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

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

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**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 первогоописание куколки и личинки IV возраста этого вида с российского Дальнего Востока. Дана обновлённая определительная таблица для куколок рода *Parachaetocladius* Wülker.

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**Introduction**

The present paper continues series of articles based on the results of Chironomidae revision, namely subfamily Orthocladiinae 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.

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**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.

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**Description**

*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 varies positions; 6 — anal point; 7 — virga. Scale bar 20 µm.

Рис. 1–8. имаго самца *Parachaetocladius akanoctavus* Sasa et Kamimura. 1–2 — гипопигиум, вид снизу; 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.** Primorski 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. Tiumova — 1♂; 11.IV.2003, leg.
Figs 8–13. Pupa of *Parachaetocladius akenoctavus* 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. Dc1 — anterior dorsocentral seta; Pc — precorneal setae.

Ðèñ. 8–13. Êóêîëêà *Parachaetocladius akenoctavus* Sasa et Kamimura. 8 — ãîëîâà; 9 — ÷àñòü ãðóäè, âèä íàêó; 10 — ñåãìåíòû IV–V, âèä íàêó; 11 — òåðãèòû IV–V; 12 — øèïû çàäíåãî ðÿäà òåðãèòà VIII è àíàëüíûé ñåãìåíò,  âèä íàêó; 13 — ñâåðõóéíûé ñåãìåíò, âèä íàêó. Dc1 — ïåðåäíÿÿ äîðñîöåíòðàëüíàÿ ùåòèíêà; Pc — ïðåêîðíåàëüíûå ùåòèíêè.
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Lengths (in µm) and proportions of leg segments of Parachaetocladius akanoctavus, male (n = 6)

| P | f | t | h₁ | h₂ | h₃ | h₄ | tₐ | LR | BV | SV |
|---|---|---|----|----|----|----|----|----|----|----|
| P₁ | 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 |
| P₂ | 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 |
| P₃ | 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 |

Cephalothorax. Frontal aperture without setae, tubercles and warts (Fig. 8). Antennepronotal setae with two thin and hair-like median antennepronotal setae 52–96 µm long and without lateral antennepronatal organs. Surface of mesonotum weakly rugulose. Thoracic horn absent. Precoarneal setae lengths (in µm): P₁: 80–84, P₃: 72–76, P₄: 78–84. Bases of setae arranged in form of triangle (Fig. 9). Dorsocentralis hair-like but Dc₁ more strong, 80–124 µm long (Fig. 9), Dc₂ 52–80 µm long, Dc₃ 40–76 µm long. Distance between Dc₁ and Dc₂ 52–68 µm; between Dc₂ and Dc₃ 240–264 µm; between Dc₃ and Dc₄ 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 thor–like spines (Figs 10–11); sternite VIII of female without thor–like spines. Number of these spines on tergites II–VIII accordingly — 8–9 : 8–11 : 9–10 : 9–10 : 8–7 : 8 : 6 : 6. Number of thor–like spines on sternites III–VIII of male accordingly — 12–13 : 9 : 8–9 : 7 : 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 Lₛ of these segments (in µm) accordingly — 140–224 : 64–108 : 72–112. Segments VIII with 4 pairs of lateral setae; length of Lₛ 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 macroseta 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 Sa–S₃, 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 latedorinated organs ending at apex of 3rd 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 1.5–1.6 times as wide as the first lateral tooth (Fig. 16). Maxilla lacking pecten galeare.

Abdomen. Procorpus 12–20 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 holotype of some Japanese Orthocladiinae from the M. Sasa collection, the following species...
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Figs 14–18. Larva of fourth instar of *Parachaetocladius akanoctavus* Sasa et Kamimura. 14 — labrum; 15 — mandible; 16 — mentum; 17 — labral setae S₁–S₄; 18 — antenna. Scale bar 20 µm.

Fig. 14–18. Личинка IV возраста *Parachaetocladius akanoctavus* Sasa et Kamimura. 14 — верхняя губа; 15 — мандибула; 16 — ментум; 17 — щетинки S₁–S₄ верхней губы; 18 — антенна. Масштабная линейка 20 мкм.

were also synonymized under this species, namely *Limnophyes kuramasingularis* Sasa, *Limnophyes kuramasingularis* Sasa et Hirabayashi, *Psectrocladius* (*Monospectrocladius*) *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).

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**Key to Pupae of *Parachaetoctadius* 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 µm long. L, seta strong ........................................... 2

2. Tergite I lacking caudal spines, sternite III possesses several caudal spines. L, seta strong ........................................... *P. akanoctavus* Sasa et Kamimura

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3. Total length about 4.0 mm; anal macrosetae about 71 µm long and 6.9 µm wide [Sæther, Sublette, 1983, Fig. 23F] ............................... *Parachaetocladius* sp. A Sæther et Sublette

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4. Anal macrosetae strong (7.1–9.5 µm wide), mostly straight, with lateral denticles at approximately same level; projection of anal lobe slightly elongate [Sæther, Sublette, 1983, Fig. 23C] .............................................. *P. hudsoni* (Sæther)

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4. Anal macrosetae less strong (4.7–6.6 µm 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)

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