

Redescription of the little-known chironomid species  
*Parachaetocladius akanoctavus* Sasa et Kamimura, 1987 (Diptera:  
Chironomidae: Orthoclaadiinae) from the Russian Far East

Переописание малоизвестного вида хирономид  
*Parachaetocladius akanoctavus* Sasa et Kamimura, 1987 (Diptera:  
Chironomidae: Orthoclaadiinae) с российского Дальнего Востока

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**Key words:** Diptera, Chironomidae, Orthoclaadiinae, *Parachaetocladius*, taxonomy, redescription, key, Russian Far East.

**Ключевые слова:** Diptera, Chironomidae, Orthoclaadiinae, *Parachaetocladius*, таксономия, переописание, определительная таблица, российский Дальний Восток.

**Abstract.** An illustrated redescription of the adult male and first description of pupa and fourth instar larva of the little-known species *Parachaetocladius akanoctavus* Sasa et Kamimura from the Russian Far East are presented, and an updated key to the pupae of *Parachaetocladius* Wülker species is provided.

**Резюме.** Приведены иллюстрированное переописание имаго самца малоизвестного вида хирономид *Parachaetocladius akanoctavus* Sasa et Kamimura, а также первоописание куколки и личинки IV возраста этого вида с российского Дальнего Востока. Дана обновлённая определительная таблица для куколок рода *Parachaetocladius* Wülker.

## Introduction

The present paper continues series of articles based on the results of Chironomidae revision, namely subfamily Orthoclaadiinae of the Russian Far East [Makarchenko, Makarchenko, 2017]. Below we give a redescription of the adult male of the chironomid species *Parachaetocladius akanoctavus* Sasa et Kamimura, little known in the Far East, and also for the first time describe the pupa and the fourth instar larva of this species, and provide an updated key for the known pupae of the genus *Parachaetocladius* Wülker.

## Materials and methods

The adults and preimaginal stages of chironomids were preserved in 70 % ethanol. The material was slide-mounted in polyvinyl lactophenol following the recommendations of Moubayed and Langton [2019]. The terminology follows Sæther [1980]. The photographs were taken using an Axio Lab.A1 (Karl Zeiss) microscope.

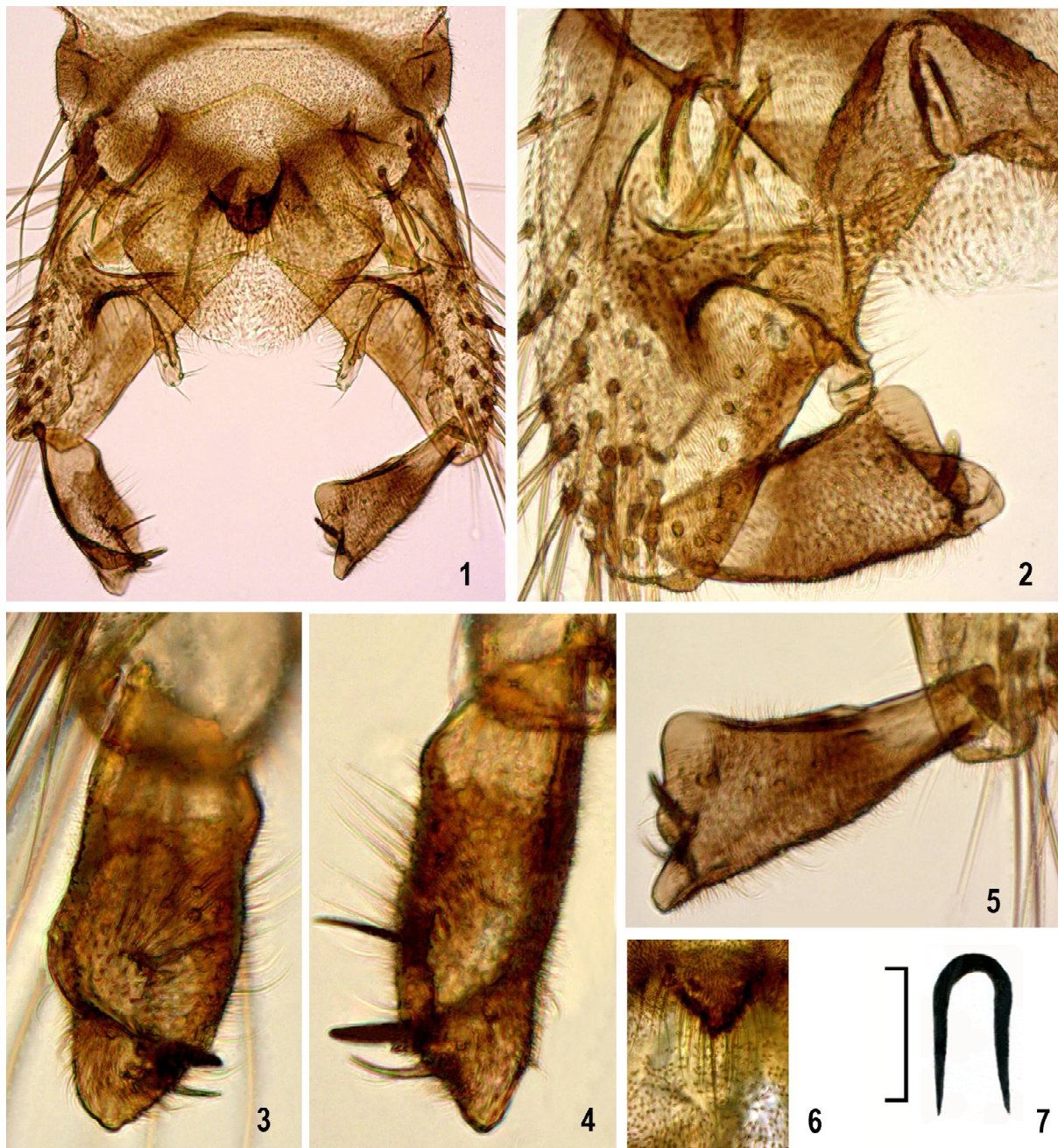
The pupae were associated with adults by male hypopygium prepared from mature pupae while the larvae were associated with pupae by the skins of the larvae that remain on the pupae.

All material is deposited in the Federal Scientific Center of the East Asia Terrestrial Biodiversity, Far East Branch of the Russian Academy of Sciences, Vladivostok, Russia.

## Description

*Parachaetocladius akanoctavus*  
Sasa et Kamimura, 1987  
Figs 1–18.

*Parachaetocladius akanoctavus* Sasa et Kamimura, 1987: 35; Sæther et al., 2000: 171; Yamamoto, 2004: 62; Makarchenko, Makarchenko, 2006: 342, 2017: 137; Ashe, O'Connor, 2012: 449; Namayandeh et al., 2020: 74, 76;



Figs 1–8. Adult male of *Parachaetocladius akanoctavus* Sasa et Kamimura. 1–2 — hypopygium in dorsal view; 3–5 — gonostylus in various positions; 6 — anal point; 7 — virga. Scale bar 20  $\mu$ m.

Рис. 1–8. Имаго самец *Parachaetocladius akanoctavus* Sasa et Kamimura. 1–2 — гипопигий, вид сверху; 3–5 — гоностиль в различных положениях; 6 — анальный отросток; 7 — вирга. Масштабная линейка 20 мкм.

= *Limnophyes kamiovatus* Sasa et Hirabayashi, 1993: 374; Namayandeh et al., 2020;

= *Parachaetocladius kamiovatus* (Sasa et Hirabayashi, 1993): Sæther et al., 2000: 171; Yamamoto, 2004: 62; Ashe, O'Connor, 2012: 450; Namayandeh et al., 2020: 74;

= *Limnophyes kuramasingularis* Sasa, 1989: 53; Namayandeh et al., 2020;

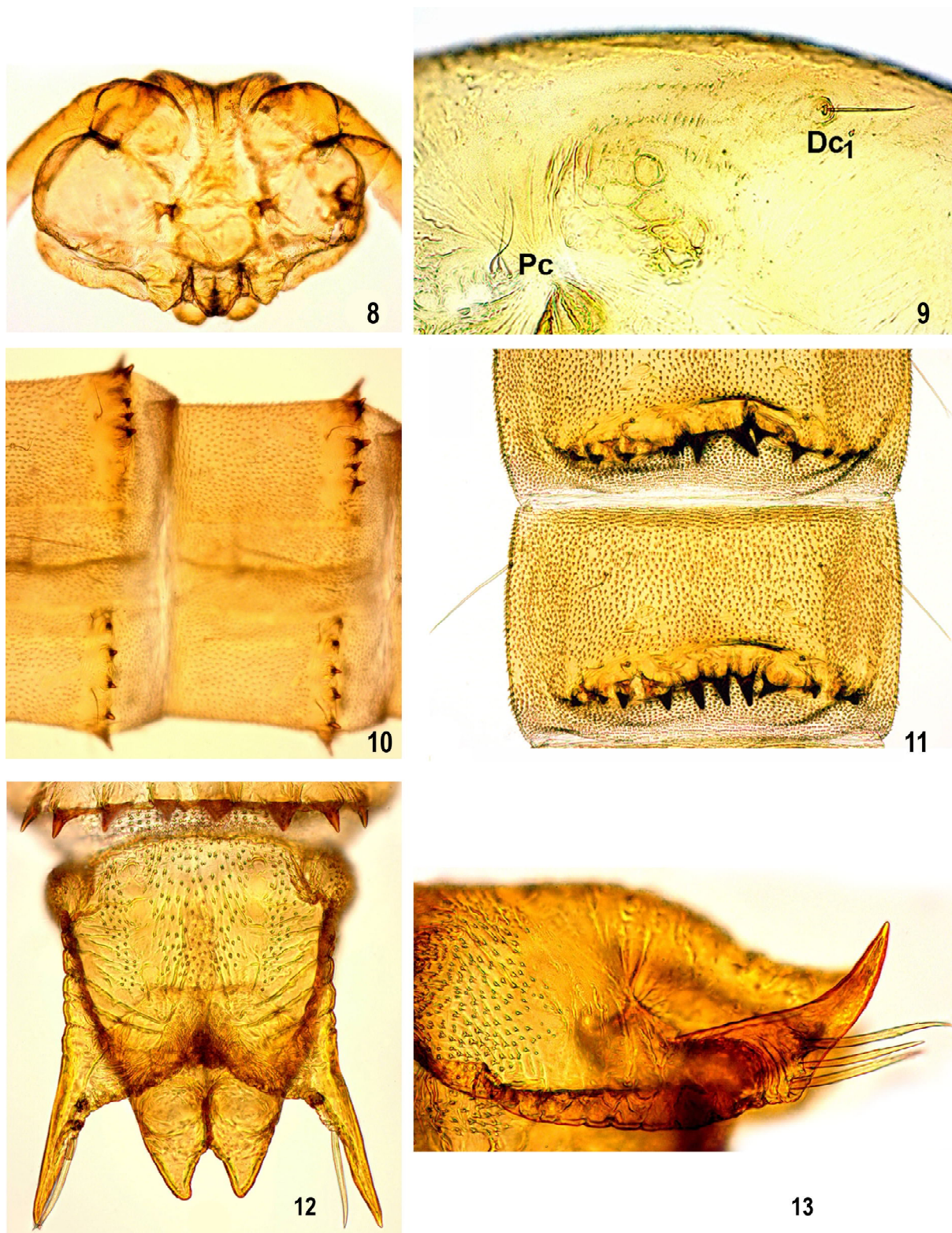
= *Parachaetocladius kuramasingularis* (Sasa, 1989): Sæther et al., 2000: 171; Yamamoto, 2004: 63; Ashe, O'Connor, 2012: 450; Namayandeh et al., 2020: 74.

= *Psectrocladius (Monopsectrocladius) sunabaabeus* Tanaka et Sasa, 2001: 43; Namayandeh et al., 2020: 74;

= *Parachaetocladius sunabaabeus* (Tanaka et Sasa, 2001): Yamamoto, 2004: 63; Ashe, O'Connor, 2012: 450; Namayandeh et al., 2020: 74.

**Material.** Primorskii Krai, Khasanskii Raion: Narva River, 18.V.1989, E. Makarchenko — 2♂♂; Barabashevka River, 22.III.2002, leg. E. Makarchenko — 1 larva; 6.V.2003, leg. E. Makarchenko — 1 mature pupa (♂), 1 larva, 1 skin of larva; 6.V.2014, leg. T. Tiunova — 1♂; 11.IV.2003, leg.





Figs 8–13. Pupa of *Parachaetocladius akanoctavus* Sasa et Kamimura. 8 — head; 9 — part of thorax in lateral view; 10 — segments IV–V in lateral view; 11 — tergites IV–V; 12 — posterior spines of tergite VIII and anal segment in dorsal view; 13 — anal segment in lateral view.  $Dc_1$  — anterior dorsocentral seta;  $Pc$  — precorneal setae.

Рис. 8–13. Куколка *Parachaetocladius akanoctavus* Sasa et Kamimura. 8 — голова; 9 — часть груди, вид сбоку; 10 — сегменты IV–V, вид сбоку; 11 — тергиты IV–V; 12 — шипы заднего ряда тергита VIII и анальный сегмент, вид сверху; 13 — анальный сегмент, вид сбоку.  $Dc_1$  — передняя дорсоцентральная щетинка;  $Pc$  — прекоorneальные щетинки.

E. Makarchenko — 3 larvae; Riazanovka River, 29.IV.2003, leg. E. Makarchenko — 4 larvae, 2 mature pupae; Izvestkovaya River, Barabashevka River basin, 8.V.2003, leg. E. Makarchenko — 3♂♂. **Nadezhdinskii Raion:** Ananievka River, Razdolnaya River basin, 15.V.2004, leg. V. Teslenko — 1♂. **Lazovskii Raion:** Lazovsky Nature Reserve, Proselochnaya River, 22.V.2007, leg. O. Zorina — 1♂; Kamennyi Stream, 26.V.2004, leg. E. Makarchenko — 3♂♂. **Khabarovskii Krai, Nanaiskii Raion:** Anyuisky National Park, Pihtsa River (tributary of Gassi Lake), Amur River basin, N 48°47'804", E 136°47'027", 22–23.V.2019, leg. N. Yavorskaya — 3♂♂, 4 mature pupae (♂♂), 5 pupal exuviae; 28.V.2020, leg. N. Yavorskaya — 5♂♂, 1 mature pupa (♂), 4 pupal exuviae.

**Description. Adult male (n=8).** Total length 3.2–4.4 mm. Total length/wing length 1.31–1.72.

**Head.** Eyes bare, with weak wedge-shaped dorsomedian prolongations. Temporal setae consisting of 13–16 verticals and postorbitals from one side. Clypeus with 9–13 setae. Antenna with 13 flagellomeres and well developed plume; 13<sup>th</sup> flagellomere 565–656 µm long, with 1–2 subapical setae 32–52 µm long; AR 1.41–1.68. Length of palpomeres (in µm): 28–36, 48–72, 104–140, 128–140, 140–196; length of 1–5 palpomeres/head width 0.82–1.22.

**Thorax.** Dark brown. Antepronotum with 7–11 lateral setae. Ac absent, Dc 27–33 (in 1–2 rows), Pa 10–12, Scts 12–14 in one row. Preepisternals and anepisternals absent.

**Wing.** Greyish. Length 2.4–2.8 mm. R with 12–10 setae, R<sub>1</sub> with 6–11 setae, R<sub>4+5</sub> without setae. R<sub>4+5</sub> ending distally of apex M<sub>3+4</sub>. Costa without extension. R<sub>2+3</sub> reduced and often not visible. Anal lobe well developed and slightly protrude. Squama with 25–39 setae 80–104 µm long, in 1–2 rows.

**Legs.** BR<sub>1</sub> 2.6–2.8; BR<sub>2</sub> 2.8–3.1; BR<sub>3</sub> 3.0–4.3. Spur of fore tibia 64–80 µm long. Spurs of mid tibia 40–48 µm and 40–52 µm long. Spurs of hind tibia 76–92 µm and 40–52 µm long. Hind tibial comb with 12–16 setae. Lengths and proportions of legs as in Table 1.

**Hypopygium (Figs 1–8).** Tergite IX with rounded triangular anal point 20–32 µm long and 28–44 µm width, covered with 8–15 setae 20–52 µm long; near of anal point 3–4 setae on tergite IX (Figs 1, 6). Laterosternite IX with 5–9 setae 120–168 µm long. Transverse sternapodeme slightly arched, 120–128 µm long, with rounded triangular projections (Fig. 1), phallapodeme sickle-shaped, 60–80 µm long. Virga horse-shoe-shaped, 22–36 µm long (Fig. 7). Gonocoxite 200–248 µm long; inferior volsella finger-shaped, 36–56 µm long, with some setae 16–32 µm long. Gonostylus 108–160 µm long, with rounded lobe in outer distal part and with outer apical projection 12–16 µm long (Figs 1, 5); megaseta 18–24 µm long, about 20 mm from it along the inner edge there is a strong seta 16–20 µm long, and one strong seta 14–17 µm long located in front of megaseta (Figs. 3–4). It should be noted that form of gonostylus varies from its position (Figs 1–5). HR 1.55–2.07.

**Pupa (n = 3).** Total length 4.1–5.0 mm. Cephalothorax brown, abdominal tergites brown, sternites light brown or yellowish brown. Exuviae yellow.

**Cephalothorax.** Frontal apotome without setae, tubercles and warts (Fig. 8). Antepronotum with two thin and hair-like median antepronotal setae 52–96 µm long and without lateral antepronotals. Surface of mesonotum weakly rugulose. Thoracic horn absent. Precorneal setae lengths (in µm): Pc<sub>1</sub> 80–84, Pc<sub>2</sub> 72–76, Pc<sub>3</sub> 78–84. Bases of setae arranged in form of triangle (Fig. 9). Dorsocentrals hair-like but Dc<sub>1</sub> more strong, 80–124 µm long (Fig. 9), Dc<sub>2</sub> 52–80 µm long, Dc<sub>3+4</sub> 40–76 µm long. Distance between Dc<sub>1</sub> and Dc<sub>2</sub> 52–68 µm; between Dc<sub>2</sub> and Dc<sub>3</sub> 240–264 µm; between Dc<sub>3</sub> and Dc<sub>4</sub> 10 µm.

**Abdomen.** All tergites, sternites and conjunctives with well developed shagreen. Tergites II–VIII of male and female, sternites III–VIII of male with posterior transverse row of large and more dark thorn-like spines (Figs 10–11); sternite VIII of female without thorn-like spines. Number of these spines on tergites II–VIII accordingly — 8–9 : 8–11 : 9–10 : 9–10 : 8 : 7–8 : 6–7. Number of thorn-like spines on sternites III–VIII of male accordingly — 12–13 : 9 : 8–9 : 7–8 : 6–7 : 5–7 and on segments of III–VII of female accordingly — 10 : 8 : 7 : 7 : 6–7. Segments without PSB and PSA. Segments I–VII with 3 pairs of hair-like lateral setae; length of L<sub>1–3</sub> of these segments (in µm) accordingly — 140–224 : 64–108 : 72–112. Segments VIII with 4 pairs of lateral setae; length of L<sub>1–4</sub> of this segment (in µm) accordingly — 132–152 : 92–108 : 88–96 : 92–108. Anal lobe with dorsal and lateral shagreen, extended posteriorly in broad claw-like projection 108–116 µm long (Figs 12–13), measured from base of internal macroseta. Anal macrosetae 80–116 µm long and 6.4–8.0 µm width at base; lateral denticles near centre of macroseta (males) or absent (female). Male genital sac pointed and not extending beyond anal lobe (Fig. 12); female genital sac rounded and short.

**Fourth instar larva (n = 2).** Total length 4.8–5.4 mm.

**Head.** Yellow, teeth of mentum dark brown, distal part of mandible and premandible dark brown, proximal part yellow. Labral setae S<sub>1</sub>–S<sub>2</sub> simple, lamelliform (Fig. 17). Pecten epipharyngis consists of 8 scales. Premandible with 1 wide apical tooth distally (Fig. 14). Antenna with 5 segments; length of 1–5 segments (in µm): 52 : 18 : 10 : 8 : 7; AR 1.21; apex of segment 2 with lauterborn organs ending at apex of 3<sup>rd</sup> segment; antennal blade 43 µm long, in 1.9–2.0 times as long as segments 1–5; one large and one small ring organs are in proximal 1/3 of basal segment; diameter of large ring organ is 5 µm (Fig. 18). Mandible with apical tooth and 2 inner teeth; seta interna with 5 serrate branches; seta subdentalis wide, with pointed apex (Fig. 15). Mentum with 2 median and 4 pairs of dark brown teeth; median teeth slightly divided, one of them is 1.5–1.6 times as wide as the first lateral tooth (Fig. 16). Maxilla lacking pecten galearis.

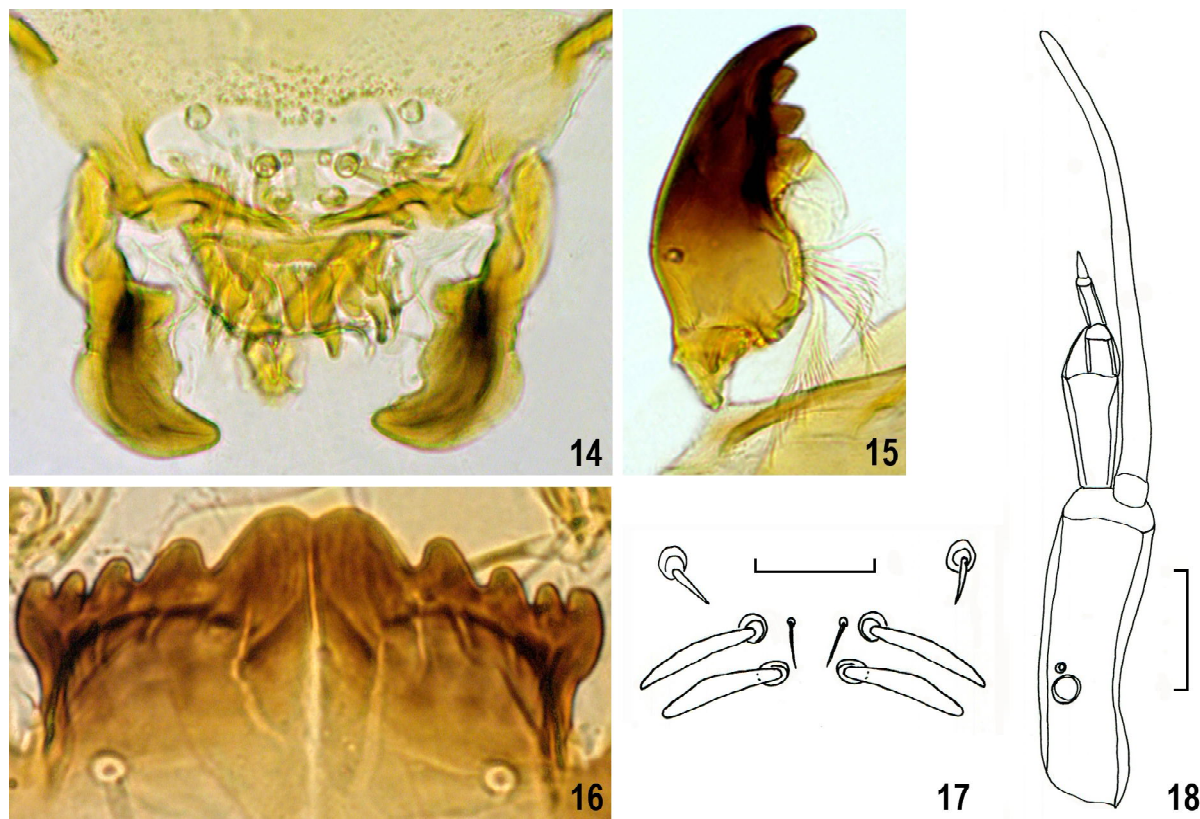
**Abdomen.** Procercus 12–20 µm long and 12–24 µm wide, with 1 anal seta 1480–1600 µm long and 2 thin lateral setae 52–68 µm long. Supraanal setae ca 100 µm long.

**Taxonomic notes.** *P. akanoctavus* was described by Sasa and Kamimura [1987] from Japan by adult male and female. After the revision of holotypes of some Japanese Orthocladinae from the M. Sasa collection, the following species

Table 1. Lengths (in µm) and proportions of leg segments of *Parachaetocladius akanoctavus*, male (n = 6)  
Таблица 1. Длина члеников ног (мкм) и их индексы самца *Parachaetocladius akanoctavus* (n = 6)

P	f	t	ta <sub>1</sub>	ta <sub>2</sub>	ta <sub>3</sub>	ta <sub>4</sub>	ta <sub>5</sub>	LR	BV	SV
P <sub>1</sub>	787–1050	1000–1246	640–820	394–525	230–344	164–197	115–131	0.62–0.68	2.56–2.76	2.68–2.98
P <sub>2</sub>	787–1033	918–1164	377–459	213–279	148–189	98–131	98–115	0.39–0.41	3.44–3.92	4.61–4.79
P <sub>3</sub>	886–1148	1033–1361	590–771	361–443	246–312	131–148	98–115	0.57–0.60	2.94–3.22	3.09–3.30





Figs 14–18. Larva of fourth instar of *Parachaetocladius akanoctavus* Sasa et Kamimura. 14 — labrum; 15 — mandible; 16 — mentum; 17 — labral setae  $S_1$ – $S_{IV}$ ; 18 — antenna. Scale bar 20  $\mu$ m.

Рис. 14–18. Личинка IV возраста *Parachaetocladius akanoctavus* Sasa et Камимура. 14 — верхняя губа; 15 — мандибула; 16 — ментум; 17 — щетинки  $S_1$ – $S_{IV}$  верхней губы; 18 — антенна. Масштабная линейка 20 мкм

were also synonymized under this species, namely *Limnophyes kuramasingularis* Sasa, *Limnophyes kuramasingularis* Sasa et Hirabayashi, *Psectrocladius* (*Monospsectrocladius*) *sunabaabeus* Tanaka et Sasa [Namayandeh et al., 2020]. The description of the adult male from the Russian Far East fits into the description of this species from Japan, although we consider it expedient to compare the Far Eastern and Japanese populations in the future with using both morphological studies and DNA barcoding.

Pupa of *P. akanoctavus* differs from all known species by the absence of caudal spines on tergite I and by the presence of several caudal spines on sternite III, as well as by other features given below in the key. Diagnostic features for the larvae are the presence of long antennal blade which is 1.9–2.0 times the length of the antennal segments 1–5, AR 1.21 and the presence of seta interna with 5 serrate branches.

**Distribution.** *P. akanoctavus* is known from Japan and Russian Far East (Amur River basin and Primorye Territory).

#### KEY TO PUPAE OF *PARACHAETOCLADIUS* WÜLKER (ADAPTED ACCORDING TO SÆTHER, SUBLETTE, 1983)

1. Tergite I and sternite III with several caudal spines [Sæther, 1969, Fig. 52]. Anal macrosetae 117–142  $\mu$ m long.  $L_1$  seta strong ..... *P. hirtipectus* Sæther
- Tergite I without caudal spines but with several caudal spines on sternite III or tergite I and sternite III with traces of caudal spinules [Sæther, Sublette, 1983, Fig. 23A, B]. Anal macrosetae 86–131  $\mu$ m long.  $L_1$  seta strong or minute ..... 2

2. Tergite I lacking caudal spines, sternite III possesses several caudal spines.  $L_1$  seta strong ..... *P. akanoctavus* Sasa et Kamimura
- Tergite I and sternite III at most with traces of few caudal spinules ..... 3
3. Total length about 4.0 mm; anal macroseta about 71  $\mu$ m long and 6.9  $\mu$ m wide [Sæther, Sublette, 1983, Fig. 23F] ..... *Parachaetocladius* sp. A Sæther et Sublette
- Total length about 4.6–5.7 mm; anal macrosetae 86–131  $\mu$ m long and either 4.7–6.6  $\mu$ m or 7.1–9.5  $\mu$ m wide ..... 4
4. Anal macrosetae strong (7.1–9.5  $\mu$ m wide), mostly straight, with lateral denticles at approximately same level; projection of anal lobe slightly elongate [Sæther, Sublette, 1983, Fig. 23C] ..... *P. hudsoni* (Sæther)
- Anal macrosetae less strong (4.7–6.6  $\mu$ m wide) mostly curved in apical half, with lateral denticles at differing levels; projection of anal lobe strongly elongate [Sæther, Sublette, 1983, Fig. 23D] ..... *P. abnobeus* (Wülker)

#### Acknowledgments

We are grateful to Dr. R.S. Andronova, S.S. Kirillin, A.B. Korzhak, A.V. Gotvanskii, S.S. Pelmenov, A.S. Moskalsky, V.O. Arshinov and A.A. Rodionov from Joint Directorate of State Natural Reserves and National Parks of Khabarovsk Territory for support of investigations in National Park «Anyuiskii». We are also grateful to Drs., T.M. Tiunova, V.A. Teslenko and O.V. Orel (Zorina) from Federal

Scientific Center of the East Asia Terrestrial Biodiversity FEB RAS (Vladivostok, Russia) for providing material for the study.

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Поступила в редакцию 15.12.2020