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Studies on Chironomid Midges of Some Lakes in Japan

日本の湖沼のユスリカの研究

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PREFACE

The insect family chironomidae (Diptera) comprises large numbers of species whose larvae breed in all types of land water. For instance, they are found from bogs on high mountains or ponds in the arctic region to various water bodies in the tropics. This fact suggests that chironomid species may represent any kind of aquatic environments. However, it is only known that chironomids are indicators of polluted water, because species found in such places are chironomids only on many occasions. We can find chironomid larvae among aquatic insects in any samples from lakes or rivers. However, as it was difficult to identify the species at larval stage, chironomids had been often neglected or treated as Chironomidae and no significant studies have been made in Japan and neighbouring regions on relationship between the chironomid species and the degree of eutrophication of lakes or pollution in rivers.

Chironomids have been used for lake typology since Thiennemann (1925); it is nothing but the indicators of the trophic state of lakes. The trophic state of lakes can be measured by various parameters; namely, standing crop of phytoplankton, primary production, vertical distribution of dissolved oxygen, and so on. Thiennemann and his successors tried to classify lakes from the species of chironomids living in lakes. Zoobenthos in lakes must be most suitable organisms to indicate the trophic state since the various characters of lakes mentioned above affect the bottom fauna. Among zoobenthos, chironomid larvae are remarkable and abundant on many occasions. In Japan, Miyadi (1933) studied the zoobenthos in various lakes and classified the lakes according to them. However, the taxonomy of chironomids had not advanced at that time and it was almost impossible to distinguish species or even genus of chironomid larvae when Miyadi had studied. Therefore, there was confusion in his lake typology such as a *Chironomus plumosus* type oligotrophic lake and a *Chironomus plumosus* type mesotrophic lake etc., These facts suggest the necessity of reexamination of chironomids in Japanese lakes. Accordingly, we studied the chironomid fauna in the lakes in the Nikko National Park (Yasuno *et al.*, 1984) and found that *Chironomus plumosus* according to Miyadi was *Chironomus nipponensis*. It was cleared from our studies not only that there are no such *C. plumosus* oligotrophic or mesotrophic lakes but also that species composition of chironomids is not so simple as he described, for example, *Tanytarsus* which was only one species throughout Japan according to Miyadi contains several species in one lake. These findings and also or further ecological studies are depending on the taxonomical studies by Sasa (1978, 1979, 1980, 1981, 1983 and 1984).

Lakes in southern Kyushu had been surveyed by Miyadi also (1933) but the situation was the same. The results of our recent surveys were partly reported (Yasuno *et al.*, 1983) but the taxonomical studies were not included. The present issue contains the taxonomy of chironomids in this district and also from the lakes of Mt. Fuji as well as of Hokkaido.

The chironomids of Lakes Ikeda and Unagi reported here are mostly new records and some are new species. However, it is interesting that some are common to those found in the River Tama or lakes in the Nikko district. This is true in lakes of Mt. Fuji where more common species to the lakes of Nikko were found. Nevertheless, a

total of 34 species were described from Lakes Ikeda, Unagi and others in southern Kyushu and a total of 45 species from lakes of Mt. Fuji. The species common to the River Tama might inhabit near shores of lakes. In the profoundal region, more common species to lakes would be expected, if the further studies are conducted in other lakes. The new lake typology must be established based on these studies considering the abundance of respective species. Ecological studies of zoobenthos including the function of chironomids in ecosystems are also useless unless the species are correctly distinguished. Therefore, this seventh issue of taxonomical studies of chironomids from National Institute for Environmental Studies will be the basis of the future environmental studies in Japan.

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A Report on the Chironomids Collected in Winter from the Sapporo Area, Hokkaido (Diptera, Chironamidae)*

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SUMMARY

Collections of the chironomid midges breeding in the Sapporo area, Hokkaido, were conducted on 2 and 3 December 1981, from where almost no information was available on the taxonomy and distribution on this group of insect. Since this area was already covered by deep snow, no adult chironomids could be collected, but a total of 11 species were recovered by laboratory rearing of bottom sediments, as shown in Table 1. From a sewage ditch in Tonden, Sapporo City, only *Chironomus yoshimatsui* could be found in high densities. From River Teine of Sapporo City, small numbers of *Ch. yoshimatsui*, *Polypedilum tamanigrum* and *Cricotopus* sp. were recovered. Bottom sediments collected from Lake Utonai near Chitose Airport were very rich in the chironomid fauna, and a total of 8 species were reared and identified as the adults, as shown in Table 1, among which *Polypedilum arundinetum* and *P. scalaenum* were the new records from Japan.

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Table 1 Species and numbers of chironomid adults emerged from bottom samples collected in Hokkaido, 2 and 3 December 1981

Code No.	Species	Sewage, Tonden		River Teine		Lake Utonai		Page
		male	female	male	female	male	female	
#1	*Chironomus yoshimatsui*	107	79	2	1			3
#2	*Chironomus nipponensis*					4	2	4
#3	*Polypedilum nubeculosum*					20	24	4
#4	*Polypedilum tamanigrum*			2	1			6
#5	*Polypedilum arundinetum*					1	2	6
#6	*Polypedilum scalaenum*					3		7
#7	*Tanytarsus* sp.					1	2	9
#8	*Phaenopsectra punctipes*					1	1	10
#9	*Psectrocladius yunoquartus*					4	0	11
#10	*Cricotopus* sp.				1			
#11	*Ablabesmyia* sp.			4		4	11	

INTRODUCTION

Very little information is available on the species and distribution of the chironomid midges in Hokkaido. The only scientific records of this group of insects from this island are the description of *Clunio aquilonius* as a new species collected from tide pools in Akkeshi by Tokunaga (1938), and of the occurrence of *Smittia aterrima* (Meigen, 1818) in Kitami by Tokunaga (1940). Ito (1975) conducted a study on the larval morphology of *Chironomus dorsalis* and *Ch. yoshimatsui* collected in Sapporo, which is the first report of the occurrence of two species of genus *Chironomus* in Hokkaido.

A collection of chironomids in the Sapporo area were conducted in December 1981 by the present author and Dr. Tomiko Ito from sewage ditches in Sapporo City and from Lake Utonai. Bottom sediments were collected and transported to the laboratory in Tokyo in order to recover adult midges by artificial culture in plastic containers. As the results, altogether 11 species of the family Chironomidae were identified as in Table 1. The occurrence of *Ch. yoshimatsui* as a common inhabitant of sewage ditches is confirmed again, and two species, *Polypedilum arundinetum* and *P. scalaenum*, are new records to Japan.

COLLECTION RECORDS AND DESCRIPTION

1. *Chironomus yoshimatsui* Martin et Sublette, 1972 (Fig. 1-A)

Collection records: A total of 107 males and 79 females emerged from a bottom sediment sample of a sewage ditch in Tonden, Sapporo, collected 2 December 1981. 2 males and a female emerged also from a bottom sample of River Teine, Sapporo. 10 males and 5 females among them were dissected and mounted (Specimen Nos. A 60:61–72).

Male: Body coloration largely yellow with brown marks; ground color of scutum yellow, scutal stripes reddish brown, scutellum brown, postnotum dark brown, ground color of abdominal tergites greenish yellow, tergites II to V with a narrow transverse brown band in the middle (a distinguishing character of male of this species; Fig. 1A-3), tergites VI to hypopygium brown or dark brown; legs without conspicuous dark rings, femora yellowish brown, tibiae brown (middle portion yellowish brown), tarsal segments brown or dark brown. Wing unmarked, vein r-m slightly darker.

Standard measurement data of 10 males; body length 6.04–7.73 mm (6.90 mm in average), wing length 2.78–4.12 mm (3.30 mm). AR 2.91–3.76 (3.25), AHR 0.46–0.51 (0.48). ER 0.22–0.31 (0.27). so 30–44 (35.4), cl 20–38 (30.4). pn absent, dm 14–31 (19.6), dl 14–32 (22.1), pa 6–9 (6.9), sc 18–44 (26.2). sq 12–25 (18.3). LR1 1.51–1.65 (1.58), LR2 0.58–0.61 (0.59), LR3 0.66–0.74 (0.71). TR1 0.25–0.28 (0.26). BR1 1.6–2.5, BR2 2.3–3.9 (2.9), BR3 2.4–5.6 (4.0).

Hypopygium in Fig. 1-A-4. Anal point long, slender, constricted at base and with rounded apex. Dorsal appendage (Fig. 1-A-5) S-type of Strenzke (1959). Gonostylus abruptly narrowed at about middle.

Remarks: This species is the predominant chironomid commonly found in sewage ditches and highly eutrophicated streams in Honshu and Kyushu, and is now shown to be distributed also in Hokkaido in the same habitats. It is morphologically similar to *Ch. samoensis* Edwards (= *Ch. flaviplumus* Tokunaga) but can be easily distinguished in male by the shape of dark marks on abdominal tergites (narrow transverse bands in the present species, oval or rhomboid patches in *samoensis*), and by the value of TR1 (about 0.26 in the present species, about 0.4 in *samoensis*). The present species breeds in eutrophicated running waters, while *samoensis* is found usually in eutrophicated stagnant waters.

#2. *Chironomus nipponensis* Tokunaga, 1940 (Fig. 1-B)

Collection records: 4 males and 2 females emerged from a bottom sediment sample of Lake Utonai collected 3 December 1981. 3 males and a female among them were mounted on slides for confirmation of identification (Nos. A 60:51–53).

Male: Body coloration largely black, with caudal white bands on abdominal tergites II to V. Ground color of scutum pruinose, scutal stripes black, scutellum dark brown, postnotum black, halteres yellow. Femora, tibiae and tarsi I to III largely yellow, dark rings are on distal end of femora, proximal and distal ends of tibiae, and distal ends of tarsi I to III; tarsi IV largely dark, V entirely dark brown. Abdominal tergites II to V (Fig. 1B-3) dark on proximal 2/3 and white on caudal 1/3, the dark area extending caudally in the middle; the distal tergites dark brown. Wing with a small dark area around r-m.

Standard measurement data with 3 males: body length 9.24–9.86 mm (9.49 mm in average), wing length 4.24–4.31 mm (4.29 mm). AR 3.55–3.95 (3.71), AHR 0.57–0.60 (0.58). ER 0.19–0.26 (0.22). so 34–52 (42.8), cl 38–45 (42.8). pn none, dm 25–27 (26.0), dl 31–36 (33.6), pa 6–8 (7.0), sc 32–40 (29.0), sq 26–32 (19.0). LR1 1.43–1.53 (1.48), LR2 0.62–0.63 (0.63), LR3 0.75–0.77 (0.76). TR1 0.22–0.25 (0.24). BR1 2.0–2.3 (2.1), BR2 1.8–2.4 (2.1), BR3 3.0–3.5 (3.3).

Hypopygium in Fig. 1-B-4. Anal point short, broad and with rounded apex. Dorsal appendage (Fig. 1-B-5) D-type of Strenzke (1959), band-like and nearly parallel-sided almost along entire length.

Remarks: This species was described first by Tokunaga (1940) by male and female collected at Sikuka, Karahuto. Hashimoto (1977) reported it as being common in Japan west of Kanto. Sasa (1978) described male, female, pupa and larva collected in Tsukuba and Nikko, Kanto region of Honshu. Sasa (1984) gave standard measurement data of males collected from Lake Yunoko, Nikko. The present specimens obtained from Lake Utonai are morphologically in well accordance with those of the Nikko lakes.

#3. *Polypedilum nubeculosum* (Meigen, 1818) (Fig. 2-C)

Collection records: A total of 20 males and 24 females emerged from bottom mud of Lake Utonai collected 3 December 1981. 6 males, 4 females, and 2 pupal skin associated were dissected and mounted (Nos. A 60:01–05).

Male: (Description based on 6 specimens). Body length 5.47–6.88 mm (6.14

mm in average), wing length 2.92–3.23 mm (3.10 mm). Body coloration almost entirely black or dark brown. Head without frontal tubercles, eyes with a long dorsomedial projection, ER 0.22–0.33 (0.29). Antenna with 13 flagellar segments, AR 1.86–2.04 (1.98). Antennal hairs long, AHR 0.52–0.57 (0.54). Supraorbital setae 13–18 (15.6), clypeal setae 30–53 (41.5). Antepronotum with 4–7 lateral setae, very unusual character as a member of genus *Polypedilum*, which usually have no antepronotal setae. Scutum with 20–24 (22.0) dorsomedian setae, 31–38 dorsolateral setae on each side, and 9–14 pre-alar setae on both sides. Scutellum with 32–38 (34.4) setae. Wing with cloudy marks, and 26–32 fringe setae on squama. Vein R2+3 clearly separated from R1 and R4+5, ending closer to end of the former than to end of the latter. fCu only slightly beyond r-m. LR1 1.48–1.55 (1.51), LR2 0.54–0.57 (0.56), LR3 0.72–0.77 (0.75). Tarsal beards relatively short, BR1 3.2–4.5, BR2 4.5–6.5, BR3 6.2–7.5. Tarsus V of front legs 0.26–0.29 times the length of front tibia. Pulvilli large and bifid.

Hypopygium in Fig. 2-C-3. Anal point long, slender and parallel-sided (Fig. 2-C-4). Dorsal appendage broadest at base and horn-like, with 2 long basal setae and a long lateral seta arising at about middle (Fig. 2-C-5). Ventral appendage long, slender and apically pointed, with some 12 long recurved setae arising on almost entire length of the shaft, and a long caudally directed apical seta (Fig. 2-C-6). Shape of gonostylus characteristic to this species, very stout and broadest at about middle, with rounded apex (Fig. 2-C-3).

Female: Body length 4.17–5.00 mm (4.53 mm in average of 4). Wing length 3.23–3.65 mm (3.37 mm). Body coloration as in male, almost entirely dark brown or black. ER 0.22–0.34 (0.28). Antenna composed of 5 flagellar segments, I to IV each with a long neck, last segment with 2 to 4 long subapical setae. Palp 4 segmented as usual. Frontal tubercles absent. Supraorbital setae 13–18 (15.1), clypeal setae 40–52 (49.3). Antepronotum with 3–4 (3.4) lateral setae on each side. Scutum with 20–27 (23.7) dorsomedian setae, 50–74 (58.5) dorsolateral setae, and 12–16 (14.3) prealar setae. Scutellar setae 32–51 (40.3). Squama with 24–32 fringe setae. Wing with faint clouds typical of this species. Wing vein R2+3 separated from R1 and R4+5 ending much closer to end of the former than that of the latter. fCu much beyond r-m, at 44% and 40% level of wing length, respectively. LR1 1.51–1.59 (1.54), LR2 0.54–0.55 (0.55), LR3 0.73–0.77 (0.75). Tarsal beards relatively short, BR1 2.2–3.0 (2.6), BR2 3.1–4.5 (3.8), BR3 4.6–5.8 (5.2). Spermathecae (Fig. 2-C-7) two, both oval, 108x82 and 98x82 microns. Cercus (Fig. 2-C-8) ear-shaped, 214 microns long and 130 micron wide.

Remarks: The present specimens collected from Lake Utonai are diagnosed as *Polypedilum nubeculosum* (Meigen), since the morphology of male, female and pupa is almost identical to the descriptions of various authors in Europe, and also to that reported by Tokunaga (1940) from Tokyo and Karahuto, and that described by Sasa (1984) from Lake Chuzenji of Nikko National Park by the same name. The male is especially characteristic in body coloration being largely black, wing with cloudy marks, antepronotum with lateral setae, and in the shape of anal point, dorsal and ventral appendages, and gonostylus of male hypopygium. The relationships between the European *nubeculosum*, Japanese specimens from Lake Chuzenji, and *P. tamagoryoense* from River Tama, were discussed by Sasa (1984).

4. *Polypedilum tamanigrum* Sasa, 1983 (Fig. 2-D)

Collection records: 2 males and a female, emerged from bottom sediment collected from River Teine, Sapporo, 2 December 1981. A pupal skin cast associated with a male (Nos. A 71:31, 32).

Male: Body length 2.23, 2.31 mm, wing length 1.82, 1.95 mm. Body almost entirely dark brown, leg segments yellow, tarsi II to V brownish yellow. Wing unmarked.

Frontal tubercles absent. Antenna with 13 flagellar segments, AR 0.89, 0.86. Antennal hairs relatively long, AHR 0.42, 0.44. ER 0.22, 0.21. Supraorbital setae 10, 12. Clypeal setae 16, 19. Antepronotum without lateral setae. Scutum with 14, 18 dorsomedian setae, and 18–20 dorsolateral setae on each side, and 5 or 6 supra-alar setae on each side. Scutum with 22, 26 setae in two rows. Squama fringed with 10 or 11 setae. Wing vein R2+3 running close to R1, ending much closer to end of R1 than to end of R4+5. fCu much beyond r-m, situated at 50% and 43% of wing length, respectively. LR1 1.67, 1.78, front tarsus V 0.28 times as long as front tibia. BR1 3.5, BR2 4.7, BR3 5.6. Pulvilli large and bifid.

Hypopygium in Fig. 2-D-3. Anal point long, slender and almost parallel-sided, with rounded apex (Fig. 2-D-4). Dorsal appendage *nubeculosum*-type, apical horn slender and only slightly curved, with 1 or 2 long basal setae, and a long lateral seta arising at about distal 1/3 (Fig. 2-D-5). Ventral appendage relatively long and slender, with 10 long, recurved setae and a very long terminal seta (Fig. 2-D-6). Gonostylus widest at about middle, inner margin slightly concave, with a terminal seta 30 microns long and 3 or 4 very long setae arising along inner margin (Fig. 2-D-7).

Female: Body length 2.86 mm, wing length 2.02 mm. Eyes with a long dorsomedial projection, ER 0.19. Palp 4 segmented, 36, 96, 140, 240 microns. Antenna with 6 flagellar segments. Spermathecae two, subequal in shape and size, 92x60, 90x62 microns (Fig. 2-D-8). Cercus 118 microns long and 86 microns wide, in Fig. 2-D-9. Body coloration as in male.

Pupa: Thoracic respiratory organs divided into 4 subequal tubes, as in Fig. 10-A of Sasa (1983a, p. 47). Distribution of spines on abdominal tergites same as in Fig. 10-B of Sasa (1983a, p. 47). Abdominal segments II to VI with 3 pairs, VII and VIII with 4 pairs of lateral hairs, among which those on II to IV are short, simple hairs (s-type) and those on V to VIII are all long and filamentous (L-type). Anal fins with 26, 27 fringe hairs.

Remarks: The above morphological characters of male, female and pupa are in well accordance with those of *Polypedilum tamanigrum* Sasa 1983 described from the upstream part of River Tama, Tokyo. The present specimens were collected from bottom of a highly polluted sewage stream in the suburbs of Sapporo City, Hokkaido.

5. *Polypedilum arundineti* Goetghebuer, 1921 (Fig. 3-E)

Polypedilum arundineti; Goetghebuer, 1921, p. 139
Chironomus (Polypedilum) arundineti; Edwards, 1929, p. 403
Polypedilum arundineti; Goetghebuer, 1937, p. 59
Polypedilum arundinetum; Pinder, 1978, p. 138

Collection records: A male, and 2 females, emerged from a bottom sample col-

lected from Lake Utonai, Hokkaido, 3 December 1981 (Nos. A 60:21, 22).

Male: Body length 3.91 mm, wing length 2.14 mm. Antennal shaft dark brown, hairs grey; ground color of scutum reddish yellow, scutal stripes and postnotum dark brown, scutellum brown, halteres yellow and with a dark apical spot; wing unmarked, purplish; r-m colorless, wing veins dark brown; leg segments largely brown, front tarsus III to V, and middle and hind tarsus IV and V dark brown; abdominal tergites largely brown, tergites I to VI each with a narrow basal and an apical pale band.

Eyes with a long dorsomedial projection, ER 0.26. Frontal tubercules absent (Fig. 3-E-1). Antenna with 13 flagellar segments, AR 1.55. Antennal hairs well developed, AHR 0.49. Supraorbital setae 10 on both sides, clypeal setae 22. Antepronotum without lateral setae. Scutum with 13 dorsomedian setae, 18 or 17 dorsolateral setae, and 5 or 6 pre-alar setae on each side. Scutellum with 8 setae in a single transverse row. Wing unmarked, venation in Fig. 3-E-1. Squama with 6 fringe hairs. fCu much beyond r-m, at 50% and 42% level of wing length, respectively. Front tibia with a basally broad and apically pointed terminal spur (Fig. 3-E-2). Terminal combs of middle and hind tibiae contiguous, and with one long spur (Fig. 3-E-3). LR1 1.62, LR2 0.52, LR3 0.67. Tarsi with relatively long beards, BR1 3.3, BR2 4.7, BR3 5.6. Front tarsus V 0.26 times as long as front tibia. Pulvilli well developed.

Abdominal segment VIII basally contricted in the middle. Hypopygium in Fig. 3-E-4. Anal point long, slender, parallel-sided and with rounded apex. Dorsal appendage (Fig. 3-E-5) rather strongly curved like letter C, broadest at base and narrowing towards apex, with 3 strong basal setae and a long lateral seta arising in proximal half. Ventral appendage (Fig. 3-E-6) rather slender, extending beyond gonocoxite, apically pointed and bears 8 recurved setae and a long apical seta. Gonostylus (Fig. 3-E-7) widest at about middle, inner margin almost straight, and bears 6 long setae along inner margin.

Female: Body length 4.01, 3.92 mm, wing length 2.41, 2.45 mm. Body almost entirely dark brown, ground color of scutum brown, stripes dark brown; leg segments brown; abdominal tergites almost uniformly dark brown, without pale bands as in the male. Spermathecae (Fig. 3-E-8) elongate spindle-shaped, 110x45 microns and 100x50 microns. Cercus (Fig. 3-E-9) 132 microns long and 100 microns wide.

Remarks: This species is morphologically a member of the *nubeculosum* group of genus *Polypedilum*, since male antenna composed of 13 flagellar segments, terminal combs of middle and hind tibiae with only one spur, dorsal appendage of male hypopygium composed of a broad base and a horn-like process bearing a long lateral seta, ventral appendage bears a long terminal seta, and gonostylus with long setae along inner margin. This species is tentatively identified as *P. arundinetum* Goetghebuer, since the body being largely dark brown, AR about 1.5, dorsal appendages slender, curved and with a long lateral seta arising in proximal half. However, the present specimen differs from *P. arundinetum* described by Pinder (1978) and Edwards (1929) from Europe in that abdominal tergites are not uniformly dark brown but with narrow pale bands along proximal and distal margins, tarsal beards relatively long, dorsal appendage being more slender and gonostylus being narrower.

6. *Polypedilum scalaenum* (Schrank, 1803) (Fig. 4-G)

Tipula scalaena; Schrank, 1803; Fauna boica, 3, 73, 2324
Chironomus (Polypedilum) scalaenus; Edwards, 1929, p. 402

Polypedilum scalaenum; Goetghebuer, 1937, p. 64
Polypedilum (Tripodura) scalaenum; Townes, 1945, p. 38
Polypedilum scalaenum; Pinder, 1978, p. 136

Collection records: 3 males and 2 pupal exuviae associated with them, emerged all on 8 January 1982, from bottom sediments collected 19 December 1981 from Lake Utonai, Hokkaido (Nos. 60:16, 17).

Male: Body length 3.60–3.74 mm (3.68 mm in average of 3), wing length 2.05–2.07 (2.06) mm. Antenna with 13 flagellar segments, AR 1.46, 1.50, 1.57. Antennal hairs well developed, AHR 0.53–0.58. Eyes with long dorsomedial projection, ER 0.23–0.29. Frontal tubercles absent (Fig. 3-F-1). Supraorbital setae 12–14 (13.0), clypeal setae 22–24 (23.0). Antepronotum without lateral setae. Scutum with 12, 16, 16 dorsomedian setae, 18–21 dorsolateral setae, and 5 or 6 prealar setae. Scutellum with 18, 20, 21 setae. Wing without dark marks (unusual as a *Tripodura* group of Japan), squama with 9–11 fringe setae, venation in Fig. 3-F-2. Vein R2+3 separated from both R1 and R4+5, ending about midway between ends of the two veins. fCu much beyond r-m, situated at 50% and 40% level of the wing length, respectively. Terminal scale of front tibia with a broad, long and sharply pointed apical scale (Fig. 3-F-3). Middle and hind tibiae with terminal combs separated from each other, the narrow one with a long terminal spur, and the broad one without spur (Fig. 3-F-4). LR1 1.46–1.52, LR2 0.55–0.59, LR3 0.71–0.73. Tarsi with beards of medium lengths, BR1 3.0–3.2, BR2 3.5–5.2, BR3 5.8–6.5. Pulvilli large and bifid.

Hypopygium in Fig. 3-F-5. Ninth tergite with a pair of prominent tubercles flanking anal point, expanded apically like a mushroom (Fig. 3-F-6). Dorsal appendage broad, pad-like, covered entirely by microtrichiae, and with some 10 long setae along apical margin (Fig. 3-F-7). Ventral appendage with some 14 recurved setae arising in apical 1/3, and a long terminal seta (Fig. 3-F-8). Gonostylus slender, widest at about middle, with 8 or 9 long setae along inner margin (Fig. 3-F-9).

Pupa: Length of abdomen 4.23, 4.40 mm. Exuviae almost colorless, excepting the lateral stripes, which are brown. Thoracic respiratory organs divided into 8 narrow tubes of subequal length (Fig. 4-G-1). Distribution of spines, spinules and hairs on abdominal tergites in Figs. 4-G-2,3. Tergite I without spines and spinules. II with a proximal transverse band of large spines (II-a), middle spinose area of smaller spines (II-b, II-c), and a caudal uniserial band of large recurved spines (II-d). Tergites III to VI also with a proximal spinose area of large spines (-a), central spinose area of smaller spines (-b, -c); in addition, tergites III and IV with a caudal band of small recurved spines arranged in triple rows (-d). Tergites VII and VIII with a pair of proximal spine patches (VII-a, VIII-a). Abdominal segments II to VI with 3 pairs, and VII and VIII with 4 pairs of lateral hairs, among which those on segments II to IV are all simple and minute, while those on the rest segments are all long, flat and filamentous. Sternites IV, V and VI with a pair of spine patches in the caudolateral corners. Caudolateral scales of segment VIII composed of a long, stout and sharply pointed principal spur, and 3 or 4 accessory lateral spurs (Fig. 4-G-9). Anal fins with 31, 31 and 32, 34 fringe hairs.

Remarks: This species obviously belongs to the *Tripodura* group (or subgenus) of genus *Polypedilum*, since ninth tergite has a pair of lateral tubercles flanking anal point, dorsal appendage is pad-like, and bears long setae along caudal margin. All the previously known Japanese species of this group has dark marks on the wing. Of species known from Europe, the present specimens are most closely related to *P. scalaenum*

(Schrank) of Pinder (1978) in that wing without dark marks, the lateral processes on ninth tergite are narrow and apically pointed, and thus the present species is tentatively identified so. However, the species previously described as *P. scalaenum* (Schrank) by Edwards (1929), Goetghebuer (1936) from Europe and by Townes (1945) from North America all bear dark marks on the wing, and thus the relationship between the two forms should be clarified before final decision be made in the identification of the present specimen.

7. *Tanytarsus* sp. "utonai" (Fig. 5-H)

Collection records: A male and a female, emerged 6 January 1982 from a bottom sediment collected from Lake Utonai (No. 60:81).

Male: Body length 2.62 mm, wing length 1.48 mm. Body coloration largely dark brown, *i.e.* ground color of scutum brown, scutal stripes dark brown, scutellum dark brown, postnotum almost black, legs dark brown, abdominal tergites uniformly dark brown, sternites yellowish brown. Wing unmarked, with macrotrichiae rather sparsely on distal half, basal half almost bare.

Head in Fig. 5-H-1. Frontal tubercles absent. Eyes without dorsomedial projection and almost reniform, ER 1.10. Antenna with 13 flageller segments, AR 0.94. Antennal hairs long, AHR 0.49. Palp 4 segmented as usual, 64, 96, 100, 158 microns. Supraorbital setae 11 on each side. Antepronotum without lateral setae. Dorsomedian setae 7, dorsolateral setae 8 on both sides, prealar setae only one on each side. Scutellum with 6 setae in a transverse row. Squama bare. Wing membrane without dark marks and slightly purple, with macrotrichiae rather sparsely on distal half, basal half almost bare. Wing vein R2+3 separated both from R1 and R4+5. Cross vein r-m short and almost parallel to wing axis. fCu much beyond r-m. Anal vein extending slightly beyond fCu. Anal lobe obtuse. Terminal scale of front tibia short, narrow and sharply pointed (Fig. 5-H-2). Terminal combs of middle and hind tibiae both narrow and separated, each with a short spur (Fig. 5-H-3). LR1 1.52, LR2 0.49, LR3 0.56. Tarsal hairs rather short, BR1 2.1, BR2 2.6, BR3 3.1. Front tarsus V 0.28 times as long as front tibia. Pulvilli absent.

Hypopygium in Fig. 5-H-4. Ninth tergite nearly quadrangular and posterior margin only slightly produced medially, and with some 10 short setae near base of anal point. Anal point (Fig. 5-H-5) short, broad and apically pointed, with a pair of lateral ridges, several short lateral setae, and 12 spine clusters in double rows but devoid of microtrichiae excepting at base. Band of ninth tergite separated in the middle. Appendage 1 (Fig. 5-H-6) somewhat bottle shaped, abruptly narrowed in the middle and with broad base, with 5 dorsal setae and 4 basal setae; appendage 1-a long, simple and apically rounded. Appendage 2 (Fig. 5-H-7) short and broad, thumb-like, with 13 short and recurved setae arising from a dorsal lobe; appendage 2-a rather short, bearing numerous long and simple setae (Figs. 5-H-7,8). Gonostylus broadest at about middle and with inner margin almost straight.

Remarks: This species is a typical member of genus *Tanytarsus* in the structure of male hypopygium, wing, or terminal combs of tibiae, and is closest to the *chyniensis* group of Reiss & Fittkau (1971), but differs from all the known species of this group in the structure of appendage 1, 1-a, 2-a, anal point, etc. Among species recorded from Japan, it is apparently closest to *T. chuzesecundus* Sasa but again differs from it in

the shape of the appendages of male hypopygium. The scientific name is reserved until more specimens become available.

#8. *Phaenopsectra punctipes* (Wiedemann, 1817) (Fig. 6-J)

Chironomus punctipes; Wiedemann, 1817; Zool. Mag. 1:65
Pentapedilum (Phaenopsectra) punctipes; Edwards, 1929, p. 375
Pentapedilum (Phaenopsectra) punctipes; Goetghebuer, 1937, p. 82
Tanytarsus (Tanytarsus) punctipes; Townes, 1945, p. 76
Phaenopsectra punctipes; Pinder, 1978, p. 134
Pentapedilum punctipes; Hashimoto, 1983, p. 19

Collection records: A male emerged from bottom sediment of Lake Utonai, 30 December (No. A 60:36).

Male: Body length 5.24 mm, wing length 2.60 mm. Antennal shaft and hairs dark brown, scutum black and stripes hardly discernible, scutellum brown, postnotum black, abdominal tergites yellow (possibly green when alive) and much paler than thorax. Wing unmarked but covered thickly by macrotrichiae. Leg segments largely yellow, tarsi III to V of front legs and tarsi V of middle and hind legs brown.

Head (Fig. 6-J-1) without frontal tubercles, eyes with a long dorsomedial projection, ER 0.34. AR 2.17, AHR 0.58. Supraorbital setae 17 on both sides, clypeal setae 22. Antepronotum without lateral setae, scutum with 32 dorsomedians, 15 and 16 dorsolaterals and 8 prealars on both sides, all arising from large pale pits. Scutellum with 31 setae. Squama with 18 fringe setae. R2+3 running close to R1 but separated from it along entire length. fCu slightly beyond r-m, situated at 45% and 41% level of wing length, respectively. Anal lobe well developed. Terminal scale of front tibia long and with rounded apex (Fig. 6-J-2). Terminal comb of middle and hind tibiae wide, confluent and bear two short spurs (Fig. 6-J-3). Front tarsus I relatively short, LR1 1.23, LR2 0.61, LR3 0.78. Tarsi with beards of medium length, BR1 3.4. Front tarsus V 0.23 times as long as front tibia. All legs with a pair of large pulvilli.

8th abdominal tergite square-shaped, not triangularly constricted in the middle such as in most *Polypedilum* and *Pentapedilum* males, and with a U-shaped ridge. Hypopygium in Fig. 6-J-4. Ninth tergite with rounded posterior margin and a group of long setae in the middle. Anal point long, slender and slightly expanded apically (Fig. 6-J-5). Dorsal appendage horn-like, almost straight but curved like a hook near apex, with several long basal setae, and a long lateral seta arising in distal half (Fig. 6-J-6). Ventral appendage long, apically expanded, with 12 recurved setae on the apical bulbulous portion, and two long, caudally directed apical setae (Fig. 6-J-7). Gonostylus with slightly concave inner margin, widest near apex and apically rounded, without long inner setae such as seen in most *Polypedilum* and *Pentapedilum* species, and instead bears numerous short setae along inner margin (Fig. 6-J-8).

Remarks: This specimen belongs to genus *Pentapedilum* Kieffer in wider sense and is a member of *Phaenopsectra* Kieffer, since wing with macrotrichiae, squama fringed, r-m long and oblique, terminal combs of posterior tibia with two short spurs, gonostylus without long setae on inner side but with numerous short setae. Among the known species of this group, it is closest to *Ph. punctipes* (Wiedemann) in body coloration, structure of hypopygium, and in the values of AR and LR (about 2, and 1.2–1.35,

respectively, according to Edwards, 1929, p. 374 and 375), and is tentatively identified so. The present species differs from *Ph. kizakiensis* (Tokunaga) in that dorsal appendage has a long lateral seta, and in the body coloration (scutum and postnotum black, scutellum brown, and abdominal tergites yellow in the present species, body almost entirely black in *kizakiensis*). This species was recorded recently by Hashimoto (1983) by a male collected from Nagoya, Aichi Prefecture.

#9. *Psectrocladius yunoquartus* Sasa, 1984 (Figs. 6-K, 7-L)

Collection records: 3 males and a pupa, emerged from a bottom sample collected from Lake Utonai, 3 December 1981 (Nos. 60:41–43).

Male: Body length 3.77–4.33 mm (4.97 mm in average of 3), wing length 2.09–2.19 mm (2.14 mm). Body largely brown, *i.e.* ground color of scutum yellow, scutal stripes dark brown, scutellum brown, postnotum dark brown, leg segments yellowish brown, abdominal tergites brown. Eyes bare, ER 1.10–1.13 (1.12). Antenna with 13 flagellar segments, AR 1.56, 1.74, 1.79. Antennal hairs long, AHR 0.51–0.55 (0.53). Supraorbital setae 8, 9 or 10, clypeal setae 17, 15, 13. Antepronotum with 6 or 7 lateral setae. Dorsomedian setae of scutum absent, dorsolateral setae 11, 12 or 14 (12.5), prealar setae 4, 5 or 6. Scutellum with 6 or 7 setae. Squama with 23–36 fringe setae. Wing unmarked, slightly brown, anal lobe strongly produced. R2+3 ending between ends of R1 and R4+5. fCu much beyond r-m, situated at 47% and 40% level of wing length, respectively. LR1 all 0.73, LR2 all 0.50, LR3 0.55–0.58. Front tarsus V 0.12–0.14 times as long as front tibia. Tarsal beards relatively short, BR1 2.4–2.8, BR2 3.8–3.9, BR3 3.7–3.8. Front tibia with one long and simple terminal spur (76 microns), middle tibia with one barbed terminal spur (54 microns), middle tarsus I and II each with two short terminal spurs, hind tibia with one long barbed terminal spur (80 microns), and a terminal comb composed of 15–17 free spurs 38–58 microns long, hind tarsus I and II each with two short terminal spurs. All legs with large pulvilli.

Hypopygium in Fig. 6-K-1. Anal tergite with roughly rectangular posterior margin, with 12, 14 or 15 setae on posterior margin. Anal point long, narrow and pointed apically (Fig. 6-K-2). Inner lobe of gonocoxite broad, occupying about 2/3 of inner margin of gonocoxite, and with broad and rounded posterior angle (Fig. 6-K-3). Gonostylus slightly curved inwards.

Pupa: Length of abdomen 3.16 mm. Color of pupal skin almost entirely pale, abdominal tergites each with a brown band along caudal margin. Thoracic respiratory organs horn-like, 328 and 336 microns long, with rounded apex and numerous large spines on the shaft (Fig. 7-L-1). Distribution of spines and hairs on abdominal segments in Figs. 7-L-2,3. Tergite I without spines and spinules. Tergite II with a pair of small spinulous areas in the oral lateral corners, and a large spine patch in the middle and along caudal margin (II-c,d). Tergite III with spinules sparsely distributed on almost the entire surface; there are two bands of large spines along caudal margin of tergite III, an uniserial band of caudally directed spines (III-c), and double or triple rows of orally directed spines (III-d). Tergite IV also with spinules almost on entire surface, and a central spine patch composed of 11 large and 3 small spines, and caudal bands of caudally directed (IV-c) and orally directed (IV-d) large spines. Tergites V and VI also with a central spines patch (V-b, VI-b), and a caudal band of caudally directed spines (V-c, VI-c), but the orally directed caudal band is absent. Tergites VII and VIII

with spinules in the caudal half, but without spines. Sternites II to VIII with spinulous areas, as in Fig. 7-L-2. Sternites IV, V and VI with a pair of spine groups (-w) in the caudolateral corners, being composed of 8 and 8 spines in sternite IV, 5 and 6 spines in V, and 3 and 2 in VI; these spines are all long, narrow and sharply pointed. Abdominal segments II to VII with 3 pairs, and VIII with 5 pairs of lateral hairs, among which those on II to V and the middle pair on VI are short and simple, while the rest lateral hairs are all long and filamentous. Anal fins with 38 or 41 fringe hairs, each with 3 long, curved terminal setae about 650 microns long, and several spines at the bases of terminal setae (Fig. 7-L-3).

Remarks: This species belongs to subgenus *Psectrocladius* of genus *Psectrocladius* Kieffer, since wings and eyes bare, squama finged, wing vein Cu2 almost straight, legs with large pulvilli, anal point present, and middle tibia with only one apical spur. Among known species of this group, the present specimens are most closely related to *Psectrocladius yunoquartus* Sasa recorded recently from Lakes Yunoko and Chuzenji of Central Honshu, with which most of the important morphological characters are nearly coincident. However, the present specimens differ from the types in body size being smaller (wing length 2.09–2.19 in the present specimens, 2.49–2.91 in the type specimens), and in that inner lobe of gonocoxite being more rounded. The value of AR is smaller in the present specimens (1.58–1.79) than in the type specimens (1.78–2.04), but this difference may not be significant. In the pupa, the basic structure is also similar to that of *P. yunoquartus*, and the size of thoracic respiratory organs, the numbers of spines in the central spine patches of tergites IV, V and VI, and the numbers of fringe hairs on anal fins are within the variation ranges of the type specimens. However, the numbers and characters of lateral abdominal hairs in the present specimen are somewhat different from the types, which have 4 pairs of simple setae on segments II to V, 4 pairs of filamentous setae on VI and VII, and 5 pairs of filamentous setae on VIII (in the present specimen, segments II to VII bear only 3 pairs of lateral setae).

EXPLANATION OF FIGURES

Fig. 1-A *Chironomus yoshimatsui* Martin et Sublette

Male: A-1 frontal tubercles. A-2 tip of front tibia. A-3 dark marks on abdominal tergites II and III. A-4 hypopygium. A-5 dorsal appendage.

B *Chironomus nipponensis* Tokunaga

Male: B-1 frontal tubercles. B-2 tip of front tibia. B-3 dark marks on abdominal tergites II and III. B-4 hypopygium. B-5 dorsal appendage.

Fig. 2-C *Polypedilum nubeculosum* (Meigen)

Male: C-1 tip of front tibia. C-2 tip of hind tibia. C-3 hypopygium. C-4 anal point. C-5 dorsal appendage. C-6 ventral appendage. Female: C-7 spermathecae. C-8 cercus.

D *Polypedilum tamanigrum* Sasa

Male: D-1 tip of front tibia. D-2 tip of hind tibia. D-3 hypopygium. D-4 anal point. D-5 dorsal appendage. D-6 ventral appendage. D-7 gonostylus.

Fig. 3-E *Polypedilum arundinetum* (Goetghebuer)

Male: E-1 wing. E-2 tip of front tibia. E-3 tip of hind tibia. E-4 hypopygium. E-5 dorsal appendage. E-6 ventral appendage. E-7 gonostylus.

F *Polypedilum scalaenum* (Schrank)

Male: F-1 frons. F-2 wing. F-3 tip of front tibia. F-4 tip of hind tibia. F-5 hypopygium. F-6 anal point and minth tergite. F-7 dorsal appendage. F-8 ventral appendage. F-9 gonostylus.

Fig. 4-G *Polypedilum scalaenum* (Schrank)

Pupa: G-1 thoracic respiratory organ. G-2 abdominal tergites I–V. G-3 abdominal tergites VI to anal tergite. G-4 spines on tergite II (II-a to d). G-5 spines on tergite III (a to d). G-6 caudolateral spine patch on sternite IV (IV-w). G-7 do, on sternite V (V-w). G-8 spinules on tergites VII and VIII. G-9 caudolateral scale of segment VIII.

Fig. 5-H *Tanytarsus* sp. "utonai"

Male: H-1 head. H-2 tip of front tibia. H-3 tip of hind tibia. H-4 hypopygium. H-5 anal point. H-6 appendages I and I-a. H-7 appendages 2 and 2-a, dorsal view. H-8 appendage 2-a. Female. H-9 spermathecae. H-10 cercus.

I *Polypedilum arundinetum* (Goetghebuer)

Female: I-1 spermathecae. I-2 cercus.

Fig. 6-J *Phaenopsectra punctipes* (Wiedemann)

Male: J-1 head. J-2 tip of front tibia. J-3 tip of hind tibia. J-4 hypopygium. J-5 anal point. J-6 dorsal appendage. J-7 ventral appendage. J-8 gonostylus.

K *Psectrocladius yunoquartus* Sasa

Male: K-1 hypopygium. K-2 anal point. K-3 gonostylus and inner lobe of

gonocoxite.

Fig. 7 ***Psectrocladius yunoquartus*** **Sasa, Pupa**

Pupa: **L-1** thoracic respiratory organ. **L-2** abdominal segments I to V, lateral view. **L-3** do, VI to anal segment, lateral view. **L-4** spines on tergite II. **L-5** spines on tergite III. **L-6** spines on tergite IV. **L-7** spines on tergite V. **L-8** spines on tergite VI. **L-8** spnes and spinules on caudorateral corner of sternite IV. **L-9** caudolateral spine group on sternite V.

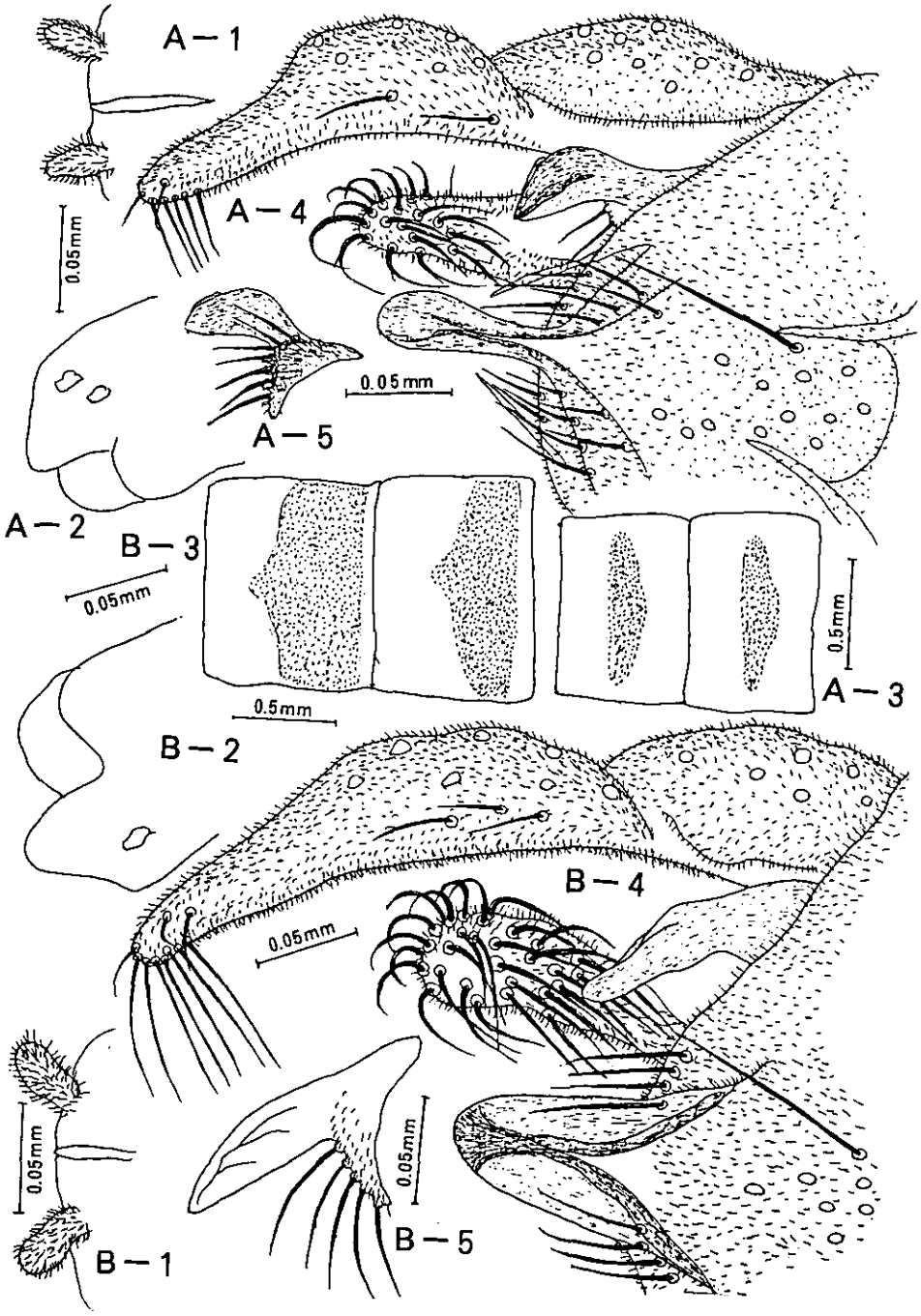

Fig. 1-A *Chironomus yoshimatsui* Martin et Sublette, male
-B *Chironomus nipponensis* Tokunaga, male

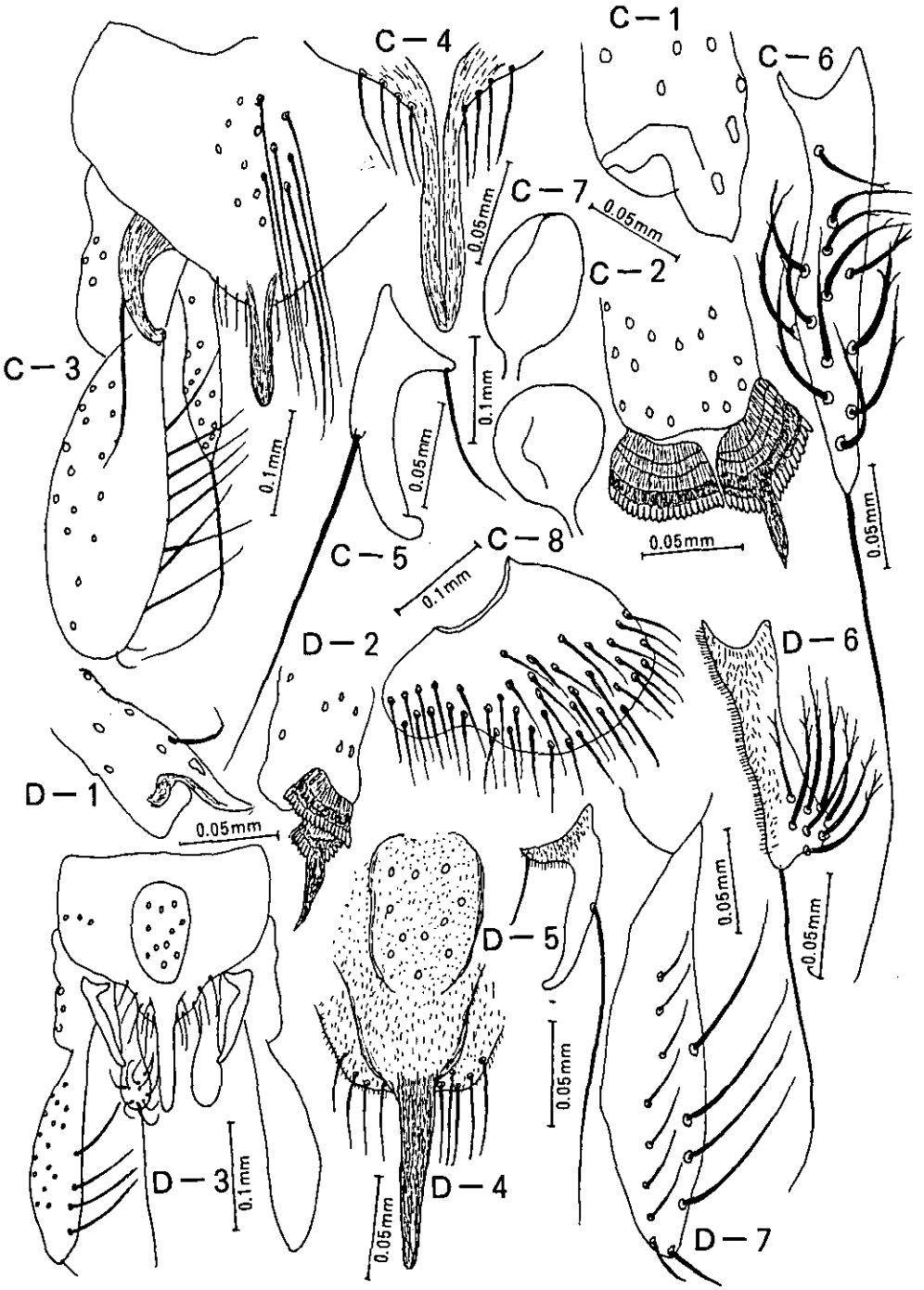

Fig. 2-C ***Polypedilum nubeculosum*** **(Meigen)**, male and female
-D ***Polypedilum tamanigrum*** **Sasa**, male

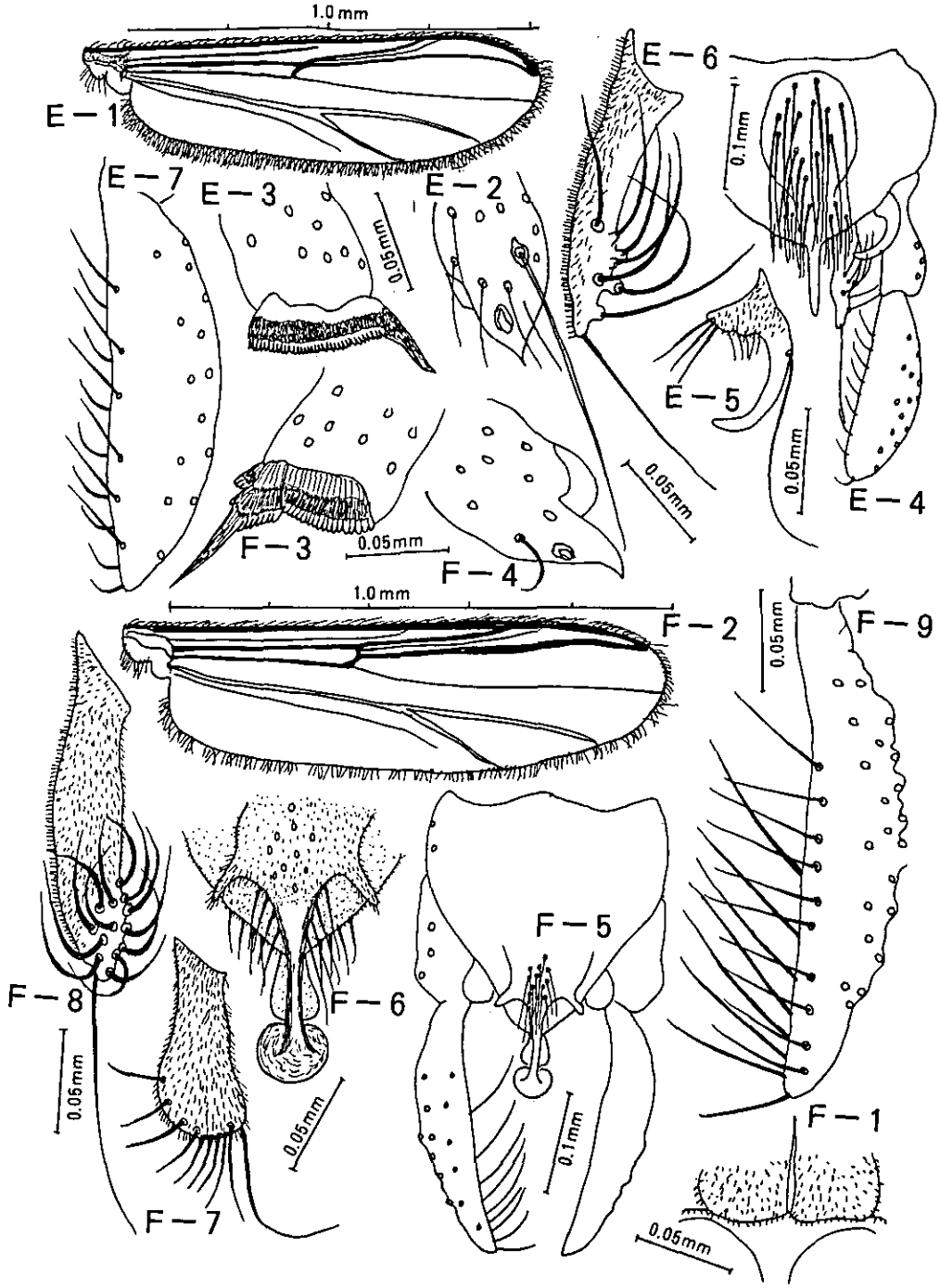

Fig. 3-E *Polypedilum arundinetum* (Goetghebuer), male
-F *Polypedilum scalaenum* (Schrank), male

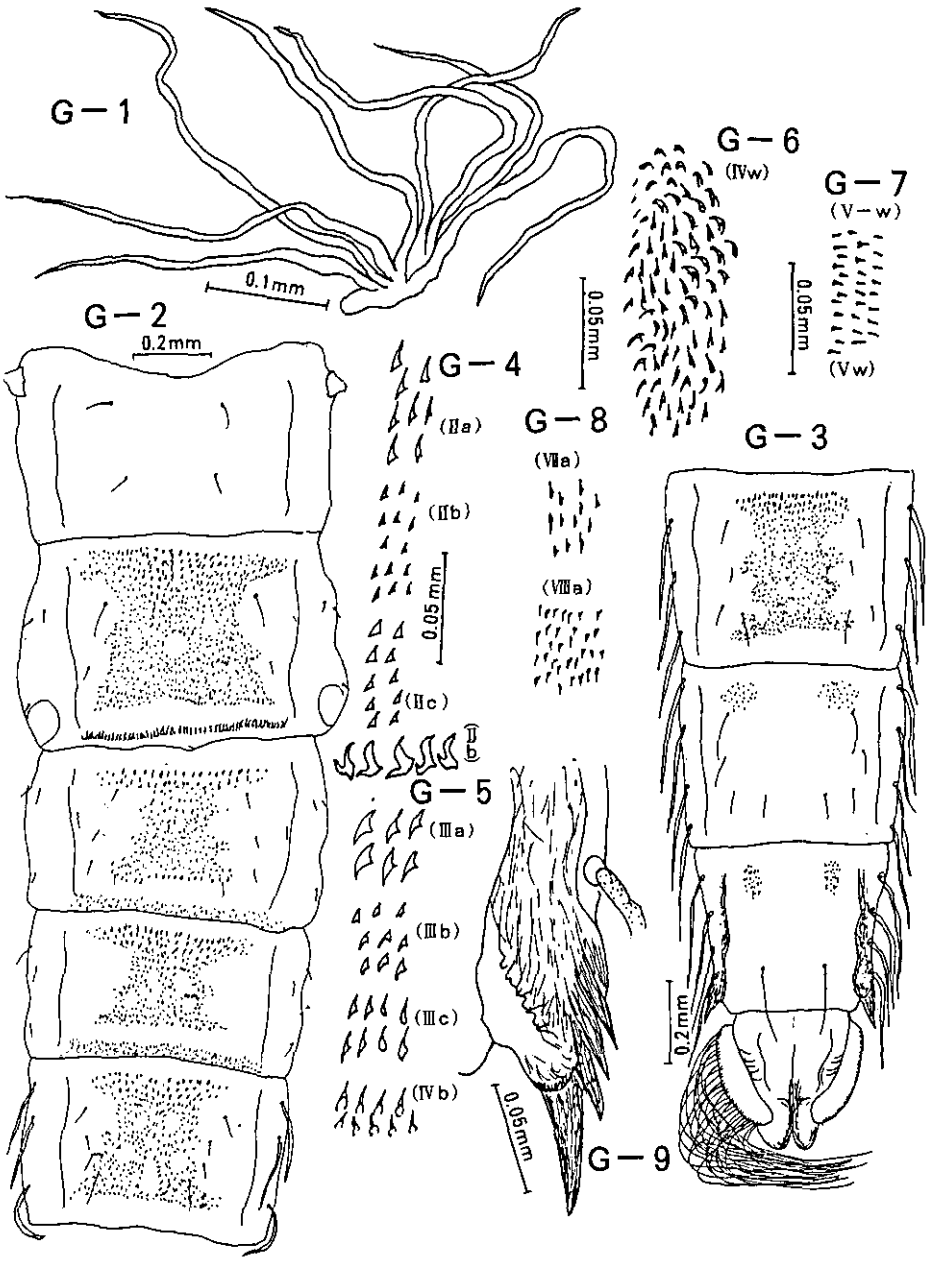

Fig. 4-G *Polypedilum scalaenum* (Schrank), pupa

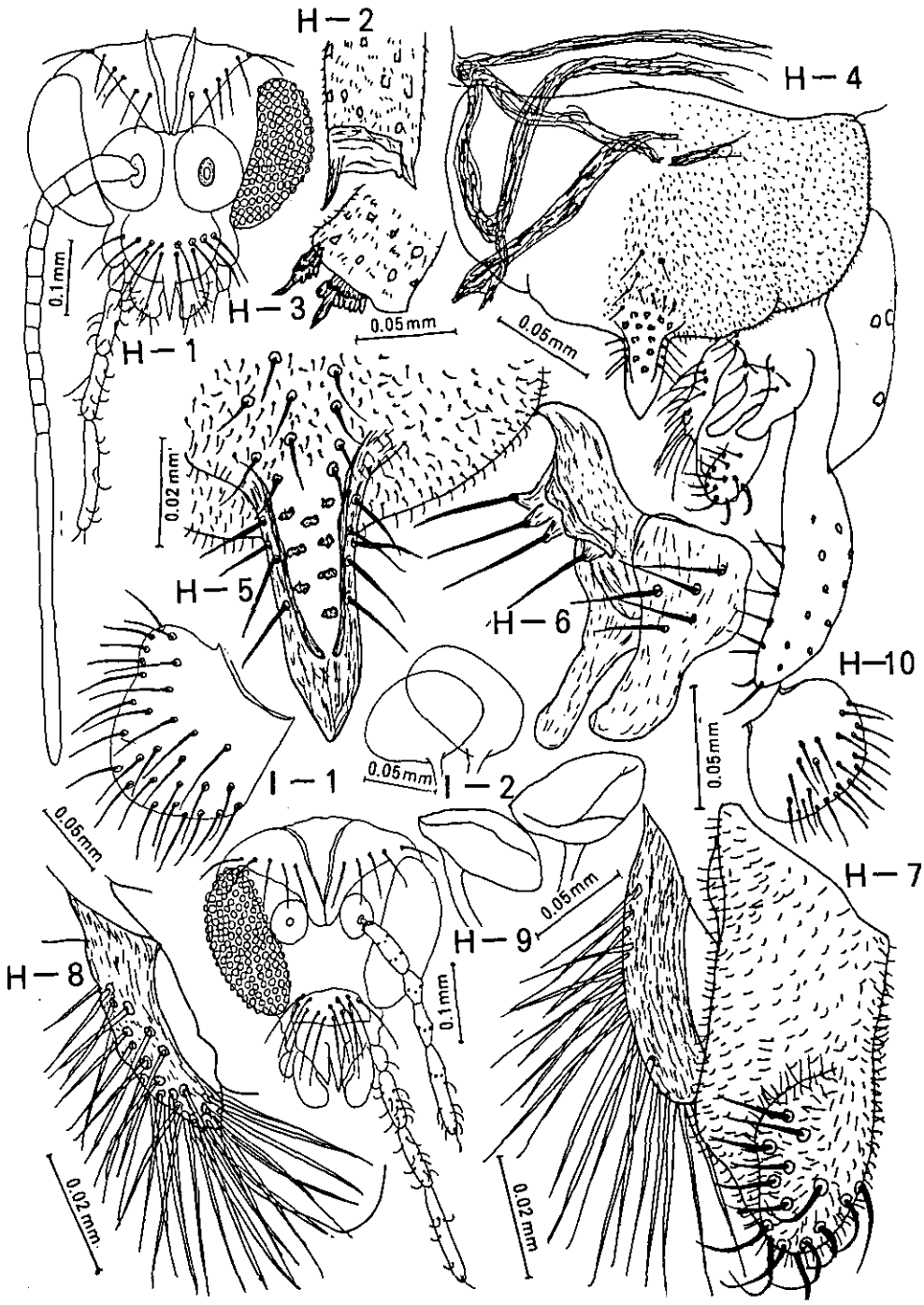

Fig. 5-H *Tanytarsus* **sp. "utonai"**, male and female
-I ***Polypedilum arundinetum*** **(Goetghebuer)**, female

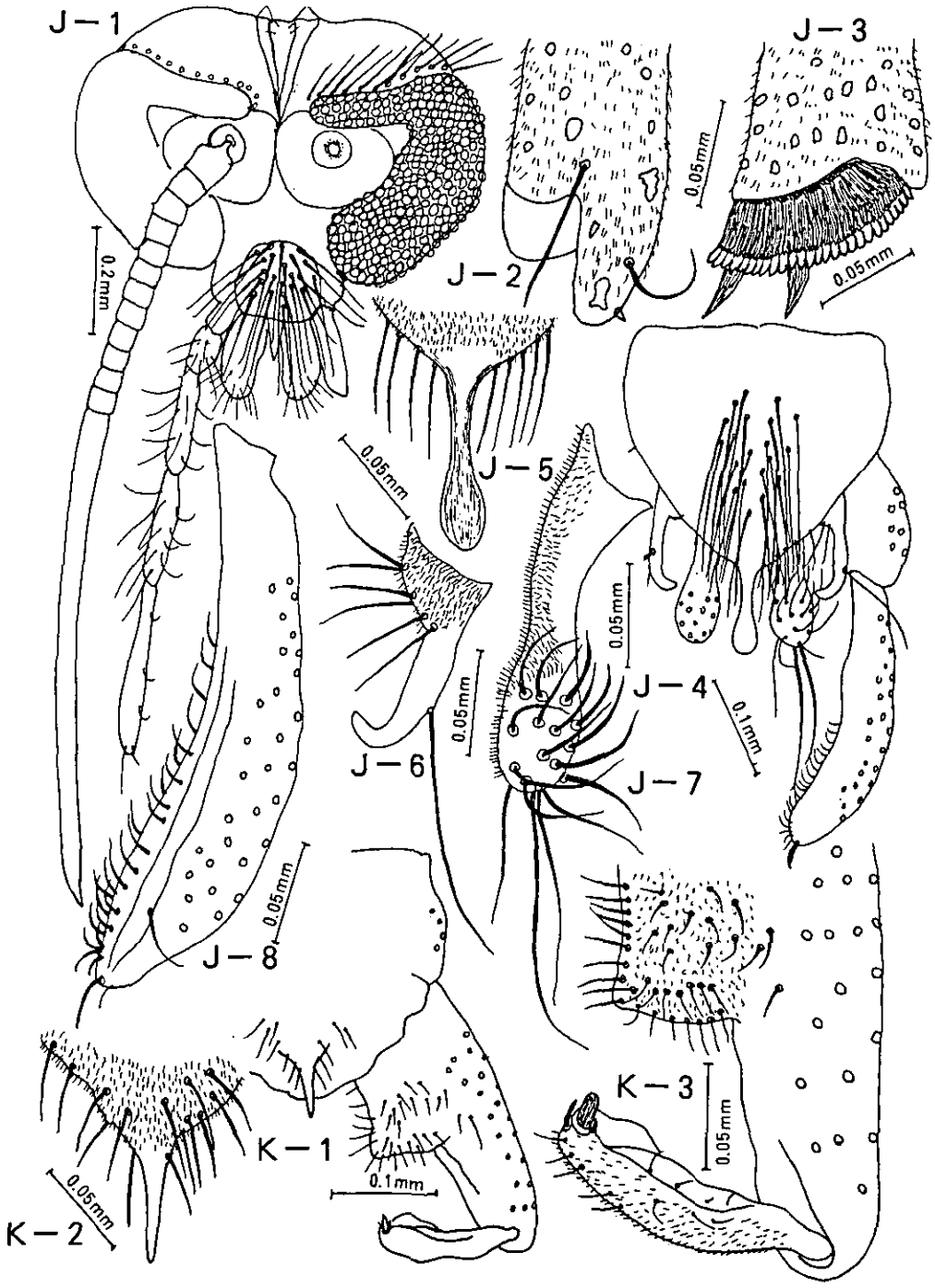

Fig. 6-J ***Phaenopsectra punctipes*** **(Wiedemann),** male
-K ***Psectrocladius yunoquartus*** **Sasa,** male

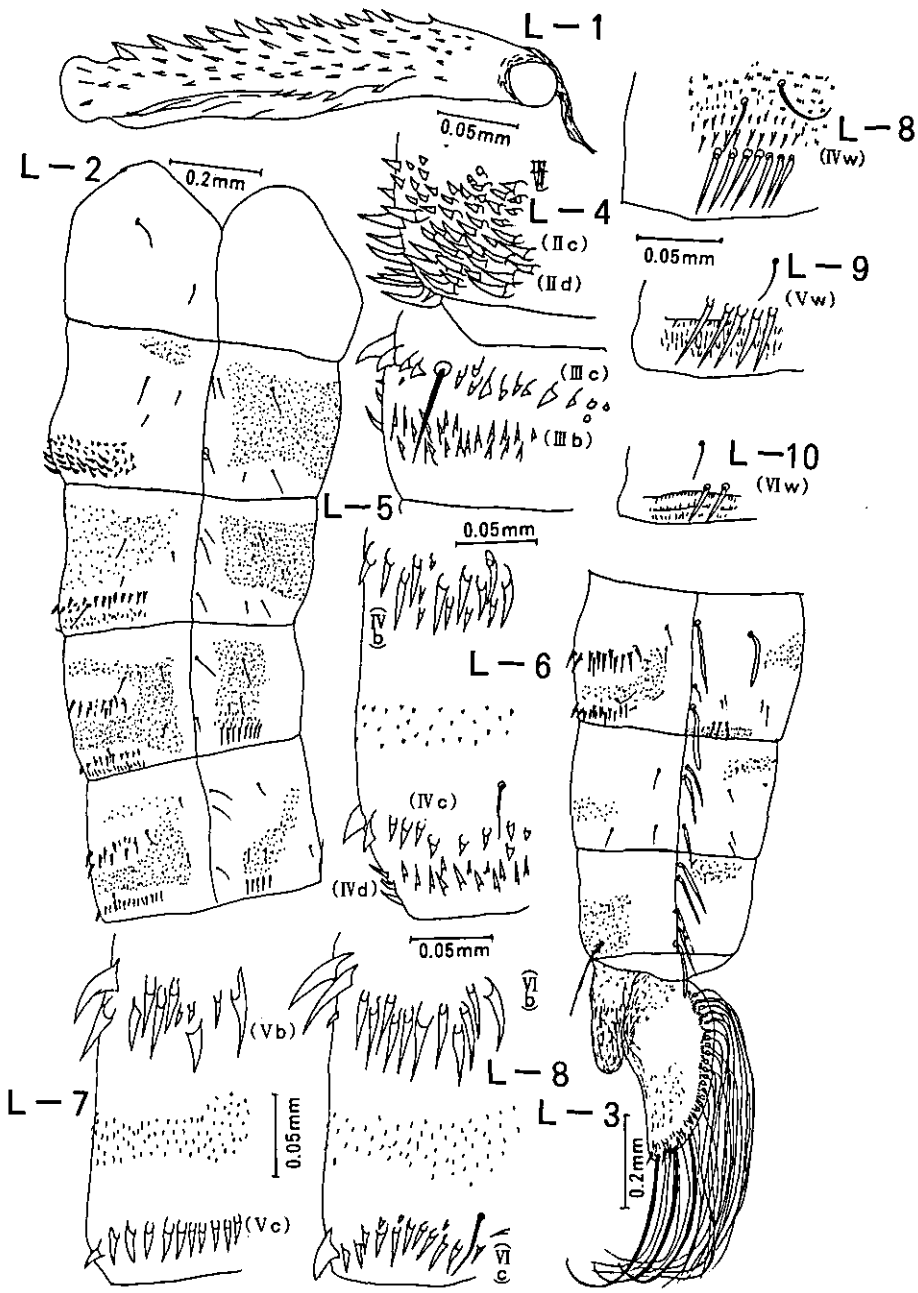

Fig. 7-L *Psectrocladius yunoquartus* Sasa, pupa

北海道の札幌付近で冬に採集した ユスリカ類について

佐々　学[1)]

北海道のユスリカについては，わずかに徳永（1938）が原岸海岸で *Clunio aquilonius* を採集記載した報告，徳永（1940）が *Smittia aterrima* を北見で採集した報告，及び伊藤（1975）が札幌で採集した *Chironomus dorsalis* と *Chironomus yoshimatsui* の幼虫の形態について検討した報告があるにすぎない。

我々は1981年12月2日に，(1) 頓田の下水溝，と(2) 手稲川，3日に(3) ウトナイ湖の底泥を採取し，研究室にもちかえって水槽に移し，成虫を羽化させたところ，(1) からは *Chironomus yoshimatsui*，(2) からは前種のほかさらに *Polypedilum tamanigrum*, *Cricotopus* sp.，(3) からは *Chironomus nipponesis*, *Polypedilum nubeculosum*, *Polypedilum arundinetum*, *Polypedilum scalaenum*, *Tanytarsus* sp., *Phaenopsectra punctipes*, *Psectrocladius yunoquartus*, *Ablabesmyia* sp.の8種が羽化した。このうち，*P. arundinetum*, *P. scalaenum* の両種は日本未記録である。

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Studies on the Chironomids Collected from Lakes in Southern Kyushu (Diptera, Chironomidae)*

Manabu SASA[1)]

SUMMARY

Surveys were made twice in 1981 on the distribution of the chironomid midges of 5 lakes located in Kagoshima and Miyazaki Prefectures, southern Kyushu. The present paper deals mainly with the morphological descriptions of the adult and pupa (when available) of previously undescribed or poorly known species. A total of 34 species belonging to the subfamilies Chironominae and Orthocladiinae were recorded, among which 6 are described as new species, and additional 3 as new to Japan. It was noted that some of these species were in common with the chironomid species recorded from the lakes in Nikko by Sasa (1984), and also with those found in the rather polluted parts of the River Tama recorded by Sasa (1980, 1981, 1983).

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Table 1 **Scientific names, collection sites, stages collected and examined, figure number and page number of the chironomid species collected in southern Kyushu, February and November 1981**

	Species	Distribution	Stages described	Figures No.	Page
#1.	*Chironomus acerbiphilus* Tokunaga	Iwodani	M F P L	1, 2, 3	28
#2.	*Chironomus yoshimatsui* M. & S.	Ikeda			30
#3.	*Chironomus samoensis* (Edwards)	Unagi			30
#4.	*Chironomus nipponensis* (Tokunaga)	Unagi, Kagami			30
#5.	*Chironomus dissidens* (Walker)	Ikeda	M F P L	4, 5	30
#6.	*Glyptotendipes tokunagai* Sasa	Ikeda, Unagi			32
#7.	*Dicrotendipes niveicaudus* (Kieffer)	Ikeda			33
#8.	*Dicrotendipes flexus* (Johannsen)	Unagi	M F	6	33
#9.	*Stenochironomus membranifer* Yamamoto	Unagi	M	7	34
#10.	*Harnischia viridula* (Linnaeus)	Ikeda	M F P	8, 9	35
#11.	*Paracladopelma camptolabis* (Kieffer)	Miike	M	10	37
#12.	*Stictochironomus akizukii* (Tokunaga)	Miike	M F	11	38
#13.	*Pentapedilum sordens* (v.d. Wulp)	Unagi	M	12	39
#14.	*Pentapedilum* sp.	Unagi	M	13	40
#15.	*Polypedilum unagiquartum* n.sp.	Unagi	M	13	41
#16.	*Polypedilum nubeculosum* (Meigen)	Unagi			42
#17.	*Polypedilum cultellatum* Goetghebuer	Unagi	M P	14, 15	42
#18.	*Polypedilum masudai* (Tokunaga)	Ikeda	M F	16	44
#19.	*Nilothauma brayi* (Goetghebuer)	Unagi	M	17	45
#20.	*Tanytarsus unagisextus* n.sp.	Unagi, Ikeda, Miike	M F P	17, 18, 22	46

	Species	Distribution	Stages described	Figure No.	Page
#21.	*Tanytarsus unagiseptimus* n.sp.	Unagi	M F P	19, 20	47
#22.	*Tanytarsus tamagotoi* Sasa	Unagi, Ikeda	M P	21, 22	49
#23.	*Tanytarsus oyamai* Sasa	Unagi	M F	22	51
#24.	*Tanytarsus tamanonus* Sasa	Ikeda	M	22	51
#25.	*Micropsectra miikesecunda* n.sp.	Miike	M F	23	52
#26.	*Orthocladius glabripennis* complex	Unagi, Ikeda	M F P	24, 25	53
#27.	*Psectrocladius yunoquartus* Sasa	Unagi	M F P		57
#28.	*Cricotopus sylvestris* (Fabricius)	Unagi	M F P		57
#29.	*Cricotopus bicinctus* (Meigen)	Ikeda	M		58
#30.	*Paratrichocladius rufiventris* (Meigen)	Ikeda	M F		58
#31.	*Limnophyes tamakitanaides* Sasa	Unagi, Fudo	M F	26	58
#32.	*Smittia aterrima* (Meigen)	Unagi, Ikeda, Unagi	M F	26	59
#33.	*Parakiefferiella bathophila* (Kieffer)	Unagi	M F P	27, 28	60
#34.	*Tsudayusurika fudosecunda* n.g., n.sp.	Fudo	M F	29	62

Note: M: male, F: female, P: pupa, L: larva

INTRODUCTION

Collections of the chironomid midges were carried out by members of NIES on two occasions in 1981, in the two prefectures in southern Kyushu, Japan. Bottom sediments were collected with an Ekman-Birge grab on 6 February, altogether 8 samples from Lake Unagi, 6 samples from Lake Ikeda, and a sample from Lake Kagami. They were carried to the laboratory of NIES, and adult midges were reared by method same as described in the previous reports by Sasa (1980, 1984). The second collection was made on 16, 17 and 18 November at 4 lakes in Kagoshima and Miyazaki Prefectures, Unagi, Ikeda, Miike and Fudo; adult midges were collected with insect nets on the shore of these lakes, and bottom sediments containing larvae were collected also with Ekman-Birge grab. The adults and larvae of a chironomid species breeding in a sulphur containing stream 'Iwodani' in the Kirishima Volcano were also collected on this occasion.

As the results, a total of 34 species belonging to the subfamilies Chironominae and Orthocladiinae were identified among the specimens collected, which included one new genus, 6 new species and other 3 species new to Japan. Morphological accounts are made on these newly recorded species or previously poorly known forms or stages among the collections.

COLLECTION RECORDS AND DESCRIPTION

#1. *Chironomus (Chironomus) acerbiphilus* Tokunaga, 1939 (Figs. 1,2,3)

Chironomus (Chironomus) acerbiphilus; Tokunaga, 1939, p.336
Chironomus acerbiphilus; Fujimatsu, 1938, p.131
Chironomus acerbiphilus; Sasa, 1978, p.10

Collection records: Large numbers of males and females were collected with insect net on the bank of a sulphur containing stream (pH 3.2) in the valley of Iwodani, Kirishima Volcano, Miyazaki Prefecture, 17 Nov. 1981. Large numbers of larvae and pupal exuviae were collected also from bottom of the stream on the same day, and also by Mr. Y. Sugaya on 2 Jan. 1984. 7 males, 7 females, 5 pupal exuviae and 5 larvae among them were dissected and mounted for morphological study (Specimen Nos. 77:1–13).

Male: Body length 4.95–5.61 mm (5.14 mm in average of 7), wing length 2.47–2.68 mm (2.56 mm). Body largely dark brown; antennal shaft dark brown, hairs brown; ground color of scutum pruinose, scutal stripes almost black, scutellum black and slightly pruinose, postnotum black; wing unmarked, r-m dark brown, wing membrane purplish under transmitted light; leg segments almost uniformly dark brown; abdominal tergites largely dark brown, tergites II to V each with a conspicuous white or pruinose band along posterior margin.

Head in Fig. 1-A. Eyes with a long dorsomedial projection, ER 0.26–0.31 (0.29).

Frontal tubercles rather small, 18 microns long and 10 microns wide, 52 microns apart from each other (from center to center; Fig. 1-C). Antenna with 11 flagellar segments, AR 2.43–3.13 (2.65); antennal hairs long, AHR 0.51–0.58 (0.53). Supraorbital setae 20–30 (25.0) on each side, clypeal setae 28–38 (34.2). Antepronotum without lateral setae. Scutum with 4–7 (5.9) dorsomedian setae, 14–21 (17.2) dorsolateral setae, and 5–8 (6.1) pre-alar setae on each side; scutellum with 22–31 (25.8) setae roughly in double rows, as in Fig. 1-E. Squama with 15–19 fringe hairs. Wing vein R2+3 separated from both R1 and R4+5, ending about midway between ends of the two veins. fCu much beyond r-m, situated at 48% and 43% of wing length, respectively. LR1 1.36–1.43 (1.39), LR2 0.50–0.53 (0.51), LR3 0.63–0.68 (0.65). Terminal scale of front tibia short and with rounded apex (Fig. 1-F). Terminal combs of middle and hind tibiae low, almost confluent, surrounding more than 2/3 of the tip of tibia, and with two (occasionally one in the hind tibia) short spurs (Figs. 1-G, H). Tarsal hairs relatively short, BR1 1.5–2.7 (2.0), BR2 1.9–2.2 (2.0), BR3 2.1–2.8 (2.4). Tarsus V of front leg 0.25–0.26 times as long as front tibia. Pulvilli large, about half as long as claws.

Hypopygium in Fig. 1-I. Anal point narrow, constricted at base and with rounded apex. Ninth tergite with 2–4 setae in the middle, and with reticular marks. Dorsal appendage in a form of boots (S-type of Strenzke, 1959; Fig. 1-J), apically broadened and curved inwards. Ventral appendage almost parallel-sided, with some 20 long and recurved setae (Fig. 1-I). Gonostylus abruptly constricted near apex.

Female: Body coloration as in male, almost entirely black, with narrow white bands along posterior margin of abdominal tergites. Head in Fig. 1-B. Frontal tubercles in Fig. 1-D. Spermathecae in Fig. 1-K, cercus in Fig. 1-L.

Pupa: Morphological characters same as previously described by Sasa (1978, p.19) with specimens from the type locality. Distribution of spines and hairs on abdominal tergites in Figs. 2-A, B. Enlarged views of spines in Fig. 2-C. Caudolateral scales of abdominal segment VIII in Figs. 2-D, E.

Larva: The structure of various organs in Fig. 3. Most characteristic to this species is the presence of a pair of short lateral processes of abdominal segment VIII (Fig. 3-J), same as seen in larvae of the type locality.

Remarks: The present specimens are tentatively identified as *Ch. acerbiphilus* Tokunaga, although the body coloration is slightly different (entirely black in specimens of the type locality, with white caudal bands on tergites II to V in the present specimens), and frontal tubercles are smaller in the present specimens. The male is characteristic in the shape of dorsal appendages, being boot-shaped (S-form of Strenzke, 1959). The type locality of this species is Lake Katanuma, Miyagi Prefecture, which contains an acidic water with pH value of as low as 1.4. The standard measurement data of 7 males collected by us from the type locality are as follows:

Body length 5.05–6.61 mm (5.72 mm in average), wing length 2.72–3.38 mm (3.02 mm), AR 2.75–3.04 (2.91), AHR 0.55–0.61 (0.58), ER 0.24–0.31 (0.28), so 20–26 (23.7), cl 26–29 (27.5), pn 0, dm 10–12 (10.5), dl 14–17 (15.2), pa 5–7 (6.0), sc 18–27 (21.8), sq 14–17 (14.8), LR1 1.26–1.35 (1.29), LR2 0.50–0.55 (0.53), LR3 0.63–0.67 (0.65), TR1 0.22–0.24 (0.23), BR1 2.1–2.6 (2.3), BR2 2.0–3.4 (2.6), BR3 2.8–3.2 (3.0).

Standard measurement data of the present specimens are all within the variation ranges of those of the type locality specimens.

Tokunaga (1940, p.291) recorded *Ch. thumini* Kieffer (presumably a misprint of *thummi*) from a hotspring at Jigoku-Onsen, Kumamoto Prefecture, probably at a similar

environment as the present collection. Body coloration and structure of hypopygium of the present specimens are quite similar to the description of *thumini* of Tokunaga, but *Ch. thummi* is a synonym of *Ch. riparius* Meigen according to Martin et Sublette (1972). However, *Ch. riparius* in Europe is a pale yellow midge and entirely different in body coloration from the present specimens. Tokunaga (1938, p.323) also recorded *Ch. lugubris* Zetterstedt from a hotspring in Unzen, Nagasaki Prefecture, but the present specimens apparently differ from it in the shape of dorsal appendages.

2. *Chironomus (Chironomus) yoshimatsui* Martin et Sublette, 1972

2 males were found among the adult chironomids collected with insect net on the shore of Lake Ikeda, 16 Nov. 1981 (Nos. A 77:18, 19).

3. *Chironomus (Chironomus) samoensis* Edwards, 1928

A male and 2 females emerged from a bottom sample collected from littoral zone of Lake Unagi, 6 Feb. 1981 (Nos. A 77:14–17).

4. *Chironomus (Chironomus) nipponensis* Tokunaga, 1940

A male emerged from a bottom sample E-05 collected from littoral zone of Lake Unagi, 6 Feb. 1981. A male was found among the adult chironomids collected with insect net on the shore of the same lake 17 Nov. 1981. A male emerged from a sample collected from Lake Kagami, 6 Feb. 1981 (Nos. A 77:21–23).

5. *Chironomus (Einfeldia) dissidens* Walker, 1851 (Figs. 4,5)

Chironomus dissidens; Walker, 1851 p. 154
Chironomus dystenus; Kieffer, 1916, p. 112
Chironomus dissidens; Edwards, 1929, p.385
Chironomus dystenus; Tokunaga, 1940, p.293
Chironomus dissidens; Hashimoto, 1977, p.84
Chironomus dissidens; Sasa & Hasegawa, 1983, p.318

Collection records: A male was collected by sweeping bushes with insect net on the shore of Lake Ikeda, 16 Nov. 1981. 2 males and a female emerged from a sample collected at 10 m depth of the same lake, 6 Feb. 1981. A pupal and a larval skin associated with a male was also recovered (Nos. A 77:31–33).

Male: Body coloration, structure of various organs and standard measurement data almost the same as those reported by Sasa & Hasegawa (1983) by the name of *Chironomus dissidens* Walker with specimens collected on Okinawa Island. Body length 4.64–5.26 mm (4.83 in average of 3), wing length 2.33–2.53 mm (2.40 mm). AR 2.60–2.68 (2.64), AHR 0.52–0.55 (0.54). ER 0.22–0.26 (0.24), so 22–28 (25.7), cl 16–18 (17.3). Frontal tubercles prominent, 48 microns long, 18 microns wide, and 30 microns

apart from each other (from center to center, Fig. 4-A). Lateral pronotals absent, scutum without dorsomedians, dorsolaterals 12–18 (15.3), pre-alars 4–7 (5.0). Scutellar setae 13–19 (15.8) in two rows. Squama with 13–19 (15.8) fringe hairs. Vein R2+3 separated from R1 and R4+5, ending closer to end of R1. r-m at 45%, fCu at 48% of wing length. Terminal scale of front tibia with rounded margin and bears 4 long subterminal setae (Fig. 4-D). Terminal combs of middle and hind tibiae contiguous, both with a short spur (Fig. 4-E). LR1 1.84–1.86 (1.85), LR2 0.54–0.58 (0.56), LR3 0.71–0.75 (0.73). Tarsal hairs relatively short, BR1 2.1, BR2 1.9–4.0 (3.1), BR3 3.2–4.1 (3.8). Tarsus V of front leg 0.29 times as long as front tibia.

Hypopygium in Fig. 4-G. Dorsal appendage composed of a high setigerous basal portion, and a bare, hook-like apical process (the *Einfeldia*-type; Fig. 4-H). Ventral appendage expanded apically, bearing short recurved setae (Fig. 4-I).

Female: Body length 4.50 mm, wing length 2.75 mm. Coloration as in male, entirely brown or dark brown, *i.e.* ground color of scutum brown, scutal stripes dark brown, scutellum brown, postnotum dark brown; wing unmarked but r-m dark brown; femora and tibiae of all legs entirely yellowish brown, proximal 3/4 of front tarsus I yellowish brown, the rest parts of front tarsal segments dark brown; in the middle and hind tarsi, proximal 2/3 of tarsi I and proximal half of tarsi II brown, the rest parts of tarsal segments dark brown; abdominal tergites almost uniformly dark brown.

Frontal tubercles prominent, nearly conical, wider and shorter than those of male, 40 microns long, 32 microns in diameter and the distance between the centers 50 microns (Fig. 4-B) so 18, 18; cl 16. ER small, 0.18. Antepronotum without lateral setae. Scutum without dorsomedian setae as in male, dorsolateral setae 14, 15, pre-alar setae 5 on both sides, scutellar setae 18 in two transverse rows. Squama with 21 or 19 fringe setae. R2+3 separated from R1 and R4+5, ending closer to end of the former than to end of the latter. fCu slightly beyond r-m, 44% and 46% level of wing length, respectively. Anal vein extending much beyond fCu. Terminal scale of front tibia with rounded margin and 4 subterminal setae as in male. Terminal combs of middle and hind tibiae confluent and with two short spurs. LR1 1.81, LR2 0.55, LR3 0.69. Tarsal hairs short, BR1 1.3, BR2 2.0, BR3 3.2. Front tarsus V 0.24. Pulvilli large and somewhat fan-shaped (Fig. 4-F). Cercus nearly square though the corners being rounded, 62 microns long and 60 microns wide (Fig. 4-J).

Pupa: Length of abdomen 4.90 mm. Thoracic respiratory organs divided into numerous branches (the *Chironomus* type). Pupal skin almost colorless in general, only slightly brown in parts. Distribution of spines, spinules and hairs on abdominal tergites in Figs. 5-A, B. Abdominal segment I with two pairs of spinose areas bearing very small spines on tergite (I-a-l, I-a-m), and an uniserial band of long, narrow and sharply pointed spines along caudal margin of sternite (I-v). Tergites II to VI each with 4 spine groups, -a forming a transverse band of small spines along oral margin, -b usually forming a butterfly-shaped spine patch in the middle, -c forming a pair of spine patches near caudal margin, and -d a band of recurved spines on intersegmental membrane. These 4 groups of spine patches are all separated from each other in the present species, though the numbers of spines and the shape of patches differ considerably by the segments. The recurved spines on the caudal margin of segment II (II-d) are uniserial, 82 in number, and from 18 to 32 microns in length, while those on III to V are much smaller and arranged in multiple rows, those on VI are extremely small spinules. Tergites VII and VIII with a pair of spinulous areas (VII-a, VIII-a). Sternites IV to VII with a pair of spinose areas in caudolateral corners (IV-w to VII-w). Sternite VIII with a peculiar conical process in the

middle near caudal margin (Fig. 5-C). Abdominal segments II to IV with 3 pairs of short and simple lateral hairs, V to VII with 4 pairs, and VIII with 5 pairs of long, flat and filamentous lateral hairs. Segment VIII without caudolateral scales (an unusual character as a member of *Chironomus*). Anal fins each with 2 long and filamentous dorsal hairs, and 78 or 92 fringe hairs (Fig. 5-D).

Larva: (description based on a larval skin associated with the pupa). Head capsule 416 microns long and 418 microns wide. Labial plate 144 microns wide, with 13 teeth, the central tooth widest and highest, 27 microns in width; the first, second and the third pairs subequal in width, but the fourth pair narrower and shorter than the neighboring pairs (Fig. 4-N). Paralabial plates fan-shaped, 138 microns wide and 70 microns high (Fig. 4-N). Antenna (Fig. 4-L) 4 segmented, length of segments I to IV 60, 28, 6 and 16 microns; segment I with a ring organ at about middle of the height, antennal blade on base of segment II only 1/3 the length of the segment, Lauterborn's organ at the base of segment III also minute. Mandible (Fig. 4-L) 142 microns long and 70 microns wide, with a comb near the tip, and mandibular brush near base. Labrum, epipharynx and premandible in Fig. 4-K. Bases of preanal hair tuft (Fig. 4-Q) not pigmented, low and flat, with two long and slender hairs. Preanal hair tuft 7 on each side. Claws on anterior pseudopods in Fig. 4-P, those on posterior pseudopods in Fig. 4-R.

Remarks: This species was recorded by Hashimoto (1977) as being common in lakes and ponds surrounded by forest in mountaneous areas of Japan. The author collected adults on the shore of eutrophicated ponds and lakes in Kanto region. It was recorded also by Sasa & Hasegawa (1983) from highly eutrophicated eel culture ponds in Okinawa. Dorsal appendages of male hypopygium are the *Einfeldia* type, but to treat it as a genus independent from *Chironomus* was reserved since the structure of dorsal appendages are somewhat related to those of *Chironomus kiiensis* Tokunaga. However, the absence of dorsomedian setae of scutum is also a distinguishing character from other *Chironomus* in wider sense. On the other hand, the structure of pupa and larva is essentially different from those of *Ch. kiiensis* and other species of this genus from Japan. In the pupa, the present species has a conspicuous row of long and narrow spines on sternite I (this is absent in *Chironomus*), and devoid of caudolateral scales on abdominal segment VIII, which are present in all the known species of genus *Chironomus* of Japan. In the larva, most characteristic is the structure of labial plate, which has 13 teeth, and the first lateral pair next to the central tooth are higher and almost as wide as the second and the third pairs of teeth (the first pair of teeth are lower and narrower than the second and the third pair in other *Chironomus* larvae).

6. *Glyptotendipes tokunagai* Sasa, 1979

Glyptotendipes tokunagai; Sasa, 1979, p. 8

Collection records: 3 males emerged from a bottom sample collected in Lake Unagi on 6 February 1981. A male emerged from a sample collected on the same day in Lake Kagamiike. (Nos. A 77:27–30).

#7. *Dicrotendipes niveicaudus* (Kieffer, 1921)

Dicrotendipes niveicaudus; Sasa & Hasegawa, 1983, p. 321

Collection record: A male was collected with insect net on the bank of Lake Ikeda, 16 Nov. 1981 (No. A 77:74).

#8. *Dicrotendipes flexus* (Johannsen, 1932) (Fig. 6)

Chironomus (Limnochironomus) flexus; Johannsen, 1932, p.530

Collection records: A male emerged on 17 March from a bottom sediment collected 6 February 1981 in a littoral zone of Lake Unagi (No. 77:72). A female emerged 24 March from the same sample (No. A 77:73).

Male: Body length 3.90 mm, wing length 2.10 mm. Antennal shaft dark brown, hairs brown, ground color of scutum greenish yellow, scutal stripes reddish brown, scutellum yellow, postnotum dark brown, abdominal tergites green; in the front leg, femur largely yellow and darkend apically, tibia and tarsi entirely dark brown; in the middle and hind legs, femora, tibiae and tarsi I yellow, tarsi II to V brown; wing unmarked, r-m area not darkened; halteres yellow.

Eyes bare, with a long and narrow dorsomedial projection, ER 0.26. Frontal tubercles small, 14 microns long, 8 microns in diameter and 35 microns apart from each other (Fig. 6-B). Supraorbital setae 16 and 20, clypeal setae 15. Antenna with 11 flagellar segments, AR 2.19. Antennal hairs long, AHR 0.53. Antepronotum without lateral setae. Scutum with 10 dorsomedian setae, 12 and 14 dorsolateral setae, and 5 and 6 supra-alar setae; scutellum with 15 setae in a single row (Fig. 6-E). Wing in Fig. 6-A. Squama with 9 or 6 fringe hairs. Anal lobe rather flat. R2+3 separated from R1 and R4+5, ending much closer to end of the former than to end of the latter. fCu slightly beyond r-m. Leg coloration peculiar to this species, as stated before, front tibia, all front tarsi, and tarsi II to V of middle and hind legs dark brown, the proximal segments yellow. Terminal scale of front tibia with rounded margin and bears two long terminal setae (Fig. 6-F). Terminal combs of middle and hind tibiae flat and wide, both with a short spur (Figs. 6-G, H). All legs with a pair of large pulvilli, claws, and an empodium.

Hypopygium in Figs. 6-I, J. Ninth tergite without long setae in the middle, and with a group of short setae at base of anal point. Anal point 35 microns long and 16 microns wide, nearly parallel-sided. Dorsal appendage long, slender and apically expanded to a knob, almost entirely covered with microtrichiae, and with three short setae directed inwards near apex (Fig. 6-K). Ventral appendage extremely long, slender and curved, apically expended, and with 8 stout recurved setae on dorsal side, a stout and curved terminal seta and 4 short simple setae on the ventral side of the apical knob (Fig. 6-L). Gonostylus long, slender and with concave inner margin.

Female: Body length 3.10 mm, wing length 2.24 mm. Coloration as in male; ground color of scutum yellow, scutal stripes reddish brown, scutellum yellow, postnotum dark brown; abdominal tergites yellowish green; halteres yellow; leg coloration as in male, front femur largely yellow and brown apically, front tibia and tarsi all dark brown; middle and hind femora, and tibiae yellow, tarsi I yellow basally and gradually darkened in apical half, tarsi II to V dark brown. Eyes with a long dorsomedial projection,

ER 0.16. Supraorbital setae 15 on each side, clypeal setae 17. Frontal tubercles small, 10 microns high and 8 microns in diameter, 49 microns apart from each other (Fig. 6-C). Antepronotum without setae. Scutum with 13 dorsomedian setae, 15 dorsolateral setae (including 2 on the prescutellar plate), and 4 pre-alar setae on each side. Scutellum with 14 setae in a transverse row. LR1 1.97, LR2 0.59, LR3 0.64. BR1 2.1, BR2 2.7, BR3 3.3. Front tarsus V 0.28 times the length of front tibia. Spermathecae in Fig. 6-M, Cercus in Fig. 6-N.

Remarks: Among the known species of this group of Chironomini, the present specimens are closest in body coloration and structure to *Chironomus* (*Limnochironomus*) *flexus* Johannsen, 1932, which was described based on a male reared from a larva taken in River Ranau, South Sumatra. It is a yellow species with fulvous mesonotal vittae and brown foretibiae. Fore tarsi broken off, and thus the color and LR1 unknown. 12th antennal segment slightly over twice as long as 2–11 combined, and thus about the same as 2.19 of the present specimen. The structure of male hypopygium drawn by the original author is also similar to that of the present specimen. In the type specimen, it is stated "no frontal tubercles", which is regarded here as being overlooked. Among the species of this genus known from Europe, it is closest to *D. nervosus* (Staeger) but clearly different in body coloration (entirely green in *nervosus* according to Pinder, 1978), and also from *D. pulsus* (Walker) in which scutal stripes are black and otherwise green (Pinder, 1978). Among the species of this genus recorded from Japan, it is closest to *D.* sp. # 12 (Yaeyamayusurika) of Sasa & Hasegawa (1983), but anal point, dorsal and ventral appendages as well as gonostylus are much more slender in the present species and the numbers of setae on the ventral side of ventral appendages are only 4 in the present species while they are more than 10 in Yaeyamayusurika, as shown in Fig. 2-G-5 of Sasa & Hasegawa (1983).

9. *Stenochironomus membranifer* Yamamoto, 1981 (Fig. 7)

Stenochironomus membranifer; Yamamoto, 1981, p.47

Collection records: 2 males emerged from a bottom sample collected 6 Feb. 1981 from littoral zone of Lake Unagi; both dissected and mounted on slides after body coloration was recorded (Nos. A 77:81, 82).

Male: Body length 4.55, 4.66 mm, wing length 2.48, 2.52 mm. Body coloration characteristic to this species, *i.e.* antennal hairs yellowish brown, shaft yellow; ground color of scutum pale yellow, median stripes pale yellow and hardly discernible, lateral stripes forming a pair of oval black patches (Fig. 7-C), scutellum pale yellow, postnotum also with a pair of oval black patches on pale yellow ground color; abdominal tergites I to V pale yellow, VI largely yellow and brown apically, VII black, VIII and hypopygium brown; halteres pale yellow, wing unmarked and colorless; in the front leg, proximal half of femur yellow and the rest parts of leg segments dark brown; middle and hind leg segments entirely yellow.

Head in Fig. 7-A. Frontal tubercles absent. Eyes with a long dorsomedial projection, ER 0.31, 0.35. Antenna with 13 flagellar segments, AR 2.30, 2.36. Antennal hairs well developed, AHR 0.51, 0.55. Supraorbital setae 12, 12 in one and 14, 14 in another specimen, clypeal setae 20, 22. Antepronotum without setae. Scutum with 20 or 22 dorsomedian setae, 15, 19 and 13, 14 dorsolateral setae, and 6 pre-alar setae on both

sides of the two specimens. Scutellum with 20 or 22 setae in two transverse rows. Squama with 14–21 fringe hairs. Wing venation in Fig. 7-B. Wing membrane bare and without dark marks. R2+3 separated from R1 and R4+5, running closer to the latter in the proximal 2/3, but ending close to end of the former. fCu only slightly beyond r-m. Anal vein extending beyond fCu. Terminal scale of front tibia relatively long and with rounded margin. Front tibia bears 4 subapical setae. Terminal combs of middle and hind tibiae contiguous and both with a short spur. LR1 relatively small, 1.16, 1.21; LR2 0.68, 0.69, LR3 0.80, 0.81. Tarsi with relatively long beards, BR1 3.1, 4.0, BR2 4.3, 5.3, BR3 6.3, 6.5. Front tarsus V relatively short, 0.21, 0.22 times the length of front tibia. Pulvilli well developed.

Hypopygium in Fig. 7-G. Ninth tergite with rounded posterior margin, and with 26 or 28 long setae in the middle and with 8 or 10 short, stout setae on posterior margin on both sides of anal point. Anal point (Fig. 7-H) long, slender, slightly expanded near apex, and dark brown in color excepting the apically expanded portion which is paler. Ventral appendages extremely long, slender and slightly curved, with a large apical spine and 4 long simple setae in the apical portion, microtrichiae are present only in the basal portion and on the convex side (Fig. 7-J). Dorsal appendages short, broad and with 5 long setae (Fig. 7-I). Gonostylus long, slender and with rounded apex, bears two long hairs on inner margin near apex (Fig. 7-G).

Remarks: This species belongs to the genus *Stenochironomus* Kieffer of the tribe Chironomini, since both combs of hind tibiae with a short spur, all legs with large pulvilli, antepronotum reduced and not reaching to front edge of scutum, and ventral appendage very long and with a terminal spine. In Japan, Tokunaga & Kuroda (1935, 1936) recorded 3 species of this genus, and Yamamoto (1981) described another two new species. The present specimens are considered as to belong to the same species as *S. membranifer* of Yamamoto (1981) in that wings have no dark marks, and in the peculiar body coloration and the structure of hypopygium.

10. *Harnischia (Cryptocladopelma) viridula* (Linnaeus, 1767) (Figs. 8,9)

Tipula viridula; Linnaeus, 1767
Chironomus (Chironomus) viridulus; Edwards, 1929, p.390
Chironomus (Cryptochironomus) viridulus; Goetghebuer, 1937, p.49
Harnischia (Harnischia) viridulus; Townes, 1945, p.168
Harnischia viridula; Sasa et Hasegawa, 1983, p.324

Collection records: A large number of adults were collected with insect net at 5 collection sites on the shore of Lake Ikeda, on 16 Nov. 1981. 92 males and 11 females were identified, among which 15 males and 3 females were dissected and mounted for morphological study (Nos. A 77:51–65). 2 males, 1 female and 3 pupal skins were recovered from bottom mud of the same lake collected 6 Feb. 1981, after laboratory rearing at NIES (Nos. A 77:66–68).

Male: Standard measurements were made with 8 males collected on 16 Nov., and 2 males on 6 Feb., 1981. Body length 3.21–3.55 mm (3.37 mm in average of 10), wing length 1.57–1.77 mm (1.68 mm). Body coloration characteristic to this species and as described by Sasa & Hasegawa (1983). Ground color of scutum yellow, scutal stripes reddish brown, scutellum yellow, postnotum dark brown, halteres yellow, wing un-

marked, abdominal tergites greenish yellow; front femur yellow, front tibia and tarsi dark brown, middle and hind femora yellow, tibiae and tarsi I to III brown, tarsi III and IV dark brown.

Frontal tubercles prominent, elongate oval, 18 microns high and 12 microns in diameter, 35 microns apart (Fig. 8-B). Antenna with 11 flagellar segments, AR 1.92–2.43 (2.10). Antennal hairs long, AHR 0.50–0.60 (0.54). ER 0.30–0.44 (0.40). Supra-orbital setae 8–13 (9.9). Clypeal hairs 11–15 (13.0). Antepronotum with only 1 lateral seta on each side in 9, with 2 lateral setae in one specimen. Number of dorsomedian scutal setae very variable, from 1 to 11 (5.4 in average, 1 in one, 3 in two, 5 in two, 6 in three, 8 in one, 11 in one specimen). Dorsolateral setae 8–13 (9.3), pre-alar setae 3 or 4 (3.2) on each side. Scutum with 7–12 (10.0) setae. Squama with 6–11 (8.6) fringe hairs. Wing venation in Fig. 8-A. R2+3 separated from R1 and R4+5, ending closer to end of R1 than to end of R4+5. fCu much beyond r-m, at 50% and 44% level of wing length, respectively. Terminal scale of front tibia with rounded margin, and bears two long subapical setae (Fig. 8-D). Terminal combs of middle and hind tibiae are separated, and both with a short spur (Figs. 8-E, F). Front tarsus I relatively long, LR1 1.82–1.94 (1.88), LR2 0.49–0.54 (0.52), LR3 0.59–0.66 (0.63). Front tarsus V 0.26–0.29 (0.28) times as long as front tibia. Tarsal hairs relatively short, BR1 2.0–2.5 (2.3), BR2 2.3–3.7 (2.9), BR3 3.1–5.0 (3.9). Legs with a pair of large pulvilli.

Hypopygium in Figs. 8-H, I, J. Ninth tergite with truncate posterior margin, with 12–16 long setae on both sides of caudolateral portion but without setae in the middle. Anal point composed of a basal setigerous portion, and an apical hyaline portion. Dorsal appendages reduced into small, finger-like processes bearing numerous microtrichiae, and 1, 2 or 3 terminal or subterminal setae (of 17 specimens examined, 9 with 1 seta on both sides, 6 with 2 setae on both sides, and 2 with 2 setae on one and 3 setae on another; see Fig. 8-K). Gonostylus fused with gonocoxite, long, slender and with concave inner margin, and bearing a row of short setae along inner margin.

Female: Body length 2.17–2.34 mm (2.26 mm in average of 4), wing length 1.59–1.69 mm (1.64 mm). Body coloration as in male, characteristic to this species. Antenna with 5 flagellar segments, all relatively short, stout and without a long neck (Fig. 8-C). Frontal tubercles small and conical (Fig. 8-B). Terminal combs of middle and hind tibiae both with a short spur (Fig. 9-1). Spermatchecae elongate oval (Fig. 9-B). Cercus almost as wide as long, with angulate posterior margin (Fig. 9-C).

Pupa: Length of abdomen of 3 pupal exuviae 3.03, 3.33, 3.43 mm. Thoracic respiratory organs a *Chironomus* type, divided into numerous filaments. Distribution of spines, spinules and hairs on abdominal tergites in Figs. 9-D, E. Tergite I with a pair of lateral patches of small spines (I-a). Tergite II with a proximal transverse band of long, narrow and sharply pointed spines (II-a), a pair of lateral patches of small spines (II-b), an uniserial row of small spines (about 12 on each side) near caudal margin (II-c), and a row of large recurved spines on a pair of low posterior lobes, (II-d), 15 to 23 (19.5 in average) on each side. Tergites III, IV and V with small spines scattered sparsely, and a pair of spine groups near posterior margin (-d). Tergite VI also with scattered small spines in the middle, a lobe in the middle on the posterior margin bearings spines (VI-d), and a group of small spines on its both sides. Tergite VII with a group of small spines in the middle (VII-a). Caudolateral scales of segment VIII simple, narrow and curved spines (Fig. 9-H). Lateral hairs are 3 pairs on segments II to IV (among which the first 2 pairs are stout and rigid and the third pairs are simple), and 4 pairs on segments V to VIII, which are all long and filamentous. Sternite IV with a pair of small whirl-like spine groups in the

caudolateral corners (Fig. 9-G), but these are vestigial in sternites V and VI. Anal fins with 70–83 (76 in average) fringe hairs, but without dorsal hairs.

Remarks: This species was recorded recently by Sasa & Hasegawa (1983) from the bank of eel ponds on Ishigaki Island, southern Okinawa. The structure of pupa is a new record from Japan. This species was recorded as early as in 1767 by Linnaeus, and is known to be widely distributed in Europe, also recorded from the United States by Townes (1945), and from Thailand by Hashimoto *et al.* (1981). Pinder (1978) classified this species into genus *Cryptocladopelma* Lenz, but this is here treated as a subgenus of *Harnischia* Kieffer by taking the genus in wider sense.

11. *Paracladopelma camptolabis* (Kieffer, 1913) (Fig. 10)

Tendipes camptolabis; Kieffer, 1913, p.40
Chironomus (Chironomus) camptolabis; Edwards, 1929, p.387
Tendipes camptolabis; Goetghebuer, 1937, p.35
Paracladopelma camptolabis; Pinder, 1978, p.132
Paracladopelma camptolabis; Sasa, 1984, p.46

Collection records: 2 males, collected on the shore of Lake Miike, 18 Nov. 1981. Both dissected and mounted on slides (Nos. A 77:91, 92).

Male: Body length 3.51, 3.58 mm, wing length 1.96, 2.00 mm. Ground color of scutum yellow, scutal stripes reddish brown, scutellum yellow, postnotum dark brown; halteres yellow; wing unmarked, membrane bare and slightly purplish by transmitted light; femora largely yellow, slightly brownish in apical portion, tibiae brownish yellow, front tarsal segments brown, tarsi of middle and hind legs yellowish brown; abdominal tergites almost uniformly brownish yellow.

Head in Fig. 10-A. Frontal tubercles prominent, elongate oval, 18 microns long, 10 microns in diameter, and 28 microns apart from each other. Eyes with a long and narrow dorsomedial projection, ER 0.24, 0.26. Antenna with 11 flagellar segments, AR 1.90 (antenna broken in another specimen). Supraorbital setae 12, 13 or 14 on each side, clypeal setae 10 or 12. Antepronotum (Fig. 10-C) with 6 or 7 lateral setae on each side. Scutum with 10 or 12 dorsomedian setae, 7 or 8 dorsolateral setae on each side, and 3 pre-alar setae on each side; scutellum with 8 setae in a transverse row (Fig. 10-D). Wing venation in Fig. 10-E. R2+3 separated from R1 and R4+5, ending closer to end of R1 than to end of R4+5. Costa not extending beyond end of R4+5. fCu much beyond r-m, situated at 48% and 40% level of wing length, respectively. Anal vein extending much beyond fCu. Terminal scale of front tibia broad and with rounded margin, bears 3 long subapical setae (Fig. 10-F). Terminal combs of middle and hind tibiae each with a relatively long spur (Figs. 10-G, H). LR1 relatively large, 1.86, 1.93; LR2 0.60, 0.62; LR3 0.66, 0.69. Front tarsus V 0.28 or 0.29 times as long as front tibia. BR1 2.2, 3.0, BR2 2.8, 4.3, BR3 4.1, 5.0.

Hypopygium in Figs. 10-I, J. Ninth tergite without long setae in the middle, and with several short setae on both sides of anal point near posterior margin. Anal point dark brown, long, slender and almost parallel-sided, slightly expanded near apex. Dorsal appendage short, broad and nearly quadrangular, all thickly covered with microtrichiae, and with several short setae on posterior margin. Ventral appendage also low, flat and pad-like, nearly triangular, covered with microtrichiae but without long setae, with round-

ed caudal margin. Gonostylus long, slender, ankylosed with gonocoxite, with concave inner margin and widest at about middle, and with very short and minute setae along inner margin.

Remarks: The present specimens are identified as *P. camptolabis* (Kieffer) because the body coloration and the structure of hypopygium and other body parts are similar to those reported by Edwards (1929), Goetghebuer (1937) and Pinder (1978) with the European specimens. Two species of this genus were reported from Japan, besides the present species, *i.e. P. tamahikawai* Sasa, 1983, and *P. tamanipparai* Sasa, 1983, both differing from the present species in the shape of anal point (both constricted in the middle and conspicuously expanded apically), and in the shape and structure of dorsal appendages, as discussed by Sasa (1984).

12. *Stictochironomus akizukii* (Tokunaga, 1940) (Fig. 11)

Chironomus (Stictochironomus) akizukii; Tokunaga, 1940, p.299
Stictochironomus akizukii; Sasa, 1984, p.48

Collection records: A male and a female, collected with insect net on the shore of Lake Miike, 18 Nov. 1981. Both dissected and mounted on slides after body coloration was recorded as dry specimens (Nos. A 77:76, 77).

Male: Body length 6.48 mm, wing length 3.10 mm. Body coloration largely black, with conspicuous white marks on scutum, legs and abdomen. Ground color of scutum black, scutal stripes black with lateral margins of median stripe and inner margins of lateral stripes silvery white. Scutellum brown, postnotum black, abdominal tergites largely black, but I to V with a narrow white band along caudal margin. All femora largely brown and with a narrow white subapical ring, all tibiae with a proximal, middle and apical dark rings and two white rings between them, the middle brown ring rather inconspicuous; in all legs, tarsi I and II largely pale and with a narrow apical dark ring, tarsus III pale in proximal half and dark in apical half, tarsi IV and V entirely dark; wing with a conspicuous dark area around cross vein r-m, otherwise without dark area. Halteres with yellow knob and brown shaft.

Eyes with a long dorsomedial projection, ER 0.33. Frontal tubercles absent. Antenna with 13 flagellar segments, AR 1.88. Antennal hairs long, AHR 0.52. Supraorbitals 16 and 18, clypeals 26. Antepronotum without lateral setae. Scutum and scutellum in Fig. 11-B. Scutum with 22 dorsomedian setae, 14 and 15 dorsolateral setae, and 5 pre-alar setae on both sides. Scutellar setae 22 in two rows. Scutum with a hump in the middle. Squama with 24 fringe setae. Wing vein R2+3 separated from R1 and R4+5, ending slightly closer to end of the former. fCu proximal to r-m, at 41% and 43% level of wing length, respectively. Legs with dark and white rings, as stated before. Terminal scale of front tibia with rounded margin and bears 4 long subterminal setae (Fig. 11-C). Terminal combs of middle and hind tibiae contiguous and with only one short spur (Figs. 11-D,E). LR1 1.15, rather small as a member of Chironomini; LR2 0.58, LR3 0.70. Front tarsus V relatively short, 0.23 times as long as front tibia. Tarsal beards moderate in size, BR1 2.9, BR2 4.4, BR3 4.0. Pulvilli large and pad-like (Fig. 11-F).

Hypopygium in Fig. 11-G. Ninth tergite with 16 long setae arising in the middle portion, and with several short setae on posterior margin on both sides of anal point. Anal point widest at base, with a segment in the middle, and with rounded apex. Dorsal

appendage composed of a flat setigerous base bearing 6 long inner setae, and a slender, horn-like apical process bearing a long lateral seta arising from near apex (Fig. 11-H). Ventral appendage long, stout, tapering towards apex, and bears a long apical seta, and more than 30 stout, recurved setae arising on the dorsal side from apex to near the base (Fig. 11-I). Gonocoxite longer than gonostylus, which is widest near base, inner margin almost straight and tapering towards apex, with a conspicuous longitudinal ridge, and numerous short and stout setae in the apical portion of inner margin (Fig. 11-J).

Female: Body length 5.76 mm, wing length 3.28 mm. Body coloration as in male, dark and white rings on leg segments conspicuous. Antenna with 5 flagellar segments, segment I to IV with a long apical neck, segment I and V entirely dark, II to IV white in the basal and apical portions and with a dark ring in the middle (Fig. 11-A). Eyes with a conspicuous dorsomedial projection, ER 0.32. Supraorbitals 20, 22, clypeals 38. Scutum with 25 dorsomedians, 20, 22 dorsolaterals, and 6 pre-alars on each side. Scutellum with 21 setae in two rows. Squama with 24, 25 fringe hairs. Spermathecae nearly globular (Fig. 11-K). Cercus ear-shaped (Fig. 11-L).

Remarks: The above described structure and measurement data of male and female are almost identical or within variation ranges of those reported by Sasa (1984) with *S. akizukii* collected from lakes in the Nikko area.

13. *Pentapedilum sordens* (van der Wulp, 1874) (Fig. 12)

Tanytarsus sordens; van der Wulp, 1874, Tijdschr. Ent. 17:141
Pentapedilum sordens; Goetghebuer, 1928, Faune Fr. 5:102
Pentapedilum sordens; Edwards, 1929, Trans. R. Ent. Soc. London 77:376
Pentapedilum sordens; Tokunaga, 1938, Phil. J. Sci. 65:321
Pentapedilum sordens; Hashimoto, 1983, Kontyu, 51:20

Collection records: 9 males and 3 females were collected with insect net on the shore of Lake Unagi, 16 and 17 Nov. 1981. A male emerged also from bottom sediment collected at a littoral zone of the same lake, 6 Feb. 1981. All dissected and mounted on slides (Nos. A 80:70–81).

Male: Body length 3.62–4.14 mm (3.80 mm in average of 10), wing length 2.17–2.52 mm (2.29 mm). Body coloration largely brown, *i.e.* ground color of scutum yellowish brown, scutal stripes dark brown, scutellum brown, postnotum dark brown, abdominal tergites brown and with pale caudal bands on tergites II to VI, leg segments almost uniformly brown.

Head in Fig. 12-A. Eyes with a long dorsomedial projection, ER 0.21–0.29 (0.26). Frontal tubercles absent. Antenna with 13 flagellar segments, AR 1.78–1.93 (1.87). Antennal hairs long, AHR 0.50–0.64 (0.59). Supraorbital setae 10, 12 in a specimen (No. 77:87), 17–26 on one side in the other 9 specimens (18.6 in average of 10 pairs). Clypeal setae 20–33 (28.2). Antepronotum without lateral setae. Scutum with 16–29 (22.7) dorsomedian setae, 27–47 (36.8) dorsolateral setae on one side, and 6–11 (8.9) pre-alar setae on one side. Scutellum with 16–29 (22.7) setae in two transverse rows.

Wing densely covered with macrotrichiae. Venation in Fig. 12-B. Vein R1 and R4+5 running close together, R2+3 separated from both veins and devoid of macrotrichiae. fCu slightly beyond r-m. Anal vein extending beyond fCu. Terminal scale of front tibia with pointed apex (Fig. 12-C). One of the terminal combs of middle and hind

tibiae with a long spur, the other comb (the wider one) without spur (Figs. 13-D, E). LR1 1.20–1.29 (1.25), LR2 0.53–0.56 (0.54), LR3 0.61–0.66 (0.63). Tibiae and tarsi with relatively long beards, BR1 3.4–4.7 (4.1), BR2 4.6–5.8 (4.8), BR3 6.6–8.2 (7.6). All legs with a pair of small bifid pulvilli (they are not so conspicuous as in most *Polypedilum* species; Fig. 12-F).

Hypopygium in Fig. 12-G. Base of eighth tergite constricted in the middle same as in most *Polypedilum* species. Ninth tergite with a group of long and stout setae in the middle. Anal point long, slender, almost parallel-sided and with rounded apex. Gonostylus very stout, widest at about middle, with slightly concave inner margin, with a strong ridge on dorsal side, and with several long setae on inner margin. Dorsal appendage composed of a low and wide base bearing 4 or 5 long inner setae and covered with numerous microtrichiae, and a long, sickle-like bare apical process usually bearing a long lateral seta arising near base, though its presence and position seems to be variable; 6 out of 9 specimens examined bear one lateral seta near the base of each dorsal appendage, (Figs. 12-J, K, L), and 3 bear lateral seta near the base of one of the dorsal appendages but the other dorsal appendage without lateral seta (Figs. 12-L, M). Ventral appendage long, slender and with rather pointed apex, with 16–18 stout recurved setae on the dorsal side of apical portion, a long apical seta, and several simple setae on the ventral side (Figs. 12-H, I).

Remarks: This species was reported by Tokunaga (1938, p.321) as being very abundant in Tomioka, Amakusa, and brief accounts were made on morphology of male. Hashimoto (1983, p.20) gave brief morphological note and simple drawing of male hypopygium, and states, without giving the locality of collection, that the adult flies were seen from April to November and particularly abundant in autumn. The specimens collected by us from Lake Unagi coincided morphologically with the descriptions of the present species by previous authors, but it was noted that special attention should be paid to the variation in the presence or absence, and in the position of the lateral hair of dorsal appendage.

14. *Pentapedilum* sp. "unagitertium" (Fig. 13)

Collection records: A male, collected on the bank of Lake Unagi, 17 Nov. 1981 (No. A 77:90).

Male: Body length 3.97 mm, wing length 2.52 mm. Body largely brown or dark brown; ground color of scutum brown, stripes dark brown, scutellum brown, postnotum dark brown, abdominal tergites dark brown and with a pale caudal band; wing unmarked, venation in Fig. 13-A, covered thickly with macrotrichiae; leg segments yellowish brown. Frontal tubercles absent, ER 0.20; so 15, 16; cl 33. Pronotum without setae. Scutum with 22 dorsomedians, 33 and 30 dorsolaterals, and 10, 11 pre-alars. Scutellar setae 26 in double rows. Squama with 15 fringe setae. LR2 0.57, LR3 0.66, BR3 5.7. Terminal scale of front tibia long, with sharply pointed apex (Fig. 13-B). Terminal combs of middle and hind tibiae with only one, very long spur (Figs. 13-C, D). Hypopygium in Fig. 13-E. 8th tergite triangularly narrowed at middle. Ninth tergite with 13 long setae in the middle, and 5 setae on posterior margin on both sides of anal point. Anal point long, slender, almost parallel-sided but slightly expanded apically. Dorsal appendage composed of a broad setigerous base bearing 5 long inner setae, and a horn-like apical process with concave inner margin and pointed apex, bearing a long lateral seta arising in

apical half or 2/3 level from the base (Fig. 13-F). Ventral appendage long, slender, nearly parallel-sided and rather pointed apically, bears 18 long, stout and recurved setae and a long, caudally directed apical seta (Fig. 13-G). Gonostylus broadest at about middle and abruptly narrowed near apex, bears 5 long setae along inner margin.

Remarks: This specimen may possibly belong also to *Pentapedilum sordens*, but is described here separately because the position of lateral seta of dorsal appendages is quite different, being situated in the distal portion in both sides. Other structures and measurement data are mostly within the variation ranges of the specimens of *P. sordens* from the same lake. The structure of hypopygium is also similar to *Pentapedilum tamahamurai* Sasa, 1983, but both differ in the structure of the terminal combs of middle and hind tibiae, the present specimen has a long spur on the fused combs, while the latter has short spurs on each of the two separated combs, such as seen in the species of the group *Phaenopsectra* Kieffer, 1921.

15. *Polypedilum unagiquartum*, sp. nov. (Fig. 13)

Collection records: . 2 males emerged 17 March 1981 in the laboratory of NIES from a sample collected 6 Feb. at littoral zone of Lake Unagi (Nos. A 77:36, 37).

Male: Body length 3.31, 3.58 mm, wing length 1.86, 1.93 mm. Body entirely brown or dark brown, *i.e.* ground color of scutum brown, stripes dark brown, scutellum brown, postnotum dark brown, abdominal tergites dark brown; wing unmarked, halteres yellow. Head with a pair of small frontal tubercles, 11 microns long, 8 microns in diameter, and 23 microns apart from each other (Fig. 13-P). Antenna with 13 flagellar segments, AR 1.71, 1.76. Antennal hairs long, AHR 0.47, 0.49. Supraorbital setae 14, 14, or 16, 18. Clypeal setae 18, 20. Antepronotum without lateral setae. Scutum with 16 or 18 dorsomedian setae, 14 or 15 dorsolateral setae on each side, and 5 or 6 pre-alar setae on each side. Scutellum with 12 setae. Wing venation in Fig. 13-H. fCu much beyond r-m. R2+3 separated from both R1 and R4+5, LR1 1.89, LR2 0.67, 0.68 (relatively high), LR3 0.78, 0.79 (also relatively high). Tarsus V of front leg long, 0.35 times as long as front tibia. Tarsi with long beards, BR1 3.2, BR2 4.1, 5.0, BR3 6.1, 6.2. Terminal scale of front tibia long and apically pointed, with 3 long terminal setae (Fig. 13-I). One of the terminal combs of middle and hind tibiae with a long terminal spur (Figs. 13-J, K).

Hypopygium in Fig. 13-L. Ninth tergite with 13 long setae arising in the middle portion. Anal point long, slender, slightly curved ventrad. Dorsal appendage (Fig. 13-M) composed of a flat setigerous base bearing 3 or 4 inner setae, and a horn-like process bearing a very long lateral seta arising in the distal half at about 2/3 level from the base. Ventral appendage (Fig. 13-N) with 12 recurved setae and a long, caudally directed apical seta. Gonostylus widest at about basal 1/3 and tapering towards apex, with two rows of long setae along inner margin.

Remarks: This species is somewhat related to *P. nubeculosum* (Meigen) which has been collected from a number of lakes in Japan including from the same sample as the present species. Both species is similar in the body coloration and in that lateral seta of dorsal appendages arise from the distal portion, but differ in the shape of gonostylus (broadest at about distal 1/3 in *nubeculosum*), in body size and wing length (much larger in *nubeculosum*), in AR value (larger in *nubeculosum*), in the numbers of cl, dm, dl, pa, sc and sq setae (all larger in *nubeculosum*), and in the absence or presence of frontal

tubercles (absent in *nubeculosum*), and of lateral antepronotal setae (present in *nubeculosum*).

#16. *Polypedilum nubeculosum* (Meigen, 1818)

Chironomus nubeculosus; Meigen, 1818, p.37
Chironomus (Polypedilum) nubeculosus; Edwards, 1929, p.402
Polypedilum nubeculosum; Goetghebuer, 1937, p.62
Chironomus (Polypedilum) nubeculosus; Tokunaga, 1940, p.297
Polypedilum (Polypedilum) nubeculosum; Townes, 1945, p.50
Polypedilum nubeculosum; Pinder, 1978, p.138
Polypedilum nubeculosum; Sasa, 1984, p.58

Collection records: A male emerged 25 Feb. 1981 from a bottom sample collected in Lake Unagi, 6 Feb. (No. A 77:39).

Male: Body length 5.51 mm, wing length 3.13 mm. Body coloration almost entirely dark brown, scutal stripes black; femora dark brown, tibiae and tarsal segments brown or yellowish brown, halteres brown. Frontal tubercles absent. AR 1.92, AHR 0.55, ER 0.31. so 12, 14, cl 34. Lateral antepronotal setae 6 on both sides. dm 26, dl 38, 40, pa 12, 13, sc 36. Wing with fuscous marks. Squama with 24 fringe hairs. R2+3 clearly separated from R1 and R4+5, ending closer to end of the former. fCu at 48%, r-m at 43% level of wing length. Terminal scale of front tibia with rounded margin. Terminal combs of middle and hind tibiae with one long spur. LR1 1.36, LR2 0.57, LR3 0.78; BR1 3.7, BR2 6.7, BR3 7.7. Front tarsus V 0.26 times as long as front tibia. Pulvilli large and bifid. Hypopygium typical of this species, dorsal appendages with a long lateral seta arising in distal half, gonostylus stout and widest at about distal 1/3.

Remarks: The present specimen is identified as *P. nubeculosum* since body coloration, structure of various organs and the standard measurement data are the same as those of the specimens of this species from lakes in the Nikko area (Sasa, 1984).

#17. *Polypedilum cultellatum* Goetghebuer, 1931 (Figs. 14, 15)

Polypedilum cultellatum; Goetghbuer, 1931, p. 212
Polypedilum cultellatum; Goetghebuer, 1937, p. 60
Polypedilum cultellatum; Pinder, 1978, p. 136
Polypedilum cultellatum; Sasa & Hasegawa, 1983, p. 330

Collection records: 5 males emerged from a bottom sample collected 6 February 1981 from Lake Unagi (Specimens Nos. A 77:41–45). 2 pupal exuviae associated with the males (Specimen Nos. A 77:46,47). A male was identified among adults collected with insect net on the shore of Lake Unagi, 17 Nov. 1981 (No. A 77:48).

Male: Body length 3.69–3.79 mm (3.75 mm in average of 5), wing length 2.10–2.24 mm (2.17 mm). Body coloration largely yellow, with brown marks; ground color of scutum yellow, stripes reddish brown, scutellum yellow, postnotum dark brown, halteres yellow, wing unmarked and colorless. Legs yellow to yellowish brown. Abdomi-

nal tergites yellowish brown, hypopygium brown.

Head without frontal tubercles, eyes with a long dorsomedial projection. Antenna with 13 flagellar segments, AR 1.55–1.75 (1.69 in average). Antennal hairs long, AHR 0.50–0.52. Supraorbital setae 14–16 (14.8), clypeal setae 20–23 (21.6). Anteprono-tum without lateral setae. Dorsomedian setae of scutum 14–18 (16.0), dorsolaterals 16–26 (21.1), pre-alars 5–7 (5.6). Scutellum with 18–26 (22.8) setae in double rows. Squama with 10–16 (12.3) fringe setae. Wing venation in Fig. 14-A. R2+3 running close to R1. fCu much beyond r-m, at 50% and 43% level of wing length, respectively. LR1 1.60–1.71 (1.65 in average of 5), LR2 0.51–0.54 (0.52), LR3 0.69–0.70 (0.69). Tarsus V of front leg 0.26–0.29 times the length of front tibia. Tarsi with hairs of medium length, BR1 3.3–3.8, BR2 4.3–9.4, BR3 5.5–8.1.

Hypopygium in Fig. 14-G. Ninth tergite with 6–14 long setae arising along the midline, and several short setae on both sides of anal point. Anal point relatively short (about 40 microns long), parallel-sided and with rounded apex. Dorsal appendage (Fig. 14-H) composed of a lateral setigerous pad forming a posterior lobe bearing 4 or 5 long setae, and a bare inner blade. Ventral appendage (Fig. 14-I) long, slender, almost parallel-sided and apically pointed, with a long apical seta and 15–17 stout, recurved setae. Gonostylus widest at about basal 1/3, inner margin slightly concave and bears 5 long setae.

Pupa: Length of abdomen 3.55, 3.69 mm. Thoracic respiratory organs divided into 6 branches of subequal length at various heights from the base, and one of the branches is divided further into two near the apex (Fig. 15-A). Abdominal tergites only faintly pigmented. Distribution of hairs and spines on tergites I to V in Fig. 15-B, VI to IX in Fig. 15-C. Tergite I without spines, lateral hairs and with two pairs of hairs. Tergite II with a proximal band of large spines (II-a), central spinose areas of smaller spines continuous to it (II-b, II-c), and a caudal uniserial band of large recurved spines (II-d) separated from the above spinose areas. Distribution of spines on tergites III and IV is similar to that of II, though bands -a, -b and -c are incompletely separated from each other in III and completely separated in IV. The caudal band of large recurved spines (-d) is absent in V and VI, and spinose areas -a, -b and -c are completely separated from each other in V and VI. Tergites VII and VIII with a pair of proximal spinulous areas. Caudolateral scales of segment VIII are short and composed of a pointed main spine and a few small accessory spines (Fig. 15-K). Lateral hairs are 3 pairs on segment II to VI and 4 pairs on VII and VIII, among which those on II to V are short and simple (s-type), while those on VI to VIII are long, flat and filamentous (L-type). Anal fins with 33–39 (36.5 in average of 2 pairs) fringe hairs, all long and filamentous.

Remarks: The body coloration and structure of the present species are almost identical with *P. cultellatum* Goetghebuer described by various authors from Europe. Especially characteristic is the structure of dorsal appendage, which has a conspicuous posterior lobe bearing 4 or 5 long setae. The present specimens are morphologically very similar to those collected at various localities of Japan and described by Sasa (1979, 1980, 1984) by a name of *P. ureshinoense*, but in the latter the posterior lobe of dorsal appendage is less conspicuous and bears only 2 or 3 long setae, as a rule. Pupa of the present collection is also quite similar to those found associated with *P. ureshinoense*, but the number of branches of thoracic respiratory organs is 7 in the present specimens while it is 6 in *P. ureshinoense*.

18. *Polypedilum masudai* (Tokunaga, 1938) (Fig. 16)

Chironomus (Polypedilum) masudai; Tokunaga, 1938, p.331

Collection records: A male and a female, emerged from a bottom sample E 26 collected at a depth of 10 m of Lake Ikeda, 6 Feb. 1981. Both dissected and mounted on a slide (No. A 77:50).

Male: Body length 3.00 mm, wing length 1.79 mm. Body almost entirely brown or dark brown; ground color of scutum brown, scutal stripes dark brown, scutellum brown, postnotum dark brown, abdominal tergites dark brown; knob of halteres brown, stem yellowish brown; coloration of leg segments characteristic to this species, *i.e.* in leg I, femur dark brown on proximal 2/3 and yellowish brown on distal 1/3, tibia yellowish brown, tarsi I to IV largely yellowish brown and each with a dark brown ring in the middle, V largely dark brown; in legs II and III, the dark rings are less conspicuous.

Frontal tubercles absent. Antenna with 13 flagellar segments, AR 1.52. Antennal hairs long, AHR 0.54. Eyes with a long dorsomedial projection, ER 0.27. Supraorbital setae 12 on each side, clypeal setae 22. Antepronotum without seta, dorsomedian scutal setae 16, dorsolaterals 16 and 17, pre-alars 5 on both sides, scutellum with 17 setae in double rows. Squama with 9 and 11 fringe hairs. Wing (Fig. 16-A) with 9 dark marks. R2+3 running close to but clearly separated from R1. fCu much beyond r-m, at 49% and 40% level of wing length, respectively. Legs in Fig. 16-C. Terminal scale of front tibia with rounded margin, and bears 3 long subterminal setae. Middle and hind tibiae with a narrow terminal comb bearing a long spur, and a broad comb without a spur (Fig. 16-E). Tarsi with long beards, BR1 4.2, BR2 4.7, BR3 9.3. Terminal segments of all legs with a pair of large pulvilli, claws and empodium (Fig. 16-F).

Hypopygium in Fig. 16-G. Posterior margins of ninth tergite almost linear on both sides and forming a sharp angle in the middle, with 8 long setae in the central portion and some 10 short setae on both sides of anal point. Ninth tergite without a pair of tubercles on posterior margin which are seen in most other Japanese *Tripodura* species. Anal point narrow, slender and almost parallel-sided. Dorsal appendage (Fig. 16-H) expanded apically, covered all with numerous microtrichiae, and bear 4 long setae on posterior margin, and 3 shorter setae on inner margin. Ventral appendages (Fig. 16-I) with a long apical seta directed backwards, and 12 stout and recurved setae. Gonostylus slender, tapering towards apex, and with 6 long setae along inner margin (Fig. 16-G).

Female: Body length 3.77 mm, wing length 1.82 mm. Coloration as in male. Head with a pair of minute frontal tubercles, 3 microns wide and 2 microns high, 10 microns apart from each other. Supraorbital setae 10 and 11, clypeal setae 24. Antepronotum without seta, dorsomedian scutal setae 20, dorsolateral setae 18, 19, pre-alar setae 4 on both sides, scutellum with 20 setae in two transverse rows. Wing in Fig. 16-B. Squama each with 9 fringe hairs. Spermathecae in Fig. 16-J, cercus in Fig. 16-K.

Remarks: This species was described by Tokunaga (1938) with male collected on light screen in Kyoto. The above morphological characters of male are almost identical with the original description of this species. Female is a new record. This species belongs to the *Tripodura*-group (or subgenus) of Townes (1945), since the dorsal appendage is broad, pad-like, bears long apical setae and entirely covered with numerous microtrichiae. The present species can be differentiated from other species of this group by that wing with 3 dark marks between R4+5 and M, two dark marks between Cu1 and Cu2, and in that ninth tergite without the pair of processes flanking anal point present in most other

Tripodura species.

19. *Nilothauma brayi* (Goetghebuer, 1921) (Fig. 17)

Kribioxenus brayi; Goetghebuer, 1921, p.133
Chironomus (Kribioxenus) brayi; Edwards, 1929, p.396
Kribioxenus brayi; Goetghebuer, 1937, p.51
Nilothauma brayi; Pinder, 1978, p.130

Materials studied: A male, emerged 17 March 1981 from a sample collected at a littoral zone of Lake Unagi, 6 Feb. (No. A 77:96).

Male: Body length 3.62 mm, wing length 1.69 mm. Body coloration yellow and brown, *i.e.* ground color of scutum yellow, scutal stripes brown, wing unmarked, halteres pale yellow; abdominal tergites yellow (possibly greenish when fresh), ninth tergite and hypopygium brownish; front femur with two brown rings occupying its basal half and a narrow subapical area, two pale rings in the middle and apex; front tibia yellow in the proximal 2/3 and brown in apical 1/3; proximal half of front tarsus I yellow, apical half brown; front tarsi II to V brown; middle and hind leg segments entirely pale yellow.

Head in Fig. 17-A. Frontal tubercles absent. Eyes with a long and broad dorsomedial projection, the distance very narrow, ER 0.06 (smallest among the Japanese chironomids so far measured). Antenna characteristic to this species (or to this genus), composed of a pedicel and 13 flagellar segments, the last segment very short and the preceding segments all elongate oval, AR 0.28, extremely small as a chironomid. Antennal hairs attached to the penultimate segment relatively short, AHR (length of antennal hair of the penultimate segment divided by the total length of flagellar segments of antenna) 0.17. Supraorbital setae 10 on both sides, clypeal setae 22. Antepronotum without lateral setae. Scutum with 16 dorsomedians, 11 or 12 dorsolaterals, and 4 or 5 pre-alars. Scutellum with only a pair of setae closely located near middle, also quite unusual character as a chironomid. Wing 1.69 mm long (from tip of arcus to tip of wing) and 0.60 mm wide, 0.36 times as wide as long, unusually wide as a male of Chironomidae. Wing venation in Fig. 17-G. R2+3 separated from R1 and R4+5, fCu much beyond r-m, Cu2 very short and forming an unusually big angle against Cu1. Squama bare. Terminal scale of front tibia with a very narrow and elongate process with pointed apex (Fig. 17-B). One terminal comb of middle and hind tibiae with a short spur, the other wider comb without spur (Fig. 27-D). LR1 1.44, LR2 0.59, LR3 unusually small, 0.56. Tip of tarsus V with a pair of claws and an empodium, but without pulvilli (Fig. 17-E).

Hypopygium in Fig. 17-F (lateral view). It is quite unusual as a member of Chironomini in that ninth tergite is provided with two additional processes besides anal point (F-c), a dorsal or anterior process which is nearly globular and bearing some 45 long, rigid and apically forked setae, and a middle or ventral process (F-b) which is somewhat finger-like and bearing 6 short and simple setae on the apical expanded portion. Dorsal appendage (F-d) pad-like, covered thickly by microtrichiae, and bearing 7 short setae on posterior margin. Ventral appendage (F-f) slender and finger-like, with 6 short and simple setae on apical portion. Gonostylus (F-e, g) long, slender, tapering towards apex and bears some 10 short setae in two rows along inner margin.

Remarks: This specimen shows morphological characters quite unusual as a member of Chironomini, in that terminal segment of antenna being very short and the other

flagellar segments being unusually elongate, with small AR value of 0.28, squama of wing bare, ninth abdominal tergite with peculiar processes, dorsal appendage pad-like, ventral appendage slender and strongly curved, and gonostylus being narrow, slender and with pointed apex. Such characters and body coloration mostly agree with the description of *N. brayi* (Goetghebuer) from Europe of various authors. It is stated by Edwards (1929), Goetghebuer (1937) and Pinder (1978) that this species in Europe has a short spur on each of the terminal scales of hind tibia, while the present specimen has only one spur on a comb and the other comb without a spur in both middle and hind tibiae. The present specimen differs also from the figure of *N. brayi* of Pinder (1978, Fig. 161A) in that bristles on the dorsal process of ninth tergite are apically forked like a brush (they are simple in Pinder's figure), and the ventral appendage of hypopygium is apparently shorter in the present specimen.

20. *Tanytarsus unagisextus*, sp. nov. (Figs. 17, 18, 22)

Collection records: 56 males and 6 females were recovered from bottom samples collected from Lake Unagi, 6 Feb. 1981. 5 males and 4 females were found also among adult chironomids emerged from bottom samples of Lake Ikeda, collected on the same day (Nos. 78:01–20). 62 pupal exuviae, partly associated with the adults, were also collected and studied.

Male: 6 males from Lake Unagi and 4 from Lake Ikeda were measured. Body length 2.00–2.55 mm (mean 2.26 mm), wing length 1.15–1.55 mm (1.30 mm). Body largely yellow, with yellowish brown marks. Ground color of scutum pale yellow, stripes yellowish brown, scutellum pale yellow, postnotum brown, abdominal tergites greenish yellow; wing unmarked, halteres yellow, legs yellow, terminal combs of middle and hind tibiae black. Frontal tubercles absent. Eyes reniform, without dorsomedial projection, ER 1.17–1.47 (1.32). Antenna with 13 flagellar segments, AR small, 0.70–1.02 (0.845). Antennal hairs long, AHR 0.44–0.52 (0.47). Supraorbital setae 6–10 (most frequently 8, mean 8.1), clypeal setae 10–14 (most frequently 12, mean 12.3). Palp 4 segmented, 40, 102, 116, 205 microns in the type specimen. Antepronotum without lateral setae. Scutum with 2–6 (most frequently 6, mean 4.7) dorsomedian setae, 4–7 (most frequently 6, mean 5.5) dorsolateral setae, and only 1 (2 in a specimen) pre-alar seta. Scutellar setae 2 in 8, 4 in 1, and 6 in 1 specimen. Squama bare, wing (Fig. 18-B) with macrotrichiae in distal portion only, between R4+5 and M, and between M and Cu1. r-m short and almost parallel to wing axis. fCu much beyond r-m. Anal lobe obtuse. Terminal scale of front tibia long and with pointed apex (Fig. 17-H). Terminal combs of middle and hind tibiae both with a spur (Fig. 17-I). LR1 large, 2.26–2.41 (2.32), LR2 0.53–0.61 (0.58), LR3 0.65–0.74 (0.70). Tarsi with long beards, BR1 3.3–5.2 (4.3), BR2 4.5–7.1 (5.5), BR3 6.4–9.0 (6.9). Tarsi V with a pair of claws and an empodium, but pulvilli absent (Fig. 17-J).

Hypopygium in Fig. 17-K. Ninth tergite with bands separated in the middle, posterior margin hardly produced in the middle, and with several short setae at the base of anal point. Anal point short and broad, with 10 or more spine clusters, and a few short lateral setae. Appendage 1 composed of a broad, setigerous base bearing a long stout basal seta arising from an elevated base, and 3 or 4 inner setae, and a broad hook-like process; appendage 1-a long, knife-like, extending much beyond inner margin of appendage 1 (Fig. 17-L). Appendage 2 rather short, setigerous and bears 8 recurved setae;

appendage 2-a long, with many stout and simple setae extending beyond tip of appendage 2 (Fig. 17-M).

Female: Body length 1.48–1.87 mm (1.68 mm in average of 10), wing length 1.07–1.38 (1.23) mm. Body coloration as in male, largely pale yellow, scutal stripes brownish yellow. Head in Fig. 22-A. Frontal tubercles absent. Eyes widely apart from each other and without dorsomedial projection. Antenna with only 4 flagellar segments. Spermathecae 2, both nearly globular and pale, 80X80 and 94X84 microns in size (Fig. 18-C). Cercus nearly circular, with rounded posterior margin, 120X88 microns (Fig. 18-D).

Pupa: Length of abdomen 2.00–2.58 mm (2.26 mm in average of 12). Thoracic respiratory organs long, slender and horn-like, length varying from 176 to 320 microns according to the specimens, very thin and with smooth surface, often difficult to be differentiated from the thoracic wall (Fig. 18-E). Distribution of spines, spinules and hairs on abdominal tergites in Figs. 18-F, G. Tergites II to VI with a pair of oval spine patches composed of short, stout spines (II-a to VI-a), to which a pair of large spinose areas composed of smaller spines are continuous, with the exception of tergite VI which has only a few small spines adjacent to the spine patches. Tergite II has an uniserial row of 76–169 (108.4 in average of 12 specimens) rather small, recurved spines (each spine 8 to 10 microns long; II-d). Tergite VII without spine patches and spinulous areas, and VIII with a pair of large spinulous areas in the oral portion. Caudolateral scales of segment VIII broad and with 6–9 (most frequently 7 or 8) spines in a transverse row (Fig. 18-I). Anal fins with 2 long, filamentous dorsal hairs, and 26–39 (30.8 in average of 11 pairs) fringe hairs (Fig. 18-J). Abdominal segments II to VI with 3 pairs, VII with 4 pairs and VIII with 5 pairs of lateral setae, among which those on II to IV are short and simple, while those on V to VIII are all long, flat and filamentous (Figs. 18-F, G).

Remarks: The structure of male hypopygium of this species falls in the *lestagei* aggregate of genus *Tanytarsus* of Reiss & Fittkau (1971), since ninth tergite and anal point without long hairs but the latter with lateral ridges and spine clusters, appendage 1-a long and extending beyond inner margin of appendage 1, appendage 2-a with long, simple hairs extending beyond tip of appendage 2, and bands of ninth tergite separated from each other. However, this species differs essentially from *lestagei* in that spine clusters of anal point are more than 10 in multiple rows (less than 8 in a single row in *lestagei*), and the structure of appendage 1 and 1-a is essentially different between the two species. Among the *Tanytarsus* species recorded from Japan, the present species is somewhat related to *tamadecimus* Sasa, 1980 and *chuzesecundus* Sasa, 1984 in that spine clusters of anal point are more than 8 in multiple rows and appendage 1-a is long, but differs from them in that 2-a is long and extending beyond tip of appendage 2, and also in the structure of appendage 1 and 1-a. Female of this species is also unusual in that antenna has only 4 flagellar segments in place of 5 in most other species of this genus.

#21. *Tanytarsus unagiseptimus*, sp. nov. (Figs. 19, 20)

Collection records: 10 males, 6 females and 14 pupal exuviae were reared and mounted from bottom samples of Lake Unagi, collected 6 Feb. 1981 and reared in the laboratory of NIES (Nos. A 78:51–64). A total of 14 pupal exuviae were also collected and examined.

Male: Body length 2.59–3.03 mm (2.82 mm in average of 10), wing length 1.76–

1.93 mm (1.83 mm). Ground color of scutum yellow, scutal stripes brown, scutellum brownish yellow, postnotum dark brown, halteres yellow, abdomen greenish yellow, leg segments largely brown excepting basal 2/3 of femur which is yellow. Head in Fig. 19-A. Frontal tubercles prominent, 17 microns long, 8 microns in diameter, and 35 microns apart from each other. Eyes with a prominent dorsomedial projection, ER 0.50–0.76 (0.63). Antenna with 13 flagellar segments, AR 1.02–1.22 (1.15). Antennal hairs long, AHR 0.47–0.52 (0.49). so 8–14 (9.3), cl 16–22 (18.3). Antepronotum without lateral setae. Scutum with 12–21 (15.3) dorsomedians, 7–11 (8.3) dorsolaterals on each side, and one pre-alar seta on each side. Scutellum with 4–6 (4.8) setae. Wing in Fig. 19-C. Squama bare, anal lobe rather obtuse, wing membrane with numerous macrotrichiae on almost entire surface. fCu much beyond r-m. Terminal scale of front tibia long, narrow and sharply pointed (Fig. 19-E). Terminal combs of middle and hind tibiae widely separated, and both with a long spur (Figs. 19-F, G). LR1 relatively high, 2.44–2.66 (2.54), LR2 0.63–0.68 (0.66), LR3 0.71–0.75 (0.73). Tarsi with long beards, BR1 3.3–3.7 (3.5), BR2 5.8–6.6 (6.2), BR3 6.2–6.6 (6.3). Tarsus V of front leg relatively long, 0.33–0.37 (0.35) times as long as front tibia. Pulvilli absent (Fig. 19-H).

Hypopygium in Fig. 19-I. Bands of ninth tergite widely separated in the middle. Ninth tergite with only 1–3 (usually 2) short setae in the middle at base of anal point. Anal point (Fig. 19-S) nearly triangular, widest at base but with rounded apex, with a pair of lateral ridges and 4–8 spine clusters between them, with several short lateral setae, and microtrichiae on basal half. Appendage 1 egg-shaped, inner margin slightly concave, with 7 short, simple setae on dorsal side (Fig. 19-K). Appendage 1-a knife-like, almost straight and apically pointed, entirely hidden behind appendage 1 or only slightly extending beyond its inner margin (Fig. 19-L). Appendage 2 thumb-like, only slightly expanded apically, with some 14 recurved setae arising in apical 1/3; appendage 2-a short, with numerous leaf-like setae directed inwards (Fig. 19-M). Gonostylus widest at about basal 1/3, with rounded apex and not abruptly narrowed near apex.

Female: Body length 2.03–2.41 mm (2.26 mm in average of 6), wing length 1.62–2.03 mm (1.78 mm). Head in Fig. 19-B. Frontal tubercles prominent, roughly conical, 15 microns high, 13 microns wide at the base, and 66 microns apart from each other. Antenna with only 4 flagellar segments. Eyes with a conspicuous dorsomedial projection, ER 0.41–0.56 (0.51). Palp with 4 flagellar segments. Supraorbital setae 8–10 (8.8) on one side, clypeal setae 20–26 (22.5). Antepronotum bare, scutum with 14–18 (15.6) dorsomedians, 9–14 (11.9) dorsolaterals on one side, and only 1 pre-alar seta on each side. Scutellar setae 4, 5 or 6 (4.6). Wing in Fig. 19-D. Squama bare. Wing membrane more densely and widely covered by macrotrichiae than in male. LR1 2.40–2.65 (2.53), LR2 0.55–0.63 (0.58), LR3 0.63–0.69 (0.66). BR1 2.8–4.0 (3.2), BR2 3.3–4.2 (3.8), BR3 3.2–5.3 (4.6). Spermathecae 2, both oval (Fig. 20-A). Cercus roughly circular (Fig. 20-B).

Pupa: Length of abdomen 2.68–3.21 mm (2.91 mm in average of 8). Thoracic respiratory organs (Fig. 20-C) simple horn-like tubes with thin membrane, 384–813 (539) microns long and about 25 microns wide at near base, without visible spinules on the surface. Spines, spunules and hairs on abdominal tergites I-V in Fig. 20-D, VI to IX in Fig. 20-E. Segment I without spines and spinules. II with a pair of proximal spinulous areas (II-a), a pair of longitudinal rows of small spines (II-b, II-c), and a transverse row of 40–63 (48.2 in average of 8) rather small recurved spines, each measuring about 15 microns (II-d). Tergite III with a pair of comb-like spine patches (III-a) composed of 18–22 long, parallel spines, each measuring 82–45 microns in length. Tergites IV, V and

VI also with a pair of oval spine patches composed of smaller spines (IV-a, V-a, VI-a). Tergites VII and VIII with a pair of oval spinulous areas in the proximal zone. Caudolateral scales of segment VIII (Figs. 20-H, I), broad, with 7–12 large spines along posterior margin and with additional small spines on the scale. Anal segment with a pair of large spinulous areas near base, 2 pairs of long, filamentous dorsal hairs, and 32–42 (37.2) long, filamentous fringe hairs on each anal fin. Lateral hairs on abdominal segments are none on I, 3 pairs on II to VII, and 5 pairs on VIII, among which the third pair on VII and all the 5 pairs on VIII are long, filamentous, and the rests are all short and simple.

Remarks: This species is co-existing in Lake Unagi with the previously described one, *T. unagisextus*, but can be clearly differentiated in adult males by larger body size (wing length 1.76–1.93 mm versus 1.15–1.55 mm), by body coloration (thorax darker), and by structure of anal point, appendages 1, 1-a and 2-a of male hypopygium. In the pupa, the presence of long, comb-like spine patches on abdominal tergite III and the fewer numbers of spines of II-d are the differentiating characters.

Among *Tanytarsus* species known from Japan, this species is closest to *T. tamaundecimus* Sasa, 1980 in that spine clusters on anal point are less than 8 in a single row, appendage 1 being oval and 1-a mostly hidden behind 1, but differs from it essentially in the structure of 2-a. In the pupa, abdominal tergite IV of *tamaundecimus* has a pair of inverted L-shaped long spine combs, while the spine patch on IV in the present species is oval in shape and composed of small spines. Among the European *Tanytarsus* species reviewed by Reiss & Fittkau (1971), this species is somewhat related to *T. smolandicus* Brundin in that spine clusters on anal tergite are fewer than 8, anal point is covered with microtrichiae at least in basal half, appendage 1 is oval and 1-a present but almost hidden behind 1, in the presence of frontal tubercles, in values of AR and LR1, but both differ essentially in the structure of appendage 2-a (with a few lamellar setae and many simple setae in *smolandicus*, with many leaf-like setae in the present species).

22. *Tanytarsus tamagotoi* Sasa, 1983 (Figs. 21, 22-B–F)

Tanytarsus tamagotoi; Sasa, 1983, p.23

Collection records: 4 males, all emerged from bottom sediment samples collected from Lake Unagi, 6 Feb. 1981, all identified after dissected and mounted on slides (Nos. A 78:71–74). 4 pupal exuviae associated with the adults were also collected and studied (Nos. A 78:76–78). A male emerged also from a sample of Lake Ikeda collected 6 Feb. 1981 (No. A 78:75).

Male: Body length 2.72–3.03 mm (2.90 mm in average of 4), wing length 1.86–1.93 (1.88) mm. Body coloration largely pale yellow, *i.e.* ground color of scutum pale yellow, scutal stripes slightly brownish, scutellum pale yellow, postnotum slightly brownish yellow, abdominal tergites greenish yellow; halteres pale yellow, leg segments pale yellow, tibial combs and eyes dark brown. Frontal tubercles absent. Eyes with a long dorsomedial projection, ER 0.45–0.56 (0.50). Antenna with 13 flagellar segments, AR 1.00–1.06 (1.03), antennal hairs long, AHR 0.49–0.56. Supraorbital setae 8 or 10 on each side, clypeals 16 or 18. Antepronotum without setae, scutum with 14 or 16 dorsomedian setae, 8, 9 or 10 dorsolateral setae, pre-alar setae 1 on each side, scutellum with 4 or 5 setae. Wing in Fig. 21-A. Squama bare. Wing membrane with macrotrichiae also on its proximal half. Terminal scale of front tibia narrow and sharply pointed.

Terminal combs of middle and hind tibiae separated from each other and both with a long spur. LR1 2.42–2.48, LR2 0.61–0.63, LR3 0.71–0.73. Front tarsus V 0.37 times the length of front tibia. Tarsi with long beards, BR1 3.2, BR2 6.0, BR3 6.4. Pulvilli absent.

Hypopygium in Fig. 21-B. Base of anal point triangularly produced and bears several short setae. Anal point with a pair of strong lateral ridges, and 4–6 spine clusters between them (Fig. 21-C). Appendage 1 with a hook-like apical process, inner margin concave, bearing 3 or 4 lateral setae, 2 inner setae arising from triangularly produced bases, and a strong seta arising on a large process at the base of appendage 1-a; appendage 1-a long, parallel-sided and with rounded apex, extending much beyond inner margin of appendage 1 (Fig. 21-D). Appendage 2 rather stout, not apically expanded, with 8 recurved setae on dorsal side and 4 caudally directed straight setae on ventral side; 2-a short, bears several wide but simple setae directed inwards (Fig. 21-E). Gonostylus widest at about basal 1/3, with rather rounded apex.

Pupa: Length of abdomen 2.83–3.51 mm (3.14 mm in average of 6). Thoracic respiratory organs (Fig. 21-F) horn-like simple tube, widest near base and tapering towards apex, with sharply pointed apex, distal 3/4 thickly covered with fine hairs, length 672–840 microns (783 microns in average of 6 pairs), width about 60 microns. Distribution of spines, spinules and hairs on abdominal tergite I to V in Fig. 21-G, VI to IX in Fig. 21-H. Tergite II with a broad proximal spinose area (II-a), a pair of middle spinose area (II-c), all composed of small spines, and a caudal uniserial row of recurved spines (II-d), each about 15 microns long, the number varying from 51 to 114 according to the specimens (80.5 in average of 6). Tergites III to VI each with a pair of pineapple-shaped spine patches, each composed of a group of short spines (Fig. 21-J, III-a to VI-a). Tergites III to VI without other spinose areas, VII free from spines, VIII and IX with a pair of proximal spinulous areas. Lateral hairs are 3 pairs on abdominal segment II to VI, 4 pairs on VII, and 5 pairs on VIII, among which those on segments II to IV are all simple, short setae (s-type), and all those on V to VIII are long, filamentous hairs (L-type). Anal segment with two long, filamentous dorsal hairs, and 38–42 long, filamentous fringe hairs on each of anal fins.

Remarks: The present specimens are tentatively identified as *T. tamagotoi* Sasa, 1983, since body coloration, structure of wings and male hypopygium are almost identical to the type specimens collected from Stations B and D of the main stream of the River Tama, both relatively unpolluted parts in the upstream sites. However, differences were seen in the absence (in the present specimens) or presence (in type specimens) of frontal tubercles, antennal ratio (1.00–1.03 versus 0.83–0.87), and in the habitats (relatively polluted lake in the present specimens). The morphology of pupa is a new record to this species.

Note: 3 males also tentatively identified as *Tanytarsus tamagotoi* Sasa were collected on the shore of Lake Miike on 18 Nov. 1981. Body coloration largely yellow, body length 2.83–3.03 (2.91), wing length 1.76–1.79 (1.77). AR 1.04–1.10 (1.08), AHR 0.42–0.50 (0.46), ER 0.53–0.73 (0.62). so 8–11, cl 10, 12, 20, pn none, dm 4 or 6, dl 6, 7 or 8, sc 4 or 5. LR1 2.81–2.89 (2.85), LR2 0.56–0.58 (0.57), LR3 0.71–0.76 (0.74), TR 0.38 or 0.39; BR1 3.6–3.9, BR2 4.8–6.4, BR3 5.3–6.4.

These specimens differ from those collected from Lake Unagi in that they have small frontal tibercles (6 microns long and 4 microns wide, 60 microns apart from each other), and higher ratios of AR and LR1, all closer to that of the type specimens from River Tama. In the structure of hypopygium (Figs. 22-B–E), they differ from the type

specimens in that appendage 1-a is not parallel-sided but widest at base, curved, and abruptly narrowed at about middle.

23. *Tanytarsus oyamai* Sasa, 1979 (Figs. 22-G–J)

Tanytarsus oyamai; Sasa, 1979, p.3
Tanytarsus oyamai; Sasa, 1980, p.28

Collection records: 4 males and a female emerged from bottom samples collected 6 Feb. 1981 from Lake Unagi (Nos. A 78:81–84).

Male: Body length 2.55–3.21 mm (2.87 mm in average of 4), wing length 1.38–1.86 mm (1.61 mm). Body largely dark brown or brown, *i.e.* ground color of scutum brown, stripes black, scutellum dark brown, postnotum black, abdomen dark brown, legs brown, halteres brown. Head with a pair of prominent frontal tubercles. ER 0.64–0.67 (0.66). AR 1.00–1.31 (1.16). Antennal hairs long, AHR 0.54–0.65 (0.59). so 10–12 (11.5), cl 12–15 (14.0). Antepronotum without setae. Scutum with 6–10 (8.8) dorsomedians, 5–7 (6.1) dorsolaterals, and 1 pre-alar seta on each side. Scutellum with 4–6 (4.8) setae. LR1 1.67–1.83 (1.75), LR2 0.48–0.52 (0.49), LR3 0.61–0.64 (0.63). BR1 3.8–4.5 (4.2), BR2 4.0–4.6 (4.3), BR3 4.1–5.4 (4.8). Front tarsus V 0.30–0.31 times as long as front tibia. Terminal scale of front tibia long, narrow and sharply pointed. Terminal combs of middle and hind tibiae separated, both with a long spur. Pulvilli absent. Hypopygium in Figs. 22-G–J.

24. *Tanytarsus tamanonus* Sasa, 1980 (Figs. 22-K–P)

Tanytarsus tamanonus; Sasa, 1980, p.25

Collection records: 2 males, collected with insect net on the shore of Lake Unagi and Lake Ikeda, 16 Nov. 1981 (Slide Nos. A 78:89, 90).

Male: Body length 1.69, 2.03 mm, wing length 1.15, 1.22 mm. Body coloration largely brown, *i.e.* ground color of scutum yellow, stripes dark brown, scutellum yellow, postnotum dark brown, abdominal tergites brown, legs brown, halteres yellow. Head in Fig. 22-K. Frontal tubercles very large and wide, conical and contiguous in the middle. Eyes without dorsomedial projection, inner margin only slightly concave, ER extremely large as a Chironominae, 1.65, 1.63. Antenna with only 10 flagellar segments (13 in most other species), AR small, 0.61, 0.68. Antennal hairs short, AHR 0.43, 0.47. Supraorbital setae 7–9 on each side, clypeal setae 13 or 14. Antepronotum without setae, scutum with 14 or 15 dorsomedian setae, 8 or 9 dorsolateral setae on each side, 1 pre-alar seta on each side, scutellum with 4 or 8 setae. Squama bare. Wing membrane with a small number of macrotrichiae restricted to only on the distal half, and on a line between cell R 4+5 and M, and in cell between M and Cu1. LR1 1.76, LR2 0.46, LR3 0.52. BR1 3.3, BR2 5.6, BR3 6.5. Pulvilli vestigial.

The structure of hypopygium (Fig. 22-L) essentially the same as that describe and illustrated by Sasa (1980) with the type specimen collected from the River Tama. Anal point (Fig. 22-M) without lateral ridges and spine clusters, bands of ninth tergite united in the middle. Appendages 1, 1-a (Fig. 22-N), 2, 2-a (Fig. 22-P) same as in Figs. F, G, H of

Plate 27, Sasa, 1980, p.84.

Remarks: This species belongs to the genus *Tanytarsus* in wider sense, as wing with macrotrichiae, squama bare, r-m short and almost parallel to wing axis, combs of middle and hind tibiae separated and both with a long spur, and eyes bare. It is somewhat related to the subgenus *Cladotanytarsus* in that macrotrichiae of the wing are restricted to only the distal half and few in numbers, but setae on appendage 2-a are simple, and anal point without spine clusters (in *Cladotanytarsus*, setae on appendage 2-a are long, branched and lamellar, anal point with spine clusters). This species is most unusual in that male antenna is composed of only 10 flagellar segments and AR values are very small. It was described with a male collected at Station No. 3 of Minamiasakawa River, a rather polluted part of the stream.

25. *Micropsectra miikesecunda*, sp. nov. (Fig. 23)

Collection records: 10 males and 4 females, collected with insect net on the bank of Lake Miike, 18 Nov. 1981 (Nos. A 78:91–100); holotype; a male; paratypes; 9 males and 4 females.

Male: Body length 2.76–3.17 mm (2.97 mm in average of 10), wing length 1.62–1.90 mm (1.77 mm). Ground color of scutum greenish yellow, stripes reddish brown, scutellum yellow, postnotum dark brown, halteres yellow, abdomen greenish yellow, hypopygium brown; leg segments yellow.

Antenna with 13 flagellar segments as usual, AR 1.11–1.26 (1.14 in average of 10). Antennal hairs long, AHR 0.48–0.56 (0.51). Eyes with a conspicuous dorsomedial projection, ER 0.30–0.50 (0.39). Frontal tubercles (Fig. 23-A) small and nearly cylindrical, 15 microns long, 5 microns wide, and 55 microns apart from each other in the type specimen. Supraorbital setae 10–15 (most frequently 10, 11.5 in average), clypeal setae 19–23 (20.1). Antepronotum usually without lateral seta (1 on each side in one out of 10 specimens examined). Scutum with 13–20 (17.0) dorsomedian setae, 10–14 (most frequently 10, 10.8 in average) dorsolateral setae, and 1 or 2 pre-alar setae. Scutellar setae 5–7 (most frequently 6).

Wing in Fig. 23-C. Squama bare. Anal lobe very low. Wing membrane thickly covered with macrotrichiae, including basal portion. r-m nearly parallel to wing axis. R 1 and R 4+5 running closely, and R 2+3 hardly distinguishable. fCu much beyond r-m. Terminal scale of front tibia very short, narrow and sharply pointed (Fig. 23-M). Terminal combs of middle and hind tibiae contiguous, and both with a short spur (Fig. 23-G). LR1 1.76–1.96 (1.86), LR2 0.58–0.64 (0.61), LR3 0.67–0.72 (0.70). Tarsal beards relatively long, BR1 3.5–4.4 (4.0), BR2 4.6–6.8 (6.0), BR3 4.7–8.4 (6.2). Front tarsus V 0.26–0.29 (0.265) times as long as front tibia. Tarsus V of all legs with two sharply pointed and curved claws bearing basal hairs, with an empodium, but pulvilli are absent (Fig. 23-H).

Hypopygium in Fig. 23-I. Ninth tergite with a conically shaped dorsal lobe bearing 8–12 strong setae on the top, a pair of small, conical tubercles on posterior margin; and several short setae on both sides of anal point. Anal point short, widest at base and with rounded apex, with a pair of lens-shaped lateral ridges (Fig. 23-J). Appendage 1 roughly semi-circular in shape, 3 setae on almost straight inner margin, 3 setae on dorsal side, a seta on lateral margin, and a basal tubercle on ventral side bearing a long, stout, medially directed seta (Fig. 23-K). Appendage 1-a basally broad and tapering towards apex like

a horn, extending much beyond inner margin of appendage 1 (Fig. 23-L). Appendage 2 long and stout, only slightly expanded apically, bears 9 recurved setae on dorsal side and 3 or 4 caudally directed seta on ventral side of apical portion (Fig. 23-M). Appendage 2-a long, slender and curved, bears numerous simple setae on basal half and many spoon-shaped setae on apical portion, which extends beyond tip of appendage 2 (Fig. 23-N). Gonostylus slender, smoothly curved, widest at about middle, with two rows of simple setae along inner margin.

Female: Body length 2.21–2.41 mm (2.28 mm in average of 4), wing length 1.76–1.86 mm (1.82 mm). Coloration as in male. Head in Fig. 23-E. Antenna with 5 flagellar segments (not 4 segmented as in *T. unagisextus* or *T. unagiseptimus*). Frontal tubercles as in Fig. 23-B. Supraorbital setae 10–14 (most frequently 12), clypeal setae 22–31 (26.3). Antepronotum without lateral hairs. Scutum with 16–21 (18.8) dorsomedians, 14–22 (17.3) dorsolaterals and 1 or 2 pre-alars. Scutallar setae 5 in 1, 6 in 3 specimens. Squama bare, wing venation in Fig. 23-D, LR1 1.82–1.93 (1.88), LR2 0.59–0.61 (0.60), LR3 0.63–0.65 (0.64). BR1 3.3–5.6 (4.8), BR2 4.3–5.6 (5.0), BR3 5.0–6.0 (5.5). Front tarsus V 0.25–0.27 (0.26) times as long as front tibia. Spermathecae in Fig. 23-P, cercus in Fig. 23-Q.

Remarks: These specimens are considered as belonging to genus *Micropsectra* Kieffer, 1909, since the structure of wing veins is typical of Tanytarsini, terminal combs of posterior tibia contiguous and with two short spurs, appendage 1 with a basal tubercle bearing a long, medially directed seta, and appendate 2-a long, curved and bearing spoon-shaped setae in apical portion. However, the structure of appendages 1 and 1-a, shape of anal point and presence of dorsal lobe on ninth tergite, etc., are quite different from the previously known species of this genus reviewed by Reiss (1969), Saewedal (1976), and Pinder (1978).

#26. The *Orthocladius glabripennis* complex (Figs. 24, 25)

Dactylocladius glabripennis; Goetghebuer, 1921, p.84
Spaniotoma (Orthocladius) glabripennis; Edwards, 1929, p.345
Orthocladius glabripennis; Goetghebuer, 1937, p.45
Orthocladius glabripennis; Brundin, 1956, p. 99, described as a synonym of *Orthocladius (Pogonocladius) consobrinus* (Holmgren)
Orthocladius (sen. str.) *glabripennis*; Tokunaga, 1965, p.40
Orthocladius (Euorthocaldius) chuzeseptimus; Sasa, 1984, p.67

Collection records: A total of 65 males and 65 females emerged from two bottom samples collected from Lake Unagi, 6 Feb. 1981. 3 males and 4 females emerged also from a bottom sample from Lake Ikeda. All of them were dissected and mounted on slides. 13 pupal exuviae from the former, and 7 pupal exuviae from the latter lake were also examined (Slide Nos. A 80:1–30, 81:1–100, 82:1–23).

Male: Males of the specimens from Lake Unagi contained two forms, those with 10–16 scutellar setae arranged in a single transverse row (the single form), and those with 18–26 scutellar setae in double or triple rows (the double form). The former is almost identical with *Orthocladius (Orthocladius) glabripennis* (Goetghebuer) of various authors reported from Europe and Japan, while the latter is indistinguishable from *Orthocladius (Euorthocladius) chuzeseptimus* Sasa found in Lake Chuzenji of the Nikko National Park.

Furthermore, the two forms are contiguous in the variation of the number of scutellar setae, and no other definitive differences could be detected in the morphology and measurement data of male and pupa. The distribution of scutellar setae of the specimens from Lake Ikeda was all the latter type. Standard measurement data of the three populations in Table 2. The frequency distribution of the numbers of scutellar setae of 65 male specimens from Lake Unagi and Ikeda is: 3 specimens with 10 scutellar setae, 11 with 11–12, 18 with 13–14, 12 with 15–16, 3 with 17–18, 10 with 19–20, 3 with 21–22, 1 with 24, and 4 with 26.

Body coloration almost entirely dark brown to black, halteres brownish yellow (some specimens of the double form and those of Lake Ikeda are largely brown, paler than the single form). Eyes bare, with a relatively conspicuous dorsomedial projection, ER 0.90–1.16. Antenna with 13 flagellar segments, AR 1.83–2.27. Antennal hair long, AHR 0.55–0.68. Supraorbital setae 12–22, clypeal setae 16–26. Antepronotum with 6–12 lateral setae. Dorsomedian setae all minute, 8–16. Dorsolateral setae stout, all arising from a large pale pit, 8–20 on one side. Pre-alar setae 4–7. Scutal setae vary in numbers from 10–26 for the entire specimens, or may be grouped into the single form with 10–16, and the double form with 18–26 scutellar setae. Dorsal view of scutum and scutellum in Fig. 24-D (double form). Variation in the distribution of scutellar setae in Figs. 24-E (double form), F (intermediate form), G (single form). LR1 0.74–0.80. Tarsal beards moderate in length, BR1 2.1–3.0 (2.5 in average), BR2 2.4–4.0 (3.1), BR3 2.6–5.1 (4.0). Distribution of terminal spurs as in other *Orthocladius* species. Pulvilli absent. Wing membrane slightly brownish under transmitted light. Anal lobe strongly produced especially in male (Fig. 24-B). R2+3 separated from both R1 and R4+5, ending about midway between the two ends. Costa not extending beyond end of R4+5. fCu almost under fork of R. Cross vein r-m long and erect. Anal vein extending much beyond fCu.

Hypopygium in Fig. 24-H (a specimen of the single form). Anal point triangular, widest at base and with pointed apex (the *Orthocladius* type) in most specimens of the single form, such as in Fig. 24-K, but may be nearly parallel-sided and with rounded apex (the *Euorthocladius* type) in most specimens of the double form, as in Figs. 24-I, J. Inner lobe of gonocoxite composed of double blades (Figs. 24-H, L). Gonocoxite with a large, obtuse process on inner margin near base (Fig. 24-L). Gonostylus simple, as in Fig. 24-H.

Female: Body coloration slightly paler in general than in male, ground color of scutum brown, scutal stripes, scutellum and abdominal tergite dark brown, postnotum almost black. Head in Fig. 25-A. Antenna with 5 flagellar segments, 2nd to 4th segments almost globular. Scutellum with 12 to 16 setae nearly in a single row, or 18 to 26 setae in double rows, and the frequency distribution of the scutellar setae of 72 specimens emerged from Lake Unagi is: 1 specimen with 10 scutellar setae, 15 with 11–12, 18 with 13–14, 12 with 15–16, 8 with 17–18, 13 with 19–20, 4 with 22, and 1 with 26. Spermathecae in Fig. 25-B, cercus in Fig. 25-C. The specimens from Lake Ikeda are all paler in color, and with large numbers of scutellar setae in double rows, 20, 20, 22 and 23, respectively, in the four specimens available.

Pupa: A total of 14 pupal exuviae from Lake Unagi associated with the adults were dissected and studied for morphological structure. 7 pupal exuviae collected after emergence of the adults from Lake Ikeda were also studies. Length of abdomen of the former group 3.72–4.29 mm (3.93 mm in average of 14). Thoracic respiratory organ in Fig. 25-D, horn-like, widest at base and tapering towards apex, thickly covered with spinules all over, length 0.39–0.43 mm (0.41 mm in average of 14 pairs). Distribution of

Table 2 Comparison of the standard measurement data of the three populations of the *Orthocladius glabripennis* complex. (A. specimens with the scutellar setae in a single row from Lake Unagi; B. specimens with the scutellar setae in double rows from Lake Unagi; C. specimens from Lake Ikeda, all in double rows)

Population	A (single row)	B (double row)	C (Ikeda)
No. examined	9	9	4
BL (mm)	4.28–4.62 (4.42)	4.28–4.95 (4.40)	4.07–4.86 (4.36)
WL (mm)	2.52–2.93 (2.67)	2.58–2.70 (2.63)	2.66–3.07 (2.83)
AR	2.00–2.20 (2.09)	1.83–2.06 (1.98)	2.02–2.27 (2.20)
AHR	0.55–0.62 (0.60)	0.52–0.60 (0.56)	0.50–0.68 (0.59)
ER	0.90–1.11 (1.01)	0.99–1.16 (1.04)	0.95–1.13 (1.05)
so	12–22 (17.6)	14–18 (16.4)	16–20 (18.0)
cl	16–22 (18.9)	16–26 (22.5)	16–26 (21.0)
pn	6–9 (7.9)	8–12 (9.5)	8–10 (9.0)
dm	12–16 (13.3)	10–16 (12.9)	8–14 (12.0)
dl	8–20 (12.9)	10–18 (12.0)	9–11 (10.0)
pa	4–6 (5.1)	5–6 (5.3)	4–7 (5.2)
sc	10–15 (11.4)	18–21 (18.3)	18–24 (21.0)
sq	20–32 (24.6)	18–30 (22.1)	26–42 (33.2)
LR1	0.74–0.79 (0.77)	0.75–0.78 (0.76)	0.77–0.80 (0.78)
LR2	0.53–0.55 (0.54)	0.53–0.56 (0.55)	0.56–0.58 (0.57)
LR3	0.58–0.61 (0.60)	0.59–0.61 (0.60)	0.60–0.63 (0.61)
TR1	0.12–0.14 (0.13)	0.13–0.14 (0.13)	0.13–0.14 (0.13)
BR1	2.4–3.2 (2.6)	2.1–2.4 (2.3)	2.4–2.9 (2.7)
BR2	2.6–3.8 (3.2)	2.4–3.2 (2.8)	2.6–4.0 (3.4)
BR3	2.8–5.0 (3.9)	2.6–4.6 (3.6)	3.8–5.1 (4.5)

spines and hairs on abdominal tergites in Fig. 25-E. Tergite I without spines. II with a large central spine patch occupying the central part (II-a, b, c), and a caudal spine patch (II-d) composed of 48–104 (70.9±15.5 in average of 13) large recurved spines. Tergites III to VI covered with numerous spines in the central part, and III, IV and V with a caudal spine patch composed of recurved spines, which are smaller than those on II but more numerous in the numbers. Tergites VII, VIII and IX each with a large spinulous area, as in Fig. 25-E. Sternites IV, V, VI and VII with a pair of caudolateral whirl-like spinose areas. The numbers of pairs of lateral hairs are 2 in segment I, 3 in II to VI, 4 in VII and 5 in VIII, all narrow and simple, among which the middle pairs on II to VIII are longer than the first and the third pairs, and the 5th pair on VIII are long and somewhat broadened. Anal fins each with 3 rigid and curved terminal bristles with the length of 232–280 microns (258 microns in average, Fig. 25-K), and small spine groups at the base of inner terminal bristles (Fig. 25-L).

Remarks: The specimens of genus *Orthocladius* in wider sense collected from Lake Unagi include two morphological types, the single form with 10–16 scutellar setae arranged in a single transverse row, and the double form with 18–26 setae in double or triple rows. The shape of anal point is nearly triangular and with pointed apex in the former, and thus it is structurally typical of the subgenus *Orthocladius* s. str., while the anal point is sometimes narrow, parallel-sided and with rounded apex in the latter, representing characters of the subgenus *Euorthocladius* in the sense of Brundin (1956, p.55). The latter is morphologically almost identical with *Orthocladius (Euorthocladius) chuzeseptimus* Sasa, 1984, collected in the spring from Lake Chuzenji, an oligotrophic lake in high mountainous area in northern Kanto, while the former is closely related to *O. (O.) glabripennis* described by various authors from Europe, and also by Tokunaga (1965) in winter from a clean stream in Kyoto. It is however very confusing that the range of variation of the scutellar setae are continuous between the two forms in the present populations, and the shape of anal point is also rather variable. No definitive differences could be detected between the two forms in other parts of male and female, and also in the structure of pupa. Both forms are characterised in the shape of anal lobe of wings being strongly produced and the tarsal beards are relatively long, and thus typical of the subgenus *Pogonocladius* Brundin, 1956, into which he included *O. glabripennis* as a synonym of the type species, *O. (P.) consobrinus* (Holmgren). Later, Pinder & Cranston (1976) again separated *glabripennis* from *consobrinus* and placed the former into subgenus *Orthocladius* s. str.

The present specimens from Lake Unagi differ considerably from the European *glabripennis* in the body size (wing length 3.20–4.16 mm, mean 3.62 mm, according to Pinder & Cranston, 1976), in AR (2.5–3.0, mean 2.8), and in the number of dorsomedian setae (0–3, mean 1.4, in *glabripennis*). These authors state that its scutellum has single row of 14–23 (mean 18.3) bristles. *O. glabripennis* of Tokunaga (1965) has the wing length of 4–4.2 mm and AR of 2.83–2.86, both being much larger than in the present specimens and nearly the same as the European *glabripennis*.

The classification of this group of the chironomids by simple external morphology seems to be rather difficult and confusing. Sasa (1984, p.66) gave a key to male and pupa of 6 species of the Japanese *Orthocladius* s. str., in which *chuzeseptimus* was not included because it was dealt as a member of subgenus *Euorthocladius*. *O. yugashimaensis* Sasa, 1979, is also closely related to the present specimens in the structure of male, but the anal lobe of wing is less produced (Fig. 24-C). The structure of pupa of *yugashimaensis* is similar to that of the present specimens and to *chuzeseptimus* in that abdominal

tergite II with a large central spinose area, VIII with 5 pairs of lateral setae (described as 4 pairs in the text of Sasa, 1979, p.25, by mistake), thoracic respiratory organs with numerous spinules on almost entire length, and anal fins with spines at the base of terminal bristles.

#27. *Psectrocladius yunoquartus* Sasa, 1984

Psectrocladius yunoquartus; Sasa, 1984, p.69 (misprinted as *yunoduarts*)

Collection records: A total of 187 males and 104 females have emerged from samples collected at littoral zones of Lake Unagi, 6 Feb. 1981. 11 males, 3 females and 12 pupal exuviae among them were mounted and examined for morphological study (Nos. A 79:31–50).

Male: Body length 3.17–4.14 mm (3.55 mm in average of 9), wing length 1.93–2.21 mm (2.07 mm). Body coloration generally paler than in the coexisting *Orthocladius, i.e.* ground color of scutum yellow, scutal stripes brown, scutellum yellow, postnotum dark brown, abdominal tergites brown, leg segments yellowish brown, halteres yellow, wing unmarked. Antenna with 13 flagellar segments, AR 1.49–1.85 (1.67), AHR 0.48–0.59 (0.54). Eyes reniform, widely apart from each other, ER 1.23–1.52 (1.37). Antepronotum with 3–8 (5.1) lateral setae on each side, scutum without dorsomedian setae, with 9–12 (most frequently 12, average 10.8) dorsolateral setae, and 3–5 (most frequently 4) pre-alar setae. Scutellum with 3–7 (most frequently 4) setae. Squama with 17–42 (29.4) fringe hairs. Wing membrane bare, slightly brown. R2+3 separated from R1 and R4+5. fCu much beyond r-m. Cu2 only slightly curved. Anal vein extending much beyond fCu. LR1 0.72–0.75, LR2 0.46–0.51, LR3 0.54–0.61, TR1 0.12–0.14, BR1 2.0–2.3, BR2 2.3–2.7, BR3 3.1–3.9. Front tibia with a long terminal spur, middle tibia with only one terminal spur, hind tibia with a long terminal spur, a row of terminal comb spurs, and a group of spurs in the apical area. Tarsi I and II of middle and hind legs with two short terminal spurs. All legs with a pair of large pulvilli.

Hypopygium as illustrated by Sasa (1984, Fig. 65). Anal point long, slender, broadest at base and with rounded apex. Inner lobe of gonocoxite broad, forming a blunt inner angle.

The structure of adult female and pupa is same as described and illustrated by Sasa (1984).

Remarks: This is again a common species breeding in the littoral zones of Lake Unagi. The morphology of male, female and pupa is almost identical with that described as *Psectrocladius yunoquartus* by Sasa (1984) from Lake Yunoko of the Nikko National Park, Tochigi Prefecture.

#28. *Cricotopus sylvestris* (Fabricius, 1794)

Collection records: 10 males and 2 females were collected with insect net on the shore of Lake Unagi, 17 November, 1981. 4 males, 2 females and 6 pupal skin casts were reared from bottom samples collected 6 February 1981.

#29. *Cricotopus bicinctus* (Meigen, 1818)

Collection record: A male was collected with insect net on the shore of Lake Ikeda on 16 November 1981.

#30. *Paratrichocladius rufiventris* (Meigen, 1830)

Chironomus rufiventris; Meigen, 1830
Spaniotoma (Trichocladius) refiventris; Edwards, 1929, p.329
Trichocladius rufiventris; Goetghebuer, 1940, p.202
Paratrichocladius rufiventris; Hirvenoja, 1973, p.88
Paratrichocladius rufiventris; Sasa, 1979, p.34
Paratrichocladius rufiventris; Sasa, 1983, p.71

Materials studied: 6 males and 2 females were identified among adult chironomids collected with insect net on the shore of Lake Ikeda, 16 Nov. 1981 (Nos. A 79:21–26). They were morphologically identical with those collected from Tsukuba by Sasa (1979), and from the more polluted parts of the River Tama by Sasa (1983).

#31. *Limnophyes tamakitanaides* Sasa, 1981 (Figs. 26-A–E)

Limnophyes tamakitanaides; Sasa, 1981, p.97

Collection records: 10 males were found among adults collected with insect net on the shore of Lake Unagi, 16 Nov. 1981 (Nos. A 79:81–86). 3 males and 2 females were collected also on the shore of Lake Fudo, 17 Nov. 1981 (Nos. A 79:87–89).

Male: Body length 2.03–2.41 (2.13 in average 10) mm in the specimens from Unagi, 2.29–2.61 (2.47 in average of 3) mm in those from Fudo. Wing length 1.27–1.48 mm (1.38 mm) in the former, 1.50–1.57 mm (1.52 mm) in the latter. Coloration as in the type specimen, body largely dark brown or black, halteres and legs dark brown. Antenna with 13 flagellar segments, AR 0.80–1.02 (0.91 in average of 11). Antennal hairs long, AHR 0.44–0.61 (0.51). Eyes nearly half-egg shaped, inner margin almost straight, ER 1.30–1.84 (1.60). Inner supraorbital seta 1, outer supraorbital setae 3, 4 or 5 on each side. Clypeal setae 9–18 (14.0). Antepronotum with 2 dorsal setae and 2–6 (most frequently 4) lateral setae on each side. Scutum and scutellum in Fig. 26-C. Dorsomedian setae of scutum 6–9 (7.7), all minute and arising in the middle portion, the anterior area free from median setae. Dorsolateral setae 18–27, those arising in the anterior 2/3 portion are simple but those on the posterior 1/3 are mostly leaf-like and expanded in the middle (Fig. 26-D). Pre-alar setae 6–8 (7.3). Scutellum with 6 or 8 (6.6) setae in a single row.

Wing membrane coarsely granular. Squama with 3–6 (4.6) fringe setae. Wing venation in Fig. 26-A. R2+3 ending about midway between ends of R1 and R4+5. Cu2 strongly sinuate. LR1 0.52–0.57 (0.55), LR2 0.49–0.51 (0.50), LR3 0.51–0.56 (0.53). Tarsus V of front leg short, 0.11 or 0.12 times as long as front tibia. Tarsal hairs relatively short, BR1 2.1–2.8 (2.4), BR2 2.7–3.3 (3.0), BR3 2.9–4.1 (3.6). Pulvilli

absent.

Hypopygium in Fig. 26-E. Anal point absent, ninth tergite with a pair of lobes on posterior margin in the middle. Inner lobe of gonocoxite long, occupying about 2/3 of inner margin, and with rounded apex. Gonostylus rather simple, with a strong apical spur but without subapical spine such as seen in some other *Limnophyses* species.

Remarks: This species was described by a male and a female emerged from a bottom sample collected at Station No. 6 of Minamiasakawa River, the highly polluted part of the stream. The present specimens were collected from the two rather polluted lakes in southern Kyushu.

#32. *Smittia aterrima* (Meigen, 1818) (Figs. 26-F–M)

Chironomus aterrimus; Meigen, 1818
Smittia (Smittia) aterrima; Edwards, 1929, p.360
Smittia aterrima; Goetghebuer, 1937, p.86
Spaniotoma (Smittia) aterrima; Tokunaga, 1940, p.289
Smittia aterrima; Pinder 1978, p.96

Collection records: A male was found among adult specimens collected on the shore of each of the three lakes, Unagi, Ikeda and Miike, on 16–18 Nov. 1981.

Male: Body length 2.83, 2.76, 2.55 mm, wing length 1.72, 1.90, 1.66 mm. Eyes reniform, highly pubescent, ER 1.15, 1.05, 1.24. Head in Fig. 26-G. Antenna with 13 flagellar segments, AR 1.80, 1.81, 1.70, last segment with a strong terminal seta (Fig. 26-H). Antennal hairs long, AHR 0.58, 0.61, 0.63. Supraorbital setae 11, 10; 8, 8; 8, 8. Clypeal setae 8, 10, 10. Body almost entirely black or dark brown, wing unmarked, halteres dark brown, leg segments dark brown, abdominal tergites dark brown. Antepronotum with 2 or 3 lateral setae on each side. Dorsomedian setae 12, 16, 10. Dorsolateral setae 11, 11; 12, 13; 8, 8. Pre-alar setae 4, 4; 4, 4; 3, 3. Scutal setae 8, 8, 6. Squama bare. Wing membrane bare, smooth, slightly brownish in transmitted light. Wing venation in Fig. 26-F. R2+3 separated from both R1 and R4+5, ending about middle of both ends. Costa extending much beyond end of R4+5. Cu1 ending proximal to end of R4+5. Cu2 strongly sinuate. Anal vein extending beyond fCu. LR1 0.54–0.56, LR2 0.47–0.49, LR3 0.59–0.62. Front tarsus V 0.12 times as long as front tibia. Tarsi with relatively long beards, BR1 2.9–3.8, BR2 3.5–4.0, BR3 4.4–10.5. Front tibia with a long terminal spur (57 microns; Fig. 26-J), middle tibia with two short spurs (24, 21 microns; Fig. 26-K), hind tibia with a long terminal spur (57 microns), a short terminal spur (25 microns), and a terminal comb composed of 12 free spurs 28–43 microns long (Fig. 26-L). Pulvilli absent, empodium well developed, claws with a strong basal seta, and apically forked into 4 teeth (Fig. 26-M).

Hypopygium in Fig. 26-N. Ninth tergite without central setae, and with a short, narrow and almost transparent anal point covered almost entirely with microtrichiae. Inner lobe of gonocoxite small, conical and with a few short setae dorsally. Gonostylus with a strong apical spur, and a conspicuous subapical expansion occupying about 1/3 of inner margin of gonostylus.

Remarks: The present specimens belong to Group B of subgenus *Smittia* of Edwards (1929, p.358), since anal vein reaching beyond fCu and curved down at tip but not reaching wing margin, and body being all black. Among the European species

described by this author, the present specimens fall in *S. aterrima* (Meigen), as eyes are finely and densely pubescent, lobe of wing right-angled, gonostylus with a large subapical expansion, and AR between 1.5–2.0. This species was described also by Goetghebuer (1937) and Pinder (1978) from Europe, and Tokunaga (1940) recorded it from Omu, Kitami, Hokkaido. The present specimens agree in structure and body coloration with these descriptions, excepting that in those of Tokunaga anal point is bare and legs without beards.

#33. *Parakiefferiella bathophila* (Kieffer, 1912) (Figs. 27, 28)

Dactylocladius bathophilus; Kieffer, 1912, p.88
Spaniotoma (Smittia) cheethami; Edwards, 1929, p.359
Parakiefferiella bathophila; Goetghebuer, 1937, p.123
Parakiefferiella bathophila; Brundin, 1956, p.148
Parakiefferiella bathophila; Pinder, 1978, p.92

Collection records: 5 males and 2 females emerged from bottom sediments of Lake Unagi collected 6 Feb. 1981. 7 pupal exuviae were also recovered, among which one contained a dead male adult of this species (Nos. 79:71–79).

Male: Body length 2.03–2.14 mm (2.11 mm in average of 4), wing length 1.38–1.48 mm (1.43 mm). Body coloration peculiar to this species, *i.e.* thorax largely black but abdomen yellow; ground color of scutum brown, scutal stripes black, scutellum dark brown, postnotum black, halteres yellowish brown, leg segments brownish yellow, abdominal tergites yellow, hypopygium brown. Head in Fig. 27-A. Eyes bare, reniform, inner margin only slightly concave, ER large, 1.41–1.60 (1.54). Antenna with 13 flagellar segments, AR 0.71–0.85 (0.78 in average of 3) last antennal segment slightly expanded apically, bears more than 20 sensory setae near apex. AHR 0.39–0.44. Palp 4 segmented. Supraorbital setae 4 on both sides, clypeal setae only 5 or 6. Antepronotum well developed and fused in the middle, with 1, 2 or 3 lateral setae on each side (Fig. 27-D). Thorax in Fig. 27-E. Scutum without dorsomedian setae, with 4–8 (most frequently 6, 5.9 in average) dorsolateral setae, and 3 or 4 pre-alar setae on each side. Wing unmarked, microtrichiae hardly visible even under high magnification. Squama without bristles. Wing venation in Fig. 27-C. R2+3 separated both from R1 and R4+5, ending closer to tip of the latter than to tip of the former. Costa extending beyond tip of R 4+5. fCu slightly beyond r-m. Cu2 moderately curved. Anal vein extending much beyond fCu. Anal lobe obtuse. Leg segments very long and slender. LR1 0.55–0.56, LR2 0.49–0.51, LR3 0.54–0.55. Tip of front tibia with a long terminal spur (41 microns, Fig. 27-G), middle tibia with two short terminal spurs (15 and 16 microns; Fig. 27-H), hind tibia with a long terminal spur (37 microns), a short terminal spur (14 microns), and a terminal comb composed of 10 free spurs 22–30 microns long (Figs. 27-I, J). Tarsus V with a pair of apically forked claws, an empodium, but without pupvilli (Fig. 27-K).

Hypopygium in Figs. 27-L, M. Ninth tergite with a small, triangular, nude anal point and 6 short bristles near its base. Inner lobe of gonostylus large and with rounded inner margin, and with 10 long setae arising along inner margin. Gonostylus simple and without subapical tooth.

Female: Body coloration generally paler than in male, *i.e.* ground color of scutum yellow, scutal stripes dark brown, scutellum brown, postnotum dark brown, abdominal

tergites yellowish brown, leg segments yellowish brown. Head in Fig. 27-B. Eyes small, reniform, widely apart from each other, ER 1.16, 1.27. Supraorbital setae 4 on each side, clypeal setae 7 or 8. Spermathecae two, both almost globular, darkly pigmented, 45X48 microns, 42X48 microns (Fig. 27-H). Cercus long, ear-shaped, with a conspicuous middle contriction (Fig. 27-P).

Pupa: Length of abdomen 1.76–2.14 mm (1.93 mm in average of 7). Thoracic respiratory organs small, almost globular and with spines sparsely distributed on apical portion, the size varying from 76X48 microns to 90X64 microns. (Figs. 28-A, B, C). Distribution of spines and spinules on abdominal tergites in Figs. 28-D, C. Tergite I without spines. II with a proximal band of small spines (II-a), middle band of further smaller spines (II-c), and a caudal band of large, recurved spines in multiple rows (II-d), all separated from each other (Fig. 28-F). Tergites III and IV with three bands of spines of similar constitution (Figs. 28-G, H). Tergite V with a proximal spine patch (V-a), a distal spine patch (V-c), and a few spine groups between them (V-b), but without caudal band of recurved spines (Fig. 28-I). Tergite VI with a pair of proximal spine patches (VI-a), a central spine patch composed of some 10 large spines (VI-b), and a pair of caudal spine patch each with about 10 large spines (VI-c), as in Fig. 28-C. Sternites IV, V, VI and VII with a pair of spine patches directed orally (Fig. 28-K; IV-w, V-w, VI-w and VII-w). Abdominal segments II to VIII all with 4 pairs of lateral hairs, all relatively short and simple. Anal segment with a pair of genital sheaths, and a pair of anal fins with pointed apex, each bearing 3 strong and curved bristles in subapical position, with lengths varying from 60 to 79 microns (Fig. 28-E).

Remarks: The present specimens are considered as belonging to the genus *Parakiefferiella* Thienemann as redefined by Brundin (1956), since in the males the eyes being bare and small, antenna with 13 flagellar segments, its last segment enlarged apically and with numerous sensory setae but without apical spur, antepronotum well developed but with only a few lateral setae, scutum without dorsomedians and with only 6–8 dorsolaterals, scutellum with 4–6 setae, squama bare, anal lobe of wing obtuse, R2+3 separated from R1 and R4+5 but ending closer to end of the latter, costa extending beyond end of R4+5, tip of Cu1 much beyond tip of R4+5, Cu2 moderately curved, anal vein extending beyond fCu, terminal spurs of tibiae normally distributed, pulvilli absent, anal point short and triangular, and gonocoxite with a single inner lobe. Among the known species of this genus, the present specimens are closest to *bathophila* Kieffer in that AR being about 0.8, Cu2 only moderately curved, inner lobe of gonostylus large and with rounded margin, and anal point being short, triangular and pointed apically. According to Edwards (1929, p.359), body coloration of *cheethami* is also similar to that of the present specimens, thorax slightly shining with brownish yellow ground color, scutal stripes blackish, postnotum black, and abdomen brownish (yellow in the present specimens). In pupa, the present specimens also fit to *P. bathophila* of Brundin (1956, p.153), in that thoracic respiratory organs cube-like and with spinules on distal half, anal fin with 3 strong and curved bristles which extend much beyond its tip, but differ from it in that abdominal tergite VI has a central spine patch which is absent in the European *bathophila.*

The present species is also similar in the structure of male and pupa to *Parakiefferiella tamatriangulatus* recorded from the upstream parts of the River Tama by Sasa (1981b, 1983b), but differs from it most remarkably in the absence of the peculiar spine patch in the center of scutum of adults, in the shape of anal point and inner lobe of gonocoxite of male hypopygium, and in the distribution of spines on abdominal tergites

of pupa, especially in the presence of a large spine patch in the center of tergite VI.

#34. *Tsudayusurika fudosecunda*, gen. & sp. nov. (Figs. 27–29)

Collection records: 15 males and 4 females collected with insect net on the shore of Lake Fudo, 17 and 18 Nov. 1981. Holotype: male, No. A 79:51. Paratypes: 14 males and 4 females, A 79:52–68.

Male: Body length 3.41–3.81 mm (3.63 mm in average of 10), wing length 2.22–2.59 mm (2.47 mm). Body coloration almost entirely dark brown to black, *i.e.* ground color of scutum dark brown, scutal stripes black, scutellum dark brown, postnotum black, abdominal tergites dark brown, halteres brown, leg segments brown to dark brown, wing unmarked and colorless. Head in Fig. 29-A. Eyes bare, with a rather conspicuous dorsomedial projection, ER 0.77–1.07 (0.95 in average of 10). Antenna with 13 flagellar segments, AR 1.26–1.48 (1.37 in 10). Antennal hairs well developed, AHR 0.51–0.60 (0.55). Supraorbital setae 4–7 (most frequently 6), clypeal setae small in numbers, 2, 3 or 4. Antepronotum well developed, with 2–4 (most frequently 3) lateral setae on each side. Scutum with 7–10 very short dorsomedian setae (7.9 in average, most frequently 8), 5–8 dorsolateral setae (most frequently 7) on each side, and 4–6 (usually 5) pre-alar setae. Scutellum with 6–8 (most frequently 6) setae (Fig. 29-F). Squama bare (one specimen has a single seta on one wing squama, No. 79–56). Wing membrane thickly covered with microtrichiae and appears granular, such as in that of *Limnophyes* spp. Wing venation in Fig. 29-D. R2+3 separated from both R1 and R4+5, ending about midway between ends of the latter two veins. Costa extending much beyond end of R4+5, which is located distal of end of Cu1. fCu almost under r-m. Cu2 conspicuously sinuate. Anal vein extending beyond fCu. Leg segments all relatively long and slender. LR1 0.72–0.76 (0.74), LR2 0.58–0.62 (0.60), LR3 0.59–0.63 (0.61) all relatively high as a member of Orthocladiinae, Metriocnemini. Front tibia with a long terminal spur (68 microns), middle tibia with two short terminal spurs (17, 23 microns, Fig. 29-H), hind tibia with a long terminal spur, a short terminal spur, and a terminal comb composed of some 8 free spurs (Figs. 29-K, L). Tarsi I and II of middle and hind legs also with two short spurs (Figs. 29-I, J), but the other tarsal segments of all legs without terminal spurs. All legs with a pair of apically forked claws, and an empodium, but pulvilli are absent. All femora with a darkly pigmented apical ridge.

Hypopygium in Fig. 29-M. Ninth tergite with rounded posterior margin and with several pairs of short bristles in the middle but anal point absent. Inner lobe of gonocoxite semiglobular, thickened and darkly pigmented. Gonostylus simple, with a strong apical spur but subapical tooth absent.

Female: The most striking feature of female of this species is the structure of antenna, which is composed of 10 flagellar segments, as in Fig. 29-C. Body coloration generally paler or more yellowish than in male. Spermathecae in Fig. 29-N, cercus in Fig. 29-P.

Tsudayusurika, new genus

A member of tribe Metriocnemini of the subfamily Orthocladiinae. Type species: *Tsudayusurika fudosecunda*, sp. nov., monotypic. Characterised by that wing, eyes, squama all bare, wing vein Cu2 strongly sinuate, costa beyond end of R4+5, anal vein

extending beyond fCu, antenna without apical spur, and AR being larger than 1.2. This is most closely related to the genus *Bryophaenocladius* among the previously known groups, but differs from the members of this genus in that anal point is absent, and female antenna is composed of as many as 10 flagellar segments. All the species of *Bryophaenocladius* known from Europe have a large anal point in male hypopygium, and female antenna is composed of 4 flagellar segments as usual. According to Brundin (1956, p.129), the larval habitat of this genus is all terrestial.

EXPLANATION OF FIGURES

Fig. 1 ***Chironomus acerbiphilus*** **Tokunaga**

Adult: **A.** head, male. **B.** head, female. **C.** frontal tubercles, male. **D.** do, female. **E.** scutum and scutellum, male. **F.** tip of front tibia. **G.** tip of middle tibia. **H.** tip of hind tibia, male. **I.** male hypopygium, left half. **J.** right dorsal appendage. **K.** spermathecae, female. **L.** cercus, female.

Fig. 2 ***Chironomus acerbiphilus*** **Tokunaga**

Pupa: **A.** abdominal tergites I–VI. **B.** do, VII to IX. **C.** spines on abdominal segments. **D.** caudolateral scale of segment VIII, right side. **E.** do, left side, and bases of lateral hairs.

Fig. 3 ***Chironomus acerbiphilus*** **Tokunaga**

Larva: **A.** labrum and epipharynx. **B.** mandible. **C.** premandible. **D.** antenna. **E.** labial plate. **F.** paralabial plate. **G.** maxilla. **H.** claws on anterior pseudopod. **I.** anal segments, dorsal view. **J.** anal segments, lateral view. **K.** claws on posterior pseudopod .

Fig. 4 ***Chironomus (Einfeldia) dissidens*** **Walker**

Adult and **larva**: **A.** frontal tubercles, male. **B.** do, female. **C.** scutum and scutellum, male. **D.** tip of front tibia. **E.** tip of middle tibia, male. **F.** middle tarsus V, female. **G.** male hypopygium. **H.** dorsal appendage. **I.** ventral appendage, dorsal view. **J.** female cercus. **K.** labrum, epipharynx and premandible, larva. **L.** mandible and antenna, ventral view. **M.** mandible, dorsal view. **N.** labial plate, and paralabial plate. **P.** various types of claws on anterior pseudopod. **Q.** base of preanal hair tuft. **R.** claws on posterior pseudopod.

Fig. 5 ***Chironomus (Einfeldia) dissidens*** **Walker**

Pupa: **A.** abdominal tergites I to VI. **B.** do, VII to IX. **C.** median process of abdominal sternite VIII, and its caudolateral corner. **D.** anal segment, right half. **E.** spines on abdominal tergites I to VI. **F.** spinules on tergites VII and VIII. **G.** spines on caudolateral corners of sternites IV and V.

Fig. 6 ***Dicrotendipes flexus*** **(Johannsen)**

Adult: **A.** wing, male and female. **B.** frontal tubercles, male. **C.** do, female. **D.** antenna, female. **E.** scutum and scutellum, male. **F.** tip of front tibia, male. **G.** tip of middle tibia, male. **H.** tip of hind tibia. **I.** male hypopygium, dorsal view. **J.** do, ventral view. **K.** dorsal appendage, ventral view. **L.** ventral appendage, dorsal view. **M.** female spermathecae. **N.** cercus.

Fig. 7 ***Stenochironomus membranifer*** **Yamamoto**

Male: **A.** head. **B.** wing. **C.** scutum and scutellum. **D.** tip of front tibia. **E.** tip of middle tibia. **F.** tip of hind tibia. **G.** hypopygium. **H.** anal point and posterior margin of ninth tergite, ventral view. **I.** dorsal appendage. **J.** ventral appendage.

Fig. 8 *Harnischia viridula* (Linnaeus)

Adult: **A.** wing, male and female. **B.** frontal tubercles, male and female. **C.** female antenna. **D.** tip of front tibia. **E.** tip of middle tibia. **F.** tip of hind tibia. **G.** front tarsus V. **H.** male hypopygium, dorsal view. **I.** hypopygium, ventral view. **J.** posterior portion of ninth tergite, dorsal appendage, and anal point, lateral view. **K.** various types of dorsal appendages.

Fig. 9 *Harnischia viridula* (Linnaeus)

Adult female and **Pupa:** **A.** tip of middle tibia, female. **B.** spermathecae. **C.** cercus. **D.** abdominal tergites I to V, pupa. **E.** do, VI to IX. **F.** spines on abdominal tergites. **G.** caudolateral spines on sternites IV, V and VI. **H.** caudolateral scales of segment VIII.

Fig. 10 *Paracladopelma camptolabis* Kieffer

Male: **A.** head. **B.** frontal tubercles, and inner margin of right eye. **C.** antepronotum. **D.** scutum and scutellum. **E.** wing. **F.** tip of front tibia. **G.** tip of middle tibia. **H.** tip of hind tibia. **I.** hypopygium, dorsal view. **J.** do, ventral view.

Fig. 11 *Stictochironomus akizukii* (Tokunaga)

Adult: **A.** antenna, female. **B.** scutum and scutellum, male. **C.** tip of front tibia, male. **D.** tip of middle tibia, male. **E.** tip of hind tibia, male. **F.** front tarsus V, male. **G.** male hypopygium. **H.** dorsal appendage. **I.** ventral appendage, dorsal view. **J.** left gonostylus. **K.** female spermathecae. **L.** female cercus.

Fig. 12 *Pentapedilum sordens* (van der Wulp)

Male: **A.** head. **B.** wing. **C.** tip of front tibia. **D.** tip of middle tibia. **E.** tip of hind tibia. **F.** front tarsus V. **G.** eighth tergite and hypopygium. **H.** ventral appendage, dorsal view. **I.** do, ventral view. **J-N.** variations in the structure of dorsal appendages.

Fig. 13 *Pentapedilum*, sp. "unagitertium"

Male: **A.** wing. **B.** tip of front tibia. **C.** tip of middle tibia. **D.** tip of hind tibia. **E.** hypopygium and 8th tergite. **F.** dorsal appendage. **G.** ventral appendage.

Polypedilum unagiquartum, n. sp.

Male: **H.** wing. **I.** tip of front tibia. **J.** tip of hind tibia. **K.** tip of middle tibia. **L.** hypopygium. **M.** dorsal appendage. **N.** ventral appendage.

Fig. 14 *Polypedilum cultellatum* Goetghebuer

Male: **A.** head. **B.** wing. **C.** tip of front tibia. **D.** tip of middle tibia. **E.** tip of hind tibia. **F.** scutum and scutellum. **G.** hypopygium. **H.** dorsal appendage. **I.** ventral appendage.

Fig. 15 *Popypedilum cultellatum* Goetghebuer

Pupa: **A.** left and right thoracic respiratory organs. **B.** abdominal tergites I–V. **C.** do, VI–IX. **D.** spines on abdominal tergite II, a to d. **E.** do, on tergite III. **F.** do, on tergite IV. **G.** do, on tergite V. **H.** do, on tergite VI. **I.** spinules on tergite VII. **J.** do, on tergite VIII. **K.** caudolateral scales on segment VIII, left and right.

Fig. 16 *Polypedilum masudai* **(Tokunaga)**

Adult: **A.** wing, male. **B.** wing, female. **C.** coloration of legs, male. **D.** scutum and scutellum, female. **E.** tip of front tibia, male. **F.** front tarsus V, male. **G.** male hypopygium. **H.** left dorsal appendage, dorsal view. **I.** inner marins of gonocoxite, and ventral appendages. **J.** female spermathecae. **K.** female cercus.

Fig. 17 *Nilothauma brayi* **(Goetghebuer)**

Male: **A.** head. **B.** tip of front tibia. **C.** tip of middle tibia. **D.** tip of hind tibia. **E.** middle tarsus V. **F.** hypopygium, lateral view (a: dorsal process of ninth tergite. b: ventral process of ninth tergite. c: anal point. d: dorsal appendage. e: right gonostylus. f: ventral appendage. g: left gonostylus). **G.** wing.

Tanytarsus unagisextus, **sp. nov.**

Male: **H.** tip of front tibia. **I.** tip of hind tibia. **J.** front tarsus V. **K.** hypopygium. **L.** appendages 1 and 1-a, dorsal view. **M.** appendages 2 and 2-a, dorsal view.

Fig. 18 *Tanytarsus unagisextus* **sp. nov.**

Adult and **pupa**: **A.** wing, female. **B.** wing, male. **C.** spermahecae, female. **D.** cercus, female. **E.** thoracic respiratory organ, pupa. **F.** abdominal tergites I to V, pupa. **G.** do, VI to IX. **H.** spines on tergites II to VI. **I.** caudolateral scale of segment VIII. **J.** *anal segment, pupa, fringe hairs and dorsal hairs are shown only by their bases.*

Fig. 19 *Tanytarsus unagiseptimus*, **sp. nov.**

Adult: **A.** head, male. **B.** head, female. **C.** wing, male. **D.** wing, female. **E.** tip of front tibia, male. **F.** tip of middle tibia, male. **G.** tip of hind tibia, male. **H.** middle tarsus V, male. **I.** hypopygium, male. **J.** anal point. **K.** appendage 1, dorsal view. **L.** do, ventral view. **M.** appendages 2 and 2-a, dorsal view.

Fig. 20 *Tanytarsus unagiseptimus*, **sp. nov.**

Female and **pupa**: **A.** female spermathecae. **B.** female cercus. **C.** thoracic respiratory organ, pupa. **D.** abdominal tergites I–V, pupa. **E.** do, VI–IX. **F.** spinose areas of tergite II. **G.** spine patches on tergites III to VI, and spinulous area of tergite VIII. **H.** caudolateral scale of segment VIII, and proximal part of anal segment, dorsal view. **I.** *caudolateral scale of segment VIII, ventral view.*

Fig. 21 *Tanytarsus tamagotoi* **Sasa, 1983**

Male and **pupa**: **A.** wing. **B.** hypopygium. **C.** appendage 1 and 1-a, dorsal view. **D.** appendages 2 and 2-a, dorsal view. **E.** pupal thoracic respiratory organ. **F.** abdominal tergites I to V. **G.** do, VI to IX. **H.** spines on tergite II (II-a, II-c, II-d). **I.** spine patches on tergites III to VI. **J.** caudolateral scale of segment VIII, and bases of lateral hairs.

Fig. 22 *Tanytarsus unagisextus*, **sp. nov.** **A.** head, female.

Tanytarsus tamagotoi **Sasa**, "Miike-form." **B.** male hypopygium. **C.** appendages 2 and 2-a. **D.** appendages 1 and 1-a, dorsal view. **E.** do, ventral view. **F.** anal point;

Tanytarsus oyamai **Sasa.** **G.** male hypopygium. **H.** appendages 2 and 2-a. **I.** appendages 1 and 1-a, ventral view. **J.** do, dorsal view.

Tanytarsus tamanonus **Sasa. Male**: **K.** head, male. **L.** hypopygium.

M. anal point. **N.** appendages 1 and 1-a, dorsal view. **P.** appendages 2 and 2-a, dorsal view.

Fig. 23 *Micropsectra miikesecunda,* **sp. nov.**

Adult: **A.** frontal tubercles and inner margin of eye, female. **B.** do, male. **C.** head, female. **D.** wing, male. **E.** wing, female. **F.** tip of front tibia. **G.** tip of hind tibia. **H.** front tarsus V. **I.** male hypopygium. **J.** anal point and caudal portion of ninth tergite. **K.** appendages 1 and 1-a, dorsal view. **L.** do, ventral view. **M.** appendages 2 and 2-a, dorsal view. **N.** do, ventral view (setae removed excepting 3 ventral ones). **P.** female spermathecae. **Q.** female cercus.

Fig. 24 **The *Orthocladius glabripennis* complex**

Adult: **A.** wing, female. **B.** wing, male. **C.** wing of *Orthocladius yugashimaensis* Sasa, male, showing difference in the shape of anal lobe. **D.** scutum and scutellum, male. **E, F, G.** variation in the distribution of scutellar setae. **H.** male hypopygium. **I, J, K.** variation of structure of anal point. **L.** ventral view of inner margin of gonocoxite, and its inner lobe.

Fig. 25 **The *Orthocladius glabripennis* complex**

Female and pupa: **A.** head, **B.** spermathecae, **C.** cercus, adult female. **D.** thoracic respiratory organ, pupa. **E.** dorsal view of abdominal tergites. **F.** spines on tergite II. **G.** spines on tergite III. **H.** spinules of tergite VIII. **I.** spinules on tergite IX. **J.** caudolateral spine patch on sternite IV (IV-w). **K.** abdominal segment VIII and IX. **L.** spines on bases of terminal setae of anal fins.

Fig. 26 ***Limnophyes tamakitanaides* Sasa**

Adult: **A.** wing, male. **B.** wing, female. **C.** scutum and scutellum, male. **D.** dorsolateral hairs of scutum. **E.** hypopygium.

Smittia aterrima **(Meigen). Male.** **F.** wing. **G.** head. **H.** tip of antenna. **I.** scutum and scutellum. **J.** tip of front tibia. **K.** tip of middle tibia. **L.** tip of hind tibia. **M.** front tarsus V. **N.** hypopygium.

Fig. 27 ***Tsudayusurika fudosecunda,* n.g., n. sp.**

Adult: **A.** head, male. **B.** head, female. **C.** wing, male. **D.** antepronotum, male. **E.** scutum and scutellum, male. **F.** scutum and scutellum, female. **G.** tip of front tibia. **H.** tip of middle tibia. **I, J.** tip of hind tibia. **K.** hind tarsi IV and V, male. **L.** male hypopygium, ventral view. **M.** do, dorsal view. **N.** spermathecae, **P.** cercus, female.

Fig. 28 ***Tsudayusurika fudosecunda,* n.g., n. sp.**

Pupa: **A, B, C.** thoracic respiratory organs from 3 specimens. **D.** abdominal tergites I to VII. **E.** do, VII and IX. **F.** spines on tergite II. **G.** do, on III. **H.** do, on IV. **I.** do, on V. **J.** do, on VI. **K.** caudolateral spine patches on sternites IV, V, VI and VII.

Fig. 29 ***Tsudayusurika fudosecunda,* n.g., n.sp.**

Adult: **A.** male, head. **B.** tip of male antenna. **C.** head, female. **D.** wing, male. **E.** antepronotum, male. **F.** scutum and scutellum, male. **G.** tip of front tibia. **H.** tip of middle tibia. **I.** tip of middle tarsus I. **J.** tip of middle tarsus II. **K, L.** tip

of hind tibia, male. **M.** hypopygium. **N.** spermathecae, female. **P.** cercus, female.

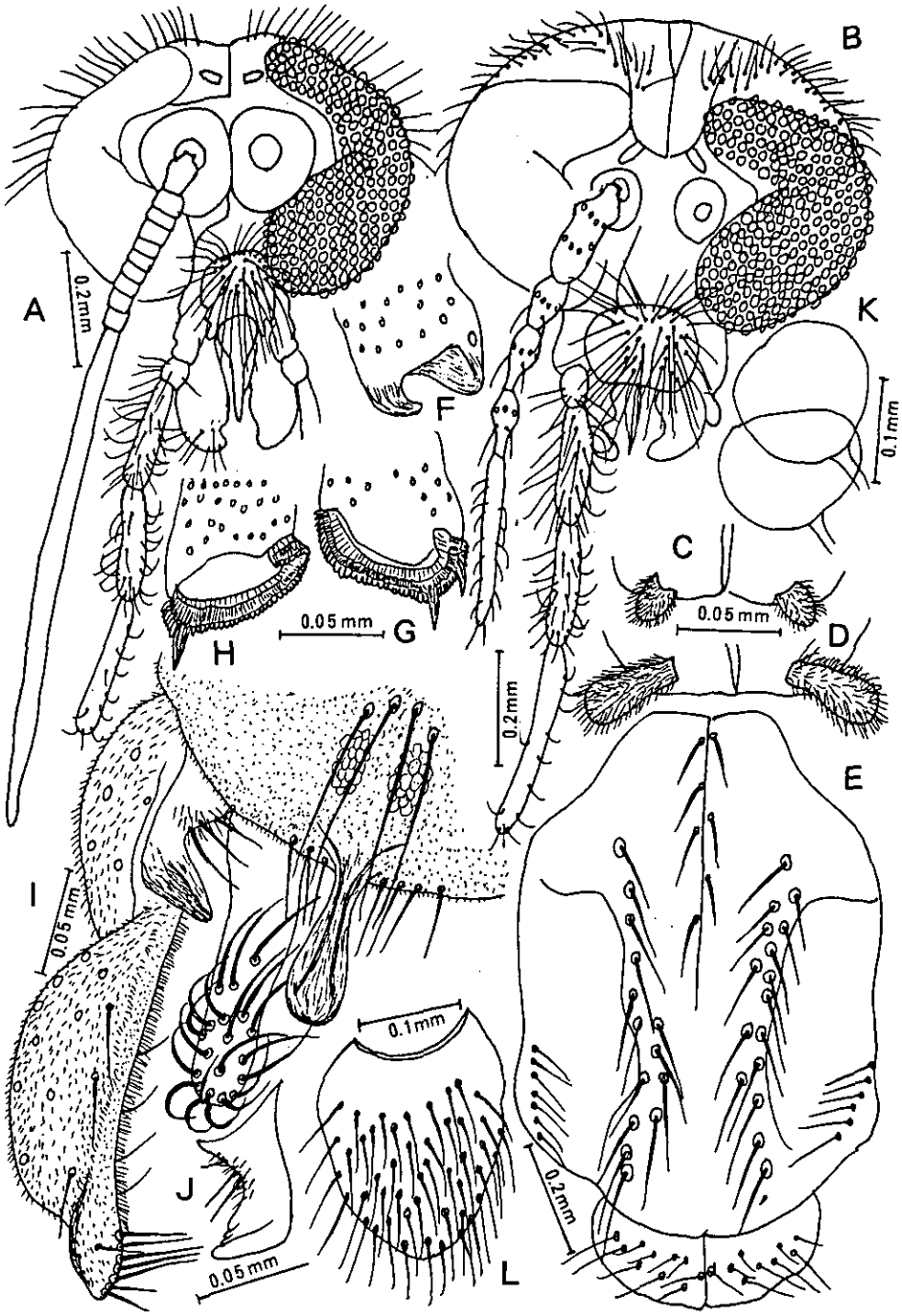

Fig. 1 *Chironomus acerbiphilus* Tokunaga

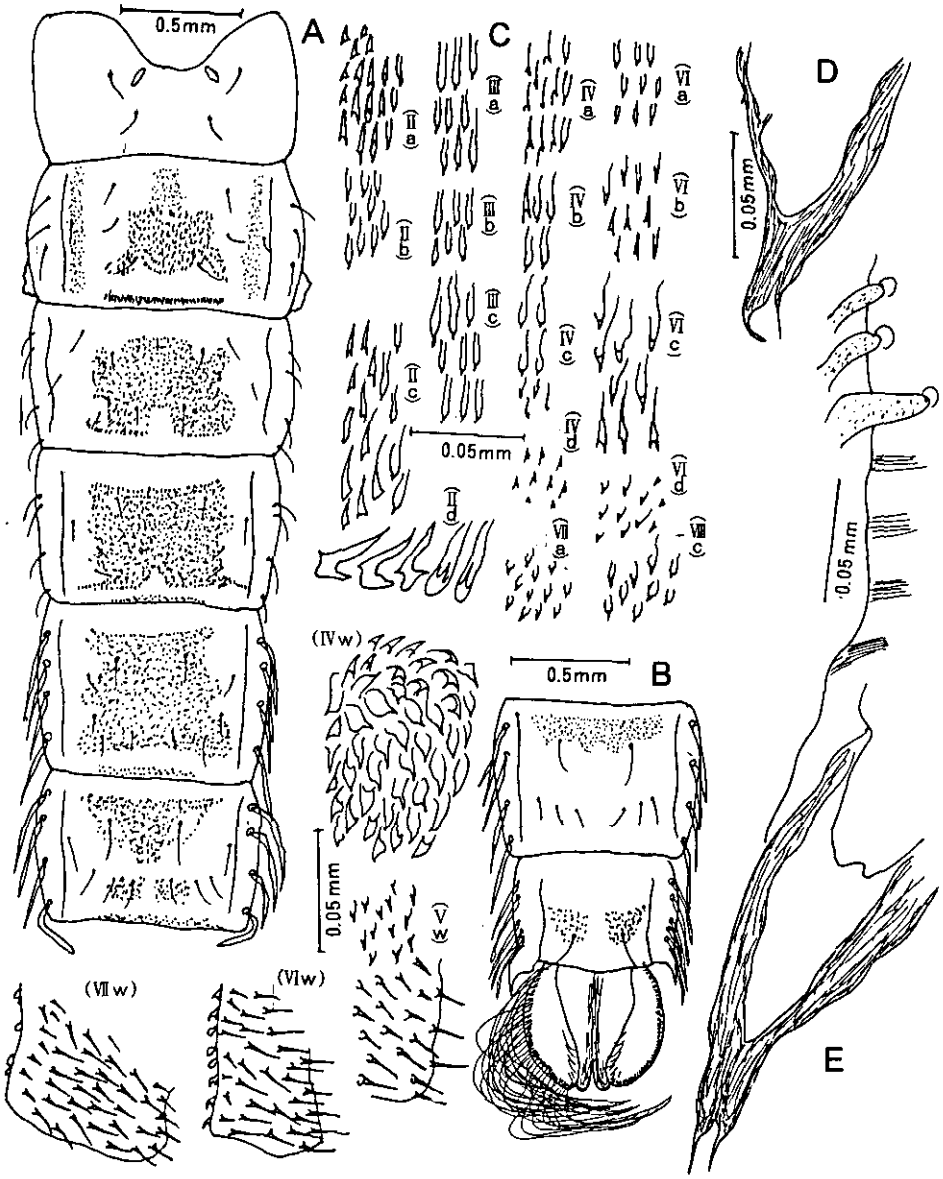

Fig. 2 *Chironomus acerbiphilus* **Tokunaga**

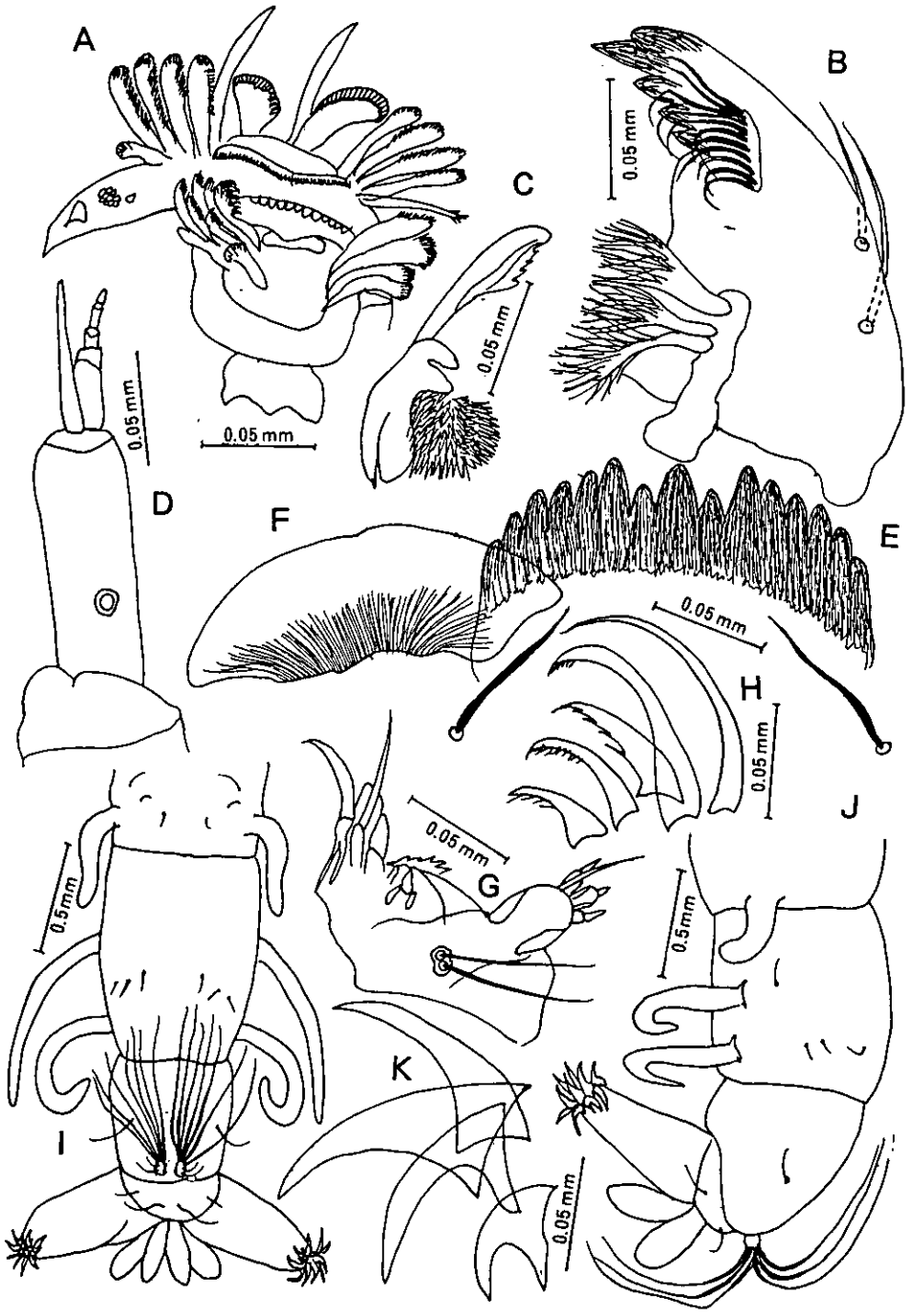

Fig. 3 *Chironomus acerbiphilus* Tokunaga

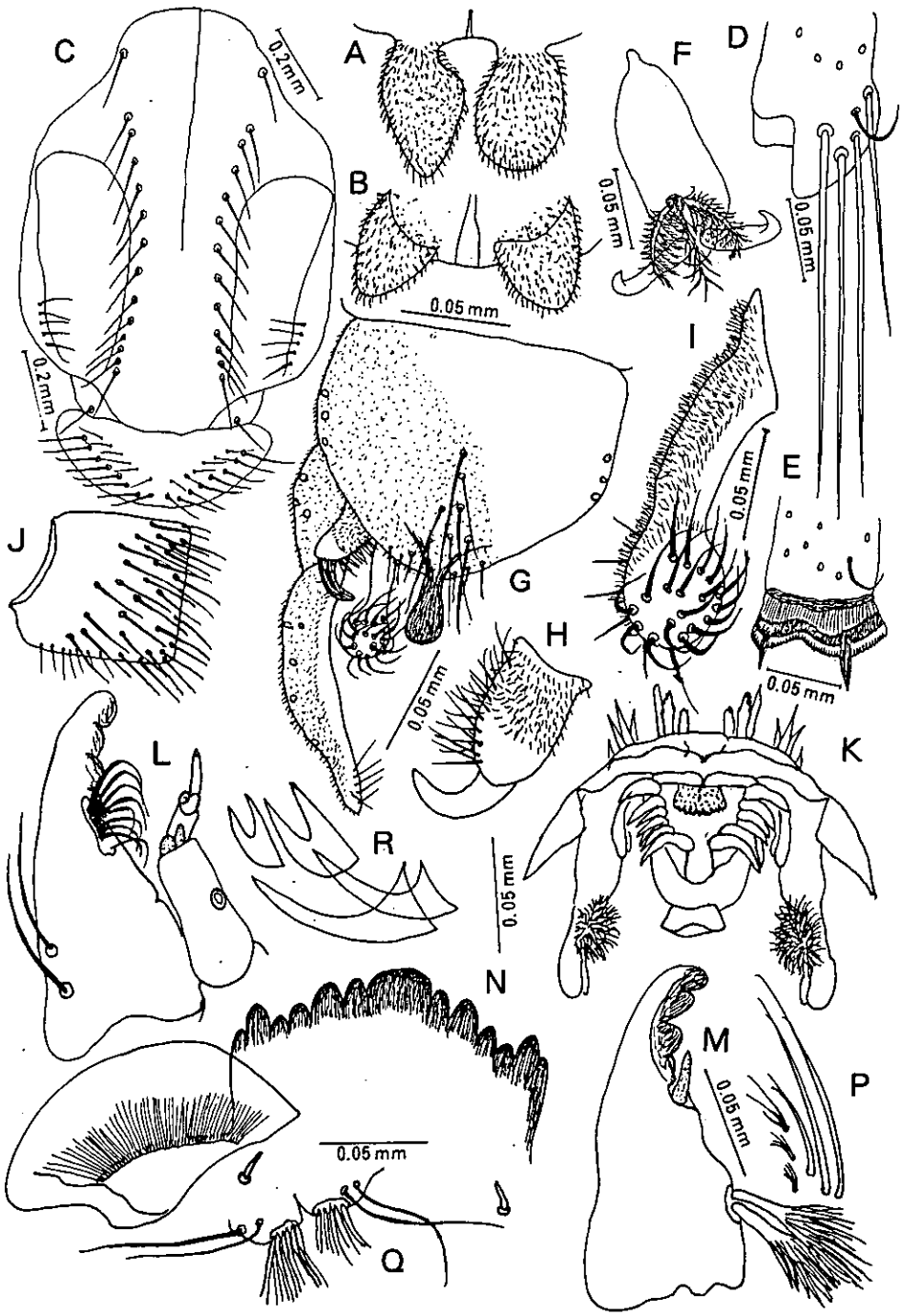

Fig. 4 *Chironomus (Einfeldia) dissidens* Walker

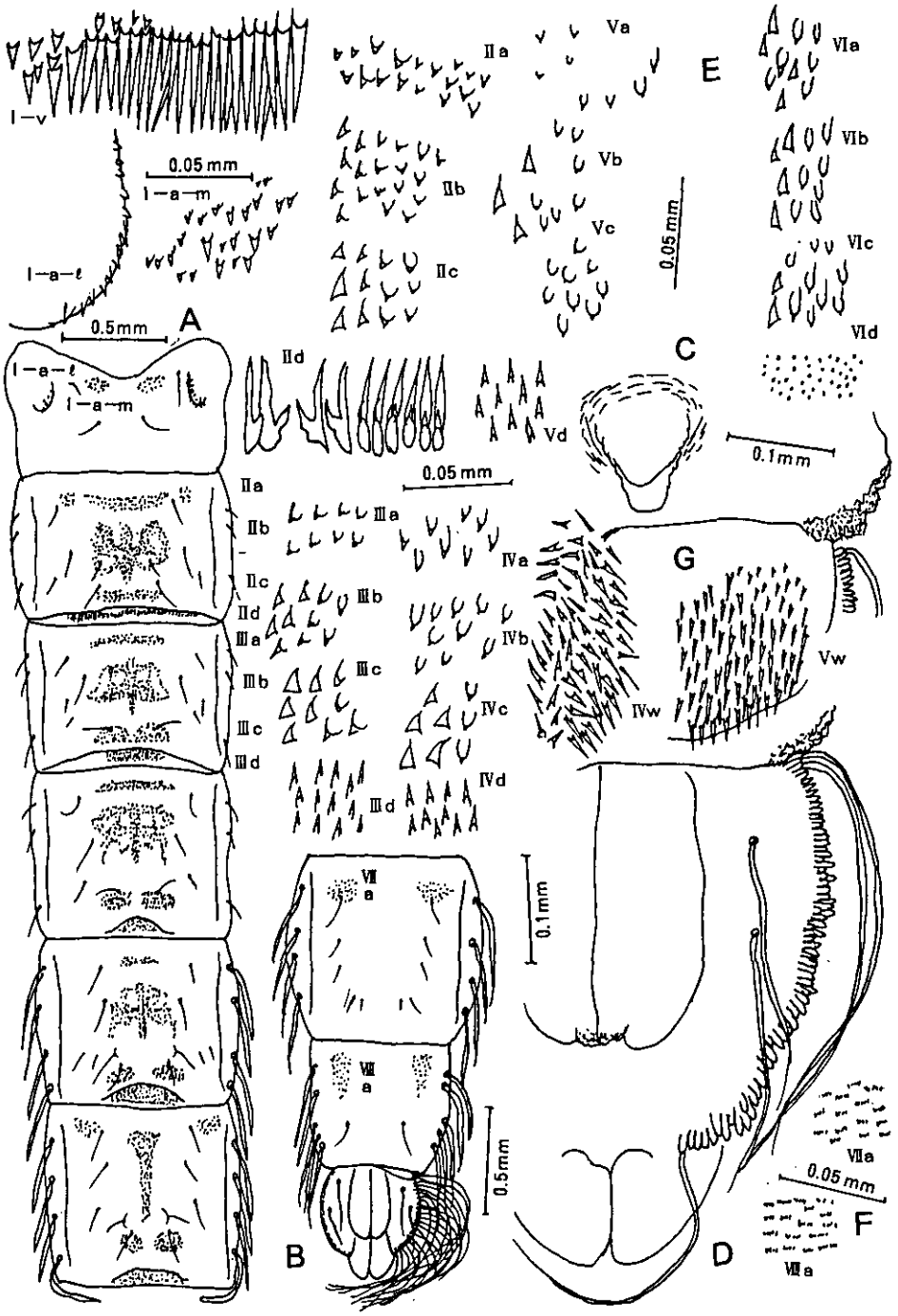

Fig. 5 *Chironomus (Einfeldia) dissidens* Walker

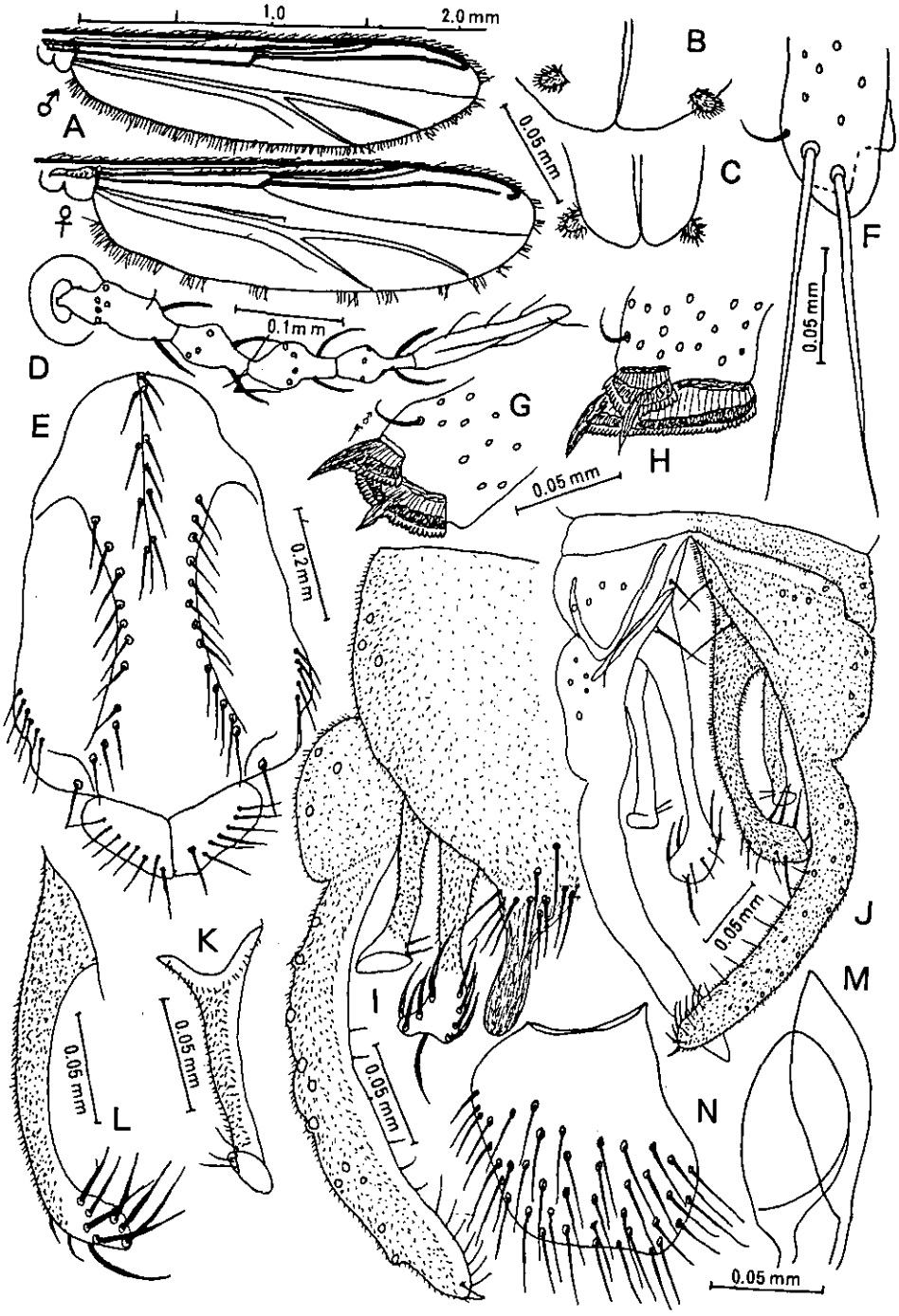

Fig. 6 *Dicrotendipes flexus* (Johannsen)

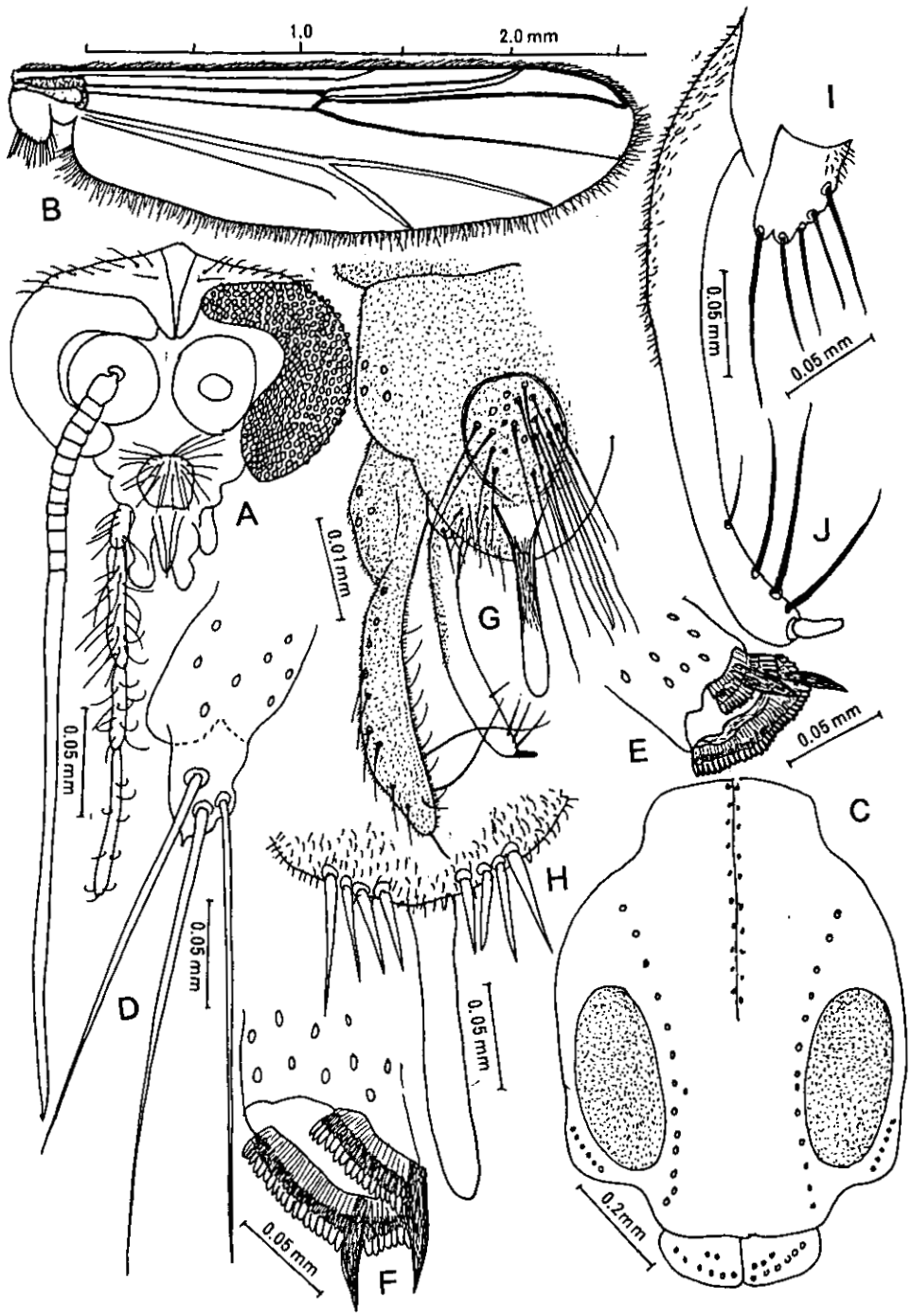

Fig. 7 *Stenochironomus membranifer* Yamamoto

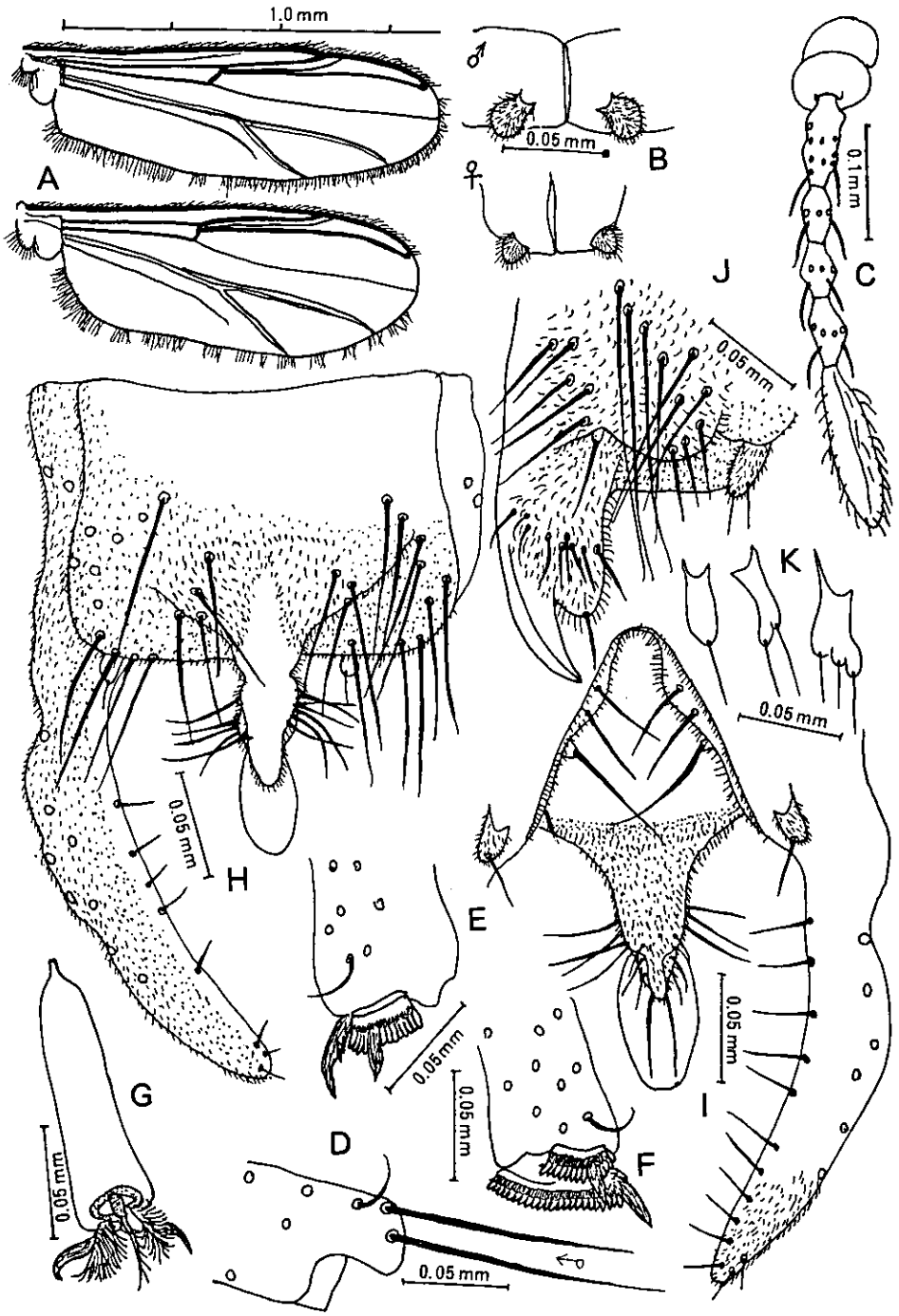

Fig. 8 *Harnischia viridula* (Linnaeus)

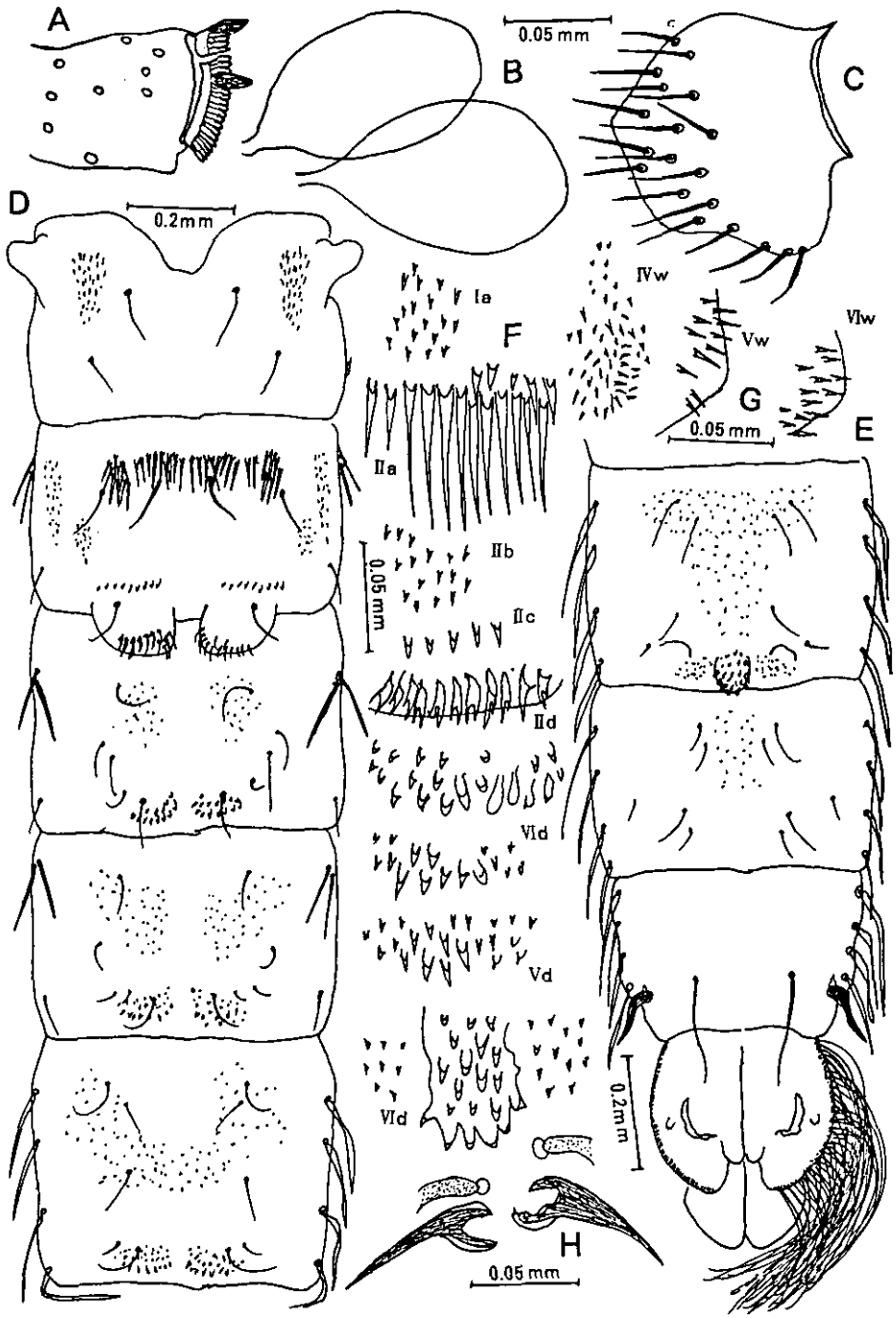

Fig. 9 *Harnischia viridula* (Linnaeus)

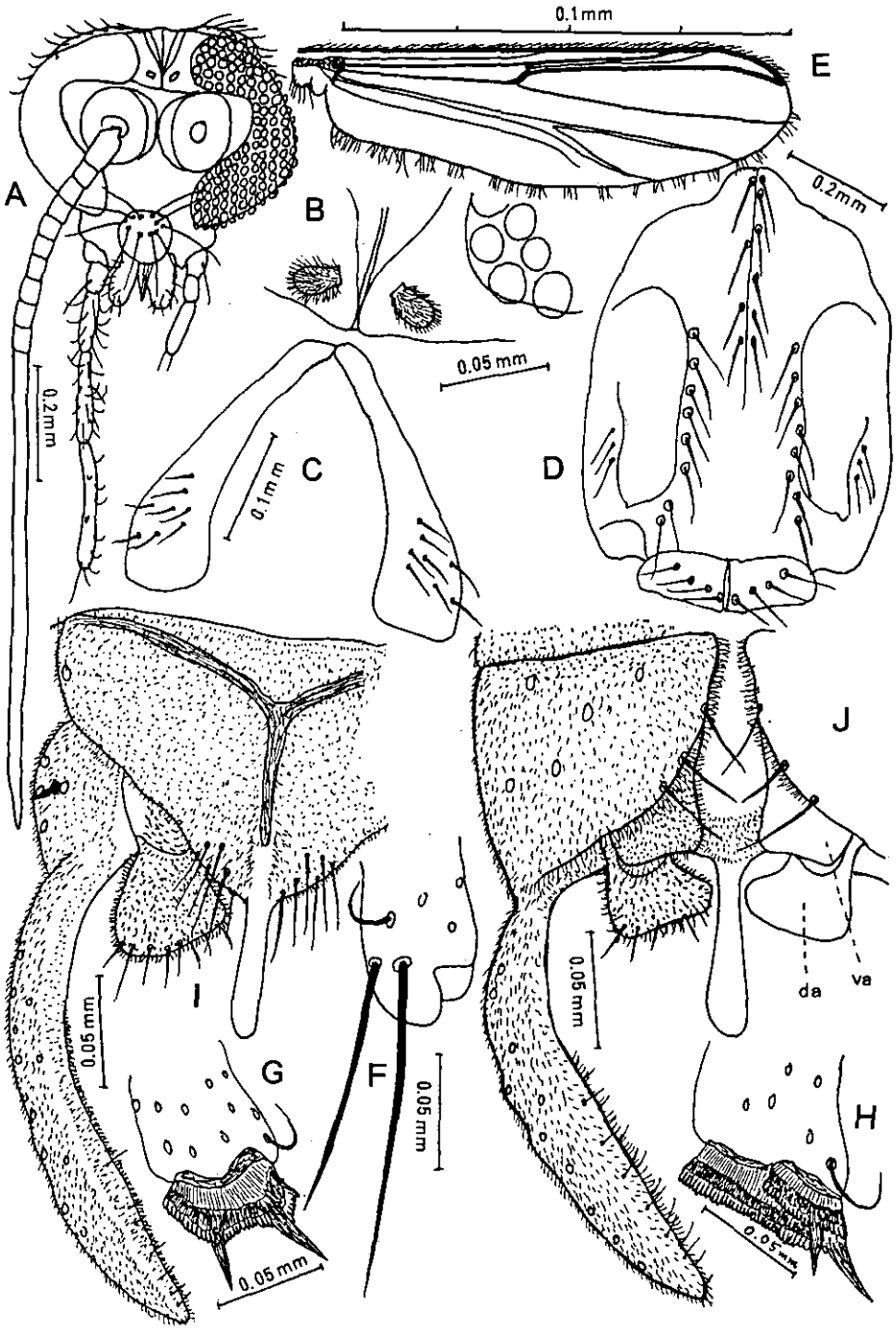

Fig. 10 *Paracladopelma camptolabis* **Kieffer**

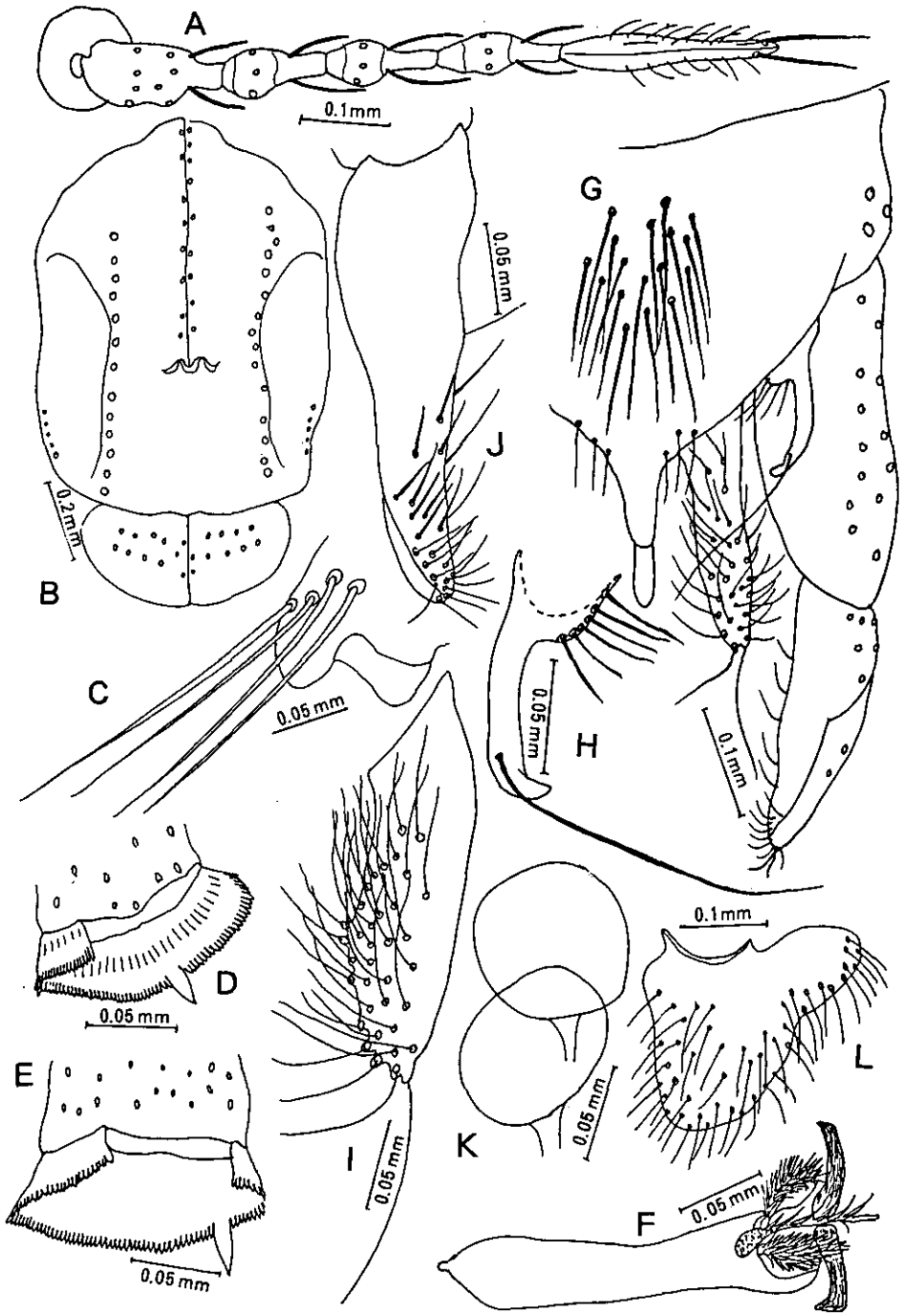

Fig. 11 *Stictochironomus akizukii* (Tokunaga)

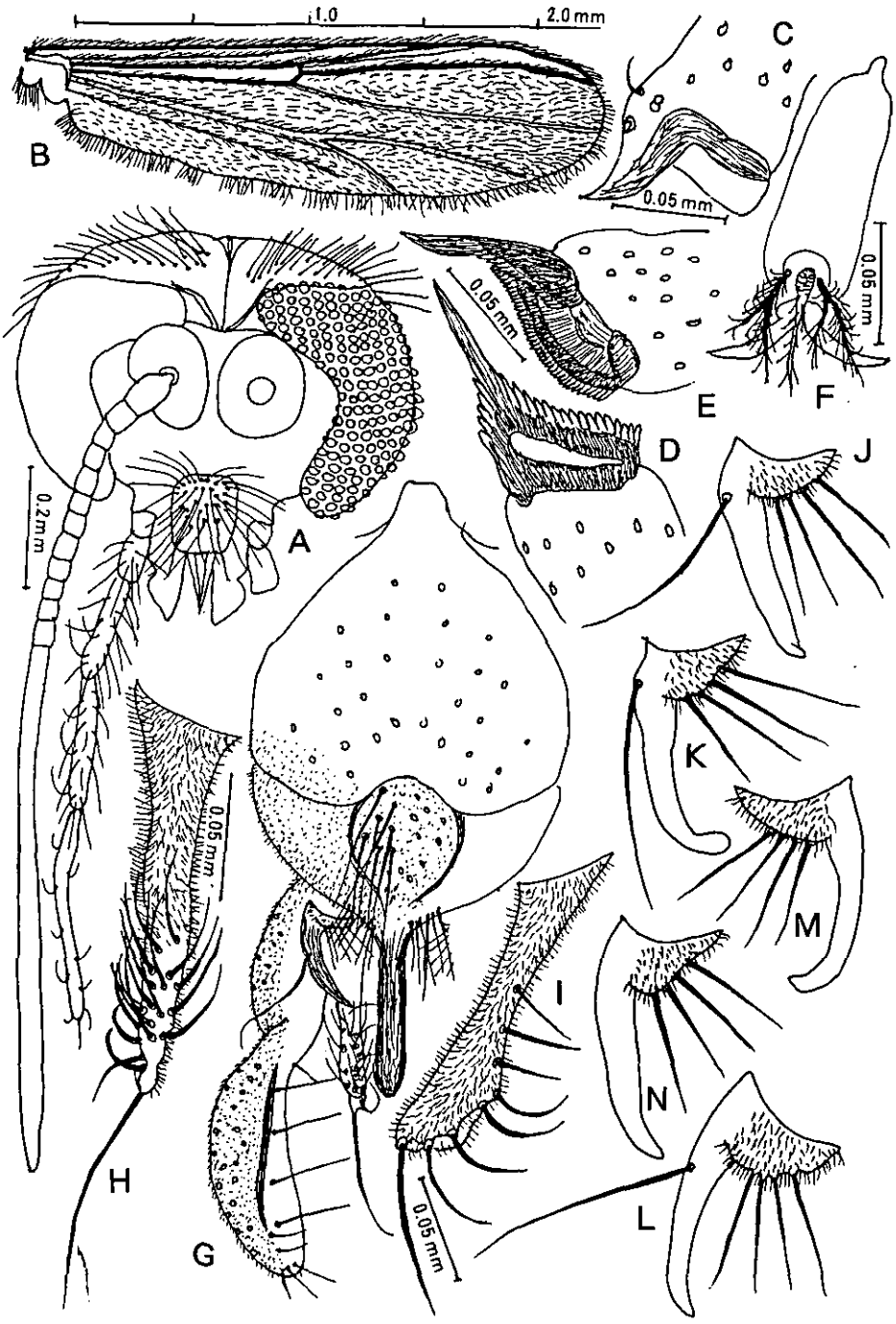

Fig. 12 *Pentapedilum sordens* (van der Wulp)

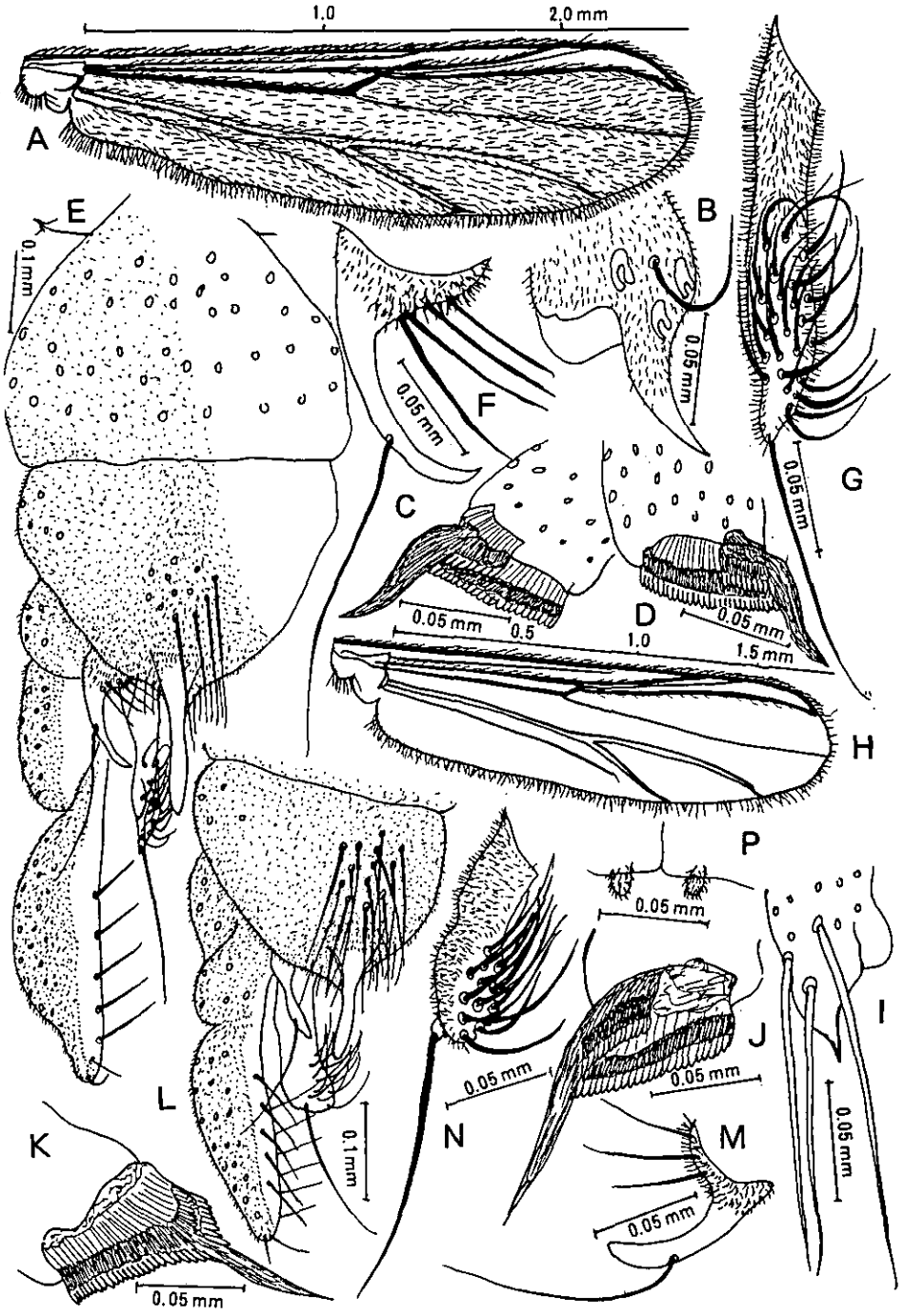

Fig. 13 *Pentapedilum*, sp. "unagitertium"
Polypedilum unagiquartum, n. sp.

Fig. 14 *Polypedilum cultellatum* **Goetghebuer**

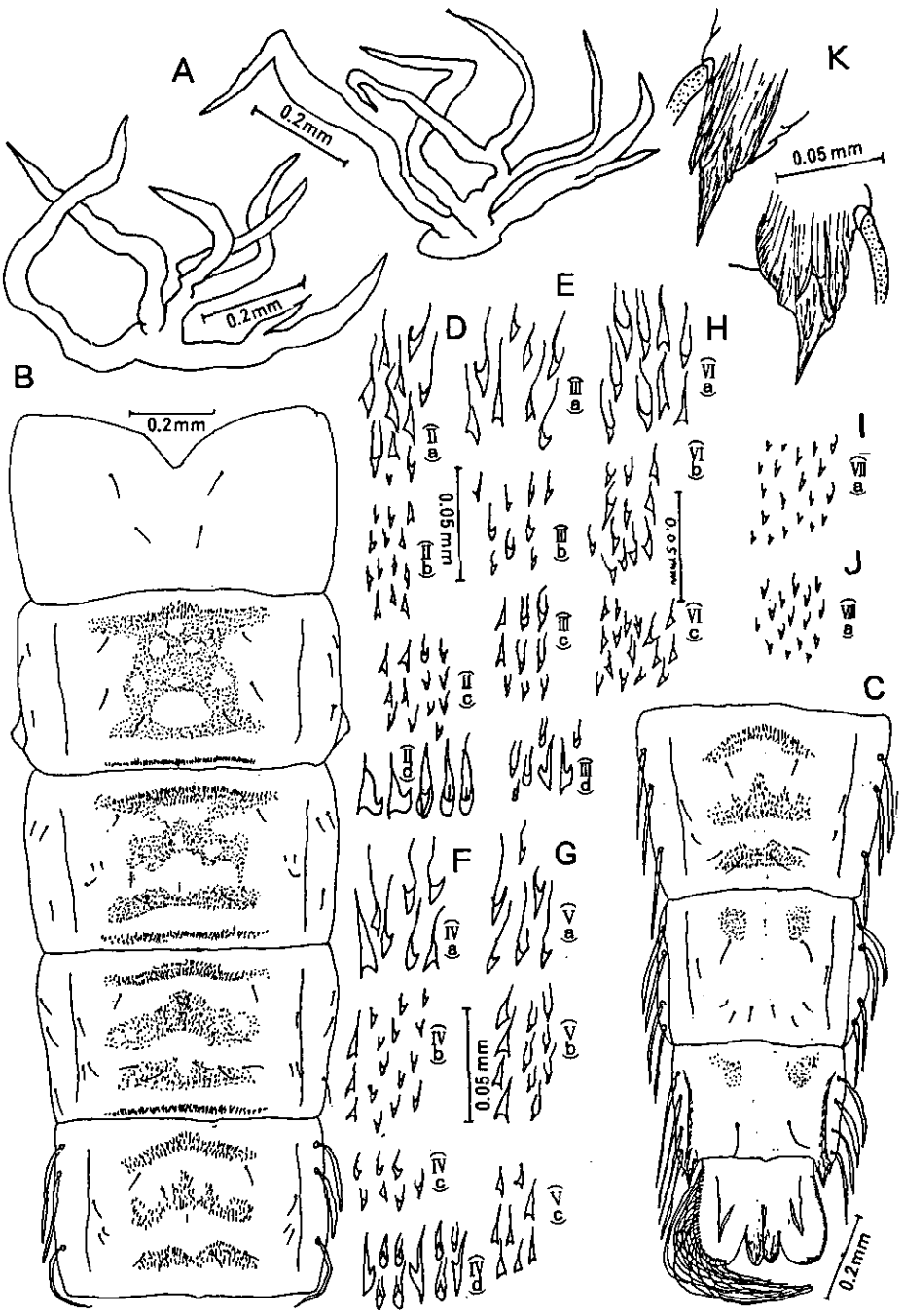

Fig. 15 *Popypedilum cultellatum* Goetghebuer

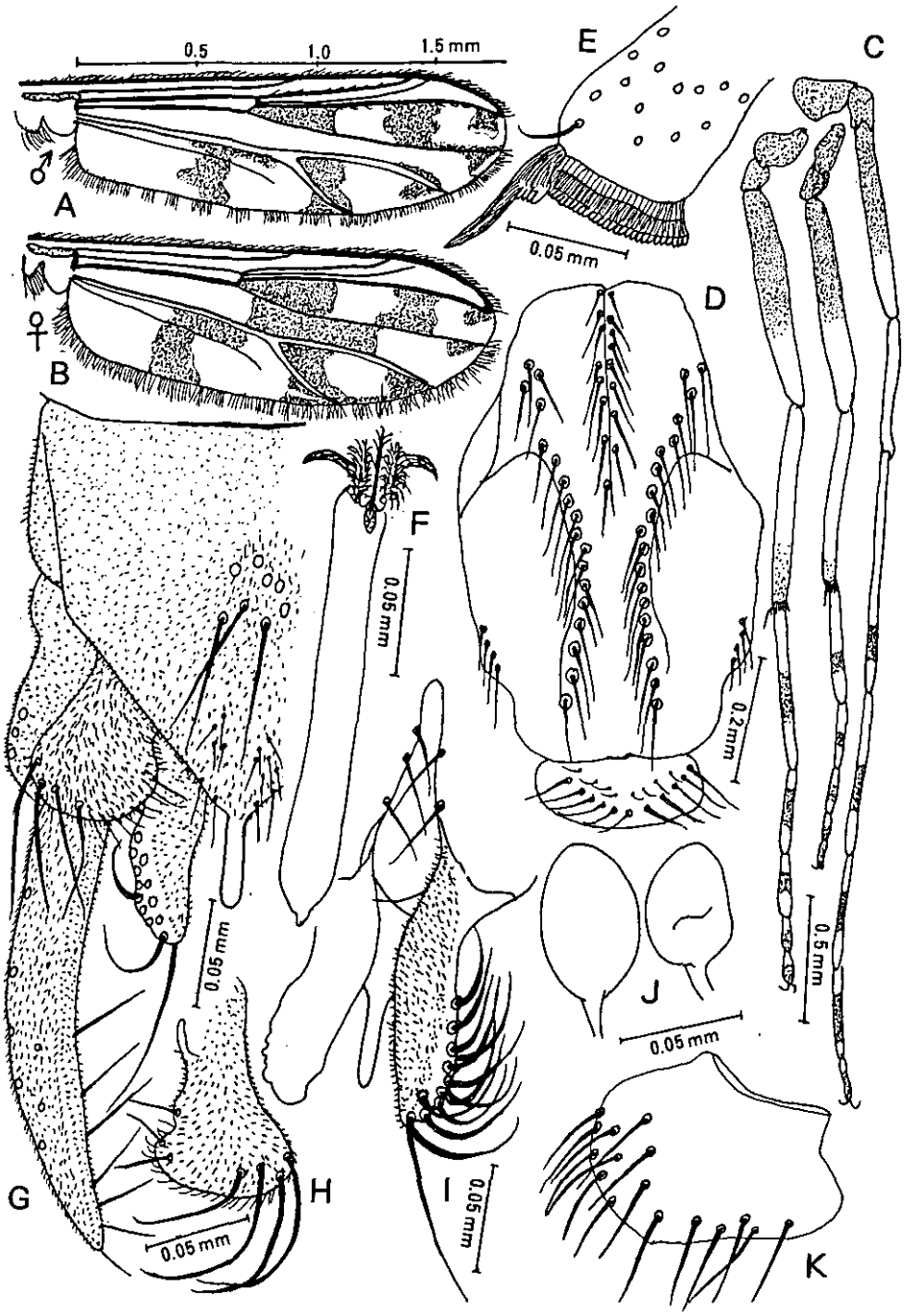

Fig. 16 *Polypedilum masudai* (Tokunaga)

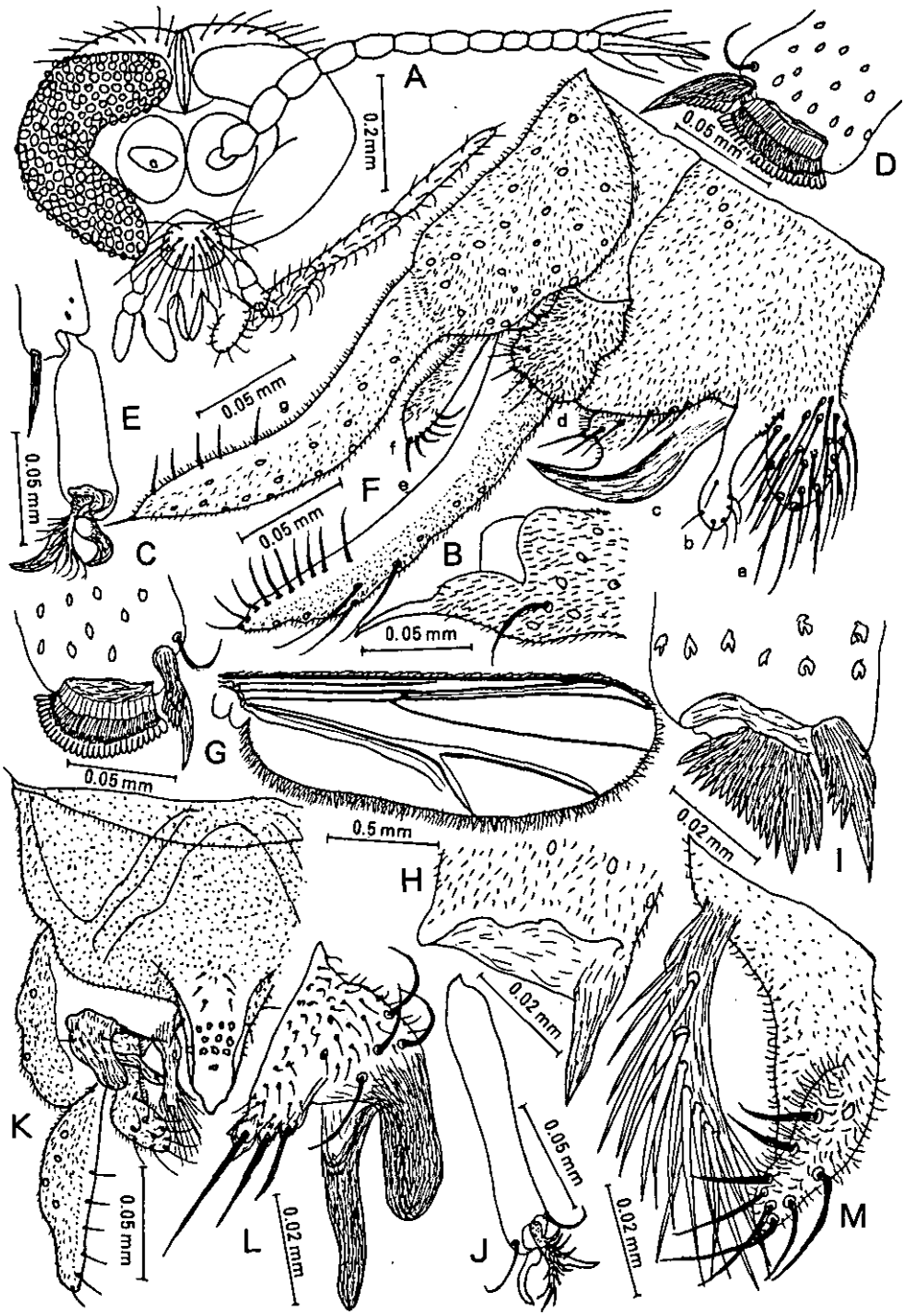

Fig. 17 *Nilothauma brayi* (Goetghebuer)
Tanytarsus unagisextus, sp. nov., male

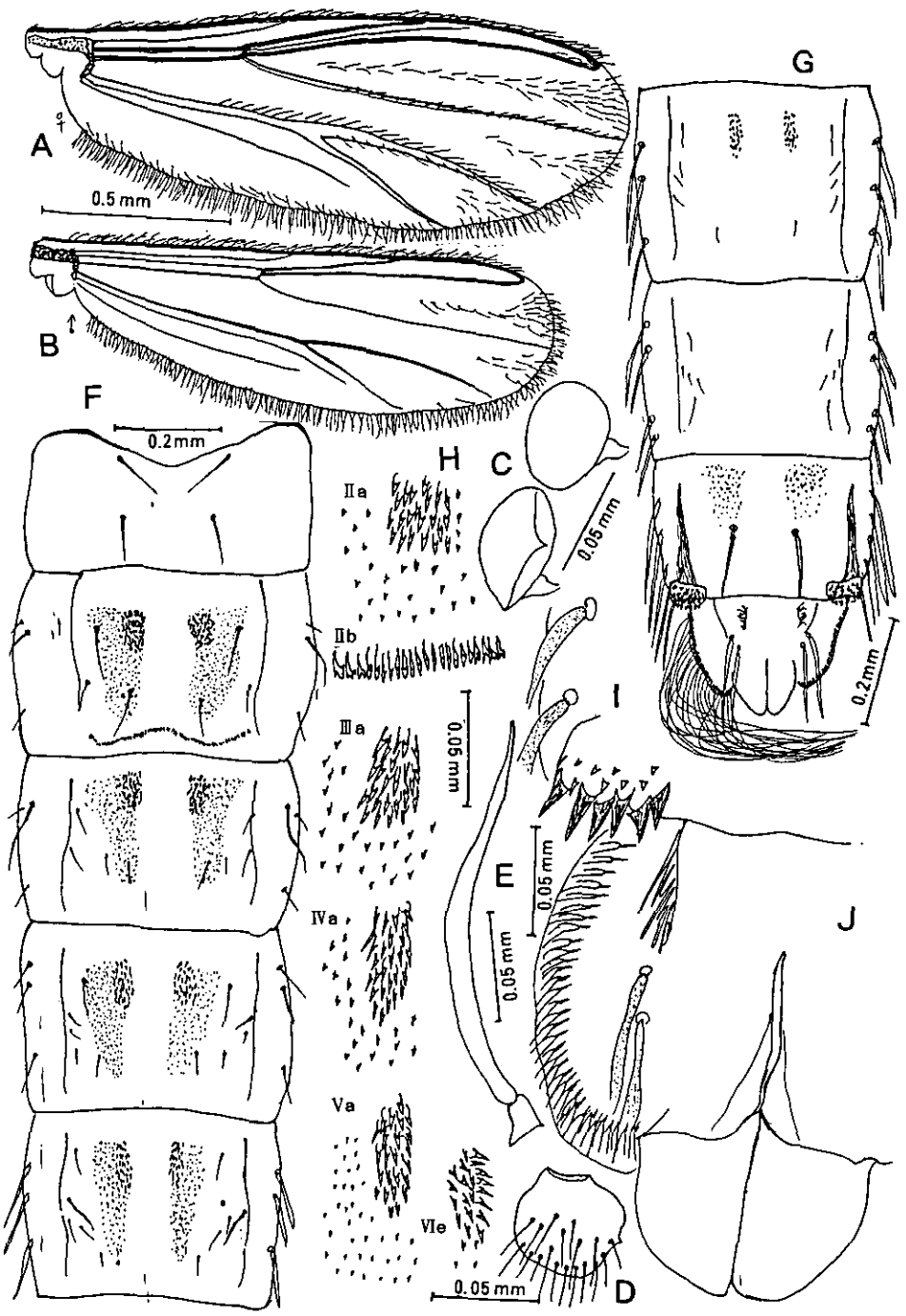

Fig. 18 *Tanytarsus unagisextus*, sp. nov. adult and pupa

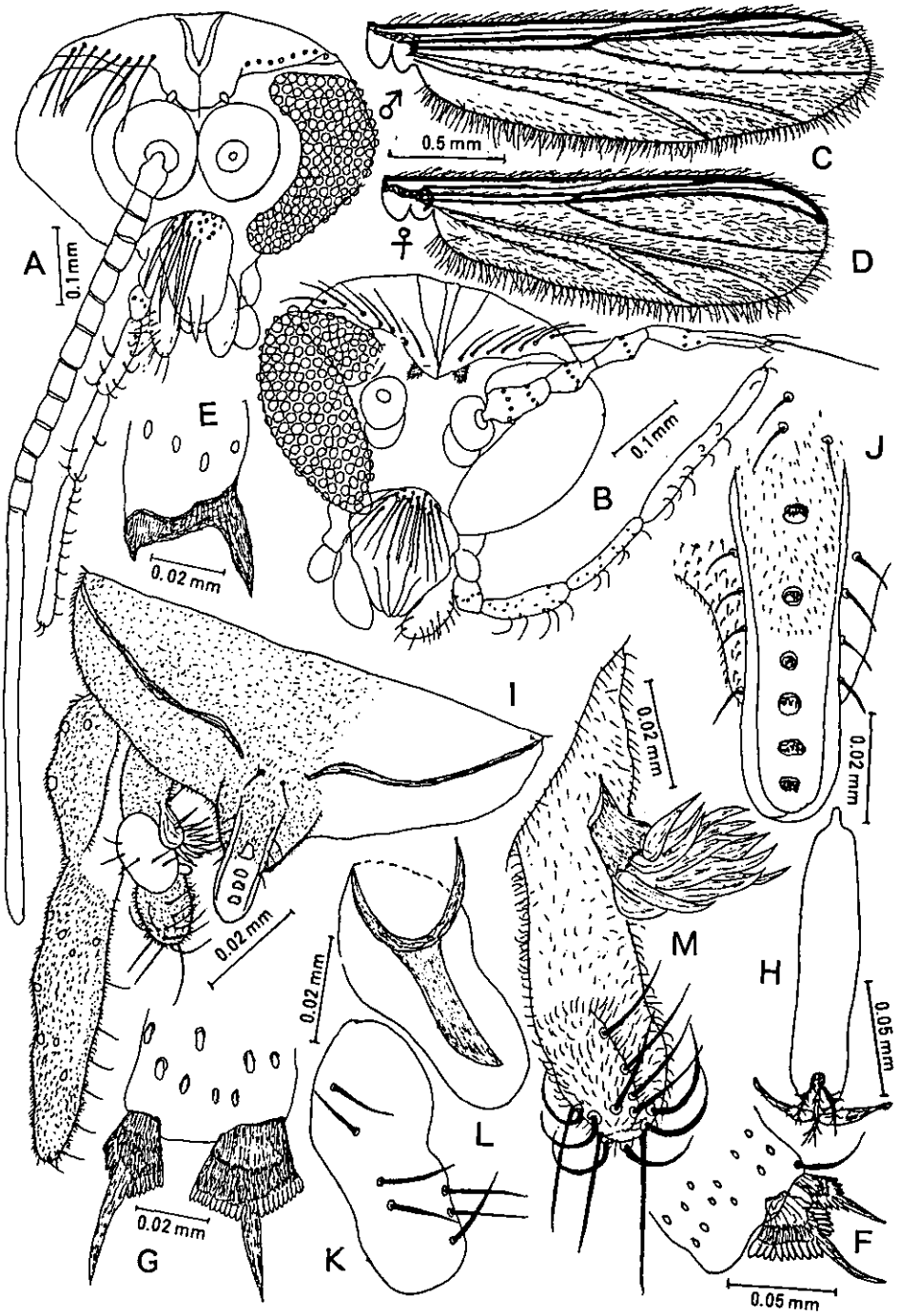

Fig. 19 *Tanytarsus unagiseptimus*, **sp. nov.**, adult

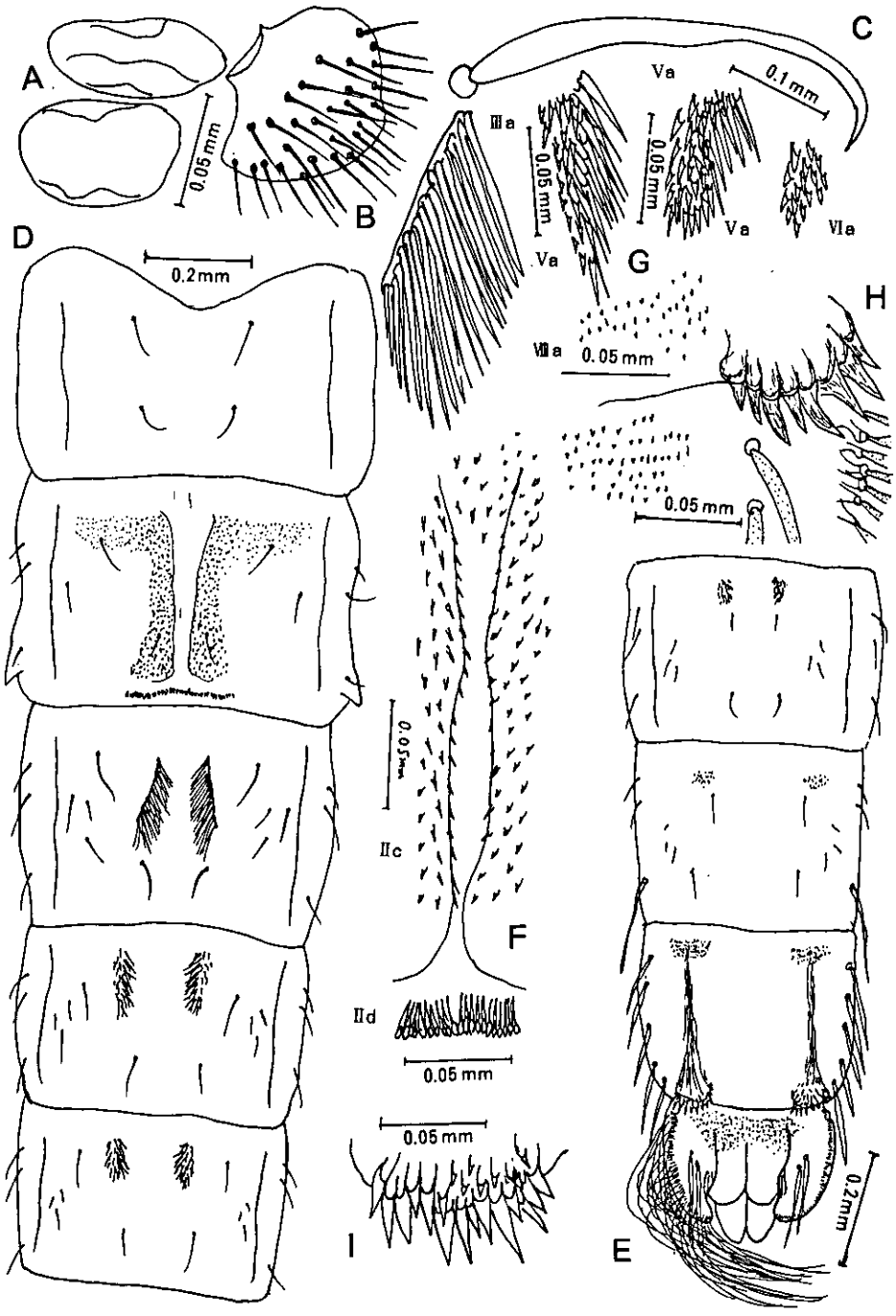

Fig. 20 *Tanytarsus unagiseptimus*, **sp. nov.**, female and pupa

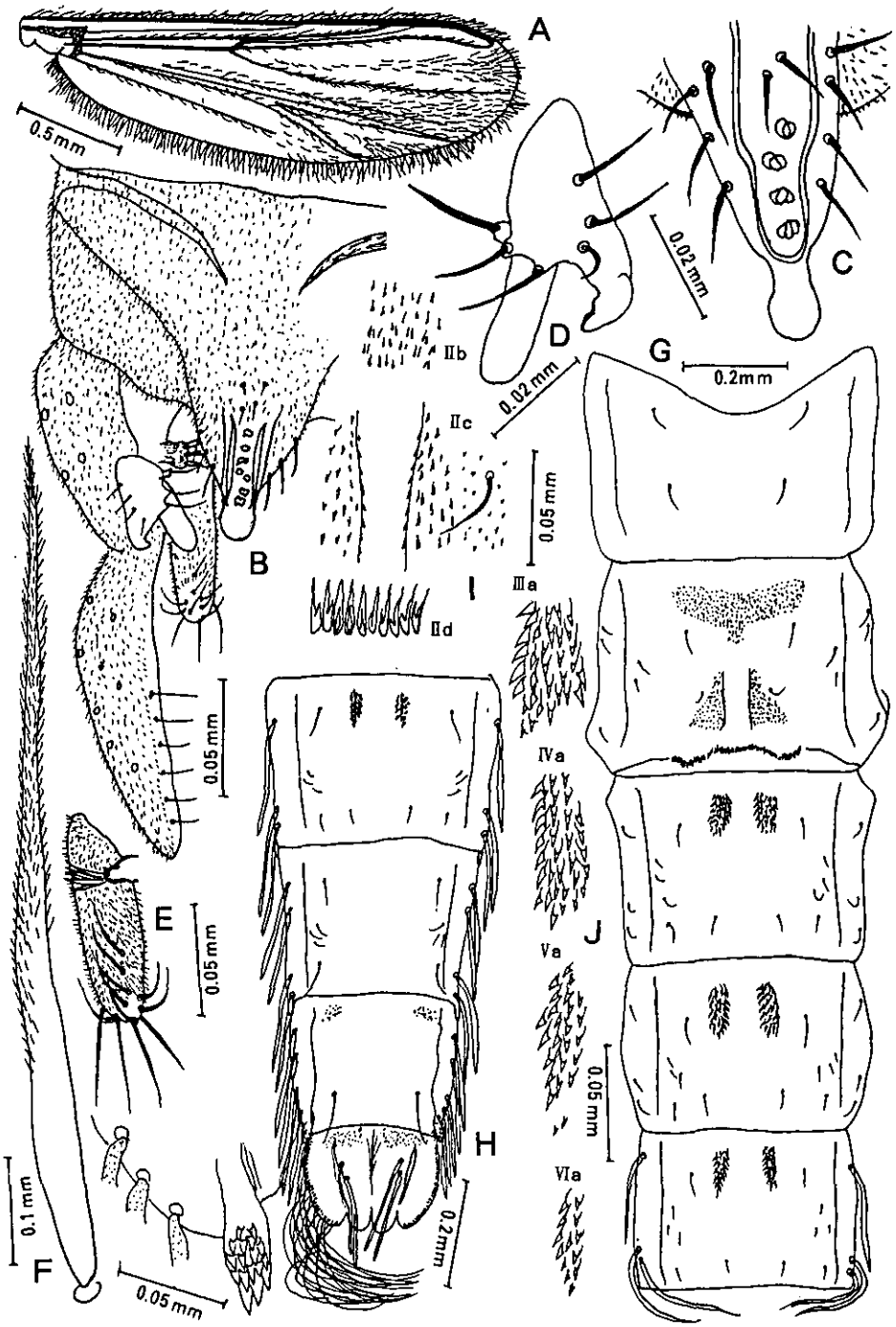

Fig. 21 *Tanytarsus tamagotoi*, Sasa, 1983

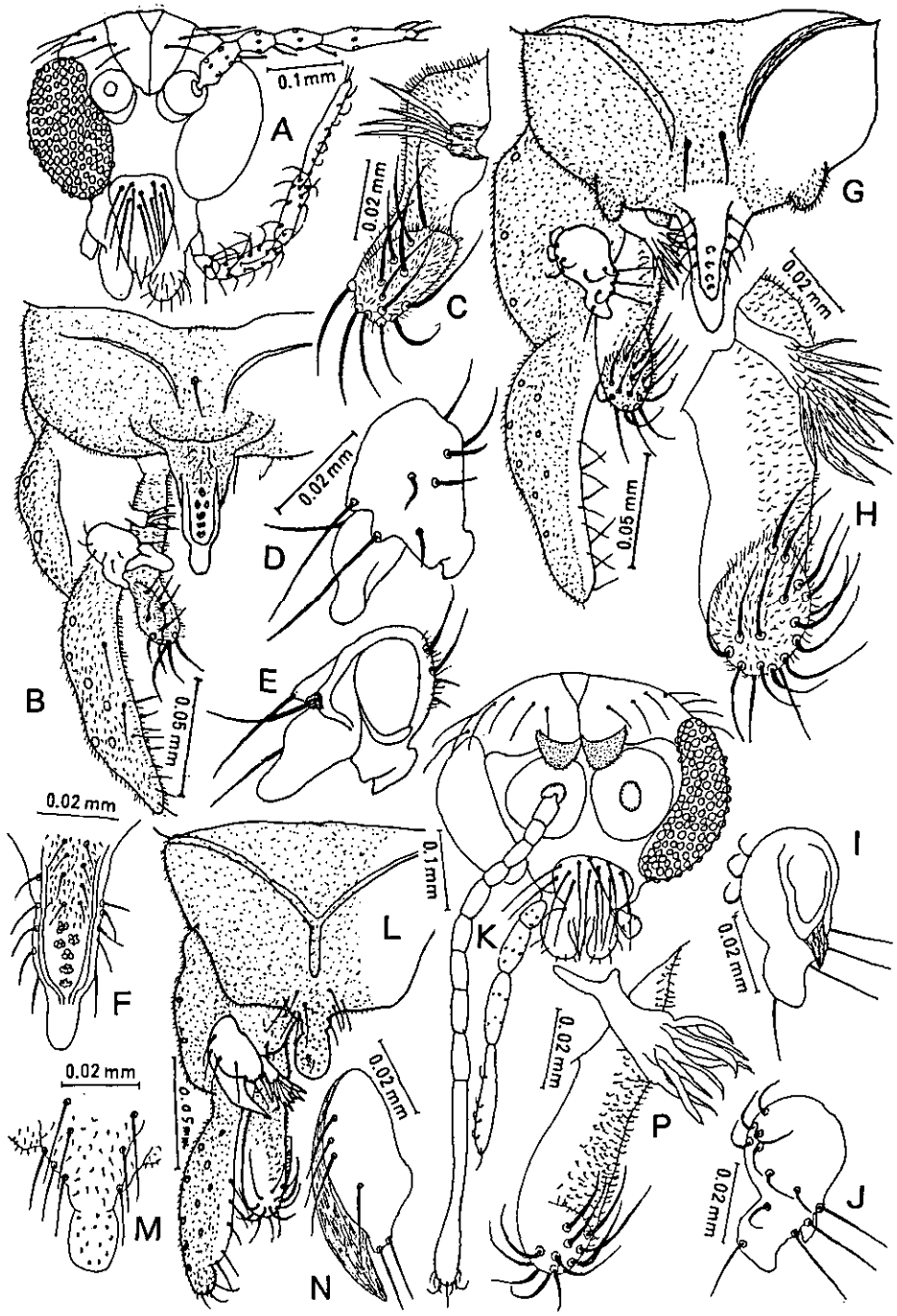

Fig. 22 *Tanytarsus unagisextus*, **sp. nov.**, head, female
Tanytarsus temagotoi **Sasa**
Tanytarsus oyamai **Sasa**

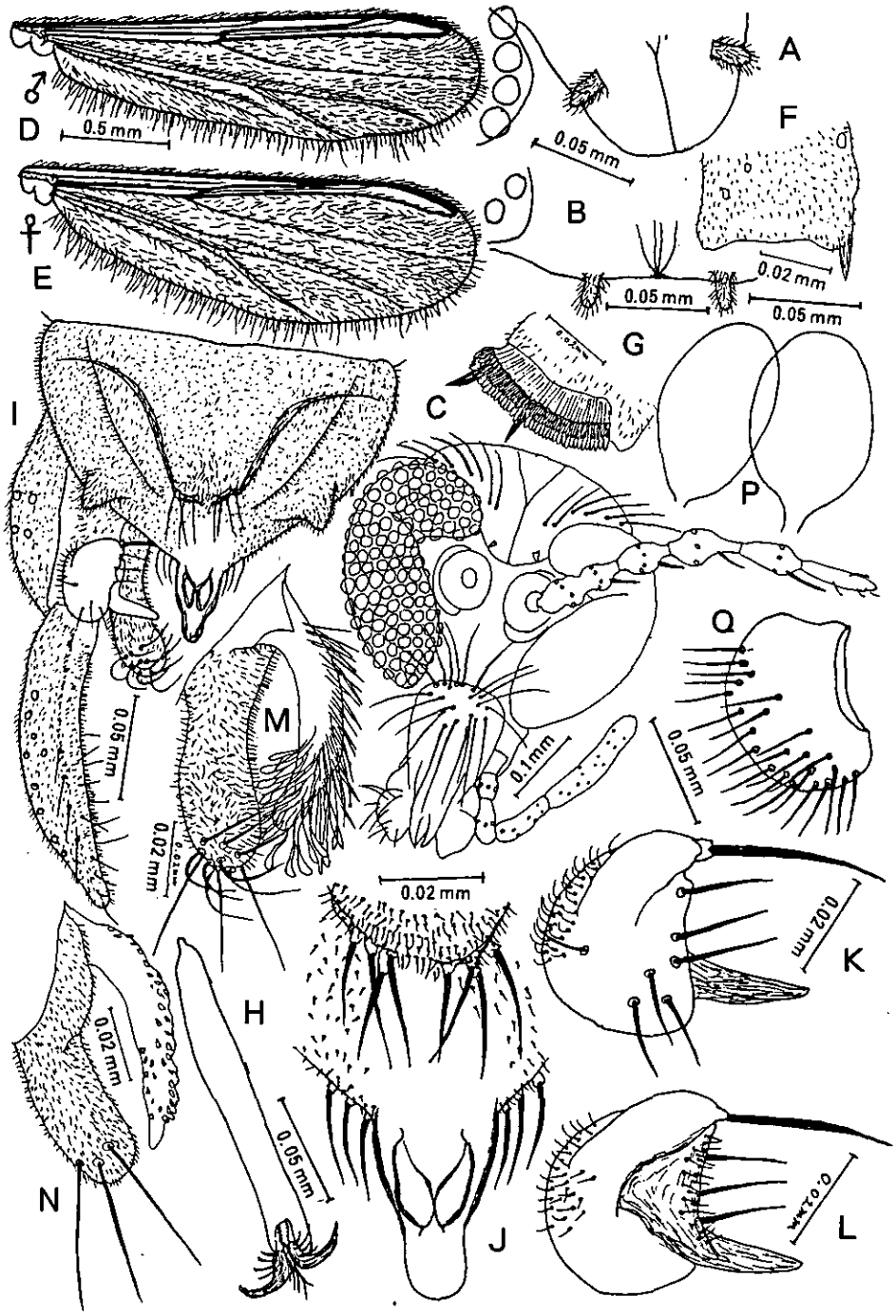

Fig. 23 *Micropsectra miikesecunda*, sp. nov.

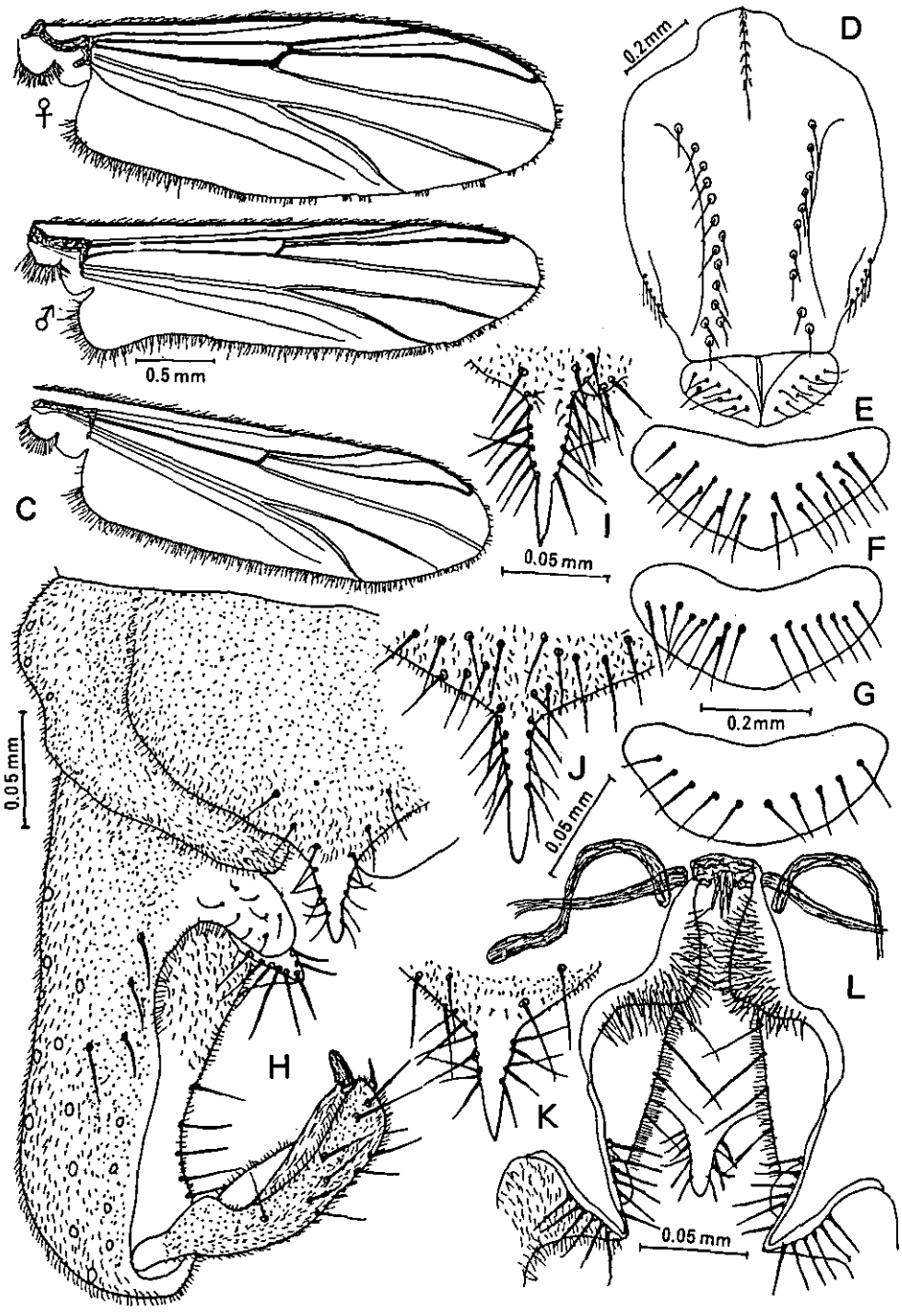

Fig. 24 **The *Orthocladius glabripennis* complex**, adult

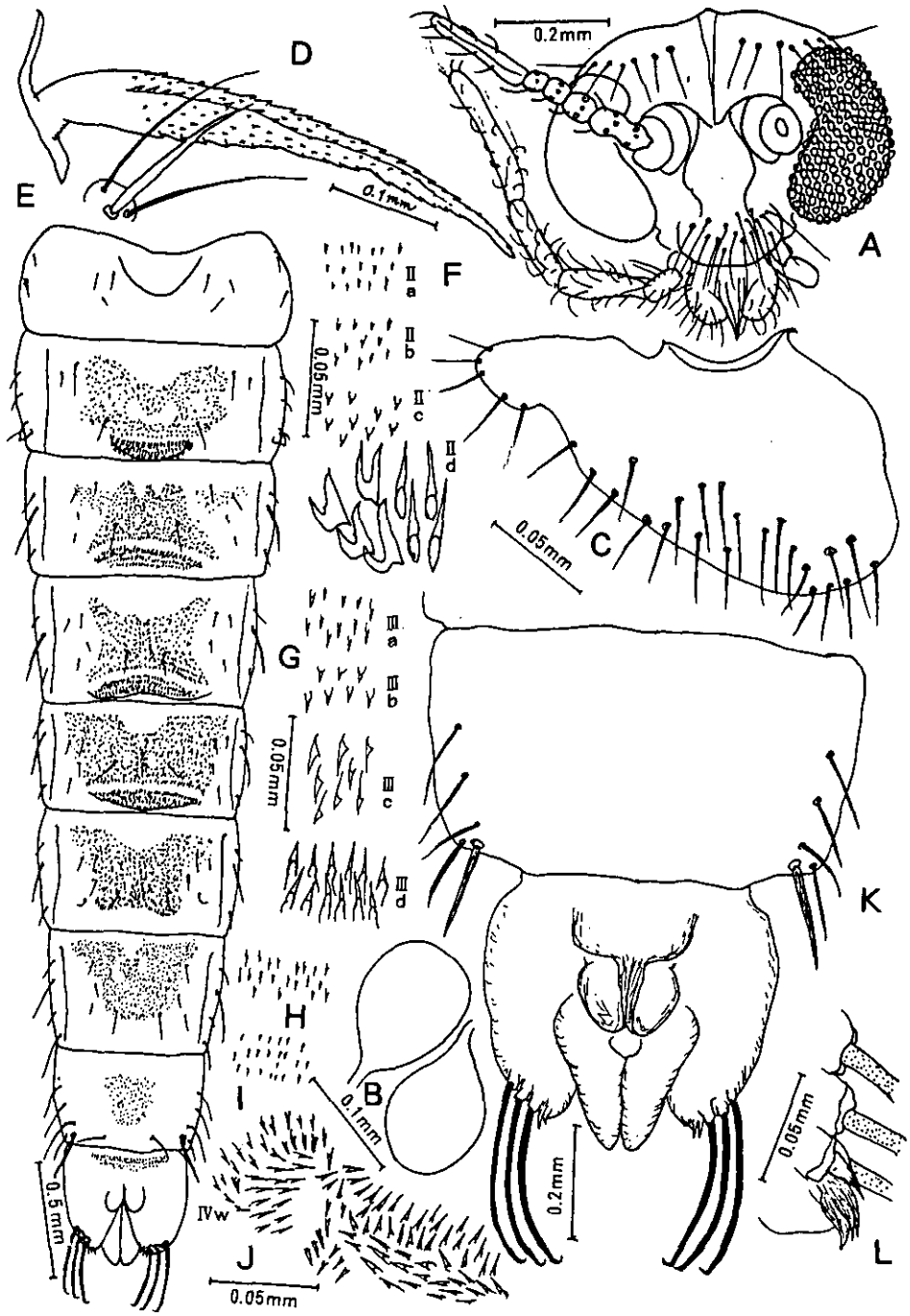

Fig. 25 The *Orthocladius glabripennis* complex, female and pupa

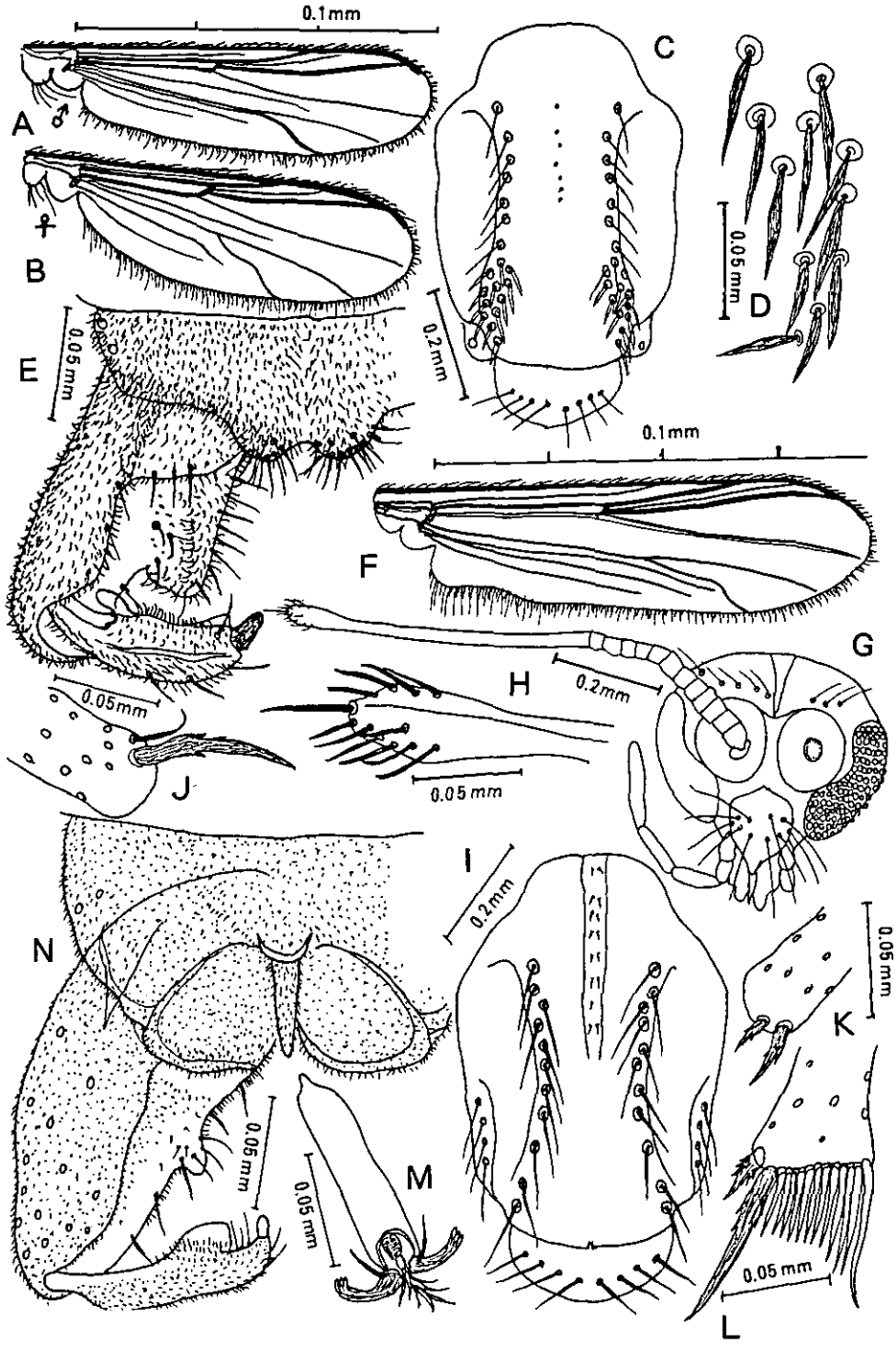

Fig. 26 *Limnophyes tamakitanaides* Sasa

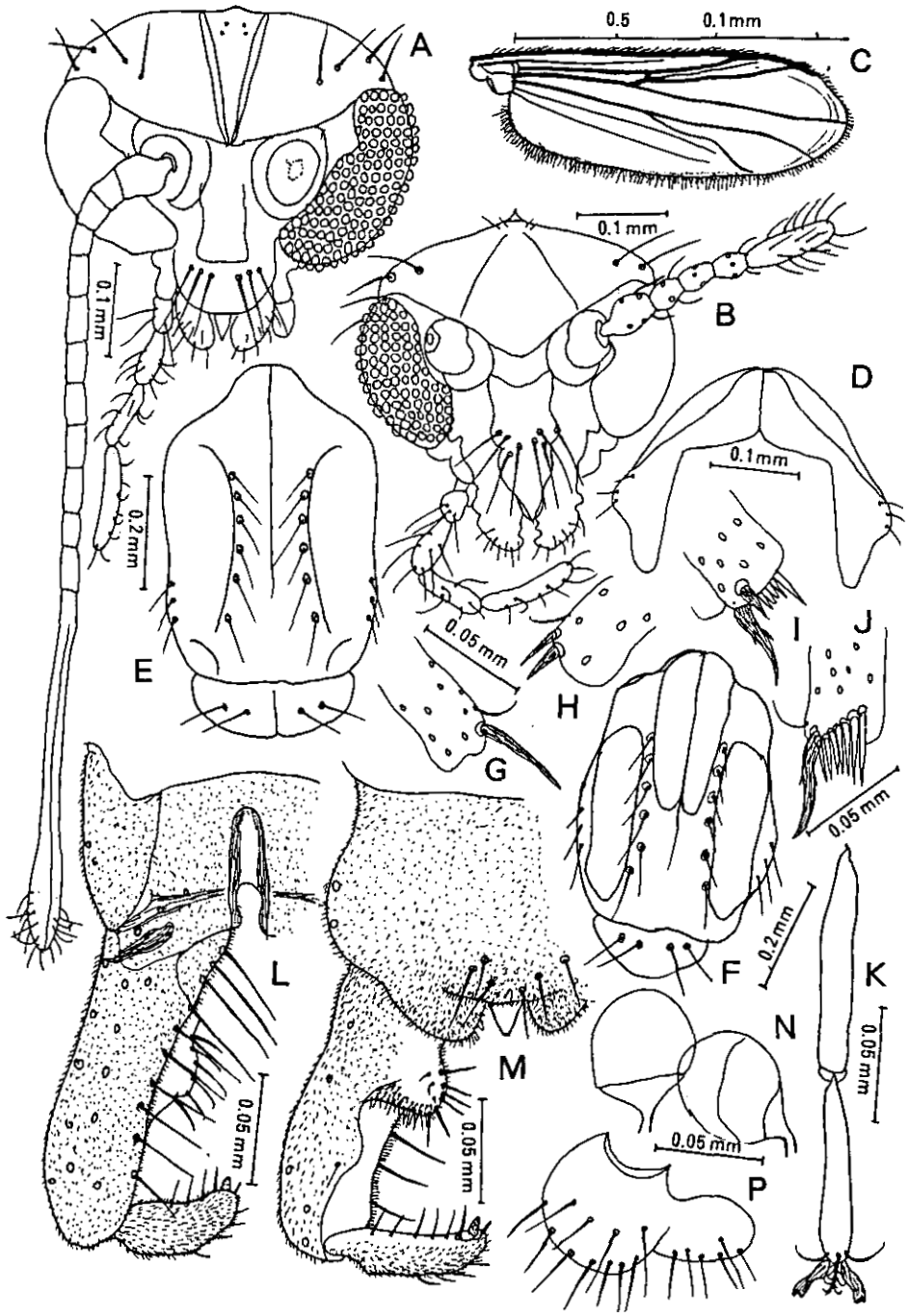

Fig. 27 *Tsudayusurika fudosecunda*, **n.g., n. sp.**

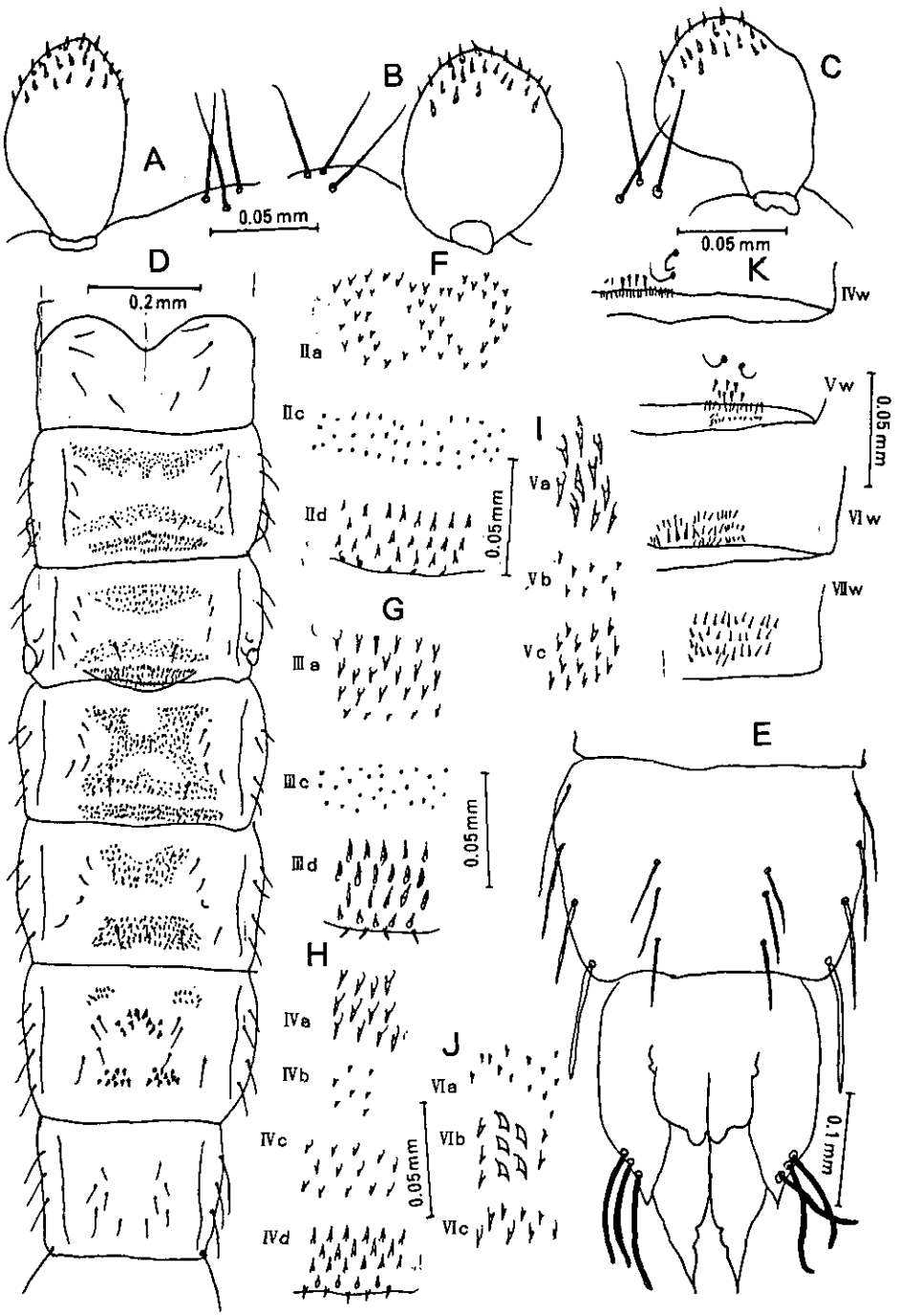

Fig. 28 *Tsudayusurika fudosecunda*, n.g., n. sp.

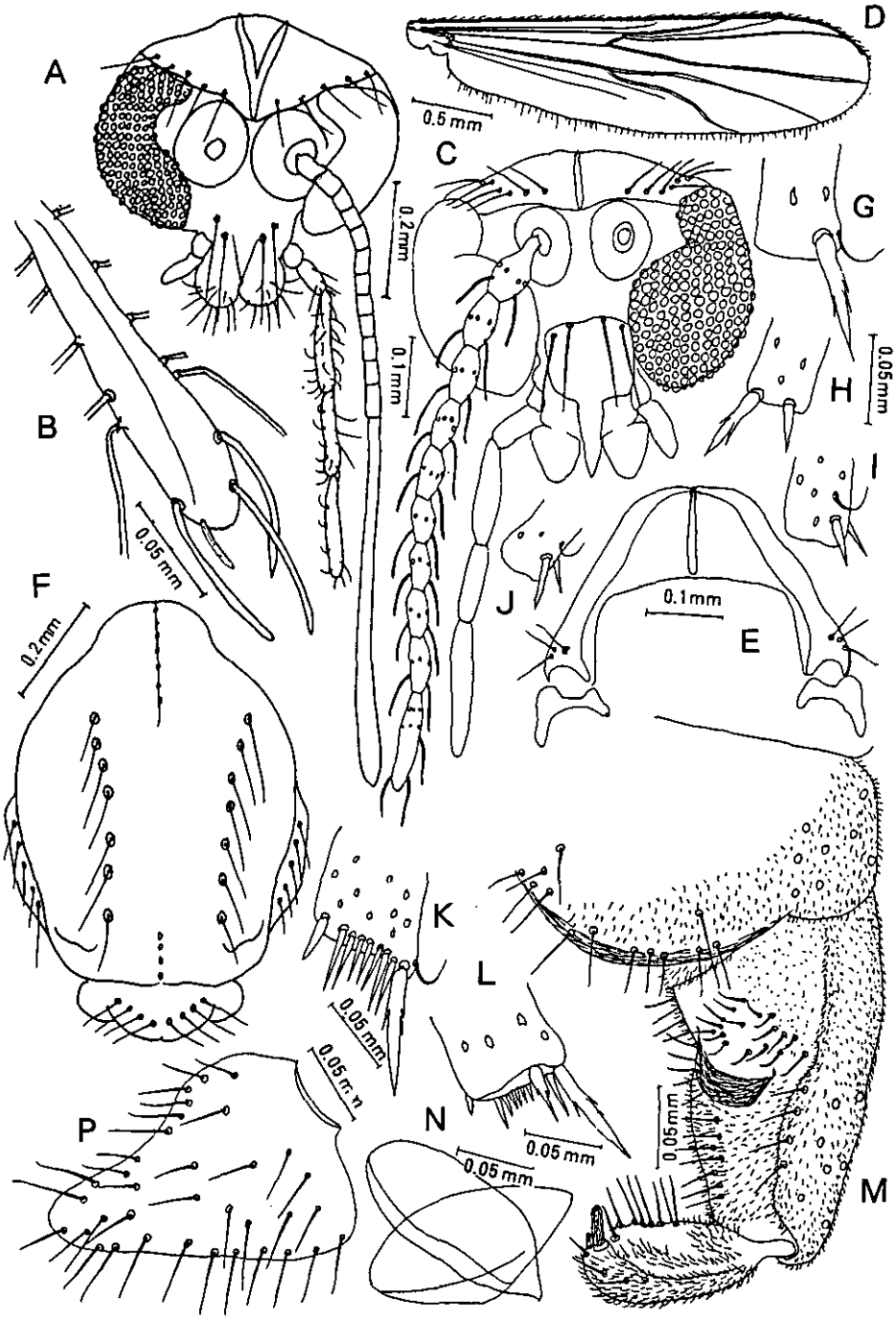

Fig. 29 *Tsudayusurika fudosecunda*, n.g., n.sp.

南九州の湖と温泉で採集した ユスリカ類について

佐々　学[1)]

我々は鹿児島県南部の鰻池，池田湖，及び宮崎県南部の霧島山塊にある御池，不動池，鏡池について1981年２月と11月にユスリカの採集を行った。第１回は各湖の底泥をとって国立公害研究所にもちかえり，成虫を羽化させた。第２回は各湖の周辺で成虫を捕虫網で集めたほか，底泥の採集と飼育も行った。

それらの標本を前報と同様の方法で検索した結果，Table １に示すように合計して33種のユスリカ科がそれぞれの湖から確認された。そのうち５種は新種，さらに他の３種は日本未記録種とみなされた。これらの各種のうち27種の雄成虫，17種の雌成虫，11種のサナギ，１種の幼虫について形態学的な記載を行った。そのほか，霧島の硫黄谷温泉の川から得た種類は宮城県潟沼の酸性湖から記録された *Chironomus acerbiphilus* Tokunaga と同定した。

1）国立公害研究所客員研究員（現在：富山医科薬科大学　〒930-01　富山市杉谷2630）

Studies on the Chironomids Collected from Lakes in the Mount Fuji Area (Diptera, Chironomidae)*

Manabu SASA[1)]

SUMMARY

Surveys were conducted on the chironomid species breeding in and around the lakes in the Mount Fuji area. A collection of adults resting on the shore of the five lakes on the foot of Mount Fuji, and Lake Ashinoko in Hakone was carried out by the author on 9 and 10 July 1981. Another collection of adults as well as larvae in the bottom sediments were made on 13 and 14 May 1983 by members of NIES and of Toyama Medical and Pharmaceutical University. The larval materials were reared in the laboratory and identified by the adult specimens.

As the results, a total of 45 species of the subfamily Chironominae and Orthocladiinae were identified as shown in Table 1. The number of species recovered was 5 from Lake Ashinoko, 16 from Lake Kawaguchi, 16 from Lake Motosu, 7 from Lake Saiko, 16 from Lake Shoji, and 24 from Lake Yamanaka. These species included 15 new to Japan, among which 11 were judged as new species. Descriptions and illustrations of 15 males and 7 females are given in the text.

A number of studies on the bottom fauna of these lakes were reported by previous workers, but the numbers of species identified were much less and their species names were rather ambiguous, because they were all examined by the chironomid larvae. The results of the present study based mainly on the morphology of adult males suggest that there exists remarkable differences in the chironomid fauna between the rather oligotrophic lakes such as Lakes Motosu and Saiko, and the more eutrophicated ones such as Lakes Ashinoko, Shoji, Kawaguchi and Yamanaka. Some species from the latter group of lakes were in common with those of the rather eutrophicated lakes of southern Kyushu reported in the previous paper, and also with Lake Yunoko of Nikko reported by Sasa (1984), while those from the former group were partly in common with the oligotrophic lakes such as Lake Chuzenji of Nikko.

* This study was supported by Toyota Foundation.

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Table 1 List of the chironomids collected from lakes in the Mount Fuji area (Scientific names, number of adults identified, their distribution to laes, sex described, figure number and page number)

Code No.	Species name	Number identified		Lakes collected	Morphological Description		
		Male	Female		Sex	Fig. No.	Page
# 1.	*Chironomus plumosus* (Linnaeus)	5		a s			103
# 2.	*Chironomus yoshimatsui* Martin et Sublette	15		a k s			104
# 3.	*Chironomus nipponensis* Tokunaga	2		y			104
# 4.	*Chironomus fujiprimus*, sp. nov.	17	2	s	M F	1	104
# 5.	*Chironomus fujisecundus*, sp. nov.	5	1	k y	M F	2	105
# 6.	*Chironomus fujitertius*, sp. nov.	5		k m	M	3	106
# 7.	*Chironomus dissidens* Walker	1		s			107
# 8.	*Glyptotendipes tokunagai* Sasa	48		k m y			108
# 9.	*Parachironomus arcuatus* Goetghebuer	14	4	k s y	M F	4	108
#10.	*Cryptotendipes fujiquartus*, sp. nov.	5	1	m s y	M F	5	109
#11.	*Demicryptochironomus chuzequartus* Sasa	5	2	y	M F	6	111
#12.	*Paracladopelma camptolabis* (Kieffer)	3		m	M		112
#13.	*Nilothauma brayi* (Goetghebuer)	1		n	M	7	112
#14.	*Dicrotendipes flexus* (Johannsen)	1		s	M	8	113
#15.	*Dicrotendipes niveicaudus* (Kieffer)	4	1	k s			114
#16.	*Stictochironomus akizukii* (Tokunaga)	8		n y			115
#17.	*Stictochironomus multannulatus* (Tokunaga)	8		m n			115
#18.	*Stictochironomus histrio* (Fabricius)	6	1	m y	M F	8, 9	115
#19.	*Pentapedilum sordens* (van der Wulp)	8	4	k s y			117
#20.	*Polypedium cultellatum* Goetghebuer	29		k y			117
#21.	*Polypedilum nubeculosum* (Meigen)	102	3	a k m s y			118
#22.	*Polypedilum asakawaense* Sasa	3		m s			118
#23.	*Polypedilum tamagohanum* Sasa	3		n			118
#24.	*Polypedilum unifascium* (Tokunaga)	1		k			119
#25.	*Tanytarsus chuzesecundus* Sasa	20	4	m			119
#26.	*Tanytarsus yunosecundus* Sasa	14		k s y			119
#27.	*Tanytarsus unagiseptimus* Sasa	26		s			119
#28.	*Tanytarsus tamagotoi* Sasa	1		n			119
#29.	*Tanytarsus oyamai* Sasa	4		k			119
#30.	*Orthocladius chuzesextus* Sasa	1		n			120
#31.	*Psectrocladius ynoquartus* Sasa	57		k y			120
#32.	*Paratrichocladius rufiventris* (Meigen)	4		a n			120
#33.	*Cricotopus sylvestris* (Fabricius)	94	44	a k s y			120
#34.	*Cricotopus yatabensis* Sasa	1		s			121
#35.	*Smittia aterrima* (Meigen)	14		m y	M	10	121
#36.	*Smittia nudipennis* Goetghebuer	9		m s y	M	10	122
#37.	*Parakiefferiella chuzeundecima* (Sasa)	9		m y	M	11	123
#38.	*Pseudosmittia forcibata* (Goetghebuer)	3		m y	M	11	124
#39.	*Orthomittia fujiquinta*, sp. nov.	1		y	M	12	125
#40.	*Eukiefferiella fujisexta*, sp. nov.	1		m	M	12	126
#41.	*Pseudorthocladius fujiseptimus*, sp. nov.	5		y	M	13	126
#42.	*Pseudorthocladius fujioctavus*, sp. nov.	11		m y	M	14	127
#43.	*Limnophyes fujinonus*, sp. nov.	4	3	k m y	M F	15	128
#44.	*Limnophyes fujidecimus*, sp. nov.	2		k y	M	16	129
#45.	*Corynoneura fujiundecima*, sp. nov.	15		y	M	17	130

Note: a: Lake Ashinoko, k: Lake Kawaguchi, m: Lake Motosu, n: Lake Saiko, s: Lake Shoji, y: Lake Yamanaka, M: male, F: female.

INTRODUCTION

Preliminary surveys of the chironomid midges breeding in and around waters of the five lakes on the foot of Mount Fuji were carried out recently by the author and his collaborators in the National Institute for Environmental Studies (NIES) and Toyama Medical and Pharmaceutical University. The first preliminary survey was conducted by Sasa on 9 and 10 July 1981, and the adult midges were collected with insect net from bushes on the shore of the five lakes, Yamanaka, Kawaguchi, Saiko, Shoji and Motosu, as well as from Ashinoko in Hakone. The second survey was conducted with colaboration of Dr. M. Yasuno, Mr. T. Iwakuma and Mr. Y. Sugaya on 24 and 25 August 1981, in which bottom sediment samples were collected and examined at the laboratory in NIES. The third survey was carried out by the above members of NIES and by Prof. K. Konishi and Mr. K. Kawai from Toyama, in which the adult midges resting on the shore of the five lakes were collected with insect net, and a part of the bottom samples recovered from the five lakes were reared in the laboratory in Toyama in order to allow emergence of adult midges. The species of adult males and females identified among these specimens are in Table 1. The methods of collection, preservation and examination of the specimens are the same as described in the previous papers by Sasa (1979–1984).

COLLECTION RECORDS AND DESCRIPTION

Subfamily CHIRONOMINAE

1. *Chironomus plumosus* (Linnaeus, 1758)

Tipula plumosa; Linnaeus, 1758, Syst. Nat. 10, 587
Chironomus plumosus; Edwards, 1929, p. 384
Chironomus plumosus; Esaki, 1932, p. 164
Chironomus plumosus; Strenzke, 1959, p. 19
Chironomus plumosus; Hashimoto, 1977, p. 83
Chironomus plumosus; Sasa, 1978, p. 18

Collection records: 3 males emerged from bottom sediment of Lake Shoji collected on 13 May 1983. 2 males were found among the adults collected with insect net on the shore of Lake Ashinoko, 10 July 1981.

Remarks: This is a very large chironomid species and is known to be commonly breeding in eutrophicated lakes throughout the world. It has been recorded from Japan by Esaki (1932), and the present author has found it in a number of eutrophicated lakes in the low-land of Japan, including Lakes Kasumigaura, Suwa, Biwa, Unagi, Ikeda, etc..

2. *Chironomus yoshimatsui* Martin et Sublette, 1972

Chironomus dorsalis, Meigen; Esaki, 1932, p. 164; Esaki, 1950, p. 1564
Chironomus yoshimatsui, n. sp.; Martin & Sublette, 1972, p. 1
Chironomus yoshimatsui; Hashimoto, 1977, p. 82
Chironomus yoshimatsui; Sasa, 1978, p. 18

Collection records: 4 males were collected on the shore of Lake Kawaguchi, 5 males on the shore of Lake Shoji, 9 July 1981, and 6 males on the shore of Lake Ashinoko on 10 July 1981. All presumably emerged from sewage ditches running into the lakes.

Remarks: This is a species commonly breeding in sewage distches and polluted rivers in Hokkaido, Honshu, Shikoku and Kyushu, but not in the Ryukyu Islands of Japan. Formerly dealt as *Ch. dorsalis* Meigen by various Japanese authors, but Martin & Sublette (1972) described it as a new species based on specimens sent from Japan.

3. *Chironomus nipponensis* Tokunaga, 1940

Chironomus (Chironomus) nipponensis; Tokunaga, 1940, p. 293
Chironomus nipponensis; Hashimoto, 1977, p. 83
Chironomus nipponensis; Sasa, 1978, p. 16
Chironomus nipponensis; Sasa, 1984, p. 43

Collection records: 2 males emerged from a bottom sediment of Lake Yamanaka collected on 13 May 1983.

Remarks: This species was described by Tokunaga (1940) by male and female collected at Shikuka, Karahuto. Large numbers of adults and larvae were collected by Sasa and colaborators (1984) from Yunoko, Nikko. It was also recorded by Sasa (1985b) from Lake Unagi and Kagami, southern Kyushu.

4. *Chironomus fujiprimus*, sp. nov. (Fig. 1)

Collection records: 9 males and a female were collected with insect net from bushes on the shore of Lake Shoji on 9 July 1981 (Holotype: male, A 89:01; paratypes: 8 males and a female, A 02:08).

Male: Body length 6.42–7.36 (6.84 in average of 9) mm, wing length 3.26–3.63 (3.37) mm. Body coloration largely yellowish green, *i.e.* antennal hairs brown, shaft dark brown, ground color of scutum yellow, stripes yellowish brown, scutellum yellow, postnotum brown; abdominal tergites greenish yellow excepting 8th tergite and hypopygium which are brown; halteres yellow, wing unmarked, r-m area dark; femora and tibiae of all legs yellow, tarsi I yellow in basal half and gradually darkened towards end, tarsi II and III brown, tarsi IV and V dark brown. Frontal tubercles prominent (Fig. 1-A). Eyes with a long and narrow dorsomedial projection, ER 0.27–0.38 (mean 0.31). Antenna composed of a pedicel and 11 flagellar segments, AR relatively high, 3.19–3.88 (3.57). Antennal hairs long, AHR 0.50–0.60 (0.55). Supraorbital setae 25–41 (30.8), clypeal setae 23–34 (27.4). Antepronotum without lateral setae. Dorsomedian setae

of scutum highly reduced, 0 in 3, 1 in 1, 2 in 1, 4 in 3, and 5 in 1 specimen (2.2 in average of 8). Dorsolateral setae 13–26 (mean 17.3, most frequently 18), pre-alar setae 6–10 (mean 7.8, most frequently 8 or 9 on one side). Scutellum with 28–42 (31.6) setae roughly in double rows. Squama with 23–33 (27.7) fringe hairs. Wing venation in Fig. 1-C. LR1 1.41–1.53 (1.45), LR2 0.54–0.57 (0.55), LR3 0.58–0.61 (0.60). Front tarsus V 0.20–0.22 (0.21) times as long as front tibia. BR1 1.9–2.4 (2.2), BR2 2.1–5.0 (2.9), BR3 2.9–4.0 (3.6). Pulvilli well developed (Fig. 1-G). Terminal combs of middle and hind tibiae both with a short spur (Fig. 1-F).

Hypopygium in Fig. 1-H. Bands of ninth tergite widely separated in the middle. Ninth tergite with a group of long setae in the middle. Anal point conspicuously darker than the other parts of hypopygium, constricted near base and expanded near apex. Dorsal appendage horn-like (E-form of Strenzke, 1959), the basal setigerous portion rather narrow and bears several long inner setae, apical portion nude and strongly curved near apex (Fig. 1-I). Ventral appendage rather stout, expanded apically and bears numerous long recurved setae. Gonostylus with concave inner margin, nearly parallel-sided and slightly constricted near apex, bears 10 short setae in apical portion along inner margin.

Female: Body length 7.63 mm, wing length 3.68 mm. Body coloration as in male, largely greenish yellow and with brown marks. Head in Fig. 1-D. Antenna with 5 flagellar segments. The last segment darker than the preceding ones and with numerous sensory setae, segments II to IV with a long neck. Frontal tubercles conspicuous, roughly bottle-shaped (Fig. 1-B). ER 0.23, supraorbitals 44, 46, clypeals 45. Scutum with 6 dorsomedians, 16 dorsolaterals and 8 or 10 pre-alars on each side. Scutellum with 28 setae. LR1 1.43, LR2 0.55, LR3 0.59, TR1 0.21, BR1 1.8, BR2 2.2, BR3 2.8. Cercus somewhat quardrangulate, 330 microns long and 300 microns wide (Fig. 1-K). Spermathecae two, both elongate oval (Fig. 1-J).

Remarks: Male of the present species is closest, among the previously recorded members of genus *Chironomus*, to *salinarius* in the structure of anal point and dorsal appendage, but both differ remarkably in body coloration (largely dull black in *salinarius*), in the size of tarsal beards (BR1 5.4–6.3 in *salinarius*, according to Strenzke, 1959), in the shape of ventral appendage (not apically swollen in *salinarius*), and in the number of central setae on ninth tergite (only 1–6 in *salinarius*, more than 10 in the present species).

5. *Chironomus fujisecundus*, sp. nov. (Fig. 2)

Collection records: 4 males and a female were collected with insect net on the shore of Lake Kawaguchi on 9 July 1981 (holotype, a male, A 89:11; paratypes A 89: 12–14). A male was collected also on the shore of Lake Yamanaka on 10 July 1981 (No. A 89:15).

Male: Body length 5.26–6.02 (5.62 in average of 5) mm, wing length 2.60–2.76 (2.54) mm. Body coloration largely yellow or greenish yellow and partly brown; antenal hairs yellow, shaft brown, ground color of scutum yellow, stripes yellowish brown, scutellum yellow, postnotum brown, abdominal tergites entirely greenish yellow, hypopygium brown; halteres pale yellow, wing unmarked; femora, tibiae and tarsi I of all legs yellow, tarsi II and III yellowish brown, IV and V brown. Eyes with a long and narrow dorsomedial projection, ER 0.26–0.44 (0.33). Frontal tubercles (Fig. 2-B) much

smaller than in the preceding species. Antenna with 11 flagellar segments, AR 3.04–3.40 (3.23). Supraorbital setae 34–48 (38.8) on one side, clypeal setae 14–24 (18.8). Antepronotum without lateral setae. Dorsomedian setae 15–19 (17.3), dorsolateral setae 12–18 (15.8), pre-alar setae 6 or 7 (6.4), scutellar setae 18–28 (21.7). Wing in Fig. 2-A. Squama with 14–20 (17.1) fringe hairs. Wing venation similar to the preceding species. Both combs of middle and hind tibiae with a short spur (Figs. 2-E,F). LR1 1.25–1.35 (1.31), LR2 0.54–0.57 (0.55), LR3 0.61–0.67 (0.63). Front tarsus V 0.22–0.24 (0.23) times as long as front tibia. Tarsi with long beards, BR1 4.0–6.2 (5.0), BR2 4.0–7.0 (5.2), BR3 4.7–7.4 (5.6). All legs with large pulvilli (Fig. 2-G).

Hypopygium in Fig. 2-I. Central bristles of ninth tergite shorter than in the preceding and the next species. Anal point (Fig. 2-J) narrow and slender, constricted near base and expanded near apex, slightly darker than ninth tergite. Dorsal appendage (Fig. 2-K) roughly C-shaped, with a broad and flat base bearing several long setae, apical horn strongly curved, narrowest at base and broadest at about middle. Ventral appendage short and almost globular, with 27–32 recurved setae on dorsal side (Fig. 2-L). Gonostylus with nearly straight inner margin, widest at about basal 1/3 and tapering towards apex (Fig. 2-I).

Female: Body length 4.59 mm, wing length 2.86 mm. Body coloration as in male. ER 0.32. Antenna with 5 flagellar segments. Frontal tubercles small, nearly cylindrical, 8 microns long and 5 microns wide, 35 microns apart from each other (Fig. 2-C). Supraorbital setae 28, 30, clypeal setae 25. Scutum with 25 dorsomedian, 14, 14 dorsolateral, and 6, 6 pre-alar setae. Scutellar setae 28. LR1 1.35, LR2 0.54, LR3 0.61, TR1 0.22. Cercus in Fig. 2-H.

Remarks: This species is similar in body coloration to the preceding species, but differs from it in that frontal tubercles are smaller, tarsi and anal point being less darkened, and in the shape of dorsal appendage, ventral appendage, and gonostylus. The shape of the dorsal and the ventral appendages of the present species is peculiar and not seen in the previously recorded species of genus *Chironomus*.

6. *Chironomus fujitertius*, sp. nov. (Fig. 3)

Collection records: 4 males emerged in the laboratory, on 11, 18, 23 and 28 June, respectively, from bottom samples collected 13 May 1983, in a littoral zone of Lake Kawaguchi. (Holotype A 89:16; paratypes A 89:17–19). A male emerged also from a bottom sample collected the same day from Lake Motosu (Specimen No. A 89:20).

Male: Body length 5.00–5.51 (5.24 in average of 4) mm, wing length 2.25–2.81 (2.65) mm. Body yellow with brown marks; antennal hairs yellow, shaft brown; ground color of scutum yellow, scutal stripes reddish brown, scutellum yellow, postnotum dark brown; abdominal tergites (Fig. 3-D) II to IV with a broad basal brown band, distal 1/3 of the tergites being yellow, tergites V to VIII largely brown and with narrow distal yellow band, hypopygium bown; wing unmarked, r-m dark, halteres pale yellow; coloration of leg segments in Fig. 3-C; femora largely yellow and with a narrow apical dark ring, tibiae also largely yellow and with a narrow basal and a narrow apical dark ring, tarsi I to IV largely yellow and each with a narrow apical dark ring, V largely brown excepting the basal portion which is yellow.

Eyes with a long dorsomedial projection, ER small, 0.19–0.23 (0.21). Frontal tubercles (Fig. 3-A) long and cylindrical, 26 microns long, 11 microns wide and 40 mic-

rons apart from each other. Antenna with 11 flagellar segments, AR 3.19–3.51 (3.31), antennal hairs long, AHR 0.53–0.64 (0.59). Supraorbital setae 30–36 (34.3) on one side, clypeal setae 22–43 (28.5). Antepronotum without lateral setae. Scutum with 18–28 (22.0) dorsomedian, 20–30 (24.8) dorsolateral, and 7 or 8 (7.3) pre-alar setae. Scutellar setae 26–32 (27.5) in double or triple rows. Wing membrane unmarked, smooth and slightly purplish. Wing venation in Fig. 3-B. R2+3 separated from R1 and R4+5, ending closer to end of R1 than to end of R4+5. fCu under r-m. Terminal combs of middle and hind tibiae both with a short spur. LR1 relatively high, 1.67–1.81 (1.79), LR2 0.63–0.65 (0.64), LR3 0.71–0.77 (0.74). Front tarsus V relatively long, TR1 0.30–0.32 (0.31). Tarsi with medium sized beards, BR1 2.6–3.4 (2.9), BR2 3.5–4.2 (3.9), BR3 3.8–5.5 (4.5). All legs with distinct pulvilli.

Hypopygium in Fig. 3-E. Ninth tergite with long central setae. Anal point stout, widest at base and with rounded apex, with conspicuously darkened ridges. Dorsal appendage (Fig. 3-F) with a wide and flat base bearing several long setae, apical horn sickle-shaped and with sharply pointed apex. Ventral appendage (Fig. 3-G) rather slender, tapering towards apex but with rounded apex. Gonostylus widest at about basal 1/3, inner margin concave, and slightly constricted near apex.

Remarks: This species is somewhat similar in the structure of hypopygium and in the pattern of dark areas on abdominal tergites to *Ch. nipponensis* Tokunaga, which was also collected from Lake Yamanaka, but differs in the body coloration (almost entirely black in *nipponensis*), in body size (much larger in *nipponensis*), and in that LR1 and TR1 are much larger in the present species. The shape of dorsal appendage, which is tapering towards apex and pointed apically in the present species, is also a distinguishing character. Among species recorded outside of Japan, it is closely related to *Ch. cingulatus* Meigen in body coloration and in the structure of male hypopygium, but is judged as a different species, because, according to Strenzke (1959), the latter has much larger body size (wing length 3.4±0.37 mm, longer tarsal beards (BR 4.4±0.27), tarsal segments of front leg largely dark brown (largely pale yellow and with apical dark rings in the present species), and dorsal appendage of hypopygium darker than the rest parts (same in coloration in the present species).

#7. *Chironomus (Einfeldia) dissidens* Walker, 1851

Chironomus dissidens; Walker, 1851, Ins. Brit, III, 154
Chironomus dissidens; Edwards, 1929, p. 385
Chironomus (Einfeldia) dissidens; Goetghebuer, 1937, p. 31
Chironomus dissideus; Hashimoto, 1977a, p. 84
Chironomus dissidens; Sasa & Hasegawa, 1983, p. 318
Chironomus (Einfeldia) dissidens; Sasa, 1985, p.30

Collection records: A male was collected on the shore of Lake Shoji on 9 July 1981.

Remarks: This is a common species breeding in eutrophicated ponds and lakes in Japan. Hashimoto (1977a,b) stated "It is common in ponds and lakes surrounded by woods in the inland and mountainous areas, but not in highly polluted waters" (author's translation from Japanese). This species seems to be widely distributed in Europe, and was recorded also by Kieffer (1916, p. 113) from Taiwan by the name of *Chirono-*

mus dystenus n.sp. Sasa & Hasegawa (1983) collected adults of this species on the bank of highly polluted eel ponds in Ishigaki, southern Ryukyu.

8. *Glyptotendipes tokunagai* Sasa, 1979

Chironomus (Glyptotendipes) glaucus Meigen; Tokunaga, 1938, p. 324
Glyptotendipes tokunagai; Sasa, 1979, p. 8
Glyptotendipes tokunagai; Sasa & Hasegawa, 1983, p. 319

Collection records: 38 males emerged from bottom samples collected from Lake Kawaguchi on 13 May 1983, 8 males from those of Lake Shoji collected on the same day. A male was found among the adults collected on the shore of Lake Yamanaka on 9 July 1981, and of Lake Motosu on 10 July 1981.

Remarks: This is probably the same as that recorded by Tokunaga (1938) from a freshwater pond at Tomioka, Kyushu, by the name of *G. glaucus*, but was described as a new species by Sasa (1979) with Tsukuba, Ibaraki, as the type locality. It is a very common species breeding in eutrophicated ponds and lakes in Japan, and was collected by the present author from Lake Kasumigaura, Ibaraki (many specimens in 1978 and 1979), eel ponds in Shizuoka in 1979, Lake Kozan-ike, Tottori, 18 June 1981, River Arakawa, Tokyo, on 25 May 1981, and by Sasa & Hasegawa (1983) from eel ponds and eutrophicated lakes in Okinawa, Ishigaki and Miyako Islands, Ryukyu.

9. *Parachironomus arcuatus* Goetghebuer, 1921 (Fig. 4)

Parachironomus arcuatus; Goetghebuer, 1921, p. 163
Parachironomus arcuatus; Goetghebuer, 1937, p. 43
Parachironomus arcuatus; Lehmann, 1970, p. 135
Parachironomus arcuatus; Pinder, 1978, p. 132

Collection records: A male was collected on the shore of Lake Yamanaka, on 9 July 1981; 4 males and 2 females were collected on 13 May 1983, at the same site. 4 males and a female were collected on the shore of Lake Kawaguchi, 9 July 1981, 2 males and a female on 9 July 1981, and 3 males on 13 May 1983, on the shore of Lake Shoji, all collected by sweeping bushes with insect net. A total of 14 males and 4 females, all identified after mounted on slides (Nos. A 89:21–34).

Male: Body length 4.29–4.74 (4.51 in average of 10) mm, wing length 2.04–2.45 (2.25) mm. Body largely yellow or yellowish green with dark brown marks; antennal hairs yellowish brown, shaft brown; ground color of scutum yellow, scutal stripes purplish brown, scutellum yellow, postnotum dark brown; wing unmarked, smooth, slightly brown, halteres yellow; abdominal tergites I to VI greenish yellow and each with a longitudinal brown band in the middle, VII to hypopygium brown; in the front leg, basal half of femur yellow, its distal half brown; tibia and tarsi all dark brown; in the middle and hind legs, femora, tibiae and tarsi I to III entirely yellow, tarsi IV and V brown.

Eyes with a long dorsomedial process, ER 0.31–0.55 (0.39). Frontal tubercles absent. Antenna with 11 flagellar segments, AR 2.49–3.00 (2.71). Antennal hairs well developed, AHR 0.51–0.56 (0.54). Supraorbital setae 16–28 (24.8), clypeal setae 14–

23 (18.6). Antepronotum with 5–8 (5.8) lateral setae. Scutum with 16–24 (20.3) dorsomedian, 16–30 (19.8) dorsolateral, and 5–8 (5.9) pre-alar setae. Scutellar setae 18–20 (18.3). Squama with 10–23 (14.3) fringe hairs. Wing bare, smooth and slightly brown, venation in Fig. 4-A. R2+3 separated from R1 and R4+5, ending closer to the end of the former. Costa not extending beyond end of R4+5, which is near to the tip of wing and much distal of end of Cu1. Anal vein extending much beyond fCu, and bent downwards near the apex. Anal lobe conspicuously produced. LR1 1.46–1.53 (1.49), LR2 0.54–0.59 (0.56), LR3 0.68–0.73 (0.71). Front tarsus V 0.23–0.25 (0.24) times as long as front tibia. Tarsal beards medium in length, BR1 2.7–3.0 (2.8), BR2 3.4–5.2 (4.4), BR3 5.1–6.8 (5.7). Front tibia with a terminal scale with rounded margin, and 3 long subterminal setae (Fig. 4-B). Middle and hind tibiae with terminal combs, both bearing a short spur (Figs. 4-C,D). All legs with an empodium, a pair of claws, and conspicuous pulvilli (Fig. 4-E).

Hypopygium in Figs. 4-F,G. Ninth tergite with rounded posterior margin, and several short setae arising near base of anal point. Anal point long, slender, almost parallel-sided and with rounded tip in dorsal view. Dorsal appendage small, roughly cylindrical but sometimes with broader base, bears numerous microtrichiae and usually 2 terminal setae (in 14 male specimens examined, one had a single seta on one side and two other, another with 3 setae on one side and 2 on the other, the rest 12 specimens bear 2 setae on both sides; Figs. 4-I,J,K). Ventral appendage (Fig. 4-G) pad-like, low, broad and with rounded posterior margin, covered thickly by microtrichiae but without long setae. Gonostylus long, slender and almost parallel-sided, with concave inner margin and rounded apex, bears short setae along inner margin.

Female: Body length 2.96–4.08 (3.75 in average of 4) mm, wing length 2.30–2.60 (2.37) mm. Body coloration as in male but generally paler. Eyes each with a conspicuous dorsomedial projection, but ER larger than in male, 0.49–0.56 (0.52). Frontal tubercles absent, as in male. Supraorbital setae 14–20 (16.3), clypeal setae 20–25 (22.5). Antenna with 5 flagellar segments, II–IV with a middle dark ring, V almost entirely dark and with a long subapical seta (Fig. 4-N). Antepronotum each with 5–9 (7.2) lateral setae. Scutum with 20–27 (23.5) dorsomedian, 24–36 dorsolateral, and 5–8 (7.2) pre-alar setae. Scutellare setae 18–24 (21.3). LR1 1.41–1.58 (1.52), LR2 0.51–0.60 (0.56), LR3 0.66–0.70 (0.67), TR1 0.22–0.24 (0.23). BR1 2.2–2.5 (2.2), BR2 2.2–2.5 (2.3), BR3 2.9–3.6 (3.1). Spermathecae two, both oval (Fig. 4-L). Cercus in Fig. 4-M.

Remarks: The present specimens are tentatively identified as *Parachironomus arcuatus* Goetghebuer according to the keys and descriptions provided by various European authors, since both dorsal and ventral appendages are highly reduced, the former rod-like and bearing a few apical setae, the latter being a low, pubescent pad, none of the distal setae of dorsal appendages arising from a distinct pit, gonostylus long and slender, and anal point is slender and not expanded apically. Lehmann (1970) gave detailed revision of European species of genus *Parachironomus* Lenz of Europe, and the present specimens fit most of the key characters to his *P. arcuatus*, but the body coloration seems to be much paler in the European specimens.

10. *Cryptotendipes fujiquartus* sp. nov. (Fig. 5)

Collection records: 2 males and a female were collected with insect net on the

shore of Lake Motosu, 9 July 1981. A male emerged from a bottom sediment collected on 13 May 1983 from Lake Shoji. A male was collected on the shore of Lake Yamanaka on 10 July 1981, another male emerged from bottom sediment of Lake Yamanaka collected 13 May 1983 (Holotype; male from Lake Motosu, No. A 89:36. Paratypes; other males and a female, Nos. A 89:37–40).

Male: Body length 2.55–3.55 (3.12 in average of 5) mm, wing length 1.38–1.62 (1.49) mm. Body largely yellow or greenish yellow, with brown marks; ground color of scutum yellow, stripes reddish brown, scutellum yellow, postnotum brown, abdominal tergites greenish yellow, hypopygium only slightly brownish; wing unmarked, halteres yellow; in the front leg, femur yellow, tibia brown, tarsus I yellow basally and brown for apical 1/3, tarsi II to V brown; in the middle and hind legs, femur and tibia yellow, tarsus I slightly brownish, II to V brown.

Head with a pair of prominent frontal tubercles (Fig. 5-C), each 30 microns long, 14 microns wide, and 30 microns apart from each other (from center to center). Eyes with a long dorsomedial projection, ER 0.19–0.44 (0.37). Antenna with 11 flagellar segments, AR 1.83–2.11 (1.94), AHR 0.48–0.54 (0.51). Supraorbital setae 9–14 (mean 10.8, most frequently 10) on each side, clypeal setae 7–13 (10.2). Antepronotum with one lateral seta in all the specimens, excepting one with 2 lateral setae on one side. Scutum with 4–9 (6.5) dorsomedian, 7–10 (8.4) dorsolateral, and 3 (in all) pre-alar setae on both sides. Scutllar setae 8–12 (9.3). Squama with 7 or 9 (8.6) fringe hairs. Wing venation in Fig. 5-A. Anal lobe rather obtuse. R2+3 running close to R1, ending nearer to end of R1 than to that of R4+5. End of Cu1 much proximal to end of R4+5. Costa not extending beyond end of R4+5. fCu beyond level of r-m. Anal vein extending much beyond fCu, and bent downwards before the level of fCu. LR1 relatively high, 1.79–1.90 (1.84); LR2 0.50–0.54 (0.52), LR3 0.61–0.64 (0.63). Front tarsus V 0.28–0.30 (0.29) times as long as front tibia. Tarsi with relatively long beards, BR1 2.7–4.6 (3.4), BR2 4.1–4.6 (4.3), BR3 3.9–7.2 (5.8). All legs with a pair of large pulvilli. Terminal combs of middle and hind tibiae both with a short spur (Figs. 5-K, L).

Hypopygium in Figs. 5-F,G. Ninth tergite slightly produced posteriorly on both sides of anal point. Anal point long and stout, with short setae laterally and ventrally on its basal half, distal half being bare and hyaline. Dorsal appendages highly reduced, finger-like and only about 25 microns long and 10 microns in diameter, sparsely covered with microtrichiae, and bear one or two terminal setae (Figs. 5-H,I). Ventral appendages absent. Gonostylus ankylosed with gonocoxite, long, slender and almost parallel-sided, inner margin concave and with short setae, apex rounded.

Female: Body length 2.24 mm, wing length 1.55 mm. Coloration as in male. ER 0.42. Supraorbitals 10, 10, clypeals 15. Lateral pronotals 2, 1. Scutum with 7 dorsomedian, 11 and 12 dorsolateral, and 3 pre-alar setae on both sides. Scutellar setae 6. Squama with 8 and 9 fringe hairs. Wing venation in Fig. 5-B, wider than in male wing, but otherwise similar in structure to the male. Spermathecae elongate oval (Fig. 5-M). Cercus almost as long as wide, with rounded posterior margin (Fig. 5-E).

Remarks: This species is judged as a member of genus *Cryptotendipes* Lenz, since general structure is similar to that of *Chironomus* in wider sense, but dorsal appendages of male hypopygium is highly reduced to small, rod-like processes bearing a few apical setae, ventral appendages are absent, and gonostylus are long, incurved and without apical tooth. Two species are known in Europe within this genus, *C. nigronitens* (Edwards) and *C. pseudotener* (Goetghebuer), but in both species anal point is narrow and simple, and is quite different from the stout, basally constricted and complicated structure in the

present species. In Japan, Sasa (1983a, p. 7) described *Cryptotendipes tamacutus* from the River Tama, but it also differs from the present species in that anal point is long and slender, gonostylus with almost straight inner margin, and anal lobe of wing being conspicuously produced.

11. *Demicryptochironomus chuzequartus* Sasa, 1984 (Fig. 6)

Demicryptochironomus chuzequartus; Sasa, 1984, p. 47

Collection records: 4 males and 2 females were collected with insect net on the shore of Lake Yamanaka, 13 May 1983. A male emerged from a bottom sediment of the same lake collected on the same day. All mounted on slides (Nos. A 39:46–50).

Male: Body length 4.79–5.82 (5.38 in average of 5) mm, wing length 2.68–3.45 (3.22) mm, the male emerged in the laboratory was conspicuously smaller than the wild specimens. Body coloration peculiar to this species, largely yellow with brown or dark brown marks; ground color of scutum yellow, scutal stripes reddish brown, scutellum yellow, postnotum reddish brown; abdominal tergites I to VII greenish yellow, VIII and IX brown, anal point and gonostylus dark brown; wing unmarked, halteres yellow; in the front leg, femur largely yellow and with an apical dark ring, tibia and tarsi entirely dark brown; in the middle and hind legs, femur and tibia entirely yellow, tarsus I largely yellow and gradually darkened from apical 1/3 to apex, II gradually darkened from brown to dark brown towards apex, III, IV and V dark brown.

Frontal tubercles (Fig. 6-B) prominent, almost cylindrical, 25 microns long and 10 microns in diameter, and 20 microns apart from each other. Antenna with 11 flagellar segments, AR 2.96–3.26 (3.07). Antennal hairs long, AHR 0.52–0.68 (0.57). ER 0.27–0.43 (0.35). Supraorbital setae 18–24 (20.7), clypeal setae 12–16 (13.8). Antepronotum with 5–8 (6.5) lateral setae on each side. Scutum with 16–25 (21.6) dorsomedian, 13–19 (16.3) dorsolateral, and 5–8 (6.5) pre-alar setae. Scutellar setae 21–28 (23.8). Squama with 14–20 (17.5) fringe hairs. Wing venation in Fig. 6-C. LR1 1.51–1.65 (1.58), LR2 0.61–0.63 (0.62), LR3 0.62–0.65 (0.64). TR1 0.25–0.28 (0.26). Tarsal beards medium in length, BR1 1.8–2.3 (2.2), BR2 3.3–3.9 (3.7), BR3 5.1–5.9 (5.4). All legs with a pair of large pulvilli.

Hypopygium in Figs. 6-F,G. Posterior margin of ninth tergite rectangularly produced in the middle at the base of anal point. Anal point dark brown, produced like a keel on the surface of ninth tergite, and extending as a long slender process beyond posterior margin. Both dorsal and ventral appendages highly reduced, represented each by a small conical process bearing 1, 2 or 3 long setae (Figs. 6-H,I,J). Gonocoxite brown, gonostylus dark brown. The latter slender, widest at about basal 1/3, with concave inner margin and rounded apex, and with a conspicuous longitudinal keel on the dorsal side.

Female: Body length 4.58, 4.63 mm, wing length 3.19, 3.40 mm. Head in Fig. 6-A. Eyes with a long dorsomedial projection, ER 0.18, 0.32. Frontal tubercles nearly cylindrical, 38 microns long, 14 microns wide, and 50 microns apart from each other, covered thickly with microtrichiae. Antenna composed of a pedicel and 5 flagellar segments, II to IV each with a long neck, last segment with a long subapical seta. Supraorbital setae 20, 20 and 16, 16, clypeal setae 15 in both specimens. Palp 4 segmented as usual. Both antenna and palp are dark brown in color. Antepronotum with 8 or 9 lateral setae. Scutum with 25 and 25 dorsomedian, 22, 20 and 21, 19 dorsolateral, and 6 or 7

pre-alar setae. Scutellar setae 35 and 39. Squama with 15–25 (19.3) fringe hairs. Coloration of thorax and legs as in the male. Both combs of middle and hind tibiae with a short spur. LR1 1.59, 1.71, LR2 0.59, 0.60, LR3 0.65, 0.67, TR1 0.24, 0.26. BR1 2.2, 2.2, BR2 3.0, 3.2, BR3 2.9, 3.2. Spermathecae elongate (Fig. 6-K). Cercus in Fig. 6-L.

Remarks: Males of the present specimens were collected all from Lake Yamanaka, and morphologically almost identical to the type specimens described by Sasa (1984) from Lake Chuzenji, Nikko National Park. The morphology of female is a new record.

12. *Paracladopelma camptolabis* (Kieffer, 1913)

Tendipes camptolabis; Kieffer, 1913; Bull. Soc. Hist. nat. Metz, p. 40
Paracladopelma camptolabis; Harnisch, 1923, Zool. Jahrb. (Syst.) 47:304
Chironomus (Chironomus) camptolabis; Edwards, 1929, p. 387
Tendipes (Cryptochironomus) camptolabis; Goetghebuer, 1937, p. 35
Paracladopelma camptolabis; Pinder, 1978, p. 132
Paracladopelma camptolabis; Sasa, 1984, p. 46

Collection records: 3 males emerged from a bottom sample of Lake Motosu, collected 13 May 1983; all mounted on slides (Nos. A 39:41–43).

Male: Body length 3.41, 3.48, 3.41 mm, wing length 1.97, 1.90, 1.90 mm. Body coloration and external morphology essentially the same as that described with specimens collected from Lake Chuzenji by Sasa (1984, p. 46, Fig. 29), but body coloration almost entirely yellow excepting scutal stripes, which are reddish brown, and generally paler than in the Chuzenji specimens. Frontal tubercles prominent, oval, about 20 microns long, 10 microns wide and 23 microns apart from each other. AR 1.90, 2.02, 2.14, AHR 0.55, 0.56, 0.63. ER 0.19, 0.22. Supraorbitals 15–17 (16.0), clypeals 13, 14, 13. Antepronotum with 3–7 (5.0) lateral setae, scutum with 15, 12, 15 dorsomedian, 6–10 (7.7) dorsolateral, and 3 or 4 pre-alar setae, scutellar setae 7, 6, 8. Squama with 4, 5 or 6 fringe hairs. LR1 1.91, 1.71, LR2 0.61, 0.63, LR3 0.68, 0.71. TR1 0.26 in all the specimens. BR1 3.3, BR2 3.4, 3.6, BR3 4.9, 4.7. Claws simple, pulvilli moderate in size.

The structure of hypopygium is characteristic to this species, and as described and illustrated by Sasa (1984, p. 46, Fig. 29). Ninth tergite without long setae in the middle, with several short setae on both sides of anal point. Anal point slender, slightly expanded apically and with rounded apex. Dorsal appendages pad-like, somewhat triangular, covered thickly with microtrichiae and bear more than 10 short setae along posterior margin. Ventral appendage low, flat and with rounded margin, entirely covered with microtrichiae but without bristles. Gonostylus long, slender and nearly parallel-sided, inner margin concave and bears short setae along inner margin, apex rather pointed.

Remarks: This is a species recorded from Europe (Germany, Netherlands and England), and was recorded and described also by Sasa (1984) from Lake Chuzenji, Nikko. The specimens from Japan were found in relatively oligotrophic lakes such as Chuzenji and Motosu.

13. *Nilothauma brayi* (Goetghebuer, 1921) (Fig. 7)

Kribioxenus brayi; Goetghebuer, 1921, p. 133

Chironomus (Kribioxenus) brayi; Edwards, 1929, p. 396
Kribioxenus brayi; Goetghebuer, 1937, p. 396
Nilothauma brayi; Pinder, 1978, p. 130
Nilothauma brayi; Sasa, 1985, p. 45

Collection records: A single male, emerged 9 June from a bottom sample collected on 14 May 1983 from Lake Saiko (No. A 39:45).

Male: Body length 3.52 mm, wing length 1.66 mm. Body largely yellow and with some brown marks; *i.e.* ground color of scutum yellow, stripes reddish brown, scutellum yellow, postnotum brown, abdorminal tergites greenish yellow including the hypopygium; leg segments largely yellow, partly brownish yellow. Frontal tubercles absent. Eyes with a long dorsomedial projection, only 13 microns apart from each other and ER 0.04 (smallest so far observed in Japanese chironomids). Both antenna missing from this specimen. Supraorbital setae 10, 10, clypeal setae 25. Antepronotum without lateral setae, scutum with 18 dorsomedian, 12 and 14 dorsolateral, and 3, 4 pre-alar setae. Scutellar setae only 2. Wing in Fig. 7-A. Squama bare (a characteristic of this genus). Wing membrane bare, slightly brown and finely granulated when seen under a high magnification (X200). Anal lobe rather flat. R2+3 separated from both R1 and R4+5, ending about midway between ends of R1 and R4+5. fCu much beyond r-m. Anal vein extending well beyond fCu. Terminal scale of front tibia with a long and narrow apical process (Fig. 7-B). Terminal combs of middle and hind tibiae both with a short spur (Figs. 7-C,D; one terminal comb of middle tibia apparently without spur). Front tarsi missing from this specimen. LR2 0.60 (unusually high), LR3 0.54 (unusually small). Pulvilli absent (a characteristic of this genus; Fig. 7-E).

Hypopygium in Figs. 7-H,J. Ninth tergite with 3 processes including anal point, *i.e.* the anterior process (Fig. 7-F) bearing long, rigid and apically forked setae, the middle process (Fig. 7-G) bearing 8 simple setae, and anal point which is basally setigerous but apically nude and hyaline. Dorsal appendage (Fig. 7-K) of gonocoxite broad, pad-like and covered thickly by microtrichiae. Ventral appendage (Fig. 7-J) long, slender, finger-like but smoothly curved, with short setae on apical portion. Gonostylus long, slender and almost straight, apically pointed and with short setae along inner margin.

Remarks: Another male of this species was collected from Lake Unagi, and was described in the previous paper (p. 43, Fig. 17 in Sasa, 1985b).

14. *Dicrotendipes flexus* (Johannsen, 1932) (Fig. 8)

Chironomus (Limnochironomus) flexus; Johannsen, 1932, p. 530
Dicrotendipes flexus; Sasa, 1985, p. 33

Collection records: A male, collected with insect net on the shore of Lake Shoji, 9 July 1981; mounted on a slide (No. A 89:44).

Male: Body length 3.97 mm, wing length 2.14 mm. Body almost entirely yellow, with brown marks; ground color of scutum yellow, scutal stripes reddish brown, scutellum yellow, postnotum brown, halteres yellow, wing unmarked, cross vein r-m dark brown; abdominal tergites greenish yellow, hypopygium brown; front femur yellow, front tibia brown at both ends and yellowish brown in the middle part (front tarsi missing from this specimen); in the middle and hind legs, femora and tibiae yellow, tarsi I

largely yellow and slightly darkened towards apex, tarsi II to V brown. Head (Fig. 8-A) with a pair of frontal tubercles (Fig. 8-B), which are 15 microns long, 8 microns in diameter and 26 microns apart from each other. Eyes with a long dorsomedial projection, ER 0.18. Antenna with 11 flagellar segments, AR 2.64, antennal hairs long, AHR 0.49. Palp 4 segmented as usual (60, 144, 184, 264 microns). Supraorbital setae 15, 16. Clypeal setae 15. Antepronotum without lateral setae. Scutum with 10 dorsomedian, 10, 10 dorsolateral, and 5, 5 pre-alar setae. Scutellar setae 10. Wing in Fig. 8-C. Squama with 5 or 6 fringe setae. Anal lobe rather obtuse. R2+3 separated from R1 and R4+5, ending closer to end of the former. Costa not produced beyond end of R4+5. fCu beyond r-m, each stituated at 46% and 41% level of wing length, respectively. Anal wing extending beyond fCu, and slightly curved downwards near apex. Terminal scale of front tibia (Fig. 8-D) short and with almost rectangular margin. Terminal combs of middle and hind tibiae (Figs. 8-E,F) both with a short spur. TR2 0.58, TR3 0.66. Tarsal beards relatively short, BR2 3.5, BR3 4.4. Pulvilli well developed (Fig. 8-G).

Hypopygium with lateral view of anal point in Fig. 8-H. Dorsal appendages long, slender, with 4 rigid and inwards directed setae arising from the apical expanded and hooked portion (Fig. 8-I). Ventral appendages extremely long, slender and curved, with 7 or 9 stout and recurved setae arising from the slightly expanded apical portion (Fig. 8-J). Gonostylus also long, slender, nearly parallel-sided and with concave inner margin, with a row of short setae along inner margin, and a group of short setae on inner margin of the truncate apex.

Remarks: This specimen is tentatively identified as a male of *Dicrotendipes flexus* (Johannsen) because of its similarity in body coloration and structure of hypopygium to the original description based on a specimen reared from larvae from River Bedali, Java, and from Lake Danau, South Sumatra. Johannsen (1932, p. 530) states "no frontal tubercles", but the present speciment has a pair of conspicuous frontal tubercles (Fig. 8-B). A male and a female of apparently the same species were recorded in the previous paper (Sasa, 1985b, p. 35) from Lake Unagi, southern Kyushu. The present specimen is also similar in coloration and structure to *D. nervosus* (Staeger, 1839) described by various authors from Europe, and its taxonomic status will be discussed more in details when additional specimens are obtained.

15. *Dicrotendipes niveicaudus* (Kieffer, 1921)

Limnochironomus niveicauda; Kieffer, 1921, p. 585
Chironomus (Limnochironomus) niveicauda; Johannsen, 1932, p. 528
Dicrotendipes niveicauda; Hashimoto *et al.*, 1981, p. 13
Kimius hoonsooi Ree, 1981, p. 217
Dicrotendipes niveicaudus; Sasa & Hasegawa, 1983, p. 321

Collection records: 3 males were found among the adult chironomids collected with insect net on the shore of Lake Shoji on 9 Junly 1981 (No. A 85:28). A male and a female were collected also on the shore of Lake Kawaguchi on the same day (No. A 87:58).

Remarks: This is a very common species found in and around highly eutrophicated ponds and lakes in Japan. The original description by Kieffer (1921) was made without giving even a figure, and the present author had considered it better to be treated

as a nomen dubium, and the name used by *Kimius hoonsooi* by Ree (1981) accompanied by good description should be regarded as the valid name. However, Hashimoto *et al.* (1981) gave a new description and illustration using the name *D. niveicauda* with materials collected in Thailand. This species was recorded also by Sasa & Hasegawa (1983) from a number of eutrophicated ponds and rivers in Okinawa, Ishigaki, and Ikema, the Ryukyu Islands.

#16. *Stictochironomus akizukii* (Tokunaga, 1940)

Chironomus (Stictochironomus) akizukii; Tokunaga, 1940, p. 299
Stictochironomus akizukii; Sasa, 1984, p. 48
Stictochironomus akizukii; Sasa, 1985b, p. 38

Collection records: 3 males emerged from a bottom sample of Lake Yamanaka collected on 14 May 1983. A male and a female were collected with insect net on the shore of the same lake on 25 September 1981. 2 males were collected also on the shore of the same lake on 13 May 1983. 2 males emerged from a bottom sample collected 13 May from Lake Saiko.

Remarks: This species was described by Tokunaga (1940) with males and females collected in Fukuoka, Wakayama and Tokyo, and also in Sakhalin. It was collected by the present author from both Lakes Yunoko and Chuzenji of Nikko, and also from Lake Miike, as described in the previous papers by Sasa (1984, p. 48; 1985b, p. 38). This is probably a common species breeding in lakes in Japan.

#17. *Stictochironomus multannulatus* (Tokunaga, 1938)

Chironomus (Polypedilum) multannulatus; Tokunaga, 1938, p. 339
Stictochironomus multannulatus; Yamamoto, 1980, p. 24
Stictochironomus multannulatus; Sasa, 1984, p. 51

Collection records: 6 males emerged from a bottom sample collected from Lake Motosu on 13 May 1983 (Nos. A 89–61–66). 2 males emerged also from a bottom sediment of Lake Saiko collected 13 May 1983 (Nos. A 89:67–68).

Remarks: This species was described by female only, and as a member of subgenus *Polypedilum* by Tokunaga (1938), but Yamamoto (1980) placed it to this genus. The structure of male, female and pupa was described by Sasa (1984) with specimens collected from Lake Chuzenji, Nikko. Since it was not found from the more eutrophicated lake of Yunoko of the same area and not from Lakes Shoji, Kawaguchi and Yamanaka, it seems to be representing an inhabitant of rather oligotrophic environments.

#18. *Stictochironomus histrio* (Fabricius, 1974) (Figs. 8-K,9)

Tipula histrio; Fabricius, 1974, Ent. Syst. IV, 244, 51
Chironomus (Stictochironomus) histrio; Fab. (*S. sticticus*, Feb.), Edwards, 1929, p.401
Stictochironomus histrio; Goetghebuer, 1937, p. 55

Stictochironomus sticticus; Pinder 1978, p. 140
Stictochironomus histrio; Yamamoto, 1980, p. 24

Collection records: 4 males and a female emerged from a bottom sediment collected 25 September, 1981, from Lake Yamanaka (Nos. A 89:71–74). 2 females were collected also on the shore of Lake Motosu on 14 May 1983 (No. A 89:75).

Male: Body length 6.38–7.04 (6.62 in average of 4) mm, wing length 3.37–3.78 (3.55) mm. Body largely black or dark brown; ground color of scutum black, stripes pruinose and black, scutellum dark brown, postnotum black; halteres brown, wing with a dark spot around r-m, otherwise without dark marks. Coloration of leg segments in Fig. 9-D; femora of all legs largely black but with a narrow brown subapical ring, front and middle tibiae largely brown and with two ends black, hind tibiae also with a dark ring in the middle, tarsi I brown in basal half and black in distal half, other tarsi entirely black; abdominal tergites largely black, II to VII with a pale band along caudal margin.

Antenna with 13 flagellar segments, AR 2.52–2.98 (2.79 in average of 4), antennal hairs very long, AHR 0.64–0.79 (0.73). Eyes with a long and narrow dorsomedial projection, ER 0.29–0.36 (0.32). Palp 4 segmented as usual. Frontal tubercles absent. Supraorbital setae 16–22 on each side, 18.3 in average. Clypeal setae 30–34 (31.5). Antepronotum without lateral setae. Scutum with a hump in the middle (a characteristic of this genus), with 14–18 (16.5) dorsomedian, 16–20 (18.0) dorsolateral, and 5–7 (5.9) pre-alar setae on each side. Scutellum with 20–30 (26.0) setae in irregular rows. Wing in Fig. 8-K. Wing membrance bare, with a dark spot around cross vein r-m. Anal lobe rather obtuse. R2+3 separated from both R1 and R4+5, ending about midway between ends of the two veins. Costa slightly extending beyond end of R4+5. fCu slightly proximal to r-m (an unusual character as Chironomini). Anal vein extending much beyond fCu. Coloration and relative length of leg segments in Fig. 9-D. Front tibia with several long subapical setae, terminal scale with rounded margin (Fig. 9-E). One terminal comb of middle and hind tibiae with a short spur (not so long as in *Polypedilum* spp.), the other comb without spur (Figs. 9-F,G). All legs with a pair of simple claws, an empodium, and a pair of large pulvilli (Fig. 9-H), LR1 relatively small, 1.11–1.15 (1.13 in average of 4), LR2 0.59–0.62 (0.61), LR3 0.72–0.74 (0.73). Tarsus V of front leg 0.21 or 0.22 times as long as front tibia. Tarsi with relatively long beards, especially those on front tarsus I unusually long, BR1 7.1–8.3 (7.6), BR2 4.2–6.0 (5.2), BR3 6.1–9.1 (6.8).

Hypopygium in Fig. 9-I. Ninth tergite with a group of very long and stout setae in the middle, and several short setae on both sides of anal point along posterior margin. Anal point long, slender, nearly parallel-sided and with a rounded or truncate tip. Dorsal appendage (Fig. 9-J) only slightly expanded basally, apical horn largely straight but strongly curved apically, with a long lateral seta arising from near apex. Ventral appendage (Fig. 9-K) long, stout, tapering towards apex, and with 18–20 strong recurved setae. Gonocoxite much longer than gonostylus (a characteristic of this genus). Gonostylus with a keel on dorsal side, and a group of short setae along the inner margin and in the apical portion.

Female: Body length 4.43–5.30 (4.74 in average of 3) mm, wing length 2.75–3.67 (3.11) mm, the two laboratory reared specimens from Motosu were much smaller than the wild female collected on the shore of Yamanaka. Coloration as in male. Head in Fig. 9-A. Eyes with a long dorsomedial projection, ER 0.21–0.38 (0.29). Frontal

tubercles absent. Antenna with 5 flagellar segments, segments II, III and IV with a long neck. Supraorbital setae 12–18 (14.7) on each side, clypeal setae 32–46 (38.0). Antepronotum bare on both sides in one, 3, 2 and 2, 1 in the other two specimens. Scutum with 12–22 (16.0) dorsomedian, 22–30 (24.7) dorsolateral, and 4–11 (8.3) pre-alar setae on each side. Scutellar setae 20–25 (22.7). Squama with 16–21 (18.3) fringe hairs. LR1 1.15–1.22 (1.19), relatively small as in male; LR2 0.56–0.57, LR3 0.67–0.73 (0.70). Front tarsus V 0.21–0.23 times as long as front tibia. BR1 3.2–4.3, BR 2.6–3.2, BR3 4.4–4.8. Spermathecae in Fig. 9-B, cercus in Fig. 9-C.

Remarks: 3 species of genus *Stictochironomus* were collected in the present surveys of the lakes in Fuji area, *S. multannulatus* from Lakes Motosu and Saiko, *S. akizukii* from Lakes Yamanaka and Saiko, and *S. histrio* from Lakes Yamanaka and Motosu. The first species can be differentiated from the other two by that wing has several dark spots, while the other two have only one dark spot around cross vein r-m. *S. akizukii* and *S. histrio* can also be easily differentiated by the coloration of tarsal segments (entirely dark in the latter, largely white and with dark apical rings in the former), in the values of AR (about 2.0 in the former, about 2.8 in the latter), and in the size of tarsal beards (BR1 about 2.4 in the former, larger than 7.0 in the latter). *S. histrio* is a species widely distributed in Europe, and its occurrence in Japan was recorded by Yamamoto (1980). *S. akizukii* was collected from the more polluted lakes such as Yunoko in Nikko, while *S. multannulatus* was collected from the less polluted lakes such as Chuzenji, and detailed morphological accounts of these two species were made by Sasa (1984).

19. *Pentapedilum sordens* (van der Wulp, 1874)

Pentapedilum (Pentapedilum) sordens; Edwards, 1929, p. 376
Pentapedilum sordens; Goetghebuer, 1937, p. 79
Pentapedilum sordens; Tokunaga, 1938, p. 321
Pentapedilum sordens; Hashimoto, 1983, p. 20
Pentapedilum sordens; Sasa, 1985, p. 39

Collection records: Adult specimens were collected with insect net on the shore, 5 males and 3 females at Lake Yamanaka on 10 July 1981 (No. a 86:46–50), a male and a female at Lake Shoji on 13 May 1983, a male at Lake Kawaguchi on 9 July 1981, and another male on 14 May 1983 on the shore of the same lake.

Remarks: This species seems to be commonly breeding in eutrophicated lakes in Japan, and was recorded also from Lake Unagi, southern Kyushu by Sasa (1985b) in the previous paper.

20. *Polypedilum cultellatum* Goetghebuer, 1931

Polypedilum cultellatum; Goetghebuer, 1931, Ann. Soc. Entomol. Belg. LXXI, p. 212
Polypedilum cultellatum; Goetghebuer, 1937, p. 60
Polypedilum cultellatum; Pinder, 1978, p. 136
Polypedilum cultellatum; Sasa & Hasegawa, 1983, p. 330

Collection records: 23 males together with females emerged from water plant

samples collected on 14 May 1983 from Lake Kawaguchi. Adults including 6 males emerged also from water plant samples collected on 13 May 1983 from Lake Yamanaka.

21. *Polypedilum nubeculosum* (Meigen, 1818)

Chironomus nubeculosus; Meigen, 1818, Syst. Beschr. I, 37, p. 37
Chironomus (Polypedilum) nubeculosus; Edwards, 1929, p. 402
Polypedilum nubeculosum; Goetghebuer, 1937. p. 62
Chironomus (Polypedilum) nubeculosus; Tokunaga, 1940, p. 297
Polypedilum nubeculosum; Pinder, 1978, p. 138
Polypedilum nubeculosum; Sasa, 1984, p. 58
Polypedilum nubeculosum; Sasa, 1985. p. 42

Collection records: 23 males were identified among adults emerged from water plant samples collected from Lake Yamanaka, 13 May 1983. 9 males were found among the adults emerged from water plant samples collected from Lake Kawaguchi on the same day. 48 males were identified among the adults emerged from Lake Shoji, and 4 males among those emerged from a sample collected from Lake Motosu, May 1983. 18 males and 3 females were found among the adult specimens collected on the shore of Lake Ashinoko, 10 July, 1981.

22. *Polypedilum asakawaense* Sasa, 1980

Polypedilum asakawaense; Sasa, 1980, p. 34
Polypedilum asakawaense; Sasa, 1984, p. 59

Collection records: 2 males emerged from a bottom sample of Lake Shoji collected 13 May 1983 (No. A 84:99). A male emerged also from a sample of Lake Motosu collected on 25 September 1981 (No. A 85:74).

23. *Polypedilum tamagohanum* Sasa, 1983

Polypedilum tamagohanum; Sasa, 1983a, p. 16
Polypedilum tamagohanum; Sasa, 1984, p. 61

Collection records: 3 males emerged from a bottom sample collected on 14 May 1983 from Lake Saiko (No. A 87:04–06).

Remarks: This is a species morphologically closely related to *P. laetum* (Meigen) of Europe, and was collected originally from the upstream parts of River Tama (Sasa, 1983a), and also from the more oligotrophic Lake Chuzenji in Nikko (Sasa, 1984). It should be noted also that the present specimens emerged only from the more oligotrophic Lake Saiko among the lakes in the Fuji area surveyed.

24. *Polypedilum unifascium* (Tokunaga, 1938)

Chironomus (Polypedilum) unifascia; Tokunaga, 1938, p. 335
Polypedilum unifascium; Sasa, 1980, p. 32

Collection records: A male was collected on the shore of Lake Kawaguchi on 9 July 1981 (No. A 89:99).

25. *Tanytarsus chuzesecundus* Sasa, 1984

Tanytarsus chuzesecundus; Sasa, 1984, p. 30

Collection records: 4 males and 4 females were collected on the shore of Lake Motosu on 14 May 1983 (Nos. A 85:67–70). 16 males emerged from bottom sediment collected on the same day from the same lake (females are left unidentified).

26. *Tanytarsus yunosecundus* Sasa, 1984

Tanytarsus yunosecundus; Sasa, 1984, p. 36

Collection records: 7 males emerged from bottom sediments collected from Lake Shoji on 13 May 1983 (Nos. A 85:31–37). 6 males emerged from bottom sediment of Lake Yamanaka collected on the same day (Nos. A 86:31–36). A male emerged froma sample collected on the same day from Lake Kawaguchi (No. A 87:61).

27. *Tanytarsus unagiseptimus* Sasa, 1985

Tanytarsus unagiseptimus; Sasa, 1985a, p. 47

Collection record: 26 males (also some females) emerged from bottom sediments collected from Lake Shoji on 13 May 1983.

28. *Tanytarsus tamagotoi* Sasa, 1983

Tanytarsus tamagotoi; Sasa, 1983a, p. 23

Collection record: A male emerged from a sample of Lake Saiko collected on 14 May 1983.

29. *Tanytarsus oyamai* Sasa, 1979

Tanytarsus oyamai; Sasa, 1979, p. 3

Collection record: 4 males emerged from a sample collected on 14 May 1983 from Lake Saiko.

Subfamily ORTHOCLADIINAE

30. *Orthocaldius chuzesextus* Sasa, 1984

Orthocladius chuzesextus; Sasa, 1984, p. 64

Collection record: A male emerged from a sample collected on 14 May 1983 from Lake Sainoko.

31. *Psectrocladius yunoquartus* Sasa, 1984

Psectrocladius yunoquartus; Sasa, 1984. p. 69

Collection records: 21 males emerged, together with some females, from samples collected on 13 May 1983 from Lake Yamanaka. 36 males, together with some females, emerged also from samples collected on 14 May 1983 from Lake Kawaguchi.

32. *Paratrichocladius rufiventris* (Meigen, 1830)

Chironomus rufiventris; Meigen, 1830, Syst. Beschr., p. 249
Spaniotoma (Trichocladius) rufiventris; Edwards, 1929, p. 329
Trichocladius rufiventris; Goetghebuer, 1940, p. 202
Paratrichocladius rufiventris; Hirvenoja, 1973, p. 89
Paratrichocladius rufiventris; Pinder, 1978, p. 74
Paratrichocladius rufiventris; Sasa, 1979, p. 74
Paratrichocladius rufiventris; Sasa, 1983b, p. 71

Collection records: 3 males were collected on the shore of Lake Ashinoko with insect net on 10 July 1981. A male emerged from a sample of Lake Saiko collected 14 May 1983.

33. *Cricotopus sylvestris* (Fabricius, 1794)

Tipula sylvestris; Fabricius, 1794; Enomol. Syst. p. 252
Cricotopus sylvestris; Edwards, 1929, p. 319
Cricotopus sylvestris; Tokunaga, 1936, p. 12
Cricotopus (Isocladius) sylvestris; Hirvenoja, 1973, p. 277
Cricotopus (Isocladius) sylvestris; Pinder, 1978, p. 62
Cricotopus sylvestris; Sasa, 1979, p. 39
Cricotopus sylvestris; Sasa, 1985, p. 57

Collection records: 28 males and 13 females were collected with insect net on the shore of Lake Ashinoko on 10 July 1981. 23 males emerged, together with some females, from samples collected on 13 May 1983 from Lake Yamanaka. 12 males and 5 females emerged from samples collected on the same day from Lake Kawaguchi. 5 males and 4 females were collected on the shore of Lake Yamanaka, 12 males and 10 females on the shore of Lake Shoji on 13 May 1983, 14 males and 12 females on the shore of Lake Kawaguchi on 14 May 1983, all with insect net from bushes.

Remarks: This is a species widely distributed in Europe (Hirvenoja, 1972), North America (Sublette & Sublette, 1965), and also in Taiwan (Kieffer, 1922) and Java (Johannsen, 1932), but Tokunaga (1936) stated that he had not seen this in Japan. However, the present author has found it to be abundantly breeding on the water plants in every eutrophicated lakes surveyed in the lowland of Japan, such as Lakes Kasumigaura, Suwa, Unagi, Ikeda, and the four eutrophicated lakes in the Fuji area, *i.e.* Ashinoko, Yamanaka, Kawaguchi and Shoji.

#34. *Cricotopus yatabensis* Sasa, 1979

Cricotopus (Isocladius) yatabensis; Sasa, 1979, p. 41

Collection record: A male was collected with insect net on the shore of Lake Shoji on 9 July 1981.

Male: Body length 2.89 mm, wing length 1.51 mm. Body almost entirely black, with some pale marks, *i.e.* scutum, scutellum and postnotum black, stripes hardly distinguishable, abdominal tergites black excepting I and IV whcih are slightly paler than the rest tergites; gonocoxite and gonostylus also pale (whitish grey); femora of all legs black, tibiae black at both ends and brown at middle one third, front tarsi entirely black, middle and hind tarsi brown; shaft of halteres brown, knob yellow.

Eyes highly pubescent, inner margin conspicuously concave, ER 0.96. Antenna with 13 flagellar segments, AR 1.02, AHR 0.42. Supraorbital setae 6 on both sides, clypeal setae 16. Scutum, with 22 dorsomedian setae and 32 dorsolateral setae on both sides, all relatively short and arising from small pits. Pre-alar setae 6 on both sides. Scutellum with 32 setae in multiple rows. Squama with 4 fringe hairs. Wing venation, distribution of abdominal setae, and the structure of hypopygium as described and illustrated by Sasa (1979) for this species.

Remarks: This species was found to be abundantly breeding in eutrophicated ponds and ditches constructed in NIES, Ibaraki. The above measurement data and the structure of the present specimen fits well to the original description.

#35. *Smittia aterrima* (Meigen, 1818) (Figs. 10-A–D)

Chironomus aterrimus; Meigen, 18181
Spaniotoma (Smittia) aterrima; Edwards, 1929, p. 360
Smittia aterrima; Goetghebuer, 1940, p.86
Smittia aterrima; Tokunaga, 1940, p. 289
Smittia aterrima; Brundin, 1956, p. 147

Collection records: 2 males were collected with insect net on the shore of Lake Yamanaka, 13 May 1983, and 12 males on the shore of Lake Motosu, 14 May 1983; all identified after mounted on slides (Nos. A 90:01–8).

Male: Body length 2.24–2.45 (2.35 in average of 12) mm, wing length 1.59–1.83 (1.66) mm. Body entirely dull black, scutellum and legs dark brown and slightly paler than the rest body, halteres brown. Eyes highly pubescent, reniform and with concave inner margin. Antenna with 13 flagellar segments, AR 1.64–1.97 (1.68), relatively large as a member of this group, last segment with a conspicuous terminal seta. ER 1.10–1.32 (1.22). Supraoribital setae 10–14 (most frequently 10, 10.9 in average), clypeal setae 6–8 (7.0). Antepronotum relatively reduced and with only 1–4 lateral setae. Scutum and scutellum in Fig. 10-B. Dorsomedian setae of scutum very short and weak, arising from small pits, 7–12 (9.4). Dorsolateral setae long and stout, arising from large pale pits, 8–17 (11.9, most frequently 12). Pre-alar setae 3–5 (4.1, most frequently 4). Scutellum with 6–8 (7.0) setae. Squama without fringe setae. Wing membrance bare, smooth and slightly brown. Wing venation in Fig. 10-A. R2+3 separated from R1 and R4+5, ending about midway between the two ends. Costa much produced beyond end of R4+5. fCu much beyond r-m. Cu2 remarkably sinuate. Anal vein extending beyond fCu, and curved downwards near the apex. Front tibia with a long terminal spur (55 microns). Middle tibia with two short terminal spurs (28 and 20 microns). Hind tibia with a long terminal spur (50 microns), a very short terminal spur (10 microns), and a terminal comb composed of 12–15 free spurs (28–36 microns). LR1 0.55–0.59 (0.75), LR2 0.47–0.50 (0.48), LR3 0.58–0.64 (0.61). Front tarsus V 0.11–0.13 (0.12) times as long as front tibia. Tarsi with relatively long beards, BR1 3.0–5.2 (3.7), BR2 3.8–6.0 (4.7), BR3 5.7–8.2 (7.0). Pulvilli absent.

Hypopygium in Figs. 10-C,D. Ninth tergite without long setae and thickly covered by microtrichiae. Anal point short, slender, covered with microtrichiae to near tip. Gonocoxite stout and short, with a small inner lobe. Gonostylus simple, with a large and long expansion occupying more than half of the inner side.

Remarks: This species has been known to be widely distributed in Europe, and was also recorded from Hokkaido by Tokunaga (1940). Among the species of this genus, it is characterised by having pubescent eyes, anal point short and pubescent to near tip, and gonostylus with inner expansion reaching from near tip to beyond middle on inner margin.

#36. *Smittia nudipennis* Goetghebuer, 1913 (Figs. 10-E–H)

Smittia nudipennis; Goetghebuer, 1913, p. 19
Spaniotoma (Smittia) nudipennis; Edwards, 1929, p. 362
Spaniotoma (Smittia) nudipennis; Tokunaga, 1939, p. 312
Smittia (Smittia) nudipennis; Goetghebuer, 1940, p. 97
Smittia nudipennis; Pinder, 1978, p. 96

Collection records: 5 males were collected with insect net on the shore of Lake Motosu, 14 May 1983. 3 males on 9 July 1981, and a male on 13 May 1983, on the shore of Lake Shoji. A male on 13 May 1983 on the shore of Lake Yamanaka. All identified after mounted on slides (Nos. A 90:11–16).

Male: Body length 1.66–2.10 mm (1.88 mm in average of 10), wing length 1.07–

1.41 (1.13) mm. Body almost entirely dull black, legs dark brown. Eyes highly pubescent, crescent shaped and without dorsomedial projection, widely apart from each other, ER 1.23–1.50 (1.34). Antenna with 13 flagellar segments, AR 1.03–1.30 (1.13). Antennal hairs long, AHR 0.47–0.61 (0.55). Palp 4 segmented as usual. Supraorbital setae 3–5 (most frequently 4, 3.9 in average), clypeal setae 6–14 (8.9). Antepronotum with only 2 lateral setae. Scutum and scutellum in Fig. 10-F. Dorsomedian setae all minute, 2–7 (5.0) in number. Dorsolateral setae well developed and arising in large pale pits, 10–17 (13.0) on each side. Pre-alar setae 4–8 (most frequently 5, mean 5.2). Scutellum with 8 or 10 (8.7) setae. Squama bare. Wing unmarked, slightly brown and smooth. Wing venation in Fig. 10-E. R2+3 separated from both R1 and R4+5. Cu1 ending at about the same level as end of R4+5. Cu2 strongly curved. Anal vein extending beyond fCu, and curved downwards apically. Costa extending beyond end of R4+5. Anal lobe rather obtuse. LR1 small, 0.45–0.54 (0.59), LR2 0.44–0.46 (0.45), LR3 0.51–0.57 (0.54). Tarsi with relatively long beards, BR1 2.7–3.6 (3.1), BR2 3.8–4.3 (4.1), BR3 4.6–7.9 (6.2). Pulvilli absent. Front tibia with a long terminal spur (42 microns), middle tibia with two short terminal spurs (21 and 17 microns), hind tibia with a long terminal spur (48 microns), a short terminal spur (13 microns), and a terminal comb composed of 12 free spurs (25–36 microns long).

Hypopygium in Figs. 10-G,H. Ninth tergite without long setae in the middle. Anal point long, slender, widest at base and with rounded apex, with microtrichiae on only the basal portion and the rest apical part nude. Gonocoxite with a small conical inner lobe. Gonostylus simple, with a large terminal spur, and a large subapical inner expansion.

Remarks: This is a species known to be distributed in the continental Europe and England, and was recorded by Tokunaga (1939) from Mount Niitaka, Taiwan, but is a new record from Japan. The structure of anal point and gonostylus is characteristic to this species.

#37. *Parakiefferiella chuzeundecima* (Sasa, 1984) (Fig. 11)

Epoicocladius chuzeundecimus; Sasa, 1984, p. 87

Collection records: 5 males were collected on the shore of Lake Motosu on 14 May 1983 (No. A 90:21–24). 3 males were collected also on the shore of Lake Yamanaka on 13 May 1983 (No. A 90:25–27). A male emerged from a bottom sample collected on the same day from Lake Yamanaka (No. A 90:28).

Male: Body length 2.03–2.52 (2.33 in average of 9) mm, wing length 1.45–1.66 (1.55) mm. Body entirely dull black. Eyes nude, without dorsomedial projection, inner margin almost straight, ER 1.15–1.52 (1.30). Antenna with 13 flagellar segments as usual, AR 0.78–0.87 (0.82). Last antennal segment with numerous short sensory setae subapically (Fig. 11-A). Antennal hairs relatively long, AHR 0.41–0.50 (0.45). Supraorbital setae 4 on each side in all the specimens, excepting one with 5 on one side, Clypeal setae 4–7, most frequently 4, mean 5.1. Antepronotum with 2 (1 and 3 each in only one specimen) lateral setae. Scutum (Fig. 11-C) with no dorsomedian setae in all the specimens examined, 4–9 (mean 5.1) dorsolateral setae on each side, and 3 pre-alar setae on each side in all the specimens examined. Scutellum with only 2 setae in all. Wing in Fig. 11-B. Squama bare. Wing membrane bare, smooth, and slightly brown.

R2+3 separated from R1 and R4+5, ending about midway between ends of the two veins. Costa extending much beyond end of R4+5. Cu1 ending on about the same level as end of R4+5. Cu2 strongly sinuate. Anal vein extending much beyond fCu, and only slightly bent downwards. Anal lobe rather obtuse. The structure of legs as usual, *LR1* 0.53–0.56 (0.54), *LR2* 0.45–0.49 (0.47), *LR3* 0.52–0.55 (0.54). Tarsus V of front leg 0.10–0.12 (0.11) times as long as front tibia. Tarsi with relatively long beards, BR1 2.5–3.2 (2.9), BR2 3.7–5.5 (4.6), BR3 5.3–5.9 (5.6). Pulvilli absent.

Hypopygium in Figs. 11-D,E. Ninth tergite with a transverse row of 7–10 setae in the middle. Anal point short, triangular and apically pointed, bare except for basal portion and colorless. Gonocoxite rather slender and with a large conical inner lobe. Gonocoxite rather slender and with a large conical inner lobe. Gonostylus slender, slightly expanded apically and with a long apical spur but without subapical inner expansion such as seen in *Smittia aterrima* or *S. nudipennis*.

Remarks: These specimens are morphologically almost identical with those of *Epoicocladius chuzeundecimus* Sasa, 1984, described by male and female emerged from a bottom sample collected from littoral zone of Lake Chuzenji, and keys out to the above genus according to Pinder (1978), but is considered here as better placed in genus *Parakiefferiella* from ecological aspects.

#38. *Pseudosmittia triappendiculata* (Goetghebuer, 1931) (Fig. 11)

Smittia triappendiculata; Goetghebuer, 1931, Bull. Ann. Soc. Entomol. Belg. 71:217
Smittia (Pseudosmittia) triappendiculata; Goetghebuer, 1940, p. 109
Pseudosmittia triappendiculata; Goetgh.; Brundin, 1956, p. 170
Pseudosmittia forcibata (Goetghebuer); Pinder, 1978, p. 94, Fig. 136D

Collection records: 2 males were collected with insect net on the shore of Lake Yamanaka, 13 May 1983. A male was collected on the same day on the shore of Lake Motosu. All identified after mounted on slides (Nos. A 90:31–33).

Male: Body length 1.90–2.17 mm (2.05 mm in average of 3), wing length 1.14–1.28 mm (1.23 mm). Body entirely black. Eyes bare and reniform, inner margin slightly concave and without dorsomedial projection, ER 1.43–1.49 (1.47). Antenna with 13 flagellar segments as usual, AR 1.00, 1.07, 1.14; terminal segment slightly expanded apically, with numerous subapical sensory setae but without terminal spur. Supraorbital setae 4 or 5 on each side (2 in the middle and 2 or 3 laterally). Clypeal setae 6 in all the specimens examined. Antepronotum with 1 or 2 lateral setae. Scutum (Fig. 11-G) without dorsomedian setae but with a small pale area in the center bearing two minute spines, with 10 or 11 dorsolateral setae and 3, 4 or 5 pre-alar setae on both sides. Scutellum with 4 setae in all the specimens. Wing in Fig. 11-F. Squama bare, membrane smooth and without dark marks, slightly brown. R2+3 running close to R4+5. Costa not extending beyond end of R4+5. fCu much beyond r-m. Cu1 ending distal of end of R4+5. Cu2 short and curved. Anal vein short and not reaching level of fCu. LR1 0.41, 0.43, 0.44; *LR2* 0.48, 0.49, 0.50; *LR3* 0.56, 0.57, 0.58. Tarsus V of front legs 0.11 or 0.12 times as long as front tibia. Terminal spurs of tibiae as usual, tarsi without terminal spurs. Pulvilli absent. Tarsi with relatively long beards, BR1 3.0–3.9, BR2 5.8, BR3 7.2.

Hypopygium in Figs. 11-H,I. Ninth tergite with 4 pairs of long lateral setae, and

4 short setae in the middle on both sides of anal point. Anal point arising at about middle of ninth tergite, rather short and pointed apically, dark in color, and thickly covered with stout setae. Gonocoxite short and stout, triangularly shaped, each with 3 conspicuous inner processes, all characteristic to this species. Gonostylus widest at near base and tapering towards apex, with a long subterminal spur, also characteristic to this species.

Remarks: This species belongs to the genus *Pseudosmittia* Goetghebuer since wings are bare, not coarsely granular, anal lobe obtuse, costa not extending beyond end of R4+5, which is situated proximal of end of Cu1, R2+3 running close to but separated from R4+5, antepronotum without dorsal setae, and scutum with a central tubercle (Mesonotalhöcker of Brundin, 1956). It belongs to the *angusta*-group according to Brundin (1956), and keys out to *triappendiculata* according to Goetghebuer (1940) and Brundin (1956) in that it has peculiarly shaped three processes on gonocoxite. The present species also fits to *forcibata* (Goetghebuer) of Pinder (1978), which however has only two processes on gonocoxite according to Goetghebuer (1940, p. 106).

39. *Orthosmittia fujiquinta* sp. nov. (Figs. 12-A–F)

Collection record: A male was collected with insect net on the shore of Lake Yamanaka, 13 May 1983 (No. A 90:51)

Male: Body length 2.24 mm, wing length 1.45 mm. Body largely dark brown (slightly paler than the preceding species), halteres yellowish brown, legs brown. Head in Fig. 12-A. Eyes bare, inner margin concave and upper corner produced towards middle, ER 0.85 (smaller than in the related species). Antenna with 13 flagellar segments, AR 1.11, last segment slightly expanded apically and without terminal spur (Fig. 12-B). Supraorbital setae 6 on each side, clypeal setae 4. Palp 4 segmented as usual. Antepronotum with 4 lateral setae on both sides. Scutum with 11 minutes dorsomedian setae, 15 and 17 dorsolateral setae, and 9 pre-alar setae on each side. Scutellum with 8 setae in a transverse row (Fig. 12-D). Wing membrane bare, smooth, and slightly brown. Squama with 3 or 4 fringe hairs. Wing venation in Fig. 12-C. R2+3 separated from R1 and R4+5, ending about midway between ends of the two veins. Costa produced beyond end of R4+5. End of R4+5 beyond end of Cu1. Cu2 slightly curved. Anal vein extending beyond fCu, and only slightly curved. Anal lobe obtuse. LR1 0.57, LR2 0.44, LR3 0.60. Front tarsus V 0.14 times as long as front tibia. BR1 3.2, BR2 3.4, BR3 4.7. Pulvilli absent.

Hypopygium in Fig. 12-E. Anal point robust, darkly pigmented, and with stout setae and numerous microtrichiae. Inner lobe of gonocoxite broad and acutely angulate. Gonostylus roughly V-shaped, with a strong dorsal process supported by keel (Fig. 12-F).

Remarks: This specimen is identified tentatively as a member of genus *Orthosmittia*, since wings and eyes bare, wing membrane smooth, squama with fringe hairs, and anal point covered with numerous microtrichiae. However, this specimen differs from all the previously known species of this and related genera in that anal point is robust and bears several strong setae, and gonostylus has a large dorsal process.

40. *Eukiefferiella fujisexta* sp. nov. (Figs. 12-G–J)

Collection recod: A male, collected with insect net on the shore of Lake Motosu, 14 May 1983 (No. A 90:53)

Male: Body length 2.66 mm, wing length 1.62 mm. Body entirely dull black. Eyes bare, reniform, inner margin only slightly concave, ER 1.32. Antenna with 13 flagellar segments as usual, AR 2.08, last segment tapering towards apex and apically pointed, without strong or curved sensory setae. Antennal hairs long, AHR 0.61. Supraorbital setae 7 on each side. Antepronotum with 5 lateral setae on both sides. Scutum with 6 dorsomedian, 11, 12 dorsolateral, and 5, 5 pre-alar setae (Fig. 12-H). Scutellum with 8 setae in a transverse row. Wing membrane very finely granular, slightly purplish. Wing venation in Fig. 12-G. Squama with 8 fringe hairs. Anal lobe conspicuously produced. R2+3 separated from R1 and R4+5, ending about midway between the two ends. Costa not produced beyond end of R4+5. Cross vein r-m long, and almost parallel to wing axis. fCu slightly beyond r-m. Cu2 moderately curved. End of Cu1 under end of R4+5. Anal vein extending slightly beyond fCu. LR1 0.54, LR2 0.43, LR3 0.52. Front tarsus V 0.12 times as long as front tibia. Pulvilli lacking.

Hypopygium in Figs. 12-I,J. Anal point absent, but ninth tergite with a large semicircular swelling in the middle bearing 12 long setae. Inner lobe of gonocoxite small, somewhat like tip of finger. Gonostylus widen near tip and tapering towards base, with a large conical subpical tooth.

Remarks: This specimen is diagnosed as a member of genus *Eukiefferiella*, since *wings are bare, squama with fringe hairs, eyes bare, Cu2 nearly straight, pulvilli absent*, wing membrane not coarsely dotted, and antenna without curved apical setae. This genus was defined originally by larval and pupal morphology, and includes heterologous species in reference to the adults. Goetghebuer (1940, p. 114) devided this genus into 5 subgenera, among which the present species belongs to subgenus *Eukiefferiella* s. str. Among the known species of this group, it somewhat resembles to *E. minor* (Edwards) in that anal point absent, eyes bare, squama fringed, and gonostylus with a subapical tooth. However, both differ remarkably in the shape of inner lobe (much smaller in the present species), in the presence of semicircular swelling bearing 12 strong setae on ninth tergite, and in the peculiar shape of gonostylus (outer margin rectangularly produced apically, and with a large rectangular subapical tooth in the present species). The high antennal ratio of 2.08 is also a characteristic to this species.

41. *Pseudorthocladius fujiseptimus* sp. nov. (Fig. 13)

Collection record: 5 males were collected with insect net on the western shore of Lake Yamanaka on 13 May 1983 (Nos. A 90:33–36).

Male: Body length 2.17–2.34 (2.23 in average of 5) mm, wing length 1.38–1.62 (1.43) mm. Body entirely dull black. Head in Fig. 13-A. Eyes bare, reniform and innrer margin slightly concave, ER 0.88–1.14 (1.03). Antenna with 13 flagellar segments, AR 0.89–0.98 (0.95), last segment slightly swollen apically and with a terminal spur. Supraorbital setae 8 or 10 on each side, clypeal setae 6 or 8. Antepronotum with 4 or 6 lateral setae. Scutum (Fig. 13-C) 8–12 (10.4) short dorsomedian setae, 8–14 dorsolateral setae all well developed and arising from large pale pits, and 4–7 (5.3) prealar setae on each side, scutellar setae 6–8 (7.2) in a transverse row. Wing venation in

Fig. 13-B. R2+3 running close to R4+5 but ending about midway between ends of R1 and R4+5. Costa extending beyond end of R4+5. fCu slightly beyond r-m. Cu1 ending almost on the same level as end of R4+5. Cu2 forming a narrow angle against Cu1, and only slightly curved. Anal vein extending much beyond fCu. Squama with 6 or 8 fringe hairs. Anal lobe rather conspicuous. Wing membrane bare, very finely granulated and slightly brown. Terminal spurs of tibiae as in Figs. 13-D,E,F. LR1 0.53–0.57 (0.55), LR2 0.41–0.44 (0.42), LR3 0.56–0.58 (0.57). Tarsi with relatively long beards, BR1 3.0–3.8 (3.3), BR2 3.6–4.4 (4.0), BR3 4.3–8.6 (6.1). Front tarsus V 0.13 or 0.14 times as long as front tibia. Pulvilli well developed (Fig. 13-G).

Hypopygium in Figs. 13-H,I. Anal point stout, apically rounded and with strong lateral setae, darker than ninth tergite (Fig. 13-J). Inner lobe of gonocoxite boot-shaped and expanded apically (Fig. 13-K). Gonostylus with angulate outer margin and straight inner margin, widest at about basal 1/3 (Fig. 13-L).

Remarks: The present specimens are judged as belonging to genus *Pseudorthocladius* Goetghebuer, 1932, since wings and eyes are bare, squama fringed, wing membrane smooth, legs with conspicuous pulvilli, and anal point stout and with strong lateral setae. Among 3 species of this genus known from Europe, this species is similar in body coloration to *P. pilosipennis* Brundin and *P. filiformis* (Kieffer), but quite different from them in the shape and structure of inner lobe of gonocoxite and of gonostylus.

42. *Pseudorthocladius fujioctavus* sp. nov. (Fig. 14)

Collection records: 4 males were collected with insect net on the shore of Lake Yamanaka on 13 May 1983 (Holotype: A 90:41a; paratypes: A 90:41b, 41c, 42a). 7 males were collected also on the shore of Lake Motosu on 14 May 1984 (paratypes: A 90:43–48).

Male: Body length 2.17–2.59 (2.30 in average of 10) mm, wing length 1.48–1.62 (1.55) mm. Body largely dark brown or brown, paler in general than in the preceding species (*P. fujiseptimus*), *i.e.* antennal shaft and hairs brown, ground color of scutum yellowish brown, stripes dark brown, halteres yellow, wing unmarked; leg segments almost uniformly brown, excepting basal portions of femora which are yellowish brown; abdominal tergites dark brown, anal point black.

Head in Fig. 14-A. Eyes bare, inner margin concave and slightly produced dorsomedially, ER 0.92–1.33 (1.06). Antenna with 13 flagellar segments, AR 0.81–0.92 (0.88 in average of 8), last segment slightly expanded apically, with numerous short sensory setae in the apical portion, and a short but strong apical spur (Fig. 14-B). Supraorbital setae 6–11 (most frequently 8, 8.5 in average) on one side. Clypeal setae 5–8 (most frequently 6, average 6.5). Antepronotum without dorsal setae, and with 1–4 (most frequently 2 or 4) lateral setae. Scutum and scutellum in Fig. 14-C. Dorsomedian setae all minute, 8–16 (12.5). Dorsolateral setae well developed and arising from large pale pits, 9–12 (most frequently 10, mean 10.3) on one side. Scutellar setae 7–12 (mean 8.9, most frequently 8). Wing in Fig. 14-C. Membrane bare but very finely granulate under high power, slightly purplish. Costa extending much beyond end of R4+5. R2+3 separated from both R1 and R4+5, ending about midway between the two ends. fCu slightly beyond r-m, and forms a narrow angle. Cu2 only slightly sinuate. Anal vein extending much beyond fCu. Squama with 1–5 (most frequently 3, mean 2.8) fringe hairs. Anal lobe rather obtuse. The structure of tibiae as usual, *i.e.* tip of

front tibia with a long terminal spur (Fig. 14-E), tip of middle tibia with two short spurs (Fig. 14-F), tip of hind tibia with a long and a short terminal spurs, and a comb of free spurs (Figs. 14-G,H). LR1 0.53–0.58 (0.56), LR2 0.42–0.46 (0.44), LR3 0.57–0.59 (0.58). Front tarsus V 0.10–0.12 (0.11) times as long as front tibia. Tarsi with relatively long beards, BR1 2.8–3.4 (3.1), BR2 3.4–5.0 (4.3), BR3 4.7–6.8 (5.5). Tarsus IV slightly longer than V, which bears an empodium, a pair of simple claws, and a pair of large pulvilli (Fig. 14-I).

Hypopygium in Figs. 14-J,K. All specimens of the present species bear an internal structure (anal brush) composed of long setae shown in Fig. 14-L, which is not seen in other related species, including *P. fujiseptimus*. Anal point conical but with rounded apex, darkly pigmented and with strong lateral setae. Inner lobe of gonocoxite shorter and broader than in the preceding species, bears strong and short setae. Gonostylus not especially expanded in the middle as in the preceding species, with a strong subterminal spur.

Remarks: This species is also judged as a member of genus *Pseudorthocladius* because wings and eyes are bare, squama fringed, wing membrane smooth, anal point stout and with strong setae, and legs with conspicuous pulvilli. The present species differs from the preceding one in that it has an internal organ (anal brush) in the apical part of abdomen composed of several long and strong bristles, inner lobe of gonocoxite being shorter and with rounded apex, and gonostylus not conspicuously expanded in the middle. Body coloration is not entirely black as in the preceding species, but is largely brown or dark brown. Among the species known from Europe, the present one is somewhat related to *P. curtistylus* (Goetghebuer, 1921) in that ground color of scutum yellowish, AR smaller than 1, and wing length is about 1.5 mm, but differs from the former in that anal point is longer and narrower, and inner lobe of gonocoxite being much more conspicuously produced (cf. Pinder, 1978, Fig. 135 D).

#43. *Limnophyes fujinonus* sp. nov. (Fig. 15)

Collection records: A male was collected on the shore of Lake Yamanaka on 10 July 1981 (holotype: A 90:71). Another male was collected at the same locality on 13 May 1983 (paratype: A 90:72). A male of presumably the same species was collected on the shore of Lake Kawaguchi on 9 July 1981 (A 90:73). Another male and 3 females, possibly the same species, were collected on the shore of Lake Motosu on 9 July 1981 (A 90:74–76).

Male: Body length 1.48, 1.62, 1.66 mm, wing length 0.90, 0.97, 0.97 mm. Body entirely dull black or dark brown; ground color of scutum dark brown, stripes black and hardly discernible, scutellum dark brown, postnotum black; abdominal tergites entirely dark brown, sternites yellowish brown; leg segments entirely brown. Head in Fig. 15-B. Eyes small, inner margin almost straight, ER 1.38, 1.69, 1.71. Antenna with only 11 flagellar segments, the basal segments fujiform, the last segment short and with only a few apical sensory setae, AR 0.36, 0.53, 0.64. Antennal hairs rather short, Antepronotum with 1 or 2 lateral setae. Scutum without dorsomedian setae, dorsolateral setae 8 or 10 on each side, pre-alar setae 4 or 5. Scutellum with only 4 setae. Wing eral setae 8 or 10 on each side, pre-alar setae 4 or 5. Scutellum with only 4 setae. Wing in Fig. 15-A. Squama with only one seta in all the specimens examined. Wing membrane coarsely granulate. Cu2 strongly curved. Anal lobe rather flat. Anal vein not extending

beyond fCu. The structure of tips of tibiae in Figs. 15-D,E,F. LR1 0.46–0.51, LR2 0.44–0.46, LR3 0.53–0.54. Front tarus V 0.11–0.13 times as long as front tibia. Tarsal beards relatively short, BR1 2.1–2.4, BR2 2.3–2.6, BR3 2.8–3.3. Pulvilli absent, claws with forked apex (Fig. 15-G).

Hypopygium in Figs. 15-H,I. Anal point low and with rounded apex, bears numerous short setae. Inner lobe of gonocoxite with angulate and sharply pointed margin. Gonostylus not expanded medially, and with a rectangularly angulate subapical tooth.

Remarks: This is a member of genus *Limnophyes* Eaton, since wings are coarsely dotted, vein Cu2 conspicuously curved, eyes bare, squama with a few fringe haris, and with broad and pubescent anal point. Among the known species of this genus, the present one seems to be closest to *L. minimus* (Meigen) in that scutum without lamellar setae and anal lobe of wing is nearly flat, but both differ in the structure of inner lobe of gonocoxite (not rectangularly angulate in *minimus*) and of gonostylus (without subapical tooth in *minimus;* cf. Pinder, 1978, Fig. 130A). A key for differentiation of 6 species of this genus recorded from Japan is presented in the remarks of the next species. Most characteristic to this species is that antenna is composed of only 11 flagellar segments (12 segmented in the specimen A 90:74) with very low AR. The female of this species has the antenna with only 4 flagellar segments (Fig. 15-J), two spermathecae in Fig. 15-L, and small cercus as in Fig. 15-K.

44. *Limnophyes fujidecimus* sp. nov. (Fig. 16)

Collection records: A male was collected on the shore of Lake Kawaguchi on 9 July 1981 (holotype: A 90:78). Another male was collected on the shore of Lake Yamanaka on 13 May 1983 (paratype: A 90:79).

Male: Body length 2.17, 2.62 mm, wing length 1.44, 1.97 mm (holotype much smaller than the paratype). Body almost uniformly dull black, ground color of scutum brown, scutal stripes black, scutellum dark brown, postnotum black, abdominal tergites dark brown, sternites brown, legs dark brown, wing unmarked. Head in Fig. 16-A. Eyes bare, inner margin concave and rather conspicuously produced dorsomedially, ER 0.92, 0.93. Antenna with 13 flagellar segments, AR 1.50, 1.52, last segment with only a few subterminal sensory setae. Antennal hairs long, AHR 0.52, 0.53. Supraorbital setae 11, 12 and 11, 11. Clypeal setae 8 or 10.

Antepronotum (Fig. 16-C) without dorsal setae but with 6, 7 or 8, 10 lateral setae. Scutum and scutellum in Fig. 16-D, dorsomedians 20 in both specimens, all minute. Dorsolaterals 18, 18 or 26, 26, all arising from a large pale pit (most of the setae are unfortunately dropped off from both specimens, it is presumed that those in the anterior part are mostly simple and those in the posterior part include short lamellar setae). Prealar setae 7, 8 or 8, 9, scutellar setae 8 in the holotype and 10 in the paratype. Wing in Fig. 16-B. Wing membrane coarsely granular when examined under high power magnification (X200). Costa extending much beyond end of R4+5. R2+3 separated from both R1 and R4+5, ending about midway between the two ends. fCu beyond r-m, both situated at 45% and 37% levels of the wing length. Cu2 only slightly curved. Anal vein extending beyond fCu. Squama with 4 or 6 fringe hairs. Leg segments are relatively long and slender, LR1 0.59, 0.64, LR2 0.48, 0.53, LR3 0.61 (tarsi of hind legs are missing from the paratype). Tarsal hairs relatively short, BR1 2.0, BR2.2 and BR3 2.4 in the type specimen. Pulvilli absent, claws with forked apex. Tips of tibiae in

Figs. 16-E,F,G.

Hypopygium in Figs. 16-H,I,J. Anal point very broad and low, and with rounded margin, bears 8–10 strong setae along posterior margin. Inner lobe of gonocoxite broad and only slightly produced but bearing short and strong setae (Fig. 16-H). Gonostylus simple, with a strong apical spur but without subapical tooth, and nearly egg-shaped when seen from dorsal aspect (Fig. 16-J, drawn from paratype). Gonocoxite has a large oval hole for the housing of gonostylus (Fig. 16-H).

Remarks: This species differs from the former in the shape of gonostylus and inner lobe of gonocoxite, and in the numbers of dorsomedian and dorsolateral setae of scutum, and in the number of antennal segments and antennal ratio. The present species is somewhat stimilar to *L. pumilio* (Holmgren) reported from Europe (cf. Pinder, 1978, Fig. 129B) in the structure of anal point and inner lobe of gonocoxite, but is quite different in the shape of gonostylus. Especially characteristic is the large oval structure of gonostylus in the present species. Altogether 6 species of *Limnophyes* have been recorded from Japan, and they can be differentiated in male by the following key.

Key to males of Japanese species of genus *Limnophyes* Eaton

1 – Gonostylus strongly produced dorsally forming an angle in the middle, tapering towards apex like a beak, and without apical spur 2
– Gonostylus not strongly produced dorsally, with rather truncate apex and with a strong apical spur 3
2 – Antenna with 13 flagellar segments as usual, AR 0.56–0.60; prescutellar area with numerous lamellar setae . . . . . *prolongatus* Kieffer, 1921 of Tokunaga, 1959, p. 40
– Antenna with only 12 flagellar segments, AR 0.22–0.30; prescutellar area with simple setae only; dorsomedian setae absent . . . . . *tamakireides* Sasa, 1983b
3 – Prescutellar area with numerous lamellar setae; antenna with 13 flagellar segments, AR 0.8; inner lobe of gonocoxite large and with rounded apex . . . . . *tamakitanaides* Sasa, 1981
– Prescutellar area with simple setae only, or with only a few lamellar setae . . . 4
4 – Antenna with 13 flagellar segments, AR 1.50–1.55; gonostylus very large and roughly oval-shaped when seen from dorsal side; inner lobe of gonocoxite low but with strong setae; dorsomedian setae of scutum 20, dorsolateral setae 13 on each side . . . . . *fujidecimus* Sasa, 1985
– Antenna with 12 or less flagellar segments, AR smaller than 1.0; gonocoxite slender and nearly parallel-sided in dorsal aspect 5
5 – Antenna with only 10 flagellar segments, AR 0.37; antepronotum with 3 dorsal and 2 lateral setae; inner lobe of gonocoxite with rounded margin; scutum with 3 dorsomedian setae . . . . . *tamakiyoides* Sasa, 1983a
– Antenna with 11 or 12 flagellar segments, AR 0.38–0.64; antepronotum without dorsal setae and with 1–3 lateral setae; inner lobe of gonocoxite with angulate and pointed margin; dorsomedian setae absent . . . . . *fujinonus* Sasa, 1985

45. *Corynoneura fujiundecima* sp. nov. (Fig. 17)

Collection records: 15 males were collected on the southern shore of Lake Yama-

naka on 13 May 1983, with insect net while swarming. 10 specimens among them were mounted on slides (Holotype: No. A 90:81a; Paratypes: No. A 90:81b–85b).

Male: Body length 1.86–2.13 (2.02 in average of 10) mm, wing length 1.14–1.24 (1.19) mm. Body coloration: antennal hairs yellowish brown, shaft brown, scutum entirely black, stipes undistinguishable; scutellum and postnotum entirely black; abdominal tergites I–V yellowish brown, VI to hypopygium dark brown; halteres pale yellow; femora and tibiae of all legs brown, tarsal segments yellowish brown.

Head in Fig. 17-A. Eyes bare, reniform, inner margin slightly concave and widely apart from each other, ER 1.26–1.70 (1.48). Supraorbital setae absent, clypeal setae 7–10 (9.7 in average, most frequently 10). Palp with 4 flagellar segments, segments I and II nearly globular (Fig. 17-C). Antenna composed of 12 flagellar segments, AR 0.62–0.70 (mean 0.66), last segment with numerous sensory setae in the apical portion (Fig. 17-B). Antennal hairs relatively short, AHR 0.37–0.46 (0.42). Antepronotum (Fig. 17-D) with 0, 1 or 2 (most frequently 1) lateral setae. Scutum and scutellum in Fig. 17-E. Dorsomedian scutal setae absent, dorsolateral setae 4, 5 or 6 on each side, pre-alar setae 2 on each side excepting in a specimen with 1 on one side. Scutellar setae only 2 in all the specimens examined.

Wing in Fig. 17-F. Squama bare. Anal lobe flat and almost linear. Veins R1, R2+3 and R4+5 fused and shortened (a characteristic of this genus). fCu much beyond r-m, and situated about 80% level of wing length from its base. Anal vein ending before fCu. Tip of front tibia with a long spur (36 microns; Fig. 17-G). Tip of middle tibia obliquely truncate and with two short spurs (Fig. 17-H). Tip of hind tibia strongly expanded like a beak, with a long terminal spur (50 microns), a short and curved spur at the tip of the beak, and a row of some 16 simple spurs along the posterior margin (Fig. 17-I). Tarsus I of all legs relatively short, LR1 0.53–0.57 (0.55), LR2 0.55–0.58 (0.56), LR3 0.56–0.59 (0.58). Front tarsus V 0.10 or 0.11 times as long as front tibia. Tarsus IV of all legs shorter than tarsus V, and bilobed (Fig. 17-J). Pulvilli absent.

Abdominal tergites II to VIII each with a middle seta, and tergites VI to VIII with a pair of lateral setae, otherwise without long hairs (Fig. 17-K). Hypopygium in Figs. 17-L,M. Tergite IX with two pairs of lateral setae, and a pair of small lobes with rounded margin and each bearing 3 short setae in the middle and on posterior margin. Anal point absent. Gonocoxite short and stout, and with a low inner lobe near its apex, which bears several short setae. Gonostylus short and simple, inner margin concave, with a strong terminal spine.

Remarks: The characteristic structure of wing and the tip of hind tibia indicates that this is a member of genus *Corynoneura* Winnertz in the strict sense. Tokunaga (1936) recorded 6 species of this group from Japan, among which the present species is most closely related to *vittalis* Tokunaga (1936) in that antenna is 12 segmented, sensillary setae of terminal segment of antenna is restricted to tip only, vein M is nearly straight, but both differ distinctly in the values of AR (about 0.2 in *vittalis*), body coloration (ground color of scutum yellow and vittae distinct, abdominal terga yellow, legs yellowish brown in *vittalis*), and in the shape of gonostylus and inner lobe of gonocoxite. Among the species of this genus known from Europe, the present species is somewhat related to *lacustris* Edwards (1924), but AR is again larger and inner lobe of gonocoxite is less pronounced in the present species.

EXPLANATION OF FIGURES

Fig. 1 ***Chironomus fujiprimus*, sp. nov.**

A. frontal tubercles, male. **B.** do, female. **C.** wing, male. **D.** head, female. **E.** tip of front tibia, male. **F.** tip of hind tibia, male. **G.** hind tarsus V, male. **H.** hypopygium, male. **I.** dorsal appendage, male. **J.** spermathecae, female. **K.** cercus, female.

Fig. 2 ***Chironomus fujisecundus*, sp. nov.**

A. wing, male. **B.** frontal tubercles, male. **C.** do, female. **D.** tip of front tibia, male. **E.** tip of middle tibia, male. **F.** tip of hind tibia, male. **G.** front tarsus V, male. **H.** cercus, female. **I.** hypopygium, male. **J.** anal point, lateral view. **K.** dorsal appendage. **L.** ventral appendages and inner margin of gonocoxites.

Fig. 3 ***Chironomus fujitertius*, sp. nov.**

Male: A. wing. **B.** frontal tubercles. **C.** dark rings of leg segments; 1: front leg segments, 2: middle leg segments, 3: hind leg segments. **D.** coloration of abdominal tergites. **E.** hypopygium. **F.** dorsal appendage. **G.** ventral appendage.

Fig. 4 ***Parachironomus arcuatus*** **Goetghebuer**

A. wing, male. **B.** tip of front tibia, male. **C.** tip of middle tibia, male. **D.** tip of hind tibia, male. **E.** hind tarsus V, male. **F.** male hypopygium, dorsal view. **G.** do, ventral view. **H.** anal point, lateral view. **I, J, K.** variation in dorsal appendages. **L.** female spermathecae. **M.** cercus. **N.** female antenna.

Fig. 5 ***Cryptotendipes fujiquartus*, sp. nov.**

A. wing, male. **B.** do, female. **C.** frontal tubercles, male. **D.** do, female. **E.** cercus, female. **F.** male hypopygium, dorsal view. **G.** do, ventral view. **H, I.** dorsal appendages. **J.** tip of front tibia. **K.** tip of middle tibia. **L.** tip of hind tibia, male. **M.** spermathecae, female.

Fig. 6 ***Demicryptochironomus chuzequartus*** **Sasa**

A. head, female. **B.** frontal tubercles, male. **C.** wing, male. **D.** tip of front tibia, male. **E.** tip of hind tibia, male. **F.** male hypopygium, dorsal view. **G.** do, ventral view. **H, I, J.** dorsal appendages with 2, 3 and 4 terminal setae. **K.** spermathecae, female. **L.** cercus, female.

Fig. 7 ***Nilothauma brayi*** **(Goetghebuer)**

Male: A. wing. **B.** tip of front tibia. **C.** tip of middle tibia. **D.** tip of hind tibia. **E.** middle tarsus V, and tip of tarsus IV. **F.** anterior process of ninth tergite. **G.** middle process of ninth tergite. **H.** hypopygium, dorsal view. **I.** do, ventral view. **J.** ventral appendage. **K.** dorsal appendage.

Fig. 8 *Dicrotendipes flexus* (Johannsen)

Male: A. head. B. frontal tubercles. C. wing. D. tip of front tibia. E. tip of middle tibia. F. tip of hind tibia. G. middle tarsus V, and tip of Tarsus IV. H. hypopygium. I. dorsal appendage. J. ventral appendage.

Stictochironomus histrio (Fabricius)

K. male wing

Fig. 9 *Stictochironomus histrio* (Fabricius), continued.

A. head, female. B. spermathecae, female. C. cercus, female. D. coloration of leg segments, male. E. tip of front tibia, male. F. tip of middle tibia, male. G. tip of hind tibia, male. H. hind tarsus V, male. I. hypopygium. J. dorsal appendage. K. ventral appendage.

Fig. 10 *Smittia aterrima* (Meigen)

Male: A. wing. B. scutum and scutellum. C. hypopygium, dorsal view. D. hypopygium, ventral view.

Smittia nudipennis Goetghebuer

Male: E. wing. F. scutum and scutellum. G. hypopygium, dorsal view. H. hypopygium, ventral view.

Fig. 11 *Parakiefferiella chuzeundecima* (Sasa)

Male: A. last two segments of antenna. B. wing. C. scutum and scutellum. D. hypopygium, dorsal view. E. hypopygium, ventral view.

Pseudosmittia triappendiculata (Goetghebuer)

Male: F. wing. G. scutum and scutellum. H. hypopygium, dorsal view. I. hypopygium, ventral view.

Fig. 12 *Orthosmittia fujiquinta*, sp. nov.

Male: A. head. B. last two segments of antenna. C. wing. D. scutum and scutellum. E. hypopygium, left half, dorsal view. F. gonocoxite and gonostylus, right side.

Eukiefferiella fujisexta, sp. nov.

Male: G. wing. H. scutum and scutellum. I. hypopygium, left half, dorsal view. J. hypopygium, right half, ventral view.

Fig. 13 *Pseudothorcladius fujiseptimus*, sp. nov.

Male: A. head. B. wing. C. scutum and scutellum. D. tip of front tibia. E. tip of middle tibia. F. tip of hind tibia. G. front tarsus V. H. hypopygium, dorsal view. I. hypopygium, ventral view. J. anal point. K. dorsal appendage. L. gonostylus.

Fig. 14 *Pseudothorcladius fujioctavus*, sp. nov.

Male: A. head. B. tip of antenna. C. wing. D. scutum and scutellum. E. tip of front tibia. F. tip of middle tibia. G, H. tip of hind tibia. I. hind tarsus IV and V. J. hypopygium, dorsal view. K. do, ventral view.

Fig. 15 ***Limnophyes fujinonus*****, sp. nov.**

Male: **A.** wing. **B.** head. **C.** scutum and scutellum. **D.** tip of front tibia. **E.** tip of middle tibia. **F.** tip of hind tibia. **G.** hind tarsus IV and V. **H.** hypopygium, dorsal view. **I.** hypopygium, ventral view and internal structures. **Female.** **J.** head. **K.** cercus. **L.** spermathecae.

Fig. 16 ***Limnophyes fujidecimus*****, sp. nov.**

Male: **A.** head. **B.** wing. **C.** antepronotum. **D.** scutum and scutellum. **E.** tip of front tibia. **F.** tip of middle tibia. **G.** tip of hind tibia. **H.** hypopygium, dorsal view, holotype. **I.** do, ventral view. **J.** hypopygium, dorsal view, from paratype specimen.

Fig. 17 ***Corynoneura fujiundecima*****, sp. nov.**

Male: **A.** head. **B.** last two segments of antenna. **C.** palp. **D.** antepronotum. **E.** scutum and scutellum. **F.** wing. **G.** tip of front tibia and base of tarsus I. **H.** tip of middle tibia and tarsus I. **I.** tip of hind tibia and tarsus I. **J.** hind tarsus III, IV and V. **K.** abdominal tergites. **L.** hypopygium, dorsal view. **M.** do, ventral view.

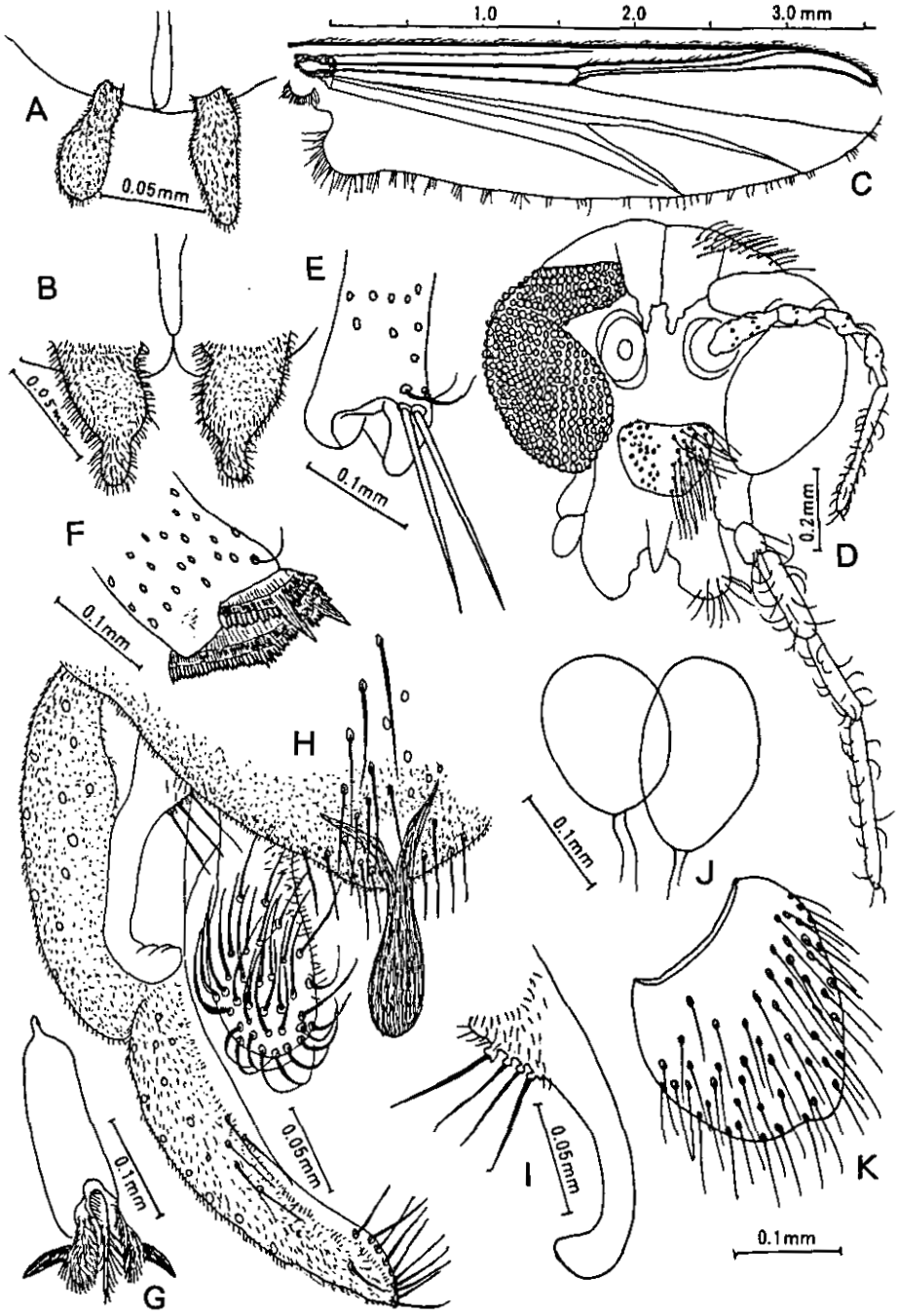

Fig. 1 *Chironomus fujiprimus*, sp. nov.

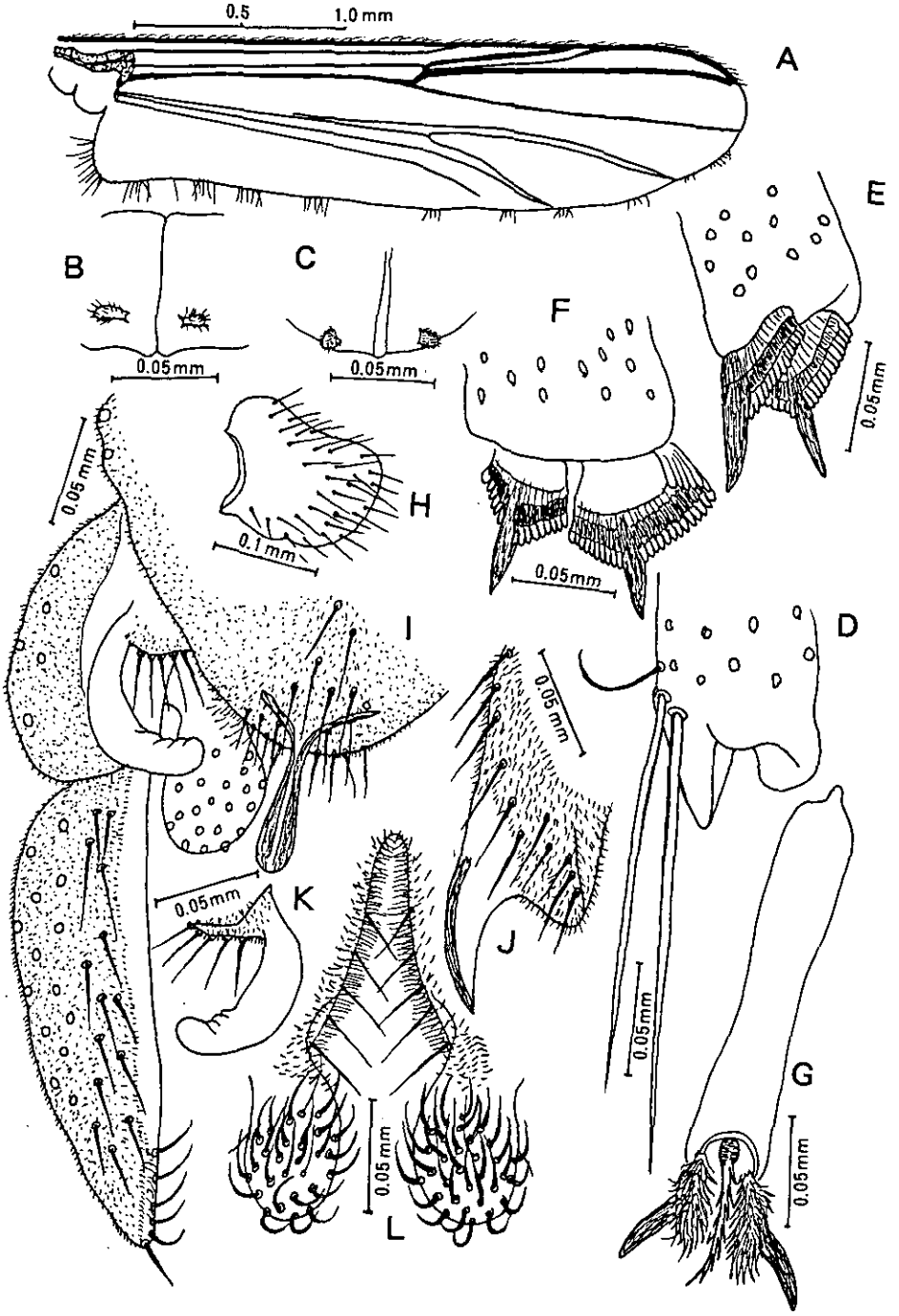

Fig. 2 *Chironomus fujisecundus*, sp. nov.

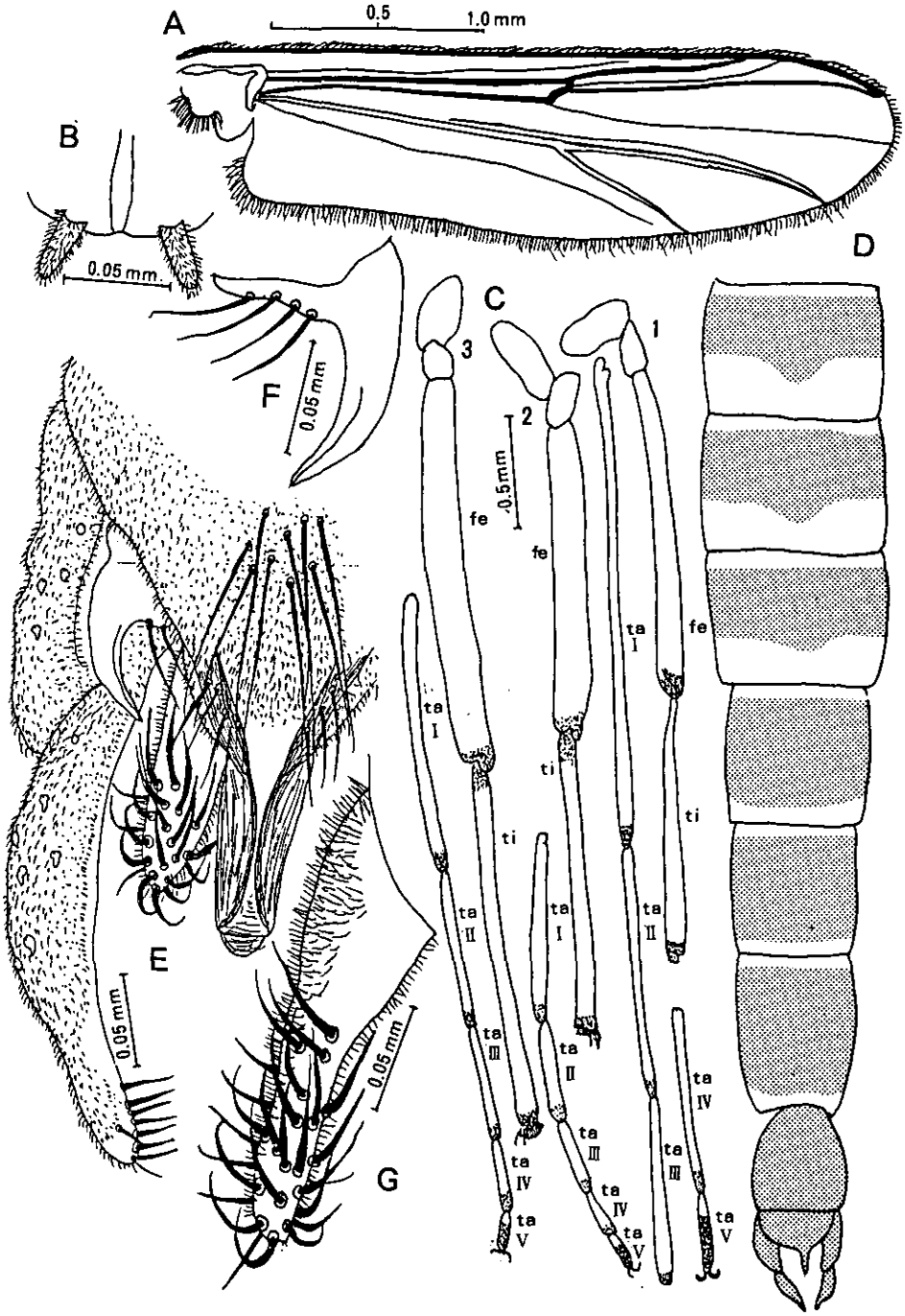

Fig. 3 *Chironomus fujitertius*, **sp. nov.**, male

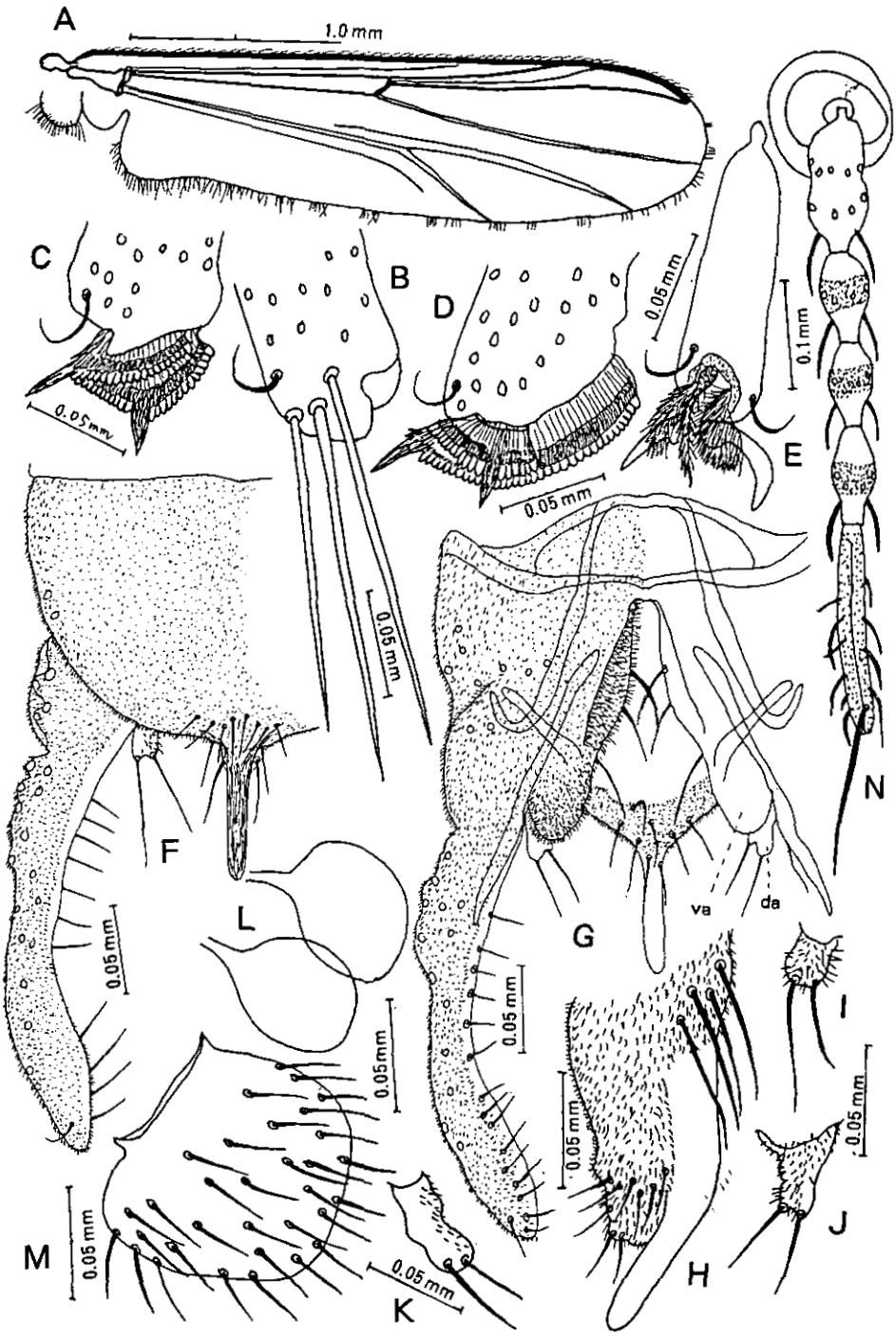

Fig. 4 *Parachironomus arcuatus* Goetghebuer

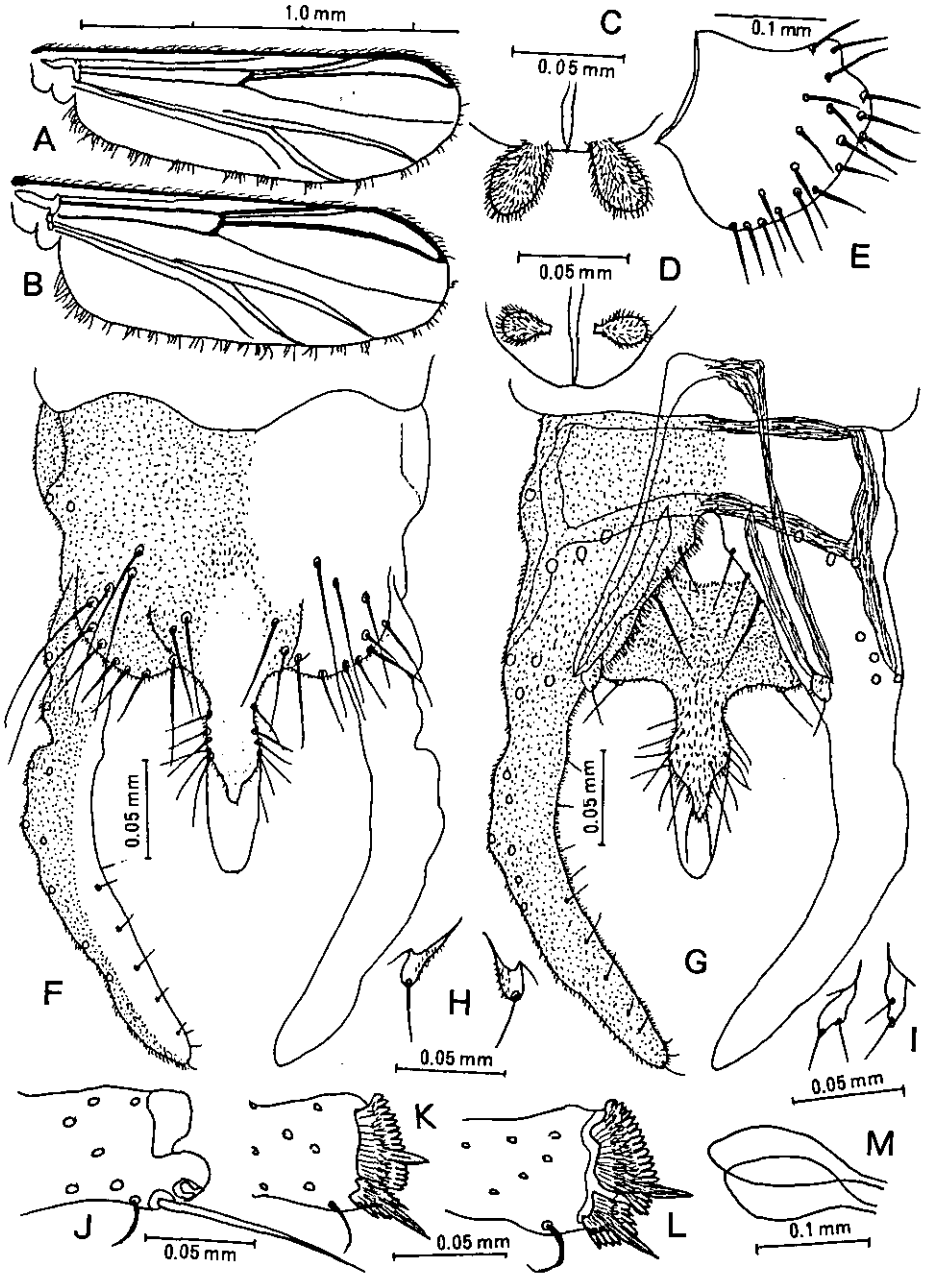

Fig. 5 *Cryptotendipes fujiquartus*, sp. nov.

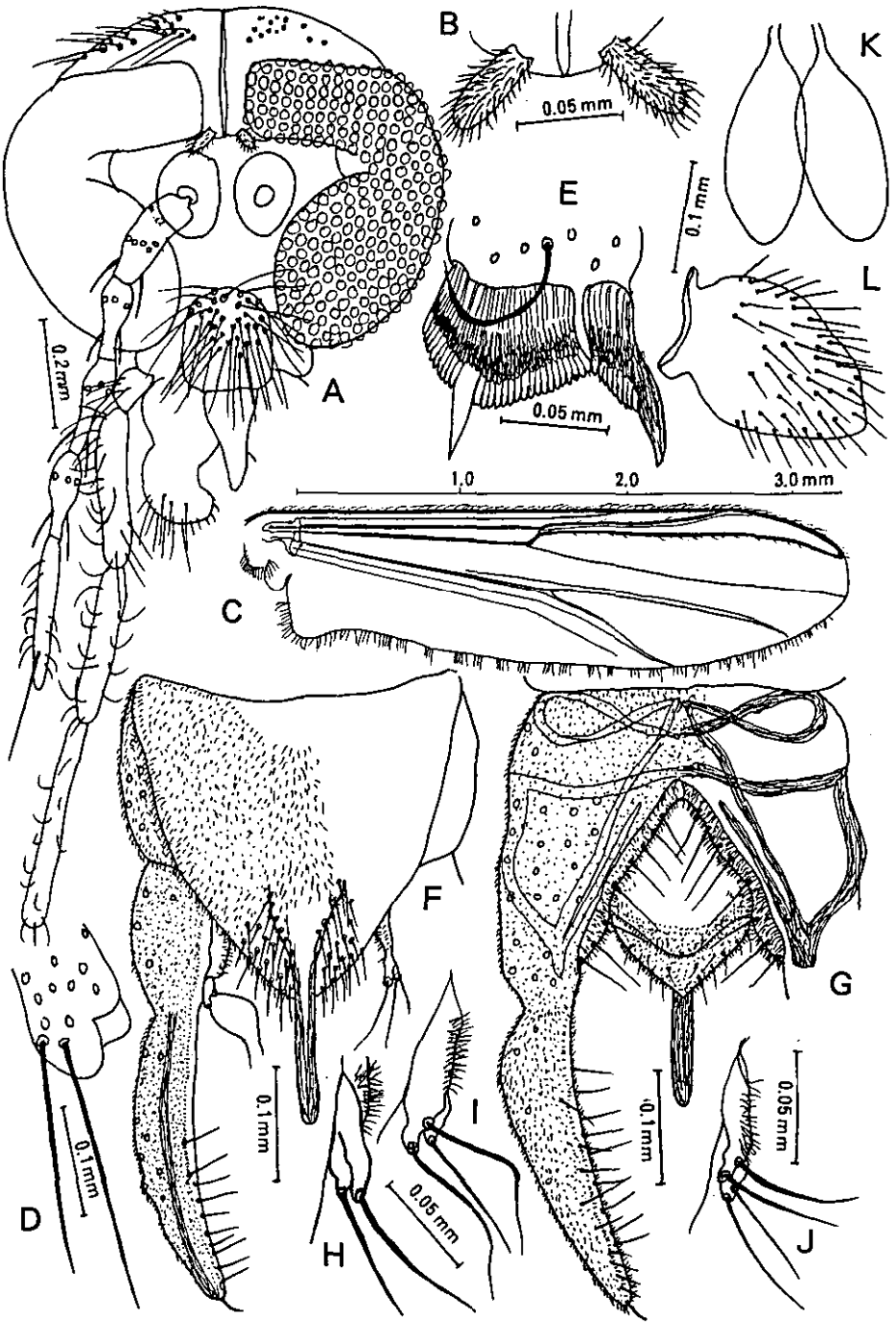

Fig. 6 *Demicryptochironomus chuzequartus* Sasa

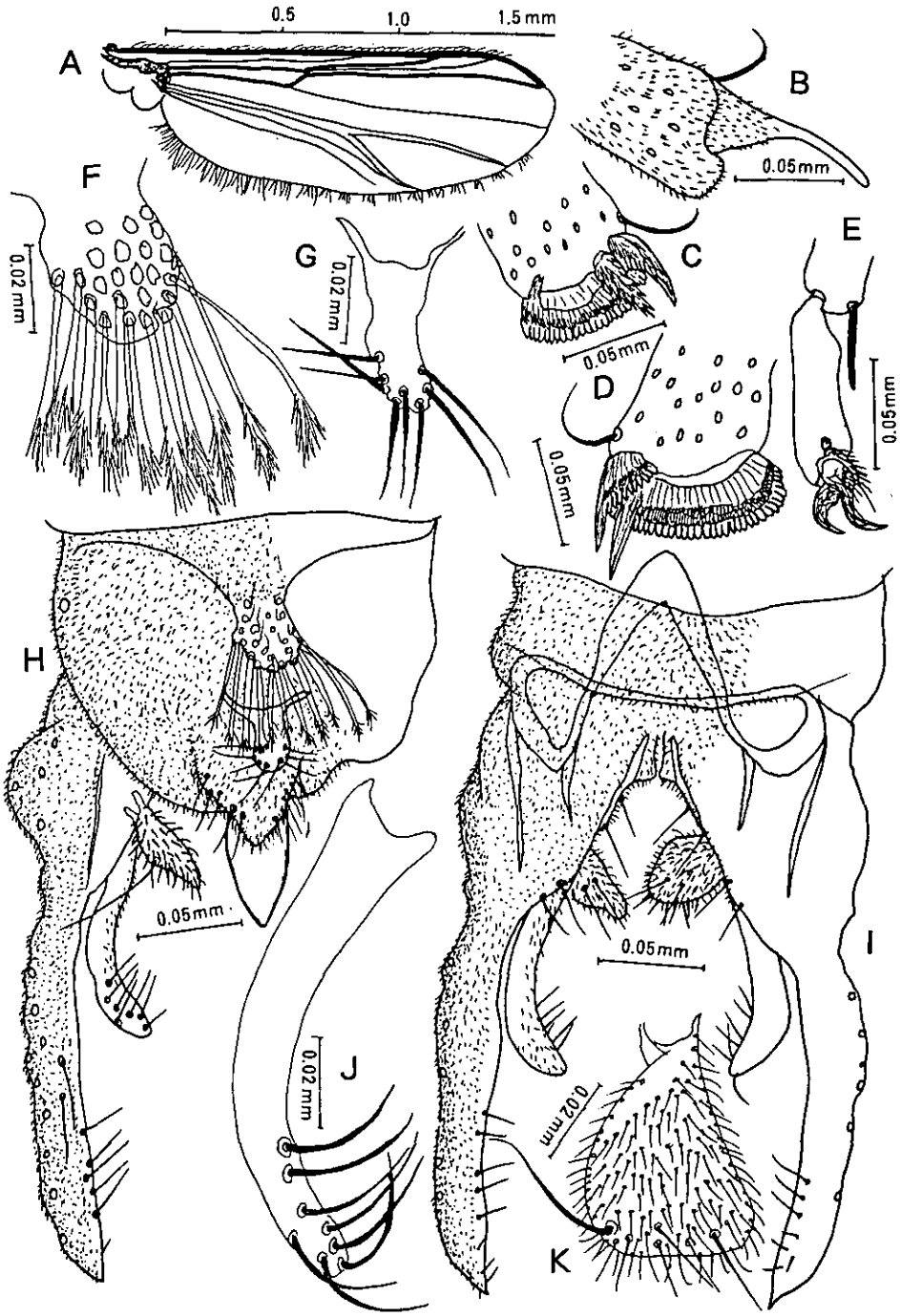

Fig. 7 *Nilothauma brayi* **(Goetghebuer)**, male

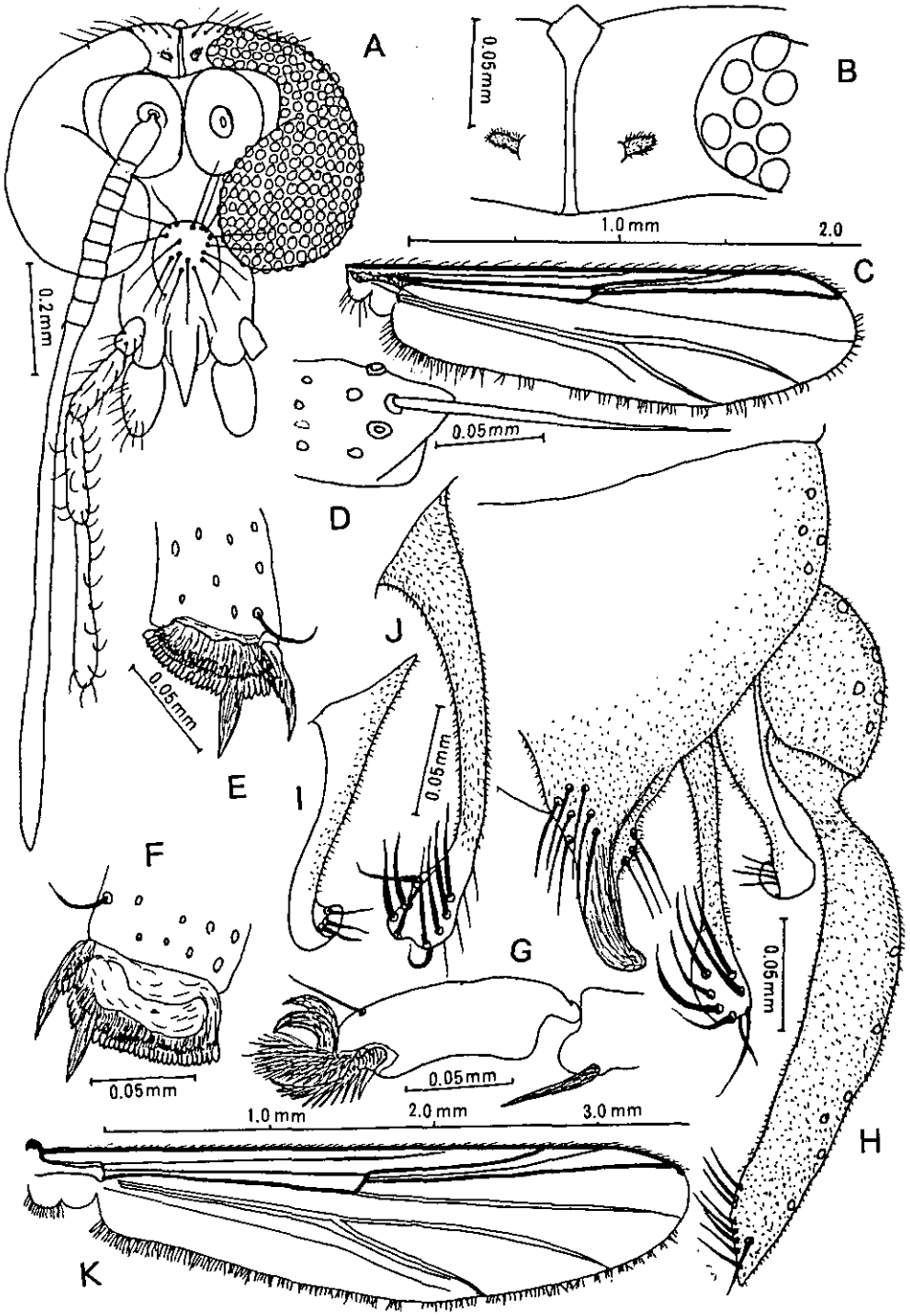

Fig. 8 ***Dicrotendipes flexus*** **(Johannsen),** male
Stictochironomus histrio **(Fabricius),** male

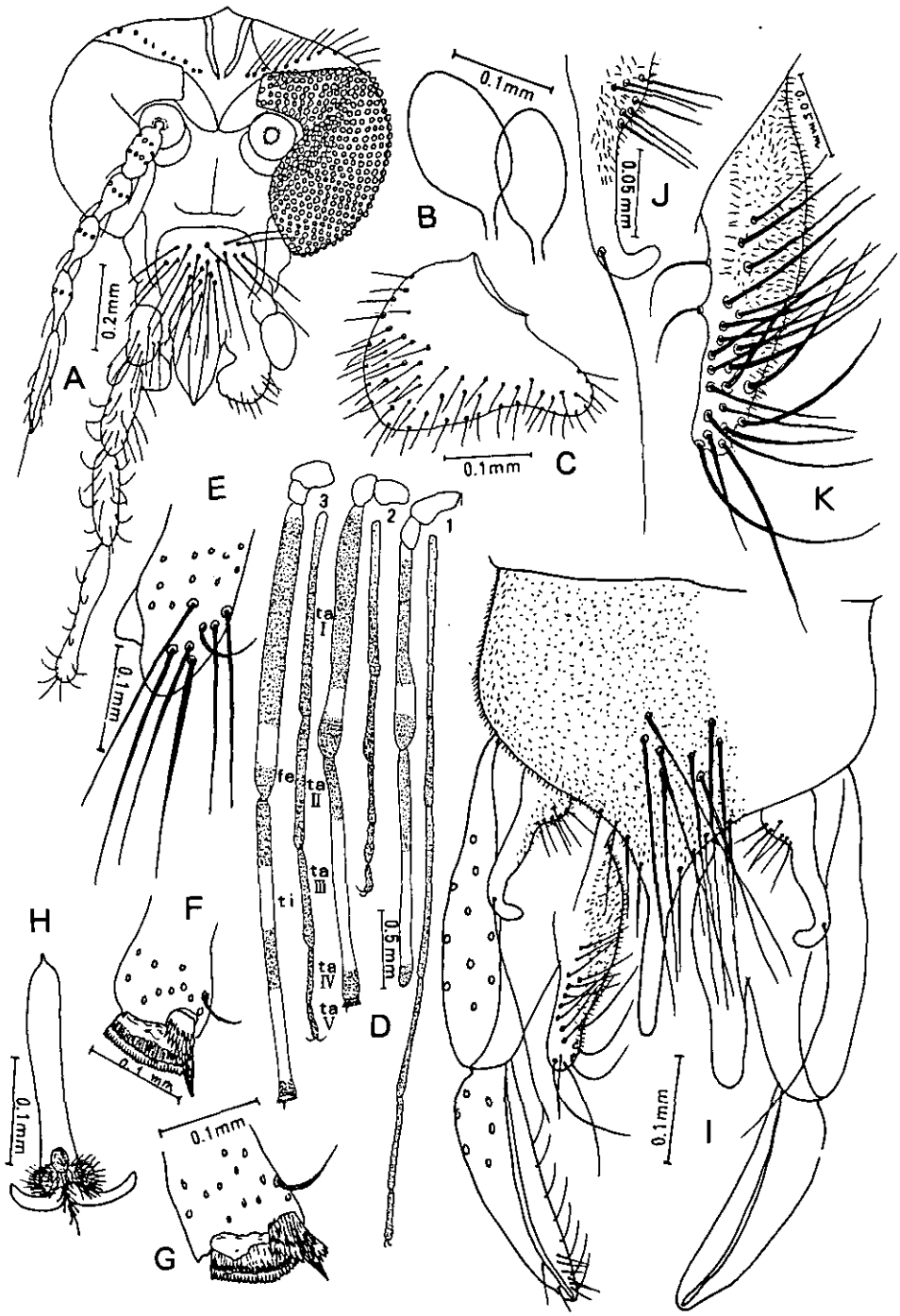

Fig. 9 ***Stictochironomus histrio*** **(Fabricius)**, continued.

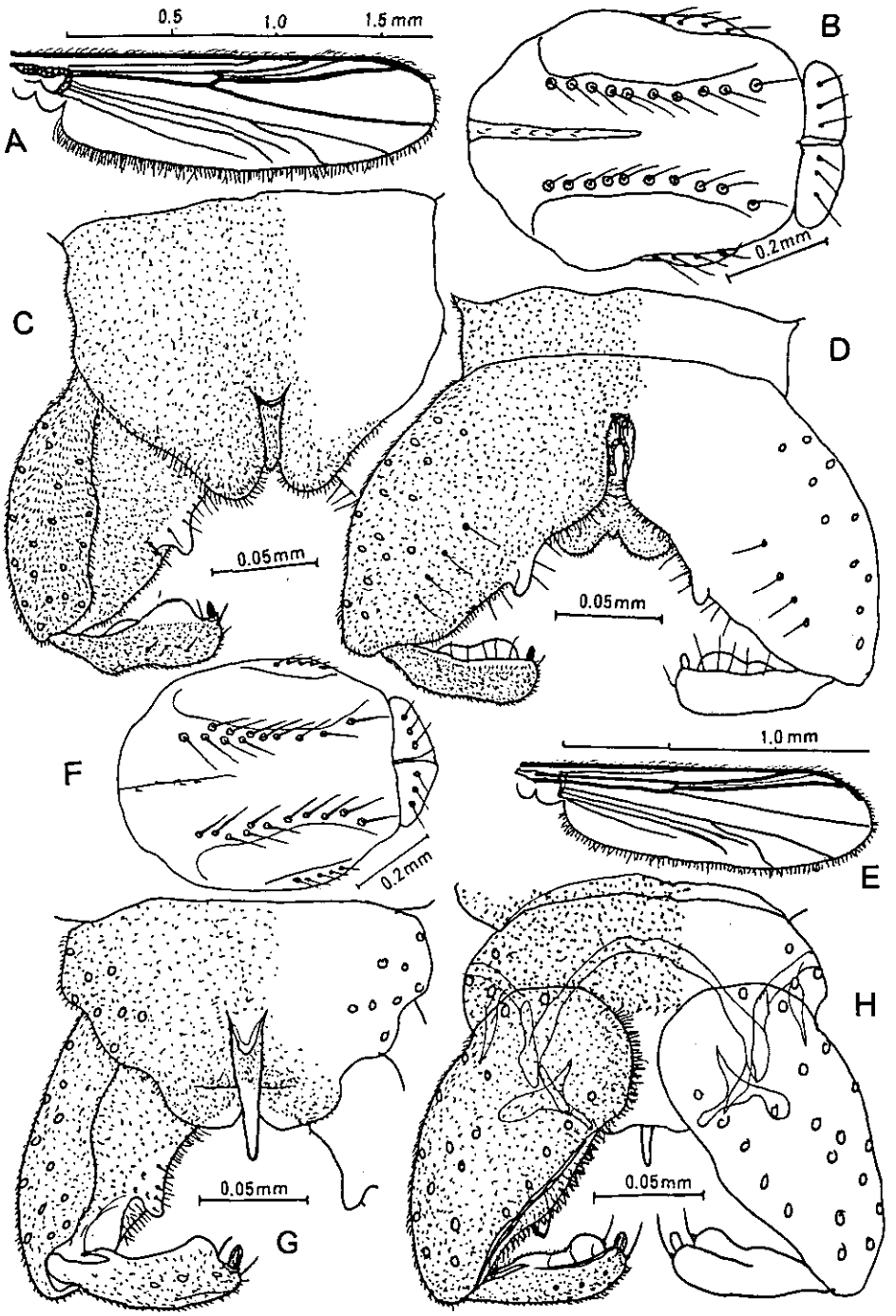

Fig. 10 ***Smittia aterrima*** **(Meigen),** male
Smittia nudipennis **Goetghebuer,** male

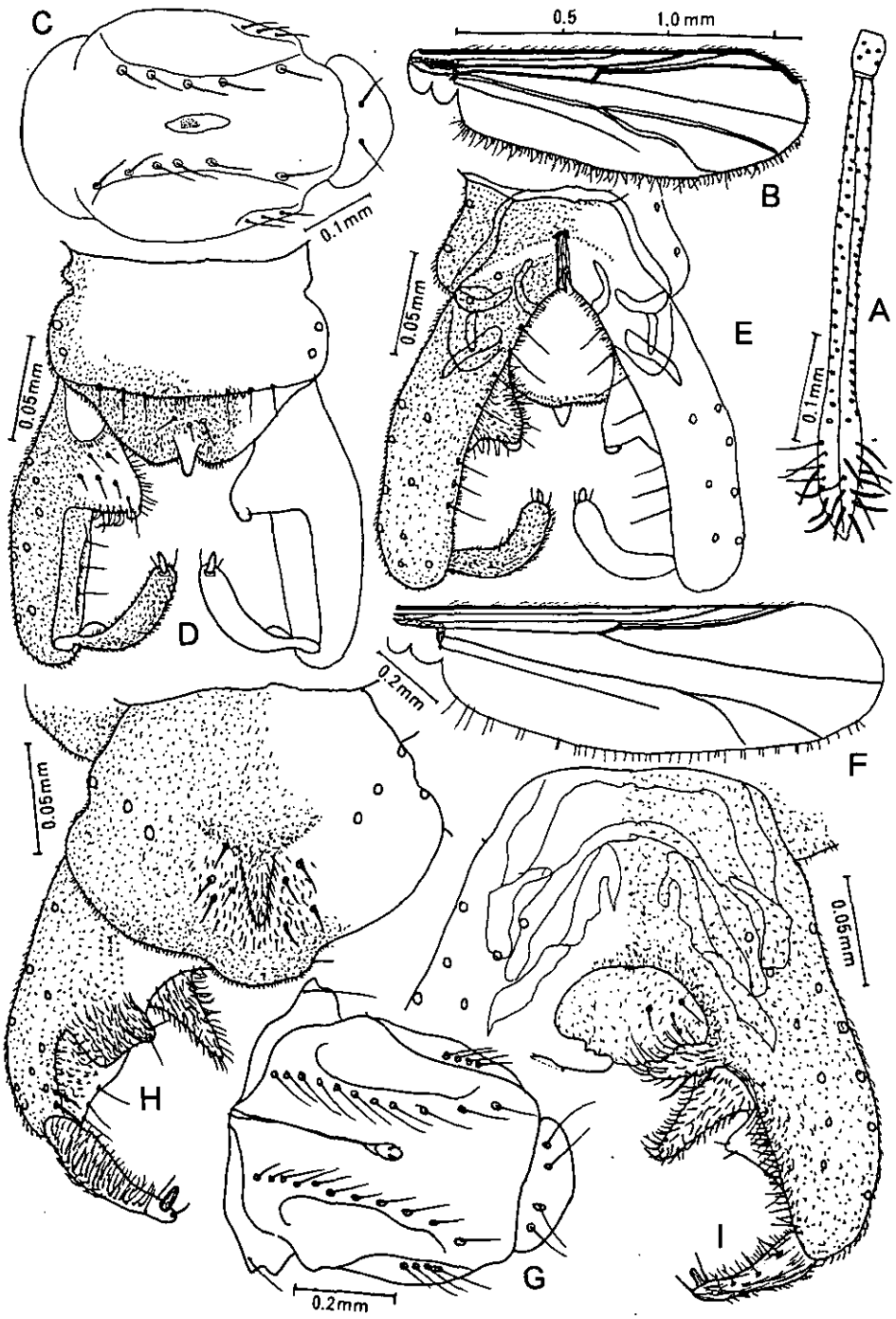

Fig. 11 ***Parakiefferiella chuzeundecima*** **(Sasa)**, male
Pseudosmittia triappendiculata **(Goetghebuer)**, male

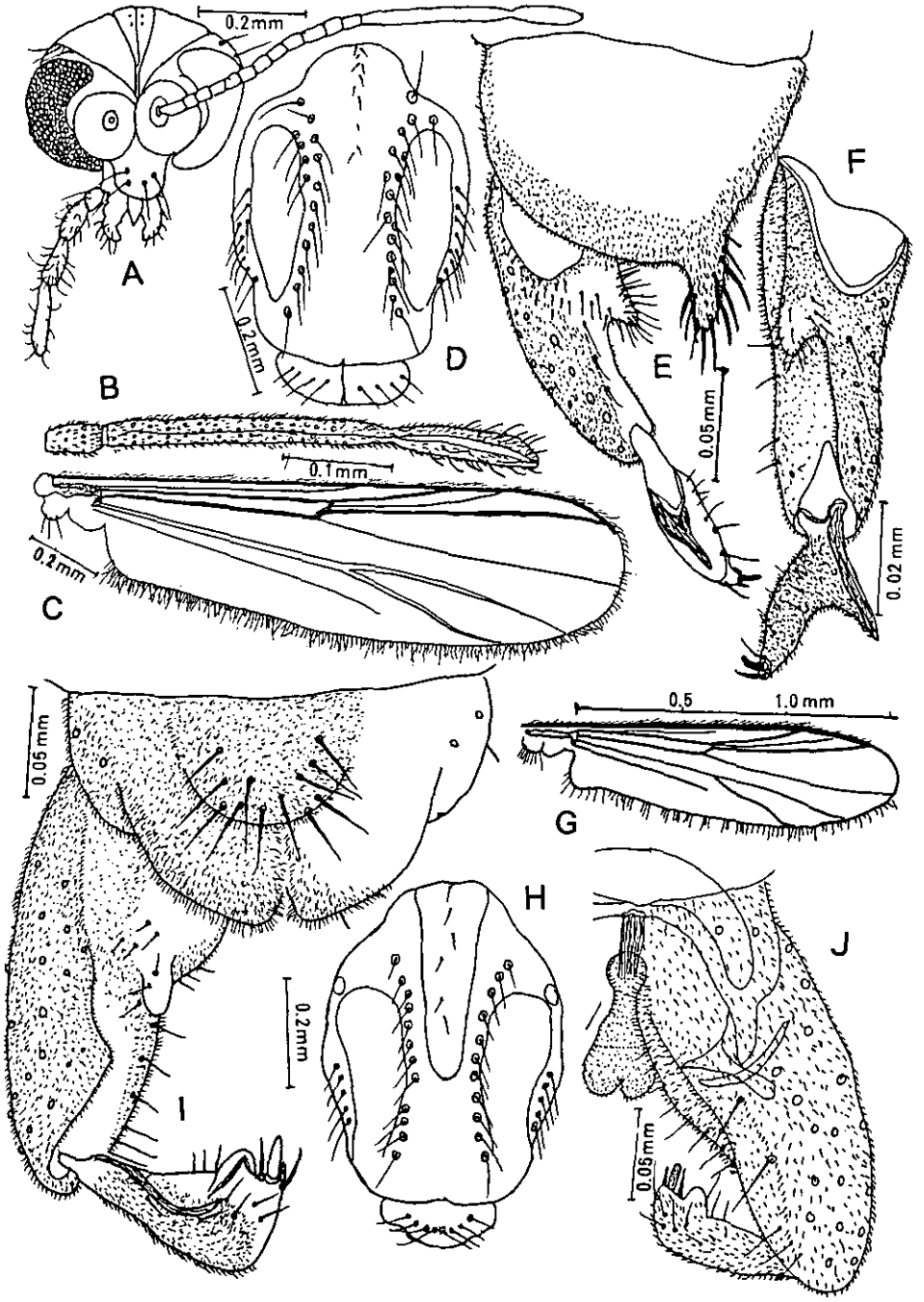

Fig. 12 ***Orthosmittia fujiquinta*, sp. nov.**, male
***Eukiefferiella fujisexta*, sp. nov.**, male

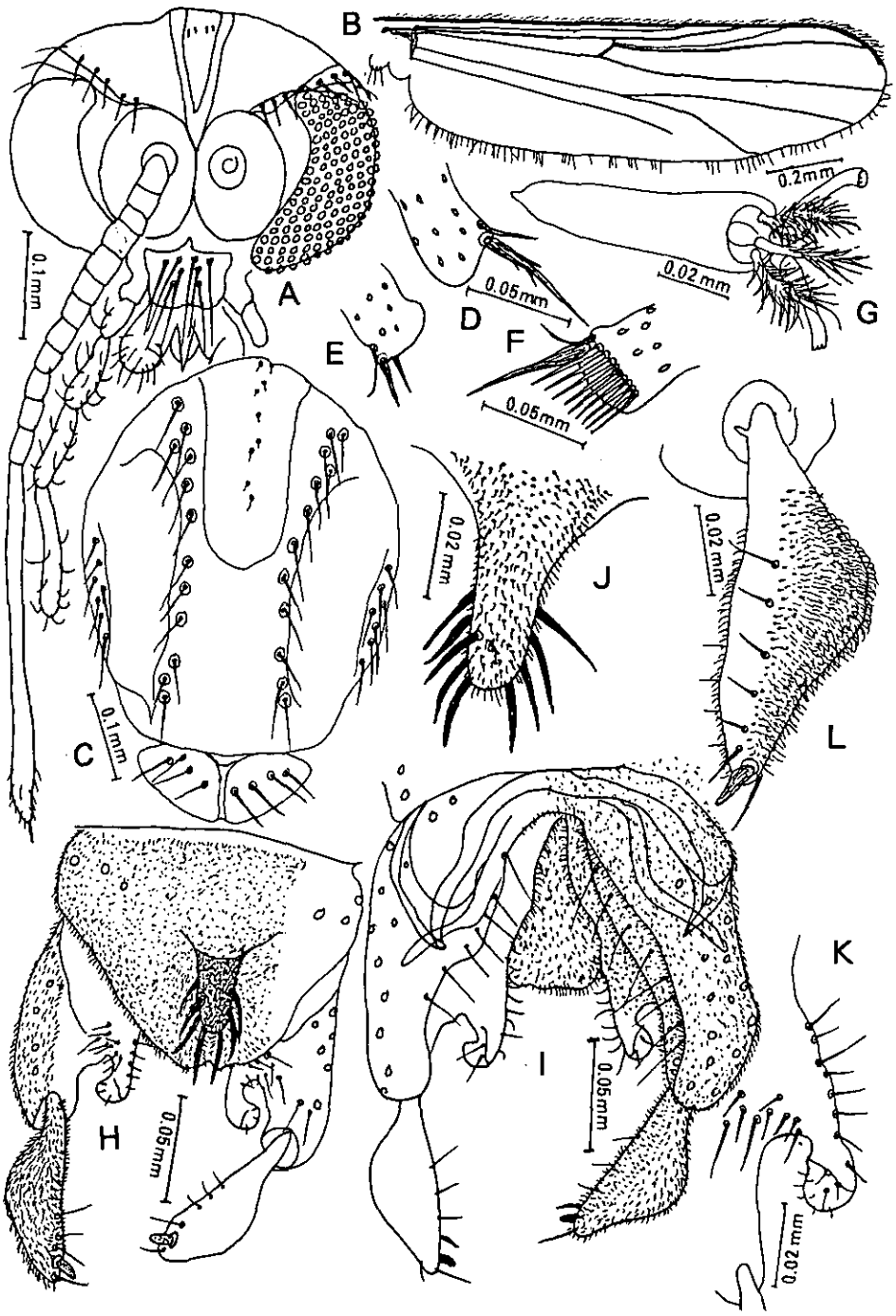

Fig. 13 ***Pseudothorcladius fujiseptimus*, sp. nov.**, male

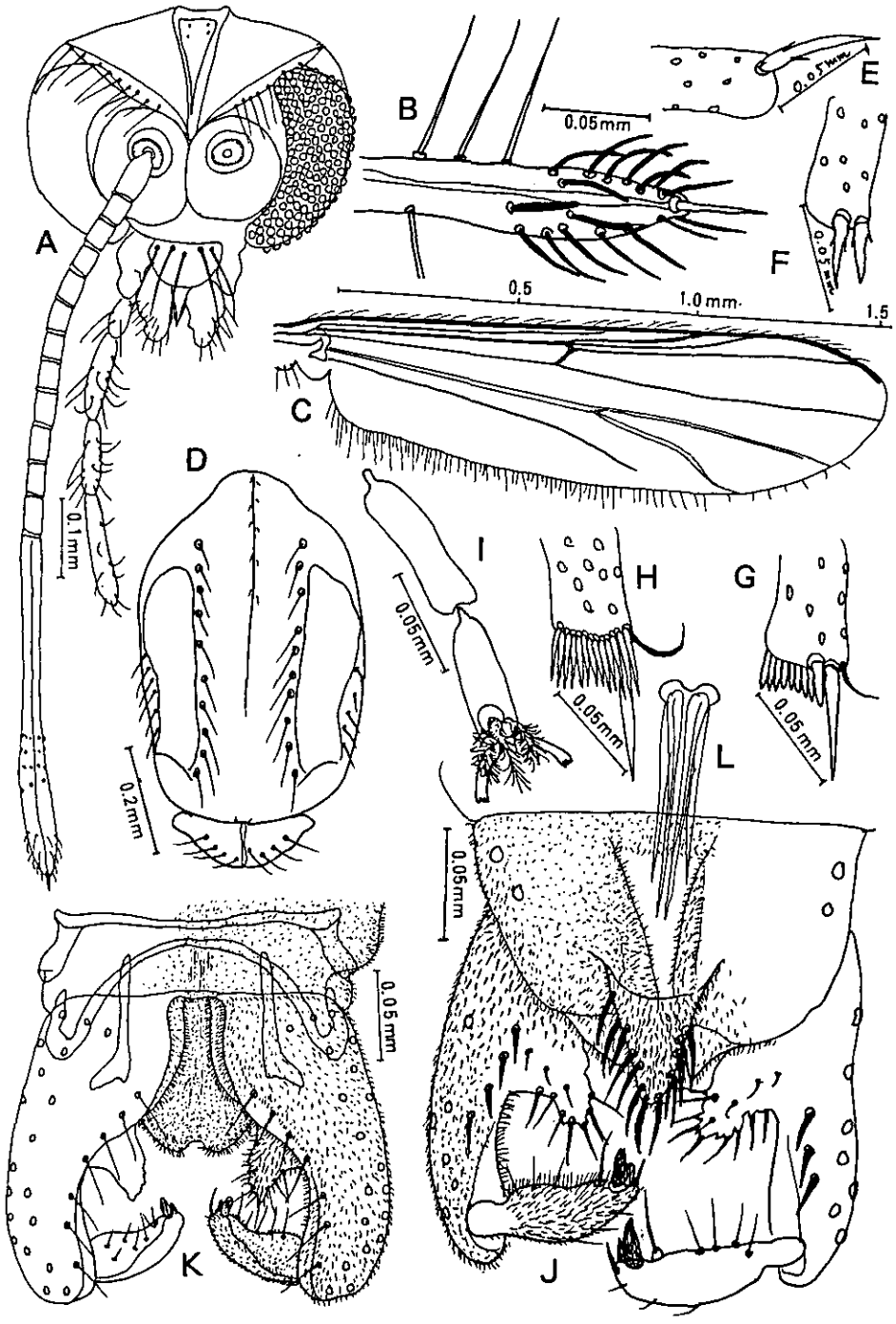

Fig. 14 *Pseudothorcladius fujioctavus*, sp. nov., male

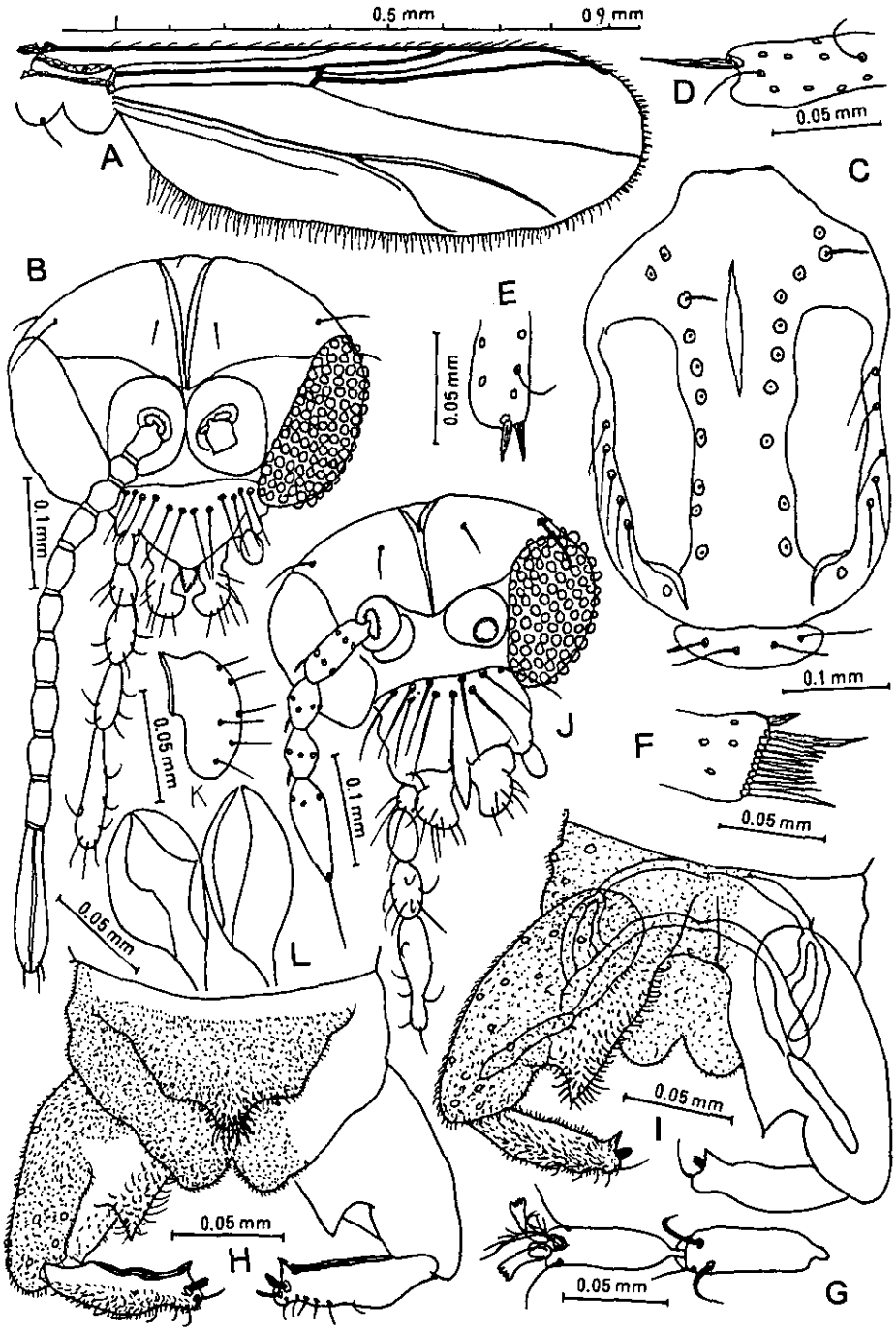

Fig. 15 *Limnophyes fujinonus*, **sp. nov.**, male

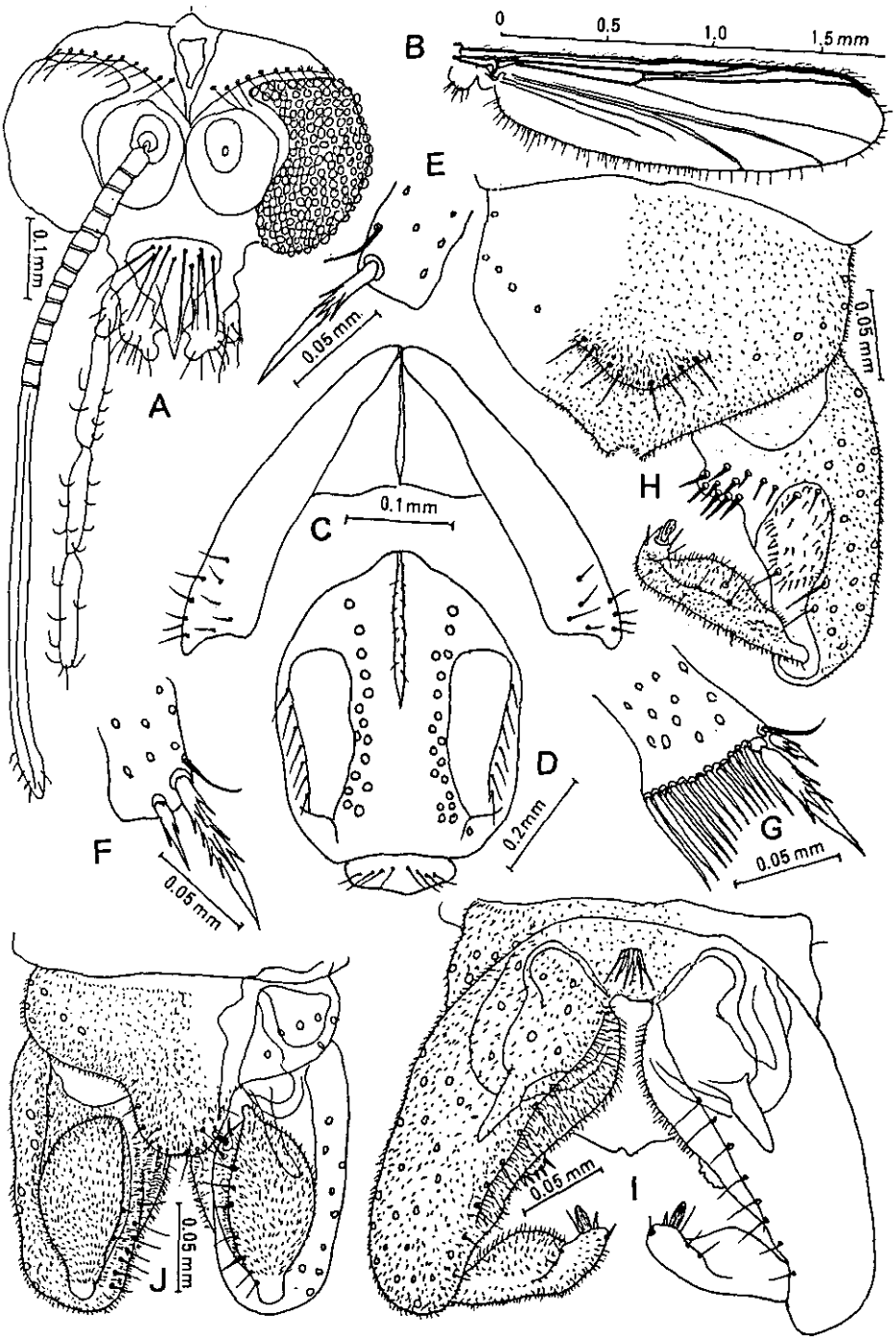

Fig. 16 ***Limnophyes fujidecimus*, sp. nov.**, male

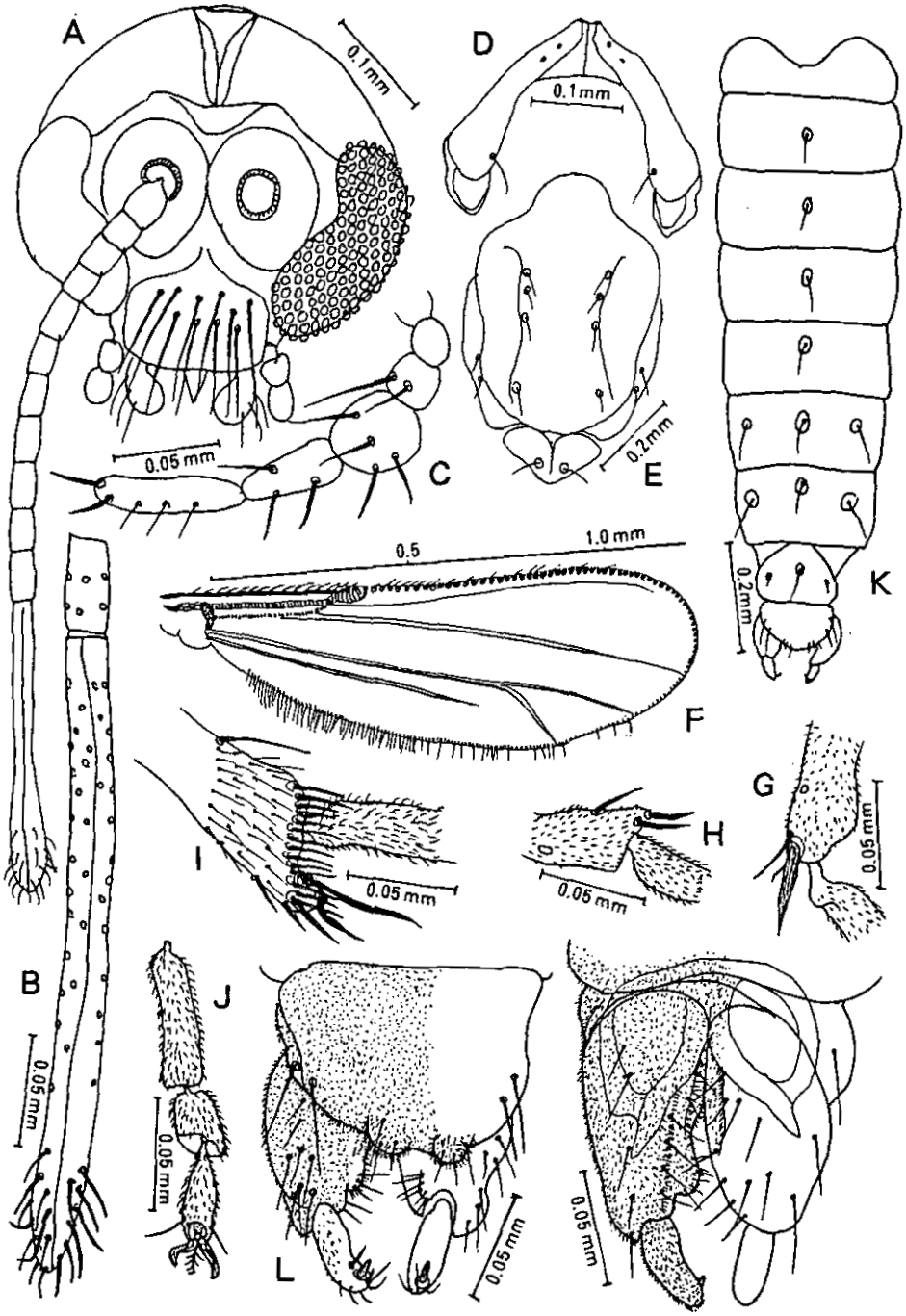

Fig. 17 *Corynoneura fujiundecima*, **sp. nov.**, male

富士周辺の湖沼で採集した ユスリカ類について

佐々　学[1)]

私どもは日本各地の水域に繁殖しているユスリカ類の分布と水質の関係などについて一連の調査研究を続けているが，その一部として富士五湖，芦ノ湖，ないしその周辺に発生するユスリカについて検索した結果をここにまとめた。検索材料は1981年7月9日，10日に佐々がこの6湖の湖岸の草むらなどに潜む成虫を捕虫網で採集したものと，1983年5月13日，14日に富山医科薬科大学の佐々　学，小西健一，河合幸一郎，国立公害研究所の安野正之，岩熊敏夫，菅谷芳雄が富士五湖について湖岸で成虫を直接に捕集したもの，及び湖底の泥や水草をもちかえり，研究室で飼育して羽化させた成虫である。それらの検索方法などについてはSasa（1979～1984）の報告に述べたとおりである。

その結果Table 1に示したように合計して45種，個体数としては雄成虫595足，雌成虫70足について種名を明らかにしえた。それらの分布については，芦ノ湖(a)から5種，河口湖(k)から16種，本栖湖(m)から16種，西湖(n)から7種，精進湖(s)から16種，山中湖(y)から24種が採集された。それらのうち，新種と判断したのが11種，日本未記録種とみなしたもの4種，及び従来その形態が十分に記載されていなかったもの6種について，合計21，雄で21種，雌で7種の形態を記載した。

富士五湖及び箱根芦ノ湖に関しては，その水質ないし水生生物についてこれまでも多くの研究が発表されているが，これに生息するユスリカについて雄成虫の形態によりその国際水準に照合して種の同定を行った報告はこれまでに公表されていない。

この報告は1981年7月と1983年5月の2回にわたり行った湖岸の草むらなどの成虫の捕虫網による採集と，5月の湖底泥や水草の材料から羽化した成虫の検索に基づいたもので，さらに広汎な採集をいろいろな季節にわたって行なえば，各湖から回収される種類も増加するであろう。また，今回の調査では，湖岸の草むらなどに潜んでいたり，湖岸で群飛していたりする成虫を検索しているが，それらは必ずしも湖中から発生したものではなく，湖に流入する小川や，湖岸の陸域で幼虫が育ったものも含まれている可能性があることはいうまでもない。

しかし，今回の部分的な調査結果からだけでも，日本の湖沼について，その物理的，化学的な水質に応じて，それらに発生するユスリカ類の種類と量に差があり，この類の昆虫

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がそれぞれの種類に応じて水質指標者としても，水質改善者としても有意義ないし重要な役割を演じているであろうことが今回の調査研究でも明らかにされたものと考える。

例えば，#25の種は日光では中禅寺湖，今回は本栖湖に見いだされ，貧栄養湖の生物とみなされるが，#26は日光では湯ノ湖，今回は精進湖，河口湖，山中湖という中等度の高栄養湖に共通していた。このような相関は今後の調査がすすむにつれ，次第に明確になっていくであろう。

この研究は以上のような生態学的，環境科学的な調査をすすめるに当たって，その基本となるユスリカ類の種 species の認識を確立するため一つのステップとして役立たせたいと考えたものである。しかし，生物における種の認識とは，決して容易にできるものではない。私がヨーロッパ等での既知種とみなしたものが，将来は新種と改訂されること，あるいは新種とみなしたものが既知種のシノニムに落とされることもあろうことを覚悟の上でこの研究をまとめたものである。

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Note: References with * are described only in Japanese, and the titles were translated into English by the present author.

国立公害研究所特別研究成果報告

第 1 号　陸水域の富栄養化に関する総合研究 ── 霞ヶ浦を対象域として ── 昭和51年度. (1977)

第 2 号　陸上植物による大気汚染環境の評価と改善に関する基礎的研究 ── 昭和51, 52年度　研究報告. (1978)

(改　称)

国立公害研究所研究報告

※ 第 3 号　A comparative study of adults and immature stages of nine Japanese species of the genus *Chironomus* (Diptera, Chironomidae). (1978)
(日本産ユスリカ科 *Chironomus* 属9種の成虫, サナギ, 幼虫の形態の比較)

第 4 号　スモッグチャンバーによる炭化水素ー窒素酸化物系光化学反応の研究 ── 昭和52年度　中間報告. (1978)

第 5 号　芳香族炭化水素ー窒素酸化物系の光酸化反応機構と光酸化二次生成物の培養細胞に及ぼす影響に関する研究 ── 昭和51, 52年度　研究報告. (1978)

第 6 号　陸水域の富栄養化に関する総合研究(Ⅱ) ── 霞ヶ浦を中心として. ── 昭和53年度。(1979)

※ 第 7 号　A morphological study of adults and immature stages of 20 Japanese species of the family Chironomidae (Diptera). (1979)
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第 11 号　Studies on the effects of air pollutants on plants and mechanisms of phytotoxicity. (1980)
(大気汚染物質の植物影響およびその植物毒性の機構に関する研究)

第 12 号　Multielement analysis studies by flame and inductively coupled plasma spectroscopy utilizing computer-controlled instrumentation. (1980)
(コンピュータ制御装置を利用したフレームおよび誘導結合プラズマ分光法による多元素同時分析)

第 13 号　Studies on chironomid midges of the Tama River. (1980)
Part 1. The distribution of chironomid species in a tributary in relation to the degree of pollution with sewage water.
Part 2. Description of 20 species of Chironominae recovered from a tributary.
(多摩川に発生するユスリカの研究
── 第1報　その一支流に見出されたユスリカ各種の分布と下水による汚染度との関係 ──
── 第2報　その一支流に見出された Chironominae 亜科の20種について ──)

第 14 号　有機廃棄物, 合成有機化合物, 重金属等の土壌生態系に及ぼす影響と浄化に関する研究 ── 昭和53, 54年度　特別研究報告. (1980)

※ 第 15 号　大気汚染物質の単一および複合汚染の生体に対する影響に関する実験的研究 ── 昭和54年度　特別研究報告. (1980)

第 16 号　計測車レーザーレーダーによる大気汚染遠隔計測. (1980)

※ 第 17 号　流体の運動および輸送過程に及ぼす浮力効果 ── 臨海地域の気象特性と大気拡散現象の研究 ── 昭和53, 54年度　特別研究報告. (1980)

第 18 号　Preparation, analysis and certification of PEPPERBUSH standard reference material. (1980)
（環境標準試料「リョウブ」の調製，分析および保証値）

※ 第 19 号　陸水域の富栄養化に関する総合研究（Ⅲ）── 霞ヶ浦（西浦）の湖流 ── 昭和53，54年度．（1981）

第 20 号　陸水域の富栄養化に関する総合研究（Ⅳ）── 霞ヶ浦流域の地形，気象水文特性およびその湖水環境に及ぼす影響 ── 昭和53，54年度．（1981）

第 21 号　陸水域の富栄養化に関する総合研究（Ⅴ）── 霞ヶ浦流入河川の流出負荷量変化とその評価 ── 昭和53，54年度．（1981）

第 22 号　陸水域の富栄養化に関する総合研究（Ⅵ）── 霞ヶ浦の生態系の構造と生物現存量 ── 昭和53，54年度．（1981）

第 23 号　陸水域の富栄養化に関する総合研究（Ⅶ）── 湖沼の富栄養化状態指標に関する基礎的研究 ── 昭和53，54年度．（1981）

第 24 号　陸水域の富栄養化に関する総合研究（Ⅷ）── 富栄養化が湖利用に及ぼす影響の定量化に関する研究 ── 昭和53，54年度．（1981）

第 25 号　陸水域の富栄養化に関する総合研究（Ⅸ）──［*Microcystis*］（藍藻類）の増殖特性 ── 昭和53，54年度．（1981）

第 26 号　陸水域の富栄養化に関する総合研究（Ⅹ）── 藻類培養試験法によるＡＧＰの測定 ── 昭和53，54年度．（1981）

第 27 号　陸水域の富栄養化に関する総合研究（Ⅺ）── 研究総括 ── 昭和53，54年度．（1981）

第 28 号　複合大気汚染の植物影響に関する研究 ── 昭和54，55年度　特別研究報告．（1981）

第 29 号　Studies on chironomid midges of the Tama River. (1981)
Part 3. Species of the subfamily Orthocladiinae recorded at the summer survey and their distribution in relation to the pollution with sewage waters.
Part 4. Chironomidae recorded at a winter survey.
（多摩川に発生するユスリカ類の研究
── 第３報　夏期の調査で見出されたエリユスリカ亜科 Orthocladiinae 各種の記載と，その分布の下水汚染度との関係について ──
── 第４報　南浅川の冬期の調査で見出された各種の分布と記載 ──）

※ 第 30 号　海域における富栄養化と赤潮の発生機構に関する基礎的研究 ── 昭和54，55年度　特別研究報告．（1982）

第 31 号　大気汚染物質の単一および複合汚染の生体に対する影響に関する実験的研究 ── 昭和55年度　特別研究報告．（1981）

第 32 号　スモッグチャンバーによる炭化水素－窒素酸化物系光化学反応の研究 ── 環境大気中における光化学二次汚染物質生成機構の研究（フィールド研究１）── 昭和54年度　特別研究報告．（1982）

第 33 号　臨海地域の気象特性と大気拡散現象の研究 ── 大気運動と大気拡散過程のシミュレーション ── 昭和55年度　特別研究報告．（1982）

第 34 号　環境汚染の遠隔計測・評価手法の開発に関する研究 ── 昭和55年度　特別研究報告．（1982）

第 35 号　環境面よりみた地域交通体系の評価に関する総合解析研究．（1982）

第 36 号　環境試料による汚染の長期モニタリング手法に関する研究 ── 昭和55，56年度　特別研究報告．（1982）

第 37 号　環境施策のシステム分析支援技術の開発に関する研究．（1982）

第 38 号　Preparation, analysis and certification of POND SEDIMENT certified reference material. (1982)
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第 39 号　環境汚染の遠隔計測・評価手法の開発に関する研究 ── 昭和56年度　特別研究報告．（1982）

第 40 号　大気汚染物質の単一及び複合汚染の生体に対する影響に関する実験的研究 ── 昭和56年度　特別研究報告．（1983）

第 41 号　土壌環境の遠隔計測と評価に関する統計学的研究．（1983）

※ 第 42 号　底泥の物性及び流送特性に関する実験的研究．（1983）

※ 第 43 号　Studies on chironomid midges of the Tama River. (1983)

Part 5. An observation on the distribution of Chironominae along the main stream in June with description of *15 new species*.

Part 6. Description of species of the subfamily Orthocladiinae recovered from the main stream in the June survey.

Part 7. Additional species collected in winter from the main stream.

（多摩川に発生するユスリカ類の研究

── 第５報　本流に発生するユスリカ類の分布に関する６月の調査成績とユスリカ亜科に属する15新種等の記録 ──

── 第６報　多摩本流より６月に採集されたエリユスリカ亜科の各種について ──

── 第７報　多摩本流より３月に採集されたユスリカ科の各種について ──）

第 44 号　スモッグチャンバーによる炭化水素－窒素酸化物系光化学反応の研究　── 環境大気中における光化学二次汚染物質生成機構の研究（フィールド研究２）── 昭和54年度　特別研究中間報告．（1983）

第 45 号　有機廃棄物，合成有機化合物，重金属等の土壌生態系に及ぼす影響と浄化に関する研究 ── 昭和53～55年度　特別研究報告．（1983）

第 46 号　有機廃棄物，合成有機化合物，重金属等の土壌生態系に及ぼす影響と浄化に関する研究 ── 昭和54，55年度　特別研究報告　第１分冊．（1983）

第 47 号　有機廃棄物，合成有機化合物，重金属等の土壌生態系に及ぼす影響と浄化に関する研究 ── 昭和54，55年度　特別研究報告　第２分冊．（1983）

第 48 号　水質観測点の適正配置に関するシステム解析．（1983）

第 49 号　環境汚染の遠隔計測・評価手法の開発に関する研究 ── 昭和57年度　特別研究報告．（1984）

第 50 号　陸水域の富栄養化防止に関する総合研究（Ⅰ）── 霞ヶ浦の流入負荷量の算定と評価 ── 昭和55～57年度　特別研究報告．（1984）

第 51 号　陸水域の富栄養化防止に関する総合研究（Ⅱ）── 霞ヶ浦の物質循環とそれを支配する因子 ── 昭和55～57年度　特別研究報告．（1984）

第 52 号　陸水域の富栄養化防止に関する総合研究（Ⅲ）── 霞ヶ浦高浜入における隔離水界を利用した富栄養化防止手法の研究 ── 昭和55～57年度　特別研究報告．（1984）

第 53 号　陸水域の富栄養化防止に関する総合研究（Ⅳ）── 霞ヶ浦の魚類及び甲かく類現存量の季節変化と富栄養化 ── 昭和55～57年度　特別研究報告．（1984）

第 54 号　陸水域の富栄養化防止に関する総合研究（Ⅴ）── 霞ヶ浦の富栄養化現象のモデル化 ── 昭和55～57年度　特別研究報告．（1984）

第 55 号　陸水域の富栄養化防止に関する総合研究（Ⅵ）── 富栄養化防止対策 ── 昭和55～57年度　特別研究報告．（1984）

第 56 号　陸水域の富栄養化防止に関する総合研究（Ⅶ）── 湯ノ湖における富栄養化とその防止対策 ── 昭和55～57年度　特別研究報告．（1984）

第 57 号　陸水域の富栄養化防止に関する総合研究（Ⅷ）── 総括報告 ── 昭和55～57年度　特別研究報告．（1984）

第 58 号　環境試料による汚染の長期的モニタリング手法に関する研究 ── 昭和55～57年度　特別研究総合報告．（1984）

第 59 号　炭化水素－窒素酸化物－硫黄酸化物系光化学反応の研究 ── 光化学スモッグチャンバーによるオゾン生成機構の研究 ── 大気中における有機化合物の光酸化反応機構の研究 ── 昭和55～57年度　特別研究報告（第1分冊）．（1984）

第 60 号　炭化水素－窒素酸化物－硫黄酸化物系光化学反応の研究 ── 光化学エアロゾル生成機構の研究 ── 昭和55～57年度　特別研究報告（第2分冊）．（1984）

第 61 号　炭化水素－窒素酸化物－硫黄酸化物系光化学反応の研究 ── 環境大気中における光化学二次汚染物質生成機構の研究（フィールド研究1）── 昭和55～57年度　特別研究報告（第3分冊）．（1984）

第 62 号　有害汚染物質による水界生態系のかく乱と回復過程に関する研究 ── 昭和56～58年度　特別研究中間報告．（1984）

第 63 号　海域における富栄養化と赤潮の発生機構に関する基礎的研究 ── 昭和56年度　特別研究報告．（1984）

第 64 号　複合大気汚染の植物影響に関する研究 ── 昭和54～56年度　特別研究総合報告．（1984）

第 65 号　Studies on effects of air pollutant mixtures on plants—Part 1. (1984)
（複合大気汚染の植物に及ぼす影響 ── 第1分冊）

第 66 号　Studies on effects of air pollutant mixtures on plants—Part 2. (1984)
（複合大気汚染の植物に及ぼす影響 ── 第2分冊）

第 67 号　環境中の有害物質による人の慢性影響に関する基礎的研究 ── 昭和54～56年度　特別研究総合報告．（1984）

第 68 号　汚泥の土壌還元とその環境影響に関する研究 ── 昭和56～57年度　特別研究総合報告．（1984）

第 69 号　中禅寺湖の富栄養化現象に関する基礎的研究．（1984）

第 70 号　Studies on chironomid midges in lakes of the Nikko National Park (1984)
Part I. Ecological studies on chironomids in lakes of the Nikko National Park.
Part II. Taxonomical and morphological studies on the chironomid species collected from lakes in the Nikko National Park.
（日光国立公園の湖沼のユスリカに関する研究
── 第1部　日光国立公園の湖のユスリカの生態学的研究 ──
── 第2部　日光国立公園の湖沼に生息するユスリカ類の分類学的，形態学的研究 ── ）

※第 71 号　リモートセンシングによる残雪及び雪田植生の分布解析．（1984）

第 72 号　炭化水素－窒素酸化物－硫黄酸化物系光化学反応の研究．環境大気中における光化学二次汚染物質生成機構の研究（フィールド研究2）── 昭和55～57年度　特別研究報告（第4分冊）（1985）

第 73 号　炭化水素－窒素酸化物－硫黄酸化物系光化学反応の研究 ── 昭和55～57年度　特別研究総合報告．（1985）

第 74 号　都市域及びその周辺の自然環境に係る環境指標の開発に関する研究．環境指標－その考え方と作成方法－昭和59年度　特別研究報告．（1984）

第 75 号　*Limnological and environmental studies of elements in the sediment of Lake Biwa. (1985)*
（琵琶湖底泥中の元素に関する陸水学及び環境化学的研究）

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第 77 号　環境汚染の遠隔計測・評価手法の開発に関する研究 ── 昭和58年度　特別研究報告．（1985）

第 78 号　生活環境保全に果たす生活者の役割の解明．（1985）

第 79 号　Studies on the method for long term environmental monitoring ── Research report 1980-1982. (1985)
（環境汚染の長期的モニタリング手法に関する研究）

第 80 号　海域における赤潮発生のモデル化に関する研究 ── 昭和57／58年度　特別研究報告．（1985）
第 81 号　環境影響評価制度の政策効果に関する研究 ── 地方公共団体の制度運用を中心として．（1985）
第 82 号　植物の大気環境浄化機能に関する研究 ── 昭和57～58年度　特別研究報告．（1985）
第 83 号　Studies on chironomid midges of some lakes in Japan. (1985)
（日本の湖沼のユスリカの研究）

※　残部なし

Report of Special Research Project the National Institute for Environmental Studies

No. 1* Man activity and aquatic environment – with special references to Lake Kasumigaura – Progress report in 1976. (1977)

No. 2* Studies on evaluation and amelioration of air pollution by plants – Progress report in 1976-1977. (1978)

[Starting with Report No. 3, the new title for NIES Reports was changed to:]

Research Report from the National Institute for Environmental Studies

※ No. 3 A comparative study of adults and immature stages of nine Japanese species of the genus *Chironomus* (Diptera, Chironomidae). (1978)

No. 4* Smog chamber studies on photochemical reactions of hydrocarbon-nitrogen oxides system – Progress report in 1977. (1978)

No. 5* Studies on the photooxidation products of the alkylbenzene-nitrogen oxides system, and on their effects on Cultured Cells – Research report in 1976-1977. (1978)

No. 6* Man activity and aquatic environment – with special references to Lake Kasumigaura – Progress report in 1977-1978. (1979)

※ No. 7 A morphological study of adults and immature stages of 20 Japanese species of the family Chironomidae (Diptera). (1979)

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No.10* Studies on evaluation and amelioration of air pollution by plants – Progress report in 1976-1978. (1979)

No.11 Studies on the effects of air pollutants on plants and mechanisms of phytotoxicity. (1980)

No.12 Multielement analysis studies by flame and inductively coupled plasma spectroscopy utilizing computer-controlled instrumentation. (1980)

No.13 Studies on chironomid midges of the Tama River. (1980)

Part 1. The distribution of chironomid species in a tributary in relation to the degree of pollution with sewage water.

Part 2. Description of 20 species of Chironominae recovered from a tributary.

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※ No.15* Studies on the biological effects of single and combined exposure of air pollutants – Research report in 1977-1978. (1980)

No.16* Remote measurement of air pollution by a mobile laser radar. (1980)

※ No.17* Influence of buoyancy on fluid motions and transport processes – Meteorological characteristics and atmospheric diffusion phenomena in the coastal region – Progress report in 1978-1979. (1980)

No.18 Preparation, analysis and certification of PEPPERBUSH standard reference material. (1980)

※ No.19* Comprehensive studies on the eutrophication of fresh-water areas – Lake current of Kasumigaura (Nishiura) – 1978-1979. (1981)

No.20* Comprehensive studies on the eutrophication of fresh-water areas – Geomorphological and hydrometeorological characteristics of Kasumigaura watershed as related to the lake environment – 1978-1979. (1981)

No.21* Comprehensive studies on the eutrophication of fresh-water areas – Variation of pollutant load by influent rivers to Lake Kasumigaura – 1978-1979. (1981)

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No.29 Studies on chironomid midges of the Tama River. (1981)
Part 3. Species of the subfamily Orthocladiinae recorded at the summer survey and their distribution in relation to the pollution with sewage waters.
Part 4. Chironomidae recorded at a winter survey.

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No.31* Studies on the biological effects of single and combined exposure of air pollutants – Research report in 1980. (1981)

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Part 5. An observation on the distribution of Chironominae along the main stream in June, with description of 15 new species.

Part 6. Description of species of the subfamily Orthocladiinae recovered from the main stream in the June survey.

Part 7. Additional species collected in winter from the main stream.

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* in Japanese

※ out of stock