

# TAXONOMIC STUDY ON THE SUBGENUS *URESIPEDILUM* (DIPTERA: CHIRONOMIDAE: *POLYPEDILUM*), WITH DESCRIPTION OF A NEW SPECIES FROM THE YAEYAMA ISLANDS, OKINAWA, JAPAN

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## ABSTRACT

As a result of a multi-year survey, we recognized four species including a new species of the subgenus *Uresipedilum* from the Yaeyama Islands, the Ryukyus, Japan. *Polypedilum (Uresipedilum) paraconvictum* sp. nov. is described. *P. (U.) classiglobum* Zhang et Wang (2004) *P. (U.) bingoparadoxum* Kawai et al. (1998) and *P. (U.) iriofegeum* Sasa et Suzuki (2000) are re-described. The first species is newly recorded from Japan, and the second species is new to the Ryukyus. The diagnostic characters of the subgenus are discussed.

**Keywords:** *Uresipedilum*, superior volsella, reconfirmation of the diagnosis, Yaeyama Islands

## Introduction

The genus *Polypedilum* Kieffer, 1912 is one of the largest genera in the family Chironomidae and divided into eight subgenera by Sæther et al. (2010). Hitherto, 127 species including all subgenera and 1 unplaced species have been reported from Japan (*Cerobregma* Sæther et Sundal: 2 species; *Kribionympha* Kieffer: 1 species; *Pentapedilum* Kieffer: 18 species; *Polypedilum s. str.*: 70 species; *Proborum* Andersen et Sæther: 1 species; *Tripedilum* Kieffer: 1 species; *Tripodura* Townes: 20 species; *Uresipedilum* Oyewo et Sæther: 12 species; unplaced species: 1 species) (Yamamoto and Yamamoto 2014). The genus *Polypedilum* is distinguished from the related genera, i.e., *Phaenopsectra* Kieffer and *Sergentia* Kieffer, by having deeply bifid pulvilli and the basal constriction of the eighth tergite producing a triangular shape.

The name *Uresipedilum* was firstly proposed without a description and the taxonomic statement by Sasa and Okazawa (1991). In 1995, Sasa and Kikuchi erected the subgenus *Uresipedilum* of the genus *Polypedilum* Kieffer, 1912, with a brief diagnosis and no designation of the type species, and mentioned that this new subgenus is identical to the cultellatum group sensu Sasa (1989) or *convictum* group sensu Niitsuma (1992). The name *Uresipedilum* Sasa and Okazawa, therefore, was *nomen nudum*. In 1998, Oyewo and Sæther (1998) redefined the subgenus *Uresipedilum* and designated *Chironomus convictum* Walker, 1856 [= *Polypedilum convictum*] as the type species. Then, the subgenus *Uresipedilum* was redefined with a slight change by Sæther et al. (2010) as follows: the adult males have the basal portion of the superior volsella much longer than wide without prominent

inner projection and wing membrane without markings or setae; the pupae are not distinguishable from those of *Polypedilum s. str.*, *Pentapedilum* Kieffer and *Problum* Andersen et Sæther; the larvae have well developed to at least posterior lobes on the ventromental plates. *Polypedilum (Uresipedilum) bullum* Zhang et Wang (2004) was removed from the subgenus *Uresipedilum* and treated as belonging to the subgenus *Probolum* by their diagnosis. Therefore, this subgenus has been defined by a part of character of the adult and larvae at present.

During a multi-year survey, we have continued to clarify the chironomid fauna in the Ryukyus, especially the Yaeyama Islands, located in the subtropical region in the southernmost area of Japan, between Taiwan and Okinawa Island. As a result, we recognized four species belonging to the subgenus *Uresipedilum* Oyewo et Sæther from this area. Of these species excluding *P. (U.) iriofegeum*, one is new to science, one is new to Japan and one is new to this area. Here, we give the description of these four species and discuss about the diagnostic characters of the subgenus *Uresipedilum* in the following lines.

## Materials and Methods

Description and re-descriptions of coloration were made on the basis of dried specimens. Before being described and illustrated, the dried specimens were macerated in a 5% hot KOH solution for 3–5 minutes. After relaxing, they were rinsed in distilled water containing a small quantity of glacial acetic acid, and then dissected with micro-pins in glycerin. The specimens used for description, re-descriptions and illustrations were then

mounted permanently on slide in Canada balsam, while other specimens were preserved in dry condition. In the description and re-descriptions, the measurements are given as ranges, followed by the number of species measured in parentheses (n). Body length and wing length are indicated in millimeters, remaining lengths of character are indicated in micrometer.

The type specimen of *Polypedilum iriofegeum* was borrowed from the National Museum of Nature and Science, Tokyo (NSMT) and was used for illustration. *Polypedilum bingoparadoxum* was borrowed from Dr. K. Kawai of Hiroshima University.

The morphological nomenclature mainly follows Sæther (1980) with the modifications and additions given in Sæther (1990). With the labium, the term prementum is used in accordance with the usage of Hoyt (1952).

Most of the specimens examined are housed in the Entomological Laboratory, Osaka Prefecture University (OPU), Sakai, Osaka, Japan.

## Taxonomy

### *Polypedilum (Uresipedilum) paraconvictum* sp. nov.

(Figs. 1a–c)

#### Type material

Holotype: male (No. OPU–NY167), Japan, Ryukyus, Okinawa Pref., Yaeyama Is., Iriomote Is., Funaura, 10. IV. 1999, M. Yamamoto; *Paratypes*: 5 males, as Holotype except 21. III. 2000.

#### Etymology

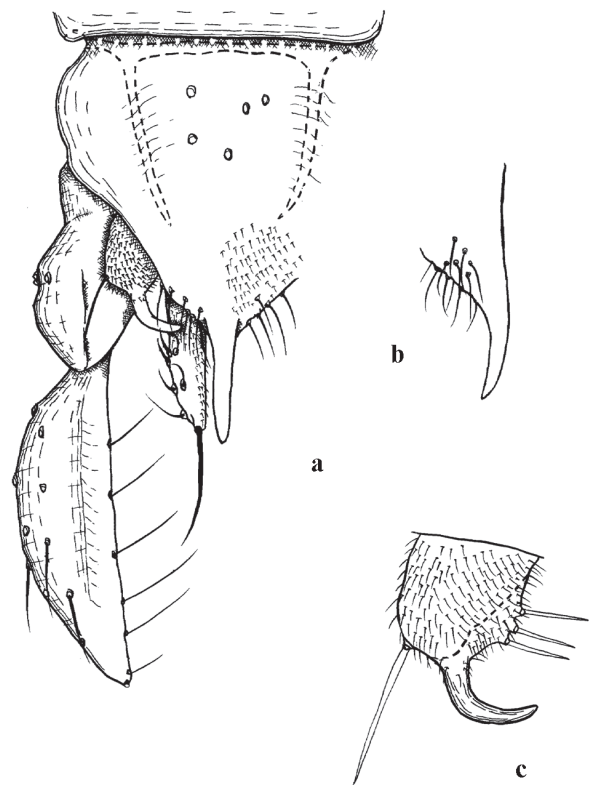
From the Latin, *para*, resemble and *convictum*, referring to its resemblance to *Polypedilum convictum* (Walker) in morphological characters in the male adult.

#### Male (n = 4)

Total length 1.9 mm. Wing 1.6 mm long, 0.35 mm wide; wing length/wing width 4.6.

Coloration: Head yellowish brown in ground color; antennal flagellum pale brown. Thorax yellowish brown. Legs yellow. Halter yellowish white. Abdomen yellow.

Head: Frontal tubercle absent. Vertex with 9 temporal setae. AR 0.97–1.05. Prementum with 3 setae. Palpomere



**Fig. 1** Adult male of *Polypedilum (Uresipedilum) paraconvictum* sp. nov. a: hypopygium, dorsal view; b: anal point, lateral view; c: superior volsella.

lengths (in  $\mu\text{m}$ ): 25, 35, 85, 105, 140; with 3, 3, 11, 10, 6 setae, respectively; 3rd palpomere with 1 sensilla clavata. Clypeus with 9 setae.

Thorax: Lateral anteprenotals absent. Dorsocentrals 11, uniserial, including 3 humerals; acrostichals 13, biserial; prealars 3, uniserial. Scutellum with 5 setae, uniserial.

Wing: Anal lobe weakly developed. VR 1.20.  $R_{2+3}$  adjacent to  $R_1$ . R,  $R_1$  and apical 2/3 of  $R_{4+5}$  with 14, 7, 16 setae, respectively. Brachiolum with 1 seta. Squama with 3 setae.

Legs: Scale of fore tibia triangular, rounded, without apical short spur. Lengths (in  $\mu\text{m}$ ) and proportions of legs as in Table 1.

Hypopygium (Figs. 1a–c): Tergum IX with 8 median setae. Anal point long, slender, parallel-sided, with rounded apex in dorsal view; narrowed, parallel-sided,

**Table 1** Lengths (in  $\mu\text{m}$ ) and proportions of legs of *Polypedilum (Uresipedilum) paraconvictum* sp. nov. Male (n = 4).

|                      | 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        |
|----------------------|---------|---------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------|-----------|-----------|
| <b>P<sub>1</sub></b> | 620–760 | 420–440 | –               | 820             | 570             | 360             | 160             | –         | –         | –         |
| <b>P<sub>2</sub></b> | 680–720 | 570–610 | 320–355         | 180–190         | 120–140         | 90–100          | 50–55           | 0.56–0.62 | 3.41–3.51 | 3.61–3.91 |
| <b>P<sub>3</sub></b> | 760–780 | 610–640 | 430–420         | 260–280         | 220–240         | 130–160         | 60–70           | 0.67–0.70 | 2.40–2.70 | 3.19–3.31 |

\* p1–3: front-, mid-, hind-legs. fe: femur. ti: tibia. ta<sub>1</sub>, ta<sub>2</sub>, ..., ta<sub>5</sub>: tarsomeres 1–5. LR: leg ratio. BV: combined length of femur, tibia and basitarsus divided by combined length of tarsomeres 2–5. SV: ratio of femur plus tibia to metatarsus.

**Table 2** Lengths (in  $\mu\text{m}$ ) and proportions of legs of *Polypedium (Uresipedium) classiglobum* Zhang et Wang male ( $n = 3$ ).

|                      | 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        |
|----------------------|-----------|---------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------|-----------|-----------|
| <b>p<sub>1</sub></b> | 890–970   | 650–710 | 1040–1120       | 770–790         | 560             | 470–500         | 200–210         | 1.58–1.60 | 1.29–1.36 | 1.48–1.50 |
| <b>p<sub>2</sub></b> | 910–1010  | 820–890 | 460–510         | 270–280         | 200–220         | 130–140         | 60–80           | 0.53–0.62 | 3.29–3.39 | 3.39–4.04 |
| <b>p<sub>3</sub></b> | 1040–1110 | 930–940 | 730–770         | 380–400         | 330–350         | 200–210         | 90–100          | 0.78–0.83 | 2.65–2.71 | 2.56–2.81 |

pointed apically in lateral view. Superior volsella with basal portion well developed, covered with microtrichia, with 3 inner setae, with 1 long seta on its outer corner, and with apical projection strongly curved medially, nearly as long as basal portion. Inferior volsella long, parallel-sided, with 8 setae on its apical 1/3 of which the apical one is long and extending posteriorly. Sternapodeme narrow and anterior margin nearly as wide as gonocoxite width. Gonocoxite with 4 uniserially arranged setae on inner margin. Gonostylus long, semicircular in shape, with one short apical and 6 long setae on inner margin of apical 4/5.

#### Remarks

The species is very similar to *Polypedium (Polypedium) convictum* (Walker 1856). However, it is distinguished from the latter by having the apical projection of superior volsella which is strongly curved inwardly at middle and low value AR.

#### Distribution

Japan (Yaeyama Islands: Iriomote Island).

#### *Polypedium (Uresipedium) classiglobum* Zhang et Wang, 2004

(Figs. 2a–d)

*Polypedium (Uresipedium) classiglobum* Zhang et Wang, 2004: 12.

#### Material examined

4 males, Japan, Ryukyus, Okinawa Pref., Yaeyama Isls., Iriomote Is., Kampira Fall, 18. II. 2003, M. and N. Yamamoto.

#### Male ( $n = 4$ )

Total length 3.1–3.3 mm. Wing 1.8–1.9 mm long, 0.50–0.524 mm wide; wing length/wing width 3.4–3.9

Coloration: Head yellowish brown in ground color; antennal flagellum pale brown. Thorax yellowish brown; scutellum whitish. Legs yellowish brown in ground color; tibiae, fore tibia concentrated (?). Halter yellowish white. Abdominal segments yellowish brown or pale green.

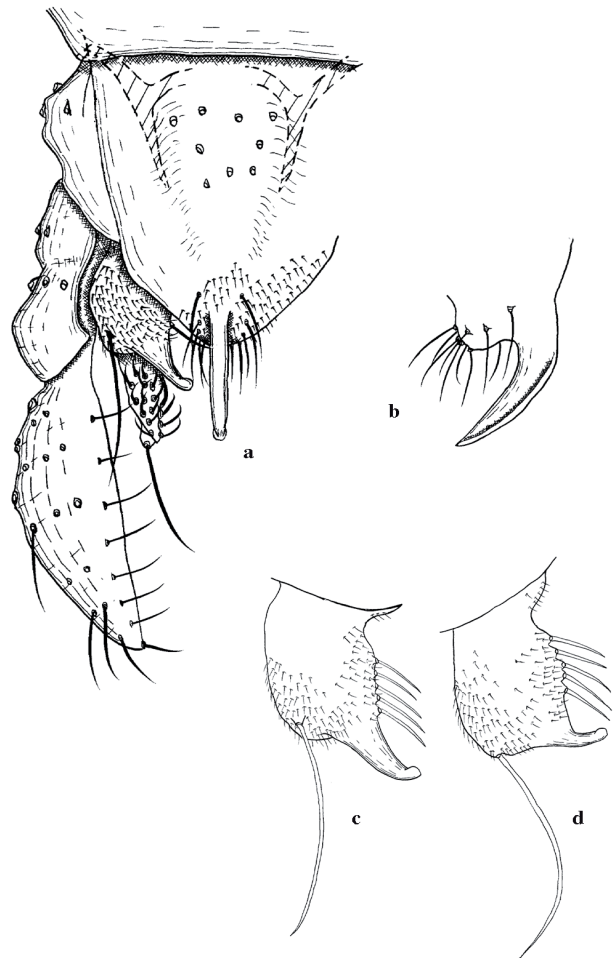
Head: Frontal tubercle absent. Vertex with 12–13 temporal setae. AR 1.20–1.43. Prementum with 1 seta. Clypeus with 12–14 setae.

Thorax: Lateral anteprenotals absent. Dorsocentrals 14–17, including 2 humerals, uniserial; acrostichals 10–12, biserial; prealars 4, uniserial. Scutellum with 10–11 setae, biserial.

Wing: Anal lobe moderately developed. VR 1.23–1.36.  $R_{2+3}$  nearly parallel to  $R_1$ .  $R$ ,  $R_1$  and  $R_{4+5}$  with 19–21, 17–21, 31–36 setae, respectively. Squama with 7 setae.

Legs: Scale of fore tibia triangular, rounded apex. Lengths (in  $\mu\text{m}$ ) and proportions of legs as in Table 2.

Hypopygium (Figs. 2a–d): Tergum IX with 9–10 median setae. Anal point long, slender, parallel-sided, with rounded apex in dorsal view; stout, horn- or sickle-shaped in lateral view. Superior volsella with basal portion well-developed, wide, nearly rectangular, with 5 setae on its inner margin, with a long apical seta on its outer corner; with projection variable in shape, length and its direction as in Figs. 2a,c,d. Inferior volsella well-developed, gradually tapering to apex, with 18–20 setae



**Fig. 2** Adult male of *Polypedium (Uresipedium) classiglobum* Zhang et Wang. a: hypopygium, dorsal view; b: anal point, lateral view; c, d: superior volsella.

on apical 1/2 of which the apical one is long and extending posteriorly. Sternapodeme narrow, without anterolateral projection, anterior margin nearly as wide as gonocoxite width. Gonocoxite with 4–5 uniserially arranged setae on inner margin. Gonostylus long, semicircular in shape, with one short apical and 7–11 inner setae.

#### Remarks

This species is distinct from any other species of the subgenus *Uresipedilum* by having the well-developed and nearly rectangular basal portion of superior volsella with 5 inner setae and horn- or sickle-shaped anal point in lateral view. This species is new to Japan, and was collected on the banks of clean streams as in the Yaeyama Islands.

#### Distribution

China (Oriental Region), Japan (Yaeyama Is.: Iriomote Is.)

#### *Polypedilum (Uresipedilum) iriofegeum* Sasa et Suzuki

(Figs. 3a–b)

*Polypedilum (Polypedilum) iriofegeum* Sasa et Suzuki, 2000: 15.

#### Material examined

Holotype: male [NSMT, No. 385:74] Japan, Ryukyus, Okinawa Pref., Yaeyama Is., Iriomote Is., Kaira River, H. Suzuki; 3 males, as previous except Ootomi, 5. VII. 1992, light trap, K. Ohara.

#### Male ( $n = 4$ )

Total length 2.3 mm. Wing 1.45 mm long, 0.43 mm wide; wing length/wing width 3.4.

Coloration: Head dark brown in ground color; antennal flagellum pale brown; antennal pedicel, maxillary pulpus brown. Thorax blackish brown. Legs predominantly yellowish brown; all coxae blackish brown; fore tibia brown except for apex. Abdomen blackish brown.

Head: Frontal tubercle absent. Vertex with 9 temporal setae. AR 0.78. Clypeus with 21 setae.

Thorax: Lateral anteprenotals absent. Dorsocentrals 14 uniserial, including 4 humerals; acrostichals 13, biserial; prealars 4, uniserial. Scutellum with 8 setae, biserial.

Wing: Anal lobe moderately developed. VR 1.33.  $R_{2+3}$  nearly parallel, separated from  $R_1$ . Squama with 10 setae.

Legs: Scale of fore tibia triangular, with terminal extension. Lengths (in  $\mu\text{m}$ ) and proportions of legs as in Table 4.

Hypopygium (Figs. 1a–c): Tergum IX with 16 median setae. Anal point long, slender, parallel-sided, with pointed apex in dorsal view. Superior volsella with apical projection long, gradually curved medially, gently tapering to rounded apex, with basal portion rectangular in shape, covered with microtrichia, with a dorsolateral seta on its outer corner and with 2 inner setae. Inferior volsella long, parallel-sided, not beyond the tip of anal point, with 12 recurved setae on its apical 1/3 of which the apical one is long and extending posteriorly. Sternapodeme

narrow. Gonocoxite with 4 uniserially arranged setae on inner margin. Gonostylus long, slender, with one short apical and 4 long setae on inner margin of apical 2/3.

#### Remarks

This species is distinct from any other *Uresipedilum* species by having the elongate projection and the well-developed nearly quadrate basal portion with 2 inner setae in the superior volsella.

#### Distribution

Japan (Yaeyama Islands: Iriomote Island)

#### *Polypedilum (Uresipedilum) bingoparadoxum* Kawai, Inoue et Imabayashi

(Fig. 3c)

*Polypedilum (Uresipedilum) bingoparadoxum* Kawai, Inoue et Imabayashi, 1998: 378

#### Material examined

Type material: Holotype, male, Japan, Hiroshima Prefecture, Shin-ichi, Fujio, Kaya River, 9. XI. 1994, K. Kawai; 1 male, Japan, Ryukyus, Okinawa Pref., Yaeyama Is., Iriomote Is., Funaura, 19. XI. 2001, N. Yamamoto. (No. OPU-NY84).

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

Total length 2.4 mm. Wing 1.6 mm long, 0.5 mm wide; wing length/wing width 3.2.

Coloration: Head yellow in ground color; antennal flagellum, clypeus, palpomeres brown. Mesonotum except pale brown postnotum yellow. Legs yellow in ground color. Abdomen predominantly yellow.

Head: Frontal tubercle absent. Vertex with 8 temporal setae. AR 1.5. Prementum with 4 setae. Palpomere lengths (in  $\mu\text{m}$ ): 33, 40, 78, 80, 138; with 2, 5, 16, 14, 6 setae, respectively; third palpomere with 5 sensilla clavata. Clypeus with 12 setae.

Thorax: Lateral anteprenotals absent. Dorsocentrals 14, including 5 humerals, uniserial; acrostichals 14, biserial; prealars 5, uniserial. Scutellum with 3 setae, uniserial.

Wing: Anal lobe moderately developed. VR 1.3.  $R_{2+3}$  nearly parallel with  $R_1$  and ended at basal 1/6 between apices of  $R_1$  and  $R_{4+5}$ .  $R, R_1$  and apical 2/3 of  $R_{4+5}$  with 21, 15, 28 setae, respectively. Squama with 12 setae.

Legs: Scale of fore tibia triangular, with smoothly rounded apex, with a tiny apical spine; fore, mid and hind trochanters with 7, 11, 7 marginal setae, respectively. Lengths (in  $\mu\text{m}$ ) and proportions of legs as in Table 3.

Hypopygium (Fig. 3c): Tergum IX with 5 median setae. Anal point long, robust, parallel-sided, with rounded apex. Superior volsella robust, basal 1/2 sparsely covered with microtrichia and apical 1/2 bare, apical portion abruptly narrowed and hooked inwardly and anteriorly, basal portion with 2–3 inner setae and a dorsolateral seta inserted at about basal 1/3. Inferior volsella long, well de-



**Table 3** Lengths (in  $\mu\text{m}$ ) and proportions of legs of *Polypedilum* (*Uresipedilum*) *bingoparadoxum* Kawai et al. 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> | 720 | 460 | –               | –               | –               | –               | –               | –    | –    | –    |
| p <sub>2</sub> | 740 | 520 | 340             | 190             | 160             | 110             | 60              | 0.65 | 3.08 | 3.71 |
| p <sub>3</sub> | 770 | 720 | 370             | 310             | 240             | 170             | 90              | 0.51 | 2.3  | 4.03 |

**Table 4** Lengths (in  $\mu\text{m}$ ) and proportions of legs of *Polypedilum* (*Uresipedilum*) *iriofegeum* Sasa et Suzuki male (n = 4).

|                | 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> | 610–670 | 410–430 | 810–830         | 590–620         | 360–390         | 260–280         | 110–130         | 1.90–1.98 | 1.38–1.41 | 1.30–1.33 |
| p <sub>2</sub> | 710–790 | 590–650 | 290–350         | 200–230         | 130–160         | 80–100          | 50–60           | 0.49–0.54 | 3.13–3.46 | 4.03–4.48 |
| p <sub>3</sub> | 740–830 | 670–700 | 480–560         | 280–320         | 220–280         | 160–170         | 70–80           | 0.72–0.82 | 2.42–2.59 | 2.59–2.93 |

veloped, with 11 recurved setae on its apical 1/2. Sternapodeme narrow. Gonocoxite with 4 uniserially arranged setae on inner margin. Gonostylus long, moderately developed, with one short apical seta and 5–6 long setae on inner margin of apical 3/5.

#### Remarks

This species is distinguished from other members of the subgenus *Polypedilum* by having the robust superior volsella of which the projection is abruptly narrowed apically and hooked inwardly and anteriorly. Kawai et al. (1998) assigned this species to the subgenus *Uresipedi-*

*lum*, although the reason is not given. Sæther and Oyewo (2008) supported their treatment as having the projection of the superior volsella is shorter than 1/3 length of the basal portion. However, the projection recognized by them is indicated as a part of whole projection. The projection of this species is well developed and is as long as, or longer than basal portion. This species is newly recorded from the Ryukyus (Oriental region), and was collected on the banks of clean streams as in the Yaeyama Islands.

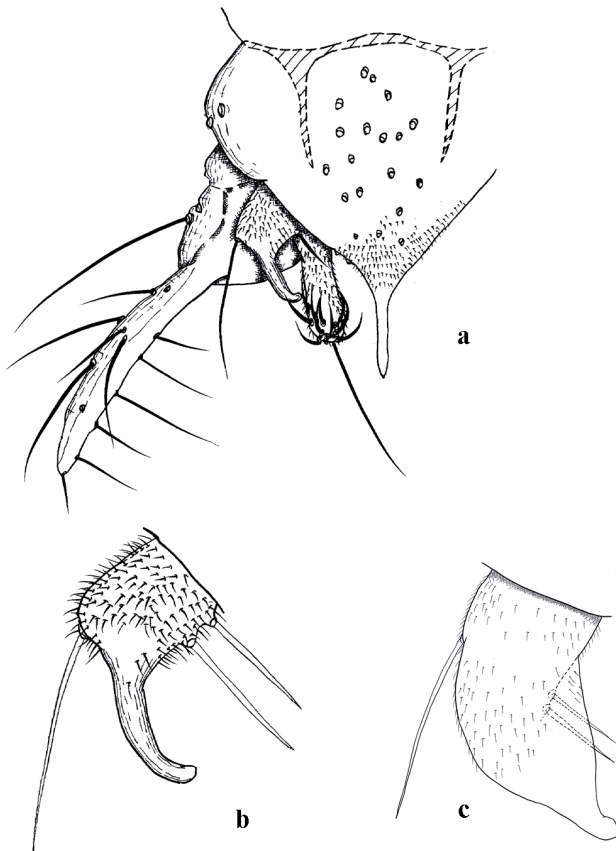
#### Distribution

Japan (Hiroshima Pref. and Yaeyama Islands)

#### Discussion

With regard to the adult diagnosis of *Uresipedilum*, Oyewo and Sæther (1998) and Sæther and Oyewo (2008) followed the statement in the “key to subgenera and groups” of Sasa and Kikuchi (1995: 112). And, Sæther et al. (2010) also followed Sasa and Kikuchi (1995). In their phylogenetic analysis, the well-developed basal portion and relative length of apicomedial projection to the basal portion of the superior volsella are important features for assigning the subgenus *Uresipedilum*. The character states selected for their phylogenetic analysis are as follows: characters number 14–18 in Oyewo and Sæther (1998) and Sæther and Oyewo (2008), 18–20, 23, 24 and 28 in Sæther et al. (2010). In Sæther et al. (2010), it seems to be a most important taxonomic character and character state (character state 1 of character number 20) for inferring the monophyly of the subgenus *Uresipedilum* the apicomedial projection of which is much shorter than the basal portion in the superior volsella. This character and character state 1 of character 19 are inferred the synapomorphies of *Probolum* and *Uresipedilum*. However, *Probolum* is separable from the latter by having an additional inner lobe in the base of the superior volsella.

In pupae, *Uresipedilum* is not distinguishable from *Polypedilum* s. str., *Pentapedilum* and *Probolum* (Sæther



**Fig. 3** Adult male of *Polypedilum* (*Uresipedilum*) *iriofegeum* Sasa et Suzuki (a–b) and *Polypedilum* (*Uresipedilum*) *bingoparadoxum* Kawai (c): a: hypopygium, dorsal view; b–c: superior volsella.

et al. 2010). In larvae, judging from the matrix in appendix 1 given by Sæther et al (2010), it seems that character 62 and 65 are rather important for inferring the monophyly of the subgenus *Uresipedilum*. The character 62 shows three different states of the ventromental plates. The matrix shows that all nominated species except *P. (U.) surugense* have the ventromental plates with moderate to well-developed posterior lobes. However, Niitsuma (1992) shows *surugense* with the well-developed posterior lobe in his figures. This character state also is held in common with some species of *Tripodura*. Although the larvae of *Stictochironomus* and *Phaenopsectra* have the ventromental plate with distinct posterior lobe, their matrix indicates these genera have no posterior lobes. The character 65 shows the developmental degree of the median ends of ventromental plates. In the matrix of appendix 1, all mentioned species except *P. (U.) surugense* have the median ends which are produced anteriorly and in contact with the first lateral teeth. However, judging from the drawings of Sæther and Oyewo (2008) and Niitsuma (1992), this character state is observable only in *P. (U.) dossenuidum* and also recognizable in *Endochironomus*, *Nilothuama*, *Phaenopsectra*, *Sergentia* and *Stictochironomus*. Therefore, it is difficult to treat the above-mentioned larval characters as the diagnostic characters supporting the monophyly of the subgenus *Uresipedilum*.

Consequently, as stated above, the subgeneric independence of *Uresipedilum* is basically secured by the character state of the superior volsella in the male hypopygium. However, some problems are present in treating *Uresipedilum* as a monophyletic subgenus. For example, *Polypedilum (Cerobregma) paucisetum* Zhang et al., 2006 has the superior volsella being basically the same as that of *Uresipedilum* in structure. In some species, it is difficult to recognize the boundary between the basal portion and apicomedial projection. Therefore, further study might serve to elucidate the taxonomic and phylogenetic significance of the superior volsella in the subgenus *Uresipedilum*.

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