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**A NEW SPECIES OF THE GENUS *TOKUNAGAIA* SÆTHER, 1973
(DIPTERA: CHIRONOMIDAE: ORTHOCLADIINAE) FROM THE
RUSSIAN FAR EAST**

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Summary. *Tokunagaia lagutini* Makarchenko et Makarchenko, **sp. n.** is described on the base of adult male, pupa and larva of fourth instar from the Bolshekhkhtsirsky Nature Reserve in Khabarovskii krai, Russia. New species is most similar to *T. rectangularis* (Goetghebuer, 1940) but distinguished from latter by more short of gonostylus and shape of inferior volsellae of adult male, by presence of thoracic horn of pupa, and by number of inner teeth of mandible and seta-like molar spines of larva.

Key words: Diptera, Chironomidae, *Tokunagaia*, taxonomy, new species, Amur River basin, Russia.

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Резюме. Из природного заповедника «Большехехцирский» (Хабаровский край, Россия) по имаго самцу, куколке и личинке IV возраста описывается новый вид хирономид *Tokunagaia lagutini* Makarchenko et Makarchenko, **sp. n.** Новый вид наиболее близок к палеарктическому *T. rectangularis* (Goetghebuer, 1940), от которого отличается более коротким гоностилем и формой придатка гоноксита имаго самца, наличием у куколки торакального рога, а также числом внутренних зубцов мандибулы и щетинковидных шипов на моле у личинки.

INTRODUCTION

The genus *Tokunagaia* Sæther, 1973 was erected for *Spaniotoma* (*Orthoclaadius*) *kibunensis* Tokunaga, 1939 (Sæther, 1973). Now this genus includes 54 species, mostly from Japan (32 species); 6 species are known from China and 15 species are recognized for the Russian Far East (Yamamoto, 2004; Liu & Wang, 2006; Makarchenko & Makarchenko, 2006, 2007, 2009; Ashe & O'Connor, 2012). Only 3 species are recorded from Nearctic region (Oliver *et al.*, 1990; Ashe & O'Connor, 2012).

One new species of *Tokunagaia* is described below from the Bolshekhkhtsirsky Nature Reserve (Russian Far East, Amur River basin). Material was collected by N.M.Yavorskaya in

2016 and fixed in 70% ethanol. Morphological terminology follow Sæther (1980). Holotype and paratypes are deposited in the collection of the Federal Scientific Center of the East Asia Terrestrial Biodiversity, Far East Branch of the Russian Academy of Sciences, Vladivostok.

DESCRIPTION OF NEW SPECIES

Tokunagaia lagutini Makarchenko et Makarchenko, sp. n.

Figs 1–16

TYPE MATERIAL. Holotype – adult male, **Russia:** Khabarovskii krai, Bolshekhkh-tsirsky Nature Reserve, Ussuri River basin, Golovina Stream, 48°11'131" N, 134°41'039" E, 13.V.2016, leg. N. Yavorskaya. Paratypes: 3 males, 4 pupae, the same data as holotype, leg. N. Yavorskaya; 3 larvae (2 larvae with visible thoracic horn), the same data as holotype, but 6.V.2016, leg. N. Yavorskaya.

DESCRIPTION. ADULT MALE (n = 3, except when otherwise stated). Total length 2.2–2.65 mm. Total length/wing length 1.28–1.58. Coloration light brown or brown.

Head. Eyes naked, with short wedge-shaped elongation. Temporal setae including 2–4 inner verticals, 1–2 outer verticals and 2–3 postorbitals. Clypeus with 4–6 setae. Antenna with 13 flagellomeres and well developed plume; AR 0.77–0.85 (n=2; males, extracted from mature pupae). Lengths of 2–5 palpomeres (µm) – 40–52 : 72–92 : 84–96 : 98–105 : 112–132.

Thorax. Antepronotum with 0–2 lateral setae. Acrostichals 18–24, dorsocentrals 5–9, prealars 4–5. Scutellum with 9 setae.

Wing. Length 1.68–1.88 mm. Anal lobe developed. Squama with 3–5 setae. R with 5–9 setae, R₁ with 0–1 seta, R₄₊₅ with 1–3 setae. Costal extension 32–60 µm. Apex of R₄₊₅ ending distal of apex of M₃₊₄. Cu₁ slightly curved in apical half.

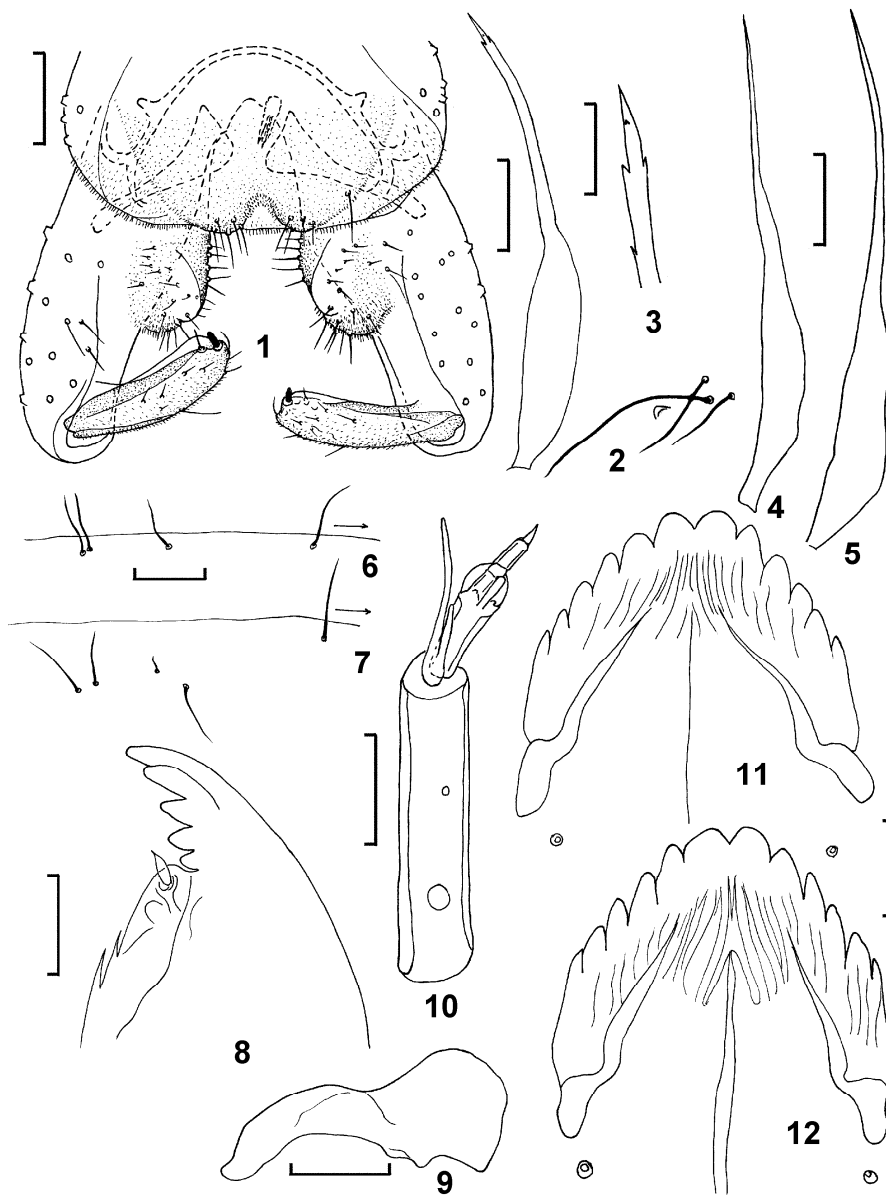
Legs. BR₁ 2.0, BR₂ 2.2–2.6, BR₃ 2.6–3.4 Spur of front tibia 32–48 µm long. Spurs of middle tibia 16 µm and 24–28 µm long, of hind tibia 40–48 µm and 16–20 µm long. Hind tibial comb with 9–12 setae. Small pulvillae are present. Middle legs on ta₁ with 2 pseudospurs, on ta₂ with 0–1 pseudospur; hind legs on ta₁ with 1–2 pseudospurs. Length (µm) and proportions of legs segments are as follow (n=3):

P	fe	ti	ta₁	ta₂	ta₃	ta₄	ta₅	LR	BV	SV
P₁	528–	752–	464–	320	240	96–	96–	0.62–	2.14–	2.74–
	688	848	560							
P₂	624–	672–	336–	176–	152–	96	96	0.48–	2.94–	3.90–
	736	736	352	192	160					
P₃	704–	784–	464–	248–	192–	112–	96–	0.57–	2.77–	3.21–
	800	864	496	272	216	128	104			

Hypopygium (Fig. 1). Tergite IX without anal point and with 11–16 setae in 2 groups; laterosternite IX with 3–6 setae. Transverse sternapodeme 116–120 µm long, with high triangular oral projections. Virga 24–28 µm long, consists of 3–4 setae. Gonocoxite length 184–200 µm. Inferior volsella rectangular-rounded. Gonostylus 80–88 µm long, with low crista dorsalis. Megaseta 8 µm long. HR 2.10–2.45.

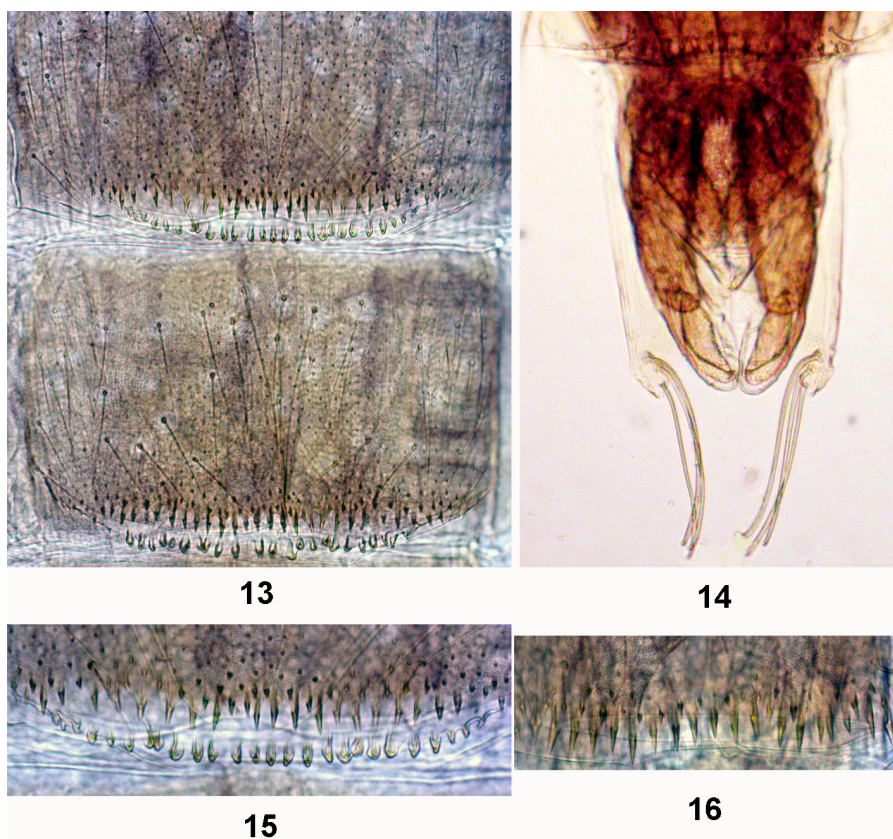
PUPA (n=4) (Figs 2–7). Total length 2.5–3.0 mm. Exuviae light-brown.

Cephalothorax. Frontal apatoma slightly rugose, without setae and tubercles. Thorax with smooth cover. Median antepronotals 1–2, lateral antepronotals 1. Dorsocentrals 4–5 (Figs 6–7). When dorsocentrals 5, Dc₃ very short and weak; distance between Dc₁ and Dc₂ 96–100 µm; between Dc₂ and Dc₃ 18–32 µm; between Dc₃ and Dc₄ 24–42 µm; between Dc₄ and Dc₅ 14–16 µm. When dorsocentrals 4, distance between Dc₁ and Dc₂ 40–80 µm; between Dc₂ and Dc₃ 50–104 µm; between Dc₃ and Dc₄ 12 µm. Thoracic horn present, 220–236 µm



Figs 1–12. *Tokunagaia lagutini* sp. n., male imago (1), pupa (2–7) and larva (8–12). 1 – total view of hypopygium (holotype) from above; 2 – thoracic horn and precorneal setae; 3 – distal part of thoracic horn; 4–5 – thoracic horn; 6–7 – dorsocentral setae of thorax; III; 8 – mandible; 9 – premandible; 10 – antenna; 11–12 – mentum. Scale bars for Figs 1–2, 4–7 are 50 μ m, for Figs 8–12 are 20 μ m.

long, with more wide basal part (46–49% of total length) and narrow distal part (Figs 2, 4–5), which may be covered by short and thin spinules in apical part (Fig. 3). Precorneals length: Pc_1 –72 μ m, Pc_2 –76–108 μ m, Pc_3 –56 μ m. Pc_2 more strong than other precorneals.



Figs 13–16. *Tokunagaia lagutini* sp. n., pupa. 13 – tergites III–IV; 14 – anal segment; 15 – posterior rows of spinules of tergite IV; 16 – posterior rows of spinules of tergite VII.

Abdomen. Tergite I without shagreen. Tergites II–VI with evenly shagreen of small spinules; in posterior part with row of narrow spines 12 μ m long. Tergites III–V after narrow posterior row of long spinules with row of caudal hooklets, number of which on these tergites respectively 17–26, 20–23, 21–22 (Figs 13, 15). Tergites VI–VIII without caudal hooklets, only with posterior spines and tender shagreen (Fig. 16). Tergite IX with shagreen of small spinules. Sternites I–III without shagreen of spinules. Strnites IV–VIII with shagreen of spinules along posterior edge. Sternite IX with small spinules in anterior half. Segments I with 1–2 pairs of lateral setae. Segments II–VIII with 4 lateral setae L_1 and L_2 located side by side. Length of lateral setae L_1 – L_4 of segment VIII respectively 16–24 μ m, 72–88 μ m, 40–52 μ m, 28–36 μ m. Anal macrosetae 140–148 μ m long. Anal lobe length 260–268 μ m. Genital sac of male overreaching anal lobe by 12–28 μ m (Fig. 14).

FOURTH INSTAR LARVA (n=3) (Figs 8–12). Total length 3.75–4.0 mm.

Head dark-brown. Labral setae S_I–S_{IV} simple. Antenna with 5 segments; AR 1.5–1.73. First segment with large ring organ in basal part and small ring organ distal of middle part; laurerborn organs good visible and the same length as segment 3; blade of second segment rich to base and sometime apex of 5th antennal segment (Fig. 10). Premandible with 1 wide apical tooth. Mandible with 1 apical and 4 inner dark brown or black teeth and 2 seta-like long molar spines; apical tooth the same length as first of inner tooth; seta subdentalis rich to 3rd inner tooth; seta interna branched to 5 parts. Pecten galearis of maxilla absent. Mentum 62–66 µm wide, with 2 middle tooth and 5 pairs of lateral teeth; middle teeth good separated; one of middle teeth in 1.3–1.7 times wider of first lateral tooth; ventromental plates good visible, in basal part with bend and rounded apically (Figs 11–12); postmentum 160–168 µm long.

Abdomen. Abdominal segments setae rare and shorter of ½ of segment length. Supraanal seta length 40–80 µm. Width of procercus is equal to their length, with 7 anal setae of different length: 3 setae 224–300 µm long, 4 setae 120–200 µm long; and with 2 weak lateral setae. Anal tubules shorter of posterior pseudolegs. Posterior pseudolegs at base in 1.7–2 times longer than their width.

DIAGNOSIS AND COMMENTS. *T. lagutini* sp. n. is close related to the Palaearctic *T. rectangularis* (Goetghebuer, 1940) and adult male can be distinguished from latter by LR₁ (0.62–0.66), HV (2.71–3.01), rectangular-rounded inferior volsella and more short (80–88 µm) gonostylus. Male of *T. rectangularis* with LR₁ 0.74, HV 3.1–3.47, inferior volsella rectangular, gonostylus length 90–98 µm (Halvorsen & Sæther, 1987). Pupa of *T. lagutini* sp. n. with thoracic horn, which is not typical for the genus *Tokunagaia* and the diagnosis of which indicates that the thoracic horn is absent. However, we have previously described pupa of *T. oleantoni* Makarchenko et Makarchenko, which also lacked thoracic horns (Makarchenko & Makarchenko, 2007). If do not take into account the presence of the thoracic horn, the pupa of the new species is close related also to *T. rectangularis* which have total length 3.06–3.78 mm, tergites III–V with 32–51 hooklets in posterior row, segment VIII with 2 pairs of lateral setae and genital sac of male overreaching anal lobe by 56–75 µm (Halvorsen & Sæther, 1987). Total length of pupa *T. lagutini* sp. n. 2.5–2.95 mm, tergites III–V with 17–26 hooklets in posterior row, segment VIII with 4 pairs of lateral setae and genital sac of male overreaching anal lobe by 12–28 µm. Larvae of both species are very similar and can be separated only two features. Larva of *T. lagutini* sp. n. with 4 inner teeth of mandible and 2 seta-like molar spines, while larva of *T. rectangularis* with 3 inner teeth of mandible and 3 seta-like molar spines (Halvorsen & Sæther, 1987).

We believe at present there is a need to revise the genera *Tokunagaia* and *Eukiefferiella* due to the fact that the pupae of species *T. oleantoni* and *T. lagutini* sp.n. have thoracic horns and do not conform to the diagnosis of this genus. At the same time, the males of some species of the genus *Eukiefferiella* (*E. ternus* Makarchenko et Makarchenko, *E. claripennis* Lundbeck, *E. intermedia* Makarchenko et Makarchenko and *E. limuri* Makarchenko et Makarchenko) also do not correspond to the diagnosis of this genus, since hypopygium of these species with virga, which is characteristic of the genus *Tokunagaia*. In our opinion, for the removal of disagreements in the taxonomy and systematics of genera *Tokunagaia* and *Eukiefferiella* it seems reasonable to close the genus *Tokunagaia*, which was erected mostly with using adults without investigation of the preimaginal stages (Sæther, 1973; Halvorsen & Sæther, 1987).

ETYMOLOGY. The species is named in honor of inspector of the Bolshekhkhtsirsky Nature Reserve and driver of the cross-country vehicle S.V. Lagutin, thanks to which it was possible to gather material in the inaccessible corners of the reserve.

DISTRIBUTION. New species is known only from the type locality in Khabarovskii krai.

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REFERENCES

- Ashe, P. & O'Connor, J. P. 2012. *A World Catalogue of Chironomidae (Diptera) Part 2. Orthoclaadiinae*. Irish Biogeographical Society & National Museum of Ireland, Dublin. XVI+968 pp.
- Halvorsen, G.A. & Sæther, O.A. 1987. Redefinition and revision of the genus *Tokunagaia* Sæther, 1973 (Diptera, Chironomidae). *Entomologica Scandinavica*, Suppl. 29: 173–188.
- Liu, Y., Wang, X. 2006. *Tokunagaia* Sæther from China (Diptera, Chironomidae, Orthoclaadiinae). *Zootaxa*, 1183: 43–56.
- Makarchenko, E.A. & Makarchenko, M.A. 2006. 5. Subfamily Orthoclaadiinae. P. 280–372, 482–530, 623–671. In: Lelei, A.S. (Ed.). *Key to the insects of Russian Far East. Vol. 6. Diptera and Siphonaptera. Part 4*. Dalnauka, Vladivostok. [In Russian]
- Makarchenko, E.A. & Makarchenko, M.A. 2007. A review of *Tokunagaia* Sæther (Diptera, Chironomidae) from the Russian Far East, with the description of four new species. P. 181–192. In: Andersen, T. (Ed.). *Contributions to the systematics and ecology of aquatic Diptera – A Tribute to Ole A. Sæther*. The Caddis Press. Columbus, Ohio, U.S.A.
- Makarchenko, E.A. & Makarchenko, M.A. 2009. New data on the taxonomy and distribution of *Tokunagaia* Sæther (Diptera, Chironomidae, Orthoclaadiinae) in the Russian Far East. *Euroasian Entomological Journal*, 8(4): 421–428.
- Oliver, D.R., Dillon, M.E. & Cranston, P.S. 1990. *A catalog of Nearctic Chironomidae*. Research Branch Agriculture Canada. Ottawa. 89 pp.
- Sæther, O.A. 1973. Four species of *Bryophaenocladus* Thien., with notes on other Orthoclaadiinae (Diptera, Chironomidae). *The Canadian Entomologist*, 105: 51–60.
- Sæther, O.A. 1980. Glossary of chironomid morphology terminology (Chironomidae, Diptera). *Entomologica Scandinavica*, Suppl. 14: 1–51.
- Yamamoto, M. 2004. A catalog of Japanese Orthoclaadiinae (Diptera, Chironomidae). *Makunagi (Acta Dipterologica)*, 21: 1–121.

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