

# TAXONOMIC NOTES ON CHIRONOMIDAE (DIPTERA) FROM OKINAWA ISLAND, JAPAN, WITH THE DESCRIPTION OF THREE NEW SPECIES

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## ABSTRACT

Three new species: *lonthosmittia cuneipenne* sp. nov., *Orthocladius (Euorthocladius) okinawanus* sp. nov. and *Parakiefferiella semiovata* sp. nov., are described from Okinawa Island, Ryukyus, Japan. In addition to these species, twelve species are newly recorded from this island. Diagnostic characters of *Tokyobrillia tamamegaseta* (Kobayashi et Sasa) are emended. *Pentapedilum yakuabeum* Sasa et Suzuki syn. nov. and *Polypedilum yakucedum* Sasa et Suzuki syn. nov. are junior synonyms of *Ainuyusurika tuberculatum* (Tokunaga). *Einfeldia kanazawai* (Yamamoto) is transferred to the genus *Chironomus* Meigen and its systematic position is discussed.

**Keywords:** Chironomidae, new species, new records, new combination, Ryukyu Archipelago, Okinawa Island

## Introduction

During the last two decades we have continued to survey the Ryukyu Archipelago to clarify the chironomid fauna. The Ryukyu Archipelago or Nansei Shoto, which belongs to the subtropical region climatically, is composed of a large number of islands located in the western Pacific Ocean which forms a chain connecting Kyushu and Taiwan. Okinawa Island (26°00'N–27°00'N, 127°30'E–128°30'E) is the largest island which is located in the middle of the Ryukyu Archipelago.

Hitherto, 217 chironomid species in 61 genera have been recorded from the Ryukyu Archipelago (Podonomiinae: 1 genus, 1 species; Tanypodinae: 10 genera, 13 species; Telmatogetoninae: 2 genera, 3 species; Orthocladiinae: 24 genera, 87 species; Chironominae: 24 genera, 114 species). Recently we had the opportunity to examine many chironomid specimens collected from Okinawa Island. At the present time, 53 species in 28 genera of chironomids are known to occur on this island (Podonomiinae: 1 genus, 1 species; Tanypodinae: 5 genera, 6 species; Orthocladiinae: 9 genera, 15 species; Chironominae: 13 genera, 31 species). As a result of this investigation, we have added 15 additional species to the chironomid fauna of Okinawa Island. Among these 15 species, 3 species are new to science and the remaining 12 species are newly recorded from this island. In this paper, we give descriptions of the three new species together with taxonomic comments and new distributional information.

## Material and Methods

Descriptions are based on male and female specimens collected using a light trap and a Malaise trap on

Okinawa Island. The type specimens of *Pseudorthocladius matussecundus* Sasa et Kawai, *Eukiefferiella amami-pubescia* (Sasa), *Polypedilum yakucedum* Sasa et Suzuki and *Pentapedilum yakuabeum* Sasa et Suzuki were borrowed from the National Museum of Nature and Science, Tsukuba (NMST). The type specimens of *Pentapedilum tuberculatum* (Tokunaga), preserved in alcohol, were borrowed from Kyusyu University. After maceration in 5% KOH solution, the specimens were temporarily mounted on microscope slides in glycerol for doing the drawings. Once the drawings were completed the specimens were mounted permanently on slides in Euparal.

The terminology and measurements mainly follows Sæther (1980). The epandrium, hypandrium, dorsal appendage, basal lobe and paramere are each used for IX T, IX S, superior volsella, inferior volsella in orthoclads and phallapodeme in the male hypopygial structure (Tokunaga 1940; Soptonis 1977; Oliver 1981; Spies et al. 2009), and laterosternite and egg-guide (Wensler and Rempel 1962) are used for gonocoxite IX and the lobe of gonapophysis VIII of Sæther (1980) in the female genitalia. The measurements are given as ranges, generally followed by the mean (n) in parentheses when 4 or more specimens were measured.

The holotypes are deposited in the Entomological Laboratory, Osaka Prefecture University, Sakai (OPU), Japan.

## Tanypodinae

### *Natarsia tokunagai* (Fittkau)

*Macropelopia goetghebuerei* auct. nec Kieffer, 1918: Tokunaga, 1937: 39.

*Macropelopia tokunagai* Fittkau, 1962: 114.

*Krenopelopia kurobefasciata* Sasa et Okazawa, 1992: 63.  
*Natarsia tokunagai*: Kobayashi et Niitsuma, 1998: 133.  
*Zavrelimyia inawaquerea* Sasa, Kitami et Suzuki, 2000: 22.

#### Material examined

[Nago City, light trap] 1 female, Kichiru, 31. x. 2007, M. Kimura; 1 female, as previous except 3. xi. 2007; 1 female, Takehara, as previous except 31. x. 2007; 3 females, Kochi, as previous except 1. xi. 2007.

#### Remarks

This species is new to Okinawa Island. In Japan, it has been recorded from Honshu, Kyushu and Amami Island of the Ryuku Archipelago.

#### Distribution

Japan (Honshu, Kyushu, Amami Island, Okinawa Island)

## Orthocladiinae

### *Cricotopus (Cricotopus) bimaculatus* Tokunaga

*Cricotopus bimaculatus* Tokunaga, 1936: 27.

#### Material examined

[Kunigami-son, Malaise trap] 1 female, Aha, iii–iv. 2008, K. Sugino; 1 female, as previous except 1–17. i. 2009; 1 female, as previous except 17–23. ii. 2009.

#### Remarks

This species resembles *Cricotopus bicinctus* (Meigen) in general appearance and the structure of the male hypopygium. However, the species is distinguished from the latter by having a pair of dark median spots on the yellowish 2nd abdominal tergum.

In the Ryukyu Archipelago, *Cricotopus bimaculatus* is known to occur on Amami Island. This is the first record of this species from Okinawa Island. It has been recorded from all the main islands of Japan.

#### Distribution

Japan (Hokkaido, Honshu, Shikoku, Kyushu, Amami Island, Okinawa Island); Russia (Far East), South Korea.

### *Ionthosmittia cuneipenne* sp. n.

(Fig. 1)

#### Type material

Holotype male (No. OPU-NY401), Japan, Ryukyus, Okinawa Prefecture, Okinawa Island, Nago City, Yofuke, 31. x. 2007, M. Kimura.

#### Diagnostic characters

*Ionthosmittia cuneipenne* sp. n. is distinguishable from any other species of the genus *Ionthosmittia* Sæther and Andersen (1995) by the following combination of char-

acters: maxillary palp very short, slightly less than 0.5 times as long as head width; third palpomere globular, with large pit on its subapical margin, in which about 10 sensilla clavata are situated; clypeal setae few in number, restricted to its dorsal-most part; antepnotum distinctly reduced dorsally; acrostichals minute but distinct, beginning close to anterior margin; wing cuneiform, with strongly extended costa,  $R_{2+3}$  running in the middle between  $R_1$  and  $R_{4+5}$ ;  $R_{4+5}$  apex ending proximal to end of  $M_{3+4}$ , and with  $Cu_1$  strongly curved posteriorly at middle; epandrium with median longitudinal ridge which is moderately elevated in dorsal view; basal lobe of gonocoxite well developed, wide, semicircular, bare; transverse sternapodeme with anterolateral projection not developed, with anterior margin straight; gonostylus gradually expanded apically, crista dorsalis wide; virga well developed, distinctly sclerotized, composed of 3 spine-like projections.

#### Etymology

This species is named after the cuneiform wing (from the Latin: *cuneus* meaning wedge and *penna* meaning wing).

#### Male ( $n = 1$ )

Total length 1.5 mm. Wing 0.9 mm long, 0.3 mm wide; wing length / wing width 3.07.

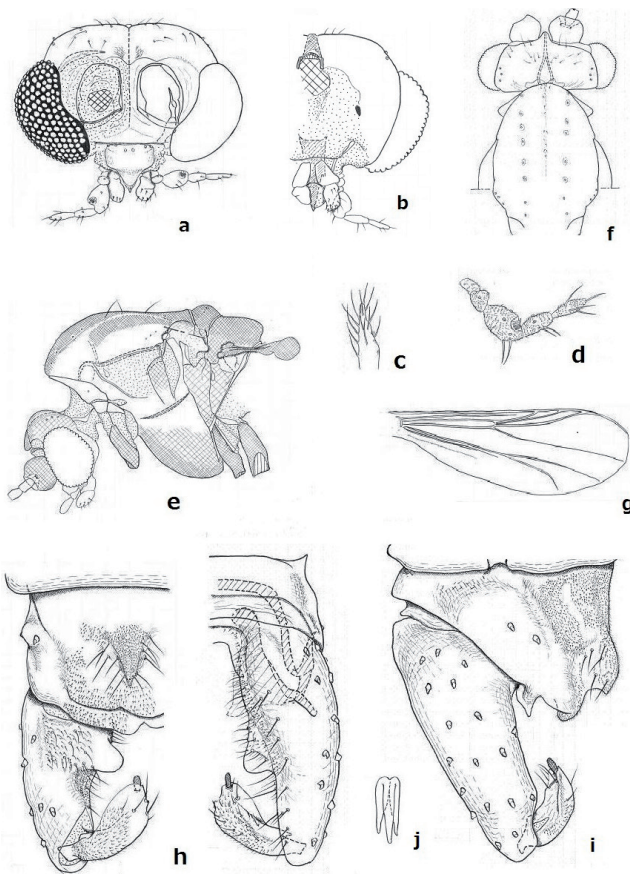
Colouration: Head brown, mouth parts pale brown. Thorax pale brown in ground colour; scutal vittae, scutellum, postnotum and pleura brown. Halter pale brown. Legs predominantly pale brown, all coxae brown. Abdomen including genitalia brown.

Head (Figs. 1a–d): Temporal setae 11. AR 0.30. Ultimate flagellomere without apical seta. Palpomere lengths (in  $\mu\text{m}$ ): 16, 16, 38, 32, 36; palpomeres with 0, 2, 4, 6, 4 setae, respectively. Third palpomere large, globular, with about 10 sensilla clavata in large pit. Clypeus with 6 setae which are restricted to its dorsal-most part. Coruna weakly developed.

Thorax (Figs. 1e, f): Antepnotum strongly reduced in middle. Lateral antepnotal seta absent; dorsocentrals 8, uniserial; acrostichals 17, biserial, beginning just behind antepnotum; prealars 3, uniserial; supraalar 0. Scutellum with 4 setae.

Wing (Fig. 1g): VR 1.26. Wing veins except costa free from setae. Brachiolum with 1 median seta; with 8 basal, 3 median, 8 subapical sensilla campaniformia. Costa strongly extended, with apex reaching to wing tip.  $Cu$  strongly curved posteriorly at middle. Squama bare.

Legs: Fore, mid and hind coxae with 2, 4, 1 setae, respectively; fore, mid and hind trochanters with 7, 5, 5, marginal setae, respectively. Spur of fore tibia broken; mid tibia with anteroventral spur 18  $\mu\text{m}$  long and posteroventral spur 20  $\mu\text{m}$  long; hind tibia with anteroventral spur 20  $\mu\text{m}$  long and posteroventral spur 40  $\mu\text{m}$  long. Tibial comb of hind leg composed of 10 spur-like setae. Lengths and proportions of legs as in Table 1.



**Fig. 1** *Ionthosmittia cuneipenne* sp. nov., male. a. head, frontal view. b. head, caudal view. c. apical portion of ultimate flagellomere. d. maxillary palp. e. head and thorax, lateral view. f. head and thorax, dorsal view. g. wing. h. hypopygium: left, dorsal view; right, ventral view. i. hypopygium, lateral view. j. virga.

Hypopygium (Figs. 1h–j): Median longitudinal ridge of epandrium moderately elevated in lateral aspect, with several setae along elevation. Hyandrium with 2 setae dorsolaterally. Gonocoxite 122  $\mu\text{m}$  long, with basal lobe well developed, semi-circular in shape. Transverse sternapodeme with anterolateral projection not developed, and with anterior margin straight. Paramere 48  $\mu\text{m}$  long. Gonostylus 44  $\mu\text{m}$  long, expanded apically, with crista dorsalis well developed, elongated and rounded apically. Megaseta 5  $\mu\text{m}$  long. Virga strongly sclerotized, composed of three spine-like projections.

#### Remarks

Hitherto, only two species, *Ionthosmittia caudiga* Sæther and Andersen (1995) and *I. otujitertia* (Sasa and Okazawa 1994) have been known from the World. This is the third species of the genus.

This new species is closely related to *I. otujitertia* in having very short maxillary palp of the 3rd palpomere which is globular and has about 10 sensilla clavata in a large subapical pit. However, the species is separable from the latter by the clypeal setae which are restricted to its dorsal-most part, the semicircular bared basal lobe and the virga composed of three spine-like projections in the hypopygium.

#### Distribution

The species is only known from the type locality.

**Table 1** Lengths (in  $\mu\text{m}$ ) and proportions of legs of *Ionthosmittia cuneipenne* n. sp. (n = 1), (Holotype).

	fe	ti	ta <sub>1</sub>	ta <sub>2</sub>	ta <sub>3</sub>	ta <sub>4</sub>	ta <sub>5</sub>	LR	BV	SV
P <sub>1</sub>	385	410	230	131	98	57	57	0.56	2.98	3.46
P <sub>2</sub>	410	402	–	–	–	–	–	–	–	–
P <sub>3</sub>	426	418	–	–	–	–	–	–	–	–

#### *Orthocladius (Euorthocladius) okinawanus* sp. nov.

(Fig. 2)

#### Type material

Holotype male (OPU-NY402), Japan, Ryukyus, Okinawa Prefecture, Okinawa Island, Nago City, Kichiru, light trap, 3. xi. 2007, M. Kimura.

#### Diagnostic characters

This species is characterized by having numerous fine but distinct acrostichals which start at the anterior-most margin of the scutum and are grouped in this area.

#### Etymology

The new species is named after Okinawa Island where the *Type material* was collected.

#### Male (n = 1)

Total length 3.1 mm. Wing 1.3 mm long; 0.4 mm wide; wing length / wing width 3.24.

Colouration: Body entirely yellowish brown except for brown scutal vittae.

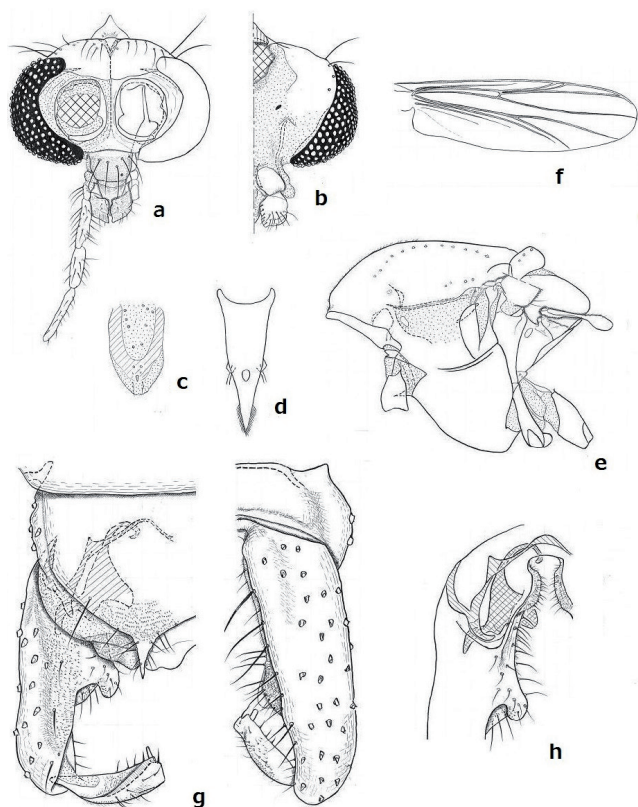
Head (Figs. 2a–d): Temporal setae 13. Antennal ratio 1.05. Palpomere lengths (in  $\mu\text{m}$ ): 40, 44, 100, 84, 196; palpomeres with 0, 7, 24, 14, 10 setae, respectively. Clypeus with 6 setae.

Thorax (Fig. 2e): Lateral anteprenotals 4/5; dorso-centrals 11, uniserial; acrostichals 28, biserial; prealars 2; supraalars 0. Scutellars 6, uniserial. Anterior-most part behind anteprenotum with several fine setae.

Wing (Fig. 2f): Anal lobe moderately developed. VR 1.20. R with 9 setae, R<sub>1</sub> and R<sub>4+5</sub> without setae. Brachiolium with 1 median seta; with 9 basal, 3 median, 9 subapical sensilla campaniformia. Squama with 10 setae, uniserial.

Legs: Fore, mid and hind coxae with 4, 4, 5 marginal setae, respectively; fore, mid and hind trochanters with 15, 9, 8 marginal setae, respectively. Spurs of fore tibia 44  $\mu\text{m}$  long; mid tibia with anteroventral spur 24  $\mu\text{m}$  and posteroventral one 30  $\mu\text{m}$  long; hind tibia with anteroventral spur 24  $\mu\text{m}$  and posteroventral one 62  $\mu\text{m}$  long. Tibial comb of hind leg composed of 12 spine-like setae. Lengths and proportions of legs as in Table 2.

Hypopygium (Figs. 2g, h): Anal point nearly triangular, tapering to pointed apex, 30  $\mu\text{m}$  long, 18  $\mu\text{m}$  wide at base, and with 8 lateral setae. Hyandrium with 4/6 setae



**Fig. 2** *Orthocladius* (*Euorthocladius*) *okinawanus* sp. nov., male. a. head, frontal view. b. head, caudal view. c. epipharynx, frontal view. d. cibarial pump, frontal view. e. thorax, lateral view. f. wing. g. hypopygium: left, dorsal view; right, ventral view. h. basal portion of gonocoxite excluding epandrium, dorsal view.

projection, and with anterior margin strongly arched. Paramere nearly triangular in shape, its anterior portion slender and strongly curved posteriorly. Virga absent. Gonocoxite 96  $\mu\text{m}$  long. Gonostylus nearly straight, 40  $\mu\text{m}$  long, with low and long crista dorsalis. Megaseta 10  $\mu\text{m}$  long. Basal lobe with dorsal part comparatively short, rounded, covering ventral part. Basal median lobe long, low, collar-like.

#### Remarks

This species can be distinguished from other species of the subgenus *Euorthocladius* by the diagnostic character mentioned above.

Sasa and Suzuki (2000) described *Orthocladius* sp. "yakuteus" from Yakushima Island based on a single male. They treated the species as a member of the subgenus *Orthocladius*. But we could not determine the subgeneric position of the species, since the shape of the basal median lobe (Soponis 1977; superior volsella *sensu* Sæther 1980) of the gonocoxite is not given in their description. Unfortunately, we could not examine the species. However, it is inferred that the species belongs to the subgenus *Euorthocladius*. Furthermore, we consider that *O. (E.) okinawanus* sp. n. and *O. sp. "yakuteus"* may be conspecific, because morphological features of the new species except the basal median lobe are almost identical with those of the latter species.

#### Distribution

Japan [Yakushima Island?, Okinawa Island].

**Table 2** Lengths (in  $\mu\text{m}$ ) and proportions of legs of *Orthocladius* (*Euorthocladius*) *okinawanus* n. sp., male (n = 1) (Holotype).

	fe	ti	ta <sub>1</sub>	ta <sub>2</sub>	ta <sub>3</sub>	ta <sub>4</sub>	ta <sub>5</sub>	LR	BV	SV
P <sub>1</sub>	664	705	541	344	254	213	115	0.77	2.06	2.53
P <sub>2</sub>	681	623	-	-	-	-	-	-	-	-
P <sub>3</sub>	722	771	443	230	197	115	107	0.57	2.99	3.37

#### *Paracricotopus irregularis* Niitsuma

*Paracricotopus irregularis* Niitsuma, 1990: 101.

*Rheocricotopus* (*Paracricotopus*) *irregularis*: Sasa and Suzuki, 2001: 155.

#### Material examined

[Naka-gusuku-gun, light trap] 1 male, Atsuta, 1. xi. 2007, M. Kimura.

#### Remarks

This species is closely similar to *P. niger* (Kieffer 1913), *P. tamabrevis* (Sasa 1983), and *P. togakuroasi* (Sasa and Okazawa 1992) in many morphological features, but is distinguished from the latter three species by irregularly arranged setae on the abdominal tergite VIII in the male.

In Japan, this species has been recorded from Honshu. This species is new to Okinawa Island.

#### Distribution

Japan [Honshu, Okinawa Island]

#### *Parakiefferiella semiovata* sp. nov.

(Fig. 3)

#### Type material

Holotype male (OPU-NY403), Japan, Ryukyus, Okinawa Prefecture, Okinawa Island, Nago City, Agarie, 3. xi. 2007, M. Kimura.

#### Diagnostic characters

This species is characterized by the following combination of characters: low antennal ratio; slender and short palpomeres (0.6 times as long as head width); antepnotum strongly reduced medially; median tubercle on scutum covered with microtrichia; wing with anal lobe not developed, costa strongly extended, R<sub>2+3</sub> running in the middle between R<sub>1</sub> and R<sub>4+5</sub>, R<sub>4+5</sub> ending proximal to end of M<sub>3+4</sub>. Cu<sub>1</sub> sinuous; anal point appearing as a median longitudinal elevation on the epandrium, large, rounded apically; gonocoxite bearing no appendage; gonostylus without crista dorsalis.

#### Etymology

This species is named after the semi-oval anal point (from the Latin: *semi* meaning half, *ovatum*, meaning shaped like an egg).

*Male (n = 1)*

Total length 1.4 mm. Wing 0.8 mm long, 0.3 mm wide; wing length / wing width 2.89.

Colouration: Body entirely yellowish brown except brown sutural vittae and thoracic pleura.

Head (Figs. 3a–c): Temporal setae 5. Antennal ratio 0.51. Palpomere lengths (in  $\mu\text{m}$ ): 12, 14, 34, 52, 70; palpomeres with 0, 1, 5, 5, 5, setae, respectively. Palpomeres slender and short, nearly 0.6 times as long as head width. Clypeus with 8 setae.

Thorax (Fig. 3d): Lateral anteprenotals 0; dorsocentrals 6, uniserial; acrostichals 0; preaalars 2, supraalars 0. Anteprenotum strongly reduced medially. Scutum with small low median tubercle covered with microtrichia.

Wing (Fig. 3e): VR 1.45. Costa strongly extended.  $\text{Cu}_1$  sinuous. R without seta;  $\text{R}_1$  with 0 or 1 seta;  $\text{R}_{4+5}$  without setae. Brachiolum with 1 median seta. Squama without setae.

Legs: Fore and mid coxae with 1 and 4 setae, respectively; fore and mid trochanters with 6 and 4 setae, respectively; hind coxae and trochanters broken. Spur of fore tibia 22  $\mu\text{m}$  long; mid tibia with anteroventral spur 12  $\mu\text{m}$  long and posteroventral spur 14  $\mu\text{m}$  long; hind tibia with anteroventral spur 12  $\mu\text{m}$  long and posteroventral spur 32  $\mu\text{m}$  long. Tibial comb of hind leg composed of 9 spine-like setae. Lengths and proportions of legs as in Table 3.

Hypopygium (Figs. 3f, g): Anal point large and wide, rounded apically. Median part of epandrium to subapical portion of anal point with median longitudinal elevation, and with four pairs of setae along elevation. Hypandrium with 2 setae dorsolaterally. Gonocoxite 12  $\mu\text{m}$  long, without any lobe. Transverse sternapodeme with low rounded anterolateral projection, and with anterior margin nearly straight. Paramere 60  $\mu\text{m}$  long. Virga 26  $\mu\text{m}$  long, composed of bifurcated spine, each of which has three branches apically. Gonostylus 52  $\mu\text{m}$  long, wide, gradually curved anteriorly. Crista dorsalis not developed. Megaseta 8  $\mu\text{m}$  long.

*Remarks*

This species keys to *Parakiefferiella* Thienemann, 1936 in the Holarctic key (Cranston et al. 1989), and in the Manual of Palaearctic Diptera (Sæther et al. 2000). The species is characterized from other members of *Parakiefferiella* by the following combination of characters: the reduced anteprenotum; a distinct microtrichose median tubercle instead of the median tuft of microtrichia on the scutum; the anal point appearing as a median longitudinal elevation on the epandrium the character state of which also is observable in *Tavastia cristacauda* Sæther (1992), *Ionthosmittia cuneipenne* sp. n. and *I. otujitertia* (Sasa et Okazawa 1994), *Mesosmittia* Brundin (1956), *Parakiefferiella cavernae* (Freeman 1962) and *Pseudosmittia guineensis* (Kieffer 1918) (Ferrington and Sæther 2011). This new species especially resembles the latter two species in having a more reduced anteprenotum and the similar structure of the anal point in the male hypopygium.

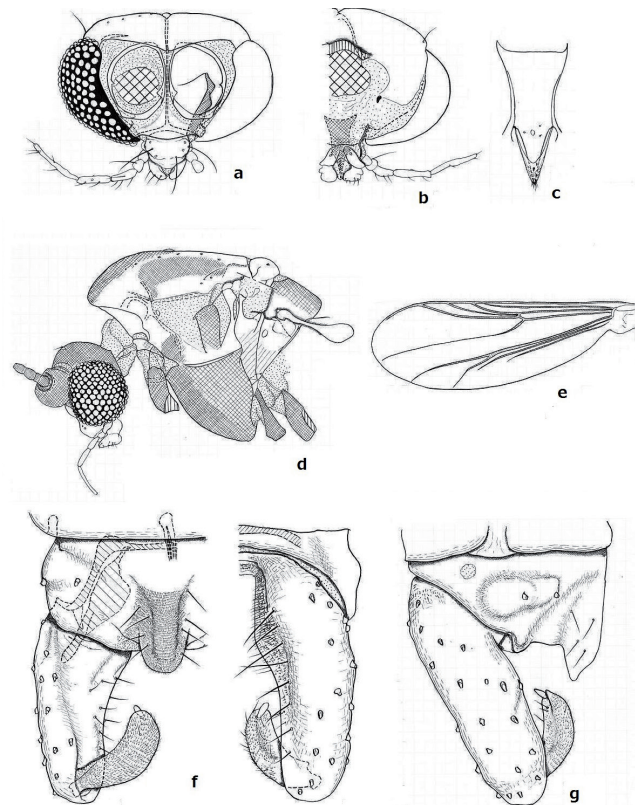
However, the species is clearly separable from these species by the shape of the median longitudinal elevation on the epandrium and the structure of the virga. In this study we consider that this new species should be treated as a member of the genus *Parakiefferiella* because of the presence of a median microtrichose tubercle on the scutum and the absence of the pseudospurs on tarsomeres.

*Distribution*

The species is only known from the type locality.

**Table 3** Lengths (in  $\mu\text{m}$ ) and proportions of legs of *Parakiefferiella semiovata* n. sp., male (n = 1) (Holotype).

	fe	ti	ta <sub>1</sub>	ta <sub>2</sub>	ta <sub>3</sub>	ta <sub>4</sub>	ta <sub>5</sub>	LR	BV	SV
P <sub>1</sub>	320	372	160	96	72	44	44	0.43	3.33	4.33
P <sub>2</sub>	380	380	156	80	60	40	40	0.41	4.16	4.87
P <sub>3</sub>	–	352	180	100	108	44	44	0.51	–	–



**Fig. 3** *Parakiefferiella semiovata* sp. nov., male. a. head, frontal view. b. head, caudal view. c. cibarial pump, frontal view. d. head and thorax, lateral view. e. wing. f. hypopygium, left, dorsal view; right, ventral view. g. hypopygium, lateral view.

*Paraphaenocladus impensus* (Walker)

(Figs. 4a, e, k)

*Chironomus impensus* Walker, 1856: 184.

*Paraphaenocladus amamirobustus* Sasa, 1990: 131; Sæther and Wang, 1995: 53 (as a new junior synonym of *Paraphaenocladus impensus*).

*Gymnometriocnemus toyamaueus* Sasa, 1996; Yamamoto, 2004: 71 (as a junior synonym of *Paraphaenocladus impensus*).

*Material examined*

[Nago City, light trap] 5 males, 2 females, 31. x. 2007, M. Kimura; 1 male, as previous except 2. xi. 2007; 1 male, Kichiru, 31. x. 2007, M. Kimura; 1 male, as previous except 3. xi. 2007.

*Remarks*

Hitherto, two species of the genus *Paraphaenocladus*, i.e., *P. impensus* and *P. exagitans* (Johannsen) were known to occur in the Ryukyu Archipelago (Sæther and Wang 1995). The former species was recorded from Amami Island under the name *P. amamirobustus* (Sasa 1990) and the latter species was described from Okinawa Island as *Metriocnemus ryutanus* Sasa et Hasegawa (Sasa et Hasegawa 1988). Therefore, this is the first record of *P. impensus* from Okinawa Island.

*Distribution*

Japan (Honshu, Shikoku, Kyushu, Amami Island, Okinawa Island); Holarctic Region (widespread).

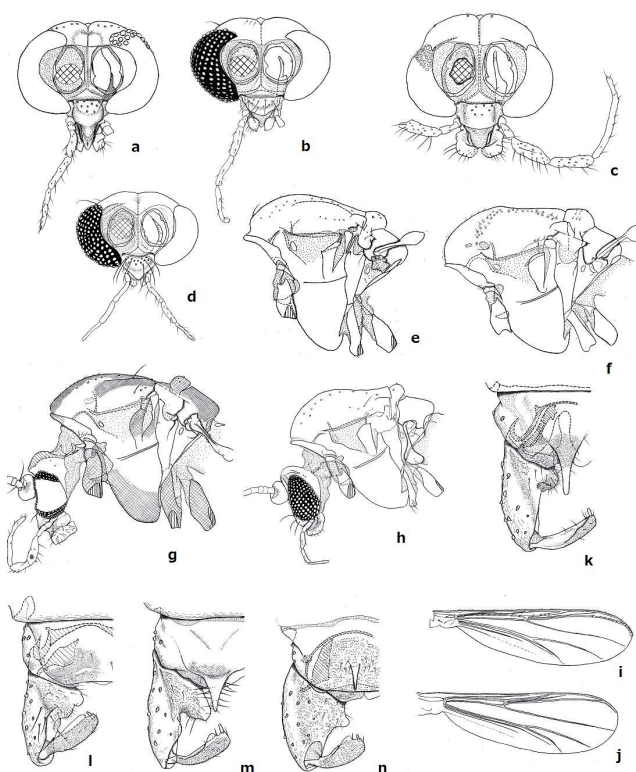
*Paratrichocladius bifascia* (Tokunaga)

(Figs. 4b, f, l)

*Cricotopus bifascia* Tokunaga, 1936: 20

*Paratrichocladius yakukeleus* Sasa et Suzuki, 2000: 68.

*Paratrichocladius bifascius*: Kawai, Inoue and Imabayashi, 2009: 82.



**Fig. 4** *Orthoclaadiinae* spp. males. a–d. head, frontal view. e–h. thorax, lateral view. i, j. wings. k–n. hypopygium. a, e and k. *Paraphaenocladus impensus* (Walker). b, f, l. *Paratrichocladius bifascia* (Tokunaga). c, g, i, m. *Rheocricotopus amamipubescius* (Sasa). d, j, n. *Smittia yakyquerea* Sasa et Suzuki.

*Material examined*

[Nago City, light trap] 1 male, Yofuke, 30. x. 2007, M. Kimura; 1 male, as previous except, Kichiru, 3. xi. 2007.

*Remarks*

This species is new to Okinawa Island. In their detail redescription, Kawai et al. (2009) stated that the scutum has a pair of humeral pits. However, we recognize that 3 pairs of humeral pits are present in Okinawa specimens.

*Distribution*

Honshu, Kyushu, Ryukyu Islands (Yakushima Island, Okinawa Island).

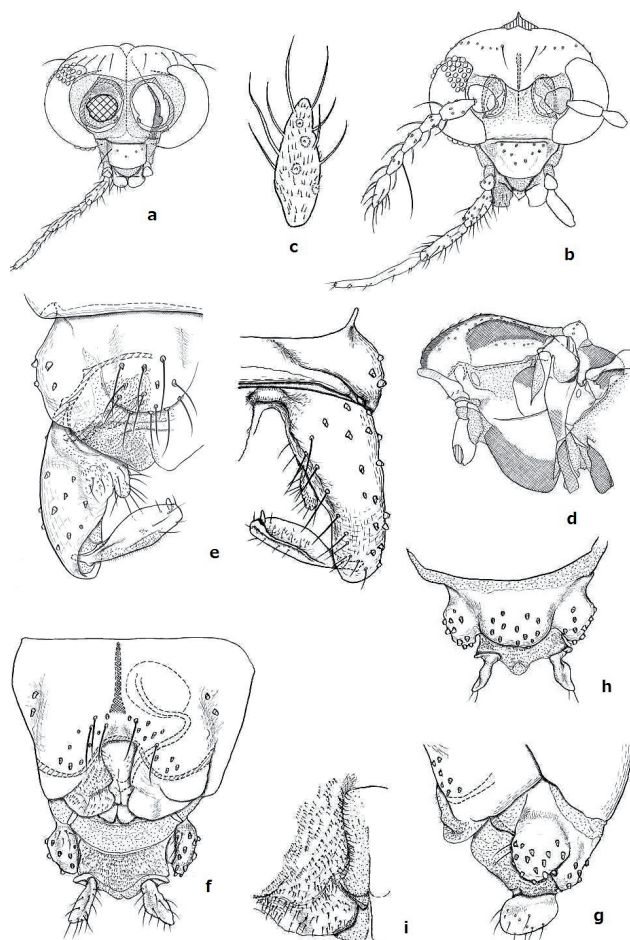
*Pseudorthocladus matusecundus* Sasa et Kawai

(Fig. 5)

*Pseudorthocladus matusecundus* Sasa et Kawai, 1987: 52.

*Material examined*

Type material: Holotype male [specimen No. 107:031 (NSMT-I-Dip 4597)] Matsukawa River, Toyama City, Toyama Prefecture, Japan, 24. v. 1983, M. Sasa; additional



**Fig. 5** *Pseudorthocladus matusecundus* Sasa et Kawai, male (a, d, e, f) and female (b, c, f–h). a. head, frontal view. b. head, caudal view. c. ultimate flagellomere. d. thorax, lateral view. e. hypopygium: left, dorsal view; right, ventral view. f. genitalia, dorsal view. g. genitalia, lateral view. h. genitalia, dorsal view. i. egg-guide, ventral view.

material: [Nago City, light trap] 4 males, 2 females, Yofuke, 30. x. 2007, M. Kimura.

The original description was based only on the holotype.

#### Diagnostic characters

This species is characterized by the following characters: ultimate flagellomere of antenna without subapical seta in both sexes; male hypopygium without anal point and virga; female genitalia with laterosternite well developed, nearly 1/2 x as wide as 9 T; 10th segment not developed; postgenital lobe obscure; egg-guide divided into large ventrolateral lobe and small dorsomedian lobe, labia with microtrichia at posterior margin, apodeme lobe linear, notum as long as length of sternum VIII; cercus small, egg-shaped.

Male ( $n = 4$ ) (Figs. 5a, d, e).

The additional morphological information is as follows.

Antennal ratio 0.53–0.57, 0.56 (1.08 in original description). Lengths and proportions of legs as in Table 4.

Female ( $n = 2$ ) (Figs. 5b, c, f–i)

Total length 1.7 mm. Wing 0.9–1.1 mm long; 0.3–0.4 mm wide; wing length / wing width 2.76–2.79.

Colouration: As in males (see Sasa and Kawai 1987).

Head (Figs. 5b, c): Temporal setae 8–9. Flagellomeres lengths (in  $\mu\text{m}$ ): 60–64, 40–44, 40–52, 36–40, 50–60;

with 5–7, 4–5, 5, 5, 0 setae, respectively. Palpomere lengths (in  $\mu\text{m}$ ): 24, 28, 72, 100–104, 136; palpomeres with 0, 4, 20–23, 24, 11 setae, respectively. Clypeus with 10 setae.

Thorax: Lateral antepnotals 3–4; dorsocentrals 17–18, uniserial; prealars 6–7, uniserial; acrostichals 11, biserial; supraalars 0. Scutellars 7, uniserial.

Wing: VR 1.28–1.40. R with 12–13 setae,  $R_1$  with 6–7 setae,  $R_{4+5}$  with 19–21 setae. Brachiolum with 1 median seta; with 9 basal, 3 median, 8–9 subapical sensilla campaniformia. Squama with 4–7 setae.

Legs: Fore, mid and hind coxae with 2, 4–5, 4 marginal setae, respectively; fore, mid and hind trochanters with 9–11, 8, 6 marginal setae, respectively. Lengths and proportions of legs as in Table 5.

Genitalia (Figs. 5f–i): Laterosternite with 17 setae; 10 T membranous, not formed; 8th sternum 11–12 setae on each side; 9th tergite with 15 setae. Notum 108  $\mu\text{m}$  long. Labium with a few microtrichia on its apical portion.

#### Remarks

This species is new to Okinawa Island and distinguished from other species of the genus by ultimate flagellomeres without no subapical setae in both sexes and absence of the anal point and virga in the male hypopygium.

#### Distribution

Japan (Honshu, Okinawa Island).

**Table 4** Lengths (in  $\mu\text{m}$ ) and proportions of legs of *Pseudorthocladus matusecundus* Sasa et Kawai, 1987, male ( $n = 4$ ).

	fe	ti	ta <sub>1</sub>	ta <sub>2</sub>	ta <sub>3</sub>
p <sub>1</sub>	476–533, 500	500–533, 517	344–377, 361	221–245, 236	164–180, 172
p <sub>2</sub>	492–533, 517	459–492, 482	205–213, 207	107–123, 115	66–90, 84
p <sub>3</sub>	492–533, 515	574–615, 590	320–336, 330	172–189, 182	115–148, 129
	ta <sub>4</sub>	ta <sub>5</sub>	LR	BV	SV
	90–107, 100	82–90, 86	0.68–0.72, 0.70	2.23–2.38, 2.32	2.70–2.93, 2.82
	57–62, 58	57–82, 64	0.42–0.45, 0.43	3.57–4.31, 3.76	4.64–5.00, 4.82
	66–82, 72	66–74, 70	0.55–0.60, 0.56	2.90–3.31, 3.18	3.24–3.41, 3.35

**Table 5** Lengths (in  $\mu\text{m}$ ) and proportions of legs of *Pseudorthocladus matusecundus* Sasa et Kawai, 1987, female ( $n = 2$ ).

	fe	ti	ta <sub>1</sub>	ta <sub>2</sub>	ta <sub>3</sub>
p <sub>1</sub>	443–517	459–525	328–361	205–221	139–148
p <sub>2</sub>	435–525	443–5492	189–205	98–115	74–82
p <sub>3</sub>	484–541	525–599	271–328	148–172	123–148
	ta <sub>4</sub>	ta <sub>5</sub>	LR	BV	SV
	90–98	74	0.69–0.71	2.42–2.59	2.75–2.89
	57	57	0.42–0.43	3.71–3.92	4.65–4.96
	66–74	66–74	0.52–0.55	3.14–3.18	3.48–3.74

**Table 6** Lengths (in  $\mu\text{m}$ ) and proportions of legs of *Rheocricotopus (Psilocricotopus) amamipubescius* Sasa, 1990, male ( $n = 6$ ).

	fe	ti	ta <sub>1</sub>	ta <sub>2</sub>	ta <sub>3</sub>
P <sub>1</sub>	705–828, 776	689–804, 752	615–705, 645	328–385, 349	238–287, 254
P <sub>2</sub>	640–730, 682	607–697, 646	410–459, 426	164–180, 168	123–139, 127
P <sub>3</sub>	697–828, 741	771–853, 813	476–566, 514	205–246, 220	272–213, 187
	ta <sub>4</sub>	ta <sub>5</sub>	LR	BV	SV
	164–197, 179	90–98, 95	0.85–0.89, 0.87	2.25–2.50, 2.46	2.27–2.49, 2.35
	66–74, 70	57–66, 59	0.63–0.70, 0.66	4.08–4.29, 4.14	2.92–3.29, 3.12
	107–123, 112	74–82, 79	0.62–0.67, 0.63	3.42–3.51, 3.46	2.98–3.09, 3.03

***Rheocricotopus (Psilocricotopus) amamipubescius* (Sasa)**

(Figs. 4c, g, i, m)

*Eukiefferiella amamipubescia* Sasa, 1990: 127.*Rheocricotopus (Rheocricotopus) amamipubescia* Sasa: Sæther, Ashe and Murray, 2000: 161.**Material examined**

Type material: Holotype male, Yakkachi River, Amami Island, 18. iii. 1989, M. Sasa. Paratype: 1 male, as holotype. Additional material: [Nago City, light trap] 2 males, Atsuta, 1. x. 2007, M. Kimura; 2 males, Yofuke, as previous except 30. x. 2007; 1 male, Takehara, as previous except 31. x. 2007; 1 male, Kichiru, as previous except 3. xi. 2007.

**Diagnostic characters**

This species is characterized by the following combination of characters: low antennal ratio; third palpomere with ten or more distinct sensilla clavata in subapical pits; humeral pit small (Fig. 4g); wing cuneiform, costa distinctly extended to wing tip; gonocoxite with basal lobe rather large, produced medially; with basal median lobe long and low, without projection; gonostylus with crista dorsalis distinct, triangular in shape (Fig. 4m).

**Male ( $n = 6$ )**

The following additional morphological characters are given.

Antennal ratio 0.34–0.51, 0.40. Lengths and proportions of legs as in Table 6.

**Remarks**

Although the crista dorsalis on the gonostylus was not shown in the original description, it is clearly recognizable in the holotype. The hypopygial features shows that this species belongs to the subgenus *Psilocricotopus* Sæther.

This species was recorded from Toyama Prefecture, Honshu by Sasa and Okazawa (1992). Furthermore, Sasa and Suzuki (1993) redescribed this species from Amami Island. Here we conclude that the former species is *Rheocricotopus oiraprimus* Sasa, 1991, and the latter species should be treated as *R. tokarakereus* Sasa et Suzuki, 1995 based on an examination of specimens housed in the National Museum of Nature and Science, Tokyo.

**Distribution**

Japan (Amami Island, Okinawa Island).

***Smittia yakyquerea* Sasa et Suzuki**

(Figs. 4d, h, j, n)

*Smittia yakyquerea* Sasa et Suzuki, 2000: 97.*Smittia aterrima*: Yamamoto, 2004 (misidentification).**Material examined**

[Nago City, light trap] 1 male, Takehara, 31. x. 2007, M. Kimura.

This species was described based only on the holotype collected from Yakushima Island.

**Male ( $n = 1$ )**

The following additional morphological information is given.

Antennal ratio 0.58 (0.85 in original description). Lengths and proportions of legs as in Table 7.

**Remarks**

This species was described from Yakushima Island which is located in the northern part of the Ryukyu Archipelago based on a single male by Sasa and Suzuki (2000), and is new to Okinawa Island.

This species was erroneously treated as a junior synonym of *Smittia aterrima* (Meigen, 1818) by Yamamoto (2004). This species is distinguished by having a rather short triangular crista dorsalis whereas *S. aterrima* has a large, wide and rounded crista dorsalis.

**Distribution**

Japan (Yakushima Island, Okinawa Island).

**Table 7** Lengths (in  $\mu\text{m}$ ) and proportions of legs of *Smittia yakyquerea* Sasa et Suzuki, 2000, male ( $n = 1$ ).

	fe	ti	ta <sub>1</sub>	ta <sub>2</sub>	ta <sub>3</sub>	ta <sub>4</sub>	ta <sub>5</sub>	LR	BV	SV
P <sub>1</sub>	385	495	262	148	107	66	57	0.57	2.93	3.22
P <sub>2</sub>	418	402	197	98	74	49	49	0.49	3.76	4.17
P <sub>3</sub>	418	435	238	123	115	57	49	0.55	3.17	3.59



***Tokyobrillia tamamegaseta* Kobayashi et Sasa**

(Fig. 6)

*Tokyobrillia tamamegaseta* Kobayashi et Sasa, 1991: 74.  
*Tokyobrillia tamamegaseta*: Sæther and Wang, 1993: 220;  
 Yamamoto, 2004: 109.

*Togecnemus toyamawexeus* Sasa, 1996: 43; Yamamoto,  
 2004: 109.

*Kurobebrillia jokaquinta* Sasa et Ogata, 1999: 96; Yamamo-  
 to, 2004: 109.

**Material examined**

[Naka-gusuku-gun, light trap] 1 male, Atsuta, 1. xi.  
 2007, M. Kimura. [Kunigami-son, Malaise trap] 3 fe-  
 males, Aha, 7–14. v. 2008, K. Sugino; 1 female, as previ-  
 ous except 18–24. ix. 2008; 2 females. as previous except  
 26. iii–7. iv. 2009.

**Remarks**

This species is new to Okinawa Island.

The taxonomic characters of this species are emend-  
 ed as follows: i) ultimate antennal flagellomere of both  
 sexes with apical seta (Figs. 6c, d); ii) clypeus with long  
 lanceolate setae (Figs. 6a, b); iii) all legs including femora,  
 tibiae and tarsomeres covered with sensilla squamiformia  
 (Figs. 6g, h). Sæther and Wang (1993) recognized this fea-  
 ture but they did not describe the distributional pattern;  
 iv) male hypopygium with thin bifurcated virga (Fig. 6i);  
 v) female genitalia (Figs. 6j–m) with distinct labium with-

out microtrichia (Fig. 6l) and with membranous apodeme  
 lobe (Fig. 6m) bearing sclerotized ridge on the anterior  
 margin. Detailed structure of the thoraxes (Figs. 6e, f) are  
 given for taxonomic information.

**Distribution**

Japan (Honshu, Okinawa Island), Oriental China.

**Chironominae*****Ainuyusurika tuberculatum* Tokunaga**

(Figs. 7a–f)

*Pentapedilum tuberculatus* Tokunaga, 1940: 290.

*Ainuyusurika tuberculatum*: Sasa, 1988: 80.

*Pentapedilum yakuabeum* Sasa et Suzuki, 2000: 56. Syn. nov.

*Polypedilum yakucedum* Sasa et Suzuki, 2000: 57. Syn. nov.

*Ainuyusurika tuberculatum*: Oyewo and Sæther, 2008: 138.

*Ainuyusurika yakuabeum*: Oyewo and Sæther, 2008: 139.

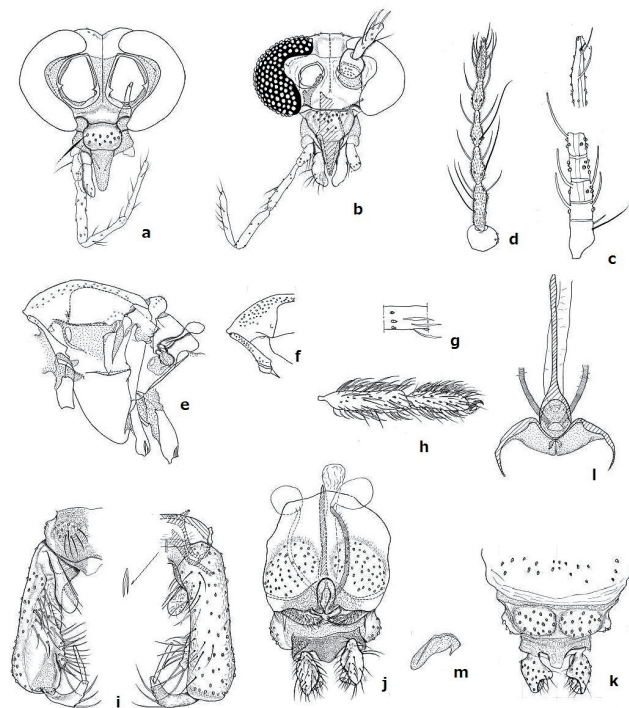
*Ainuyusurika yakucedum*: Oyewo and Sather, 2008: 140.

**Material examined**

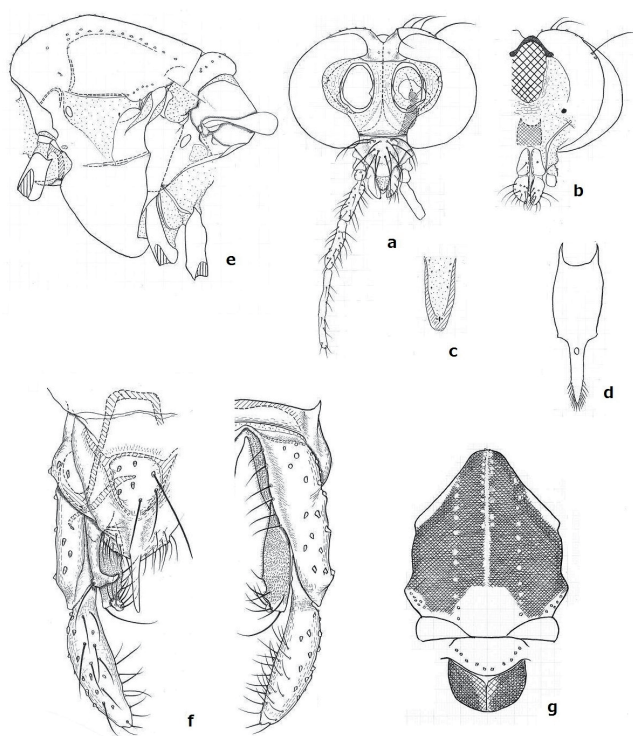
Type material: Holotype is missing; Paratypes: 30 ma-  
 les (Tokunaga Collection No. 15-4, Kyushu University),  
 USSR [now Russia], Karafuto (Sakhalin), Kita-Haku-  
 tyo-ko; holotype male of *Polypedilum yakucedum* (spec-  
 imen No. 382:097, NSMT-I-Dip 5263), Japan, Kagoshi-  
 ma Prefecture, Yakushima Island, Miyanoura, 24. iii.  
 1999, H. Suzuki; holotype of *Pentapedilum yakuabeum*  
 (specimen No. 384:099 NSMT-I-Dip 5284), Japan, Ka-  
 goshima Prefecture, Yakushima Island, town of Miyan-  
 oura, 28. iii. 1999, H. Suzuki; paratypes of *Pentapedilum*  
*yakuabeum*: 1 male (specimen No. 381: 81), as previ-  
 ous except Issogawa River, 24. iii. 1999; 9 males (specimen  
 Nos. 381:41, 384:92–98, 100), as previous except 20. iii.  
 1999; additional specimens (all specimens collected by K.  
 Kawai at light): 1 male, Wakayama Prefecture, Kushimo-  
 to, 11. iv. 2004; 1 male, Hiroshima Prefecture, Yasuura,  
 20. x. 2009; 1 male, Hiroshima Prefecture, Kure City, Ku-  
 rahashi, Sugawa, 3. x. 2008; 1 male, Kagoshima Prefec-  
 ture, Yakushima Island, Ohura River mouth, iv. 2003; 1  
 male, as previous except Nagata River; 1 male, Kagoshi-  
 ma Prefecture, Kikajima Island, other data not given; 1  
 male, as previous except Tokunoshima Island, Akirigami;  
 1 male, Okinawa Prefecture, Okinawa Island, 24. v. 2007;  
 1 male, as previous except Kumejima Island, 18. iv. 1999;  
 1 male, as previous except Ishigaki Island, Hira City, 7.  
 vii. 2010; 1 male, Okinawa Prefecture, Ishigaki Island, 18.  
 xii. 2008; 1 male, Okinawa Prefecture, Iriomote Island,  
 1. vi. 2000; 1 male, Okinawa Prefecture, Okinawa Island,  
 Kunigami-son, Aha, 18–24. iv, K. Sugino.

**Remarks**

*Ainuyusurika* was erected by Sasa and Shirasaka in  
 Sasa (1998) for *Pentapedilum tuberculatus* Tokunaga,  
 1940. Two years later, Sasa and Suzuki (2000) described  
*Pentapedilum yakuabeum* and *Polypedilum yakucedum*



**Fig. 6** *Tokyobrillia tamamegaseta* Kobayashi et Sasa, male (a, c, e, g, i) and female (b, d, f, h, j–l). a, b. head, frontal view. c. antennal flagellomeres. d. antenna. e, f. thorax, lateral view. g. setal sockets and sensory scales on mid tibia. h. 4th and 5th tarsomeres of mid leg. i. hypopygium: left, dorsal view; right, ventral view. j. genitalia, ventral view. k. genitalia, dorsal view. l. genitalia, notum, rami and labia. m. apodeme lobe.



**Fig. 7** *Ainyuyusurika tuberculatum* (Tokunaga), male (a–f) and *Stenochironomus membranifer* Yamamoto, female (g). a. head, frontal view. b. head, caudal view. c. epipharynx, frontal view. d. cibarial pump, frontal view. e. thorax, lateral view. f. hypopygium: left, dorsal view; right, ventral view. g. thorax, dorsal view.

both of which were collected from Yakushima Island, Ryukyus. These two species were transferred to the genus *Ainyuyusurika* by Oyewo and Sæther (2008). They treated these three taxa as separate independent species mainly based on the presence or absence of a seta on the dorsal appendage and if present the position of the seta. During this study, we had the opportunity to examine the paratypes of *P. tuberculatus* housed in Kyusyu University, the holotypes and paratypes of *P. yakuabeum* and *P. yakuce-deum*, and many other additional specimens identified as *Ainyuyusurika* which were collected at various localities in Japan. Consequently, we recognized that the differences relating to the dorsal appendage are due to individual variation. Therefore, we conclude that all three species are conspecific.

#### Distribution

Russian Far East (Sakhalin); Japan (Honshu, Kyushu, Ryukyu Archipelago including Okinawa Island and the Yaeyama Islands).

#### *Chironomus kanazawai* (Yamamoto) **comb nov.**

(Fig. 8)

*Einfeldia kanazawai* Yamamoto, 1996: 241.

#### Material examined

[Nago City, light trap] 2 females, Kunen-mata, 30. x. 2007, M. Kimura; 1 male, Kochi, 1. xi. 2007, M. Kimu-

ra; 1 male, as previous except 2. xi. 2007; [Kunigami-son, Aha, Malaise trap] 1 male, 1 female, 27. iii. 2008, K. Sugino; 2 males, 3 females, as previous except 7–21. iv. 2008; 1 male, 1 female, as previous except 5–18. ix. 2008; 3 males, as previous except 7–20. x. 2008; 1 female, as previous except 24. ix–7. x. 2008; 1 male, as previous except 8–20. iii. 2009; 1 male, as previous except 21–27. vii. 2009.

The original description of the species was based only on the holotype.

#### Male ( $n = 9$ )

Additional morphological information is as follows.

Antennal ratio 2.61–3.06, 2.81. Lengths and proportions of legs as in Table 8.

#### Female ( $n = 6$ , unless otherwise stated)

Total length 3.4–5.6 mm. Wing 2.0–2.9, 2.6 mm long; 0.6–0.9, 0.7 mm wide; wing length / wing width 3.05–3.48, 3.21.

Colouration: As in male (see Yamamoto 1996).

Head (Figs. 8a–f): Temporal setae 16–24. Flagellomere lengths (in  $\mu\text{m}$ ): 144–176, 163; 96–120, 110; 108–128, 119; 100–124, 110; 188–248, 219; with 10–13, 7–8, 6–7, 6–7, 1 setae, respectively. Ultimate flagellomere with subapical seta. Palpomere lengths (in  $\mu\text{m}$ ): 40–60, 50; 56–68, 60; 160–200, 176; 196–232, 213; 264–348, 310; palpomeres with 1, 3–6, 26–29, 27–40, 13–16 setae, respectively. Clypeus with 21–33 setae.

Thorax (Fig. 8g): Lateral anteprenotals 0; dorsocentrals 16–20, partially biserial; prealars 3–8, uniserial; acrostichals 10–19, biserial; supraalars 1. Scutellars 16–29, partially triserial.

Wing: VR 1.08–1.21, 1.13. R with 31–39 setae,  $R_1$  with 23–39 setae,  $R_{4+5}$  with 42–70 setae. Brachiolum with 2 median setae; with 11–12 basal, 3 median, 10–12 ( $n = 5$ ) subapical sensilla campaniformia. Squama with 15–28 setae, occasionally biserial.

Legs: Fore, mid and hind coxae with 7–9, 6–8, 5–6 marginal setae, respectively; fore, mid and hind trochanters with 11–14, 5–8, 7–9 marginal setae, respectively. Lengths and proportions of legs as in Table 9.

Genitalia (Figs. 8h–j): Laterosternite with 3–5 setae; 10 T with 4–10 setae. Notum ( $n = 5$ ) 196–224, 208  $\mu\text{m}$  long. Labium bare. Apodeme lobe linear (Fig. 8j).

#### Systematic remarks (Figs. 9, 10)

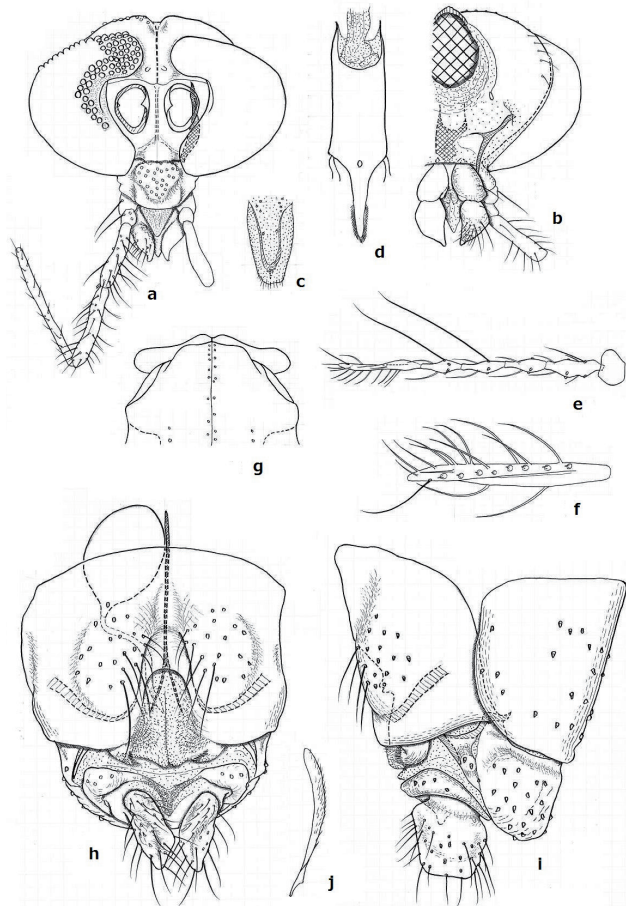
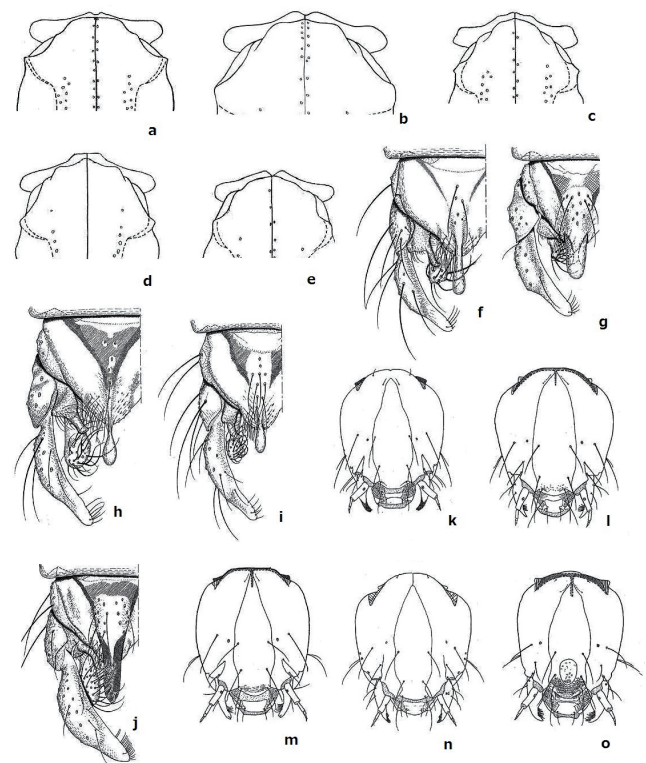
The genus *Einfeldia* Kieffer is defined by the following characters in the male adult: dorsal appendage (superior volsella) with pad-like microtrichose and setose base, with variably developed, bare, digitiform extension arising dorsomedially and distinctly anterior to termination of pad-like base (Cranston et al. 1989). The senior author thinks that this definition has caused confusion to occur in the systematics of the genus *Einfeldia* in the adult male. Previously *E. dissidens* (Walker) was treated as a member of the subgenus *Lobochironomus* Ryser, Wülker et Scholl

**Table 8** Lengths (in  $\mu\text{m}$ ) and proportions of legs of *Chironomus (Chironomus) kanazawai* (Yamamoto 1996), male (n = 9).

	fe	ti	ta <sub>1</sub>	ta <sub>2</sub>	ta <sub>3</sub>
P <sub>1</sub>	1200–1460, 1313	720–880, 798	1460–1700, 1620	780–960, 850	600–760, 678
P <sub>2</sub>	1100–1320, 1225	900–1100, 1010	640–820, 725	320–400, 368	240–300, 263
P <sub>3</sub>	1240–1400, 1330	1080–1380, 1230	900–1080, 990	460–540, 497	320–400, 367
	ta <sub>4</sub>	ta <sub>5</sub>	LR	BV	SV
	660–840, 740	260–320, 293	1.84–2.15, 2.01	1.38–1.52, 1.47	1.25–1.40, 1.32
	160–180, 168	100–140, 115	0.70–0.74, 0.72	3.14–3.40, 3.24	2.98–3.17, 3.09
	220–260, 230	120–160, 133	0.80–0.84, 0.83	2.78–2.89, 2.85	2.48–2.60, 2.53

**Table 9** Lengths (in  $\mu\text{m}$ ) and proportions of legs of *Chironomus (Chironomus) kanazawai* (Yamamoto 1996), female (n = 6).

	fe	ti	ta <sub>1</sub>	ta <sub>2</sub>	ta <sub>3</sub>
P <sub>1</sub>	1280–1660, 1507	800–1045, 930	1720–2140, 1953	880–1100, 1000	700–880, 807
P <sub>2</sub>	1140–1540, 1370	960–1360, 1180	680–920, 807	340–460, 393	220–300, 267
P <sub>3</sub>	1240–1680, 1500	1160–1600, 1373	940–1220, 1090	460–560, 535	340–420, 395
	ta <sub>4</sub>	ta <sub>5</sub>	LR	BV	SV
	900–1120, 1007	360–420, 390	1.84–2.15, 2.01	1.33–1.46, 1.37	1.21–1.28, 1.25
	160–200, 180	12–140, 130	0.67–0.71, 0.68	3.31–3.56, 3.46	3.09–3.22, 3.16
	220–280, 255	140–180, 160	0.76–0.82, 0.80	2.83–2.99, 2.91	2.49–2.75, 2.60

**Fig. 8** *Chironomus (Chironomus) kanazawai* (Yamamoto), female. a. head, frontal view. b. head, caudal view. c. epipharynx. d. cibarial pump, frontal view. e. antenna. f. ultimate flagellomere. g. anterior portion of thorax, dorsal view. h. genitalia, ventral view. i. genitalia, lateral view. j. apodeme lobe.**Fig. 9** So-called *Einfeldia*, *Chironomus* and *Chaetolabis*, thorax (a–d), male hypopygium (f–j) and larval head capsule (k–o). a, f. *C. longipes* Staeger. b, g. *C. kanazawai* (Yamamoto). c, h, m. *C. ocellata* (Hashimoto). d, i, n. *Benthalia dissidens* (Walker). e, j, o. *Einfeldia pagana* (Meigen). k. *C. flaviplumus* Tokunaga. l. *Chaetolabis macani* (Freeman).

of the genus *Chironomus* along with *C. longipes* Staeger by some workers. Recently Jon Martin (pers. comm. to M. Yamamoto) emphasised that *E. dissidens* should be removed from *Chironomus* (*Lobochironomus*) to the genus *Benthalia* Lipina based on chromosomal and DNA evidence. It is also obvious that *E. dissidens* does not belong to either *Chironomus* or *Einfeldia* based on evidence from morphological features. The senior author agrees with Jon Martin, and now the species is recognized as belonging to the genus *Benthalia*. The genus *Einfeldia* was divided into 4 species groups (A–D) based on larval and pupal morphological features (Pinder and Reiss 1983, 1986). Among the groups, species group A is now treated as *Einfeldia* s. str., group B is *Benthalia* and group C is *Chironomus* (*Lobochironomus*). However, the definitions of the genera are still unclear. In Japan we have 6 species identified as *Einfeldia* which here are treated as so-called *Einfeldia* excepting *C. (L.) longipes* (Figs. 9g–j). These are *C. thailandicus* Hashimoto, *E. dissidens* (Walker) (Fig. 9i), *E. kanazawai* Yamamoto (Fig. 9g), *E. ocellata* Hashimoto (Fig. 9h), *E. pagana* (Meigen) (Fig. 9j) and *E. nojiriprima* Sasa. Yamamoto (1979) pointed out that the presence or absent of the median suture on the antepnotum is a very important character for separating *Chironomus* from its related genera (Figs. 9a–e). Yamamoto (1987) recognized the subgenus *Chaetolabis* Townes of the genus *Chironomus* as an independent genus based on the presence of the median suture on the antepnotum. On the other hand, the genus *Chironomus* has no suture on the median portion of the antepnotum. It is inferred that this character is the most important autapomorphic character of the genus *Chironomus*. There is no problem with *C. (L.) longipes* belonging to the genus *Chironomus* since it is without a median suture on the antepnotum (Fig. 9a). *B. dissidens* is clearly separable from species of the genus *Chironomus* by larval and pupal characters. On the other hand, *E. ocellata* has the same characters excepting the median suture of the antepnotum (Fig. 9d) as in *Chironomus*. *E. pagana* shares the medially deeply divided antepnotum (Fig. 9e) with *E. nojiriprima*. The senior author thinks that these two species may be placed into the same clade.

The larva of *Ch. macani*, (Freeman) with two pairs of ventral tubules, has a *thummi*-type larva. *E. ocellata* is not separable from the genera *Chironomus* or *Chaetolabis* in larval features and *E. ocellata* is classified as having an *anthracinus*-type larva. On the other hand, *B. dissidens* and *E. pagana* both have a pair of ventral tubules. Both larvae are clearly separable from that of *Chironomus*. In larval heads of so-called *Einfeldia*, the frontal setae S5 are situated more anterior to the ring organs (Figs. 9m–o). However, in *Chironomus* excepting *C. salinarius* Kieffer, the frontal setae S5 are situated posterior to or at the same level of the ring organs (Fig. 9k). This may be a useful character for separating the larvae of *Chaetolabis macani* (Fig. 9l) and *E. ocellata* from those of the genus *Chironomus*. *Benthalia dissidens* has a rather wide head capsule compared

with other species of so-called *Einfeldia* (Fig. 9n). The larva of *E. pagana* is distinct from other so-called *Einfeldia* larvae in having a large oblong fenestra (Fig. 9o).

The structure of the labro-epipharynx resemble each other in *Chironomus yoshimatsui* (Fig. 10a), *Chaetolabis macani* (Fig. 10b), *E. ocellata* (Fig. 10c) and *E. pagana* (Fig. 10e). *Benthalia dissidens* is distinct from any other so-called *Einfeldia* in having an oval pecten epipharyngis which has many small toothlets on the surface (Fig. 10d). *Chaetolabis macani*, *E. pagana*, *E. ocellata* and *Chironomus yoshimatsui* each have a similar mentum (Figs. 10f, g, i). However, the mentum of *B. dissidens* (Fig. 10h), which is strongly produced anteriorly, is quite different from any other species of the genera *Chironomus*, *Chaetolabis* and so-called *Einfeldia*.

In *C. macani* and *E. ocellata*, the maxillae are very similar to each other and to those of *Chironomus* species (Figs. 10j, k). This fact shows that *Chaetolabis macani* and *E. ocellata* are closely related to the genus *Chironomus*. *Einfeldia pagana* has comparatively long chaetulae of the palpiger (Fig. 10m) which is an intermediate type between those of *B. dissidens* (Fig. 10l) and genera of the *Gyptotendipes*-group (*Glyptotendipes* Kieffer, *Kiefferulus* Goetghebuer, etc.), and quite different from those of other so-called *Einfeldia*.

The prementa of *Chaetolabis macani* and *E. ocellata* are each similar to that of *Chironomus* (Fig. 10n). *Benthalia dissidens* (Fig. 10o) and *E. pagana* (Fig. 10p) each has a similar prementum. The prementa of *Chironomus* and so-called *Einfeldia* are separable from those of genera of the *Gyptotendipes*-group (Fig. 10q) by having a small number of paraligular scales.

In pupae of the genus *Chironomus*, conjunctivae between 3rd to 4th terga and 4th to 5th terga each has a pair of setae. This feature is also recognized in *Chaetolabis macani* and *E. ocellata*. Peter Cranston (pers. comm. to M. Yamamoto) has pointed out that this is an autapomorphic character of the genus *Chironomus*. The senior author thinks that this character state is synapomorphic for the genus *Chironomus* s. lat. including *Chaetolabis*, *E. ocellata* and probably also *Baetotendipes* Kieffer.

The antepnotum without a median suture is observable in species of the genus *Chironomus*. However, we could not find this feature in *Chaetolabis macani* or in species of so-called *Einfeldia*. Although the immature stages of *C. thailandicus* were not examined, this species probably belongs to the same species group as *E. dissidens*. Furthermore, *E. kanazawai* is included in the *ocellata*-group based on adult morphological features. Six species of so-called *Einfeldia* are classified into three species groups based on features of the adult thorax and the larval maxilla (Yamamoto 2006).

1. *ocellata*-group: two antepnotal lobes fused medially and weakly produced anteriorly; scutal tubercle distinct, acrostichals normally developed; larva of *anthracinus*-type, chaetulae of palpiger as in *Chironomus*. Includes *ocellata* Hashimoto, *kanazawai* Yamamoto.

This species group is classified as belonging to the genus *Chironomus* by the morphological features of larva and by having a pair of setae on the conjunctivae of tergites III–IV and IV–V in the pupa. However, *E. ocellata* is different from all other members of the genus *Chironomus* in having a distinct median suture on the antepronotum. The membranous area behind the premandible has a lot of minute and distinct particles in *E. ocellata*, whereas this feature is not observable in the genus *Chironomus*.

2. *dissidens*-group: antepronotum and scutal tubercle as in those of the *ocellata*-group, acrostichals reduced in number (0–3); larva with one pair of ventral tubules, chaetulae of palpiger composed of 2 different types of chaetulae. Includes *dissidens* (Walker) (*dystenus* Kieffer?) and probably *thailandicus* Hashimoto.

This species group is the same as species group B of Pinder and Reiss (1983).

3. *pagana*-group: antepronotum distinctly divided at middle by a conspicuous V-shaped notch, scutal tubercle indistinct, acrostichals normally developed; larva with one pair of ventral tubules, chaetulae of palpiger rath-

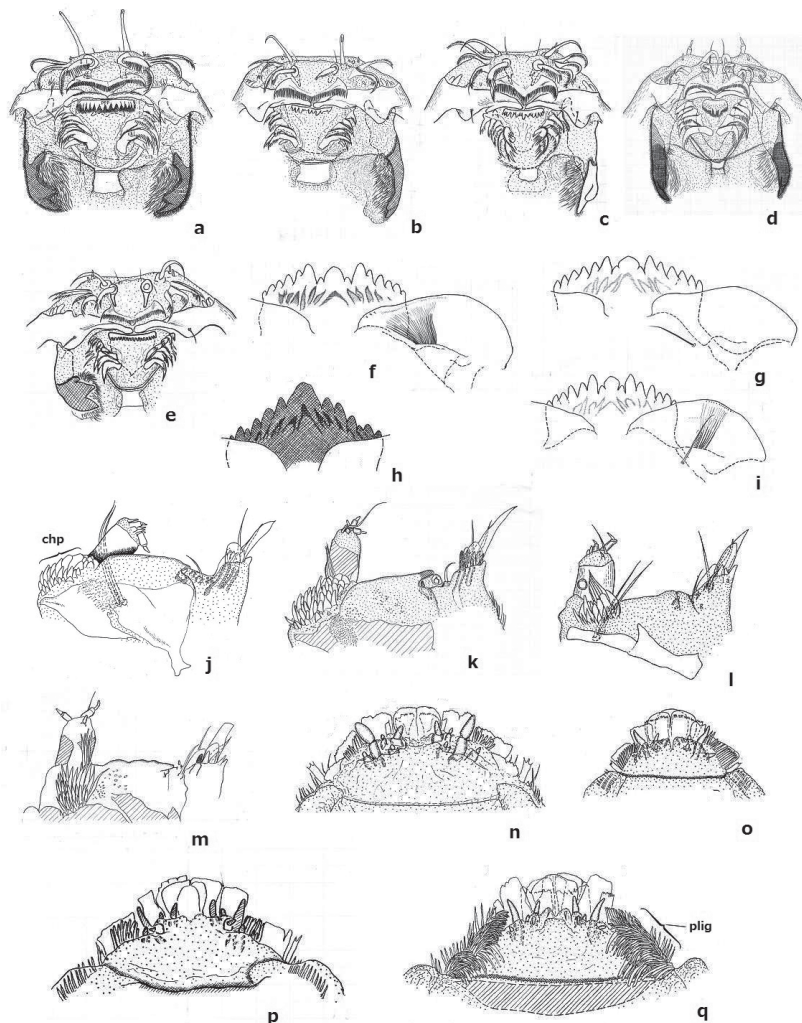
er long, compared with those of *Chironomus*. Includes *pagana* (Meigen), *nojiriprima* Sasa (*Einfeldia chelonias*: Yamamoto 2006, misidentification).

This species group, the same as species group A of Pinder and Riss (1983), contains *pectoralis*, *pagana* and *synchrona*. Now, *E. synchrona* Oliver is a junior synonym of *pagana*. Unfortunately, the senior author has no detailed information on *E. pectoralis* Kieffer which is the type species of the genus. This species group should be treated under the genus *Einfeldia* in the strict sense.

The evidence mentioned above supports the removal of *E. kanazawai* Yamamoto and *E. ocellata* Hashimoto, from the genus *Einfeldia*. Although the antepronotal features is different from the genus *Chironomus*, *ocellata*-group species are tentatively treated as belonging to the genus *Chironomus* in this paper. However, in this study we do not give the subgeneric rank to the *ocellata*-group species.

#### Distribution

Japan (Honshu, Kyushu, Okinawa Island).



**Fig. 10** So-called *Einfeldia*, *Chironomus*, *Chaetolabis* and *Glyptotendipes*, labro-epipharynx (a–e), mentum (f–i), maxilla (j–m) prementum (n–q). a. *C. yoshimatsui* Martin et Sublette. b, f, k. *Chaetolabis macani* (Freeman). c, i. *C. ocellata* (Hashimoto). d, h, o. *Benthalia dissidens* (Walker). e, g, m, p. *E. pagana* (Meigen). j. *C. flaviplumus* Tokunaga. q. *G. pallens* (Meigen). Abbreviations: plig, paraligula; chp, chaetulae of the palpiger.

***Stenochironomus membranifer* Yamamoto**

(Fig. 7g)

*Stenochironomus membranifer* Yamamoto, 1981: 47**Material examined**

[Nago City, light trap] 2 females, Takehara, 31. x. 2007, M. Kimura.

**Remarks**

This species is distinct from any other Japanese species of the genus *Stenochironomus* by having a largely blackish scutum. Sasa (1985) recorded a species identified as *Stenochironomus membranifer* from Kagoshima Prefecture, in Kyushu. Although the species described by Sasa closely resembles *S. membranifer* based on morphological features of the male hypopygium, it is distinctly different from the latter by having a pair of large spot-like lateral scutal vittae. So, we think that the species identified by Sasa may be a new species.

**Distribution**

Japan (Honshu, Kyushu, Okinawa Island).

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