



Review of the Japanese *Microtendipes* (Diptera: Chironomidae: Chironominae), with description of a new species

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Abstract

Japanese species of *Microtendipes* are reviewed. Eleven names proposed in this genus, including Russian *M. sakhalinensis* Zorina, 2001, are synonymized with *M. umbrosus* Freeman, 1955, for which male and female adults, pupa and larva are redescribed based on specimens collected from Japan. Two species, *M. shoukomaki* Sasa, 1989 and *M. famiefefus* Sasa, 1996, are validated based on the re-examination of type specimens and are redescribed based on specimens newly collected from Japan. Descriptions of the larva of *M. shoukomaki* and the female adult, pupa and larva of *M. famiefefus* are given here for the first time. *Microtendipes chloris* (Meigen, 1818) *sensu* Sasa is redescribed as a new species, *M. parachloris* Niitsuma & Tang **sp. nov.**, based on the male adult. Additionally, synonymic notes of *Polypedilum* (*Cerobregma*) *yamasinense* (Tokunaga, 1940) **comb. nov.** and *P. (Polypedilum) tsukubaense* (Sasa, 1979), transferred from *Microtendipes*, are given. *Polypedilum kamotertium* Sasa, 1989 and *M. irioceus* Sasa & Suzuki, 2000 are synonymized with the above two species, respectively, based on each original description.

The distribution of *M. umbrosus* extends from Africa to the Russian Far East and East Asia (Japan, China), and Australia and Thailand (with new distributions reported here). Although no African type material is examined here, the morphological features of those populations are consistent with Freeman's concept.

Key words: Chironomidae, *Microtendipes*, taxonomy, new species, synonym, Japan

Introduction

The genus *Microtendipes* Kieffer has a nearly worldwide distribution, and hitherto comprises more than 60 described species from around the world (Freeman & Cranston 1980, Cranston & Martin 1989, Ashe & Cranston 1990, Oliver *et al.* 1990, Zorina 2001, Qi & Wang 2006, Qi *et al.* 2014, Yamamoto & Yamamoto 2014, Hazra *et al.* 2016). In Japan, 19 species of *Microtendipes* were listed in the most recent catalogue (Yamamoto & Yamamoto 2014).

However, most were described by Sasa and his co-workers. Kobayashi & Endo (2008) wrote, "it is well known among chironomid researchers that many of the species described by Sasa probably are junior synonyms of other species."

Therefore, we re-examined the type and voucher specimens of all species of *Microtendipes* deposited in the Sasa collection of the National Museum of Nature and Science, Tsukuba, Japan (NSMT). We conclude that the following ten species, *M. tamaogouti* Sasa, 1983, *M. shounagasaki* Sasa, 1989a, *M. kamoprimum* Sasa, 1989b, *M. amamihosoides* Sasa, 1990, *M. hibaraquintus* Sasa, 1993, *M. tokarafefus* Sasa & Suzuki, 1995, *M. simantofefus* Sasa, Suzuki & Sakai, 1998, *M. simantogefus* Sasa, Suzuki & Sakai, 1998, *M. tusimabeceus* Sasa & Suzuki, 1999 and *M. tusimacedeus* Sasa & Suzuki, 1999, are junior synonyms of *M. umbrosus* Freeman, 1955, and only two species, *M. shoukomaki* Sasa, 1989a and *M. famiefefus* Sasa, 1996, are considered to be valid species of Japanese *Microtendipes*. Judging from the original description, the Russian species *M. sakhalinensis* Zorina, 2001 also is a junior synonym of *M. umbrosus*. Here, the synonymic notes of *M. umbrosus*, *M. shoukomaki* and *M. famiefefus* are

based on comparisons between type specimens. These three species are redescribed based on specimens collected newly from Japan by the second author. Descriptions of the larva of *M. shoukomaki* and the female adult, pupa and larva of *M. famiefeus* are given for the first time. Distributions in China is compiled based on specimens collected by the first author, and elsewhere in Asia and Australia by P.S. Cranston (Canberra, Australia).

The species identified as *M. chloris* (Meigen, 1818) by Sasa (1984) and Sasa & Kamimura (1987) is redescribed here as a new species, *M. parachloris* Niitsuma & Tang **sp. nov.**, based on the male specimens deposited in NSMT.

Of 19 species listed by Yamamoto & Yamamoto (2014), two species, *M. yamashinensis* (Tokunaga, 1940) and *M. irioceceus* Sasa & Suzuki, 2000, are transferred to *Polypedilum* on the basis of the male morphology. Further, the latter is treated as a junior synonym of *P. (Polypedilum) tsukubaense* (Sasa, 1979).

Material and methods

Morphological nomenclature follows Sæther (1980) and Cranston (2013) except for pupal morphology, *e.g.* frontal warts, pedes spurii A and LS-setae, which are referred to as cephalic tubercles, vortex and Lt-setae, respectively, according to current usage (Langton & Visser 2003). For the different life stage of examined material, the following abbreviations are used: M, male; F, female; P, pupa; L, larva; Pe, pupal exuviae; Le, larval exuviae; Le/Pe/M (F), reared adult male (female) with associated pupal and larval exuviae. The number of observations (n) is expressed at the beginning of the species description, except when otherwise indicated in parenthesis. Measurements and counts are given as ranges, followed by the means when three or more specimens are measured or counted.

The type material examined is deposited in the Sasa collection of NSMT, and the additional material is housed in the Shizuoka University Museum, Japan (SUM) and the Institute of Groundwater and Earth Sciences, Jinan University, China (EJNU).

Taxonomy

Microtendipes umbrosus Freeman

(Figures 1, 5A)

Microtendipes umbrosus Freeman, 1955:32; Freeman 1961: 720.

Microtendipes tamaogouti Sasa, 1983: 7. **Syn. nov.**

Microtendipes shounagasaki Sasa, 1989a: 30. **Syn. nov.**

Microtendipes kamoprimus Sasa, 1989b: 62. **Syn. nov.**

Microtendipes amamihosoides Sasa, 1990: 116. **Syn. nov.**

Microtendipes hibaraquintus Sasa, 1993: 75. **Syn. nov.**

Microtendipes tokarafegesus Sasa & Suzuki, 1995: 263. **Syn. nov.**

Microtendipes simantofegesus Sasa, Suzuki & Sakai, 1998: 53. **Syn. nov.**

Microtendipes simantogeheus Sasa, Suzuki & Sakai, 1998: 54. **Syn. nov.**

Microtendipes tusimabeceus Sasa & Suzuki, 1999: 4. **Syn. nov.**

Microtendipes tusimacedeus Sasa & Suzuki, 1999: 5. **Syn. nov.**

Microtendipes sakhalinensis Zorina, 2001: 35. **Syn. nov.**

Material examined. Syntypes of *Microtendipes tamaogouti*, 10 M, 8 F (NSMT-I-Dip 5669–5680), labelled, “No. 67: 51–62”, respectively, JAPAN: Tokyo, Okutama, Tama River, 12.vi.1981. Holotype of *Microtendipes shounagasaki*, M (NSMT-I-Dip 4639), labelled, “No. 152: 47”, JAPAN: Toyama, Shou River, 25.viii.1988. Holotype of *Microtendipes kamoprimus*, M (NSMT-I-Dip 4660), labelled, “No. 163: 1”, JAPAN: Kyoto, Kamo River, 12.x.1988. Holotype of *Microtendipes amamihosoides*, M (NSMT-I-Dip 4686), labelled, “No. 178: 96”, JAPAN: Kagoshima, Amami Island, Yakkachi River, 18.iii.1989 (emerged 10.iv.1989). Holotype of *Microtendipes hibaraquintus*, M (NSMT-I-Dip 4843), labelled, “No. 223: 36”, JAPAN: Fukushima, Kitashiobara, Lake Hibara, 6.viii.1991. Holotype of *Microtendipes tokarafegesus*, M (NSMT-I-Dip 5011), labelled, “No. 290: 15”, JAPAN: Kagoshima, Nakanoshima Island, 20.v.1994. Holotype of *Microtendipes simantofegesus*, M (NSMT-I-Dip 5199),

labelled, “No. 358: 47”, JAPAN: Kochi, Nakamura, Shimanto River, 26.iv.1998. Holotype of *Microtendipes simantogehus*, M (NSMT-I-Dip 5202), labelled, “No. 358: 53”, JAPAN: Kochi, Nakamura, Shimanto River, 26.iv.1998. Holotype of *Microtendipes tusimabeceus*, M (NSMT-I-Dip 5140), labelled, “No. 353: 69”, JAPAN: Nagasaki, Tsushima Island, Uchiyama, Izuhara, 24.iii.1998; Holotype of *Microtendipes tusimacedeus*, M (NSMT-I-Dip 5139), labelled, “No. 353: 68”, JAPAN: Nagasaki, Tsushima Island, Uchiyama, Izuhara, 24.iii.1998. Paratype of *Microtendipes ginzaneheus*, M (NSMT), labelled, “No. 403: 46”, JAPAN: Hokkaido, Mt. Ginzan, 2.ix.2000. Non-types. Le/Pe/M (SUM), JAPAN: Fukushima, Hirono, Asami River, 15.viii.2001 (emerged 30.viii.2001); M (SUM), Fukushima, Iwaki, Yaguki, 15.vii.2012 (emerged 30.vii.2012); M, L (SUM), Tochigi, Ichikai, Miage, 1.ix.1989 (emerged 10.ix.1989); Pe/M (SUM), Kanagawa, Kiyokawa, Miyagase, 23.ii.1994 (emerged 27.iii.1994); Le/Pe/M (SUM), as previous except 26.v.1996 (emerged 26.vi.1996); 2 M (SUM), Shizuoka, Sunto, Shimizu-cho, Kakita River, 3.iii.1985; 2 Le/Pe/F, 2 L (SUM), Shizuoka, Shimizu, Yanbara River, 3.iii.1985 (emerged 10.v.1985); Pe/M (SUM), as previous except 3.iv.1985 (emerged 8.iv.1985); 3 M, Le/Pe/M, 3 F, 3 Le/F, 13 Pe, 4Le, 13L (SUM), as previous except 16.vi.1985 (emerged 19–30.vi.1985); Pe/M (SUM), Shizuoka, Shimizu, Ihara River, 12.ix.1988 (emerged 20.ix.1988); Pe/M (SUM), Shizuoka, Kujiragaike, 19.xi.1987 (emerged 25.xi.1987); 2 L (SUM), Shizuoka, Kakegawa, Osuka-cho, 14.i.1989; 2 L (SUM), as previous except 27.i.1989; Pe/M, Pe/F (SUM), as previous except 11.iii.1989 (emerged 16.iii.1989); 4 Le/Pe/M (EJNU), CHINA: Guangdong, Guangzhou, Bage villa, 20.iii.2015 (emerged 1.v.2015); 4 M (EJNU), as previous except 29.xi.2015; Pe/M (EJNU), Hainan, Wuzhi Mt., 3.xii.2011; 3 M, 4 Pe (EJNU), Yunnan, Honghe, Jinping County, Maandi Town, 8.vi.2017; 2 M, 4 Pe (EJNU), Yunnan, Pu'er, Ximeng County, 20.i.2015; 2 M (EJNU), Fujian, Mt. Wuyi, 9.viii.2014; Pe, M (EJNU), Zhejiang, Xiangshan County, 15.vi.2017.

Description. Male (n = 15). Total length 3.7–5.6, 4.6 mm.

Coloration. Thorax brown with 3 scutal vittae, anepisternum II, preepisternum and postnotum darkened. Abdomen green with dark segments VII–IX. Wing (Figure 1A) with faint cloud around RM and FCu or more extensively, occasionally on apical half. Foreleg yellow with dark markings; femur dark brown on middle and apex; tibia variable in extent of brown areas, darkened only on both ends or along its entire length; occasionally ta_1 broadly darkened basally. Mid and hind legs yellow with darkened knees.

Head. Temporals 14–24, 20 (13), uniserial, partially biserial. Frontal tubercles absent. AR 1.7–2.1, 2.0. Clypeus trapezoid with 27–42, 32 setae. Lengths of palpomeres 1–5 (μm): 60–75, 67 (13); 55–70, 64 (13); 260–325, 291 (13); 275–335, 298 (13); 330–460, 388 (13), respectively. Pm_4/Pm_3 0.97–1.1, 1.0 (13); Pm_5/Pm_4 1.1–1.4, 1.3 (13). Pm_3 apically with 4–6, 5 sensilla clavata, longest 18–23, 20 μm long.

Thorax. Lateral anteprenotals 3–8, 5; acrostichals 5–12, 8, concentrated at apex of scutum; dorsocentrals 12–18, 15, uniserial, occasionally biserial anteriorly; prealars 3–8, 4, uniserial; scutellars 24–35, 28.

Wing. Length 2.5–3.6, 3.0 (11) mm. VR 1.1–1.2, 1.1 (11). Vein R_{2+3} ending close to apex of R_1 , R , R_1 and R_{4+5} with 22–35, 26 (12); 18–28, 23 (12); 35–53, 42 (12) setae, respectively. Squama with 11–20, 15 setae.

Legs. Forefemur with 2 rows of proximally directed setae on outer side. Foretibia apically truncate, unarmed. Mid and hind tibiae each with 2 combs and 1 recurved spur. Mid ta_1 with 5–10, 7 (13) sensilla chaetica, distalmost located 0.47–0.54, 0.51 (13) from base. Lengths and proportions of leg segments as in Table 1.

Hypopygium (Figure 1B). Anal tergite with anterior bands; median setae 1–5, 2, arising from pale pits on each end of tergal bands; anal point parallel-sided, with truncate apex. Superior volsella sickle-shaped, rounded apically, with one basal and 3–7, 5 dorsal setae; occasionally with sparse microtrichia basally. Median volsella poorly developed, consisting of small tubercles with 1–4, 2 setae, occasionally absent. Gonostylus 118–165, 138 (11) μm long, 3.2–3.6, 3.5 (11) times as long as broad at middle, apically with short and stout setae.

Female (n = 9). Total length 2.5–4.2, 3.3 mm.

Coloration. Similar to male.

Head. Temporals 18–24, 21. Antenna with 5 flagellomeres; terminal flagellomere 160–200, 177 (8) μm long, shorter than preceding 2 flagellomeres together; AR 0.34–0.41, 0.37 (8). Clypeus with 32–45, 40 setae. Lengths of palpomeres 1–5 (μm): 50–75, 57; 60–70, 62; 280–310, 293; 290–340, 308; 350–460, 390, respectively. Pm_4/Pm_3 1.0–1.1, 1.0; Pm_5/Pm_4 1.2–1.4, 1.3. Pm_3 with 5–6, 5 sensilla clavata, longest 15–23, 19 μm long.

Thorax. Lateral anteprenotals 1–5, 3; acrostichals 6–12, 9; dorsocentrals 17–25, 21; prealars 3–6, 4; scutellars 25–37, 31.

Wing. Length 2.3–3.5, 2.7 mm. VR 1.2–1.3, 1.2 (8). Veins R , R_1 and R_{4+5} with 22–37, 29; 23–41, 30; and 55–89, 71 setae, respectively. Squama with 11–22, 15 setae.

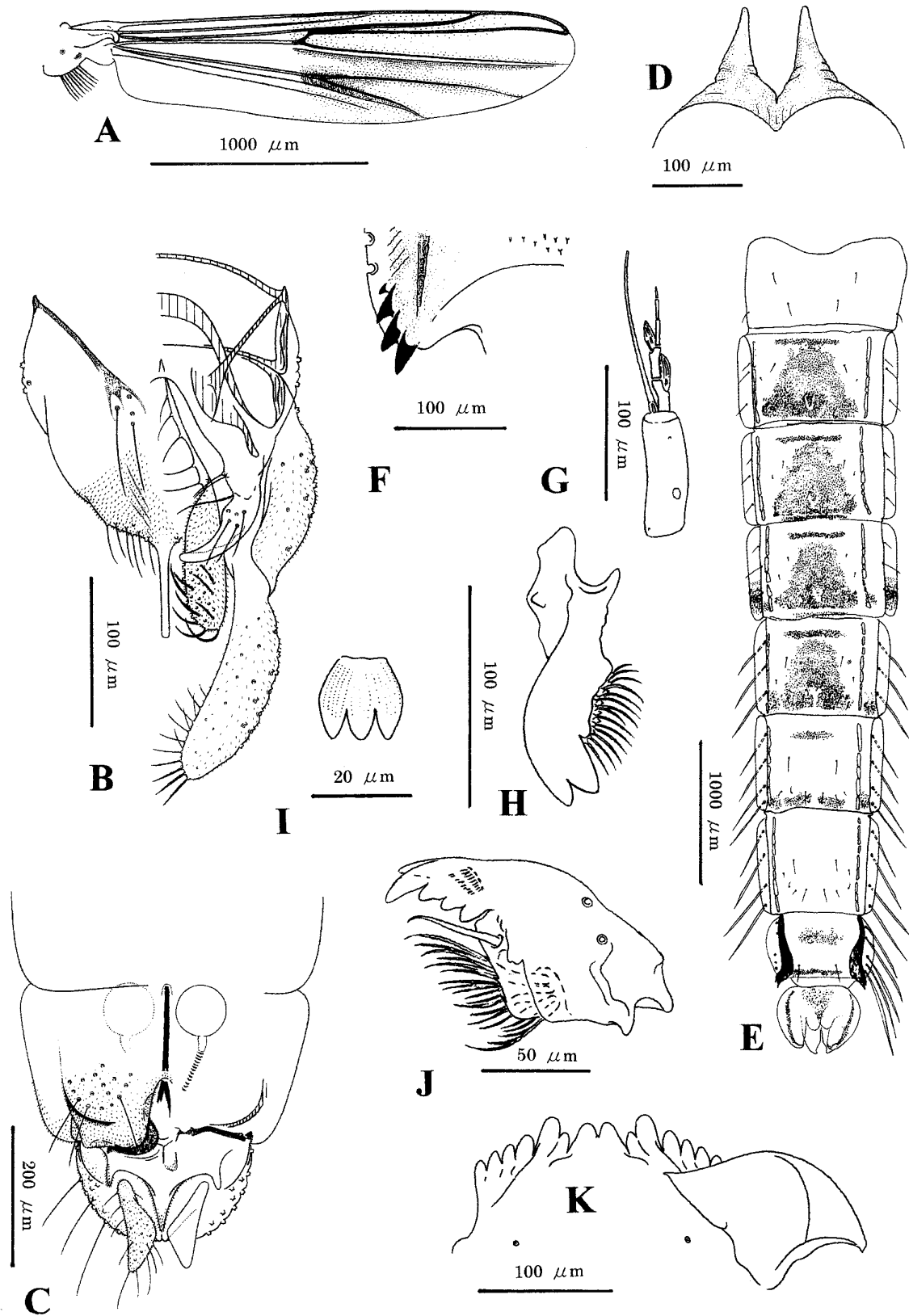


FIGURE 1. *Microtendipes umbrosus* Freeman, male (A, B), female (C), pupa (D–F) and larva (G–K). A, Wing; B, hypopygium, dorsal view; C, genitalia, ventral view; D, cephalic tubercles; E, abdomen, dorsal view; F, posterolateral corner of abdominal segment VIII, dorsal view; G, antenna; H, premandible; I, pecten epipharyngis; J, mandible; K, mentum.

TABLE 1. Lengths (μm) and proportions of legs of *Microtendipes umbrosus* Freeman, male ($n = 12$) and female ($n = 9$)

		fe	ti	ta ₁	ta ₂	ta ₃	ta ₄	ta ₅	LR	BR
Male	P ₁	1167–1523	1167–1599	1548–2005	711–990	660–914	558–736	279–406	1.1–1.4	2.1–2.6
		1322	1343	1753	825	753	632	311	1.3	2.4
	P ₂	1269–1700	1091–1523	711–990	355–533	279–406	178–254	102–152	0.62–0.67	3.5–4.2
		1453	1267	831	431	324	209	123	0.66	3.9
	P ₃	1421–1878	1218–1650	939–1294	558–787	406–584	228–355	127–178	0.75–0.79	3.5–5.0
		1626	1400	1081	652	484	290	142	0.77	4.5
Female	P ₁	1244–1523	1167–1472	1675–2030	787–964	711–888	584–736	279–330	1.3–1.4	
		1376	1300	1839	854	792	669	305	1.4	
	P ₂	1269–1599	1142–1447	685–888	381–508	279–381	178–228	102–152	0.60–0.62	
		1435	1300	789	427	319	206	121	0.61	
	P ₃	1421–1777	1244–1624	939–1218	584–736	431–558	254–330	127–152	0.74–0.79	
		1616	1416	1085 (8)	650 (8)	492 (8)	282 (8)	133 (8)	0.76 (8)	

Legs. Mid ta₁ with 16–26, 21 sensilla chaetica, distalmost located 0.52–0.60, 0.55 from base. Lengths and proportions of leg segments as in Table 1.

Genitalia (Figure 1C). Sternite VIII with 16–26, 20 (6) setae on each side. Gonocoxapodeme strong. Gonapophysis VIII broad, rounded caudally. Gonocoxite IX with 1–3, 2 (7) setae. Lateral plate of segment X triangular without setae. Postgenital plate triangular. Notum 150–165, 158 (4) μm long, 2.0–2.6, 2.3 (4) times as long as ramus. Labium with microtrichia. Seminal capsule oval, 65–75, 72 μm long, 1.1 times as long as broad, and 0.45–0.48, 0.46 (4) times as long as notum, with cylindrical neck.

Pupa ($n = 23$). Total length 4.7–6.7, 5.4 mm.

Coloration. Exuviae pale brown with somewhat infuscated thorax and abdomen.

Cephalothorax. Cephalic tubercles (Figure 1D) conical, 100–160, 127 (22) μm long, 1.3–1.5, 1.4 (22) times as long as basal width in mounted exuviae. Frontal setae absent. Dorsum of thorax strongly pebbled along median suture.

Abdomen (Figure 1E). Tergites I and VII without spinulation; II–V each with more or less extensive, triangular spinule patch; VI with posterior transverse spinule band, usually interrupted medially; VIII with central spinule patch and posterior transverse spinule band; IX with somewhat strong central spinule patch, and occasionally very weak anterolateral spinule patches. Tergites II–VI each with anterior transverse band of spines. Tergite II with row of 45–89, 62 (21) caudal hooklets; its row 0.40–0.51, 0.45 (21) times as long as tergal width. Conjunctives III/IV and IV/V each with spinule band. Segment IV with vortex. Segment V with 3 Lt-setae on each side; VI–VII each with 4 Lt-setae, occasionally VI with 3 Lt-setae; VIII with 5 Lt-setae. Anal comb (Figure 1F) on segment VIII with 2–4, 3 (21) teeth becoming smaller anteriorly. Anal lobe 275–400, 326 (21) μm long, 1.5–2.0, 1.7 (21) times as long as broad, with 47–77, 56 (22) lateral taeniae; with dorsal seta simple, located 0.19–0.29, 0.24 (20) from apex. Male genital sac 0.96–1.1, 1.1 (12) times as long as anal lobe.

Fourth instar larva ($n = 31$). Body length 7.2–10.6, 8.7 (7) mm.

Coloration. Head generally yellowish, with dark brown postoccipital margin, in alcoholic specimen.

Head. Length 434–545, 480 (12) μm long; cephalic index 0.72–0.76, 0.73 (11). Antenna (Figure 1G) 0.33–0.39, 0.36 (11) times as long as head capsule, with 6 segments. Lengths of first to sixth segments (μm): 80–110, 93 (19); 20–28, 23 (19); 23–33, 26 (19); 14–28, 20 (19); 10–18, 15 (19); 6–10, 8 (19). AR 0.9–1.0, 1.0 (19). First segment with ring organ located 0.24–0.31, 0.28 (19) from base; blade 105–155, 121 (10) μm long, extending far beyond apex of terminal segment; accessory blade very small, 8–10, 9 (4) μm long. Each of second and third segments laterally with Lauterborn organ 18–25, 23 (18) μm long. Third segment laterally with style 8–13, 10 (17) μm long. Labral lamella with 11–18, 15 (23) teeth. Premandible (Figure 1H) 88–130, 102 (27) μm long, with 3 teeth. Pecten epipharyngis with 3 equal-sized teeth (Figure 1I). Mandible (Figure 1J) 155–215, 175 (19) μm long with seta subdentalis 40–65, 50 (16) μm long, curved apically, reaching distalmost inner tooth; seta interna 4-branched. Mentum (Figure 1K) 143–190, 157 (19) μm wide; median tooth bifid, pale, 30–45, 35 (19) μm wide,

with very small central tooth. Ventromental plate 70–100, 82 (18) μm long, 120–160, 137 (18) μm wide, with 28–35, 30 (20) striae; distance between both plates 0.47–0.51, 0.50 (19) times as broad as width of mentum. Postmentum 175–233, 193 (28) μm long.

Body. With 8 anal setae.

Remarks. *Microtendipes umbrosus* Freeman is distributed in Africa and Australia (Freeman & Cranston 1980, Cranston & Martin 1989). In Australian populations, the pupa was drawn with three Lt-setae on abdominal segment VI (Cranston 2000) but across a series of specimens this number varies (3 or 4) including between one side and the other (P.S. Cranston, Canberra, Australia, pers. comm.). Of 23 Japanese specimens examined here, three specimens (13 %) have three Lt-setae on one side of the segment VI and four Lt-setae on the other, 20 (87 %) possessing four Lt-setae on each side of the segment. The features of the Japanese specimens are consistent with Freeman (1955, 1958, 1961) for the males and females and with those of Australian pupal and larval exuviae associated with their adults (P.S. Cranston, Canberra, Australia, pers. comm.) for the pupae and larvae.

After re-examinations of the syntype males and females of *M. tamaogouti* Sasa and the holotype males of *M. shounagasaki* Sasa, *M. kamoprimum* Sasa, *M. amamihosoides* Sasa, *M. hibaraqintus* Sasa, *M. tokarafegesus* Sasa & Suzuki, *M. simantofegesus* Sasa, Suzuki & Sakai, *M. simantogehesus* Sasa, Suzuki & Sakai, *M. tusimabeceus* Sasa & Suzuki and *M. tusimacedeus* Sasa & Suzuki, it was evident that all features of *M. umbrosus* are common to these taxa with little difference between them, and thus, we regard these as junior synonyms of *M. umbrosus*.

Judging from the original morphological description of the male, the Russian species *M. sakhalinensis* Zorina, 2001 also may be conspecific with *M. umbrosus*.

The male of *M. umbrosus* resembles that of Palearctic *M. pedellus* (De Geer, 1776) in the coloration of thorax and legs, and also the general appearance of the hypopygium, but differs in the wing with a faint cloud (at least around the vein FCu) and the poorly developed median volsella, bearing 0–4 setae on small tubercles. In *M. pedellus*, the male is characterized by the wing without any marking, and the median volsella with a bundle of setae on a well-developed tubercle (Langton & Pinder 2007: 110, fig. 219 C).

Microtendipes umbrosus is most common in Japanese *Microtendipes*. However, not only wide variation in the leg and wing markings but also the inadequate justifications for differentiation made by Sasa and his co-workers have led to much confusion. In the description of *M. tamaogouti*, Sasa (1983: 7) wrote, “Dorsal appendage with a slightly expanded base bearing 2 or 3 long inner setae, and a finger-like process with rounded apex and bearing 4 setae in the middle on the dorsal surface.” He failed to distinguish the setae of the median volsella from those of the superior volsella.

In describing *M. tusimacedeus*, Sasa & Suzuki (1999: 5) wrote, “Dorsal appendage wide and sickle-shaped”, and drew a curiously short superior volsella (p. 43, fig. 3g). Re-examination of the holotype proved that they overlooked the apical portion of the volsella folded by the mounting procedure (Figure 5A). Further, in the description of *M. simantofegesus*, Sasa *et al.* (1998: 53) even miscalculated the value of male antennal ratio. The correct value is 1.6, not 0.97.

Microtendipes ginzanefesus Sasa & Suzuki, 2001 was erected on the basis of two male specimens collected from Hokkaido, northern Japan. Re-examination of the type series showed that the original description is not based on the holotype, but on the paratype, which is a male of *M. umbrosus*.

Two species groups, the *M. pedellus* group and the *M. rydalensis* group, based on the pupal and larval morphology are recognized currently in this genus (Pinder & Reiss 1983: 324 for the larva, 1986: 334 for the pupa). *Microtendipes umbrosus* belongs to the *M. pedellus* group, because the pupa has long transverse bands of anterior spines on the abdominal tergites II–VI, a central spinule patch on the anal tergite, and five Lt-setae on the abdominal segment VIII, and the larva possesses a bifid median tooth in the mentum, three equal-sized teeth in the pecten epipharyngis, and three teeth in the premandible.

Recently the first author collected many specimens of *M. umbrosus* from Zhejiang, Fujian, Guangdong, Hainan and Yunnan Provinces in Oriental China. Collections from Thailand by several collectors from Chiang Mai and Kasertsart University, deposited in the Australian National Insect Collection (ANIC, Canberra, Australia), show that specimens of *Microtendipes*, predominantly larvae but including pupae and adults, are common in standing and flowing waters. These can be allocated to *M. umbrosus* in our current understanding, with distribution extending from 19°26'N in Chiang Rai Province to 9°18' N in Phang Nga Province, including provinces of Chiang Mai, Kampaeng Phet, Lamphung, Loei, Pechabun, Prachuap Kiri Khan, Ranong, Sakorn Nakorn and Sra Kaew, at elevations ranging from sea level ('post-tsunami' ponds) to 600 m above sea level on Doi Inthanon (Chiang Mai)

(P.S. Cranston, pers. comm). In Australia, the species is restricted to the state of Queensland, between 17°01'S to 27°06'S, including the tropical lakes Barrine and Eacham (Cranston & Dimitriadis 2004). The larvae were very abundant early colonizers of an experimental artificial stream channel fed by water derived from a eutrophic dam in South East Queensland (specimens deposited in ANIC, P.S. Cranston, pers. comm.).

For a morphologically defined but somewhat variable species with such a wide range, we can assume that molecular data will show geographically discrete populations or cryptic species, as with *Polypedilum nubifer* (Cranston *et al.* 2016). However, sampling across such a wide range is time consuming, impractical and well beyond the scope of this study. Furthermore, the species in the range of its type locality (Africa, Kenya, Nyanza) would need to be sampled, as would specimens from throughout the range including species described as endemic to China but potentially synonyms of other named species.

***Microtendipes shoukomaki* Sasa**

(Figures 2, 5B)

Microtendipes brittani [nec Edwards, 1929: 399]: Sasa 1980: 29; Qi & Wang, 2006: 40.

Microtendipes shoukomaki Sasa, 1989a: 29.

Microtendipes ginzaneifeus Sasa & Suzuki, 2001: 12. **Syn. nov.**

Material examined. Holotype of *Microtendipes shoukomaki*, M (NSMT-I-Dip 4649), labelled, “No. 154: 31”, JAPAN: Toyama, Shou River, 7.ii.1989. Holotype of *Microtendipes ginzaneifeus*, M (NSMT), labelled, “No. 403: 51”, JAPAN: Hokkaido, Mt. Ginzan, 2.ix.2000. Non-types. M, F (SUM), JAPAN: Mie, Takicho, small stream, 23.vii.1981; Le/Pe/M, 2 Pe/M, 8 Pe/F, F, 3 Pe, Le/Pe, 9 Le, 6 L (SUM), Shizuoka, Shimizu, Okitsu River, 3.ii.1985 (emerged 9.ii–5.iii.1985); F (SUM), Shizuoka, Shimizu, Yanbara River, 16.vi.1985; M (SUM), as previous except 29.xi.1986; Pe/M (SUM), Shizuoka, Shimizu, Ihara River, 15.x.1989 (emerged 30.x.1989); Pe/M (SUM), Shizuoka, Fujinomiya, Inase River, 15.vii.1991 (emerged 28.vii.1991); Pe/M (SUM), Fukushima, Iwaki, Obisa River, 16.viii.1991 (emerged 25.viii.1991); Pe/M (SUM), Fukushima, Hirono, Asami River, 15.viii.2001 (emerged 21.viii.2001); 6 Le/Pe/M (EJNU), CHINA: Guangdong, Guangzhou, Zengcheng District, Lan Stream, 30.iv.2017 (emerged 5.vi.2017); Pe/M (EJNU), Anhui, Mt. Huang, Fuxi stream, 25.v.2012 (emerged 1.vi.2012); M (EJNU), Yunnan, Xishuangbanna, Yiwu County, Guafengzhai, 26.iv.2017.

Description. Male (n = 8). Total length 4.1–4.9, 4.5 mm.

Coloration. Thorax dark brown with 3 scutal vittae shining black. Abdomen green with somewhat darkened segments VI–IX or VII–IX. Wing without any marking. Legs yellow with all knee joints and foretibia dark brown.

Head. Temporals 14–21, 16. AR 2.0–2.1, 2.0. Clypeus with 17–25, 20 setae. Lengths of palpomeres 1–5 (µm): 55–60, 59 (6); 60–70, 65 (6); 275–300, 286 (6); 250–275, 265 (6); 375–460, 409 (6), respectively. Pm₄/Pm₃, 0.91–0.95, 0.93 (6); Pm₅/Pm₄ 1.5–1.7, 1.5 (6). Pm₃ with 2–4, 3 (7) sensilla clavata, longest 15–20, 18 (7) µm long.

Thorax. Lateral anteprenotals 4–6, 5; acrostichals absent; dorsocentrals 9–13, 12; prealars 4–5, 4; scutellars 20–30, 23.

Wing. Length 2.8–3.3, 3.0 (6) mm. VR 1.1–1.2, 1.1 (6). Veins R, R₁ and R₄₊₅ with 16–24, 21 (6); 15–26, 21 (6); 25–42, 32 (6) setae, respectively. Squama with 15–20, 17 (6) setae.

Legs. Forefemur externally with 2 rows of proximally directed setae. Mid ta₁ with 7–14, 10 sensilla chaetica, distalmost located 0.40–0.53, 0.47 from base. Lengths and proportions of leg segments as in Table 2.

Hypopygium (Figure 2A). Anal tergite with anterior bands medially separated from each other; median setae absent; anal point tapering toward pointed apex. Superior volsella (Figures 2B, C) stout, curved ventrally, pointed apically, with one basal and 2–7, 5 dorsolateral setae. Median volsella absent. Gonostylus 140–180, 155 (5) µm long, 4.0–4.4, 4.3 (5) times as long as broad at middle.

Female (n = 11). Total length 2.8–4.0, 3.6 mm.

Coloration. Similar to male.

Head. Temporals 16–24, 19. Antenna with terminal flagellomere 170–230, 194 µm long, as long as or slightly shorter than preceding 2 flagellomeres together; AR 0.36–0.49, 0.44 (10). Clypeus with 19–28, 22 setae. Lengths of palpomeres 1–5 (µm): 45–60, 57 (10); 55–70, 63 (10); 270–320, 294 (10); 260–335, 290 (10); 355–490, 426 (10), respectively. Pm₄/Pm₃, 0.84–1.1, 0.99 (10); Pm₅/Pm₄ 1.3–1.6, 1.5 (10). Pm₃ apically with 4–5, 4 sensilla clavata, longest 18–25, 21 µm long.

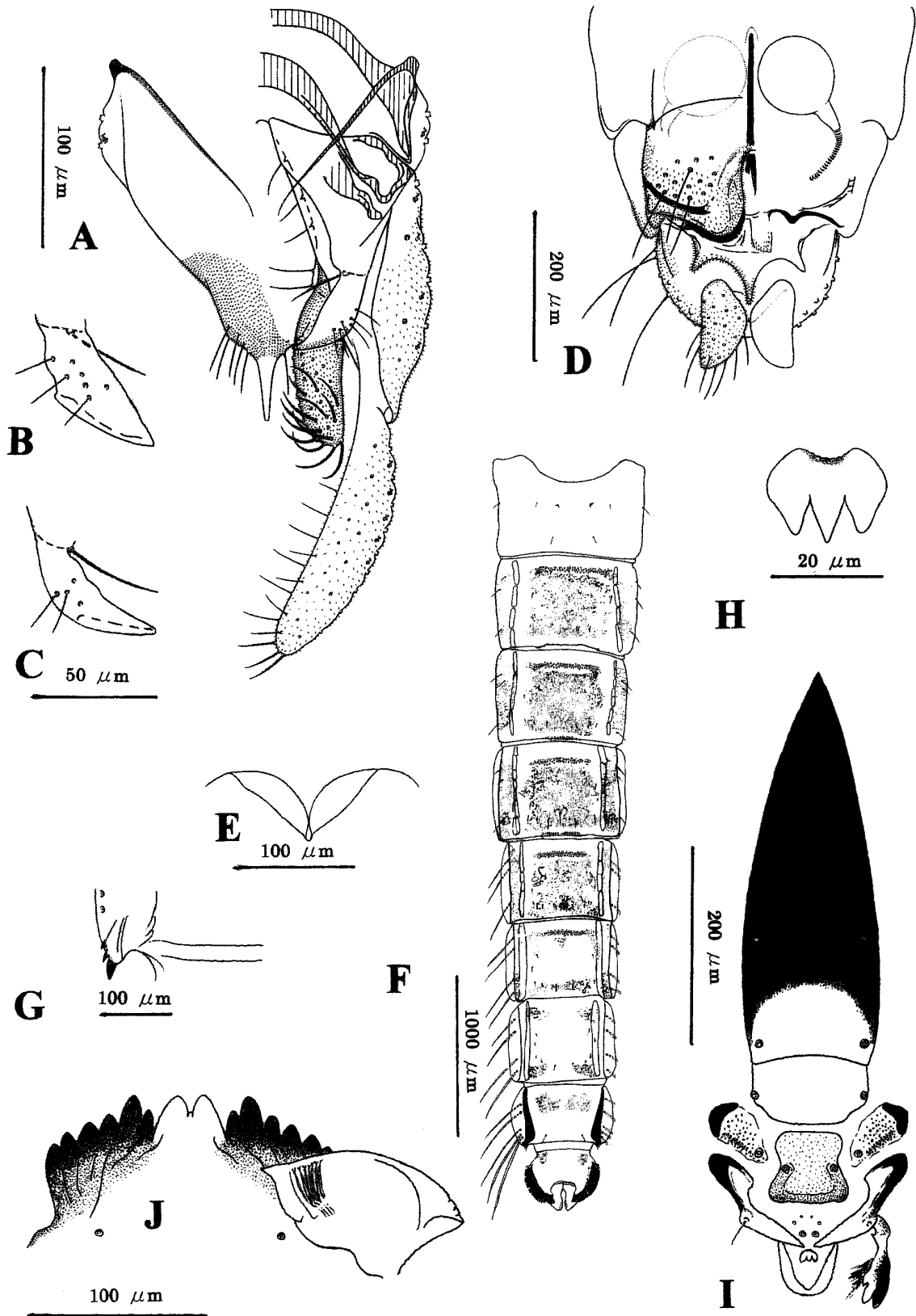


FIGURE 2. *Microtendipes shoukomaki* Sasa, male (A–C), female (D), pupa (E–G) and larva (H–J). A, Hypopygium, dorsal view; B, C, superior volsella, dorsal view, showing variation; D, genitalia, ventral view; E, cephalic tubercles; F, abdomen, dorsal view; G, posterolateral corner of abdominal segment VIII, dorsal view; H, pecten epipharyngis; I, dorsal head sclerites; J, mentum.

Thorax. Lateral anteprenotals 3–5, 4; acrostichals absent; dorsocentrals 13–21, 17; prealars 4–5, 4; scutellars 24–32, 28.

Wing. Length 2.6–3.7, 3.4 mm. VR 1.2 (6). Veins R, R₁ and R₄₊₅ with 24–31, 28 (9), 26–35, 29 (9) and 50–85, 62 (9) setae, respectively. Squama with 17–23, 20 setae.

Legs. Mid ta₁ with 24–37, 28 sensilla chaetica, distalmost located 0.53–0.61, 0.56 from base. Lengths and proportions of leg segments as in Table 2.

TABLE 2. Lengths (µm) and proportions of legs of *Microtendipes shoukomaki* Sasa, male (n = 8) and female (n = 11).

		fe	ti	ta ₁	ta ₂	ta ₃	ta ₄	ta ₅	LR	BR
Male	P ₁	1192–1447	1167–1447	1497–1700	736–888	660–787	584–697	254–305	1.2–1.4	2.1–2.7
		1269	1266	1621	793	698	614	279	1.3	2.4
	P ₂	1269–1523	1167–1421	736–838	406–482	305–355	178–203	102–127	0.58–0.65	3.2–4.5
		1380	1294	799	450	337	197	124	0.62	3.7
	P ₃	1421–1700	1294–1523	939–1117	558–635	406–482	228–279	127–152	0.73–0.75	3.8–4.6
		1526	1399	1031	603	428	251	136	0.74	4.3
Female	P ₁	1320–1624	1269–1472	1802–2005	812–964	761–888	635–787	279–330	1.3–1.4	
		1493	1394	1887	895	833	720	307	1.4	
	P ₂	1371–1700	1269–1624	761–914	406–533	305–381	203–232	102–152	0.56–0.60	
		1576	1479	858	482	353	208	127	0.58	
	P ₃	1523–1878	1371–1726	1041–1218	609–736	457–533	254–305	127–152	0.70–0.76	
		1742	1578	1147	676	496	279	143	0.73	

Genitalia (Figure 2D). Sternite VIII with 14–21, 18 (7) setae on each side. Gonocoxite IX with 1–3, 2 (9) setae. Segment X without setae. Notum 175–188, 183 (3) µm long, 2.1 (3) times as long as ramus. Labium with microtrichia. Seminal capsule relatively large, 130–145, 139 (8) µm long, 1.1–1.2, 1.1 (8) times as long as broad, and 0.75–0.83, 0.78 (3) times as long as notum.

Pupa (n = 19). Total length 5.3–6.8, 6.1 mm.

Coloration. Exuviae largely pale brown.

Cephalothorax. Cephalic tubercles (Figure 2E) broadly rounded, 25–40, 34 (17) µm long, 0.25–0.32, 0.29 (17) times as long as basal width in mounted exuviae.

Abdomen (Figure 2F). Tergite I without spinules; II–V each with more or less extensive spinulation; VI with anterior and posterior transverse spinule bands; VII with anterolateral and posterolateral spinule patches; VIII and IX each with anterolateral spinules. Tergites II–VI each with anterior transverse band of brown and relatively large spines. Tergite II with row of 73–110, 91 caudal hooklets; its row 0.60–0.70, 0.65 times as long as tergal width. Paratergites II–V each with somewhat strong spinulation. Segment V with 3 Lt-setae on each side, VI–VII each with 4 Lt-setae; VIII with 5 Lt-setae. Anal comb (Figure 2G) with one large and 2–4, 3 small teeth. Anal lobe 270–380, 329 µm long, 1.4–1.7, 1.5 times as long as broad, with 33–46, 39 lateral taeniae; dorsal seta absent. Male genital sac 1.2–1.3, 1.3 (6) times as long as anal lobe.

Fourth instar larva (n = 18). Body length 7.1–9.5, 8.2 (6) mm.

Coloration. Head capsule largely dark brown, with somewhat extensive white areas around eye spots, and body yellowish in alcoholic specimen.

Head. Length 444–515, 477 (5) µm long; cephalic index 0.71–0.78, 0.74 (5). Antenna 0.30–0.36, 0.33 (6) times as long as head capsule; lengths of first to sixth segments (µm): 80–88, 84 (10); 13–18, 15 (8); 18–20, 19 (8); 13–16, 13 (8); 10–13, 11 (8); 5–8, 7 (8). AR 1.1–1.4, 1.2 (8). First segment with ring organ located 0.18–0.24, 0.21 (10) from base; blade 83–93, 87 (4) µm long, and accessory blade 8 (1) µm long. Second and third segments each with Lauterborn organ 13–18, 15 (8) µm long. Third segment with style 8 (6) µm long. Labral lamella with 12–18, 15 (16) teeth. Pecten epipharyngis with 3 teeth (Figure 2H). Premandible (Figure 2I) 95–110, 103 (12) µm long, with 3 teeth. Mandible 165–188, 178 (11) µm long; seta subdentalis 43–45, 44 (5) µm long. Mentum (Figure 2J) 140–168, 156 (12) µm wide; median tooth bifid, pale, 30–43, 39 (17) µm wide. Ventromental plate 70–85, 80 (12)

µm long, 110–128, 122 (12) µm wide, with 26–30, 27 (12) striae; distance between both plates 0.46–0.54, 0.50 (12) times as broad as width of mentum. Postmentum 175–200, 187 (17) µm long.

Body. With 8 anal setae.

Remarks. The male much resembles that of European *M. britteni* (Edwards) in the entirely dark brown foretibia, and the hypopygium with no median anal tergal seta, a triangular, apically pointed anal point, and lacking median volsellae. Additionally, the larval head capsule is largely dark brown as in the specimen deposited under the name of *M. britteni* in the Zoologische Staatssammlung Muenchen, Germany (M. Spies, pers. comm.). However, the species is separable from *M. britteni* by the pupal morphology. The cephalic tubercles are broadly rounded in the former, whereas relatively short, somewhat conical or dome-shaped in the latter (Laville 1971: 202, fig. 7, a; Langton & Visser 2003, fig. 119e).

Judging from the pupal and larval morphology, *M. shoukomaki* belongs to the same group, *M. pedellus* group, as *M. britteni* (Pinder & Reiss 1983 for the larva, 1986 for the pupa). Indeed, *M. shoukomaki* was misidentified as *M. britteni* by Sasa (1980: 29), who distinguished *M. shoukomaki* from *M. britteni* by the parallel-sided anal point in his key to males (Sasa 1998: 34, couplet 5). After re-examination of the holotype of *M. shoukomaki*, it was revealed that the anal point is not parallel-sided, but triangular and apically pointed. The reared Chinese material from Guangdong and Anhui Provinces also points to previous records of *M. britteni* by Qi & Wang (2006) being *M. shoukomaki*, and thus perhaps no true *M. britteni* exists in East Asia.

The male also resembles North American *M. caducus* Townes, 1945 in the thoracic scutum lacking acrostichal setae, the hypopygium without median anal tergal seta, and the triangular anal point, but differs in the dark brown thorax and the entirely darkened foretibia. In *M. caducus*, the thorax is light brown, and the foretibia is whitish medially, according to Townes (1945: 24).

The type series of *M. ginzanefeus* Sasa & Suzuki, 2001 comprises holotype and a single paratype. Re-examination of the type series showed that the holotype is a male of *M. shoukomaki* and the paratype is that of *M. umbrosus*. The original description is based not on the holotype, but on the paratype. Although the holotype is in too poor condition, the anal tergite with no median seta, the anal point tapering toward the apex, and the apically pointed superior volsella can be recognized (Figure 5B).

***Microtendipes famiefeus* Sasa**

(Figure 3)

Microtendipes truncatus Kawai & Sasa, 1985: 18 [preoccu. Kieffer 1922: 13]; Qi & Wang 2006: 43.

Microtendipes famiefeus Sasa, 1996: 53.

Microtendipes tusimadeeus Sasa & Suzuki, 1999: 5. **Syn. nov.**

? *Microtendipes rydalensis* [nec Edwards, 1929: 404]: Tanaka, Sasa & Hashizume 2003: 122.

Material examined. Holotype of *Microtendipes famiefeus*, M (NSMT-I-Dip 4940), labelled, “No. 255: 11”, JAPAN: Toyama, Lake in the Toyama City Family Park, 21.ix.1993. Holotype of *Microtendipes tusimadeeus*, M (NSMT-I-Dip 5245), labelled, “No. 373: 5”, JAPAN: Nagasaki, Tsushima Island, Izuhara, Azugawa River, 23.iii.1998. Non-types. M, Pe/F, L (SUM), JAPAN: Miyagi, Shiroishi, Kamasaki Hot Spring, Yukawa River, 1.i.1997 (emerged 11 and 19.i.1997); Pe/M, L (SUM), Fukushima, Iwaki, Yaguki, Matuyamazawa, 10.viii.1997 (emerged 30.viii.1997); 3 Pe/M (SUM), as previous except 2.i.1998 (emerged 19–29.i.1998); 3 M, Pe/F (SUM), as previous except 15.vii.2012 (emerged 3–7.viii.2012); Le/Pe/F (SUM), as previous except 5.i.2013 (emerged 13.i.2013); M (SUM), as previous except 27.iii.2013 (emerged 10.iv.2013); 2 Pe/M (SUM), Iwaki, Obisa River, 5.i.1990 (emerged 15 and 20.ii.1990); Pe/M (SUM), Fukushima, Naraha, Kido River, 24.xii.1991; Pe/M (SUM), Fukushima, Hirono, Asami River, 25.iii.2006 (emerged 1.iv.2006); 2 M (SUM), Tochigi, Nakagawa, Naka River, 4.v.1996; M (SUM), Tochigi, Nasukarasuyama, Naka River, 4.v.1999; M (SUM), Shizuoka, Shimizu, Yanbara River, 28.iv.2000; 5 M (EJNU), CHINA: Anhui, Mt. Huang, Fuxi stream, 26.v.2012; M (EJNU), Liaoning, Benxi, Xiaodonggou village, 6.vii.2015; Pe (EJNU), Guangdong, Shantou, Jinxi stream, 14.x.2016; 2 Pe (EJNU), Yunnan, Anning, Qinglongxia, 23.x.2016.

Description. Male (n = 16). Total length 3.0–4.3, 3.6 mm.

Coloration. Thorax yellowish green with scutal vittae indistinct. Abdomen green, occasionally with dark segments VII–IX. Wing without any marking. Legs entirely pale yellow.

Head. Temporals 10–17, 12. AR 1.3–1.7, 1.4 (15). Clypeus with 12–17, 14 setae. Lengths of palpomeres 1–5 (μm): 40–55, 46 (15); 40–60, 50 (15); 190–255, 226 (15); 145–215, 183 (15); 230–380, 303 (15), respectively. Pm_4/Pm_3 0.75–0.86, 0.81 (15); Pm_5/Pm_4 1.5–1.8, 1.7 (15). Pm_3 apically with 4–5, 4 sensilla clavata, longest 18–23, 19 μm long.

Thorax. Lateral anteprenotals 0–2, 1 (15); acrostichals 0–2, 2; dorsocentrals 5–11, 7; prealars 3–4, 3; scutellars 7–12, 9 (15).

Wing. Length 1.9–3.0, 2.5 mm. VR 1.1–1.2, 1.2. Veins R, R_1 and R_{4+5} with 14–29, 21; 11–19, 16; and 18–50, 31 setae, respectively. Squama with 5–10, 7 setae.

Legs. Mid ta_1 with 3–5, 4 (15) sensilla chaetica, distalmost located 0.35–0.62, 0.46 (15) from base. Lengths and proportions of leg segments as in Table 3.

Hypopygium (Figure 3A). Anal tergite with 1–8, 4 median setae on each end of tergal bands; anal point (Figure 3B) parallel-sided, apically truncated and curved ventrad. Superior volsella (Figures 3C, D) relatively broad, curved ventrally, with one basal seta arising from large tubercle and 3–10, 5 dorsolateral setae. Median volsella well developed, composed of tubercles bearing 5–12, 8 (14) apical setae. Gonostylus 130–165, 150 (12) μm long, 3.6–4.2, 3.9 (12) times as long as broad at middle.

Female ($n = 3$). Total length 2.5–3.6 (2) mm.

Coloration. Similar to male.

Head. Temporals 9–10, 9. Antenna with terminal flagellomere 140–155, 150 μm long, shorter than preceding 2 flagellomeres together; AR 0.36–0.42, 0.40. Clypeus with 16–18, 17 setae. Lengths of palpomeres 1–5 (μm): 50–60, 55; 50–65, 58; 205–265, 237; 185–235, 210; 320–390, 350, respectively. Pm_4/Pm_3 0.88–0.90, 0.89; Pm_5/Pm_4 1.6–1.7, 1.7. Pm_3 with 4 sensilla clavata, longest 18–20, 19 μm long.

Thorax. Lateral anteprenotals 1 (2); acrostichals 0–2, 1; dorsocentrals 10–13, 11; prealars 3–4, 3; scutellars 7–10, 8.

Wing. Length 2.0–3.2 (2) mm. VR 1.2 (2). Veins R, R_1 and R_{4+5} with 18–34 (2), 16–24 (2) and 29–51 (2) setae, respectively. Squama with 8–12, 9 setae.

Legs. Forefemur externally with 2 rows of proximally directed setae. Mid ta_1 with 6–7 (2) sensilla chaetica, distalmost located 0.47–0.50 (2) from base. Lengths and proportions of leg segments as in Table 3.

TABLE 3. Lengths (μm) and proportions of legs of *Microtendipes famiefusus* Sasa, male ($n = 16$) and female ($n = 2$).

		fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BR
Male	P_1	836–1167	761–1091	1066–1523	482–736	406–619	330–508	152–228	1.3–1.6	2.1–2.9
		1040	923	1346	638	537	453	200	1.5	2.4
	P_2	914–1294	812–1142	533–787	279–381	203–305	152–206	76–102	0.66–0.73	3.2–5.0
		1121	988	681	332	257	175	92	0.69	3.8
	P_3	964–1345	838–1218	660–990	381–533	305–431	178–254	102–127	0.73–0.82	3.7–5.0
1158		1060	829	471	381	221	113	0.78	4.2	
Female	P_1	990–1421	761–1091	1345–1802	609–812	533–711	457–609	178–228	1.7–1.8	
	P_2	990–1447	863–1244	609–863	279–406	203–305	127–178	76–102	0.69–0.71	
	P_3	1015–1497	888–1345	711–1041	381–558	330–457	178–228	102–129	0.77–0.80	

Genitalia (Figure 3E). Sternite VIII with 6–16, 11 setae on each side. Gonocoxite IX with 1 seta. Segment X with 3–6, 4 setae on each side. Notum 115–150, 130 μm long, 1.5–2.1, 1.7 times as long as ramus. Labium without microtrichia. Seminal capsule 55–58 (2) μm long, 1.1–1.2 (2) times as long as broad, and 0.37–0.46 (2) times as long as notum.

Pupa ($n = 11$). Total length 3.8–4.9, 4.3 mm.

Coloration. Exuviae pale brown with infuscated thorax.

Cephalothorax. Cephalic tubercles (Figure 3F) dome-shaped, 25–50, 39 (8) μm long, 0.25–0.56, 0.47 (8) times as long as basal width in mounted exuviae. Thorax weakly pebbled on dorsum.

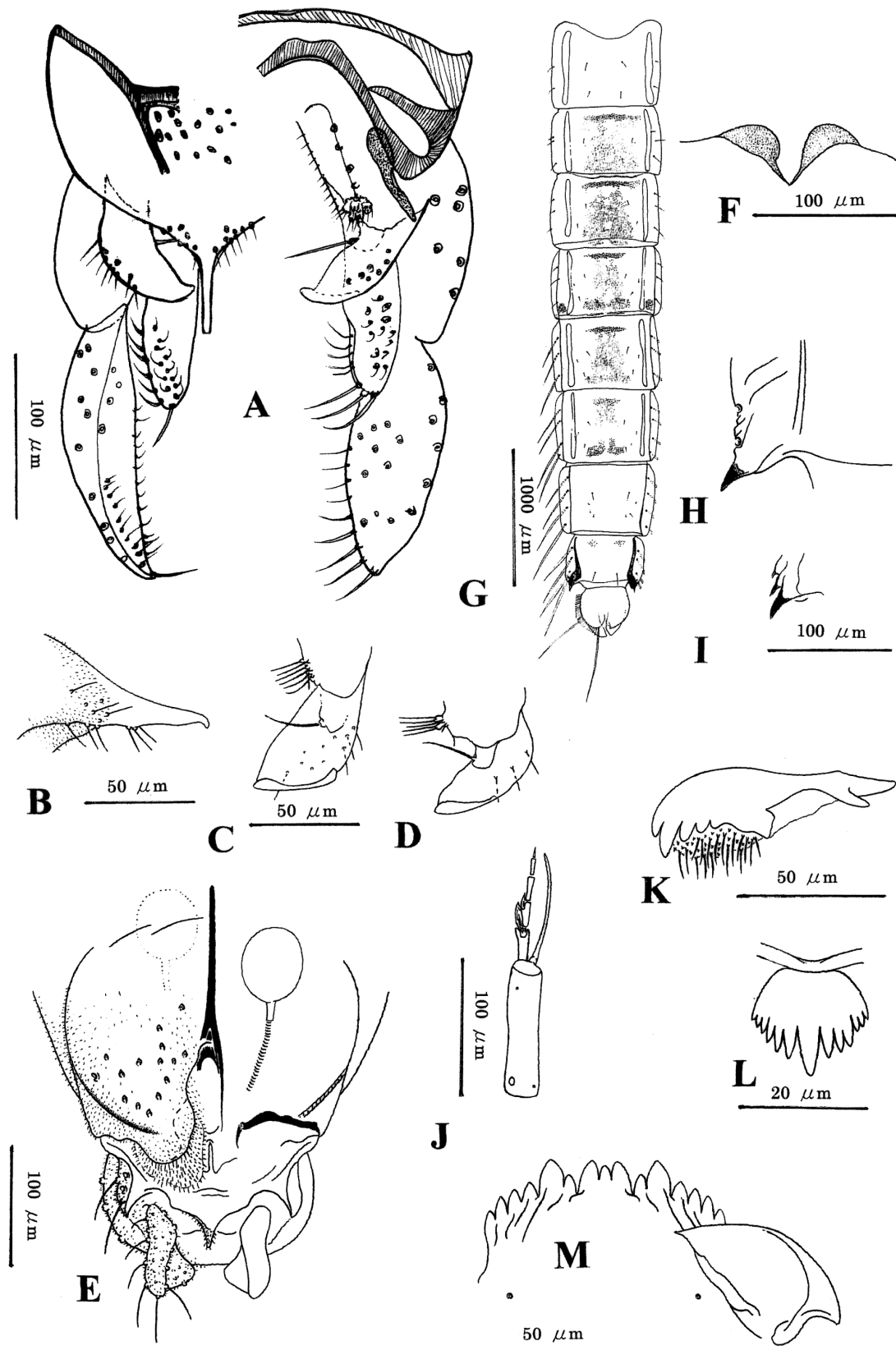


FIGURE 3. *Microtendipes famieficus* Sasa, male (A–D), female (E), pupa (F–I) and larva (J–M). A, Hypopygium, dorsal view; B, apex of anal tergite with anal point, lateral view; C, D, superior volsella and median volsella, ventral view, showing variation; E, genitalia, ventral view; F, cephalic tubercles; G, abdomen, dorsal view; H, posterolateral corner of abdominal segment VIII, dorsal view; I, anal comb of abdominal segment VIII, showing variation; J, antenna; K, premandible; L, pecten epipharyngis; M, mentum.

Abdomen (Figure 3G). Tergites I, VII and IX without spinules; II–V each with more or less extensive spinulation; VI with anterior and posterior spinule patches; VIII with anterolateral spinules. Tergites II–V each with anterior transverse band of pale spines. Tergite II with row of 47–81, 67 (10) caudal hooklets; its row 0.46–0.64, 0.54 (5) times as long as tergal width. Segment V with 3 Lt-setae on each side, VI–VIII each with 4 Lt-setae. Anal comb (Figures 3H, I) with one strong tooth and 0–5, 1 weak tooth. Anal lobe 215–260, 237 (8) μm long, 1.7–1.9, 1.8 (8) times as long as broad, with fringe of 29–42, 36 lateral taeniae; with dorsal seta located 0.18–0.27, 0.21 (8) from apex. Male genital sac 1.1–1.3, 1.1 (5) times as long as anal lobe.

Fourth instar larva (n = 3). Body length 5.3 (1) mm.

Coloration. Generally white except dark brown postoccipital margin in alcoholic specimen.

Head. Length 345–400 (2) μm long; cephalic index 0.78 (1). Antenna (Figure 3J) 0.42–0.44 (2) times as long as head capsule; lengths of first to sixth segments (μm): 88–95, 91; 23–28 (2); 20–23 (2); 15 (1); 11 (1); 6 (1). AR 1.1 (1). First segment with ring organ located 0.08–0.11, 0.09 from base; blade 78 (1) μm long, barely reaching apex of terminal segment; and accessory blade 15 (1) μm long. Second and third segments each with Lauterborn organ 20 (2) μm long. Third segment with style 8–10 (2) μm long. Premandible (Figure 3K) 75–85, 82 μm long, with 5 teeth. Labral lamella with 13–15 (2) teeth. Pecten epipharyngis with one large middle tooth and 6 pairs of lateral teeth becoming smaller laterally (Figure 3L). Mandible 125–135, 128 μm long; seta subdentalis 28–30 (2) μm long. Mentum (Figure 3M) 113–125, 119 μm wide; median tooth trifid, pale, 33–40, 35 μm wide. Ventromental plate 53–60, 58 μm long, 93–95, 94 μm wide, with 16–19 (2) striae; distance between both plates 0.51–0.56 (2) times as broad as width of mentum. Postmentum 138–170, 157 μm long.

Body. With 8 anal setae.

Remarks. In the original description of *M. famiefesus* Sasa, the author (Sasa 1996: 54) wrote that the species is separable from *M. truncatus* Kawai & Sasa as the male has no anteprenotal seta and the hypopygium has dorsal appendages with a conspicuous ridge along the outer margin and stout ventral appendages. After re-examination of the holotype male, it had become clear that the male possesses two distinct setal pits on the anteprenotum. Generally, the ridge of the superior volsella is not stable in the appearance, which is variable depending on the mounting orientation. Indeed, Kawai & Sasa (1985: 18, fig. 3) drew slightly the apical ridge of the volsella in the original description of *M. truncatus*. Not only superior volsellae but also inferior volsellae may be deformed when the specimen is compressed by the cover glass. Therefore, *Microtendipes famiefesus* is considered to be conspecific with *M. truncatus* Kawai & Sasa, which is a junior primary homonym of *M. truncatus* Kieffer, 1922 described from Cameroon in central Africa.

Microtendipes tusimadeeus Sasa & Suzuki, 1999 was established on the basis of three male specimens collected from Tsushima Island in western Japan. By the comparison between the holotypes of *M. tusimadeeus* and *M. famiefesus*, however, it was proved that there is no major difference between them. *Microtendipes tusimadeeus* is a junior synonym of *M. famiefesus*.

The male of *M. famiefesus* much resembles that of European *M. rydalensis* (Edwards, 1929) in the yellowish coloration on the body and legs, the hypopygium with broad superior volsellae and well-developed median volsellae, but differs in the hypopygial anal point with a truncate apex. In the latter, the anal point is pointed apically (Pinder 1976). The closer examination of the specimens deposited in SUM revealed a more distinct difference between the anal points of both the males. In the lateral view, the anal point is narrow and suddenly bent ventrad at the apex in *M. famiefesus*, whereas broad and gently curved ventrad along its entire length in *M. rydalensis* (Pinder 1976: 179, fig. 1). The immature forms, pupa and larva, are also very similar to those of *M. rydalensis*, but barely separable by the cephalic tubercles of the pupa and the pecten epipharyngis of the larva. The cephalic tubercles are relatively small, dome-shaped in *M. famiefesus*, whereas broadly rounded in *M. rydalensis* (Langton & Visser 2003, fig. 123g). The pecten epipharyngis is armed with a large median tooth and 6 pairs of small lateral teeth, becoming smaller laterally in *M. famiefesus*, whereas in *M. rydalensis*, it has three large median teeth and 2 or 3 pairs of small lateral teeth (Pinder 1976: 179, fig. 5d; Epler *et al.* 2013: 506, fig. 10.41, G).

Microtendipes famiefesus is placed in the *M. rydalensis* group, because the pupa has anterior transverse bands consisting of pale spines on the abdominal tergites II–V, 4 Lt-setae on the abdominal segment VIII, and an anal tergite without spinules (Pinder & Reiss 1986), and the larva possesses a mentum with a trifid median tooth, a pecten epipharyngis with one large middle tooth and 12 small lateral teeth, and premandibles with 5 teeth (Pinder & Reiss 1983).

Tanaka *et al.* (2003) recorded a chironomid midge under the name *M. rydalensis* from a rice paddy area in

Gunma, central Japan. Actually, the species may be *M. famiefesus*, although it is a record without morphological accounts. Recently *M. famiefesus* was recorded, under the name of *M. truncatus* Kawai & Sasa, from Fujian, Guizhou, Yunnan and Shaanxi Provinces in China (Qi & Wang 2006). The first author also collected the species from Anhui, Guangdong and Yunnan Provinces. *Microtendipes famiefesus* may be widely distributed in China.

***Microtendipes parachloris* Niitsuma & Tang sp. nov.**

(Figure 4)

Microtendipes chloris [nec Meigen, 1818: 28]: Sasa 1984: 56; Sasa & Kamimura 1987: 16.

Type material. Holotype: M (NSMT), labelled, “No. 101: 81”, JAPAN: Hokkaido, Lake Akan, 17.vi.1982. Paratype: M (NSMT), labelled, “No. 39: 86, 87”, JAPAN: Tochigi, Nikko, Lake Yunoko, 28.iv.1979 (emerged 26.v.1979).

Derivatio nominis. From Greek *para-*, a prefix meaning near, like, and the name of *Microtendipes chloris* (Meigen), referring to the morphological similarity of the male adults of both the species.

Description. Male (n = 2). Total length 5.3–5.8 mm.

Coloration. Thorax entirely dark brown; scutal vittae indistinct. Abdomen largely pale yellow; tergite I darkened anteriorly, tergites II–V each with vertically long and dark marking anteromedially (Figure 4A), tergites VI–IX darkened entirely; hypopygium dark brown on gonocoxite and gonostylus. Wing without any marking on membrane. Foreleg brown with apical 0.10–0.11 of femur dark brown; tibia and ta_1 uniformly dark brown. Mid and hind legs brown, each with femur and tibia somewhat darker.

Head. Temporals 17–22. AR 2.5–2.7. Clypeus with 24–29 setae. Lengths (μm) of palpomeres 1–5: 60–75, 75–90, 245–310, 260–310, 360–450, respectively. Pm_4/Pm_3 1.0–1.1; Pm_5/Pm_4 1.4–1.5. Pm_3 with 3 sensilla clavata, longest 25 μm long.

Thorax. Anteprototum with 3–4 lateral setae. Acrostichals 4–7; dorsocentrals 9–15, uniserial; prealars 4–5, uniserial. Scutellum with 26–27 setae.

Wing. Length from arculus to apex 3.9–4.1 mm. Veins R, R_1 and R_{4+5} with 24–25, 22–28, 38–43 setae, respectively. VR 1.1. Squama broken off.

Legs. Forefemur externally with 2 rows of 20–28 setae directed basally on distal half; foretarsus without long setae. Mid ta_1 with 7–9 sensilla chaetica, distalmost located 0.43–0.45 from base. Lengths and proportions of legs as in Table 4.

TABLE 4. Lengths (μm) and proportions of legs of *Microtendipes parachloris* Niitsuma & Tang n. sp., male (n = 2)

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BR
P_1	1523–1650	1650–1777	1878–2107	990–1091	838–888	635–660	305	1.1–1.2	1.9–2.3
P_2	1726–1904	1650–1751	1091–1142	558–609	431–457	279–305	152–178	0.65–0.66	3.6–5.3
P_3	1954–2107	1878–2056	1447–1574	888–990	635	330–381	203	0.77	4.3–4.8

Hypopygium (Figure 4B). Anal tergite with 2–8 median setae on each end of tergal bands; posterior tergal margin with 18–21 setae on each side. Anal point (Figure 4C) nearly parallel-sided with truncate apex. Superior volsella (Figure 4D) sickle-shaped, pointed at apex, with one basal and 7–8 dorsolateral setae. Median volsella poorly developed, with 2–3 clustered setae; tubercle indistinct. Inferior volsella reaching beyond tip of gonocoxite, stout, with many recurved dorsal setae on distal 2/3. Transverse sternapodeme broad.

Female, pupa and larva. Unknown.

Remarks. Sasa (1984) recorded a single male under the name of *M. chloris* (Meigen, 1818) from Lake Yunoko in Tochigi, central Japan. The same name was also assigned to the male collected from Lake Akan in Hokkaido, northern Japan, by Sasa & Kamimura (1987).

Indeed, the male is very similar to that of *M. chloris* in the hypopygial structure: anal point parallel-sided; superior volsella sickle-shaped with a basal and several dorsolateral setae; and inferior volsella long, reaching beyond the apex of the gonocoxite. For the same reason, the male resembles that of *M. pedellus* (De Geer, 1776),

too. However, the male will not key past couplet 8 in the Langton & Pinder (2007: 177) because of the uniformly darkened foretibia and the foretarsus without long setae, and differs from the males of these two species in the poorly developed median volsella, only bearing a few setae, in the hypopygium. The males of *M. pedellus* and *M. chloris* are armed with distinct tubercles of the median volsella bearing several setae (Langton & Pinder 2007: 110, fig. 219 C, D).

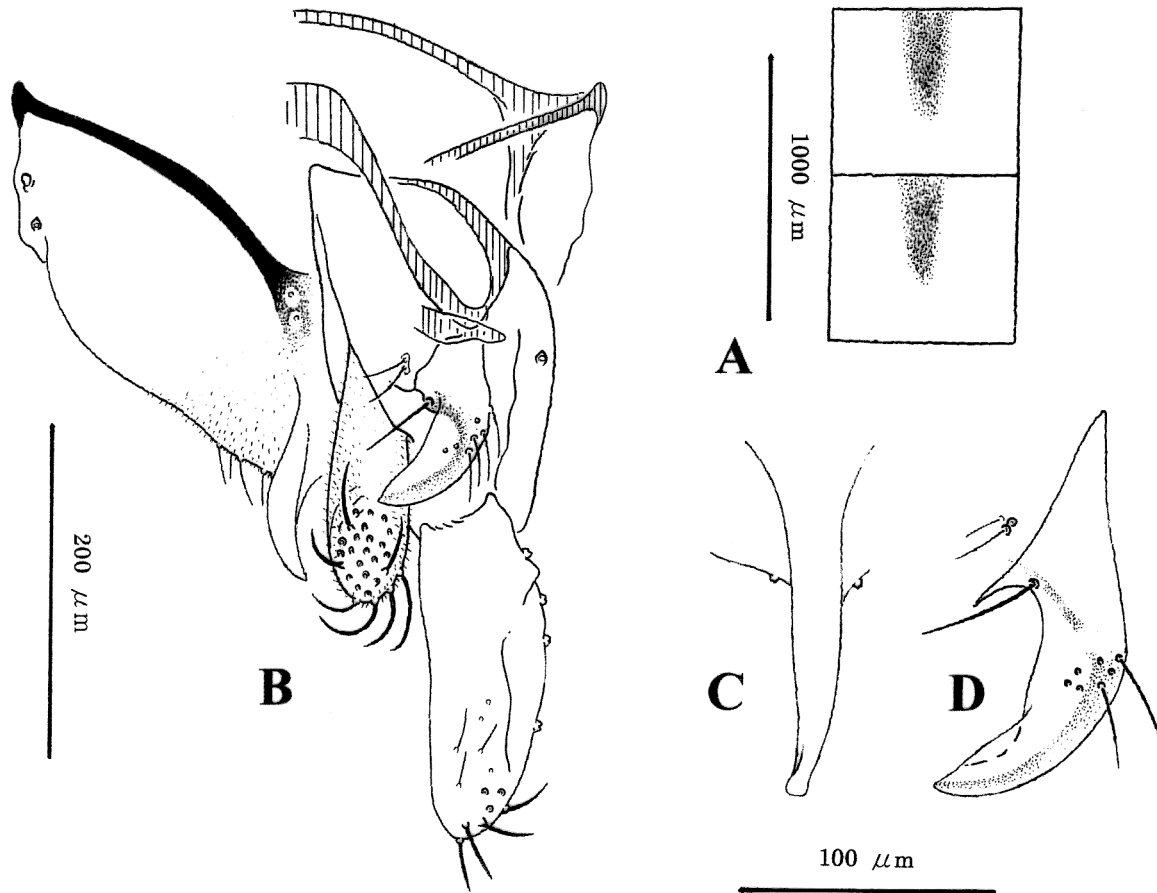


FIGURE 4. *Microtendipes parachloris* Niitsuma & Tang **sp. nov.**, holotype male, NSMT No. 101: 81 (A, B) and paratype male, NSMT No. 39: 87 (C, D). A, Abdominal tergites III–IV, dorsal view, showing marking pattern; B, hypopygium, dorsal view; C, anal point, dorsal view; D, superior volsella and median volsella, dorsal view.

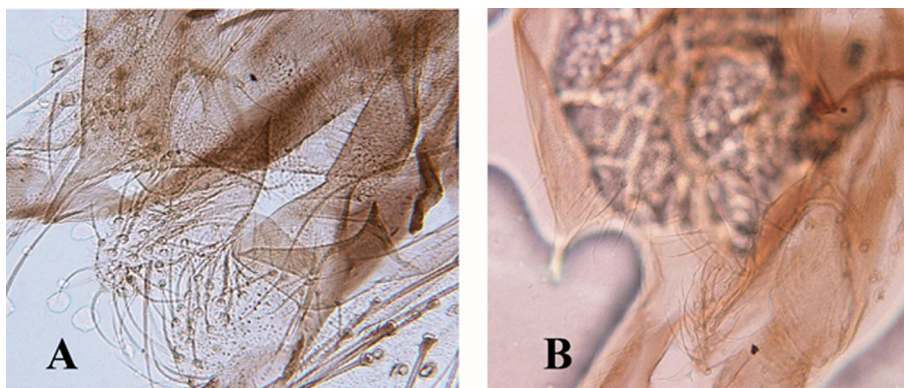


FIGURE 5. *Microtendipes* spp., male hypopygium. A, Holotype of *Microtendipes tusimacedeus* Sasa & Suzuki, NSMT-I-Dip 5139; B, holotype of *Microtendipes ginzanefeus* Sasa & Suzuki, NSMT No. 403: 51.

The male somewhat resembles that of *M. umbrosus* in the hypopygium with a parallel-sided anal point, sickle-shaped superior volsellae, and poorly developed median volsellae, but differs from it in the relatively high value of AR 2.5–2.7, the wings without any marking, and the entirely dark brown basitarsus of the foreleg. The male of *M. umbrosus* has a low value of AR 1.7–2.1, a cloud on the wing membrane, and a basitarsus darkened at most basally in the foreleg.

***Polypedilum (Cerobregma) yamasinense* (Tokunaga) comb. nov.**

Chironomus (Microtendipes) yamasinensis Tokunaga, 1940: 295.

Microtendipes yamasinensis: Sasa & Kikuchi 1995: 34.

Polypedilum kamotertium Sasa, 1989b: 64; Sasa & Kikuchi 1995: 37 (as *Polypedilum s. str.*). **Syn. nov.**

Remarks. In the original description of *Chironomus (Microtendipes) yamasinensis* Tokunaga, 1940, the author (p. 296) wrote, “R₂₊₃ extending closely along R₁”, and “ventral appendages compressed, with three long setae on apical end”. The combination of these features occurs in *Polypedilum*, rather than *Microtendipes* (Edwards 1929, Freeman 1955, Cranston *et al.* 1989). He continued, “styles swollen basally, narrowed on apical half, with long bristles on apical part”. It shows that the species belongs to the subgenus *Cerobregma* Sæther & Sundal, 1999 of the genus *Polypedilum*. The type of *Polypedilum (Cerobregma) yamasinense* may be still extant in the Kyushu University Museum as an alcoholic specimen, but even so, its condition may be too poor to make necessary observations. Therefore, no type material was examined.

Sæther & Sundal (1999: 345) transferred *P. (P.) kamotertium* Sasa to the subgenus *Cerobregma*. Kobayashi *et al.* (2003) redescribed *P. (C.) kamotertium* based on the males, females, pupae and larvae collected from Aomori, Kyoto and Nagasaki in Japan, including the types, and noted that the male is characterized by an AR of 1.1–1.3; the inferior volsella bilobed apically, bearing many setae on the dorsal lobe and a few setae on the ventral lobe; the superior volsella arcuated, bearing 1–4 lateral and 2–13 basal setae; and the gonostylus apically with a row of 4–7 long setae. Further, according to Sasa (1989b: 64), the holotype male has a long setal beard (BR 3.8–4.4) on the foretarsi. These features are consistent with the description by Tokunaga (1940), especially in the inferior and superior volsellae (plate 3, figs 69 and 72). *Polypedilum (C.) kamotertium* is a junior synonym of *P. (C.) yamasinense*.

***Polypedilum (Polypedilum) tsukubaense* (Sasa)**

Microtendipes tsukubaensis Sasa, 1979: 17.

Polypedilum tsukubaense: Sasa 1983: 12; Sasa & Suzuki 1991: 94 (as *Polypedilum s. str.*).

Microtendipes irioceus Sasa & Suzuki, 2000: 12. **Syn. nov.**

Remarks. The holotype male of *M. irioceus* Sasa & Suzuki may be lost (A. Shinohara, pers. comm.). In the original description of *M. irioceus*, the authors (2000: 13) wrote, “Wing bare, without dark marks, R₂₊₃ in contact with R₁. Tip of fore tibia with a long, narrow and apically pointed terminal process”, and “Oral or anterior margin of 8th abdominal segment is inverted V-shaped like in *Polypedilum* species”. These are features of *Polypedilum* rather than *Microtendipes*. Further, they draw the foretibial scale in the somewhat lateral view (p. 31, fig. 12e), and noted that the superior volsella is somewhat sickle-shaped, apically hooked, and has 1 or 2 inner setae arising at about basal one-third, and one lateral seta, and the gonostylus is slender, widest at about middle. It shows that the species belongs *Polypedilum s. str.* and conspecific with *P. (P.) tsukubaense* (Sasa).

The adults, male and female, are very similar to those of *Polypedilum (Polypedilum) flavescens* (Johannsen, 1932) collected from Indonesia in the morphology or even conspecific, especially the structure of male hypopygium. *Polypedilum (P.) tsukubaense* almost satisfies the original description of *P. flavescens*, except that the foretibial scale is rounded apically. In *P. (P.) flavescens*, the scale is pointed apically, according to Johannsen (1932: 521).

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