median and inferior volsellae, part of sternapodeme and fallapodeme; **31–33,** median volsellae, **34,** gonostylus. Scale bars are as follows: **Fig. 28** – 100 µm, **Figs. 30–34** – 50 µm.

Hypopygium (Figs. 28–34). Anal point bare, 25–35 µm long. Tergite IX with 50–70 setae; laterosternite IX with 8–10 setae. Transverse sternapodeme 155–183 µm long. Gonostylus 143–160 µm long; basal lobe of gonostylus 300 µm long. Megaseta of gonostylus 18 µm long. Gonocoxite 188 µm long; inferior volsella 120–188 µm long; superior volsella 120–140 µm long; median volsella with long and straight basal part 88–100 µm long, and apical part 28–30 µm long as spinous process directed near at right angles to basal part; outer margin of median volsella with sparse hair-like setae (Figs. 30–33). HR 2.76.

Pupa *and* ***larva*** *unknown.*

Distribution. Known only from type locality—the Low Amur River basin (Russian Far East).

Propsilocerus jacuticus (Zvereva)

(Figs. 35–39)

Syndiamesa jacutica Zvereva, 1950: 273; Pankratova 1970: 73; Ashe & Cranston 1990: 236 (as nomen dubium, probably *Tokunagayusurika*).
Tokunagayusurika jacutica (Zvereva): Meriläinen 1987: 90.
Propsilocerus jacuticus (Zvereva); Sæther 1997: 242; Makarchenko & Makarchenko 2006: 349, 519, 661; Kiknadze *et al.* 2007: 36 (karyotype); Ashe & O'Connor 2012: 501.

Material examined. ***Russia:*** 1 adult male, West Siberia, Tomsk Region, Chernoe Lake of Chulma River basin (Ob River basin), 12.VII.1979, leg. A. Ruzanova.

Comments. Of all the species of the genus *Propsilocerus, P. jacuticus* has been extremely insufficiently studied. There is only one description of an adult male from Finland (Sæther 1997), while the type locality of the species is in west of the Ural Mountains in the Vichegda River, Komi, Russia. In our material, there was only one male *P. jacuticus* in poor condition from western Siberia, but we found it expedient to give a description of his structures that were preserved in the slide.

Description

Adult male. Total length 9.3 mm. Total length/wing length 1.85. Temporal setae including 7 inner verticals and 8 outer verticals. AR 2.34. Clypeus with *ca* 40 setae. Acrostichals absent, dorsocentrals 28; prealars 13–14, supraalar 1; preepisternum with 18–20 setae. Scutellum with *ca* 40 setae. Wing length 5.1 mm. Anal lobe moderately projecting. R with 16 setae; other veins bare. Squama with *ca* 64 setae. LR_1 0.65, BV_1 2.40, SV_1 2.56.

Hypopygium (Figs. 35–39). Anal point, 88 µm long, slightly tapering to blunt apex, with 18–20 setae, 36–40 µm long; tergite IX with 100–110 setae, 40–44 µm long; laterosternite IX with 14–16 setae. Phallapodeme 138 µm long; transverse sternapodeme 144 µm long. Gonocoxite 771–787 µm long; superior volsella as in Fig. 39; median volsella as tubercle with 1–2 setae. Gonostylus bilobate, outer branch 525–541 µm long, with 4 megasetae, 15–20 µm long; inner branch 394–410 µm long. HR 1.46–1.47.

Pupa and ***larva*** were described by Zvereva (1950), Pankratova (1970) and Sæther (1997).

Distribution. Palaearctic species, known from Finland, North of European part of Russia and West Siberia.

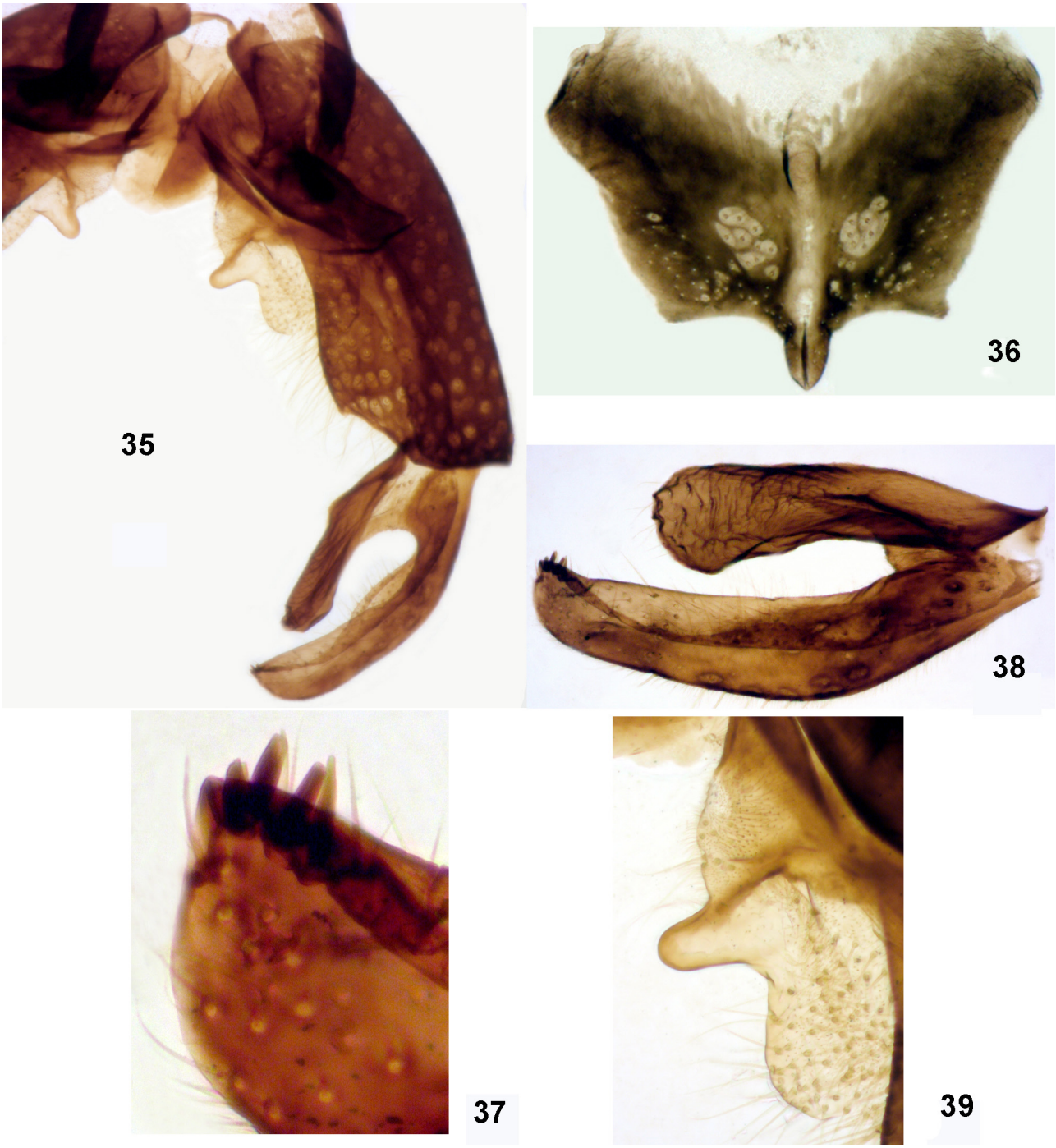
Propsilocerus paradoxus (Lundström)

(Figs. 40–48)

Orthocladius paradoxus Lundström, 1915: 14.
Synpropsilocerus paradoxus Kieffer 1923: 3.
Syndiamesa komensis Zvereva, 1950: 275; Pankratova 1970: 75.
Propsilocerus paradoxus (Lundström); Sæther & Wang 1996: 469; Petrova *et al.* 2003: 36; Sæther 2004: 17; Makarchenko & Makarchenko 2006: 349; Ashe & O'Connor 2012: 502.

Material examined. ***Russia:*** 2 adult males, Eastern Siberia, Trans-Baikal Territory, Chita City, Kenon Lake, 1.V.2003, 52.030147 N, 113.380136 E, leg. O. Klishko; 4 adult males, Jewish Autonomous Region, Smidovichsky District, Nature Reserve "Bastak", Zabelovskoye Lake, 48.432583 N, 134.213889 E, 16.IV.2008, leg. V. Lubarets; 2 adult males, Republic of Buryatia, Selenginsky District, Gusinoe Lake, 20.V.2017, leg. N. Bazova.

Comments. Some variation is added based on the males from the Russian Far East.



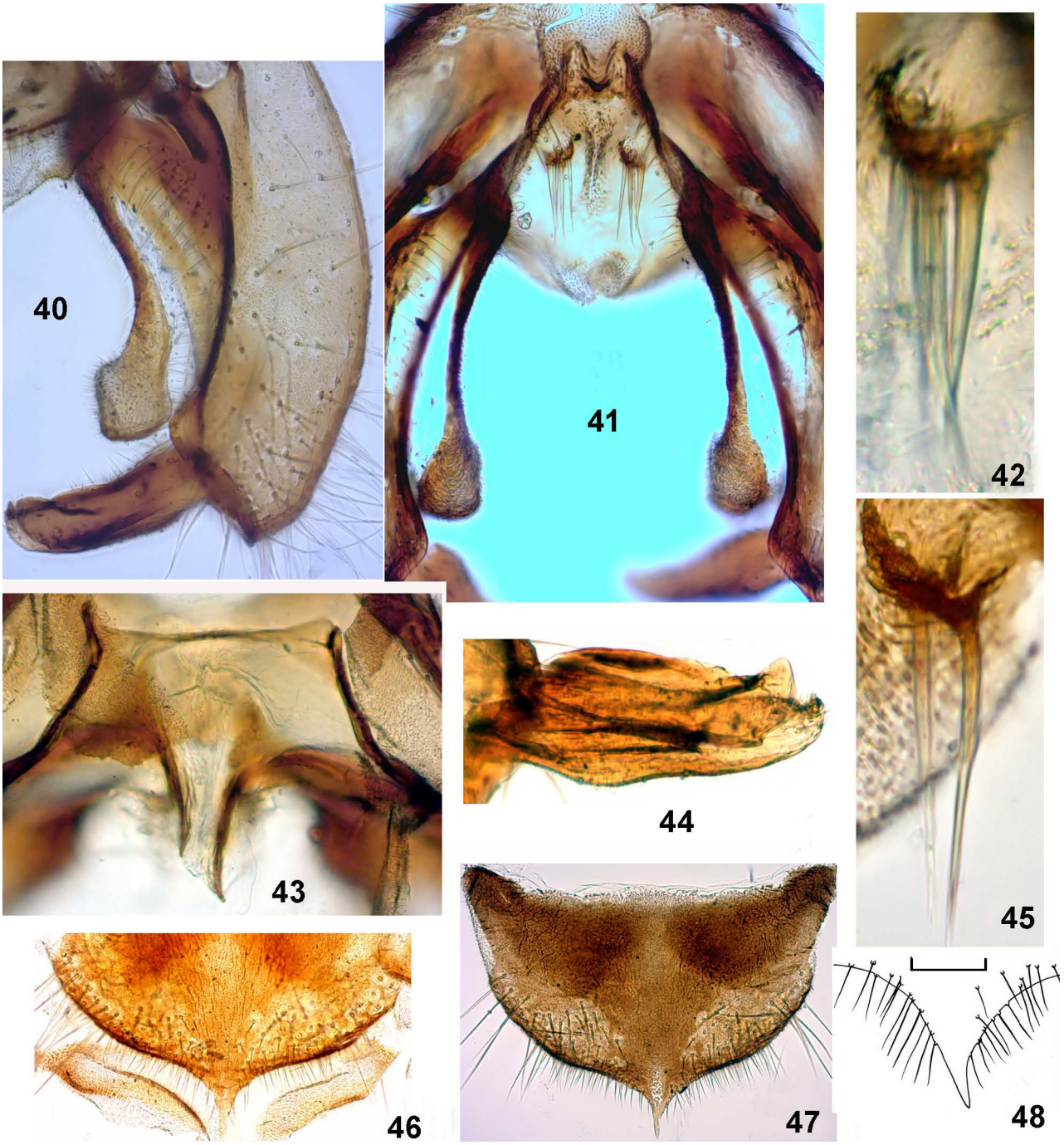
FIGURES 35–39. Adult mail of *Propsilocerus jacuticus* (Zvereva). **35,** hypopygium without tergite IX, in dorsal view; **36,** tergite IX; **37,** apical part of gonostylus; **38,** gonostylus; **39,** superior volsella.

Description

Adult male (n = 4, except when otherwise stated). Total length 4.2–6.2 mm (n = 11). Total length/wing length 1.24–1.36.

Coloration (slide-mounted material). Head, thorax, tergites of abdomen dark brown; legs brown ot yellowish-brown; hypopygium brown; wings grayish.

Head. Eyes bare, reniform. Temporal setae including 2–3 verticals and without postorbitals. Clypeus with *ca* 50–70 setae. Antenna with 13 flagellomeres and developed plume; terminal flagellomere with 3 sensitive setae, 20–36 µm long; AR 2.25–2.33. Palpomeres lengths (in µm): 20–40; 68–73; 152–160; 92–100; 100–108. Palpomeres 1–5 length/head width 1.68–1.74.



FIGURES 40–48. Adult males of *Propsilocerus paradoxus* (Lundström). **40,** part of hypopygium in dorsal view; **41,** part of hypopygium in ventral view; **42, 45,** median volsella; **43,** transverse sternapodeme, phallapodeme and aedeagal lobe; **44,** gonostylus; **46–47,** tergite IX; **48,** anal point. Scale bar is 50 µm.

Thorax. Antepronotum with 13–21 lateral setae. Acrostichals absent, dorsocentrals 60–84 (in anterior part in 2–3 rows, in posterior in 4–6 rows), prealars 6–11 scutellars 21–28 (in 1–2 rows);

Wing. Length 3.4–4.1 mm, width 0.84–1.2 mm. R with 8 setae, R_1 and R_{4+5} with 0 setae. Costa extension 120–190 µm long. RM length/MCu length 1.22–1.3. Anal lobe developed, outline rounded. Squama with 27 setae 72–92 µm long. VR 1.0–1.1.

Legs. Spur of fore tibia 84–96 µm long; spurs of mid tibia 56–60 µm and 64–72 µm; of hind tibia 56–62 µm and 72–92 µm long. Lengths and proportions of leg segments as in Table 7.

TABLE 7. Lengths (in µm) and proportions of leg segments of *Propsilocerus paradoxus* (Lundström), male (n=4).

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5
P_1	1017–1378	1230–1574	722–918	394–459	295–344	213–246	197–246
P_2	1968–1394	1230–1542	508–623	287–361	230–295	180–213	180–213
P_3	1115–1525	1394–1689	623–771	301–426	279–554	148–197	180–213

continued.

	LR	BV	SV	BR
P_1	0.58–0.59	2.70–2.99	3.11–3.22	0.9–1.1
P_2	0.40–0.41	3.20–3.29	4.52–4.71	1.1–1.6
P_3	0.45–0.46	2.87–3.45	4.03–4.17	1.9–2.8

TABLE 8. Comparison of adult males characters of *Propsilocerus paradoxus* (Lundström) from the Russian Far East, China and other regions.

Characters	*P. paradoxus* (n=4), Russian Far East, our data	*P. paradoxus* (n=6–8), other regions (after Sæther & Wang 1996)
Total length, mm	4.2–6.2	5.55–6.19
Wing length, mm	3.4–4.1	2.90–3.26
TL/WL	1.24–1.36	1.73–2.08
AR	2.25–2.33	2.0–2.50
Verticals	2–3	3–6
Clypeals	50–70	38–55
Dorsocentrals	60–84	36–73
Prealars	6–11	7–10
Scutellars	21–28	12–20
Squamal setae	27–39	47–62
LR1	0.58–0.59	0.58
LR_2	0.40–0.41	0.43
LR3	0.45–0.46	0.46
BV1	2.70–2.99	2.89
BV2	3.20–3.29	3.31
BV3	2.87–3.45	3.32
SV1	3.11–3.22	3.02
SV2	4.52–4.71	4.40
SV3	4.03–4.17	3.89
Tergite IX, number of setae	102–122	70–104
Anal point length, ìm	68–132	40–79
TSA length, ìm	208–264	120–184
MVo length, ìm	64–100	66–101
IVo length, ìm	400–432	307–308
Gonocoxite length, ìm	590–804	570–683
Gonostylus length, ìm	188–246	195–240
HR	3.28–4.9	2.76–3.08

Hypopygium (Figs. 40–48). Tergite IX with 102–122 setae and tapering to pointed apex anal point 68–132 µm long; with 5–7 lateral setae, 36–48 µm long (Figs. 46–48). Laterosternite IX with 9–12 setae. Phallapodeme 129–180 µm long; transverse stemapodeme 208–264 µm long, slightly concave, with oral projections (Fig. 43). Gonocoxite 590–804 µm long. Inferior volsella as in Figs. 40–41), 400–432 µm long. Median volsella with 2–7

strong setae 64–100 µm long on small tubercle (Figs. 42, 45). Gonostylus with two branches, basal branch 188–246 µm long; megaseta 8 µm long (Figs. 40, 44). HR 3.28 –4.9.

Remarks. Comparison of males from the Russian Far East with males from other populations showed that they are similar in main characters, except for a greater number of dorsocentrals (60–84), a longer anal point (68–132 µm) and a transverse sternapodeme (208–264 µm). Specimens from China have 36–73 dorsocentrals, the length of anal point is 40–79 µm, and length of transverse sternapodeme is 120–184 µm (Table 8).

Distribution. Reliably known from China, Mongolia, East Siberia and Russian Far East.

Propsilocerus taimyrus Zelentzov
(Figs. 49–58)

Propsilocerus taimyrus Zelentzov, 2000: 1242; Ashe & O'Connor 2012: 503.
Propsilocerus saetheri Wang, Liu et Paasivirta, 2007: 310; Ashe & O'Connor 2012: 503. **Syn. nov.**

Material examined. ***Russia:*** 2 adult males (paratypes), Eastern Siberia, Krasnoyarsk Territory, 10 km North of Norilsk Airport, Alykel station, nameless lake, 69.380287 N, 87.397822 E, 7.VII.1991, leg. N. Zelentzov.

Description

Adult male (n = 2). Total length 5–6 mm. Total length/wing length 1.63–1.96.

Coloration (slide-mounted material). Dark brown.

Head. Eyes bare, reniform. Temporal setae including 10–17 inner verticals (in 2 rows), 4–6 outer verticals and without postorbitals. Clypeus with 20–26 setae. Antenna with 13 flagellomeres and developed plume; terminal flagellomere without subapical setae; AR 1.87–2.2. Palpomeres lengths (in µm): 50–84; 72–96; 132–150; 140–156; 180–200. Palpomeres 1–5 length/head width 1.12–1.15.

Thorax. Antepronotum with 17–26 lateral setae. Acrostichals absent, dorsocentrals 69–89, prealars 49–60, supraalars 1–3, preepisternals 38–65, scutellars 38–52; posterior anepisternum II with 6–9 setae. All setae except supraalars arranged in 3–5 rows.

Wing. Length 2.8–3.5 mm, width 0.60–0.80 mm. R and R_1 with 28–56; R_{4+5} with 0–2 setae in distal part. Costa extension 120–190 µm long. Anal lobe developed, outline rounded. Squama with 20–35 setae, 88–100 µm long. VR 1.18–1.30.

Legs. Spur of fore tibia 80–96 µm long; spurs of mid tibia 60–66 µm and 63–75 µm; of hind tibia 62–72 µm and 78–102 µm long. Hind tibial comb with 10–11 setae. Lengths and proportions of leg segments as in Table 9.

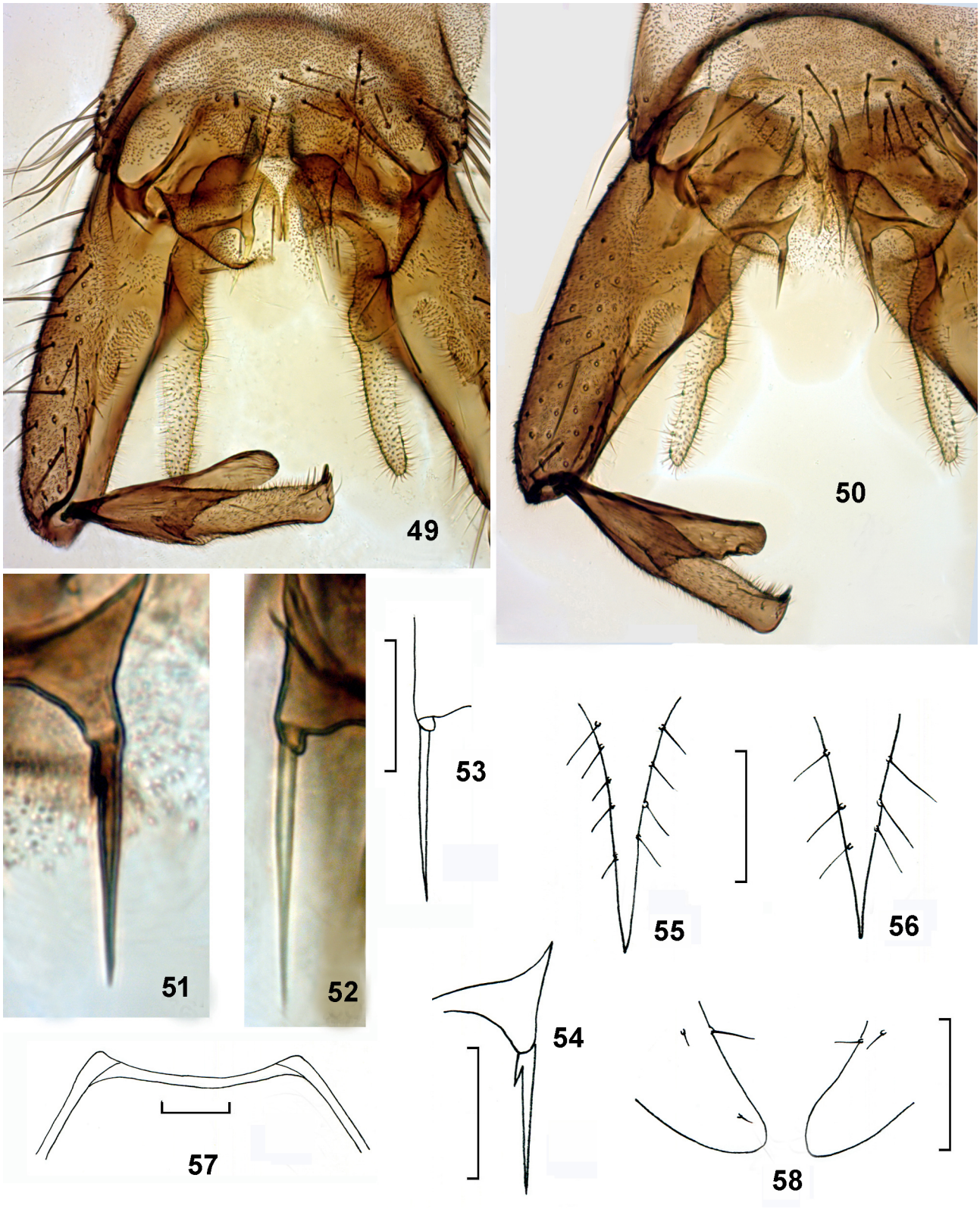
Hypopygium (Figs. 49–58). Tergite IX with 36–55 long setae and narrow, tapering to pointed apex anal point 76–108 µm long, with 6–7 long lateral setae and 4–6 setae at base (Figs. 49, 55–56). Laterosternite IX with 7–10 setae. Phallapodeme 129–180 µm long; transverse stemapodeme 124–186 µm long, with oral projections (Fig. 57). Gonocoxite 392–432 µm long. Superior volsella as in Fig. 58, 48–64 µm long. Inferior volsella as in Figs. 49–50, 96–228 µm long. Median volsella with rounded base and strong apical spine (Figs. 51–54), 54–88 µm long, sometimes with small tooth in base. Gonostylus with two branches (Figs. 49–50), basal branch 220–228 µm long, inner branch 176–180 µm long; megaseta 16–18 µm long. HR 1.75 –1.78.

TABLE 9. Lengths (in µm) and proportions of leg segments of *Propsilocerus taimyrus* Zelentzov, male (n=2).

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5
P_1	968–1000	1250–1263	787–820	459–508	344–361	213–230	164–180
P_2	1131–1180	1230–1246	541–590	295–328	262	180	164
P_3	1099–1132	1361–1427	607–689	394–410	295–328	197–230	180

continued.

	LR	BV	SV	BR
P_1	0.63–0.65	2.47–2.48	2.76–2.82	1.6–2.2
P_2	0.44–0.47	3.22–3.23	4.11–4.36	1.5–2.4
P_3	0.45–0.48	2.79–2.91	3.71–4.05	1.9–2.8



FIGURES 49–58. Adult male of *Propsilocerus taimyrus* Zelentzov (paratypes). **49,** hypopygium in dorsal view; **50,** hypopygium in ventral view; **51–54,** median volsellae; **55–56,** anal point; **57,** transverse strenapodeme; **58,** superior volsellae. Scale bars are 50 µm.

TABLE 10. Comparison of adult males characters of *Propsilocerus taimyrus* Zelentsov from Taimyr Region and Finland.

Characters	*P. taimyrus* (n=5) (after Zelentsov 2000 and our data)	*P. taimyrus* (= *P. saetheri*) (n=4) (after Wang *et al*. 2007)
Total length, mm	5.0–6.0	4.63–4.83
Wing length, mm	2.8–3.5	2.85–3.02
TL/WL	1.63–1.96	1.81–1.92
AR	1.87–2.2	2.14–2.27
Clypeals	20–38	36–42
Dorsocentrals	69–98	102–108
Prealars	30–52	26–31
Supraalars	1–3	1
Preepisternals	38–65	0
Scutellars	38–52	26–28
Squamal setae	20–35	24–32
LR1	0.58–0.65	0.49–0.57
LR_2	0.43–0.50	0.37–0.40
LR3	0.46–0.54	0.47–0.55
Hind tibial comb	with 10–11 setae	with 10–11 setae
Tergite IX, number of setae	36–55	30–36
Anal point length, ìm	76–108	105–127
SVo length, ìm	48–64	60–68
MVo length, ìm	54–88	25–35
IVo length, ìm	196–280	278–296
Gonocoxite length, ìm	392–432	375–432
Gonostylus length, ìm	220–228	236–248
HR	1.75–1.78	1.75–2.44

Pupa and ***larva*** unknown.

Remarks. The description of this species from the Taimyr region was published in Russian (Zelentzov 2000), and, unfortunately, was not used in the paper of Wang *et al.* (2007) with description of *P. saetheri* from Finland. After comparing adult males of *P. taimyrus* with the description of the *P. saetheri*, as well as photographs of the hypopygium of this species from Norway, which were kindly provided by Dr. E. Stur, we came to the conclusion that the *P. saetheri* is a synonym of the *P. taimyrus*, since the hypopygium of all specimens, as well as other features, are similar, except for the absence of setae in *P. satheri* on the preepisternum (Table 10), but according to E. Stur (pers. comm.), a male from northern Norway has at least 40 preepisternals.

Distribution. Known from arctic region of East Siberia, Finland and Norway.

Results of DNA barcoding

In the present study we have sequenced fragments of the cytochrome oxidase subunit I (618-657 bp in length) of 21 chironomids of which: 4—*M. bathyphila*, 2—*M. fontinalis* **sp. nov.**, 9—*P. olivacea* and 6—*P. akamusi*. For each species all sequences belong to the same haplotype so the intraspecific distances were 0.

Phylogenetic tree was reconstruct using obtained sequences as well as DNA barcodes from GenBank and BOLD system (Fig. 59). The Bayesian inference phylogeny revealed two well-supported primary clades, one including *Propsilocerus* (Bayesian PP, BPP = 0.8) and one polytomic clade including *P. levanidovae* + *P. nagaii*, *P. olivacea* and *Monodiamesa*. According to species delimitation methods, sequences of *M. fontinalis* **sp. nov.** were conspecific to *M. bathyphila* from South Korea (BOLD Process ID: GBDP12298-12, GenBank accession number: JN887070) and previously incorrect defended as *M. bathyphila* and further renamed sequence *M. fontinalis* **sp. nov.** (BOLD:

GBDP12298-12 GenBank: MG520095). The average sequence divergence (p-distance) between four sequences was 0.18%. Closest species to *M. fontinalis* **sp. nov.** was undefined *Monodiamesa* sp. from China. Interspecific distances between species were 6.13% in average which correspond to species level (Han *et al.* 2021) which is confirmed by the species delimitation results.

M. bathyphila from Russia were placed as sister to *M. bathyphila* from the Norway and United Kingdom (BPP = 1.0) with average divergence between them 2.83%. ASAP and GMYC methods suggest their conspecificity while mPTP related them to different molecular taxonomic units (mOTU). We assume that the identified divergence is at the intraspecific level.

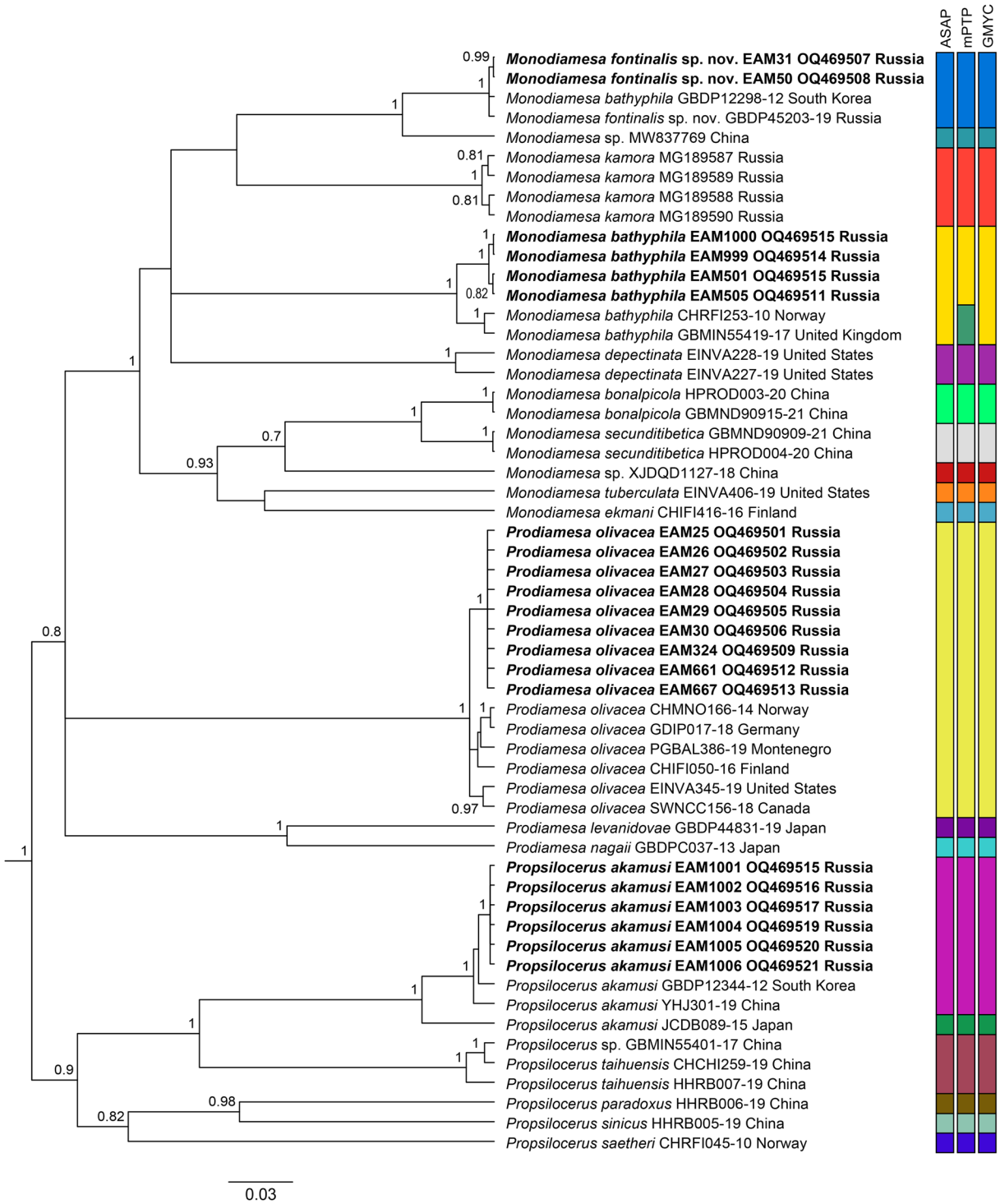


FIGURE 59. Ultrametric Bayesian inference (BI) tree based on the cytochrome c oxidase I (COI) nucleotide sequence data of available Prodiamesinae (except *Odontomesa*). Bayesian posterior probabilities (higher than 0.7) are given above tree nodes. Specimens obtained in this study are in bold.

Specimens of *P. olivacea* from Europe, and North America belongs to a single clade (BPP = 1.0) with average intraspecific distances equal to 0.78%.

P. akamusi from Russia, South Korea and China were conspecific (intraspecific distances—0.61%) while the specimen *P. akamusi* from Japan (BOLD: JCDB089-15 GenBank: MW128457) and additional 41 specimens from BOLD systems under BIN BOLD: ACQ5058 belongs to another mOTU according to four approaches of species delimitation and high values of genetic distances equal to 4.52%.

Acknowledgements

We are very grateful to all the many collectors of material that was used in the preparation of this paper for making material available to us and to Dr. Elisabeth Stur (Department of Natural History, NTNU University Museum, Norwegian University of Science and Technology,

Trondheim, Norway) for sending us some figures of *Propsilocerus saetheri* from Norway which we used in our revision.

The study was supported by the Russian Science Foundation (RSF), project No. 23-24-00620.

References

Albu, P. (1967) Chironomide din Carpatii (II). *Revista Studii şi cercetări de Biologie*, Série de Zoologie, 19, 15–25.

Ashe, P. & Cranston, P. S. (1990) Family Chironomidae. *In*: Soós, Á. & Papp, L. (Eds.), *Catalogue of Palaearctic Diptera. Vol. 2. Psychodidae—Chironomidae*. Akademia Kiadó, Budapest, pp. 113–355.

Ashe, P. & O'Connor, J.P. (2009) *A World Catalogue of Chironomidae (Diptera). Part 1. Buchonomyiinae, Chilenomyiinae,P odonominae, Aphroteniinae, Tanypodinae, Usambaromyiinae, Diamesinae, Prodiamesinae and Telmatogetoninae.* Irish Biogeographical Society & National Museum of Ireland, Dublin, 445 pp.

Ashe, P. & O'Connor, J.P. (2012) *A World Catalogue of Chironomidae (Diptera). Part 2. Orthocladiinae.* Irish Biogeographical Society & National Museum of Ireland, Dublin. 469–968.

Baranov, V. (2021) *Propsilocerus* Kieffer, 1923 shares morphological synapomorphies with Prodiamesinae. *CHIRONOMUS Journal of Chironomidae Research*, 2021, 40–45. https://doi.org/10.5324/cjcr.v0i34.4100

Botnariuc, N. & Cure, V. (1956) Noi larve de Tendipedide gasite in fauna Republicii Populare Române. (New tendiped larvae from Romania). *Analele Institutui de Cercetari Piscicole*, Series 1, 257–271. [in Romanian]

Brundin, L. (1952) Zur Kenntnis der Taxonomie und Metamorphose der Chironomidengattungen *Protanypus* Kieff., *Prodiamesa* Kieff. und *Monodiamesa* Kieff. Report. *Institute of Freshwater Research, Drottningholm*, 33, 39–53.

Brundin, L. (1956) Zur Systematik der Orthocladiinae (Dipt. Chironomidae). Report. *Institute of Freshwater Research, Drottningholm*, 37, 5–185.

Cranston, P.S., Hardy, N.B & Morse, G.E. (2012) A dated molecular phylogeny for the Chironomidae (Diptera). *Systematic Entomology*, 37 (1), 172–188. https://doi.org/10.1111/j.1365-3113.2011.00603.x

Dimitrov, M. (1963) Prinos kam izuchavane na khironomidnata fauna (larvae) na Balgariya. (Beitrag zur Erforschung der Chironomidenfauna (Larvae) Bulgariens. *Izvestiya na opytna Stantia po Sladkovodno Ribarstvo*, Plovdiv, 2, 5–24. [in Bulgarian]

Goetghebuer, M. (1922) Nouveaux matériaux pour l'étude de la faune des Chironomides de Belgique. *Annales* de biologie *lacustre,* 11 (1), 38–62.

Goetghebuer, M. (1939) Tendipedidae (Chironomidae). c) Subfamilie Diamesinae. A. Die Imagines. *In*: Lindner, E. (Ed.), *Die Fliegen der palaearktischen Region*, 3 (13d), pp. 1–28.

Guo, X. (1995) Studies on chironomid communities of Nanhu Lake (South Lake), Wuhan, China. *Journal of Huazhong Agricultural University*, 14, 578–585. [in Chinese with English summary]

Han, W., Tang, H. & Ni, Z. (2021) DNA barcodes and morphology reveal two new species of *Monodiamesa* Kieffer (Diptera: Chironomidae: Prodiamesinae) in Tibetan Plateau. *Zootaxa*, 4990 (1), 81–103. https://doi.org/10.11646/zootaxa.4990.1.5

Hasegawa, M., Kishino, H. & Yano, T. (1985) Dating of the human-ape splitting by a molecular clock of mitochondrial DNA. *Journal of Molecular Evolution*, 22, 160–174. https://doi.org/10.1007/bf02101694

Kieffer, J.J. (1918) Beschreibung neuer, auf Lazarettschiffen des östlichen Kriegsschauplatzes und bei Ignalino in Litauen von Dr. W. Horn gesammelter Chironomiden, mit Uebersichtstabellen einiger Gruppen von paläarktischen Arten (Dipt.). *Entomologische Mitteilungen*, 7 (4–6), 94–110.

Kieffer, J.J. (1919) Chironomides d'Europe conservés au Musée National Hongrois de Budapest. *Annales historico-naturales Musei nationalis hungarici*, 17, 1–160.

Kieffer, J.J. (1922) Diagnose de nouveaux genres et espèces de Chironomides [Dipt.]. *Bulletin de la Société entomologique de France*, 1921 (19), 287–289.
https://doi.org/10.3406/bsef.1921.26884

Kieffer, J.J. (1923) Nouvelle contribution à l'étude des Chironomides de la Nouvelle-Zemble. Report *Scientific Results Norwegian Expedition Novaya Zemlya 1921*, 9, 1–12.

Kiknadze, I.I., Istomina, A.G., Golygina, V.V., Rubtsov, N.B., Karamysheva, T.V. (2007) The structural peculiarities of karyotypes in species of *Propsilocerus akamusi* sibling group (Diptera: Chironomidae). *Comparative Cytogenetic*, 1 (1), 33–43.
https://doi.org/10.11646/zootaxa.765.1.1

Kobayashi, T. & Endo, K. (2008) Synonymic notes on some species of Chironomidae (Diptera) described by Dr. M. Sasa (†). *Zootaxa*, 1712 (1), 49–64.
https://doi.org/10.11646/zootaxa.1712.1.3

Krasheninnikov, A.B. & Bogomolova, Yu. M. (2017) Chironomids (Diptera, Chironomidae) of the Pechora's estuary. *Vladimir Ya. Levanidov's Biennial Memorial Meetings*, 7, 85–89. [In Russian]

Langton, P.H. & Pinder, L.C.V. (2007) Keys to the adult male Chironomidae of Britain and Ireland; 2 vols. *Freshwater Biological Association Scientific Publications*, 64, 239 + 168 pp.

Linevich, A.A., Makarchenko, E.A. & Aleksandrov, V.N. (2002) *Chironomids of Baikal and Pribaikalye. Podonominae, Tanypodinae, Diamesinae, Prodiamesinae, Orthocladiinae. Index of species and forms.* Novosibirsk, Nauka, 136 pp. [in Russian]

Liu, W., Ferrington, L.C. Jr. & Wang, X. (2016) First record of *Odontomesa* Pagast from China, with description of the immature stages of *O. ferringtoni* Sæther (Diptera, Chironomidae, Prodiamesinae). *Zootaxa*, 4132 (1), 135–142.
https://doi.org/10.11646/zootaxa.4132.1.12

Lundström, C. (1915) Résultats scientifiques de lExpédition Polaire Russe en 1900–1903, sous ladirection du Baron E. Toll. Section E: Zoologie. Vol. II. Livr. 8. Diptera Nematocera aus den arctischen Gegenden Sibiriens. *Mémoires de lAcadémie Impériale des Sciences, Classe Physico-Mathématique*, VIII Série, 29 (8), 1–33.

Makarchenko, E.A. (1982) A new species of *Prodiamesa* Kieff. (Diptera, Chironomidae) from Amur River basin. *Zoologicheskyi Zhurnal*, 61, 305–307. [in Russian]

Makarchenko, E.A. (1984) A new species of *Monodiamesa* Kieffer (Diptera, Chironomidae) from South Primorye. *In*: *Biology of the Far Eastern Freshwater.* DVNC AN SSSR, Vladivostok, pp. 99–101. [in Russian]

Makarchenko, E.A. (1985) *Chironomids of the Soviet Far East. Subfamilies Podonominae, Diamesinae and Prodiamesinae (Diptera, Chironomidae).* DVNC AN SSSR Press, Vladivostok, 208 pp. [in Russian]

Makarchenko, E.A. (2006) Subfamily Prodiamesinae. *In*: *Key to the Insects of Russian Far East. Vol. 6. Diptera and Siphonaptera. Pt. 4.* Dal'nauka, Vladivostok, pp. 276–280 + 480–482 + 622–623. [in Russian]

Makarchenko, E.A. & Makarchenko, M.A. (1999) Chironomidae. *In*: Tsalolikhin, S. Ya. (Ed.), *Opredelitel' presnovodnykh bespozvonochnykh Rossii i sopredel'nykh territorii. Vol. 4. Vysshie nasekomye. Dvukrylye*. Zool. Inst. Ross. Akad. Nauk, Sankt-Peterburg, pp. 210–295 + 670–857. [in Russian]

Makarchenko, E.A. & Makarchenko, M.A. (2006) Subfamily Orthocladiinae. *In:* Lelej, A. (Ed.), *Key to the insects of Russian Far East. Vol. 6. Diptera and Siphonaptera. Pt 4.* Vladivostok, Dal'nauka, pp. 280–372 + 482–530 + 623–671. [in Russian]

Makarchenko, E.A. & Makarchenko, M.A. (2009) *Propsilocerus amurensis* sp.n. (Diptera, Chironomidae, Orthocladiinae) from Amur River basin (Russian Far East). *Euroasian Entomological Journal*, 8 (2), 261–263.

Makarchenko, E.A. & Yavorskaya, N.M. (2008) *Monodiamesa kamora* sp.n. (Diptera, Chironomidae, Prodiamesinae) from the Amur River basin. *Euroasian Entomological Journal*, 7 (2), 175–176.

Makarchenko, E.A., Velyaev, O.A. & Yavorskaya, N.M. (2018) Morphological redescription and DNA barcoding of *Monodiamesa kamora* Makarchenko et Yavorskaya (Diptera: Chironomidae) from the Amur River Basin (Russian Far East). *Far Eastern Entomologist*, 350, 155–159.
https://doi.org/10.25221/fee.350.1

Makarchenko, E.A., Semenchenko, A.A. & Palatov, D.M. (2023) Fauna and taxonomy of Diamesinae (Diptera, Chironomidae) from the Caucasus, with a morphological description and DNA barcoding of new taxa and a discussion of diagnostic problems for *Diamesa* Meigen and *Pseudodiamesa* Goetghebuer. *Zootaxa*, 5271 (2), 313–328.
https://doi.org/10.11646/zootaxa.4695.2.3

Meigen, J.W. (1818) *Systematische Beschreibung der bekannten europäischen zweiflügeligen Insekten. Erster Theil.* F.W. Forstmann, Aachen, XXXVI + 332 pp., XI pls.
https://doi.org/10.5962/bhl.title.12464

Merilainen, J.J. (1987) The profundal zoobenthos used as an indicator of the biological condition of Lake Päijänne. *Biological Research Reports from the University of Juväskylä*, 10, 87–94.

Pagast, F. (1947) Systematik und Verbreitung der um die Gattung *Diamesa* gruppierten Chironomiden. *Archiv für Hydrobiologie*, 41, 435–596.

Pankratova, V. Ya. (1970) Larvae and pupae of the midges of the subfamily Orthocladiinae (Diptera, Chironomidae = Tendipedidae) of the USSR fauna. *In: Key to the USSR fauna, published by Zoological Institute of the USSR Academy of Sciences. Vol. 102.* Leningrad, Nauka, pp. 1–344. [in Russian]

Petrova, N.A., Zelentsov, N.I., Klishko, O.K., Chubareva, L.A. (2003) First description of polytene chromosomes, larval morphology and biology of two species in the genus *Propsilocerus* (Diptera, Chironomidae, Orthocladiinae). *Trudy Russkogo Entomologicheskogo Obshchestva*, 74, 33–50. [in Russian]

Pinder, L.C.V. (1978) A key to adult males of the British Chironomidae (Diptera). *Scientific Publications of the Freshwater Biological Association*, 37, 1–169.

Sæther, O.A. (1973) Taxonomy and ecology of three new species of *Monodiamesa* Kieffer, with keys to Nearctic and Palaearctic species of the genus (Diptera: Chironomidae). *Journal of the Fisheries Board of Canada*, 30, 665–679. https://doi.org/10.1139/f73-115

Sæther, O.A. (1977) Female genitalia in Chironomidae and other Nematocera: morphology, phylogenies, keys. *Bulletin* of the *Fisheries Research Board of Canada*, 197, 1–209.

Sæther, O.A. (1979) Chironomid communities as water quality indicators. *Holarctic Ecology*, 2, 65–74. https://doi.org/10.1111/j.1600-0587.1979.tb00683.x

Sæther, O.A. (1980) Glossary of chironomid morphology terminology (Diptera: Chironomidae). *Entomologica scandinavica*, Supplement 14, 1–51.

Saether, O.A. (1983) 8. The larvae of Prodiamesinae (Diptera: Chironomidae) of the Holarctic region—Keys and diagnoses. *Entomologica scandinavica*, Supplement 19, 141–147.

Sæther, O.A. (1986) A review of *Odontomesa* Pagast, 1947 (Diptera, Chironomidae, Prodiamesinae). *In*: Fittkau, E.J. (Ed.), Beiträge zur Systematik der Chironomidae, Diptera. *Spixiana*, Supplement 11, pp. 15–29.

Sæther, O.A. (1997) First description of the imagines and pupa of *Propsilocerus jacuticus* (Zvereva) (Diptera: Chironomidae). *Acta Zoologica Academiae Scientiarum Hangaricae*, 43 (3), 241–249.

Sæther, O.A. (2004) The chironomids (Diptera, Chironomidae) described by Lundström (1915) from arctic Siberia, with a redescription of *Derotanypus sibiricus* (Kruglova & Chernovskii). *Zootaxa*, 595 (1), 1–35. https://doi.org/10.11646/zootaxa.595.1.1

Sæther, O.A. & Wang, X.H. (1996) Revision of the orthoclad genus *Propsilocerus* Kieffer (equals *Tokunagayusurika* Sasa) (Diptera: Chironomidae). *Entomologica Scandinavica*, 27, 441–479. https://doi.org/10.1163/187631296X00151

Sasa, M. (1978) Taxonomical and biological notes on *Tokunagayusurika akamusi* (Tokunaga), with description of immature stages (Diptera, Chironomidae). *Japanese Journal of Sanitary and Zoology*, 29, 93–101. https://doi.org/10.7601/mez.29.93

Sasa, M. (1989) Chironomidae of Japan: Checklist of species recorded, key to males and taxonomic notes. Part 3. Taxonomic notes on some Japanese Chironomidae. *Research Report from the National Institute for Environmental Studies*, 125, 1–177.

Sasa, M. & Hirabayashi, K. (1993) Studies on the additional chironomids (Diptera, Chironomida) collected at Kamikochi and Asama-Onsen, Nagano Prefecture. *Japanese Journal of Sanitary and Zoology*, 44 (4), 361–393. https://doi.org/10.7601/mez.44.361

Sasa, M. & Kawai, K. (1985) Morphological accounts on selected chironomids collected in Toyama. *Bulletin of the Toyama Science Museum*, 7, 7–22.

Sasa, M. & Tanaka, N. (2000) Description of new species of Chironomidae collected with light traps at the side of Tone River, Gunma Prefecture. *Annual Report of Gunma Prefectural Institute of Public Health and Environmental Sciences*, 32, 38–48.

Shi, J., Niitsuma, H. & Tang, H. (2021) *Compteromesa* Sæther (Diptera, Chironomidae, Prodiamesinae) newly recorded in China with the description of a new species. *Zootaxa*, 5082 (2), 169–176. https://doi.org/10.11646/zootaxa.5082.2.6

Shilova, A.I. (1966) Larva of *Odontomesa fulva* Kieff. (Diptera, Chironomidae—Orthocladiinae). *In*: Kuzin, B.S. & Shtegman, B.K. (Eds.), Plankton i bentos vnutrennikh vodoemov. *Trudy Instituta Biologii vnutrennih Vod Akademii Nauk SSSR*, 12 (15), pp. 239–250. [in Russian]

Tavaré, S. (1986) Some Probabilistic and Statistical Problems in the Analysis of DNA Sequences. *Lectures on Mathematics in the Life Sciences. American Mathematical Society*, 17, 57–86.

Thienemann, A. (1919) Untersuchungen über die Beziehungen zwischen dem Sauerstoffgehalt des Wassers und der Zusammensetzung der Fauna in norddeutschen Seen. Zweite Mitteilung. (Mit 12 Abbildungen). *Prodiamesa bathyphila* Kieff., eine Chironomide aus der Tiefe norddeutscher Seen. (Mit einem Beitrag von Professor Dr. J. J. Kieffer (Bitsch). *Zeitschrift für wissenschaftliche Insektenbiologie*, 14 (9/10), 209–217.

Thienemann, A. (1944) Bestimmungstabellen für die bis jetzt bekannten Larven und Puppen der Orthocladiinen (Diptera Chironomidae). *Archiv für Hydrobiologie*, 39 (4), 551–664.

Tokunaga, M. (1938) Chironomidæ from Japan (Diptera), X. New or little-known midges, with descriptions of the metamorphoses of several species. *Philippine Journal of Science,* 65, 313–383.

Tokunaga, M. (1950) Chironomidae. *In*: *Nihon Konchu Zukan, Descriptions of adults of 15 species*. Hokuryukan, Tokyo, pp. 1560–1565.

Tshernovskij, A.A. (1949) Key to larvae of the midges of the family Tendipedidae. *In: Key to the USSR fauna, published by Zoological Institute of the USSR Academy of Sciences. Vol. 31.* Nauka, Leningrad-Moscow, pp.1–185. [in Russian]

Yan, J.S. & Ye, C.J. (1977) Notes on the larvae of some chironomid midges from Bai-Yang-Dian lake in Hebei Province.

Acta Entomologica Sinica, 20, 183–198.
Yu, H.-J., Lin, X.-L., Zhang, R.-L., Wang, Q. & Wang, X.-H. (2020) Species delimitation and life stage association of *Propsilocerus* Kieffer, 1923 (Diptera, Chironomidae) using DNA barcodes. *ZooKeys*, 975, 79–86. https://doi.org/10.3897/zookeys.957.54668
Wang, X. (2000) A revised checklist of chironomids from China (Diptera). *In*: Hoffrichter, O. (Ed.), *Late 20th Century Research on Chironomidae: an Anthology from the 13th International Symposium on Chironomidae*. Shaker Verlag, Aachen, pp. 629–652.
Wang, X., Liu,Y. & Paasivirta L. (2007) A new species of *Propsilocerus* Kieffer from Finland (Diptera: Chironomidae, Orthocladiinae). *In*: Andersen, T. (Ed.), *Contributions to the Systematics and Ecology of Aquatic Diptera—A tribute to Ole A Sæther.* The Caddis Press, Columbus, Ohio, pp. 309–313.
Zelentzov, N.I. (2000) A new Orthocladiin species of the genus *Propsilocerus* (Diptera, Chironomidae) from Taimyr Peninsula. *Zoologichesky Zhurnal*, 79, 1242–1246.
Zharkikh, A.J. (1994) Estimation of evolutionary distances between nucleotide sequences. *Molecular Evolution*, 39, 315–329. https://doi.org/10.1007/BF00160155
Zvereva, O.S. (1950) New larval forms of Tendipedidae (Diptera) from Pechora and Vychegda Rivers. *Entomologicheskoe Obozrenie*, 31, 262–284. [in Russian]
Zavřel, J. (1926) Metamorfosa nekolika nových Chironomidu. Metamorphose einiger neuen Chironomiden (mit Imagendiagnosen von J. J. Kieffer). *Práce Moravské Přírodovedeckě Spollečnosti* [*Acta Societatis Scientiarum Naturalium Moravicae*], 3 (8, F 28), 251–282. [in Czech, with German summary]