

The first record of *Neostempellina simantoneoa* (Sasa, Suzuki *et* Sakai, 1998), comb. nov. for the Russian Far East, with a description of the preimaginal stages (Diptera, Chironomidae)

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Abstract

Zavrelia simantoneoa (Sasa, Suzuki *et* Sakai, 1998) is moved to the genus *Neostempellina* Reiss as new combination. The pharate male of *Neostempellina simantoneoa* (Sasa, Suzuki *et* Sakai, 1998) is redescribed. The pupae and larvae collected in rivers of the southern part of Primorye Territory (Russian Far East) are described and illustrated for the first time.

Key words: *Neostempellina*, taxonomy, pharate male, pupa, larva, Russian Far East

Introduction

The genus *Neostempellina* was established by Reiss (1984) with type species *Neostempellina thienemanni* Reiss. Later he described the adult male of *N. pilosa* Reiss from Eastern Turkey (Reiss 1987). Two species from Central Africa, *N. saetosa* (Lehmann, 1981) and *N. abnormis* (Lehmann, 1981), were transferred to the genus *Neostempellina* by Stur & Ekrem (2000). *Neostempellina reissi* Caldwell, 2000 was described based on the male from north-central Maine, USA. It was the first record of the genus for the Nearctic region. Ten years later, Caldwell *et al.* (2010) described the immature stages and the adult female of this species based on reared specimens from New York and Ohio.

Sasa *et al.* (1998) described the adult male of *Micropsectra simantoneoa* Sasa, Suzuki *et* Sakai collected on the shore of the Shimanto River (Shikoku Island, Prefecture Kohchi, Japan). Kobayashi (2014) gave a redescription of the adult male of *Micropsectra simantoneoa*, and transferred the species to the genus *Zavrelia* Kieffer, Thienemann *et* Bause in Bause, 1913. As a result of studying the benthos of Primorye Territory rivers, we found a pharate male and pupae with larval exuviae here determined as *Zavrelia simantoneoa* (Sasa, Suzuki *et* Sakai, 1998). However, the morphological features of the pupa and larva of this species indicate that they belong to the genus *Neostempellina*. Below we present for the first time an illustrated description of the immature stages and a redescription of the male *Neostempellina simantoneoa* (Sasa, Suzuki *et* Sakai) **comb. nov.** from the Russian Far East.

Material and methods

The material was collected in two rivers in the southeastern part of Primorye Territory - Barabashevka (Khasasnsky district) and Proselochnaya (Lazovsky district). For sampling of zoobenthos, scrapers were used, with the help of which the top layer of bottom sediments was sampled, which then was washed through a washing sieve, and drift traps. The collected material was fixed in 70% ethanol. Then the pupae and larvae of chironomids were placed on a glass slide in Faure-Berlese solution. Morphological terminology and abbreviations follow Sæther (1980).

The material is deposited in the Laboratory of Freshwater Hydrobiology Federal Scientific Center of East Asia Territorial Biodiversity.

The photographs were taken using an Olympus DP74 digital camera, and then stacked using post-processed for contrast and brightness using Adobe® Photoshop® software.

Results

Systematics

Family: Chironomidae Newman, 1834

Subfamily: Chironominae Newman, 1834

Tribe: Tanytarsini Zavřel, 1917

Genus: *Neostempellina* Reiss, 1984

Neostempellina Reiss, 1984: 204.

Neostempellina Reiss: Reiss 1987: 1; Pinder & Reiss 1986: 334; Cranston *et al.* 1989: 391; Caldwell 2000: 164; Caldwell *et al.* 2010: 272; Epler *et al.* 2013: 448.

Type species: *Neostempellina thienemanni* Reiss, 1984, by monotype.

Other included species: *Neostempellina abnormis* (Lehmann, 1981) (Central Africa), *Neostempellina pilosa* Reiss, 1987 (East Turkey, Greek mainland, Oriental Region), *Neostempellina reissi* Caldwell, 2000 (Nearctic), *Neostempellina saetosa* (Lehmann, 1981) (Central Africa), *Neostempellina simantoneoa* (Sasa, Suzuki et Sakai, 1998) (Japan, Russian Far East).

***Neostempellina simantoneoa* (Sasa, Suzuki et Sakai, 1998), comb. nov.**

Figs 1–26.

Micropsectra simantoneoa Sasa, Suzuki et Sakai, 1998: 62, Fig. 15.

Zavrelia simantoneoa (Sasa, Suzuki et Sakai, 1998): Kobayashi 2014: 41.

Neostempellina sp. Makarchenko *et al.* 2005: 414; Orel 2016: 193.

Material examined. Mature pupa (pharate male), RUSSIA, PRIMORYE TERRITORY, Khasansky District, Barabashevka River, 01.vii.2002 (T. Tiunova); 2 pupae with larval exuviae, 3 larvae, Lazovsky District, Proselochnya River, 1 km from the cordon, 3–4.vii.2007 (O. Orel).

Diagnosis. The male has morphometric features consistent with the diagnosis of the genus *Neostempellina*, namely, pubescent eyes, 10–11-segmented antenna, frontal tubercles absent, tibial spurs absent, anal tergite bands of V-type, median setae present, anal crests present, spinulea absent, superior volsella oval, digitus absent, median volsella short.

The structure of the pupa of this species supplements the diagnosis of the genus *Neostempellina*: [cephalic tubercles](#) well-developed, trapezoidal, frontal setae taeniate, elongated; thoracic horn elongate, gradually tapering towards apex and with short setae apically; Pedes spurii B absent; pedes spurii A well-developed on sternite IV; tergites II–V with a large rectangular to quadrate field of shagreen; segment VIII with large anal spurs.

The larva of this species conforms to the diagnosis of the genus *Neostempellina*, namely, the head capsule with numerous granulations and tubercles and/or spines; antennal pedestal with a broad spur and a larger multispined process; antennal segment 2 apically with a pair of Lauterborn organs on short pedicels; pecten epipharyngis of 3 apically serrated scales; premandible with 3 large apical teeth and 1 small basal tooth; brush present; mentum with 1 wide median tooth and 6 pairs lateral teeth; procerci strongly sclerotized, with numerous spines and projections; and the curved, tapered, tubular transportable case.

Description. Pharate male (n=1).

General colour yellowish brown.

Head. Eyes pubescent. Frontal tubercles absent. Temporal setae 5. Clypeus with 7 setae. Flagellomeres (1–11) dark brown (flagellomeres clearly separated), 584 µm long; ultimate flagellomere 184 µm long. AR 0.46. Maxillary palp lost.

Thorax. Ground colour of scutum pale yellow, mesonotal stripes and postnotum brown. Aps 0, Ac 5, Dc 6, Pa 1. Scutellum yellow, with 2 setae.

Wings 0.76 mm (not spread), covered with setae apical third.

Legs (Table 1) yellowish brown. Spur on ta_1 6 µm long. Combs of ti_2 and ti_3 without spurs. BR_1 2.6, BR_2 4.0, BR_3 4.6. Sensilla chaetica on ta_1 of P_2 absent.

TABLE 1. Length (µm) and proportions of legs of the pharate male of *N. simantoneoa* (Sasa, Suzuki *et* Sakai).

P	f	t	ta_1	ta_2	ta_3	ta_4	ta_5	LR	SV	BV
P_1	384	240	440	224	120	96	64	1.83	1.42	2.11
P_2	376	320	192	144	72	64	56	0.60	3.63	3.08
P_3	392	416	216	160	112	80	64	0.52	3.74	2.46

Hypopygium (Figs 1–2). Anal tergite with V-type bands and 7 median setae. Anal point 15 µm long and 6 µm wide, widest at its base and tapering towards rounded apex, with anal crests (30 µm long), spinulae absent, 8–10 lateral setae on each side of anal point. Gonocoxite 81 µm long, with 3 setae along inner margin. Transverse sternapodeme 24 µm wide, phallopodeme 39 µm long. Superior volsella oval (30 µm long, 15 µm wide), bearing 3 strong inner and 3–4 fine dorsal setae, microtrichia absent. Digitus and basal seta absent. Stem of median volsella short, 9 µm long and 6 µm wide, with several slender, lanceolate setae. Inferior volsella gradually narrows towards its apex, 51 µm long, with 10 setae. Gonostylus slender, slightly curved inwards, 60 µm long 15 µm wide. HR 1.35.

Pupa (n=4)

Cephalothorax. Length of thorax 0.64–0.69 mm. Frontal tubercles well-developed, 18–24 µm long, 30–36 µm wide. Frontal setae taeniate, 75–81 µm long and 12–15 µm wide, consisting of two parts: an inner core and a transparent shell (Figs 3, 21). Thorax granulose along median suture. Thoracic horn elongate, gradually tapering towards apex (159–189 µm long and 15–21 µm wide), apically covered with short setae (Figs 4, 13). Antepronotals 2 (median and lateral, taeniate). Precorneals 2–3 (135–171 µm long, taeniate). DC_{1-4} simple, 15–39 µm long. Distance between DC_1 and DC_2 3–6 µm, DC_3 and DC_4 3–12 µm, DC_2 and DC_3 93–99 µm. Wing sheath 270–276 µm long, 75 µm wide. Prealar tubercle absent.

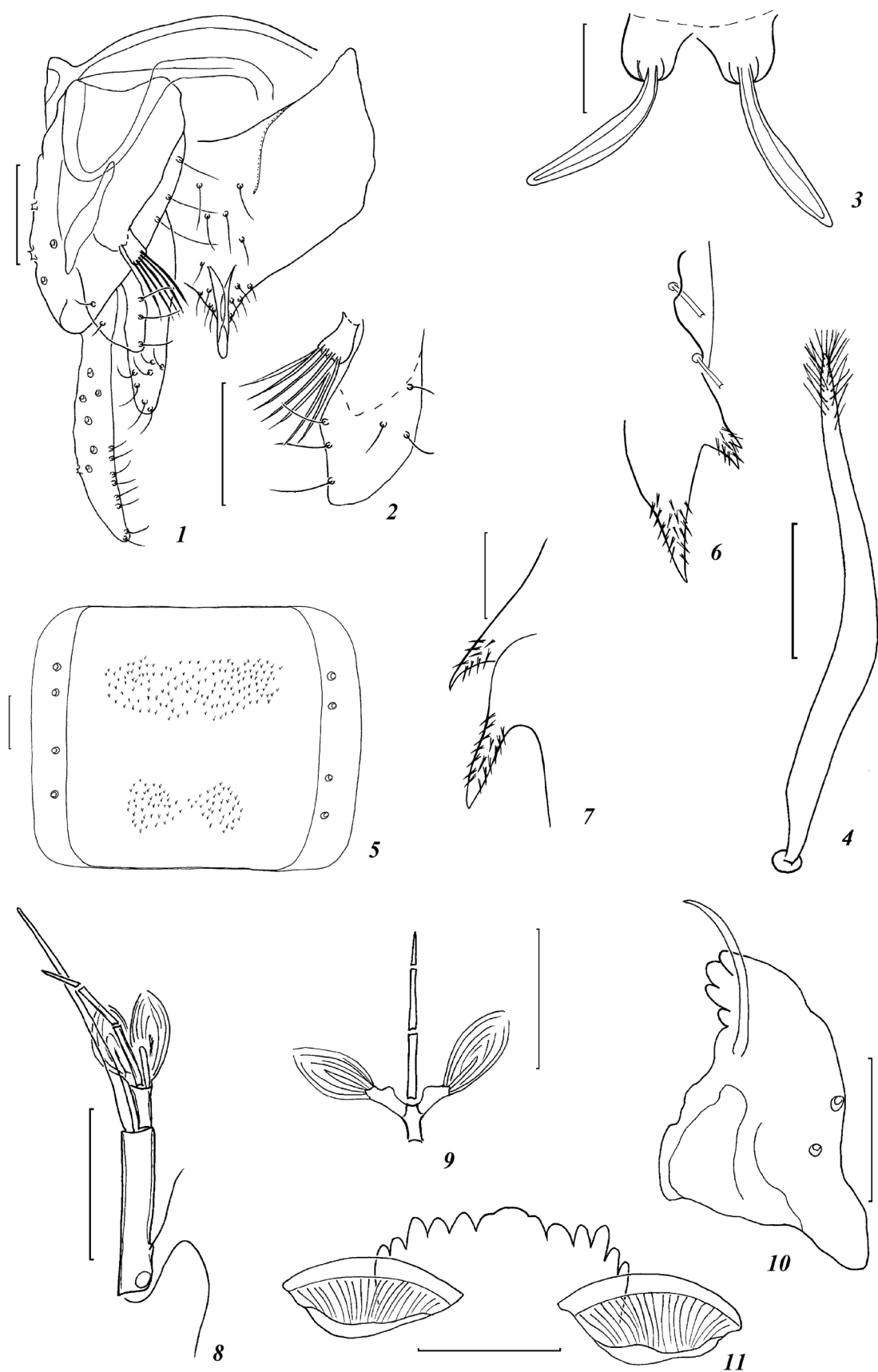
Abdomen (Figs 5, 14–17) 0.30–0.35 mm long. Hook rows with 53–63 hooks, 90–111 µm wide. Tergite I bare; II–VI with median shagreen; VII in proximal part with two patches of shagreen, with transverse stripe of shagreen in distal part; VIII with anterolateral and posterolateral patches of shagreen. Pedes spurii B absent; pedes spurii A well-developed on sternite IV. Sternite VI with anterolateral and posterolateral patches of shagreen or with three shagreen patches in the proximal part and with posterolateral patches of shagreen; VII with pair anterolateral patches of shagreen and posterior transverse band of spines (Fig. 5); VIII with anterolateral and posterolateral patches of shagreen or only with posterolateral patches of shagreen or shagreen absent. Laterosternites II–VI with shagreen. Segment VIII with 2–3 strong dark spurs (12–39 µm long) covered with small spines (Figs 6–7, 17). Segment II–IV with 3 L setae, V with 3 LS setae, VI–VII with 4 LS setae, and VIII with 3 LS setae. Anal lobe well developed with complete fringe of 16–20 taeniate setae in single row, dorsal setae absent. Anal segment 99–120 µm long and 171–201 µm wide.

Fourth instar larva (n=5)

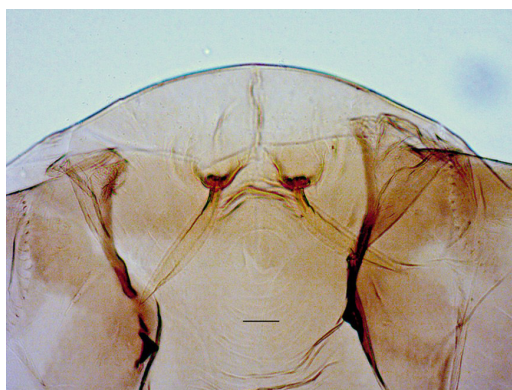
Colouration white (in alcohol), with yellowish brown head capsule.

Head. Dorsal surface granulated; S 3 bifid. Frontoclypeal apotome apically with crown of 5 long spines.

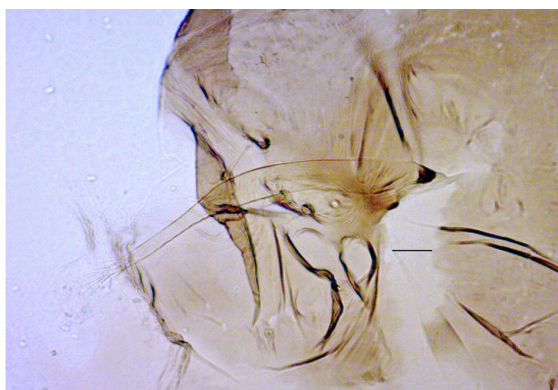
Antenna (Figs 8–9, 21–22) situated on tall pedestal with pronounced distal spur (15–24 µm long and 12–15 µm wide) and multispined process (39–54 µm long). Antenna 5-segmented, total length 86–90 µm, length of each segment (in µm): 39–41; 11–12; 12–15; 15; 6–9. AR 0.76–0.84. Ring organ located at base of basal segment; seta strong, 18–24 µm long, located 15 µm from base of basal segment and extends beyond the middle of segment. Lauterborn organ 30 µm long, placed apically on short pedicels (7.5 µm long), not reaching apex of fourth segment. Blade 60–63 µm long, situated apically on basal segment, extending to antennal apex. At the apex of the basal segment there is a style 12 µm long.



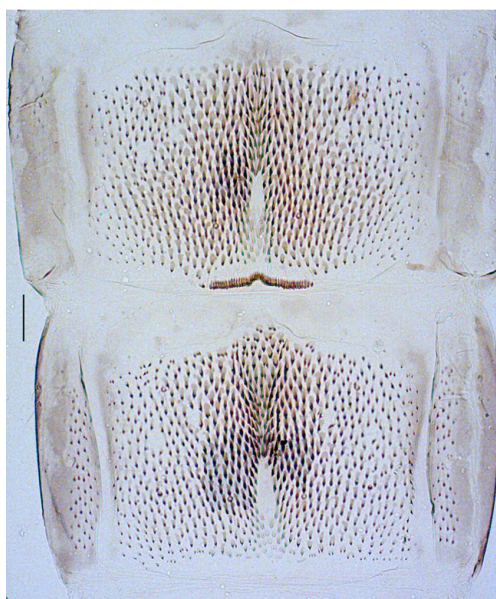
FIGURES 1–11. Pharate male (1–2), pupa (3–7) and larva (8–11) *Neostempellina simantoneoa* (Sasa, Suzuki *et* Sakai, 1998). 1—hypopygium; 2—superior and median volsellae, dorsal view; 3—frontal tubercles and setae; 4—thoracic horn; 5—tergite VII, 6, 7—anal spurs; 8, 9—antenna; 10—mandible; 11—mentum and ventromental plates. Scale bar 50 μ m.



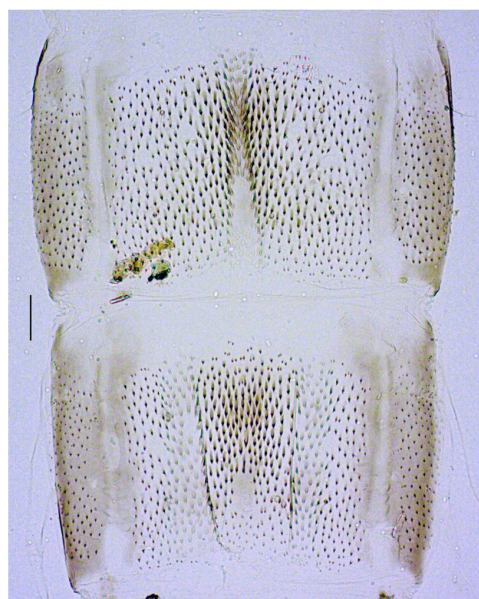
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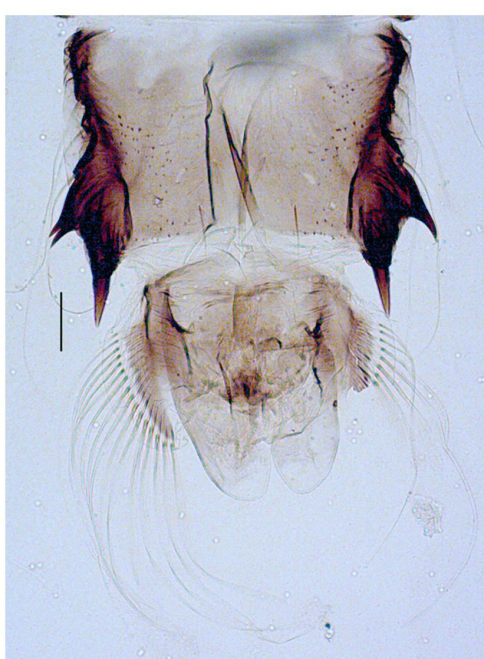
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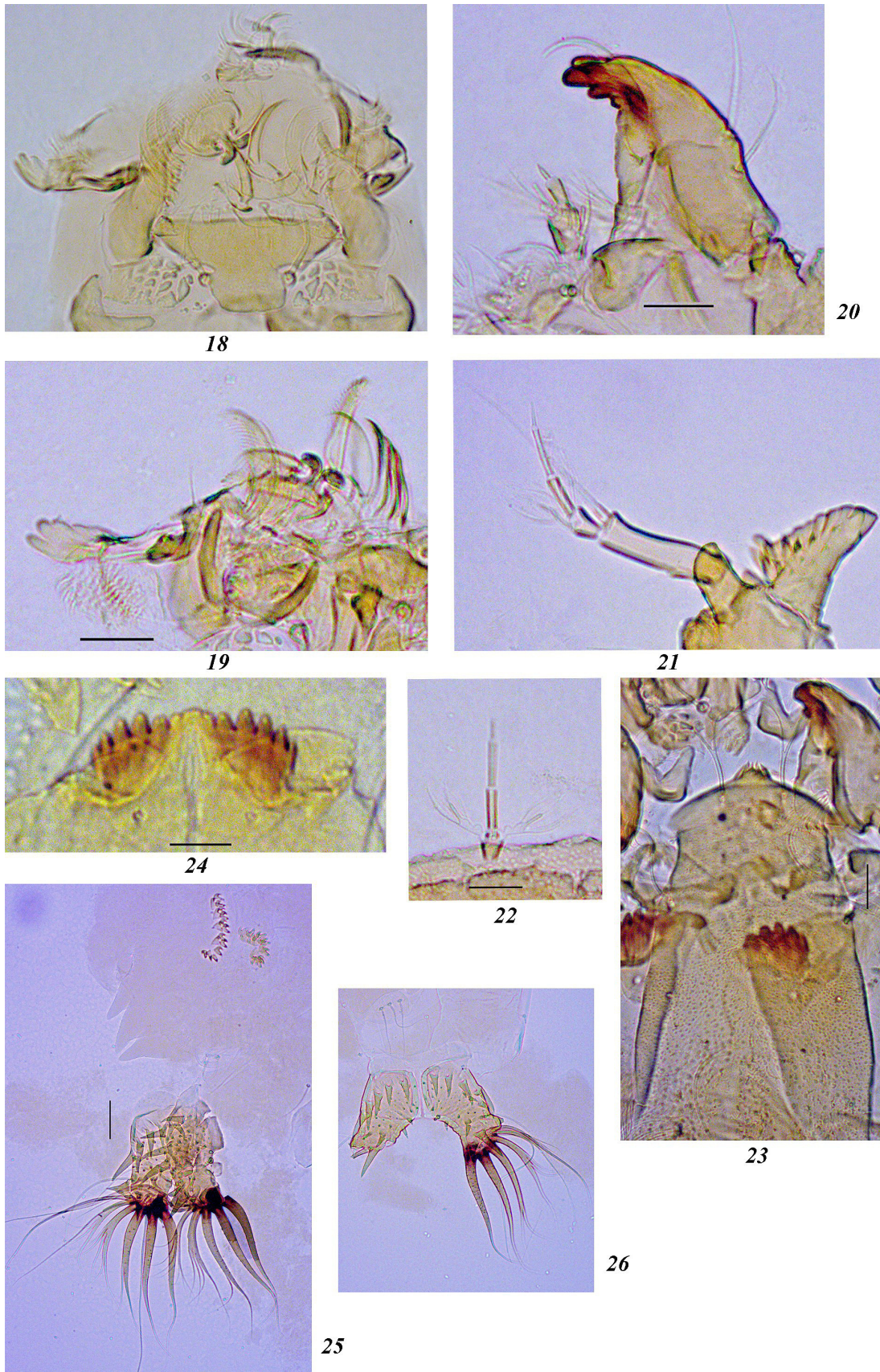


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FIGURES 12–17. Details of the structure of the pupa *Neostempellina simantoneoa* (Sasa, Suzuki *et* Sakai, 1998). 12—frontal apotome; 13—thorax, lateral view; 14—tergites II–III; 15—tergites IV–V; 16—tergites VI–VII; 17—tergites VIII–IX. Scale bar 20 μ m.



FIGURES 18–26. Details of the structure of the larva *Neostempellina simantoneoa* (Sasa, Suzuki *et* Sakai, 1998). 18—labrum and tergite 1; 19—labrum; 20—mandible and maxillar palp; 21—antenna, distal spur and multispined process; 22—2–5 antennal segments and Lauterborn organ; 23—frontoclypeal apotome; 24—mentum and ventromental plates; 25—posterior parapods, anal tubules and procerci; 26—procerci. Scale bar 20 μm.

Labrum (Figs 18–19). S I 15–18 μm long, comb-like; S II 24–27 μm long, plumose, situated on tall pedestal 9–15 μm long; S III 24–30 μm , simple; S IV A, B 4.5 and 6 μm long, respectively, finger-shaped. Labral lamella 18 μm long and 24 μm wide. Pecten epipharyngis consisting of 3 separate, distally serrated scales. Premandible 42–48 μm long, with 3 large apical and 1 small basal teeth; brush present.

Mandible (Fig. 10, 20) 69–72 μm long, 45 μm wide, with pale dorsal tooth, with brownish apical and two inner teeth. Seta subdentalis 39–45 μm long, curved. Seta interna consisting of 4 plumose branches.

Maxillary palp (Fig. 20) 3-segmented; basal segment 15 μm long, ring organ located near base, with several simple setae and sensilla, second segment 9 μm and third 4.5 μm long.

Mentum (Figs 11, 24) 60 μm wide; 1 median tooth (15 μm) and 6 pairs lateral teeth (if the teeth of the mentum are worn, then the medial tooth merges with the first lateral teeth and we see one wide pale medial tooth with two notches and 5 lateral teeth); medial and first lateral teeth lighter than other lateral teeth. Ventromental plate 42–45 μm wide, 21–24 μm high; distance between ventromental plates 15 μm .

Body. Posterior parapods with 15 simple hooks (Fig. 25). Procerci sclerotized and modified (99 μm long and 66 μm wide), covered with spines of different lengths; anal setae also modified, 5 wide, apically branched setae and 3 thinner setae split at the end (Figs 25–26). Anal tubules conical, 45–54 μm long.

Remarks. The male of *N. simantoneoa* collected in Primorye Territory practically does not differ from Japanese specimens of morphometric parameters (Sasa *et al.* 1998, http://www.type.kahaku.go.jp/TypeDB/mediaDetail?cls=diptera&pkey=diptera-000707&lCls=m_diptera&lPkey=275053&detailnkIdx=0; Kobayshi 2014).

The males of *N. simantoneoa* can be distinguished from all known species of the genus by the following combination of morphological features: eye hairy, antenna with 11 flagellomeres, frontal tubercles absent, AR 0.41–0.46; LR_{p1} 1.83–1.90; anal tergite bands of H-type, anal point relatively short tapered to apex, superior volsella oval with 3 inner and 2–3 dorsal setae, digitus absent, median volsella with a short rectangular stem, gonostylus slender, slightly curved inward.

The pupa of *N. simantoneoa* is most similar to *Tanytarsini* gen.? sp.? Pe 1 (Langton & Visser 2003), but differs from the latter by the following features: cephalic tubercles well-developed, trapezoidal, tergite VII with pair anterolateral patches of shagreen and posterior transverse band of shagreen, Pedes spurii B on segment II absent, segment VIII with 1 strong apical spur and 1–2 smaller, more anterior spurs. Whereas pupa the *Tanytarsini* gen.? sp.? Pe 1 has very small conical cephalic tubercles, tergite VII with anterior and posterior transverse bands of spines, pedes spurii B on segment II hardly perceptible, segment VIII with 1 strong apical spur.

The pupa of *N. simantoneoa* is also similar to *N. reissi* Caldwell, 2000 on the thoracic horn form, but differs in the following morphological features: cephalic tubercles well-developed, trapezoidal, frontal setae taeniate, tergite VIII with anterolateral and posterolateral patches of shagreen. Whereas pupa *N. reissi* Caldwell has small cephalic tubercles, slender frontal setae, shagreen on tergite VIII is located medially and anterolaterally (see Table 2).

The larva of *N. simantoneoa* differs from the larvae of *N. reissi* and *N. thienemanni* by the following combination of characters: frontoclypeal apotome apically with crown of 5 long spines, S 3 bifid; antenna 5-segmented, width of distal spur equal to or slightly greater than width of basal segment, seta of basal segment strong, extends beyond the middle of the segment, Lauterborn organ placed apically on short pedicels, not reaching the apex of fourth segment, blade long, extending to antennal apex; premandible with 3 large apical and 1 small basal teeth; inner margin of mandible (mola) without spines.

Distribution. Japan (Shimanto River, Prefecture Kohchi, Shikoku Island), Russian Far East (Primorye Territory).

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TABLE 2. Comparison of diagnostic characters of the known pupae of *Neostempellina*.

Characters	<i>N. reissi</i> (from Caldwell <i>et al.</i> 2010, n=4)	<i>N. thienemanni</i> (from Reiss 1984)	Tanytarsini gen.? sp.? Pe 1, (from Langton & Visser 2003, n=2)	<i>N. simantoneoa</i> (our data, n=4)
	Nearctic	Western Europe	Western Europe	Japan, Russian Far East
Total length, mm	2.3–3.0	3.0	2.1, 2.4	–
Cephalic tubercles	small	absent	very small, conical	well developed, trapeziform
Frontal setae	slender, 52–55 µm long	short and slender	taeniate, 62–70 µm long, 14 µm wide	taeniate, 75–81 µm long, 12–15 µm wide
Thoracic horn	162–241 µm long, with setae only near apex	170 µm long, with lateral fringe of long chaetae	180–190 µm long, with setae confined to apex 20–24 µm long	159–189 µm long, with setae confined to apex 39 µm long
Tergite VII	with pair anterola- teral patches of sha- green and posterior transverse band of shagreen	with anterolateral and posterolateral patches of shagreen	with anterior and pos- terior transverse bands of spines	with pair anterola- teral patches of sha- green and posterior transverse band of shagreen
Tergite VIII	shagreen mostly me- dian and anterolateral	shagreen anterola- teral	–	with anterolateral and posterolateral patches of shagreen
Pedes spurii B II	absent	absent	hardly perceptible	absent
Lateral taeniae of segments V–VIII	3, 4, 4, 3	3, 3, 4, 3	3, 4, 4, 3	3, 4, 4, 3
Postero-lateral corners of segment VIII	with 1 strong apical spur and 1–2 smaller, more anterior spurs	with 3–4 dark teeth	with a large spur	with 1 strong apical spur and 1–2 smaller, more anterior spurs

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