



## Morphology and Cytology of Oriental *Chironomus* species

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This version is updated from the previous version (v0220) particularly by additional information on the genus *Einfeldia*, but is still far from complete and the number of valid species from the region is still uncertain.

It is also a compromise between the species of the genus *Chironomus* recorded and those for which cytological confirmation exists, found in India, South East Asia, China and Japan, i.e. the Oriental region as used here largely corresponds to that defined by Heiser and Schmitt (2013) on the basis of the distribution of Odonata.

Also included are two genera that have been considered as subgenera of *Chironomus*, with most known species originally described in that genus. These genera are *Einfeldia* and *Benthalia*, with much confusion as to which genus the species actually belong.

I am very much indebted to numerous people who have provided me with material from these areas.

### **thummi-cytocomplex species**

*C. (Lobochironomus) dorsalis* Meigen (as *C. longipes* Staeger)

*C. (Austrochironomus)\* javanus* Kieffer 1924

*C. pulcher* (?) Weidemann 1830

*C. salinarius* Kieffer 1915

*C. sinicus* Kiknadze *et al.* 2005

*C. suwai* Golygina & Martin 2003

The status of “*Austrochironomus*” as a valid subgenus is uncertain as it appears to have only been named in an abstract of a meeting proceedings.

### **pseudothummi-cytocomplex species**

*C. acerbiphilus* Tokunaga 1939

*C. alpestris* Goetghebuer 1934 [Senior synonym of \*C. nippodorsalis\* Sasa 1979](#)

*C. apicatus* Johannsen 1932

*C. circumdatus* (Kieffer 1916)

*C. costatus* Johannsen 1932

*C. crassiforceps* Kieffer 1916

- C. flaviplumus* Tokunaga 1940 (*C. flaviplumus* Type A)
- C. flaviplumus* Type B (was *C. sp.*PK2)
- C. flaviplumus* Type C (from China)
- C. nr flaviplumus* (from India)
- C. incertipennis* Chaudhuri & Das 1996 (formerly *C. niger* Chaudhuri *et al.* 1992)
- C. incertipennis* auctt. nec Chaudhuri & Das 1996 – see *C. flaviplumus* Type B
- C. kiiensis* Tokunaga 1936. [Junior homonym of \*C. striatipennis\*](#)
- Chironomus nippodorsalis* Sasa 1979 – see *C. alpestris*.
- C. 'orientalis'* – manuscript name.
- C. ramosus* Chaudhuri *et al.* 1992
- C. samoensis* Edwards 1928- not Oriental, but included to clarify the differences from the species to which this name has been applied (*C. flaviplumus*, *C. nr flaviplumus*, *C. indiaensis* and *C. 'orientalis'*).
- '*C. samoensis*' auctt. nec Edwards.
- C. striatipennis* Kieffer 1910
- C. striatipennis* Type 2
- C. yoshimatsui* Martin & Sublette 1972
- C. sp.*DSC1

#### **camptochironomus-cytocomplex or subgenus**

- C. biwaprimus* Sasa & Kawai 1987
- C. mongolabeus* Sasa & Suzuki 1997
- C. mongolbeceus* Sasa & Suzuki 1997

#### **Cytology Unknown**

- C. acutus* Das *et al.* 2015 (junior homonym of *C. acutus* Goetghebuer 1928 - [New name required.](#))
- C. alternus* Das *et al.* 2015
- C. atrosignatus* Kieffer 1911
- C. (Lobochironomus) bifidus* Pal & Hazra 2017 – description of pupa suggests this is not *Chironomus*.
- C. bipunctus* Johannsen 1932
- C. brevistylus* Guha *et al.* 1985
- C. claggi* Tokunaga 1964
- C. clavipenis* Das *et al.* 2015
- C. confectus* Das *et al.* 2015
- C. culterus* Das *et al.* 2015
- C. flavitibia* Johannsen 1932
- C. formosae* Kieffer 1912
- C. fortibracchius* Das *et al.* 2015
- C. fortistylus* Chaudhuri *et al.* 1992
- C. fujisecondus* Sasa 1985
- C. fujitertius* Sasa 1985 (the “lowland form” of *C. nipponensis*)
- C. fusciceps* Yamamoto 1990
- C. hemicyclius* Das *et al.* 2015
- C. incertus* Kieffer 1924, as subgenus *Camptochironomus*. [New name required.](#)
- C. indiaensis* Martin 2011(formerly *C. samoensis* sensu Chattopadhyay *et al.*)
- C. lurilatus* Das *et al.* 2015

- C. mayri* Majumdar, Mazumdar & Chaudhuri 2009
- C. mongolcedeus* Sasa & Suzuki 1997
- C. mongoldeceus* Sasa & Suzuki 1997
- C. mongolefeus* Sasa & Suzuki 1997
- C. mongolgeheus* Sasa & Suzuki 1997
- C. mongolheus* Sasa & Suzuki 1997
- C. nippodorsalis* Sasa 1979 (see *C. alpestris* Goetghebuer)
- C. nipponensis* Tokunaga 1940 (the “highland form”)
- C. nudipes* Kieffer 1911
- C. (Lobochironomus) ocellatus* (Hashimoto, 1985)
- C. (Austrochironomus) okinawanus* Hasegawa & Sasa 1987
- C. palpalis* Johansen 1932
- C. quadratus* Johannsen 1932
- C. sp.* “shimantoabeus” Sasa, *et al.* 1998 (intersex of ‘nippodorsalis-group’)
- C. simantobeceus* Sasa *et al.* 1998
- C. sollicitus* Hirvenoja 1962
- C. sulfurosus* Yamamoto 1992
- C. tokarabeceus* Sasa & Suzuki 1995
- C. trinigrivittatus* Tokunaga 1940
- C. uttarpradeshensis* Singh & Kulshretha 1976

#### Subgenus *Chaetolabis*

- C. (?Chaetolabis) echizensis* Sasa 1994
- C. (Chaetolabis) macani* Freeman 1948

The following species are no longer considered to be in the genus *Chironomus* but are included because of the current confusion surrounding their accurate identification:

#### ***Einfeldia***

*E. kanazawai* Yamamoto, 1996 (placed in *Chironomus* by Yamamoto *et al.* (2015), but in the absence of any information about the larvae, the illustrations suggest this species was correctly in *Einfeldia*.

*E. ocellata* Hashimoto 1985 - probably *C. (Lobochironomus)*,. (see above)

*E. pagana* (Meigen 1838). There is considerable confusion that exists as to the identity and distinguishing characters of this species and those in *Benthalia*. It is possible that the Japanese material requires a new name.

*E. sasai* Yamamoto & Yamamoto, 2018.

#### ***Benthalia***

Currently only one species is accepted as occurring in this region and has been claimed to be *B. carbonaria* (Meigen 1804) but this should be considered to be just a group name (see below)

There is also a long list of species described as *Chironomus* or *Tendipes* from the Oriental region that were classed as “Unplaced Chironomini” or “Nomina Dubia” by Sublette and Sublette (1973).

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## Species Descriptions

In general, the morphological terminology used in this document follows Sæther (1980), Webb & Scholl (1985) and Vallenduuk & Moller Pillot (1997).

In the adult descriptions reference is made to the types of superior volsella shape as recognized by Strenzke (1959). This is a helpful initial classification, but experience has shown that the types are not discrete but are part of a continuum. The three categories as described by Strenzke are:

S-type: The SVo is shoe shaped, i.e. it is drawn out distal-medially into a broad, rounded lobe (Fig. a-c, below) (Strenzke's figure suggests the most distal point will be at the toe of the shoe),

D-type: The SVo is ribbon-like: distally it may have a weakly thickened shoulder (Fig. d, below) (most distal point is not at the internal margin), or bent in a shallow sickle-shape (Fig. e-f, below).

E-type: The SVo has the form of an elephant's tusk; distally it is sharply graded to a point, or with an expanded knob (Fig. g-i, below) (line from base to most distal point goes outside the limits of the SVo).

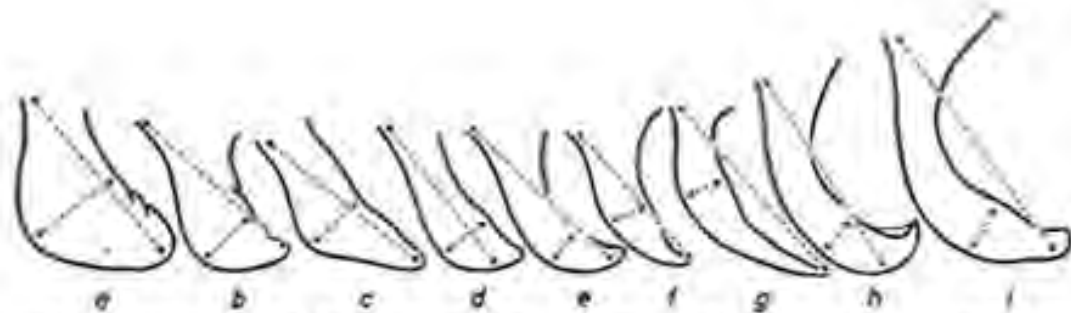


Abb. 4. Grundformen der Claspette des *Chironomus*-Hypopyge (♂). a—c S-Typ (a *halophilus*, b *thummi thummi*, c *luridus*), d—f D-Typ (d, e *domella*, f *aristus*), g—i E-Typ (g *ciogolatus*, h *salinarius*, i *annularius*).

In the following descriptions, reference is made to the larval type. The scheme used here is the revision of older classifications as proposed by Proulx *et al.* (2013). The categories are: **Lacking posterolateral (PLT) and ventral tubules (VT):**

**salinarius** - posterior prolegs of usual dimensions, about 2 times longer than wide

A new variant of this type has been defined: **yama**, where posterior prolegs long and narrow, as in Tanypodines, about 4 times longer than wide, while the anal tubules are arranged in a star-shape (Martin & Chingambam (2016).

**Lacking PLT:**

**halophilus** - anterior VT very short or absent, posterior VT short

**bathophilus** – moderate to long, essentially straight VT.

**fluviatilis** - VT slightly curved and coming to a point at ends. (often hard to distinguish from bathophilus-type, particularly in some fixed material)

**thummi** – long, anterior VT with 'elbows', posterior VT coiled

Possessing PLT:

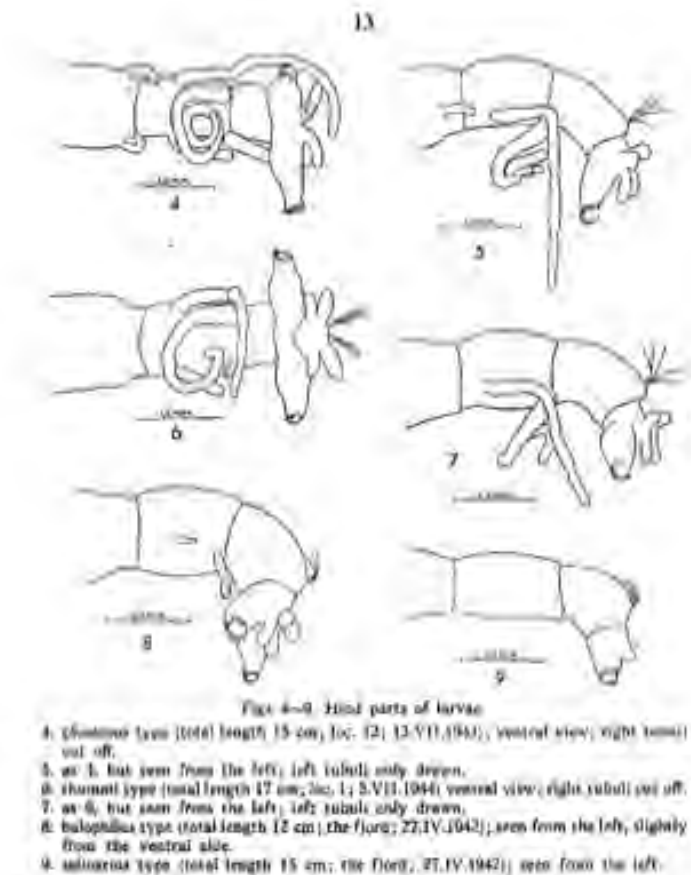
**reductus** – lacking ventral tubules.

**semireductus** – short, straight or slightly curved VT.

**melanotus** – moderate to long, essentially straight VT.

**plumosus** – long, anterior VT with 'elbows', posterior VT coiled.

“short” is generally less than the width of segment 11.



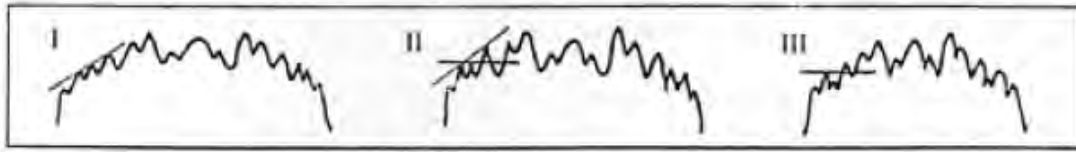
Reference is also made to the mentum and mandible types originally devised by Webb & Scholl (1985), Vallenduuk & Moller Pillot (1997) and Proulx *et al.* (2013). These classifications were made for relatively small numbers of species, but with the much larger number of species they do not cover all the variability seen in these characters and so further modification has been necessary. As well a ventromental character is included

The **mentum type** is defined only by the degree of development of the 4th lateral teeth:

Type I - height in same line as the rest of the lateral teeth;

Type II - 4th laterals reduced, height about equal to that of the 5th laterals;

Type III - 4th laterals further reduced, height less than that of the 5th laterals.



From Vallenduuk and Moller Pillot 1997

The **mentum** may be further classified by the characters of the **central trifid tooth**:

Type IA - c2 teeth only partially separate from c1, i.e. as shoulders on c1. (figure a)

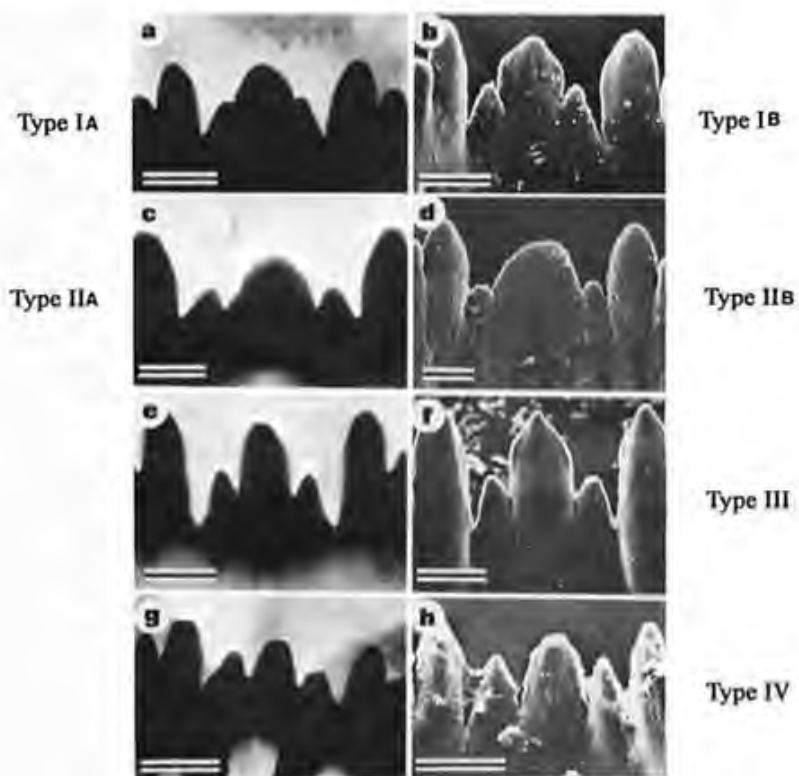
Type IB – c2 teeth slightly more separated (figure b).

Type IIA - c1 broad, c2 teeth distinctly separated (figure c).

Type IIB – c1 very broad, c2 less separated (figure d).

Type III - c1 tooth relatively narrow and much higher than the separated c2 teeth (figs e and f).

Type IV - c2 teeth well separated, not much lower than the relatively narrow c1 tooth (figs g and h).



From Webb and Scholl 1985

The **mandible type** is defined by the degree of darkening and separation of the 3rd inner tooth. It appears preferable to consider these as separate characters:

Separation

Type I - almost completely fused on lower margin;

Type II - tooth partly free on lower margin;

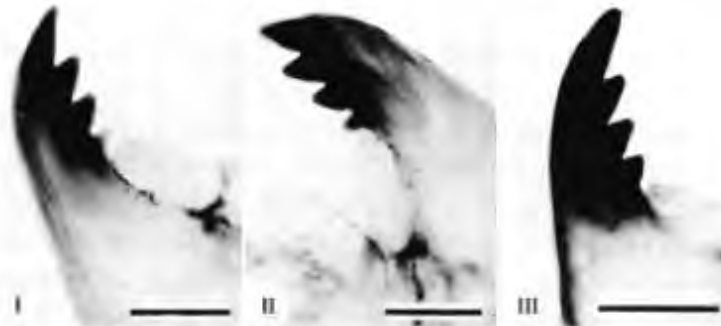
Type III - 3rd tooth completely separate.

Color

Type A – pale

Type B – slightly darkened

Type C – as dark as other teeth



From Webb and Scholl 1985.

I – type IA; II, type IIB; III – type IIIC

#### Mandible length and Mdt-Mat:

Hirvenoja and Michailova (1998) illustrated that the distance between the tip of the dorsal tooth and the apical tooth could differ between related species (Mdt-Mat) (blue line in figure below).

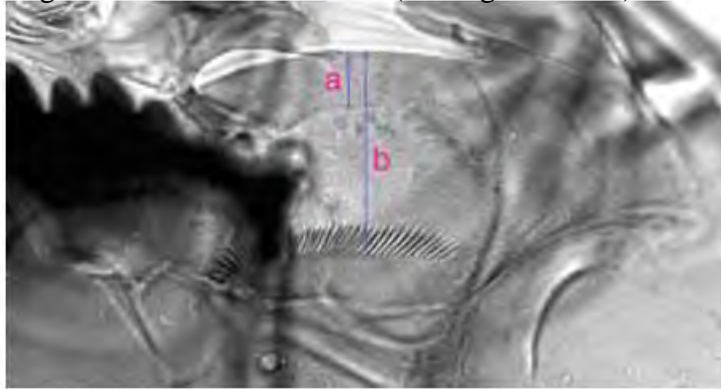


However for different sized species it may be preferable to divide this value by the length of the inner tooth row (black line in figure above) to obtain the MTR.

#### Ventromentum

There are several measures that can be made from the ventromental plates including VPA and the number of striae. Two others need some explanation:

Ventromental plate ratio (VMR) - ratio of the width of the marginal region of ventromentum (usually seen as a granular band under light microscopy) (**a** in figure below) to the distance from the anterior margin to the base of the striae (**b** in figure below).

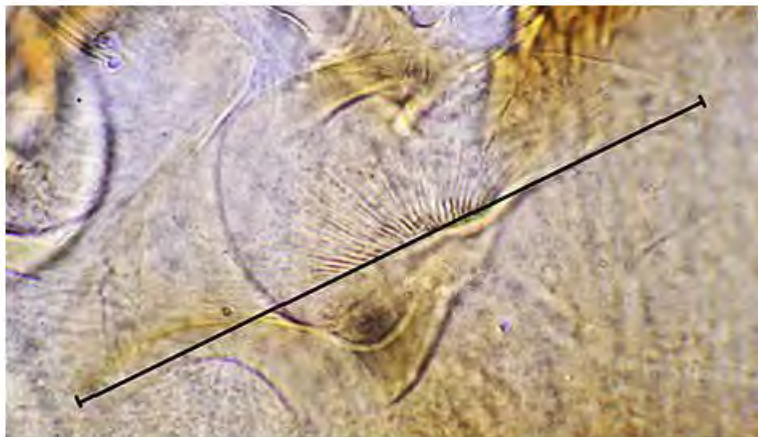


$$\text{VMR} = a/b$$

Note: 'b' is also used as a measure of the depth of the VM in comparing length to depth.

'b' also serves as a measure of the depth of the VM for the ratio of length to depth of the VM plates.

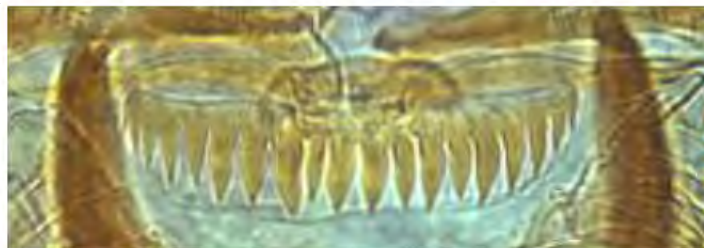
VM length (VML) is measured directly from inner margin to outer margin:



This seems preferable to the sometimes used 'horizontal length' which can be subject to parallax error and to the effects of rotation of the plates under pressure during slide mounting.

**Pecten epipharyngis** (PE) - Proulx *et al.* (2013) recognised 4 types of PE. These are useful if the teeth are not worn down, as they often are in older larvae.

Type A - fine sharp rather uniform teeth.



Type B - teeth broader but still sharp. Sometimes with one or two fine smaller teeth interspersed.





Type C - rounded and rather uniform. Worn type B teeth may be mistaken for this type.

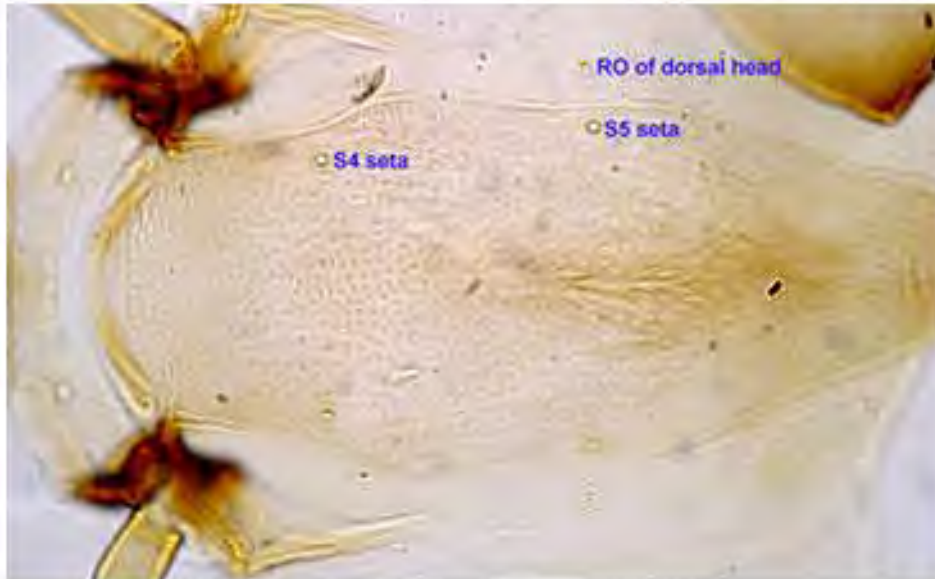


Type D - rounded teeth with smaller teeth interspersed (generally found in the subgenera *Lobochironomus* or *Chaetolabis*).



#### Relationship on the FC of the distance between antennal bases and distance between S4 setae

This character gives some indication of the shape of the anterior region of the FC: the amount and extent of the narrowing at the anterior end near the antennal bases, and where the S4 setae are in relation to the broadening of the clypeus (see figure below). This relationship can be further characterized by the distance of the S4 setae from the margins of the FC – most easily expressed by the fraction of the FC width between the two S4 setae. This has two components: how far the setae are from the FC margin, and how close they are to the widest point of the FC.



Frontoclypeus with approximately equal distance between antennal bases and S4 setae  
Note also the barely visible ‘ring organ’ of Yamamoto et al. (2015), (more obvious at top) immediately opposite the S5 setae. This is characteristic of the genus *Chironomus*.

**Abbreviations:**

AR – Antennal ratio. In larvae it is A1/A2-A5, measured only from the sclerotized parts of each segment as the soft tissue between each segment can stretch to different extents during slide mounting.

AT – Anal tubules

BOLD - Barcode of Life Database (<http://www.boldsystems.org/index.php>)

BR - Balbiani Ring

CBDB – Chironomid DNA Barcode Database

COI - Cytochrome oxidase subunit I

FA - Frontoclypeal apotome (Frontoclypeus)

GC – Gonocoxite IX

GP – Gonopophesis VIII

GS - Gonostylus

IVo - Inferior volsella

Mt – Mitochondrial

Mdt-Mat – distance from the tip of dorsal tooth to the tip of apical tooth of the mandible.

MTR – Mdt-Mat divided by length of inner tooth row

MW – width of Mentum N – Nucleolus (i.e. the sac produced by an active NOR)  
NOR – Nucleolar Organizing Region (i.e. the chromosomal locus capable of producing a nucleolus)  
PE - Pecten epipharyngis  
PLT - Posterolateral tubules  
PM – Premandible  
PMa – Pecten manibularis  
PSA – Pedes spurii A  
PSB – Pedes spurii B  
SCf - Sensilla campaniformia (on brachiolum)  
RO - Ring organ  
SVo - Superior volsella  
VHL - Ventral Head Length  
VM – Ventromentum  
VMR – Ventromental Plate Ratio  
VT - Ventral tubules.  
i - occurrence not confirmed

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***Chironomus acerbiphilus* Tokunaga 1939**

Synonym: *C. crassimanus* Strenzke 1959.

In BOLD Bin: [BOLD:AAJ4234](#).

Specimens from North America are placed in a separate Bin (see below)

**Adult:**

Adults of Japanese specimens are entirely black, but those from Europe are paler, suggesting coloration is variable depending upon environmental conditions. Details of adults and pupa drawn from Sasa (1978) and Yamamoto (1986).

**Male:**

AR 2.50 - 3.33. Wing length 2.9 - 3.2 mm, width 0.9 mm. LR 1.15 - 1.25, BR 2.2.

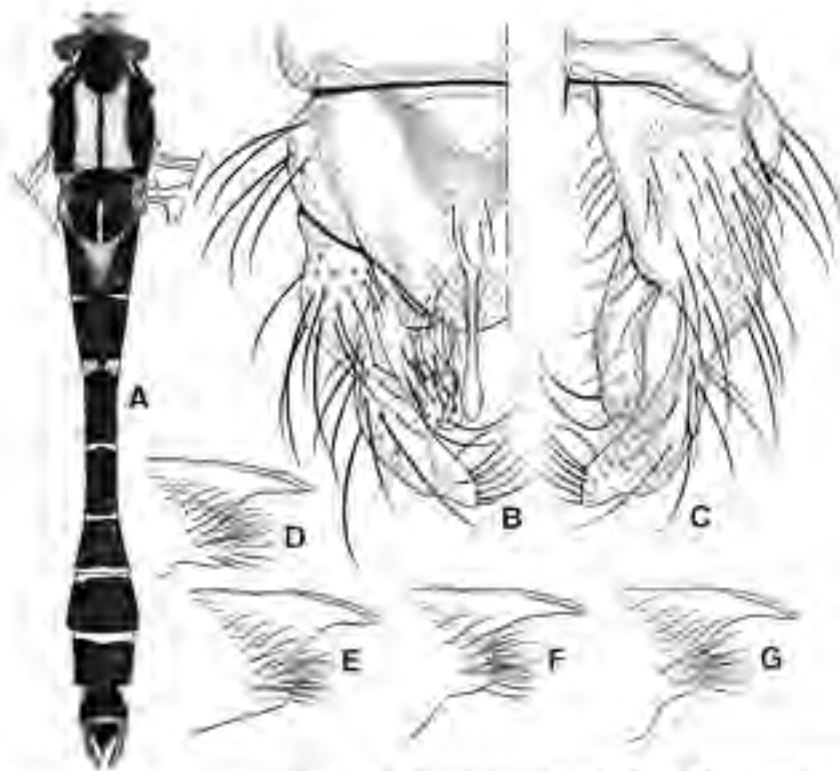


FIG. 1. *E. crassimanus* gen. sp. n. A) Dorsal view of the body. B) Genitalia in dorsal view. C) Genitalia in lateral view. D-G) anal point in lateral view.

From Yamamoto 1986

Head: Frontal tubercles, 22.5 - 35 µm long, 10 - 17.5 µm wide.

Ratio of palpal segments (µm) 59 : 64 : 203 : 199 : 254. 36 - 48 setae on clypeus.

Thoracic setae: Acrostichals: 8 - 10; dorsocentrals 13 - 23; prealars 6 - 11; supra alar 1; scutellar 22 -36.

Legs: Note the measurements of Yamamoto (1986) are generally larger than those of Sasa (1978), and show the unusual feature that the antTa1 is shorter or only as long as AntFe, which is not seen in Sasa's measurements.

Proportions from Sasa (1978) (µm):

|             | <b>Fe</b>  | <b>Ti</b>  | <b>Ta1</b> | <b>Ta2</b> | <b>Ta3</b> |
|-------------|------------|------------|------------|------------|------------|
| <b>PI</b>   | 1400       | 1220       | 1480       | 710        | 565        |
| <b>PII</b>  | 1495       | 1250       | 675        | 390        | 310        |
| <b>PIII</b> | 1650       | 1495       | 990        | 560        | 445        |
|             | <b>Ta4</b> | <b>Ta5</b> | <b>LR</b>  | <b>F/T</b> | <b>BR</b>  |
| <b>PI</b>   | 440        | 270        | 1.24-1.51  | 1.10-1.15  | 2.2        |
| <b>PII</b>  | 210        | 185        | 0.51-0.58  | 1.10-1.25  | -          |
| <b>PIII</b> | 265        | 205        | 0.65-0.70  | 1.07-1.13  | -          |

Hypopygium as in figure above. 2 - 5 setae on central field of anal tergite. Anal point narrow and slender, slightly expanded at distal end. SVo of figured by Sasa as Strenzke's D-type, and by Yamamoto as S-type. Strenzke (1959) described the German specimens (as *C. crassimanus*) as having a D-type SVo.

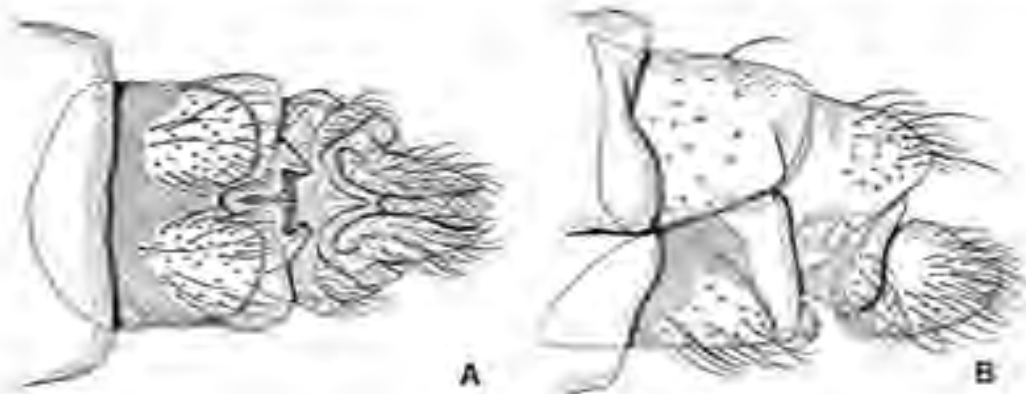
Female

Wing length 3.3 - 3.5 mm; width 1.1 - 1.2 mm; VR 0.81 - 0.87. LR 1.17 - 1.30.

Colour essentially as in male. Cercus black.

Head: Antennal segments ( $\mu\text{m}$ ) 148 : 98 : 104 : 104 : 292. Frontal tubercle 15 - 38  $\mu\text{m}$  long, 10 - 24  $\mu\text{m}$  wide.  
 Ratio of palpal segments ( $\mu\text{m}$ ) 66 : 66 : 202 : 208 : 260. 49 - 57 setae on clypeus.  
 Thoracic setae: Acrostichals: 10 - 14; dorsocentrals 25 - 28; prealars 8 - 10; supra alar 1 - 2; scutellar 34 - 40.  
 Wing squama with 27 - 36 setae, bi- or triserial.  
 Leg proportions (from Sasa 1978)( $\mu\text{m}$ ):

|             | <b>Fe</b>  | <b>Ti</b>  | <b>Ta1</b> | <b>Ta2</b> | <b>Ta3</b>    |
|-------------|------------|------------|------------|------------|---------------|
| <b>PI</b>   | 1600       | 1300       | 1630       | 715        | 600           |
| <b>PII</b>  | 1645       | 1400       | 705        | 375        | 300           |
| <b>PIII</b> | 1775       | 1645       | 1035       | 570        | 480           |
|             | <b>Ta4</b> | <b>Ta5</b> | <b>LR</b>  | <b>F/T</b> | <b>Ta5/Ti</b> |
| <b>PI</b>   | 465        | 285        | 1.17-1.30  | 1.20-1.25  | 0.21-0.23     |
| <b>PII</b>  | 220        | 205        | 0.49-0.54  | 1.14-1.21  | 0.14-0.15     |
| <b>PIII</b> | 290        | 225        | 0.61-0.67  | 1.04-1.12  | 0.13-0.14     |



Foregut anatomy of *Chironomus arthropodus*. A. Ventral view. B. Lateral view.

From Yamamoto 1986

Genitalia: Apodeme of 8th sternum rounded caudolaterally, not joined mesally.  
 Sternite of segment IX with 3 - 7 setae.

**Pupa:** (Based on Yamamoto 1986). Length 7.8-8.8 mm. Body dark brown. Cephalic tubercle acutely pointed with simple subapical seta. First and ninth terga practically without shagreen. Intersegmental membrane of V-VI segments and VI-VIIth segments with very weak centrally placed shagreen.

Caudolateral spur of segment VII with 1-3 spines, most commonly with 2 (Sasa 1978).

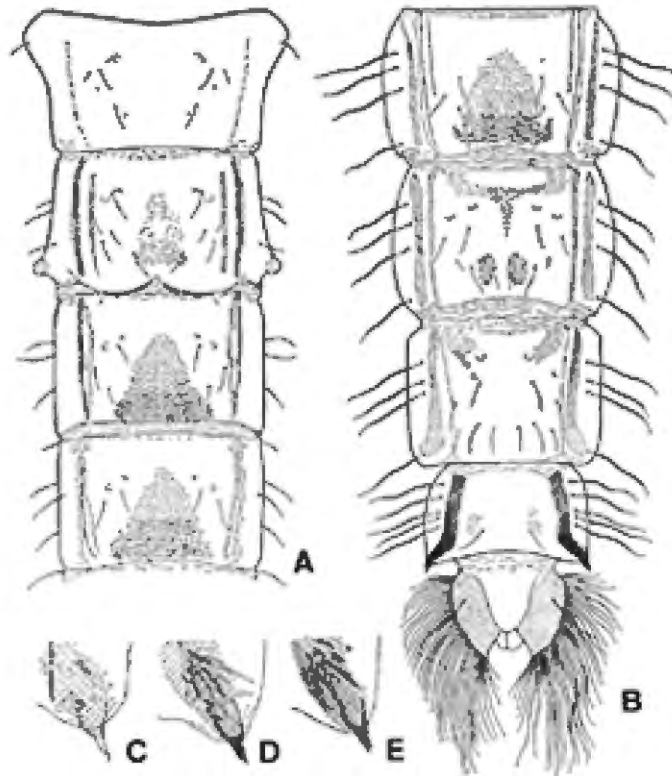


Fig. 5. Pupa of *Chironomus acerhophthalis*. A-D: Dorsum of abdomen. C-E: Postero-lateral spurs of segment VIII.

From Yamamoto 1986.

**Fourth instar larva:** A small-medium plumosus-type larva, length 12.5 – 14.5 mm. Lateral tubules turn ventrally as described by Sasa (1978) for Japanese specimens. VT well developed.

Head capsule generally brownish; gula and FA sometimes darkened.

Mentum (c, below) width about half the VHL; C1 teeth relatively broad, with c2 teeth well separate and sharp (type III); lateral teeth sharp, 4<sup>th</sup> laterals hardly reduced (type I) with 5<sup>th</sup> laterals slightly above the graduated level of the other lateral teeth. Sasa (1978) shows small notches near the tip of the center tooth, but these will only be seen if the mentum is not worn. Ventromental plates (d, below) separated by about 37 - 40% of mentum width; with about 39 – 40 striae; VMR about 0.28. PE (a, below) with about 17 - 20 sharp graded teeth (although Yamamoto describes them as uneven).

Antenna (b, below) with basal segment relatively long, about 3.4 times longer than wide; RO about 1/3 to 1/2 up from base of segment; AR about 2.22; segment 3 very short, shorter than segment 5; relative length of segments ( $\mu\text{m}$ ) 129 : 28 : 4 : 11 : 5.

Premandibles (a, below) with the two teeth about equal length, or outer tooth slightly longer; inner tooth about 1.7 times wider than outer tooth.

Mandible (e, below) with 3<sup>rd</sup> inner tooth defined and darkened (type IIIC), about 12–13 furrows on outer surface near the base.



**Cytology:** 4 polytene chromosomes with the pseudothummi-cytocomplex combination, AE, BF, CD, G. Centromeres strongly heterochromatic and constricted. Pairing may occur between

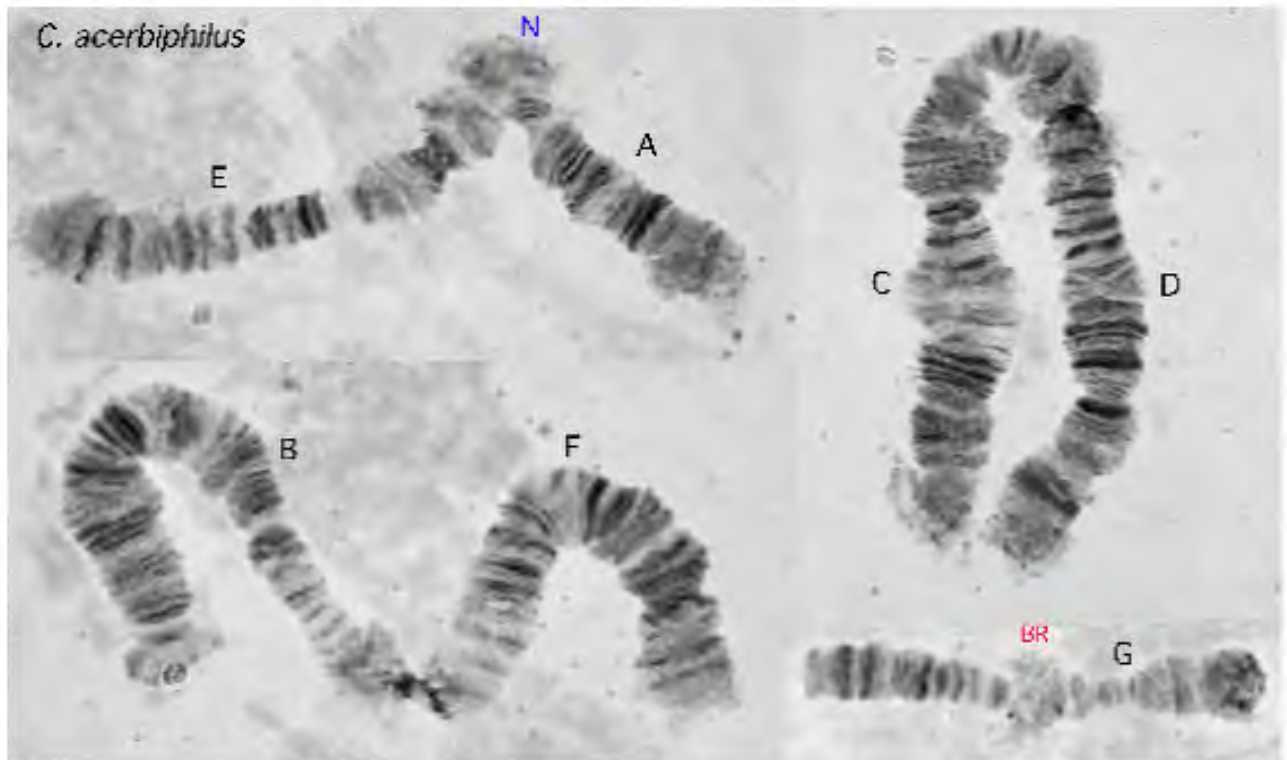
Arm G mostly paired, with BR near middle of arm and no nucleolus. Nucleolus developed in arm A.

A fixed asymmetrical pericentric inversion occurs on chromosome CD, transferring the proximal bands of arm D into arm C (Jablonska-Barna *et al.*), or alternatively it may be related to the duplication of the CD centromere region reported in other pseudothummi-cytocomplex species such as *C. dorsalis* (= *C. alpestris*) (Kiknadze *et al.* 2008).

No polymorphism in studied North American, European or Japanese populations.

- aceA1: 1a-i, 7 - 9, 2d - 3, 12 - 10, 2c - 1k, 6 - 4, 13 - 19 - with large nucleolus in segment 15
- aceC1: 1 - 2, 10 - 3, 11 - 16, 22, 24 - 21, D(see below) (Jablonska-Barna *et al.* 2010)
- aceD1: 1 - 3, 6 - 4, 7 - 9, 18f-a, 13 - 10, 17 - 14, 18g - 20 (Jablonska-Barna *et al.* 2010)
- aceE1: 1 - 3e, 10b - 3f, 10c - 13 ie. as *halophilus*, etc.
- aceF1: 1, 12p - 11, 2 - 6 14 - 12p, 16 - 17, 10 - 7, 18 - 23 (Wülker, prelim)
- aceF1: (alternate) 1-7, 17-16, 11-14a, 15-14b, 4-6, 9-8, 1-3, 10, 18-20 (clarified from Jablonska-Barna *et al.* 2010)

aceG1: BR near middle of arm.



**DNA sequence:** MtCOI sequence is in the BOLD database (DQ648201) and in GenBank. Sequence of a North American specimen is also in the BOLD database. BOLD places it in a separate Bin ([BOLD:AAL9507](#)). However there is currently no reason to believe that the difference is due to anything other than geographic isolation.

**Found:** Japan - **Lake Katanuma (38.733°N, 140.721°E), Naruko, Miyagi, Honshu (Type locality)**; Kirishima Volcanic Range(31.94°N, 130.86°E), Kyushu (Yamamoto 1986).

also in North America: **California: Wyoming-** Nymph Creek, Yellowstone National Park.

also found in **Europe** - Reinbeck, Germany (Keyl 1962 as *C. crassimanus*); Łuk Mużakowa Landscape Park, Poland ((Jablonska-Barna *et al.* 2010)

In acidic waters (pH1.4 – 4.3), and also elevated temperatures in North America.

The adult, pupa and larva of Japanese specimens were described and figured by Sasa (1978) and much more fully by Yamamoto (1986). Cytology of the European specimens was illustrated by Keyl & Keyl (1959), and banding pattern of arms A and E by Keyl (1962), as *C. crassimanus*, and subsequently the whole karyotype by Jablonska-Barna *et al.* (2010) as *C. acerbiphilus*.

Yamamoto (1986) notes a close relationship between *C. acerbiphilus*, *C. fusciceps* and *C. sulfurosus*, differing in LR and shape of SVo.

### ***Chironomus alpestris* Goetghebuer 1934**



Syn: *Chironomus dorsalis* sensu Strenzke 1959.

*Chironomus nippodorsalis* Tokunaga 1940 (Yamamoto and Hashimoto, unpubl.)

*Chironomus strenzkei* sensu Sasa 1978 (name preoccupied Goetghebuer)

*Chironomus inaabeus* Sasa, Kitami and Suzuki 2001 (Yamamoto and Yamamoto 2018)

In BOLD Bin: [BOLD:AAW4001](#)

**Adult:**

The adults of *C. alpestris* were well described by Strenzke (1959) as *C. dorsalis*, and *C. nippodorsalis* was initially described by Sasa (1979), in Japanese. Re-examination of *C. nippodorsalis* by Yamamoto and Hashimoto in 1976 convinced them that it was indistinguishable from *C. dorsalis* (personal communication), and hence from *C. alpestris*.

**Pupa:** (based on *C. dorsalis* from Langton & Visser 2003)

Length 7.5-8.1 mm. Exuviae golden brown to dark brown.

Cephalic tubercles 90 µm by 80 µm, setae 50 µm. Thoracic horn much branched, basal ring 107-120 x 45-55 µm, 9-12 tracheoles across. Hook row of abdominal segment II entire occupying 0.51-0.55 of width of segment, with 44-55 hooks. Caudolateral spur of segment VIII with 2-5 somewhat elongated teeth. Anal fringe with 82-116 taeniae.

**Fourth instar larva:** (some information from Vallenduuk and Moller-Pillot 2002) A plumosus-type larva, with VT of equal length. Gula slightly darkened at center of posterior third, FC usually dark but may be lighter.

Mentum with 4th laterals reduced to level of 5th (type III).

VM about 282 (255-325) µm long (length of periphery), with 39.6 (36-42) striae (Webb *et al.* 1985).

AR about 1.82

Mandible with third inner tooth only partly separated and colored (Type IA-IIB).

**Cytology:** Four polytene chromosomes with the pseudothummi arm combination AE, BF, CD, G.

Nucleolus subterminal in arm G, which is closely paired and has three BRs, the largest about a third from the distal end. No nucleolus in other chromosomes.

Chromosomal polymorphism is known only in arm G.

alpA1: 1 - 2c, 4 - 9, 2d -3, 12 -10a, 13 - 19

alpB1: not mapped. Puff (group 7?) about a third from the distal end.

alpC1: 1 - 2f, 11c - 10, 16 - 17a, 6 -2g, 11d - 15, 9 - 7, 17b - 22

alpD1: 1a(b), 17d - 19d, 10d - 1c(b), 17c - 10e, 19e - 24

alpE1: 1 - 2c, 8b - 2d, 8c - 9b, 12b - 9c, 12c - 13

alpF1: 1 - 10, 15 -11, 16 - 23

alpG1: The three BRs are in the distal part of the arm. BRa is developed only in the special lobe.

alpG2: simple inversion between the nucleolus and the large BRc, including BRb.

All mapping from Kiknadze *et al.* 2016 (as *C. dorsalis* sensu Strenzke with *C. alpestris* as a synonym). Other studies of the cytology have been made by a number of authors.

The synonymy of *C. nippodorsalis* with *C. dorsalis* Strenzke was recognized by Yamamoto and Hashimoto in 1976, and this conclusion is supported by the DNA analyses of Kondo *et al.* (2016). Langton and Visser (2003) list this as a synonym of *C. dorsalis*, but this is only true of *C. dorsalis* sensu Strenzke, for which it is the senior synonym.

**Found:** Type locality – nr. Garmish-Partenkirchen, Bavaria, GERMANY

other locations – Japan – Tohoko-chiho, Minamisma and Lake Inawashiro (type locality of *C. inaabeus*), both Fukushima Pref.; Experimental Pond, NEIS, Ibaraki.

**Molecular:**

MtCOI sequence from *Chironomus nippodorsalis*, *C. dorsalis* sensu Strenzke 1959 and *C. alpestris* is in GenBank and the BOLD database (where all are in the same BIN)

### ***Chironomus apicatus* Johannsen 1932**

**Adult:**

Male

Length 5 mm.

Very similar to *C. costatus*, but LR about 1.85, the tarsi largely brown, only the two apical segments somewhat paler.

Thoracic vittae are brownish.

Crossvein of wings brown.



Male hypopygium of *C. apicatus* from Johannsen 1932

Additional data on anterior tarsi of type (thanks to Duncan Sivell, Natural History Museum): Ta1 twice the length of Ta2; Ta2-4 subequal, but decreasing in length; Ta5 less than half the length of Ta4.

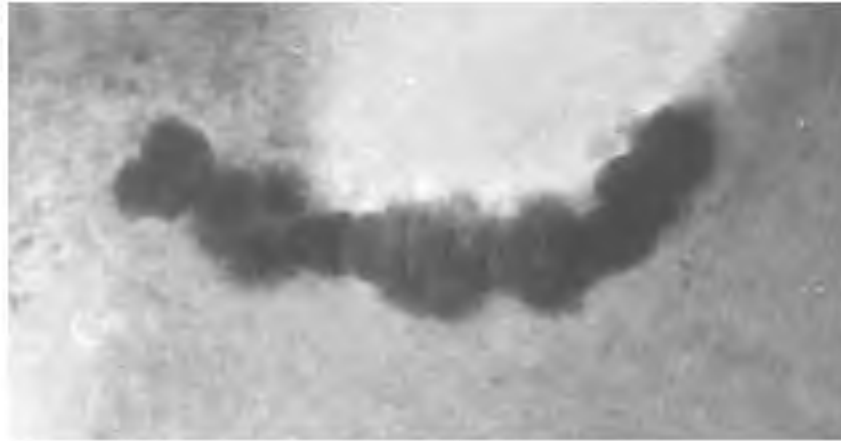
**Fourth instar larva:** (based on Singapore specimens) A small plumosus-type, length about 9.0–10.5 mm (males). Lateral projections about 170–240  $\mu\text{m}$ , posterior pair of VT usually longer (ant. 0.83–1.04 mm; post. 0.90–1.08 mm). Gular region pale to slightly darkened, FA very slightly dark to dark. Anal tubules long with a constriction near centre.

Mentum with generally sharp teeth, C1 tooth broad, c2 teeth well separated (type II-III), 4<sup>th</sup> laterals hardly reduced or reduced to about halfway between height of 3<sup>rd</sup> and 5<sup>th</sup> laterals (type I-II).

About 13–15 teeth in PE. Premandible with inner tooth only about 1/3 wider than outer tooth, and about equal in length.

3<sup>rd</sup> inner tooth of mandible slightly darkened but with variable separation (type I-IIB).

**Cytology:** Four polytene chromosomes, probably with the pseudothummi-cytocomplex combination BF, CD, AE, G. Possibly no nucleolus in arm G.



Arm G.

**Found:** Type locality – Toba Dist., Samosir, Sumatra, INDONESIA.

Also Sigaol, Samosir.

Singapore - this material probably misidentified.

India - Jammu & Kashmir - Farooq Nagar.

In Indonesia found in salt ponds and a pool at 29°C and pH 2.83 (Lenz 1937)

Fourth instar larva described by Lenz 1937.

Possibly the correct name for the various samples in the Oriental region that have been incorrectly attributed to *C. samoensis* (not Edwards), other than the species renamed as *C. indiaensis* by Martin (2011).

***Chironomus bicoloris* Tokunaga 1964**

***Chironomus bipunctus* Johannsen 1932**

Adult

Male



Male hypopygium of *C. bipunctus* from Johannsen 1932

**Pupa:** Brownish, about 6mm long. Cephalic tubules small, fine and pointed. Postero-lateral spur of segment VIII with a single spine.

**Fourth instar larva:** Described by Lenz (1937), as a bathophilus-type, with short tubules. Anal setae short and not on a distinct tubercle, AT also short.

Possibly at higher localities as Lenz (1937) describes larvae and adults from 1860-2090 m.

**Found:** Type locality – spring pool, Ngadsari, Java, INDONESIA  
Tenger-Gebirge, East Java

***Chironomus biwaprimus* Sasa & Kawai 1987**

In BOLD Bin: [BOLD:AAW4005](#)

**Adult** (from Sasa & Kawai 1987)

Male

Length 6.96-8.11; wing length 3.58-4.05; VR 1.02 - 1.06. AR 3.17-3.89

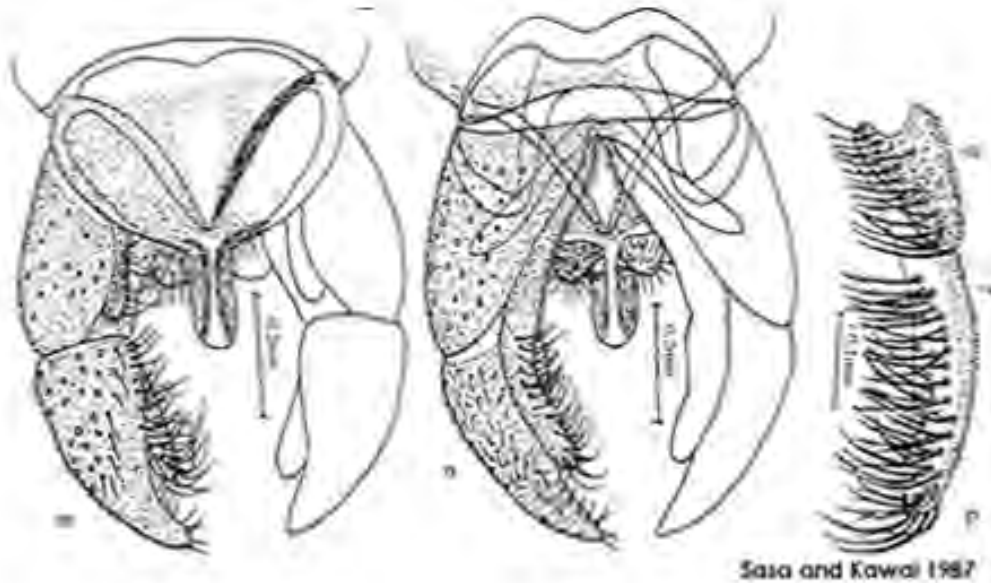
LR: Ant. 1.34-1.58; mid 0.50-0.56; hind 0.58-0.64. BR 1.6.

Coloration unusual - antennal shaft brown, hairs brownish yellow; ground color of scutum greenish yellow or pale yellow, vittae dark brown; legs with femur and tibia largely yellow with a narrow apical dark ring; tarsi darkening from brown to dark brown.

Head with relatively small frontal tubercles 22 micron long, 14 micron wide.

Thorax: Anteprenotum united and expanded in the middle, without lateral setae. Setae: Acrostichal 6-14; dorsolateral 19-36; prealar 6-10; scutellar 24-36 in a double row.

Legs: Front tibia with 4 subterminal setae arising on a rounded terminal scale.



Hypopygium (above) typical for the subgenus, apparently closest to *C. tentans*.

**Fourth instar larva:** A moderate sized, up to 20 mm, plumosus-type larva. PLT well developed, about 300  $\mu\text{m}$  long. AT nearly as long as the posterior prolegs and are constricted in the middle, about 2.5-2.7 times longer than wide. Gula dark on posterior half, FC dark, particularly towards the rear.

Mentum (Fig. c, below) with broad c1 tooth, closest to type IIB but c2 teeth more separated; 4th laterals hardly reduced (type I).

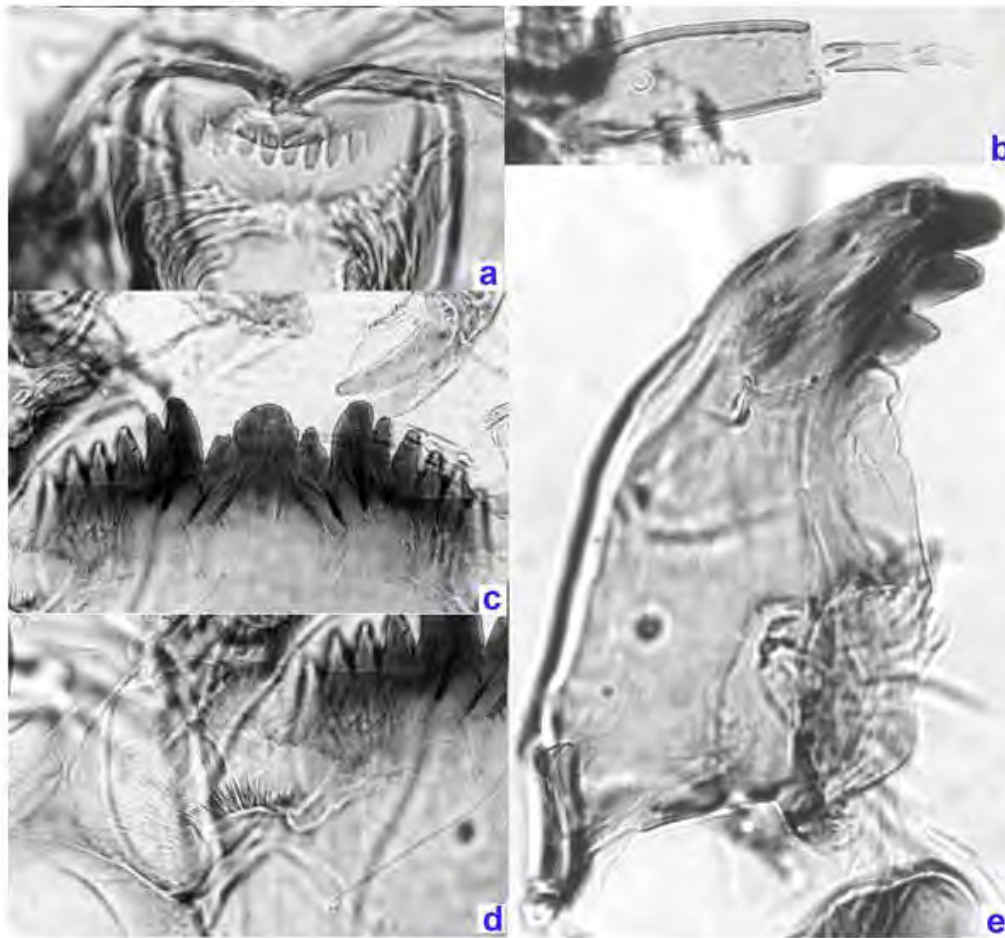
Ventromental plates (Fig. d, below) separated by about a third of the mentum width, about 3-3.3 times longer than depth to base of striae; about 48-49 striae; VMR 0.40-0.41. PE (Fig. a, below) with about 14 teeth of type B.

Distance between the antennal bases greater than that between the S4 setae, which are separated by about 72% of the FC width.

Antenna (Fig. b, below) with A1 about 3.2 times longer than wide and 0.4 of the VHL; RO about 0.4 up from base of segment, AR about 2.14; segment proportions (micron): 135 : 32 : 10 : 13 : 8.

Premandible (Fig. c, below) with teeth about equal in length, inner tooth about twice as wide as the outer tooth.

Mandible (Fig. e, below) about 250  $\mu\text{m}$  in length, third inner tooth pale and incompletely separated (type 1A); about 21 furrows on the outer surface at the base and probably normally about 14 setae in PMa although one mandible of available specimen had about 18 generally narrower setae.



**Cytology:** Four polytene chromosomes with the *Camptochironomus* cytocomplex combination AB, CF, DE, G. Specimens available did not have particularly good chromosomes, but some banding patterns could be determined. Arm G may have a nucleolus but main nucleolus is in a long chromosome, probably near the centromere of the AB chromosome. One heterozygote, probably in arm B.

biwA1:

biwB1

biwC1

biwD1

biwE1: 1 - 2b, 7h - 10b, 3e - 2c, 7g - 3f, 10c -13 i.e. as *dilutus* E1

biwF1: possibly 1a-d, 12-9b, 2f-3b, 13-14c, 5d-6, 9a-7a, 14d-16, 5c-3c, 1e-2e,.17-23

biwG1:

**Found:** Type locality - Lake Biwa (35.33°N, 136.17°E), Otsu City, Honshu, JAPAN; ; Lake Kasumigaura (36.42°N, 140.39°E); NEIS, Tsukuba (36.08°N, 140.08°E), Yatabe, Ibaraki.

***Chironomus circumdatus* (Kieffer 1916)**

Syn.: *C. basitibialis* Tokunaga 1936

- C. bharati* Singh & Kulshretha 1976  
*C. costatus* sensu Karunakaran 1969 (mtCOI - Wong, unpubl.; cytology - Martin unpubl.)  
*C. plumatisetigerus* Tokunaga, 1945 (Martin & Saxena 2009)  
*C. setonis* Tokunaga 1936 (Yamamoto 2013)

In BOLD Bin: [BOLD:AAG5483](#)

Adult:

Male



Male terminalia of *C. circumdatus*

Anal point relatively narrow, superior volsella D-type curved at the tip.

AR about 3.12-3.8. The high value comes from Japanese material (Sasa 1978), Indian specimens are less than 3.5.

Frontal tubercles about 25-43 µm long, 10-17 µm wide. Palpal proportions (µm) 56 : 54 : 213 : 218 : 334. Clypeal setae - 17-34.

Thorax greenish, scutal stripes conspicuous with dark brown margins; scutellum pale yellow, postnotum dark brown. Thoracic setae: acrostichals - 13-18; dorsocentrals - 18-27; prealar - 5-6; scutellar - 8-14 in anterior row, 13-26 in posterior row (higher numbers have an intermediate row of 11-12 setae).

Wing length: 2.72-3.04 mm; wing width 0.67-0.74 mm. VR about 1.02-1.05

Wings without darkening of the crossvein. 25-27 setae in squamal fringe.

Legs pale, with darkening at distal ends, also on distal half of Ti4 and all of Ta5.

Leg lengths (microns) and proportions as follows:

|     | Fe   | Ti   | Ta1  | Ta2 | Ta3 |
|-----|------|------|------|-----|-----|
| PI  | 1145 | 1060 | 1610 | 835 | 745 |
| PII | 1230 | 1110 | 705  | 395 | 295 |

|             |            |            |           |            |           |
|-------------|------------|------------|-----------|------------|-----------|
| <b>PIII</b> | 1350       | 1350       | 1000      | 560        | 475       |
|             | <b>Ta4</b> | <b>Ta5</b> | <b>LR</b> | <b>F/T</b> | <b>BR</b> |
| <b>PI</b>   | 645        | 325        | 1.42-1.67 | 1.04-1.12  | 1.64-1.9  |
| <b>PII</b>  | 165        | 135        | 0.62-0.66 | 1.05-1.13  |           |
| <b>PIII</b> | 250        | 170        | 0.72-0.81 | 0.97-1.02  |           |

(i.e. ant Ta5/Ti about 0.31)

Abdominal segments pale, but with increasing central dark oval patch, so that tergites V-VIII are virtually all dark.

Anal point narrow; 1-16 setae on tergite IX. SVo of the D-type, between d and e of Strenzke (1959), but tip may be more bent. Sasa classes Japanese material as E-type, although one illustration looks more like a D-type. Basal setae on IVo ramose.

Female (based on Sasa 1978):

Wing length 2.8 mm.

Antennal proportions ( $\mu\text{m}$ ): 80 : 190 : 120 : 120 : 130 : 280.

Frontal tubercle short and stout, 24  $\mu\text{m}$  long and 17  $\mu\text{m}$  wide.

Palpal proportions (segs. 2-5) ( $\mu\text{m}$ ): 60 : 240 : 250 : 540.

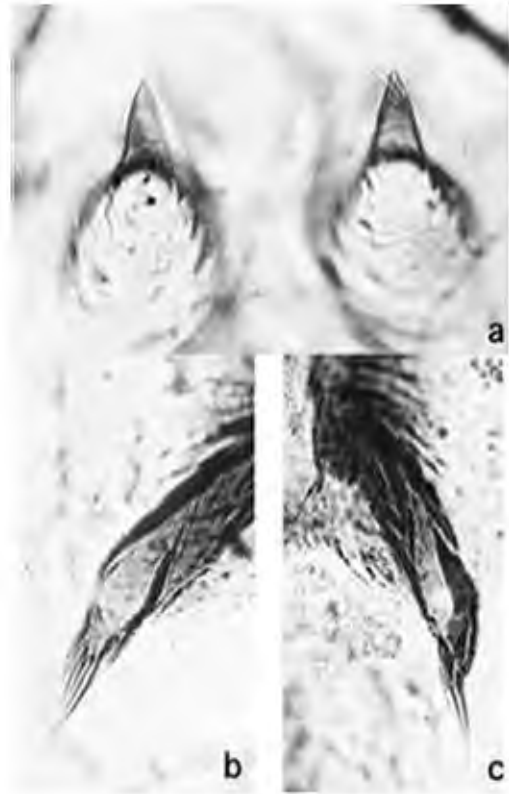
Leg lengths (microns) and proportions as follows:

|             | <b>Fe</b>  | <b>Ti</b>  | <b>Ta1</b> | <b>Ta2</b> | <b>Ta3</b>    |
|-------------|------------|------------|------------|------------|---------------|
| <b>PI</b>   | 1440       | 1150       | 2050       | 1000       | 930           |
| <b>PII</b>  | 1630       | 1340       | 810        | 410        | 290           |
| <b>PIII</b> | 1490       | 1490       | 1150       | 560        | 460           |
|             | <b>Ta4</b> | <b>Ta5</b> | <b>LR</b>  | <b>F/T</b> | <b>Ta4/Ti</b> |
| <b>PI</b>   | 880        | 410        | 1.79       | 1.25       | 0.43          |
| <b>PII</b>  | 180        | 150        | 0.60       | 1.22       | 0.13          |
| <b>PIII</b> | 270        | 180        | 0.77       | 1.00       | 0.18          |

Abdominal tergites almost entirely dark brown, with narrow apical pale bands on tergites I to VII.



**Pupa:** Brown. Exuviae pale brown.  
 Body about 6.6-7.7 mm (male) and 6.5-7.6 mm (female). Frontal tubercles (a, right) about 70-100  $\mu\text{m}$ , with a subapical seta (40-80  $\mu\text{m}$ ). Thorax rugose, with 2 pairs of precorneal setae. Abdominal tergite II with median shagreen and about 52-68 hooklets, tergites III-V entirely with shagreen, tergite VI with T-shaped shagreen, tergites VII-VIII with 2 broad patches of shagreen. Caudolateral spur of segment VIII (b & c, right) with about 2-4 spines.



**Fourth instar larva:** a medium plumosus-type (length 10.6-13.7 mm; females 11.2-12.5 mm), lateral tubules well developed (about 480  $\mu\text{m}$ ). Posterior pair of VT generally longer than anterior pair (ant. 1.84; post. 2.48), and coiled. Anal tubules may vary in size in different areas, from about twice as long as wide (Allahabad) to almost three times as long as wide (Jammu), length 290-440  $\mu\text{m}$ , width 165  $\mu\text{m}$ .

Gular region darkened, FA variable from very slightly darkened to dark.

Mentum (c, below) with fourth laterals reduced to about the level of the 5th laterals (type II), 6th laterals pointed outwards; c2 teeth of the central tooth (type III) well separated.

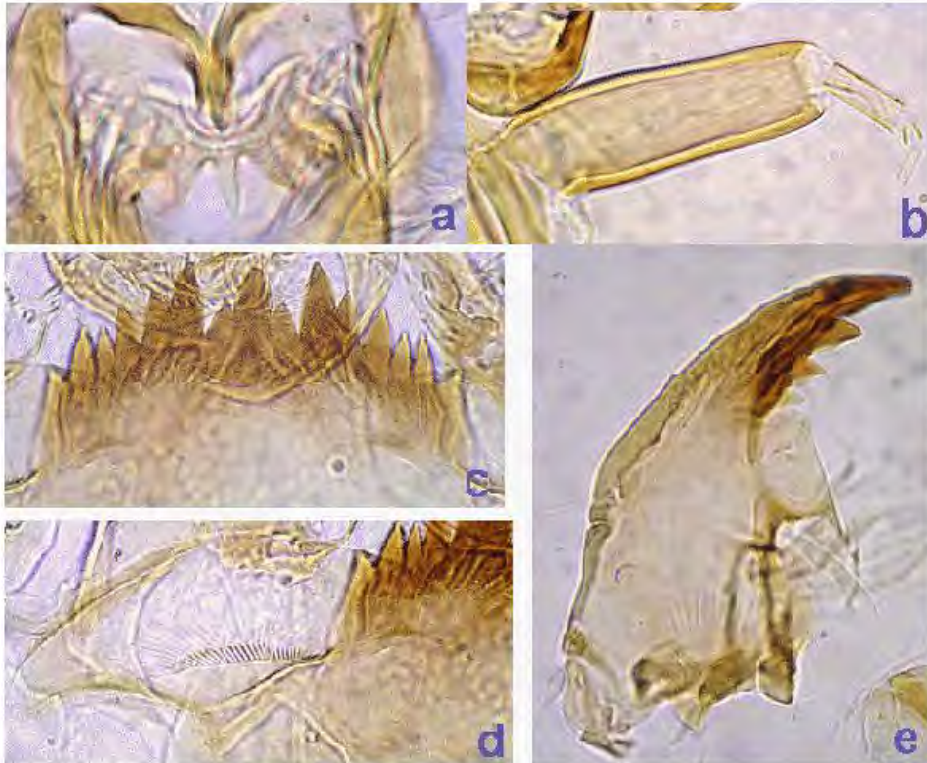
VM (d, below) with about 30 - 36 striae. PE (a, below) with about 12 - 15 teeth.

Premandible with inner tooth shorter and about twice the width of the outer.

Antenna (b, below) with basal segment less than 3.5 times as long as wide; A2/A1 about 0.24; A4/A3 about 2.3 - 2.6. AR about 2-2.3.

Distance between antennal bases greater than that between the S4 setae.

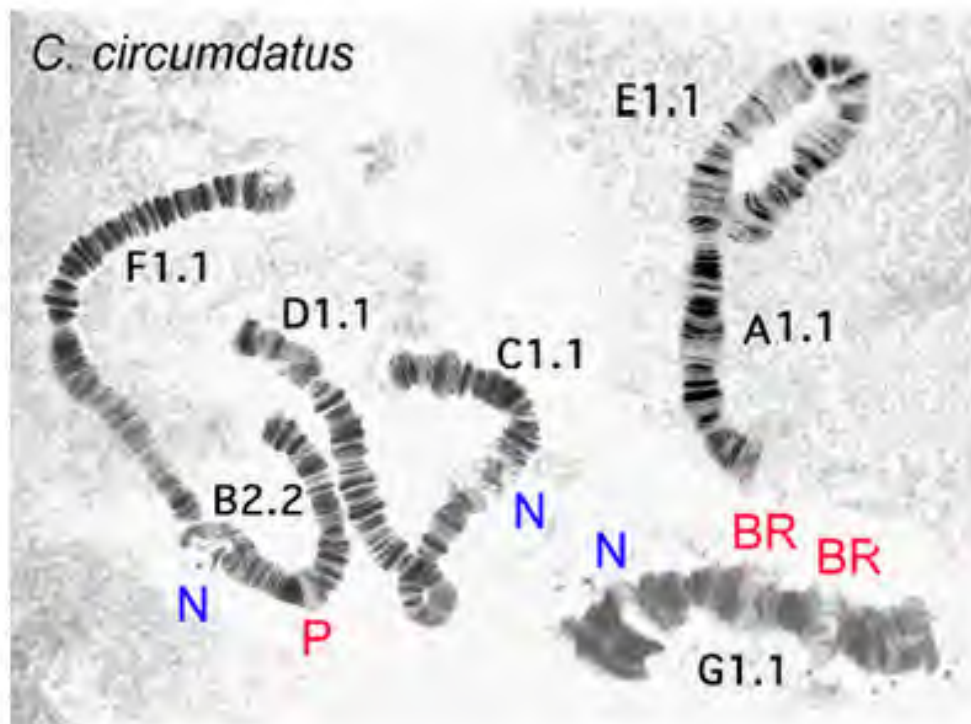
Mandible (e, below) with third inner tooth slightly darkened and only partly separated (type IIB).



**Cytology:** Four polytene chromosomes with the pseudothummi-cytocomplex combination BF, CD, AE, G. Nucleoli in arm B and C, with a small one also present subterminal in arm G (which is not always present/active). Arm G closely paired with generally 3 obvious BRs from near the nucleolus to the opposite end, depending upon the sequence. Polymorphism in arms A, B, C, D and G, although Pamual *et al.* report pericentric inversions involving the AE and BF chromosomes. Most polymorphism in arm B.

- cirA1: 1 - 3, 12 - 4, 13 - 19 as *pseudothummi* (widespread)  
 cirA2: 1 - 2c, 10 - 12, 3 - 2d, 9 - 4, 13 - 19 as *holomelas, incertipenis* (widespread)  
 cirA3: approx. 1 - 2d, 11 - 12, 3 - 2e, 10 - 4, 13 - 19 (Thailand)  
 cirA-E (called A4): A1-3, 12-5, E11-13, A6-4, 13-19, E 10i-c, 3f, 3a-e, 10ba-4, 2-1  
 (India and Thailand)  
 cirB1: Puff just beyond middle of arm with dark bands distal (gps. 8 - 7) (widespread)  
 cirB2: Puff near nucleolus, with dark bands on proximal side (gps. 7 - 8) (widespread)  
 cirB3: abt same size as B2, but moved a few bands proximal, ending at nucleolus (India)  
 cirB4: small inversion distal to the distal break of B2 (Thailand)  
 cirB5: Similar to B2, but about 2-3 bands shorter at each end (Thailand)  
 cirB6: Inversion of distal third of arm (Thailand)  
 cirB7: Small subterminal inversion (Thailand)  
 cirB8: Small inversion of the region of the BRs (northern India)  
 cirB-F: involves the characteristic bands (groups 24-26) of arm B, to about F19 (Thailand).  
 cirC1: Median nucleolus (widespread)

- cirC2: Inversion of about a third of the arm distal of the nucleolus (widespread)
- cirD1: differs from oppD1 by at least one inversion (widespread)
- cirD2: Inversion of approximately the middle third of the arm (widespread)
- cirD3: noted by Kumar & Gupta, but seems to be in same region as cirD2 (India)
- cirE1: 1 - 2, 4 - 10ab, 3e-a, 3f, 10c - 13 from *aprilinus* by Inv4-3a
- cirF1: 1 - 2a, 10d - 2c, 15c - 11a, 2b, 15d - 23 as *oppositus* F3
- cirG1: Nucleolus near one end, three BRs towards the other end (most distal not always visible) (widespread)
- cirG2: Inversion of over two thirds of the arm, from proximal of the nucleolus to between the two larger BRs (widespread)
- cirG3: Inversion of region around the BRs (India)



**Found:** Type locality – Tainan (abt 23.0°N, 120.0°E), Yentempo, (formerly Takao Prefecture), FORMOSA (TAIWAN).

India to Thailand, to New Guinea, Australia and the Pacific area.

**India** - University of Jammu & Kashmir, Jammu (32.73°, 74.87°); Bishnah wetland 32.70°, 75.00° Jammu & Kashmir; Madurai, Tamil Nadu (9.91°, 78.00°); Varanasi, Banaras, Uttar Pradesh (25.20°, 83.03°)

**Indonesia** - Kampung Damai, Balikpapan (-1.25°, 116.82°), Kalimantan.

**Malaysia** - Langat River, Selangor.

**Singapore** - Sungei Api Api (as *C. costatus*)

**Thailand** - Ban Bangkanark, Chachoengsao Province (Hashimoto *et al.* 1981); Bangkok area; Ban Don Chi, Amphoe Phibun Mangsahan, Ubol Ratchathani Province (Hashimoto *et al.* 1981), Ban Haet; Ban Phai; Ban Thung Ka La, Amphoe Chiang Dao, Chiang Mai Province (Hashimoto *et al.* 1981); Borabue; Changan; Chiang Khwan; Chiang yuen; Kamalasai;

Kantharavichai; Kham Ta Kla; Meuang Kalasin; Meuang Khon Kean; Meuang Nakhon Phanom; Meuang Roi Et; Na Kae; Phang Khon, Pra Yuen; Renu Nakhon; Rong Kham; Sawang Daen Din; Si Somdet; That Phanom; Yang Talat; Wanon Niwat (mostly from Pramual *et al.* 2008)

The morphology was redescribed by Sasa (1978) and Chaudhuri *et al.* (1992). Chaudhuri *et al.* claim the larval VT are not coiled.

Chromosomes described by Kumar & Gupta (1990) and Pramual *et al.* (2008) as *C. circumdatus*, by Kuvangkadilok (1985) from Thailand, and for arms A, E and F (with some errors) by Saxena (1995) as *C. plumatisetigerus*.

There have been numerous studies of mitochondrial *COI* sequence (indicated below).

The species can be bred in the laboratory (Kuvangkadilok 1994).

#### DNA Sequence:

mt*COI*: sequence is in GenBank for India (acc. no. KX271850), Pakistan (acc. no. KJ768129), Malaysia acc. no.), Thailand (acc. nos. GU944724, JQ287743-51, KT212956 - 977), Singapore (acc. no. KJ530964-69, KP462069-74, KP462468-69, KP462389-94, 68-70, KP462650, 53-56, 59, 62-70, 84), Australia (acc. no. AF19225), China (acc. no. KP902724-29), Japan (acc. no. LC050935).

#### ***Chironomus claggi* Tokunaga 1964**

Syn: *Chironomus simantobeceus* Sasa, Sukuki and Sakai 1998 (Yamamoto *et al.* 2018)

In BOLD Bin: [BOLD:ACQ6925](#)

#### Adult:

(based on Tokunaga (1964)

##### Male:

Wing length 2.67-2.69 mm; width 0.68-0.72 mm. LR 1.7 (1.66-1.77); Fe1/Ti1 1.22. AR 2.7 (2.5-2.85).

Large yellow and dark brown or brown species; scutum white, vittae yellow; distal part of femur and rest of legs dark; abdominal tergites with brownish bands or entirely brownish. Palpal segments in ratio: 15.5 : 16.5 : 70.5 : 70.5 : 84.

Thoracic setae – only noted that scutellum has 10-11 setae along caudal margin with 9-11 small setae on anterior part.

Hypopygium of the dorsalis-type. Setae of IVo bi- or trifurcate apically.

##### Female:

Wing length 3.04 mm, width 0.89 mm. LR about 1.81. Frontal tubercles about 1.5 times as long as the diameter; palp proportions about 20 : 18 : 70.5 : 82.5 : 107.

Scutal vittae entirely brown; scutellum with 12 setae along caudal margin and 7-10 smaller setae anteriorly.

Abdomen mainly yellow with dark tergal bands on all but last two segments which are dark brown.

**Pupa:** It is not clear whether this known pupa is definitely associated with this species. It was collected along with a female, but there is no detail as to how they were associated – the caudo-lateral spur is rather unusual for a *Chironomus* species, more like that of a

*Stictochironomus*, as is a “rounded” anal swim fin. With that proviso, Tokunaga’s description gives the following information:  
Length about 7 mm. Cephalic tubercles small on a basal blunt swelling and with a small lateral seta. Abdominal surface very weakly spinulose, sternite IVo with lateral groups of spinules hardly visible; tergite II with about 71 yellow simple hooklets; caudolateral spur black with 5-6 lateral and 3-5 apical spines.

Larva and Cytology: not known.

Type localities: Futami-ko; Camp Beach, Omura; Gen’s beach, Minato-ko, Yatsue Region; all Chichi Jima, Micronesia

Japan - Tokyo Metropolitan; Chichijima Is. and Hahajima Is., Bonin Isles, Tokyo; Shimanto River, Nakamura, Kochi Pref. (type locality of *C. simantobeceus*) (all Yamamoto & Yamamoto 2018); Ogasawara, Kanto (GenBank & BOLD)

According to Yamamoto & Yamamoto (2018), *C. claggi* superficially resembles *C. flaviplumus* and *C. yoshimatsui* but is separable by the more slender SVo. In scutal coloration and SVo shape it resembles *C. circumdatus*.

DNA Sequence:

The mtCOI sequence for Japan in GenBank is AB740233 & 34.

### ***Chironomus costatus* Johannsen 1932**

This species as recognized by Karunakaran (1969) is almost certainly a synonym of *Chironomus circumdatus* Kieffer 1916 – but see notes under “Fourth instar larva”.

Adult:

Compiled from description of Johannsen (1932)

Male: Body length 4.5 mm. AR greater than 3. LR about 1.73.

Head pale yellow, including proboscis and palpi; scape deeper yellow, flagellum brownish; eyes deeply emarginate, narrowly separated on the front; frontal tubercles well developed; twelfth antennal segment over three times as long as segments 2-11 combined.

Thorax pale yellow; mesonotum with three deep yellow vittae each margined on both sides with brown, making it appear as if there were six short narrow brown vittae, the lateral pairs connected on the front margin; metanotum deep yellow with two closely approximated brown spots; pleura with a brown spot below wing; sternum deeper yellow; scutellum pale. Abdomen pale yellow, perhaps greenish in life; each tergite with a large, brown, transverse, oval spot which does not touch the incisures.

Abdominal tergites with a large brown transverse oval spot, which does not touch the incisures.

Legs yellow; extreme tips of fore femora, immediate bases of fore tibiae, and the extreme tips of tarsal segments 1-4 and whole of 5 of mid and hind legs, brown.

Anterior leg proportions: 45 : 37 : 64 : 33 : 30 : 26 : 13 (i.e. Ta5/Ti abt 0.20); fore tibia with rounded scale; middle and hind tibiae each with two spurs on the usual combs; empodium long, pulvilli large; fore tarsi not bearded.

Wings hyaline, veins pale, crossvein faintly tinged with brown; costa not produced, ending slightly farther in front of wing tip than the media does behind it; cubitus forks under the crossvein. Squama fringed. Halteres pale.



Male hypopygium of *C. costatus* from Johannsen 1932.

Hypopygium yellow, gonostylus slender, gradually tapering, with some short stiff, inwardly directed bristles near apex; inferior appendages with the usual curved bristles; superior appendages bare, curved, pointed, reaching the base of the spur of the ninth tergite, the spur extending almost as far caudad as the tip of the inferior appendage. Apparently without setae at the base of the anal point. Superior appendage difficult to interpret from illustration, but possibly narrow and reaching to end of the GC.

Female: In coloring resembling the male but with the darker marks on the mesonotum nearly black and rather broader thus nearly obliterating the yellow on the lateral vittae. Abdominal tergites with brown transverse fasciae which do not reach incisures.

Basal third of fore tibiae and tips of all femora dark brown.

Antennae six-segmented, second compound; sixth segment brown, twice as long as the fifth, intermediate segments flask-shape, the neck about as long as the bulbous part.

Similar to male, but body stouter, markings darker and abdominal fasciae very broad covering almost the entire tergites.

Johannsen also notes considerable variation in the extent of the brown on the thorax and legs, In the palest specimens the legs and thorax show only traces of brown. In the darkest females the vittae of the mesonotum are almost wholly dark brown and the leg markings are sharply defined.

**Pupa:** Lenz (1937) describes it as “thummi-type”

**Fourth instar larva:** There is no larval description from the type locality (see below), so this description relates to Singapore specimens, which are probably *C. circumdatus*.

A small to moderate plumosus-type, length about 11.8–14.3 mm (female) 11.0–12.0 mm (male).

Lateral projections about 220–400 μm, posterior pair of VT usually longer (ant. 1.36–2.48 mm; post 1.52–2.76 mm). Anal tubules about 2-3 times longer than wide, ventral pair may be longer and thinner (3.5-4.3 times longer than wide).

Head width about 420 μm. Gular region darkened on posterior half, FA very slightly dark to dark, sometimes with very pale markings along outside edge of clypeus.

Mentum with generally rounded teeth, c2 teeth well separated (type II), 4<sup>th</sup> laterals reduced to level of 5<sup>th</sup> laterals or below (type II-III). About 12–13 teeth in PE.

Third inner tooth of mandible dark but only partially separated (type IIC).

Karunakaran also describes the first - third larval instars.

**Cytology:** (from unillustrated description by Alfred & Michael, 1990):

Four polytene chromosomes with the pseudothummi arm combination AE, BF, CD, G.

No mention of nucleoli. Polymorphic in arms A and G, both for small terminal inversions.

This description is insufficient to distinguish these chromosomes from those of *C. circumdatus*.

**Found:** Type locality - Buitenzorg, BOGOR, INDONESIA.

Also Malang and Ngebel,

‡India - Madurai University, Madurai (Alfred 2006); Shillong, Meghalaya (Alfred & Michael 1990)

‡Malaysia - Selangor, (Habib *et al.* 1997)

In pools and ditches and in running water.

Lenz (1937) describes six immature types for this species:

1. A small plumosus-type, length about 10-12 mm, ventral tubules long, anal tubules long.
2. A plumosus-type, length 12-13 mm.
3. A plumosus-type, about 12 mm long, ventral tubules not very long.
4. **A pupal type from the type locality, larva not known .**
5. A thummi-type larva, with long ventral tubules, moderately long anal tubules, the hind tubuli swollen at the base.
6. from a pupal type, larva not known.

Since Johannsen notes variation in coloration of the adults and Lenz ascribes a number of different larval types to this species, it raises the possibility that more than one species is included under this name. In the absence of a good adult description of material from other countries, it remains uncertain whether these reports relate to the same species, and whether *C. costatus* or one of the variants is the synonym of *C. circumdatus*.

The report by Karunakaran (1966) of nematode parasitism in *C. costatus* actually refers to *C. circumdatus*.

### ***Chironomus crassiforceps* Kieffer 1916**

Synonyms

*Chironomus esakai* Tokunaga 1940

*Chironomus insolens* Johannsen 1946 - synonymised with *C. esakai* by Hardy (1960).

*Yaesecundus iriobeceus* Sasa *et* Suzuki, 2000

*Chironomus daitoabeus* Sasa *et* Suzuki 2001

*Daitoyusurika daitofegee* Sasa *et* Suzuki, 2001,

Probably in BOLD Bin: [BOLD:AAJ4269](#)  
along with *C. magnivalva*

**Adult:**

**Kieffer description** - Annales Musei Nationalis Hungaricis **14**: 111-112 (1916)

10. *T. crassiforceps* n. sp.

**Male:** Fawn colour. Frons with two small white lobes. Palps of a dark brown. Antennae of 12 segments, brownish, with fawn variegation, transverse segments 3-11 twice as wide as long, the



Fig. 19.  
*Tendipes crassiforceps* n. sp.  
Half of claspers of the male  
viewed from above

12th twice as long as previous ten together. Mesonotum frosted white, with 3 reddish bands, short, dull, whitish; scutellum, metanotum and pleura reddish or fawn. Halteres white, extremity of club brown. Wings subhyaline, crossvein black, second longitudinal vein close to radius, cubitus more than half as long as the radius, posterior fork a little distal to the crossvein. Legs yellowish, the last two tarsal segments and the extremity of the third darker, anterior tarsus not bearded, long anterior tibia, hardly shorter than the unmarked femur, metatarsus at least longer by half than the tibia, segments 2-4 gradually and slightly shortened, the fourth not distinctly shorter than the third one, more than twice as large as the 5th, large pulvillus, shorter than empodium. Abdomen linear, of a brownish white, lateral edges black, the last two tergites and claspers a little duller than the other tergites. Large claspers, very large terminal segments, longer and larger than the basal segments, straight, slightly thinner and rounder at the edge, except the distal quarter which possesses, as well as the extremity, short hairs, erect and quite dense, the setae of the lateral part are relatively shorter than usual, shorter than the width of the segment; coxite appendages in a short point; superior appendages extend out a little past the basal segments, flat, linear, curved; inferior appendages very long, nearly reaching the extremity of the terminal segments, more than twice as large as the superior appendages, but not half as big as the terminal segments, slightly swollen before the extremity which is thinner, pubescent, dorsal surface armed, on the distal third, with long hairs, rigid and strongly curved.— L. 4.5 mm.

(i.e. AR about 1.5, LR about 1.5)

Male

Wing length 2.70 - 3.4 mm.; AR 1.55 - 1.75; VR abt. 1.14.

Head: Palp proportions segs. 2 -5 (microns): 56 : 170 : 195 : 260. Clypeal setae 28-37.

Thoracic setae: dorsolateral abt. 12; dorsocentral 14-24; prealar 5-7; supra alar 1; scutellar in approx. 2 rows ant. 5-10. post.9-13.

Leg proportions and ratios (microns)

|      | Fe   | Ti   | Ta1  | Ta2 | Ta3 | Ta4 | Ta5 | LR        | F/T       | BR   |
|------|------|------|------|-----|-----|-----|-----|-----------|-----------|------|
| PI   | 1430 | 1245 | 1820 | 875 | 775 | 740 | 370 | 1.45-1.70 | 1.13-1.20 | 1.44 |
| PII  | 1450 | 1400 | 650  | 385 | 300 | 215 | 190 | 0.43-0.49 | 1.03-1.05 |      |
| PIII | 1635 | 1600 | 910  | 530 | 460 | 265 | 215 | 0.55-0.62 | 0.98-1.10 |      |





Hypopygium: Anal point stout, gonostylus large with a more-or-less rounded end, dorsal volsella long and slender, IVo slightly curved and almost as long as the gonostylus. No setae centrally on 9th tergite.

Female

Wing length 2.08-2.77; width 0.60-0.83.

Head: Antennal proportions 112: 76 : 80 : 73 : 161; AR 0.43-0.58; A5/A1 1.28-1.42.

Palpal proportions 38 : 38 : 134 : 142 : 203. Clypeus about 1.5 times the diameter of the antennal pedicel; 20-22 clypeal setae.

Thoracic setae – Acrostichal 9-12; Dorsolateral 21-24; Prealar 5-6; Supraalar-1; Scutellum with 7-11 small anterior setae and 8-12 in posterior row.

Leg proportions and ratios

|      | Fe   | Ti   | Ta1  | Ta2 | Ta3 | Ta4 | Ta5 | LR        | F/T       | Ta4/Ti    |
|------|------|------|------|-----|-----|-----|-----|-----------|-----------|-----------|
| PI   | 1120 | 880  | 1400 | 680 | 560 | 520 | 280 | 1.58-1.65 | 1.15-1.23 | 0.59-0.67 |
| PII  | 1120 | 1140 | 520  | 280 | 240 | 180 | 140 | 0.46      | 0.98      |           |
| PIII | 1300 | 1280 | 800  | 440 | 400 | 210 | 180 | 0.63      | 1.02      |           |

Abdomen largely yellow or yellowish-brown, darker at posterior.

**Pupa** (from Tokunaga 1964) Body length 5-6 mm.

Frontal tubercles triangular, as long as the basal length, with small apical seta.

Abdominal tergite II with a caudal ridge of 77 hooklets; caudolateral spur of segment VIII with 3 or 4 spines.

**Fourth instar larva** a medium sized plumosus-type larva; length about 7–12.3 mm. Anterior ventral tubules (1.68 mm) generally slightly longer than the posterior pair (1.72mm).

Gular region slightly darkened to dark on posterior third to half, FA also darkened, and slight darkening elsewhere on dorsal surface.

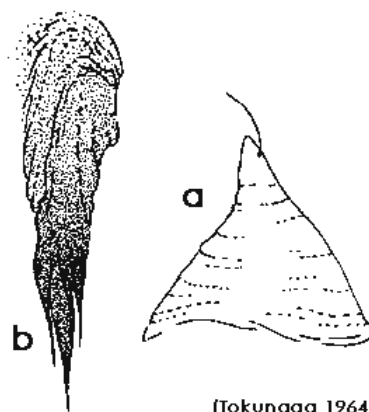
Mentum with 4th laterals only slightly reduced (essentially type I), and c2 teeth partly separated from c1 (type IB-IIA).

Ventromentum with about 35 (31-47) striae. PE with about 16 (14-19) teeth. Premandible with outer tooth slightly longer than the inner tooth which is 1.8-2.4 times wider.

Antenna with relatively long basal segment, about 3.75 (3.4-4.2) times as long as wide; AR about 2.14 (1.76-2.56), segment lengths (micron) 114 : 26 : 9 : 11 : 7 .

Distance between antennal bases generally greater than that between the S4 setae.

Mandible with 3rd inner teeth showing some colour and separate (type II-IIIB); about 16 (13-19) furrows on outer surface near the base; 11 (10-13) taeniae in PMa.



(Tokunaga 1964)

**Cytology:** Four polytene chromosomes with the pseudothummi-cytocomplex combination BF, CD, AE, G. Nucleolus in arm F at about group 19, and a small nucleolus sometimes developed in arm G. No known inversion polymorphism. Differs from *C. magnivalva* by fixed inversions in arms C, E and G.

craA1: 1-2c, 3-2d, 10-12, 14-13, 4-9, 15-19

as magnivalva A1

craB1: Large puff with distal dark bands (groups 7-8) near distal end of arm as magnivalva  
 craC1: the distinctive groups 3-4 are about one quarter of the arm length from the centromere  
 craD1: as arm D of magnivalva  
 craE1 1-3a, 10g-c, 3f-4, 10b-5, 3e-b, 4-3f, 11-13 from cingulatus/magnivalva by Inv10g-3b  
 craF1: 1-2a, 10d-a, 2b-9, 11-23 as magnivalva F1  
 craG1: Nucleolus sometimes subterminal, with BR immediately next to it, and two other BRs spread along the arm



Arm G of *C. crassiforceps*

**Found:** Type locality – Tainan, Taiwan, (Republic of China). Types were in the Natural History Museum in Budapest, and so are lost. Type localities of the synonyms are not in Asia.

**Japan** - Miyako Island, Okinawa Prefecture, Ryukyu.

**Philippines** - Sozan, Taihoku.

?**Micronesia:** S. Mariana Island, Palau, Yap, Caroline Atolls, Ponape, Kusaie, Marshall Is., Gilbert Is.

?**Hawaii** - Oahu; Molokai. Some specimens were obtained from a hot spring at temperature 38°C

?**Thailand** - Ban Bu, Amphoe Muang, Nakhon Ratchasima Province; Ban Kud Khaee Khon Kaen Province; San Pa Tong Rice Experimental Station. Amphoe San Pa Tong, and Doi Inthanon, Amphoe Hang Dong, both Chiang Mai Province; (all Hashimoto *et al.* 1981).

?**India** - Berhampur (24.23°N, 88.43°E), West Bengal (Pal & Hazra, 2017).

? - the identity of these specimens is uncertain in the absence of cytological or DNA data.

All life stages were redescribed by Tokunaga (1939, 1964).

This species is very closely related to *Chironomus magnivalva* Kieffer which occurs in northern Australia and the Pacific Islands, and to the Indian species *C. nudipes* Kieffer. The barcode sequences of *C. crassiforceps* and *C. magnivalva* are so similar as to be in the same BOLD bin.

*C. nudipes* differs from *C. crassiforceps* in the presence of dark spots on the abdomen, and the unusually short posterior femur (that of *C. crassiforceps* being longer than the tibia).

The information provided by Pal and Hazra (2017) is completely inadequate to confirm that the specimens that they examined were *C. crassiforceps*, *C. nudipes* or some other species entirely. It is unfortunate that they chose to publish in a journal lacking rigorous review.

The major difference in the morphology of the males between *C. crassiforceps* and *C. magnivalva* is that, while the gonostyle of *C. magnivalva* narrows evenly to the distal end, that of *C. crassiforceps* appears to remain the same width for most of its length and then rounds off (see figure above).

### ***Chironomus (Lobochironomus) dorsalis* (Meigen 1818)**

Described from Japan as *C. longipes* Staeger, which is currently considered to be a synonym of *C. dorsalis*. Epler (2001) did not accept the synonymy of *C. dorsalis* and *C. longipes*,

considering that *C. dorsalis* was *Einfeldia*, but *C. longipes* was *Lobochironomus*. However Spies and Sæther (2004) confirmed this synonymy.

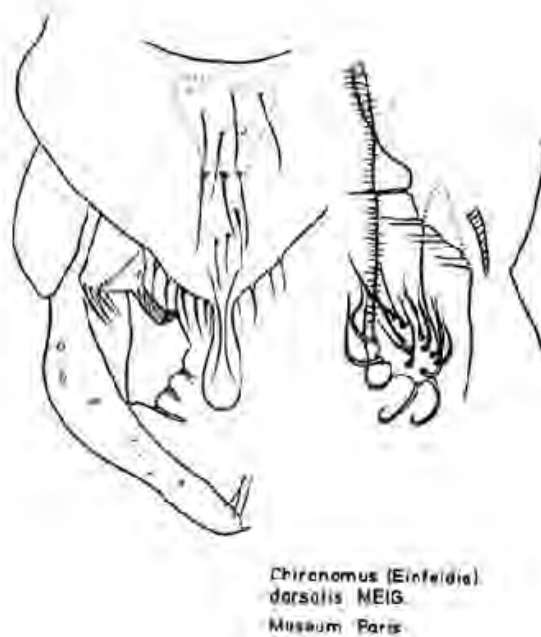
However it remains to be clarified whether all specimens do belong to a single species and whether either *C. dorsalis* or *C. longipes* occur in Asia

Doubtfull synonymy: *Einfeldia ocellata* Hashimoto 1985 (see under *C. ocellatus*)

*Chironomus longipes* sensu Shilova 1980 – needs to be renamed  
(Vallenduuk & Langton, 2010)

In BOLD Bin: [BOLD:AAW3454](#) as *C. longipes*

However this appears to be a misidentification, as specimens in this Bin are a form of *Benthalia* (see *Benthalia* sp. 3, below)



Male terminalia drawn from type specimen

**Fourth instar larva** a medium semi-thummi-type, i.e. small lateral projections and well developed VT. PE with some thinner teeth interspersed between the normal teeth.

**Cytology:** (based on North American material) 4 polytene chromosomes with the thummi-cytocomplex combination AB, CD, EF, G. Arm G with a subterminal nucleolus, a large BR just proximal to it and another BR near other end of chromosome. Other nucleoli on arms B and D.

Arm A:

Arm E: possibly 1-3c, 9-10a, 8i-a, 3ed, 10b, 5-7, 4-3f, 10c-13.

Arm F:

**Found:** Type locality - not given (?France) Type locality (*C. longipes*) – Denmark

India – (BOLD)(needs to be confirmed)

***Chironomus* (?*Chaetolabis*) *echizensis* Sasa 1994**

**Found:** JAPAN – Yamashiro Spa, Ishikawa Pref. (Type locality

***Chironomus flaviplumus* Tokunaga 1940**

Syn: *Einfeldia okisiroia* Sasa 1993

Was placed as a synonym of *Chironomus samoensis* Edwards by Hashimoto (1977), but this synonymy is considered doubtful (Sasa 1978).

According to Sasa (1978), Tokunaga's description was very brief and not illustrated. Notes that tergal side of abdominal segments II to IV each with a small, oval, dark central spot; antennal ratio is about 3.5 and larger than the 2.9 of *C. dorsalis* (Sasa assumes this is *C. yoshimatsui*)

The major reason for doubting the synonymy of *C. flaviplumus* with *C. samoensis* is the higher AR (abt 3.5 - 4) (Sasa 1978), and the difference in the anterior fore leg ratios of the female. There is also a difference in the distribution of *C. flaviplumus* and the Japanese *C. samoensis*, in that *C. flaviplumus* has a more northerly, cooler, distribution.

However the "*C. samoensis*" used as a laboratory organism and from which the cytology of Japanese specimens obtained (see below) are probably one of the *C. flaviplumus* types.

**Found:** JAPAN. - Saga, Kyoto (Type locality)

If correctly identified, this species can be bred in the laboratory, as Japanese specimens have been maintained in a laboratory culture (Kuhn *et al.* 1987).

Four species have been found described under this name based on the available BARCODE sequences, two in Japan, one in China and the Korean material of Ree & Kim (1981), which is actually *C. yoshimatsui*.

Since there has been no further study of material from the type locality, it is not clear which of these species is the true *C. flaviplumus*.

Specimens found in Northern Australia are probably a closely related species.

The three types of *C. flaviplumus* are here referred to as Type A, type B, and type C.

It seems likely that they comprise a very closely related group of species, showing cytological differences (where known) and small differences in the BARCODE sequences.

#### Molecular Sequence:

mtCOI Barcode sequences of these species are in Genbank from Japan (2 species) and China (another species, accession numbers KP902730 - 731), and there are also sequences in the Japanese Chironomid DNA Barcode database. The Korean samples in GenBank (accession numbers JF412075 - 077) are misidentified and are actually *C. yoshimatsui*.

#### ***Chironomus flaviplumus* type A.**

This variant was described by Sasa (1978)

Sasa lists important features as the LR of about 1.6–1.8 and the relatively long anterior Ta5, which is about 0.35-0.4 length of anterior Ti.

In a later paper, Sasa and Hasegawa (1983) give a much broader range of values (including Ta5/Ti values of only 0.25) which could suggest that they had material of more than one species.

This species is in BOLD Bin: [BOLD:ACQ8383](#)

#### Adult

Male: AR about 3.5-4.0.

Head: Frontal tubercles about 20-39 µm long and 13 µm wide. Palp proportions: 44 : 53 : 189 : 222 : 315.

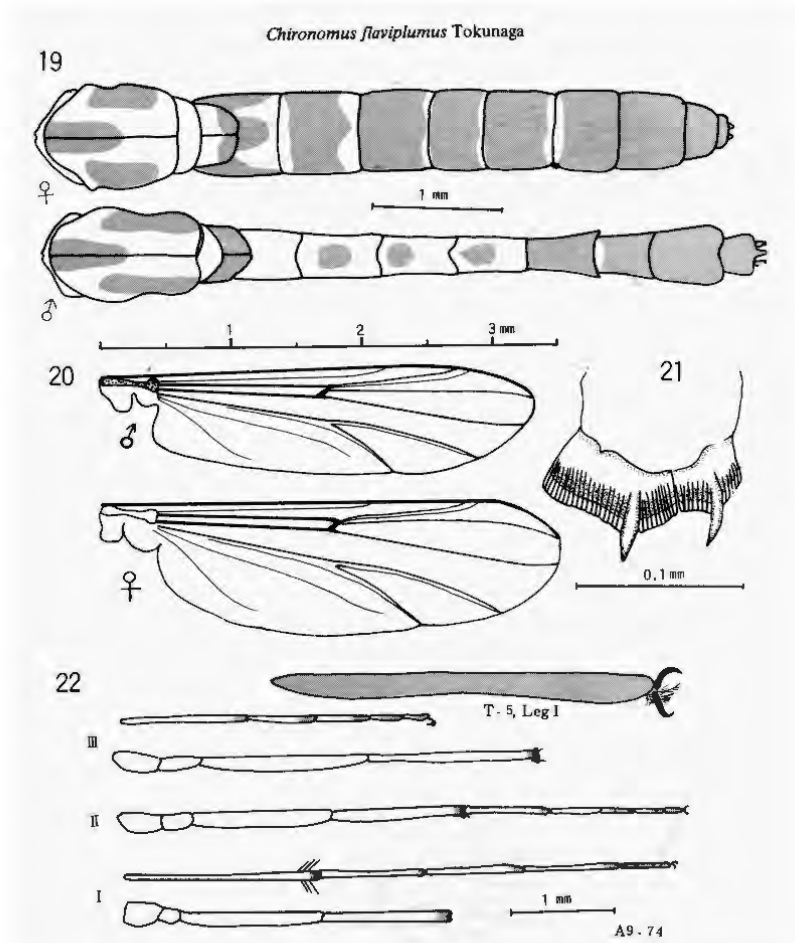
Wing length: 2.85-3.15 mm; wing width 0.30-0.67 mm. VR about 1.0

Leg lengths (microns) and proportions as follows:

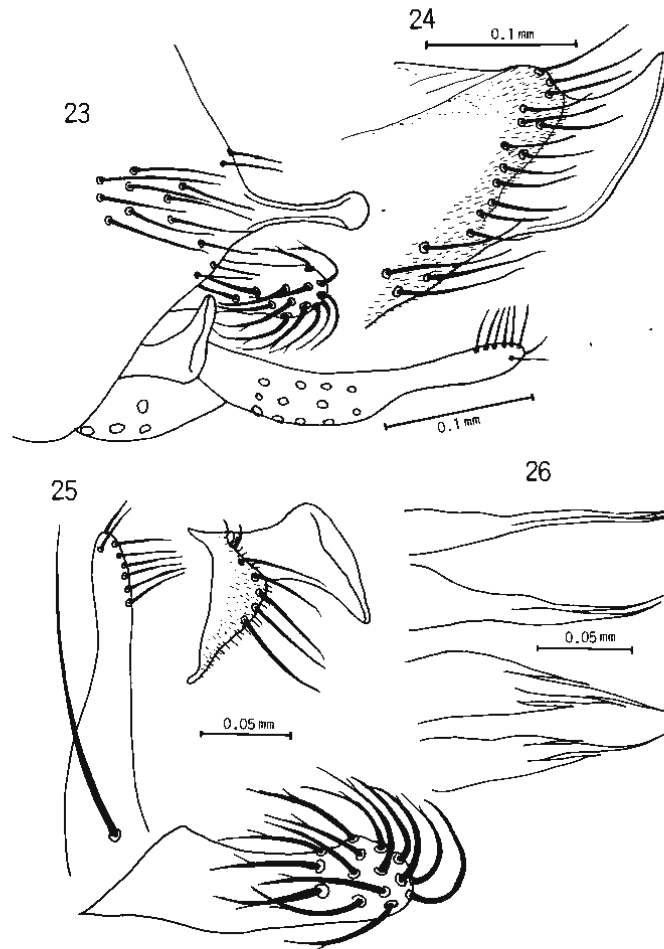
|             | <b>Fe</b>  | <b>Ti</b>  | <b>Ta1</b> | <b>Ta2</b> | <b>Ta3</b> |
|-------------|------------|------------|------------|------------|------------|
| <b>PI</b>   | 1390       | 1240       | 2030       | 1020       | 930        |
| <b>PII</b>  | 1460       | 1290       | 810        | 460        | 340        |
| <b>PIII</b> | 1660       | 1660       | 1240       | 660        | 490        |
|             | <b>Ta4</b> | <b>Ta5</b> | <b>LR</b>  | <b>F/T</b> | <b>BR</b>  |
| <b>PI</b>   | 880        | 500        | 1.63       | 1.12       | 2.1        |
| <b>PII</b>  | 190        | 130        | 0.62       | 1.31       |            |
| <b>PIII</b> | 280        | 175        | 0.75       | 1.00       |            |

Ant Ta5/Ti – 0.40.

Abdominal tergites II-IV with a dark central oval spot, tergites V-VIII almost uniformly dark brown. Setae on 9th tergite: 9-12.



Sasa's (1978) illustrations of morphology of *C. flaviplumus*.



Sasa 1978 - *Chironomus flaviplumus*

Sasa's (1978) illustrations of *C. flaviplumus*: Male hypopygium (top) and superior appendage (right) (note boot shape – S-type). Also Gc (left) and IVo (below)

Setae on 9th tergite: 9-12. SVo “beaked”. Gonostyle reduces relatively sharply at about half way.

Female

Head: Antennal proportions (micron): 180 : 130 : 140 : 140 : 250.

Frontal tubercles about 26 µm long and 12 µm wide.

Palp proportions (micron): - : 60 : 250 : 250 : 370.

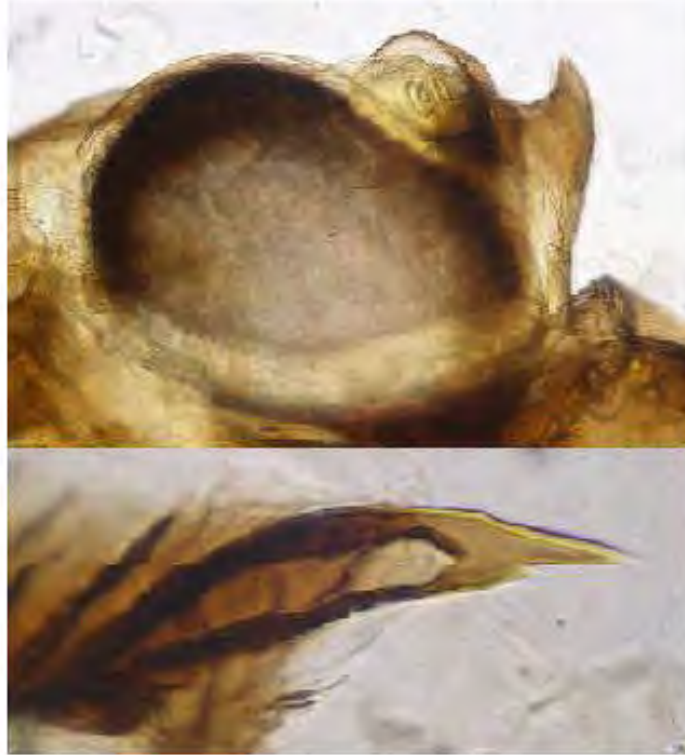
Thorax coloration as in males.

Wing length: 3.5 mm; wing width 1.1.

Leg lengths (microns) and proportions as follows:

|             | <b>Fe</b>  | <b>Ti</b>  | <b>Ta1</b> | <b>Ta2</b> | <b>Ta3</b>    |
|-------------|------------|------------|------------|------------|---------------|
| <b>PI</b>   | 1510       | 1220       | 2150       | 1170       | 1100          |
| <b>PII</b>  | 1540       | 1370       | 830        | 440        | 340           |
| <b>PIII</b> | 1660       | 1610       | 1220       | 660        | 500           |
|             | <b>Ta4</b> | <b>Ta5</b> | <b>LR</b>  | <b>F/T</b> | <b>Ta4/Ti</b> |
| <b>PI</b>   | 1100       | 510        | 1.76       | 1.24       | 0.90          |
| <b>PII</b>  | 200        | 140        | 0.61       | 1.12       |               |
| <b>PIII</b> | 290        | 200        | 0.76       | 1.03       |               |

**Pupa:** Exuvia length about 7.8 mm (female), 7.0-7.5 mm (male). Caudolateral spur of segment VIII commonly with 3 spines, but range from 1-4 (Sasa 1978), often with one longer, stronger spine.



Pupa of *C. flavipumus*.type A

**Fourth instar larva:** a medium sized plumosus-type larva (length about 14.0-14.8 mm.). Anterior VT (1.14-1.20 mm.) shorter than posterior pair (1.40-1.52 mm.). Anal tubules long and cylindrical, about 250-320  $\mu$ m, about 2.3-3.2 times longer than wide, ventral pair possibly slightly shorter and thicker (260 x 100; 250 x 110 micron).

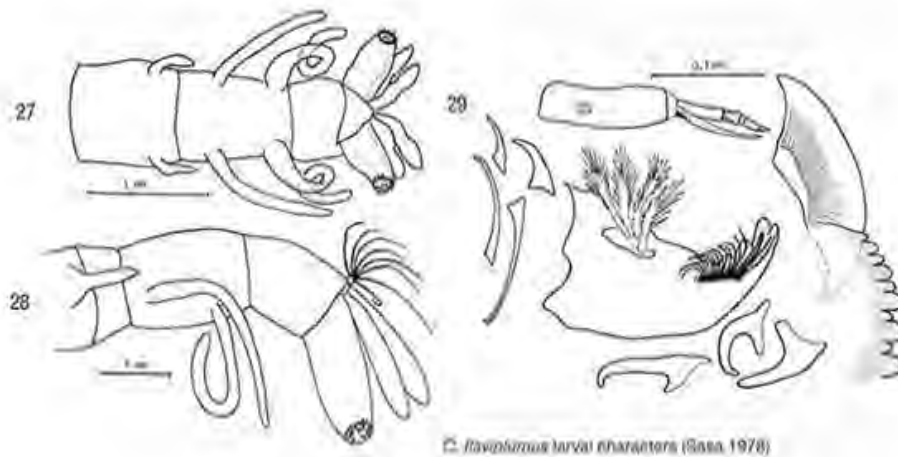
Gula pale or very slightly darkened on posterior third; FA pale.

Mentum with square sharp teeth, c2 teeth of central trifid tooth well separated from c1 tooth (type III), 4th laterals slightly reduced (type I-II).

PE with about 16-21 variable but sharp teeth. Ventromentum with about 29-36 striae; VMR 0.27-0.38.

Antenna with a moderately long basal segment, which is about 3.5-4.5 times as long as wide; RO about a third to 2/5 up from base; AR about 1.75-2.0. Antennal proportions: 115 : 30 : 10 : 12 : 6. Distance between antennal bases possibly greater than that between the S4 setae.

Mandible with third inner tooth only partly separated and darkened (Type I-IIB), and with about 12-14 furrows on outer surface at the base; about 10-12 taeniae in PMan.



**Cytology** (based on material studied by Wülker *et al.* 1989 and unpublished): 4 polytene chromosomes with the pseudothummi arm combination AE, BF, CD, G. Nucleolus virtually terminal in arm G; well developed BR about one third from the other end, and a smaller BR close to this other end; closely paired. A nucleolus also occurs near the characteristic bands of arm F. Arm A of Australian “*C. orientalis*” differs from that of this species by a complex inversion, and arm F by possibly a simple inversion. Polymorphism in arms C and G.

- flaA1: 1a-i, 2k-d, 9e - 4a, 13a - 14i, 3h-i, 12c - 10a, 2c - 1k, 3a-g, 15 - 19 (Japan)
- flaB1: Puff with distal dark bands (groups 8-7?) about the middle of the arm
- flaC1: Characteristic band groups 3-4 about one quarter from distal end.
- flaC2: Differs by a small terminal inversion, distal of characteristic band groups 3-4.
- flaD1:
- flaE1: 1 - 3e, 10b - 3f, 10c - 13 as halophilis, etc.
- flaF1: 1 - 2a, 10d-a, 15 - 11, 2b - 9, 16 - 23
- flaG1: Virtually terminal nucleolus, two BRs as noted above.
- flaG2: Simple inversion of most of the chromosome, bringing the large BR close to the nucleolus.



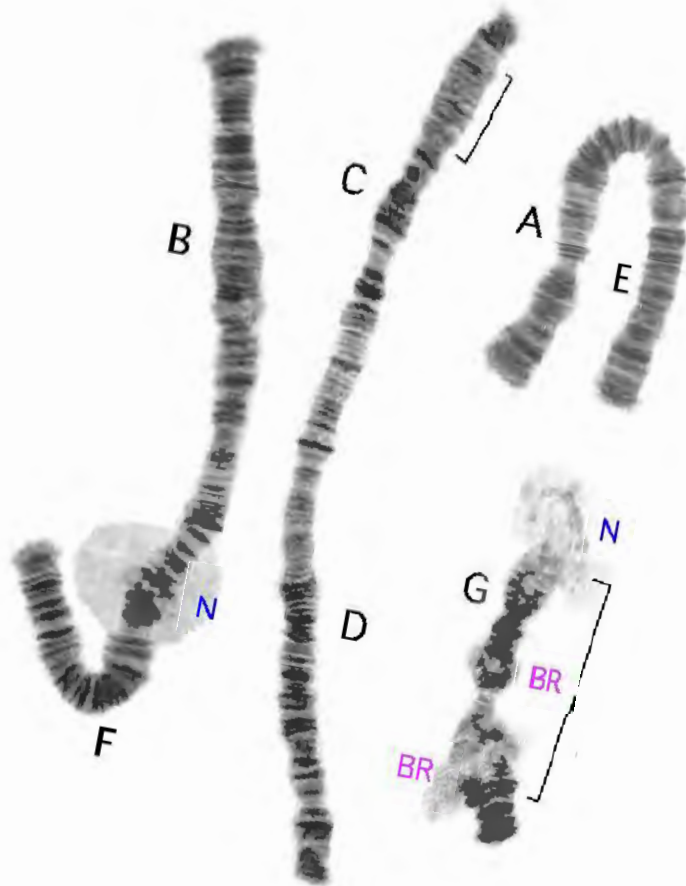


Photo courtesy of the late W.F. Wülker

Chromosome arms A, E and F were described by Wülker *et al.* (1989) as *C. samoensis*. However, some sequences of Australian specimens are not the same, although closely related. Indian specimens described by Chattopadhyuy *et al.* (1991) also do not appear to be the same species, as the LR is reported as 1.4; the ant. Ta5 is only about 0.25-0.28 length of Ti, and the frontal tubercles are only about 18-25 micron. The Indian material is also cytologically distinct. However the mtCOI sequence is very similar to those of *C. flaviplumus* Type B, and a specimen from Bishnah wetlands, Jammu and Kashmir is particularly close.

Important features are the central oval spots on abdominal tergites II-IV, the LR of about 1.8-2.0 (though known range of the possibly multiple species: 1.6-1.8) and the relatively long anterior Ta5, which is about 0.35-0.4 length of anterior Ti.

**Found**      **Japan:** NEIS and Hanamuro, Tsukuba; Minitoku, Tokyo; Ohta River, Hiroshima Prefecture. Ryukyu: Mt Omotodake, Ishigaki City, Ishigaki Island, Yaeyama Islands, Okinawa Prefecture.

**Molecular Sequence:**

**MtCOI:** Sequence for these specimens is in GenBank (accession numbers AB740235–9), the BOLD Database and the Japanese Chironomid Barcode Database – often identified as *C. flaviplumus*, but as noted above, the identity of the true *C. flaviplumus* has yet to be confirmed.

***Chironomus flaviplumus* Type B**

This type was identified as *C. flaviplumus* by H. Yamamoto. BLAST comparisons of available sequences in GenBank or the BOLD Database reveals that the species is widely distributed from India, Japan, Pakistan (as *C. incertipenis*), Thailand (as *Chironomus* sp.),

Previously called *C. species* PK2 and PK7

This species is in BOLD Bin: [BOLD:AAW3997](#) sometimes as *C. incertipenis*

**Adult:**

Male

AR 2.94 (2.85-3.05), LR 1.65 (1.59-1.75).

Wing length 2.82 – 3.57 mm., width 0.68 – 0.88 mm., VR 0.95-1.05; squamal fringe 12-22; SCf on brachiolum 2-5.

Head: Frontal tubercles 15-51 x 10-18 µm, palpal proportions (µm) 51 (48-55) : 57 (50-60) : 213 (205-240) : 222 (205-235) : 345 (326-371). Clypeus as wide as the antennal pedicel, with 19-24 setae.

Thoracic setae: acrostichal about 15 in double staggered row; dorsolateral about 14-26 in one to three rows; prealar 5-6; scutellar in two or three rows: anterior row of 2-8 smaller setae, mid abt 12 - 14, posterior row of 10-15 larger setae.

Legs yellowish, becoming darker on the tarsi. Foretarsus without a beard.

Leg lengths and proportions (µm):

|             | <b>Fe</b>  | <b>Ti</b>  | <b>Ta1</b> | <b>Ta2</b> | <b>Ta3</b>    |
|-------------|------------|------------|------------|------------|---------------|
| <b>PI</b>   | 1237       | 1137       | 1805       | 962        | 826           |
| <b>PII</b>  | 1299       | 1176       | 734        | 399        | 291           |
| <b>PIII</b> | 1481       | 1449       | 1102       | 598        | 452           |
|             | <b>Ta4</b> | <b>Ta5</b> | <b>LR</b>  | <b>F/T</b> | <b>Ta5/Ti</b> |
| <b>PI</b>   | 737        | 350        | 1.59-1.75  | 1.02-1.20  | 0.24-0.35     |
| <b>PII</b>  | 185        | 139        | 0.58-0.69  | 1.06-1.17  |               |
| <b>PIII</b> | 286        | 169        | 0.64-0.83  | 1.00-1.06  |               |

Sensilla chaetica: Mid Ta1 - 9,10; Hind Ta1 - 6,6.



Abdomen with dark oval markings on tergites II-IV or V, others light brown.



Male hypopygium and superior volsella of *C. flaviplumus* Type B  
Note that the anal point is not dark and the SVo is strongly bent and “beaked”

SVo beaked and not easily fitted into the scheme of Strenzke (1959). Setae of IV forked. About 19 setae on tergite IX. The anal point does not appear to be darkened.

**Pupa:** Length 6.51 (5.99-6.61) mm in males, 7.21 (7.01-7.53) mm in females. Colour brown, but pupal exuviae pale brown. Frontal tubercles 75  $\mu$ m long and 57  $\mu$ m wide at base. Thorax rugose, wing sheath 1.69 mm long.

**Fourth instar larva:** A small to medium plumosus-type (length (fem) 12.2-14 mm). Anterior VT about 1.6 (1.04-2.44) mm; posterior pair about 1.85 (1.40-2.64) mm; much shorter in Japanese larvae. Anal tubules about 250-480  $\mu$ m long and about 2.5-3 times longer than wide. Gular region pale in some Japanese populations slightly dark to dark over posterior 1/3 to 1/2, FA darkened. Mentum (Fig. c, below) with c1 tooth tall, c2 teeth well separated (type III), 4th laterals slightly reduced (type I-II).

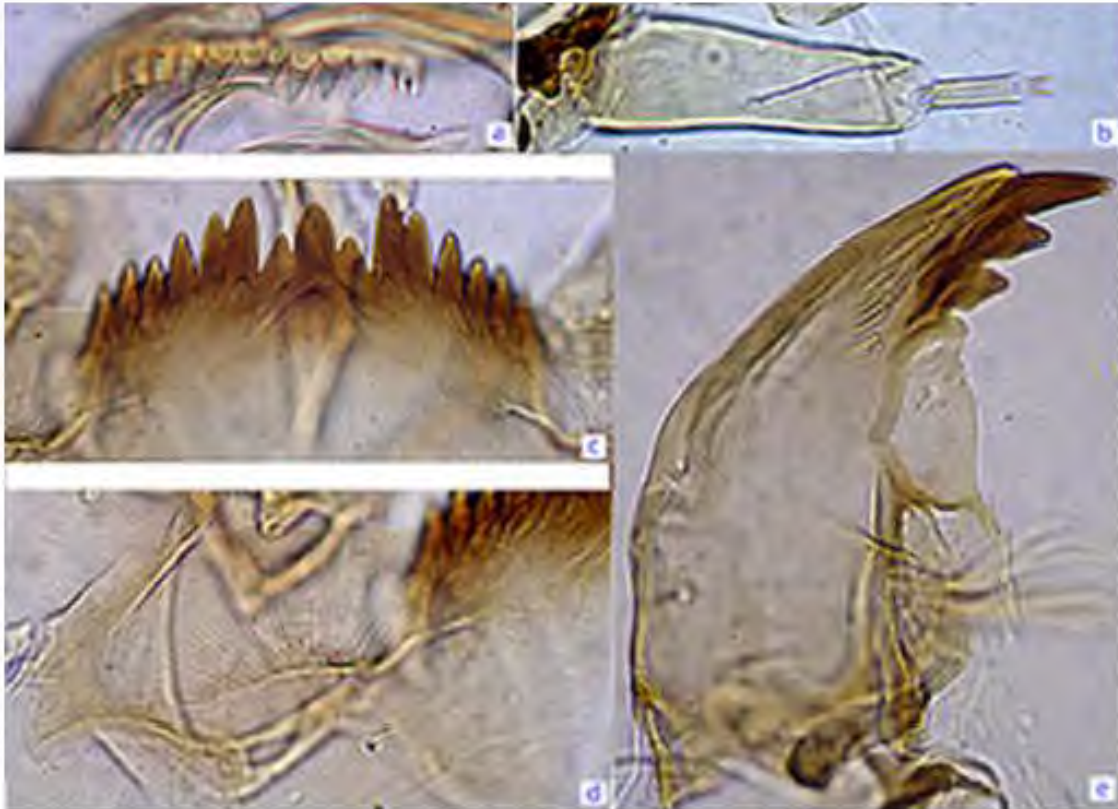
Ventromentum (Fig. d, below) with smooth anterior edge and about 38 (34-44) striae. VMR 0.24-0.32.

PE (Fig. a, below) with 12-16 teeth broad sharp teeth (type B). Premandible with outer tooth slightly longer and sharp, inner tooth blunt and 1.5-2x wider.

Distance between antennal bases generally larger than that between the S4 setae.

Antenna (Fig. b, below) with basal segment 2.8-3.8 times as long as wide, RO about one third to 2/5th up from base; AR about 2.1 (1.97-2.31); segments lengths ( $\mu$ m) 118 : 29 : 9 : 11 : 6. Distance between the antennal bases generally greater than that between the S4 setae.

Mandible (Fig. e, below) with 3rd inner tooth partly or sometimes almost fully separated, and partly darkened (type IIB), with about 13 (10-15) furrows on the outer surface at the base. PM with about 10 (9-12) taeniae.

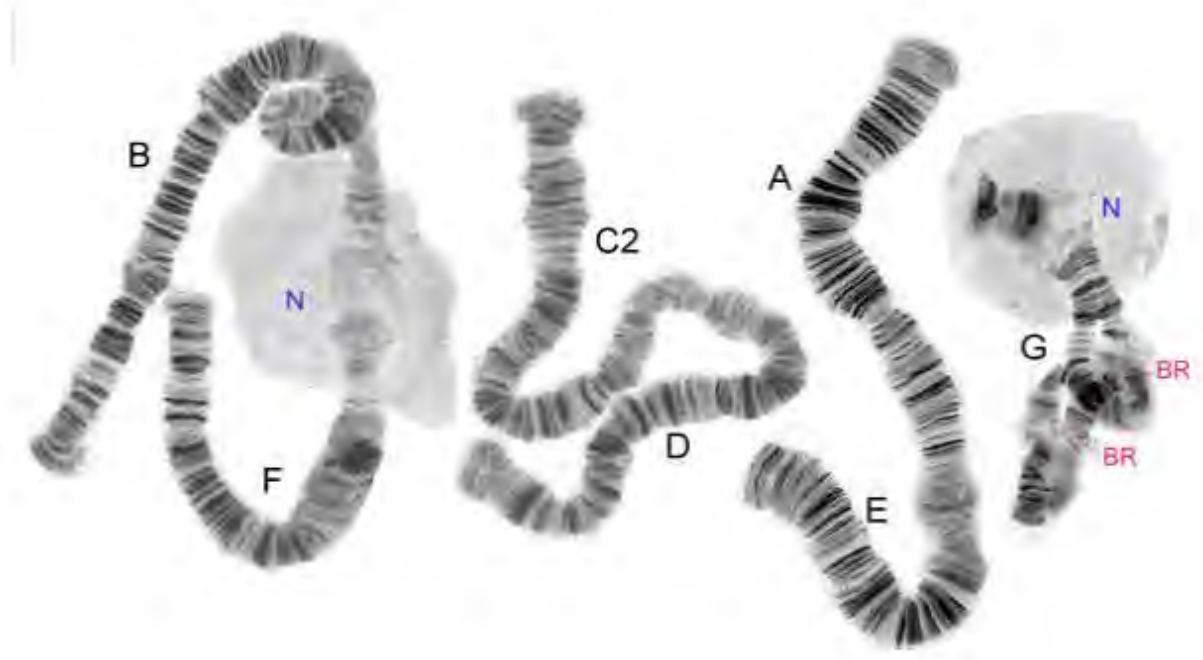


**Cytology:** Four polytene chromosomes with the pseudothummi-cytocomplex combination BF, CD, AE, G.

Nucleolus in arm F, although a nucleolus is developed subterminal in arm G of some Indian specimens, while in others it may just appear as a puff. Arm G partly unpaired at one end, with prominent BR near middle of the arm and another about one third from the other end.

Polymorphism in arms A, B, C, F and G: ArmC1 occurs in Varanasi while ArmC2 has been found at Jammu.

- ArmA1: 1 - 2, 10 - 12, 3, 9 - 4, 13 - 19 as *circumdatus* A2, *holomelas*, *ramosus*
- ArmA2: 1 - 2c, 10 - 12, 3, 14c - 13, 4 - 9, 2ed, 14d - 19 (India)
- ArmB1: Puff near centre of the arm with dark bands proximal (gps 7 - 8)
- ArmC1: Large puff often, about the middle of the arm.
- ArmC2: Inversion of about two thirds of the arm, characteristic bands near centromere  
as *ramosus*
- ArmD1:
- ArmE1: 1 - 2c, 5 - 10b, 3e - 2d, 4 - 3f, 10c - 13 as *ramosus*
- ArmF1: possibly 1 - 10, 15 - 11, 16 - 23 Nucleolus in abt region 19.
- ArmG1: Prominent BR near middle of arm, another about 1/3 from paired end.
- ArmG2: Inversion of about 1/3 of arm around the central BR.



Chromosomes described by De & Gupta (1994), as *C. niger*, as *Chironomus* species 1 by Sharma *et al.* 1990), *Chironomus plumosus* form B (although it has no relationship whatever to *C. plumosus*) and incorrectly placed in the thummi-cyto-complex, and the similarly incorrect form A (Sharma *et al.* (2004) are very likely also this species.

The question of whether this species is conspecific with *C. incertipenis* is not easy to resolve at this time, particularly since the polytene chromosome complement of that species is unknown. The two species are similar in many aspects and the comparison of the adult of *C. incertipenis* to *C. yoshimatsui* is consistent with it being a member of the “flaviplumus-group” (perhaps type C?). Many of the distinguishing features of *C. incertipenis* in the original description as *C. niger* are typical of the group, but two adult characters of *C. incertipenis* suggest it is distinct from the present species: 1. the anal point of the adult male is dark brown, cf. the more usual yellow brown of Type B, and 2. the SVo of *C. incertipenis* is described as gently curved while that of the present species is strongly curved and beaked.

**Found:** **India** - Jammu & Kashmir: Deoli Village; Farooq Nagar; Kabeer colony, Jammu; Bishnah wetlands; Gadhighargh; Sangrampur village; Univ. Jammu & Kashmir, Jammu;  
**Japan** - Kyushu: Nabikimatsu, Koge-Machi, Chikujyo-gun, Fukuoka Pref.;  
**Malaysia** – University of Malaya, Selangor (3.1295°N, 101.657°E) (BOLD)  
**Pakistan** – Islamabad (33.6863°N, 73.0763°E) (BOLD)  
**Singapore** - Bedok Canal.  
**Thailand** – Mahasarakham University, Kantharawichai District, Maha Sarakham Province (14.85°N, 103.26°E); Ban Tha Reu, Satuek District, Buri Ram Province (15.33°N, 103.56°E); Ban Keab, Kantharawichai District, Maha Sarakham Province (16.26°N, 103.22°E); Ban Khi, Chiang Yuen District, Maha Sarakham Province (16.27°N, 103.23°E).

also

**Israel** - Mt. Hermon.

It includes some of those Indian samples (besides *C. indiaensis*) that have been classed as “*C. samoensis*” or “*C. nr. samoensis*” and in the BOLD database as *C. incertipenis*.

**Molecular Sequence:**

MtCOI: A sequence from Japan and several from India are in the data of J. Martin, some of which are in the BOLD database.

The sequence indicates that this species is relatively close to the European *C. alpestris*, Goetgh.

### ***Chironomus flaviplumus* Type C**

This type was identified as *C. flaviplumus* from the Yangtze River basin in China by Chen and Zhang (GenBank 2015 – unpubl.), for which only the DNA BARCODE sequence is available. Limited information on the larva was available from Thailand (Pramual *et al.* 2016).

It is in BOLD Bin: [BOLD:AAV5954](#)

**Fourth instar larva:** The larvae of this species are a plumosus-type larva, very similar to those of *C. striatipennis*,

#### **Molecular Sequence:**

COI – GenBank accession nos. for Chinese specimens are KP902730 & -31. and for Thailand KT213029- 038. In BOLD they have 99.5% similarity to an early release sequence named as ChironomidaeGC sp. 7 from Queensland, Australia.

**Found:**            **China** – Yangtze River basin  
                         **Thailand** - Maha Sarakham; Buriram.

### ***Chironomus fujisecondus* Sasa 1985**

#### **Adult:**

Male:

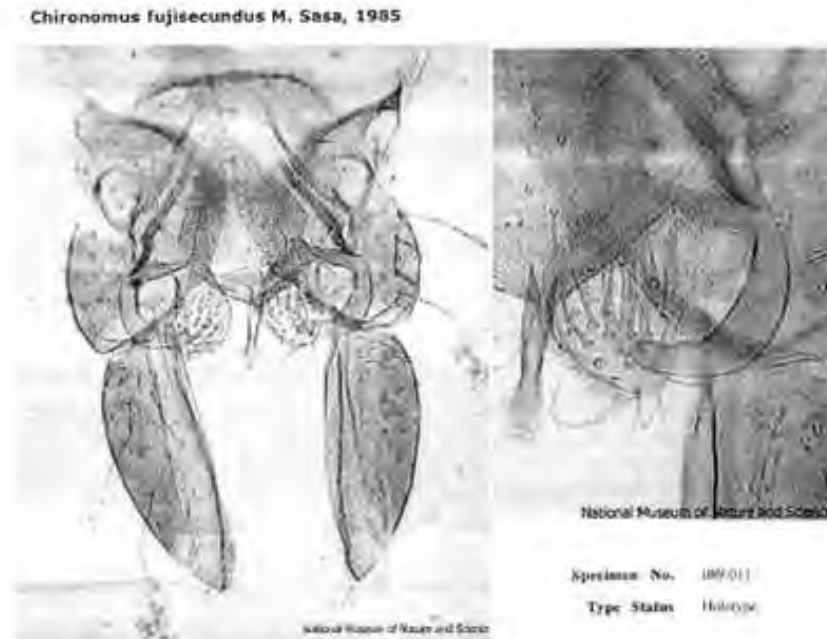
Wing length 2.54 (2.60-2.76) mm. AR 3.23 (3.04 -3.40).

Coloration largely yellow or greenish yellow and partly brown; scutum yellow stripes yellowish brown, scutellum yellow, postnotum brown; abdominal tergites entirely greenish yellow, hypopygium brown.

Thoracic setae - Acrostichal 17 (15-19); Dorsolateral 16 (12-18); Prealar 6-7; Scutellar 22 (18-28)

Legs with femur and tibia yellow but darkening to brown along the tarsi. All tarsi with long setae, BR1 5.0 (4.0- 6.2); LR1 1.31 (1.25-1.35), LR2 0.55 (0.54-0.57), LR3 0.63 (0.61-0.67); Fore tarsus 0.23 (0.22-0.24) the length of the fore tibia.

Hypopygium and SVo as in figure below; IVo almost globular Gonostylus with straight inner margin, widest at basal third and tapering towards the apex.



Male hypopygium and SVO of the holotype of *C. fujisecundus*.  
from National Museum of Nature and Science collection.

Female:

Wing length 2.86 mm. Coloration as male.

Frontal tubercles 8  $\mu$ m long, 5  $\mu$ m wide; 25 clypeal setae.

Thoracic setae - Acrostichal 25; Dorsolateral 14; Prealar 6; Scutellar 28.

LR1 1.35; LR2 0.54; LR3 0.61.

**Found:** Type locality – JAPAN: Lake Kawaguchi (35.59°N, 136.79°E) and Lake Yamanaka (35.42°N, 138.79°E), Yamanashi Prefecture.

### *Chironomus fujitertius* Sasa 1985

Valid name for the “Lowland form” of *C. nipponensis* e.g. Hashimoto 1977, Sasa 1985, Yamamoto 1988 and 2010.

Syn: *C. tsusimaabeus* Sasa & Suzuki 1999: 2.

In BOLD Bin: [BOLD:ACQ7612](#)

**Adult:** Information from Sasa 1985(b) supplemented by Sasa & Suzuki 1999..

Male

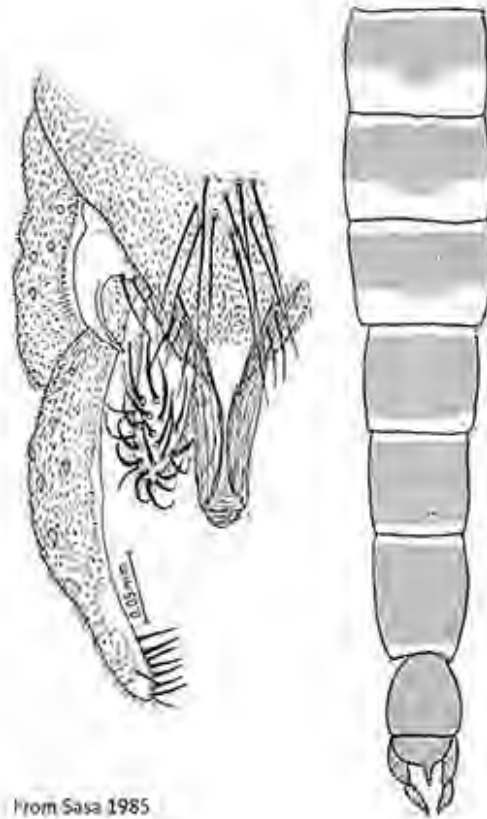
Wing length 2.25-4.84 mm; VR abt 1-1.09; 32-40 setae in squamal fringe.; AR 3.31 (3.19-3.51); VR abt 1; LR 1.79 (1.67-1.81); BR 2.9 (2.6- 3.4).

Body yellow with brown markings, scutal stripes reddish brown, scutellum yellow, postnotum brown. Abdominal markings as in figure below. Legs with femora largely yellow with a narrow apical dark ring, tibiae with a narrow apical and basal dark rings, tarsi 1-4 with apical dark band, Ta5 largely brown.

Head: AR 3.19-4.11; frontal tubercles abt 26  $\mu$ m long and 11  $\mu$ m wide. 22-56 clypeal setae.

Thoracic setae: Acrostichal 22 (12-28); Dorsolateral 25 (20-36); Pre-alar 7-8; Scutellar 30 (26-41) in double or triple rows.

Legs: LRF 1.43-1.81; BR 2.6-5.4; LRM 0.58-0.62; LRh 0.70-0.80



Ninth tergite with about 9 long central setae, not arising from defined pale areas (as in figure above); anal point with conspicuously darkened ridges. The SVo resembles that of *C. cingulatus*, so type E(g) of Strenzke (1959); setae of IVo not shown as forked. Gonostylus widest at about basal third, narrowing relatively sharply over posterior third.

Female: not described

Pupa, Larva and Cytology: not described

**Found:** Type locality –Japan: Lake Kawaguchi (35.59°N, 136.79°E) and Lake Motosu (35.77°N, 138.88°E) Yamanashi Prefecture; Kechi Dam, Tsushima Island (34.42°N, 120.33°E) Nagasaki Prefecture.

This species was incorrectly considered as a synonym of *C. nipponensis*, but subsequent study indicated that, as the “lowland form” of that species, it was a valid species (Yamamoto *et al.* 2019). There was a suggestion that this may be a synonym of *C. cingulatus*, however the molecular data of Kondo *et al.* (2016) indicates a clear interspecific difference in the BARCODE sequences of those two species.

***Chironomus fusciceps* Yamamoto 1990**

as new name for *Chironomus lugubris* sensu Tokunaga 1938, and Sasa & Yamamoto (1977).



Also called *Chironomus thmini* (misspelling of thummi?) Tokunga 1940 and *Chironomus riparius* Sasa & Yamamoto 1977.

In BOLD Bin: [BOLD:ACH4992](#)

Also includes a specimen of *C. sulfurosus* with 99.73% homology

**Adult:**

Information from Yamamoto 1990.

Male:

Coloration similar to *C. acerbiphilus* but legs and anterolateral margin of scutum paler.

AR 2.40 (2.15-2.67). Frontal tubercle about 12.5-30 µm long, 10-15 µm wide.

Palpal proportions: 52 : 62 : 164 : 164 : 208.

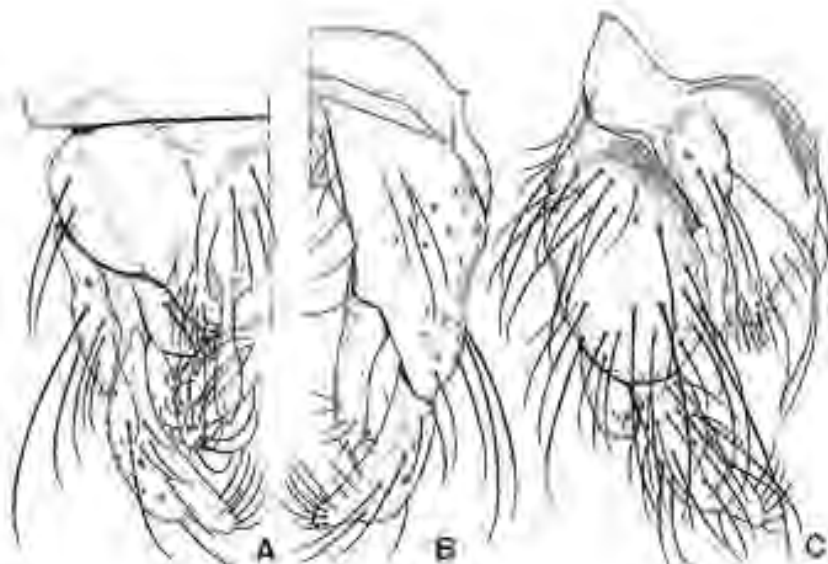
Wing length 1.8- 2.6 mm, width 0.6-0.8 mm. VR 0.91 (0.88-0.93). Squama with 10-20 setae.

Thoracic setae: Anteprenotum without setae; acrostichals 6-16; dorsolaterals 15-27; prealars 5-7; supraalar 1; scutellars 13-30 (biserial).

Leg lengths and proportions:

|             | Fe   | Ti   | Ta1  | Ta2 | Ta3 | Ta4 | Ta5 | LR        | F/T  | Ta5/Ti |
|-------------|------|------|------|-----|-----|-----|-----|-----------|------|--------|
| <b>PI</b>   | 1280 | 980  | 1460 | 730 | 610 | 470 | 270 | 1.43-1.52 | 1.31 | 0.28   |
| <b>PII</b>  | 1290 | 1100 | 570  | 340 | 270 | 200 | 170 | 0.51-0.53 | 1.17 |        |
| <b>PIII</b> | 1420 | 1260 | 800  | 450 | 380 | 240 | 170 | 0.63-0.65 | 1.13 |        |

At least 6 setae on TIX (only part shown).



*C. fusciceps* male genitalia: A. dorsal view; B. ventral view; C. lateral view.

Genitalia resembling that of *C. acerbiphilus* but S-type SVo much stouter; anal point narrower at base; SVo with 6-8 setae on base; IVo with 20-29 long recurved setae on apical half; gonostyle with 6-8 apical setae.

Female:

Coloration almost the same as the male. Cercus brown.

Head: Antennal proportions: 134 : 88 : 106 : 100 : 244. AR - 0.57; A5/A1 – 1.82

Frontal tubercle 12.5-17.5 µm long and 10.0-15.0 µm wide.

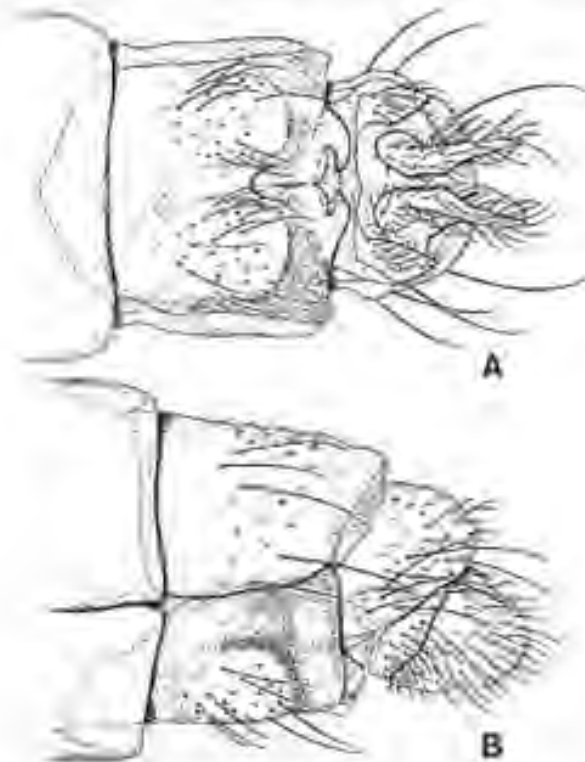
Palpal proportions (µm): 56 : 68 : 172 : 170 : 232. Vertex with 23-25 setae; Clypeus with 29-40 setae.

Wing length 2.2-2.9 mm, width 0.8-1.0 mm. VR 0.85 (0.76-0.89); squama with 14-24 setae.

Thoracic setae: acrostichals 9-18; dorsocentrals 19-34; prealars 6-9; supraalar 1; scutellars 21-41.

Leg lengths and proportions:

|             | Fe   | Ti   | Ta1  | Ta2 | Ta3 | Ta4 | Ta5 | LR        | F/T  | Ta4/Ti |
|-------------|------|------|------|-----|-----|-----|-----|-----------|------|--------|
| <b>PI</b>   | 1370 | 1000 | 1420 | 690 | 590 | 470 | 280 | 1.32-1.52 | 1.37 | 0.28   |
| <b>PII</b>  | 1360 | 1160 | 590  | 330 | 260 | 200 | 160 | 0.49-0.54 | 1.17 |        |
| <b>PIII</b> | 1460 | 1320 | 510  | 450 | 390 | 240 | 190 | 0.60-0.62 | 1.11 |        |

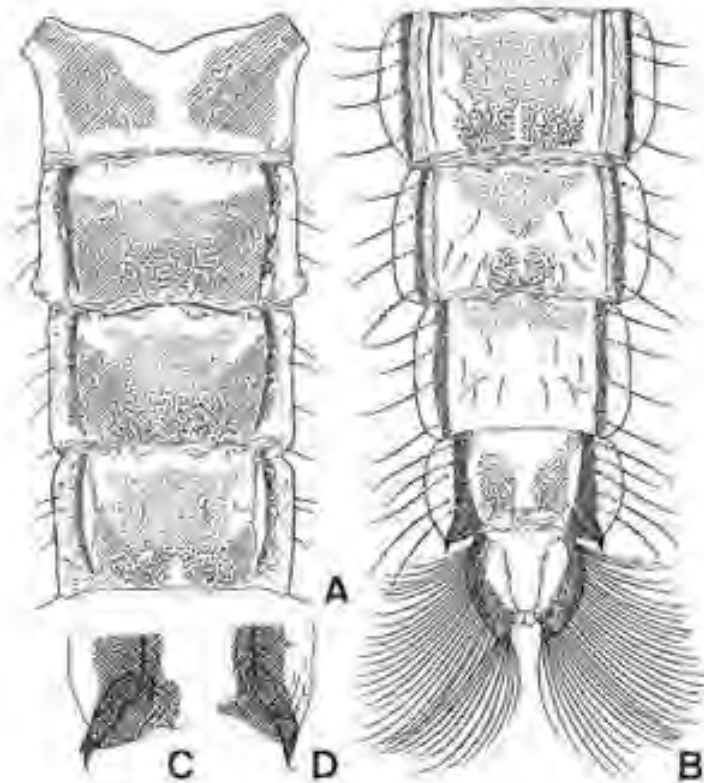


*C. fusciceps* female genitalia: A. ventral view; B. lateral view.

Genitalia almost the same as in *C. acerbiphilus*, but segment X separated from TIX by a slender membranous area. Laterosternite with 3-7 setae, Segment X with 9-18 setae.

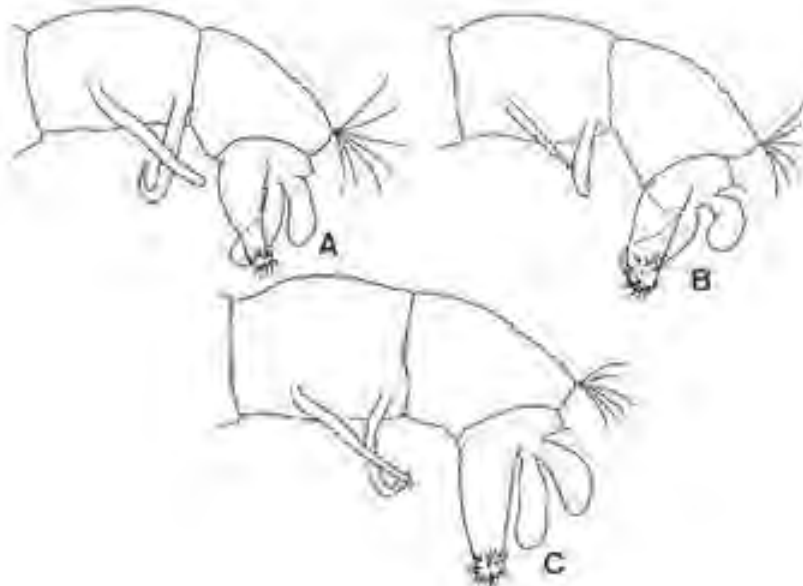
**Pupa:** Body dark brown, length 4.5-6.5 mm. Cephalic tubercles acutely pointed, with subapical spine.

Abdominal segment II with a row of about 60 hooks, pedes spurii B developed. Postero-lateral spurs of segment VIII with 1-2 spines. Chaetotaxy and shagreen as shown in his figures (below).

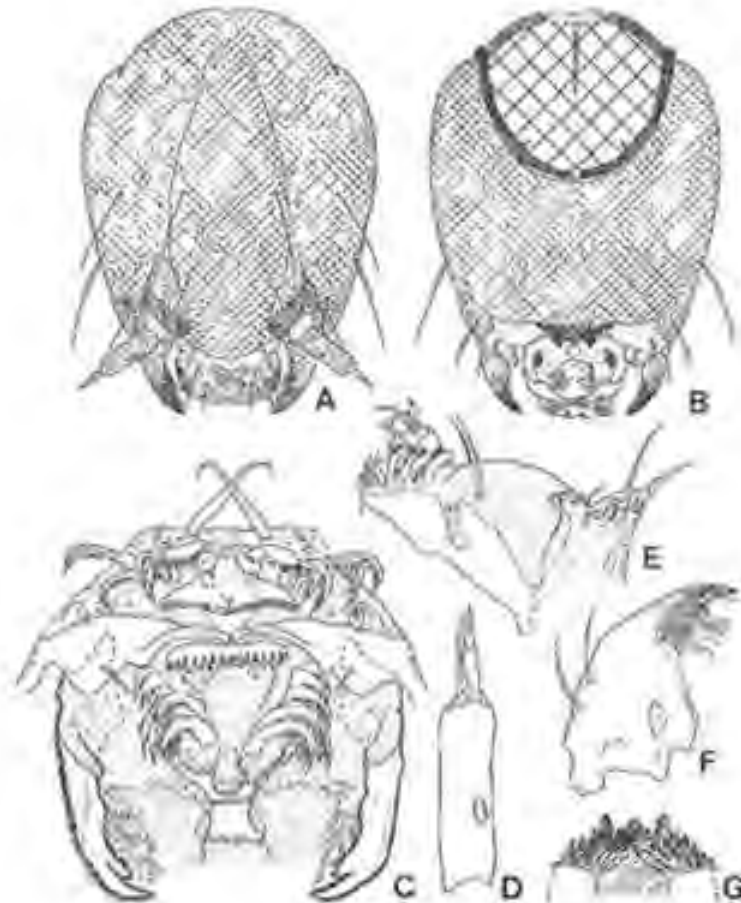


*C. fusciceps* pupal abdomen: A anterior; B posterior; C & D spurs

**Fourth instar larva:** A small (length - 10 mm) thummi-type larvae, i.e. lacking lateral tubules. Anal tubules well developed, of a single lobe, dorsal pair shorter than the ventral pair, which are about 3/4 the length of the posterior pseudopods. Head uniformly dark brown.



*C. fusciceps* posterior larval segments showing variation of ventral and anal tubules



*C. fusciceps* larval head. A. dorsal; B. ventral; C. hypopharynx; D. antenna; E. maxilla; F. mandible; G. mentum

Mentum of type I, in fact Yamamoto's illustration suggests that the 5th and 6th laterals are reduced, central tooth could be type III. Ventromentum not described and illustrated by only a vague outline, which indicates they are longer than the mentum width.

PE with about 20 uneven but pointed teeth, suggesting possibly type B. Premandible with 2 teeth, outer tooth shown as much longer than the inner tooth and only relatively narrower.

Antenna with 5 segments, relative lengths of segments: 42 : 10 : 2 : 4 : 2 ; segment A1 with a ring organ at basal 2/5. Antennal blade long, reaching the base of 5th antennal segment, accessory blade indistinct.

Distance between the S4 setae greater than that between the antennal bases.

Mandible possibly of type IIIC, furrows not illustrated or recorded; 3 spines on inner margin; PMA with 10 taeniae.

**Cytology:** no information.

**Found:** Type locality – Mount Unzen, Nagasaki Prefecture, Kyushu, JAPAN.

Also found **Japan:** - Tarutama, Kumamoto Prefecture. Kyushu.

Found in sulphur-containing water.

Noted by Yamamoto (1990) to be closely related to *C. acerbiphilus* and *C. sulfurosus*.

The adult can be distinguished from *C. acerbiphilus* by the higher LR, and the male from *C. sulfurosus* by the more slender anal point.

The larva can be distinguished from *C. acerbiphilus* and *C. sulfurosus* by the uniformly dark head capsule.

**DNA analyses:**

If correctly identified, the barcode for *C. sulfurosus* has 99.73% homology, while *C. acerbiphilus* is in a different BOLD Bin: [BOLD:AAJ4234](#).

MtCOI: there are sequences in GenBank: Accessions AB704938 and LC377640 (mined to BOLD database).

***Chironomus incertipenis* Chaudhuri & Das**

*Chironomus* species 1 Sharma *et al.* 1990

*Chironomus niger* Chaudhuri, Das & Sublette 1992: 21 (Name preoccupied by Wiedemann)

*Chironomus plumosus* form A Tripathi *et al.* 2002 (probable synonymy)

*Chironomus plumosus* form B Sharma *et al.* 2004

All morphology from Chaudhuri, Das & Sublette 1992. Many of the measurements seem unrealistic to be millimetres, as claimed.

**Adult:**

Male

Body length 5.68-6.32 mm; Wing length 2.34 (1.96-2.40) mm. Wing width 0.78 (0.68-0.82) mm. VR 1.01 (1.00-1.03). AR 3.0

Head: Vertex with 18 setae. Frontal tubercles well developed

Clypeus with 28 setae. Relative length of palpomeres 1-5: 7 : 6 : 22 : 25 : 31.

Thorax yellow with 3 dark brown vittae. Setae: Acrostichal - 17 biserial; dorsocentral – 24 biserial; prealar – 4; supraalar – 1; Scutellar – 26-28.

Legs with femora, tibia and tarsomeres 1-3 yellow, but tarsomeres with dark apex and tarsomeres 4 and 5 brown.

Leg proportions and ratios:

|             | <b>Fe</b>  | <b>Ti</b>  | <b>Ta1</b> | <b>Ta2</b> | <b>Ta3</b>    |
|-------------|------------|------------|------------|------------|---------------|
| <b>PI</b>   | 55         | 47         | 79         | 42         | 38            |
| <b>PII</b>  | 56         | 51         | 32         | 19         | 14            |
| <b>PIII</b> | 64         | 62         | 49         | 27         | 21            |
|             | <b>Ta4</b> | <b>Ta5</b> | <b>LR</b>  | <b>F/T</b> | <b>Ta5/Ti</b> |
| <b>PI</b>   | 32         | 16         | 1.67       | 1.17       | 0.34          |
| <b>PII</b>  | 8          | 6          | 0.63       | 1.10       | 0.12          |
| <b>PIII</b> | 12         | 8          | 0.79       | 1.03       | 0.13          |

Abdomen yellowish, tergites II-V with brown oval median spot. About 8-14 setae on tergite IX. SVo appears to be a D-type, but may have a beak like some members of the *C. samoensis* group. Anal point dark brown and widest at base - a diagnostic characteristic.

Female

Body length 5.61- 5.98 mm; Wing length 2.89-2.87 mm, width 0.96-1.06 mm.

Antennal segments in the ratio 8 : 5 : 5 : 6 : 11; AR - 0.46; A5/A1 – 1.38.

Genocoxapodeme VIII ovoid, Goxosternapodeme well developed and bow shaped.

Gonapophysis VIII divided into an elongated dorsomesal lobe and a stout ventrolateral lobe, apodeme lobe prominent. Postgenital plate broad. Cerci stout and finely setose.

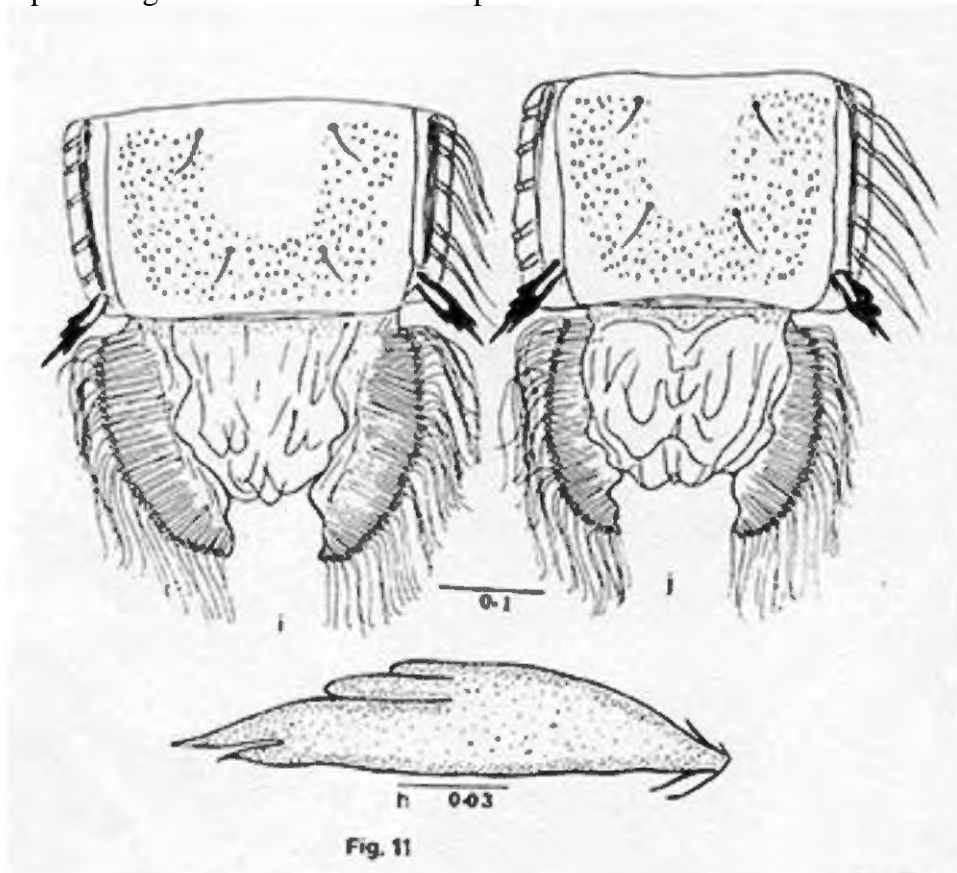
**Pupa:** Exuviae grey. Length 6.22-6.62 mm (fem.); 6.98-8.04 mm (male). Frontal tubercles 0.06-0.08 mm long and 0.080-0.087 in diameter at base.

Wing sheath 1.58-1.72 mm long. Respiratory organ with an elliptical base, 0.11 mm wide.

Abdomen with usual PSB caudolaterally on segment II and PSA on segments IV-VI. Tergite I bare, tergites II-VI with median shagreen, tergite VII with two longitudinal patches and tergite VIII with a V-shaped patch of shagreen.

About 28-40 recurved hooks posteriorly on tergite II

Caudolateral spur of segment VIII with about 4 spines.



Pupa of *C. incertipenis* from Chaudhuri et al. (1992) (as *C. niger*)

**Fourth instar larva:** A plumosus-type larva, 6.25-12.64 mm long. Gula and frontoclypeus apparently not darkened. VT illustrated as about the same length, AT as long and narrow, about 3.5 times longer than wide.

Mentum (Fig.10g) with 4th laterals hardly reduced (type I), centre trifid tooth with c2 teeth well separated (either type IIa or III).

Pecten epipharyngis (Fig.10d) with about 13 sharp teeth. Ventromentum about 0.042-0.05 wide about 3.9 times longer than the depth, figure suggests about 33 striae, finishing before the margin.

Antenna (Fig.10b) with A1 about 3 times longer than wide, RO about 0.3 up from the base; AR 1.76 (1.74-1.79); A2/A1 about 0.27; relative lengths of segments: 22.3 : 6.1 : 1.9 : 3.1 : 1.6.

Premandible (Fig.10e) with 2 unequal teeth, outer long and pointed, inner blunt.

Mandible (Fig.10f) about 0.19-0.23 mm long; third inner tooth apparently separated and darkend (type IIIC), pecten manibularis shown with 10 setae.

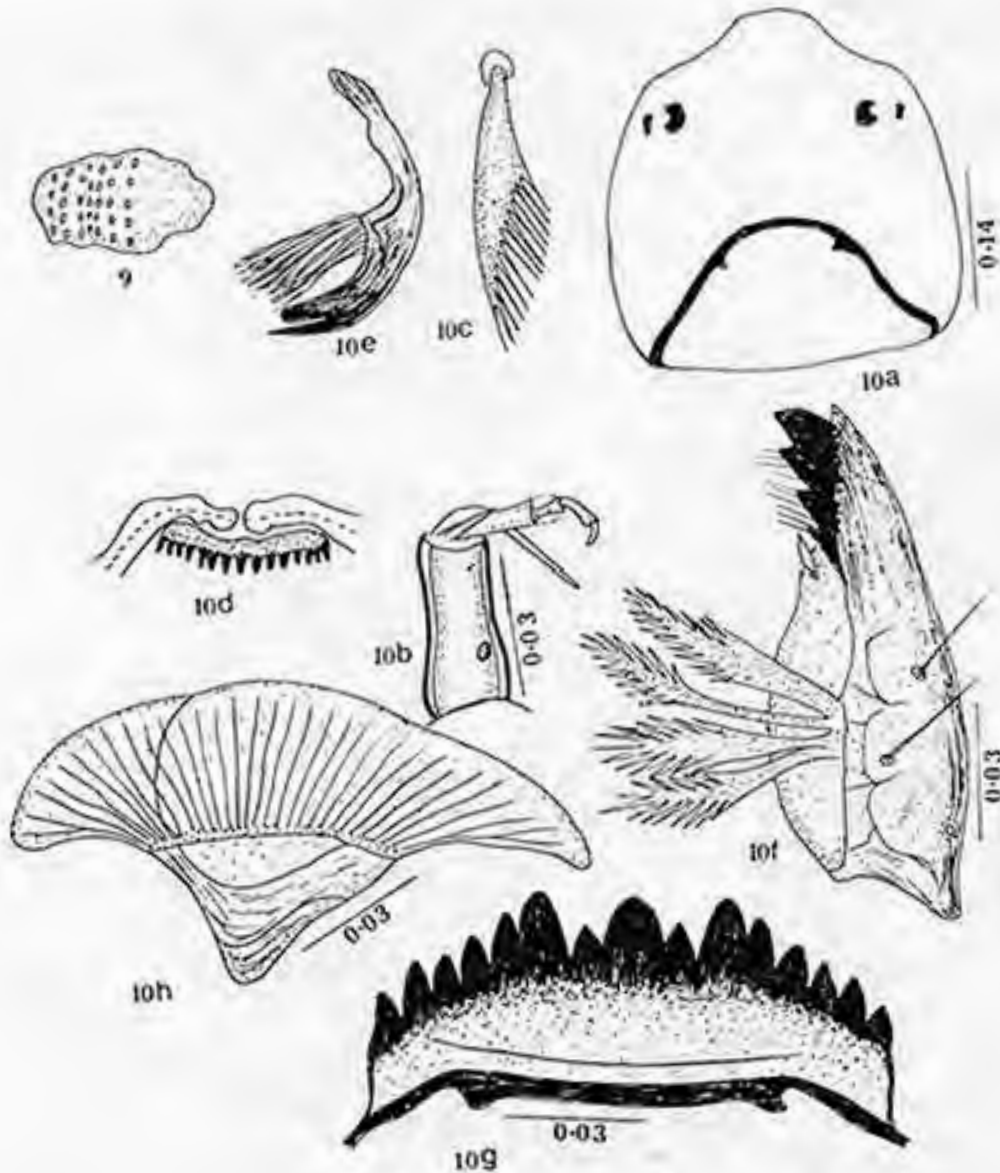


Fig. 9&10

Larval mouthparts of *C. incertipenis* from Chaudhuri *et al.* (1992) (as *C. niger*)

**Cytology:** De and Gupta (1994) described polytene chromosomes which they attributed to this species (as *C. niger*). However, as with most subsequent work claimed to be this species, they actually described *C. flaviplumus* type B. (see below).

**Found:** Type locality - Barasat, West Bengal, INDIA.

Other Indian localities: Varanasi - Banaras Hindu University.

Singapore, and Japan, but all other than type locality are probably misidentifications

All life stages described by Chaudhuri *et al.* (1992) as *C. niger*.

The original Chaudhuri *et al.* (1992) name related to the dark anal point.

***Chironomus incertipenis* Auctt.** (not Chaudhuri & Das 1996)

A widespread species from India, Pakistan, Singapore, Japan, etc., has been called *C. incertipennis*. However this appears to have been a misidentification as the adult male SVo is a different type (D-type of Strenzke rather than S-type), and the anal point is not dark as noted by Chaudhuri and Das to be characteristic in *C. incertipennis*.

See under species *C. flaviplumus* type B.

***Chironomus incertus* Kieffer 1924**

Junior homonym of *C. incertus* Walker 1856. Therefore new name required.  
Placed in subgenus *Camptochironomus*.

**Adult:** Known only from the adult male.

Male:

Description of Kieffer, largely from translation by Johannsen 1932.

Yellowish. Eyes separated by their greatest width, thin part longer than wide. Palps long, 1st segment not much longer than high, 2nd and 3rd subequal, 4th little longer than the third (current 2nd-5th segments). Scape kidney shaped, antenna broken

Thorax shining, three vittae on mesonotum and mesosternum tawny, metanotum black, halteres white. Wing hyaline, lobed, finely stippled, the cubitus forks distad of the crossvein. Legs bright (or pale) yellow, extremity of femur black, fore tibia black with a dark yellow preapical band, last two or three segments of the mid a hind tarsi dark, middle and hind tibiae each with two spurs, the one on the small combs as long as the one on the large combs. Pulvilli also as long as the empodium, a little shorter than the claws, with numerous median branches. Tergites with a large dark spot.

Hypopygium dark brown, formed as in *Camptochironomus*, except the ninth tergite; terminal segments curved on the outside, free to the medial side whose distal third has fine hairs; SVo yellowish, curved, glabrous barely exceeding the GS, most of the distal two thirds is very slender and ending in a point, proximal third more than twice as wide and bearing on medial side five long aligned bristles; IVo linear, with just over half the width of the terminal segment, then reach the final third their surface pubescent, the distal half has large dorsal setae, long and curved; ninth tergite yellow, formed as in *Chironomus*, the anal point black, reflexed at tip. L. 5 mm.

**Found:** Type locality – Buitenzorg, Java, INDONESIA

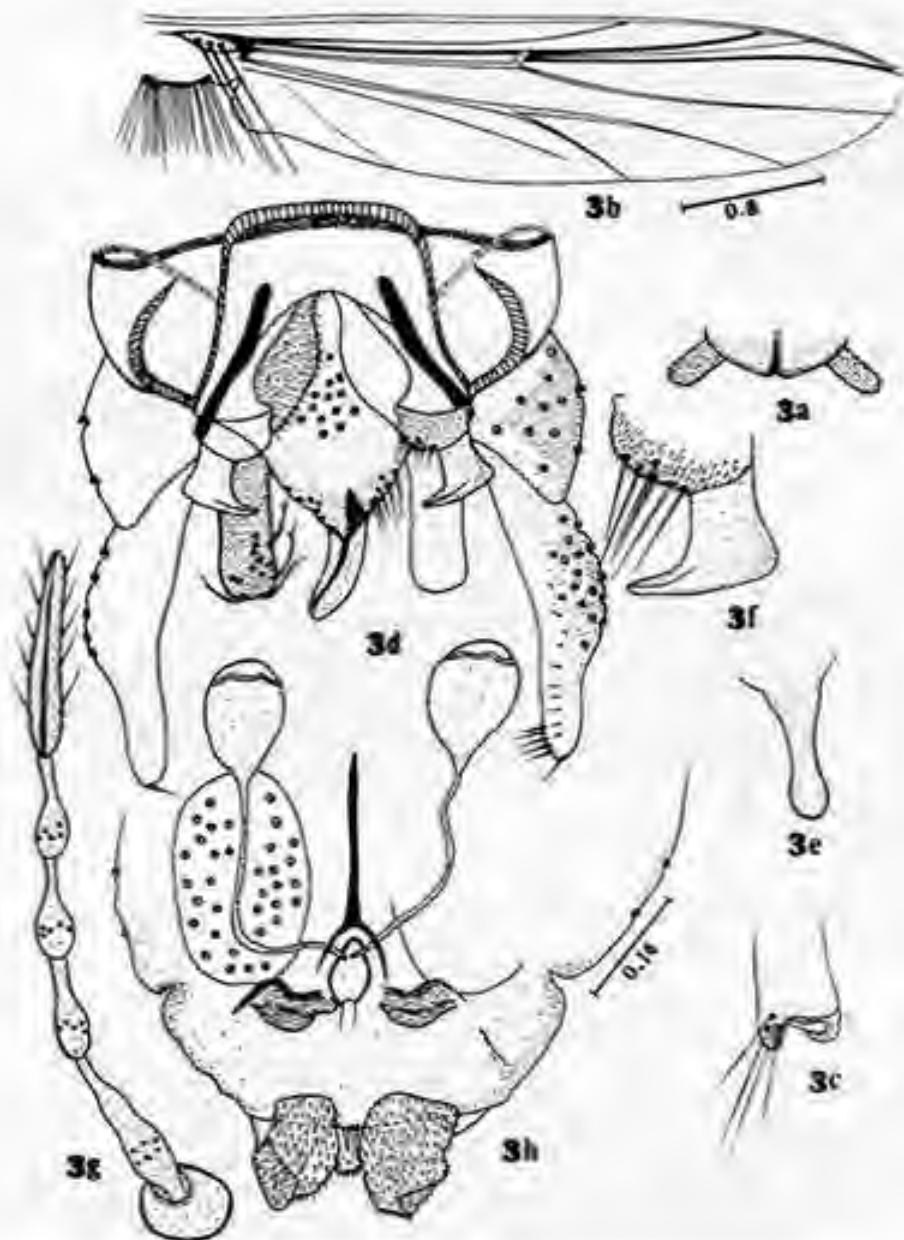
***Chironomus indiaensis* Martin 2011**

New name for *Chironomus samoensis* sensu Chattopadhyay *et al.* 1991

Description and metrics based on Chattopadhyay *et al.* (1991)

**Adult:**





Adult of *C. indiaensis* from Chattopadhyay *et al.* (1991) (as *C. samoensis*)

Male: Wing length 2.53-2.58 mm, wing width 0.73-0.76, VR 1.02. AR 2.99.

LR 1.41

Brownish species; yellow thorax with brown vittae, abdomen light brown to brown with median grey spots on segments II-VI. Legs yellow.

Head: Frontal tubercles present, abt 180  $\mu$ m; abt 23-25 clypeal setae

Palpal proportions (arbitrary units): 10 : 12 : 59 : 61 : 81.

Thorax: Setae - Achrostical 14; dorsolateral 11-12; prealar 6; scutellar in two or three rows, ant. row 9-10 small setae, post. rows 10-12 long setae.

Leg proportions (arbitrary units):

|             | <b>Fe</b>  | <b>Ti</b>  | <b>Ta1</b> | <b>Ta2</b> | <b>Ta3</b> |
|-------------|------------|------------|------------|------------|------------|
| <b>PI</b>   | 42         | 39         | 55         | 30         | 26         |
| <b>PII</b>  | 45         | 38         | 24         | 13         | 8          |
| <b>PIII</b> | 49         | 50         | 35         | 20         | 15         |
|             | <b>Ta4</b> | <b>Ta5</b> | <b>LR</b>  | <b>F/T</b> | <b>BR</b>  |

|             |    |    |      |      |      |
|-------------|----|----|------|------|------|
| <b>PI</b>   | 23 | 11 | 1.41 | 1.08 | 2.44 |
| <b>PII</b>  | 6  | 4  | 0.63 | 1.18 |      |
| <b>PIII</b> | 9  | 5  | 0.70 | 0.98 |      |

AntTa5 about 0.28 of Ti.

Hypopygium with stout anal point, 5-6 basal setae, about 13 setae on tergite IX. SVo a boot or shoe shape (S-type of Strenzke); IVo with 13-15 bifid or trifid setae.

Differs from *C. samoensis* where the frontal tubercles are longer (33-38 micron); the LR is greater (1.82-1.96); and the fore Ta5 is relatively longer (0.35-0.4 of the length of fore Ti).

Female:

Wing length about 2.79 - 2.83 mm, wing width 0.76-0.77. AR 0.39.

Antennal proportions: 13 : 9 : 8 : 8 : 15.

The description of the female of this species does not mention the unusually long foreTa4 noted by Tokunaga (1964), which appears to be characteristic of *C. samoensis*.

**Pupa:** Length 6.51 (5.99-6.61) mm in males, 7.21 (7.01-7.53) in females. Colour brown, but pupal exuviae pale brown. Frontal tubercles 75 µm long and 57 µm wide at base, subapical seta 39 µm long.

Thorax rugose, wing sheath 1.69 mm long.

About 84-96 hooklets on tergite II, tergites II-VII with median shagreen, tergite VIII with 2 median patches of shagreen. PSA caudolateral on segments IV-VII, PSB caudolateral on segment II. Tergite I bare, tergite II-VII with median shagreen, tergite VIII with 2 median patches of shagreen.

Caudolateral spurs of segment VIII with 2-4 spines.

**Fourth instar larva:** a small to medium plumosus type (8.41-9.83 mm), with anterior VT shorter than posterior pair; anal tubules tubular, about 340µm long.

Head capsule described as brown, but only mention of darkening is on the occipital margin.

Antenna with basal segment about 2.7 times longer than wide, RO only about a quarter up from base; AR 1.86; blade 390 µm, accessory blade 150 µm long; ratio of antennal segments (micron): 80 : 25 : 9 : 6 : 3.

Mentum shown as type I-II, i.e. 4th laterals appear slightly reduced, but laterals noted as gradually reducing in size.

PE with 14 teeth. Premandible with outer tooth longer.

Mandible shown with 3rd inner tooth only partially separated and pigmented.

The most obvious difference from the larva of *C. samoensis* is that antennal segment A4 of that species is longer than A3, while the relative lengths are reversed in this species.

**Cytology:** - not known.

**Found:** West Bengal – Berhampur, Farakka, Burdwan,

No type has been designated, but the specimens are stated to be in the National Zoological Survey of India, Calcutta; the British Museum (Natural History), London; and the United States National Museum, Washington, D.C.

***Chironomus javanus* Kieffer 1924**

Syn.: *Chironomus daitocedeus* Sasa & Suzuki, 2001 (Yamamoto, unpubl.)

*Chironomus prasinellus* - Tokunaga 1940 (misidentified)

*Chironomus vitellinus* Freeman 1961 (Chaudhuri *et al.* 1992)

Yamamoto (2002) has suggested that this species should be in a separate subgenus *Austrochironomus*, as type of the subgenus. There is some doubt as to whether this publication meets the requirements for a valid description.

In BOLD Bin: [BOLD:AAG6924](#)

**Adult**

Kieffer's original description of *C. javanus*.

**Female.** Yellow. Eyes separated by not more than their terminal width, gradually thinning at the top. Palps long, brownish black, 4<sup>th</sup> segment matching the previous two segments combined, 2<sup>nd</sup> shorter than 3<sup>rd</sup>, 1<sup>st</sup> much longer than wide [these are actually segments 2–5]. Antenna 2<sup>nd</sup> segment narrowed in the middle, the neck a little longer than wide, the rest broken. Metanotum, three short bands, mesonotum and mesonotum reddish. Halteres light green. Wing whitish, not distinctly stippled, veins a whitish yellow, crossvein and base of the cubital black, cubital arched, ending very near the tip of the wing. Legs light green, fore tarsus long and thin, white, both ends of segments 1-4 deep black, 5<sup>th</sup> slightly clouded, pulvilli a little wider, with long hairs, not exceeding the middle of the crotchets, hardly shorter than the empodium, probably branched four hind tarsi broken; fore femur much longer than the tibia, the latter and the tarsal segments are  $2 : 3 \frac{2}{3} ; 2 : 1 \frac{1}{2} : 2 : \frac{3}{4}$  [i.e. LR = 1.80], the 4<sup>th</sup> segment is longer than 3<sup>rd</sup>, the four hind tibiae have confluent combs which occupy two thirds of the circumference, the two spurs short. Abdomen a bright green, unmarked. L. 4 mm.

**Male.** Pale yellow, abdomen spotless, four bands on mesonotum, metanotum and mesosternum fawn, red scape, flagellum broken. Wing as female. Legs white, distal end of tarsomeres 1-4 and 5<sup>th</sup> tarsal segment black. Anterior tarsus broken. Eyes separated by 1.5 times their terminal width. Terminal articles of the genitalia ('pince') arcuate, the distal half suddenly narrowed in a straight beak, glabrous, having only one third of the width of the proximal half and carrying on the distal half of the medial side straight six large rigid bristles. Superior appendages very thin, glabrous, linear, reaching the end of the basal article (gonostylus), weakly curved and ending in a point; inferior appendages large, pubescent, just exceeding the gonostylus and bearing dorsally the usual long and thick curved setae. Anal point long and thin. L. 4.5 mm.

Male:

A yellowish-green species with dark bands on the tarsi and darkening of the cross veins of the wings.

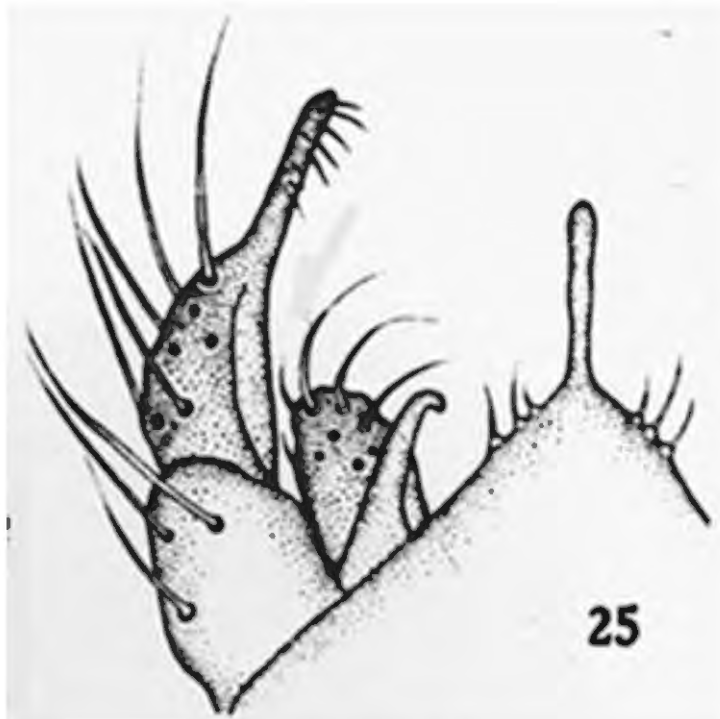


Illustration of the hypopygium of *C. javanus*  
From Johannsen (1932)

Thorax yolky colour, dull with practically no pruinosity. Abdomen without dark markings but with strong pruinosity at the incisures and on segments 5 and 7. Anal point of male narrow. Freeman (1961) quotes the AR as about 4.5, but in other populations the AR is quoted as lower (2.9-3.82 (Tokunaga 1964; Chaudhuri *et al.* 1992)).

Wing length 2.07-3.0 (2.75) mm, width 0.56 - 0.73 (0.62) mm; VR 1.05-1.08.

Head Frontal tubercles about 30µm; about 17-21 clypeal setae;

Palpal proportions (segs. 1 - 5) (µm): 60 : 60 : 185 : 220 : 330

Thoracic setae: acrostichals abt 10, but often not evident; 6-14 dorsolaterals; 2-4 prealars; scutellars abt 8, often not evident.

Wing Hyaline, brachiolum with 2 SCf; squama with 8 setae.

Leg proportions and ratios (microns):

|             | <b>Fe</b>  | <b>Ti</b>  | <b>Ta1</b> | <b>Ta2</b> | <b>Ta3</b> |
|-------------|------------|------------|------------|------------|------------|
| <b>PI</b>   | 1215       | 1050       | 1120       | 955        | 840        |
| <b>PII</b>  | 1305       | 1120       | 725        | 375        | 280        |
| <b>PIII</b> | 1445       | 1445       | 1120       | 605        | 470        |
|             | <b>Ta4</b> | <b>Ta5</b> | <b>LR</b>  | <b>F/T</b> | <b>BR</b>  |
| <b>PI</b>   | 770        | 350        | 1.6-1.8    | 1.15       | 2.1-2.5    |
| <b>PII</b>  | 185        | 140        | 0.60-0.64  | 1.16       | -          |
| <b>PIII</b> | 300        | 160        | 0.70-0.77  | 1.00       | -          |

Hypopygium with long tubular anal point, SVo well developed and curved, IVo with 12 -14 incurved setae.

Female

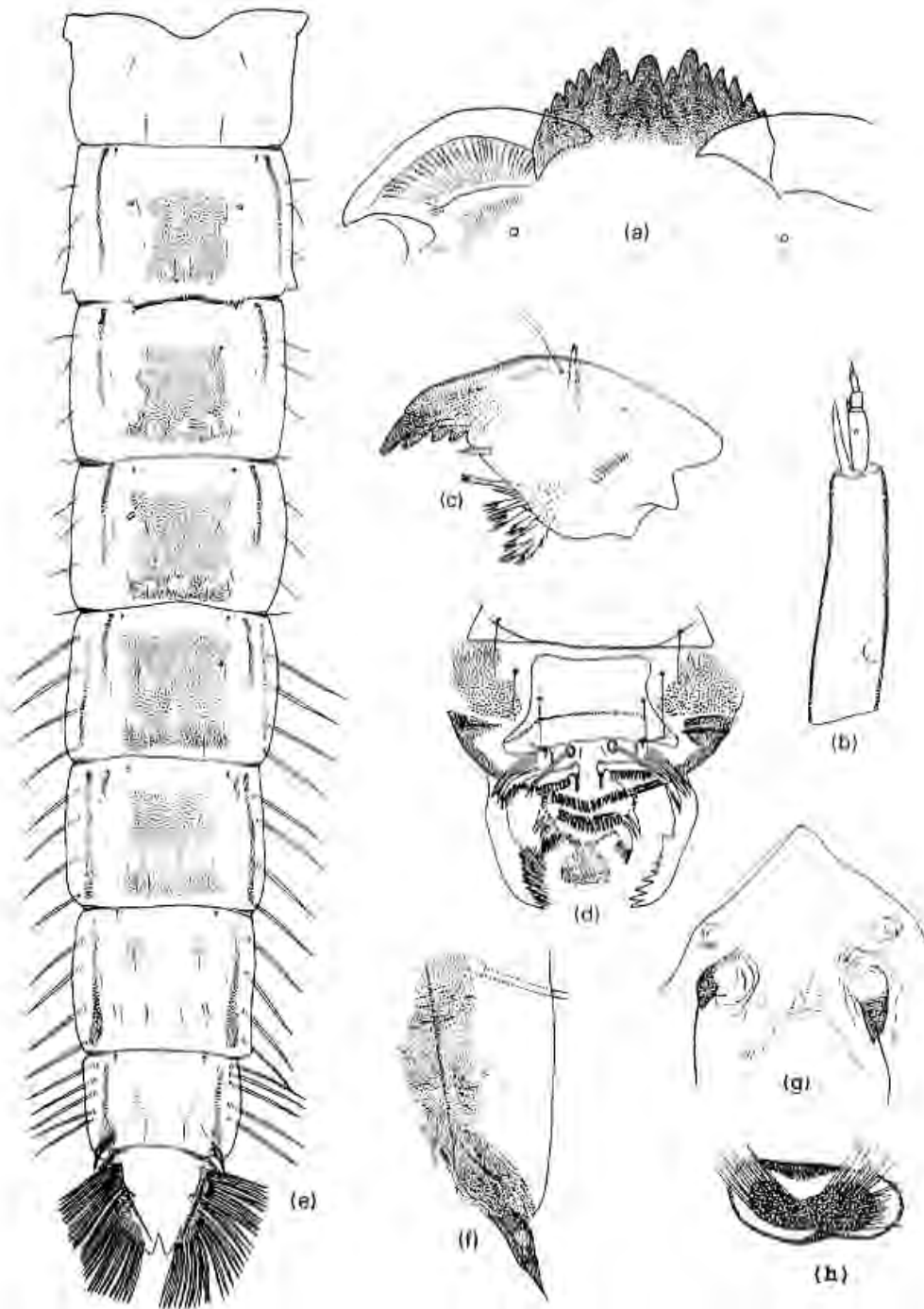
Body length 3.57 - 3.89 (3.69) mm. Wing length 2.08 - 2.93 (2.57) mm; width 0.66 - 0.96 (0.83) mm.

Thoracic setae: acrostichals 20-26.

**Pupa** has been described by Chaudhuri *et al.* (1992), and also illustrated by P.S. Cranston in his Electronic Guide to Chironomidae of Australia, as *C. vitellinus* (below):

Length: Male 6.38 – 6.70 (6.40) mm; female 6.90 – 7.14 (7.01) mm (6 – 7 mm in Lenz 1937). Exuviae grey. Frontal tubercles 0.10-0.11 long and 0.06-0.07 in diameter, subapical seta 0.09-0.10 long, i.e. about as long as the tubercles. Respiratory base about 0.11-0.14 wide. 2 pairs of precorneal setae.

Abdomen with PSA caudolateral on segments IV-VI, PSB basolateral on segment I and caudolateral on segment II, which also bears a caudal row of about 66-70 hooks.



CHIRONOMINAE: Chironomini: *Chironomus vitellinus* Freeman. Larva: (a) mentum, (b) antenna, (c) mandible, (d) dorsal head; Pupa: (e) tergites, (f) posterolateral spur, (g) ocephalic area, (h) base of thoracic horn.

Reproduced from Cranston's Electronic Guide to Chironomidae of Australia, (with permission)

**Fourth instar larva:** Medium sized plumosus-type larva (length fem. 9.3-13.7 mm (11), male 13.0 mm (1) ), although PLT (about 380 micron long) are more ventrally placed than in other species. Chaudhuri et al. (1992) show the VT arising very close together, but this is not

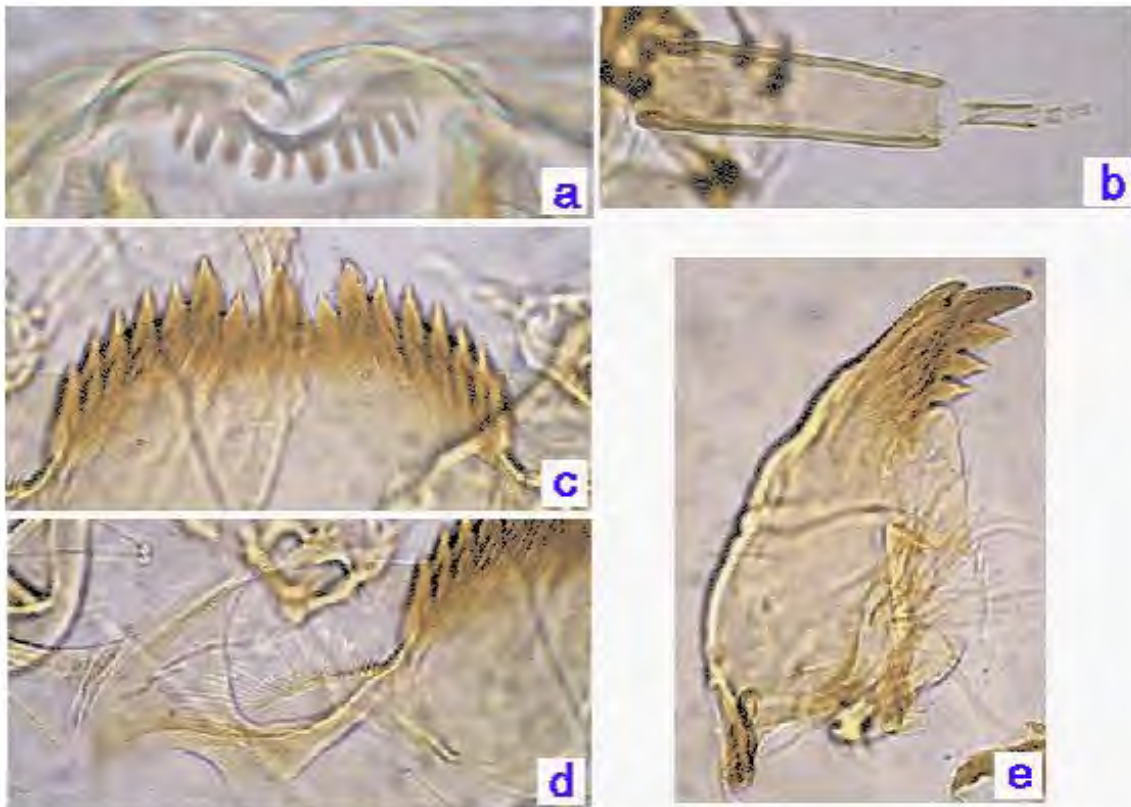
normal in this species from other countries. Anal tubules variable across distribution from about 220-425 microns long, and 3-3.6 times longer than wide with median constriction. Gula pale or slightly darkened on posterior third; frontoclypeus generally not darkened. Mentum (c, below) with the central trifid tooth set below the 1st laterals, and the c2 teeth markedly separated from c1 tooth (type III) and pointed towards it; 4th laterals at most slightly reduced (type I).

PE (a, below) with about 12-13 often irregular teeth. Ventromentum (d, below) with about 27-28 striae.

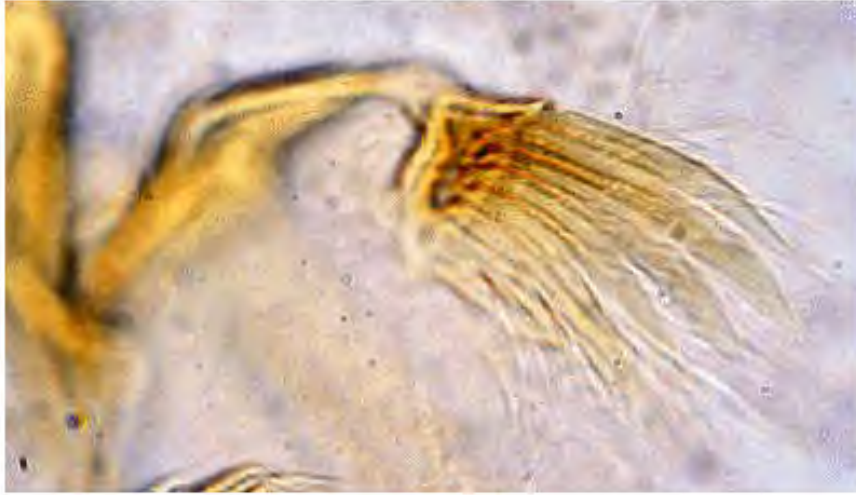
Antenna (b, below) with the basal segment about 4 times as long as wide; AR about 2.4; ratio of segments 125 : 29 : 6 : 9 : 5.

Distance between S4 setae slightly larger than with between antennal bases.

Mandible (e, below) with third inner tooth darkened and completely separated (type IIIB), with three spines on inner margin, and about 12 - 13 striae at the base.



The larva is most readily recognized by the unusual premandible, which has 6 (as illustrated by Chaudhuri *et al.* (1992) for Indian specimens) or 7 (as illustrated below) teeth rather than the usual two. However, specimens have been described from Malaysia and Singapore (e.g. Kuvangkadilok 1969) where the premandible has a normal premandible with only two teeth.



Some larval characters have been illustrated by P.S. Cranston in his Electronic Guide to Chironomidae of Australia, as *C. vitellinus*. These are reproduced here (with permission).

**Cytology:** Four polytene chromosomes with the thummi-cytocomplex combination, AB, CD, EF, G. Subterminal nucleolus in arm G, with prominent BR about one third from the other end. Dr. Midya has an alternative species from India identified as *C. javanus*.

javA1:

javB1: Puff (gp. 7) about one third from distal end of the arm with dark bands distal.

javC1:

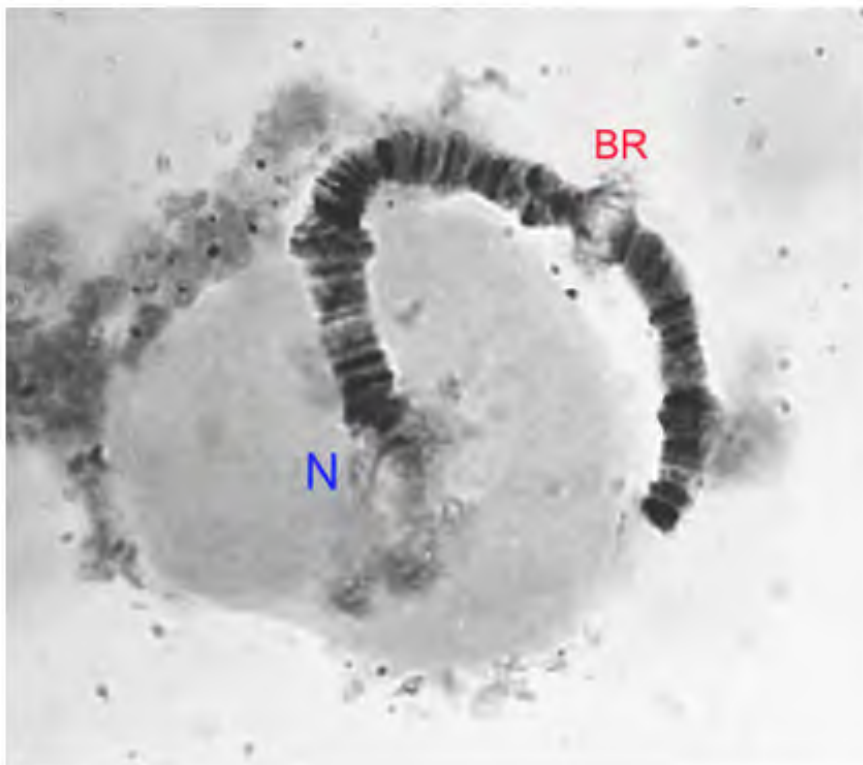
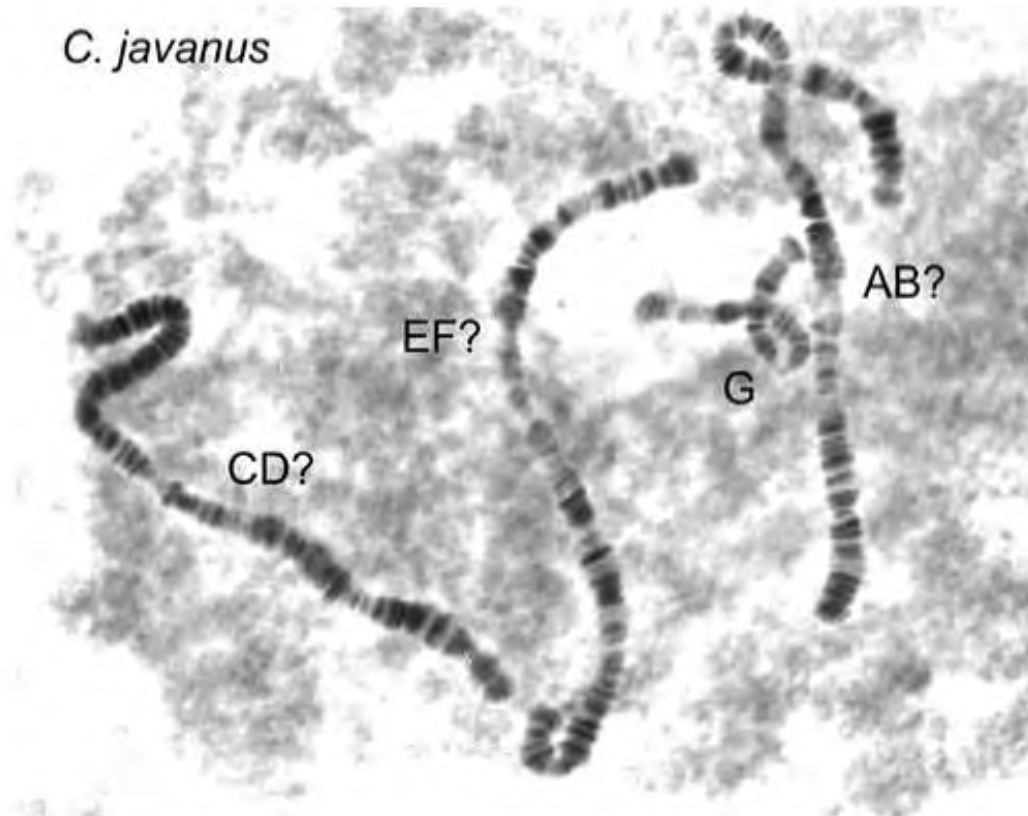
javD1:

javE1:

javF1:

javG1: Nucleolus subterminal, BR about one third from other end; closely paired.





**Molecular:** The mitochondrial *cox1* barcode sequence is available in GenBank (Accession number DQ648203) for a specimen from Japan.

**Found:** Type locality - **Buitenzorg, Java, INDONESIA.** also **Sumatra** (Johannsen 1932).

**India** - Jammu & Kashmir: University of Jammu Campus (32.73; 74.87).

**Japan** - Shizuoka, Shizuoka Prefecture, Honshu (34.989; 138.38).

**Malaysia** - Minden (5.13; 100.13) and Bukit Merah Rice Res. Stn, Permatang Pauh, Penang; Tregganu.

Thailand - Ban Bangkanark, Chachoengsao Province; San Pa Tong Rice Experimental Station, Amphoe San Pa Tong, Chiang Mai Province; Ban Mae Kachiang, Amphoe Wiang Pa Pao, Chiang Rai Province (Hashimoto *et al.* 1981)

**Other regions:**

Fiji - Viti Levu

Melanesia - Caroline Islands and Marshall Islands.

Central Africa - Blantyre, Malawi.

Australia - Manning River, Kundibakh, New South Wales; Darwin, Northern Territory (type locality of *C. vitellinus*); Mareeba; Sarina; and 3 km w. Sarina Beach, Queensland.

Papua New Guinea - Mafulu (1200 m), Lae-Goroka Road, Eastern Highlands Province; Sogeri, Central Province

Broadly distributed through India, south east Asia, the Pacific regions and Africa, in rice paddies and small temporary water bodies, even sewage works.

The adult male was described from Thailand by Hashimoto *et al.* (1981), and all stages for India by Chaudhuri, Das & Sublette (1992). The cytological description given here is based on Australian, Papua New Guinea and Japanese specimens. Includes species PK3.

***Chironomus javanus* (sensu T. Midya)**

**Fourth instar larva:** Not seen. This may be the larva with a standard *Chironomus* premandible (e.g. Kuvangkadilok 1969)

**Cytology:** Four polytene chromosomes with the pseudothummi-cytochrome combination BF, CD, AE, G. Nucleoli in arms C (or D?) and A. Arm G subacrocentric and closely paired, with a BR near the centre of the chromosome and another near the distal end. No reported polymorphism.

**Found: India:** Calcutta area.

***Chironomus kiensis* Tokunaga 1936**

As currently used, this name is a junior synonym of *C. striatipennis* Kieffer 1910 (Pramual, Simwisat & Martin 2016 (see under that species)). The location of type material is not recorded, so it is not certain whether the original specimens are identical to those currently recognized, since morphological and DNA data from Japan and Korea does indicate the presence of a second species with similarly patterned wings.

However, considering the extensive use of the name for specimens of *C. striatipennis*, it is recommended that the name NOT BE USED, as its application to a different taxon would only cause further confusion.

Several names have been synonymised with *C. kiiensis*, but these are either synonyms of *C. striatipennis* or distinct species:

*Chironomus calipterus* - misidentification in Bugledich et al. 1999., and other authors.

*C. pallidinubeculosus* Tokunaga 1964 - incorrect synonymy by Hashimoto *et al.* 1981, as this is a distinct species with similarly patterned wings.

In Bold Bin: BOLD: [BOLD:ABZ2474](#)

i.e. the same Bin as *C. striatipennis*.

Tokunaga's original description of the male is given here for information:

## Adult.

### Male

*CHIRONOMUS (CHIRONOMUS) KIIENSIS* sp. n.  
 This species is commonly found at Seto and formalin are often captured at light ashore in summer.  
*Male*.—Body slender, ground color yellow, about 5 mm long.  
 Frontal tubercles present, small; antennae 12-segmented, brown; second antennal segment yellow, but its distal end brown; antennal ratio about 3.2 to 3.3; maxillary palpi distinctly 4-segmented (3 : 7 : 7 : 11); last maxillary palpal segment yellow; prothorax with many long brown setae.  
 Scutum with distinct reddish brown vitta; median vitta with a longitudinal, pale median line; pale posterior region of the scutum with a fine, dark, median line; scutellum yellow, setigerous, its lateral margins brown; sternal side of the mesosternopleteron reddish brown; mesonotopleteron, mesonotoplemeron, and mesosternoplemeron each with a reddish brown spot near base of wing articulation; supra-alar setal group represented by five to seven small setae.  
 Abdomen slender, yellowish; first tergum with two pairs of brown stripes: mesal pair small and lateral pair long and oblique; second to fourth terga each with a median I-shaped brown stripe; following three terga entirely brown, stripes being obscure, each with a brown V-shaped chitinization on its meson. Hypopygium (Plate 3, fig. 23) brown, setigerous; ultimate tergum with a small, oval, setigerous plate and V-shaped chitinization on meson; its caudal setae near basis of anal point slender; anal point strongly chitinized, bare, curved ventrad, not trilobed apically; coxites slightly constricted, each with five slender setae on its ventromesal ridge; styles distinctly narrowed on apical one-third, each provided with six, small, strong setae on apex and about thirteen, small, slender setae on ventral ridge of style; dorsal appendages large and slender, not extending to tip of anal point, bare, strongly curved ventrad, each with a few setae on its basal pubescent area; ventral appendages large and straight, extending far beyond middle of styles, provided with many, strong, recurved setae and a few slender setae on apical one-third.

Legs yellow in ground color; coxae and trochanters brown; femora each with a distinct brown ring just before distal tip; two distal segments and distal ends of three proximal segments of each tarsus reddish brown; forelegs without tibial spurs; each tibia of the middle and hind legs provided with two basally fused combs, which occupy about three-fourths the circumference of tibial end; two tibial combs each provided with a small spur; five tarsal segments have the following proportional lengths: 80 : 45 : 30 : 24 : 12; leg ratio 1.7 to 1.8; claws simple; empodium slender, setigerous; pulvilli large, padlike, setigerous, extended distad far beyond middle of claws.

Wings slightly clouded; two elongated nebulae in cell  $R_{5+6}$ , a narrow nebula in cell  $M_2$ ; along vein  $M_{1+2}$ , narrow nebulae along veins  $M_{3+4}$ ,  $Cu_1$ , 1A, and 2A; r-m distinctly darkened; fCu beyond the crossvein;  $R_{2+3}$  extended closely along  $R_1$ , ending slightly distad of the end of  $R_1$ ;  $Cu_1$  and 1A slightly sinuous on distal parts;  $R$ ,  $R_2$ , and  $R_{3+4}$  brown, setigerous. Halteres yellow.



Original description of *C. kiiensis* male from Tokunaga 1936

Tokunaga's illustration suggests the SVo is similar to that of the other members of this group, i.e. an E-type, perhaps closest to fig. h of Strenke (1959), but end more sharply curved.

**Molecular:**

**MtCOI:** Barcode sequence attributed to this species exists for a number of specimens from a number of areas, and falls into 3 groups. The majority of sequences refer to *C. striatipennis*, but there are four sequences in GenBank that differ from them by about 9%. These may be *C. kiiensis*, but note caution above.

The GenBank accession numbers are: JQ350720 (Korea), AB740240 (Ibaraki, Miho, Yogoiri headrace), AB838642 (Japan), AB838644 (Japan).

**Found:** JAPAN - Seto, Wakayama Prefecture (**Type locality**)

***Chironomus (Chaetolabis) macani* Freeman 1948**

Redescribed from Japan by Yamamoto 1987 as *Chaetolabis macani*.

Males lack tarsal beard of European specimens.

**Found:** JAPAN – Hosooka, Kushiro, and Kayanuma, Kawakami, both Kushiro-county.  
ENGLAND – Three Dubs Tarn, Hawkshead, Lancashire (**Type locality**).

***Chironomus mayri* Majumdar, Mazumdar & Chaudhuri 2009**

**Adults**

Male

Wing length 2.1-2.3 mm. AR 1.99. LR 1.7. BR 2.3

Head brown. Palp proportions (segs 2-5): 112 : 96 : 128 : 192. Clypeus with 6-8 setae.

Thorax yellow. Setae: acrostichal 10-12; dorsocentral 12-14 uniserial; prealar 4-6, scutellar 18-20 biserial. Postnotum pale.

Wings with 2 SCf on brachiolum and 14 setae in squamal fringe.

Legs yellow to light brown, 5th tarsus darker.

Leg lengths and ratios. The published figures claim to be in micron, but appear to be only 1/10 of the correct micron values (below):

|             | <b>Fe</b> | <b>Ti</b> | <b>Ta1</b> | <b>Ta2</b> | <b>Ta3</b> | <b>Ta4</b> | <b>Ta5</b> | <b>LR</b> | <b>F/T</b> | <b>Ta5/Ti</b> |
|-------------|-----------|-----------|------------|------------|------------|------------|------------|-----------|------------|---------------|
| <b>PI</b>   | 1080      | 960       | 1600       | 840        | 720        | 640        | 280        | 1.67-1.7  | 1.13       | 0.29          |
| <b>PII</b>  | 1040      | 920       | 600        | 320        | 240        | 160        | 120        | 0.65      | 1.13       |               |
| <b>PIII</b> | 1120      | 1080      | 920        | 480        | 360        | 200        | 160        | 0.85      | 1.04       |               |

Abdomen greenish with dark median spots on tergites II-V, tergite IX triangular with about 10 median setae.

Anal point narrow at base. SVo of E-type of Strenzke (1959); IVo broad, rather like that of *C. javanus* or *Kiefferulus* species. Gonostylus widest at base, narrowing very sharply from about half way.

Female: not described (claimed as unknown, yet mating and egg laying was observed).

**Pupa:** Length 7.2 mm. Cephalothorax with conical frontal tubercles bearing a subapical seta 40 µm long. Basal ring constricted medially. Two pairs precorneal setae. Abdomen light brown; tergite I bare, II-V with evenly distributed shagreen, VI with a patch of shagreen at each end; VII with a single anterior patch and VIII with little shagreen restricted to the lateral and posterior end. Hook row of tergite II with 48-52 hooklets apparently covering about two thirds of the width of the segment.

Posterolateral spur of segment VIII with 3 spines, the medial one elongated. Anal lobe with 80-100 taeniae.

**Fourth instar larva:** Small (5.2 mm) plumosus- type.

Mentum with wide central tooth, closest to type IIA; 4th laterals do not appear to be reduced. VM with smooth anterior margin; length 168 µm and about 3.8 times longer than deep. PE with 14 unequal teeth (type B?). Premandible with inner tooth shorter and hardly wider than the outer tooth.

Antenna with A1 shown about 2.2 times longer than wide, RO only about 1/4 way up from base; AR 1.4-1.47; antennal proportions 100 : 36 : 16 : 12 : 4.

Mandible appears to be type IA. No information on the number of furrows or the number of taeniae in the PMan.

**Cytology:** Not studied.

**Found:** INDIA - Gopiballavpur (21°34'N, 85°11'E), West Bengal (**Type locality**).

***Chironomus mongolabeus* Sasa & Suzuki 1997**  
as *Camptochironomus*.

Adults

Males

Female: Not described.

Pupa, Larva and Cytology: not described

Found: MONGOLIA - (Type locality) Bogd.

***Chironomus mongolabeus* Sasa & Suzuki 1997**  
as *Camptochironomus*.

Adults

Males

Female: Not described.

Pupa, Larva and Cytology: not described.

Found: MONGOLIA – (Type locality) Bogd.

***Chironomus mongolcedeus* Sasa & Suzuki 1997**

Adults

Males

Female: Not described.

Pupa, Larva and Cytology: not described

Found: MONGOLIA - (Type locality) Bogd (1500 m).

***Chironomus mongoldeceus* Sasa & Suzuki 1997**

Adults

Males

Female: Not described.

Pupa, Larva and Cytology: not described

Found: MONGOLIA - (Type locality) Karakorum.

***Chironomus mongolefeus* Sasa & Suzuki 1997**

Adults

Males

Female: Not described.

Pupa, Larva and Cytology: not described

Found: MONGOLIA - (Type locality) Karakorum.

***Chironomus mongolgeus* Sasa & Suzuki 1997**

Adults

Males

Female: Not described?

Pupa, Larva and Cytology: not described

Found: MONGOLIA - (Type locality) Gobi Desert.

***Chironomus mongolheus* Sasa & Suzuki 1997**

Adults

Males

Female: Not described?

Pupa, Larva and Cytology: not described.

Found: MONGOLIA - (Type locality) Bogd (1500 m).

***Chironomus nippodorsalis* Sasa 1979**

See *C. alpestris* Goetghebuer 1934.

***Chironomus nipponensis* Tokunaga 1940**

In BOLD Bin: [BOLD:AAW3996](#)

Morphological and molecular data both clearly indicated that there were two species included under this name, referred to as the “Lowland type” and the “Highland type”.

An examination of specimens from the type locality by M. Hashimoto (M. Yamamoto, personal communication), confirmed that the “Highland type” was the true *C. nipponensis*, while the “Lowland type” was *C. fujitertius* Sasa.

The following description is based on Sasa (1975) who described the correct form.

**Adult.**

**Male**

A large black species, ground color of scutum silvery white, stripes brown, scutellum brownish yellow, postnotum dark brown; abdominal segments with pale apical bands. Wing length 4.8 mm; VR approximately 1.

Head: AR 3.8, frontal tubercles 50 x 21 µm; palpal proportions (segs 2-5; micron) 110 : 310 : 350 : 540).

Leg lengths and proportions:

|             | <b>Fe</b> | <b>Ti</b> | <b>Ta1</b> | <b>Ta2</b> | <b>Ta3</b> | <b>Ta4</b> | <b>Ta5</b> | <b>LR</b> | <b>F/T</b> | <b>BR</b> |
|-------------|-----------|-----------|------------|------------|------------|------------|------------|-----------|------------|-----------|
| <b>PI</b>   | 2050      | 1850      | 2830       | 1390       | 1020       | 930        | 460        | 1.53      | 1.11       | 2.1       |
| <b>PII</b>  | 2220      | 2240      | 1170       | 950        | 490        | 320        | 240        | 0.52      | 0.99       |           |
| <b>PIII</b> | 2540      | 2610      | 1830       | 1370       | 730        | 460        | 270        | 0.70      | 0.97       |           |

Anal point broad, wider at base than apex; SVo E-type of Strenzke (1959). SVo similar to that of *C. anthracinus* (Yamamoto 2010), setae branched.

**Female**

Coloration basically similar to male, but scutum yellow, and scutellum with a brown basal band. Abdomen largely black with a white caudal band on segments I-VII.

Head: Frontal tubercles 53 x 26 µm. Antennal proportions: 220 : 170 : 170 : 150 ; 310; AR - 0.44;; A5/A1 - 1.41. Palpal proportions (seg 2-5): 110 : 310 : 350 : 540.

Leg lengths and proportions:

|            | <b>Fe</b> | <b>Ti</b> | <b>Ta1</b> | <b>Ta2</b> | <b>Ta3</b> | <b>Ta4</b> | <b>Ta5</b> | <b>LR</b> | <b>F/T</b> | <b>Ta4/Ti</b> |
|------------|-----------|-----------|------------|------------|------------|------------|------------|-----------|------------|---------------|
| <b>PI</b>  | 1630      | 1510      | 2440       | 1270       | 970        | 890        | 400        | 1.61      | 1.08       | 0.59          |
| <b>PII</b> | 1810      | 1730      | 1000       | 590        | 420        | 250        | 170        | 0.58      | 1.05       |               |



|             |      |      |      |     |     |     |     |      |      |  |
|-------------|------|------|------|-----|-----|-----|-----|------|------|--|
| <b>PIII</b> | 2150 | 2120 | 1780 | 900 | 630 | 380 | 220 | 0.84 | 1.01 |  |
|-------------|------|------|------|-----|-----|-----|-----|------|------|--|

**Pupa:** Only the number of spines on the spur of segment VIII noted: 3 (2-4).

**Larva:** The larva is called a plumosus-type, but Sasa's illustration suggests it could be a melanotus -type. The PLT are small; anal tubules about half as long as the posterior prolegs and not constricted in the middle. The illustration suggests that the mentum is type II-III (i.e. 4th laterals reduced almost to the level of the 5th laterals), and the central teeth could be type II, while the third inner tooth of the mandible seems to be well developed (type III).

**Cytology:** - no information

**Found:** JAPAN - Sakhalin Island, Sikuka, Karahuto, RUSSIAN JAPAN (Type locality);  
 Japan: Tsuchiura, nr. Lake Kaiwaguchi, Honshu, Lake Chuzenji, Lake Yunoko and Kanto, Nikko Natl. Park, Tochigi; Omachi-shi, Nagano, Chuba.  
 South Korea (no details).

**Molecular:**

MtCOI sequence shows some differentiation between high and low altitude populations (Kondo *et al.* 2016), consistent with the view of Yamamoto (2010) that there were morphological differences between these habitats. Subsequently clarified that the "Highland form" is *C. nipponensis*, while the "Lowland form" is *C. fujitertius* Sasa

***Chironomus nudipes* Kieffer 1911**

Redescribed by Chaudhuri *et al.* (1992)

**Adult:**

KIEFFER, J. J. - Records of the Indian Museum **6**(3): 164 (1911)

Male. Head, palps, scape and thorax reddish, antenna brown; mesonotum whitish yellow and lustrous, with three furruginous bands, of which the median is gradually becoming thinner into a line percurrent to the rear, the laterals foreshortened at the front; halteres white, legs yellow, the two or three last segments of tarsi becoming darker; anterior half of abdomen green, posterior half brown like the claspers. Eyes separated by the distance of their own width. Segments 3 - 13 of the antennae a little transverse(?), 14th half as long again as the 12 previous segments together, plumes brown. Wings hyaline, veins pale, radius equally distant from the point of the wing as the anterior branch, very near to the 2nd longitudinal; cubitus not extending beyond the costal, more distant from the point of the discoidal; crossvein oblique, situated above the bifurcation of the posticale. Anterior metatarsus nearly double the tibia, which is a little shorter than the femur, 4th segment longer than the 3rd, more than twice as long as the 5th, the latter 8 times as long as wide(?); claws without long hairs, subglabrous. Lamellae of the claspers with a prolongation to a point, terminal segment a little longer than the basal, slightly thinner at its rear, lobe extending notably to the middle of the terminal segment.

Length 4.5 mm.

Calcutta, 10-viii-1907 (N. Annandale).

Additional data from Chaudhuri *et al.* (1992):

AR 2.03 - 2.09; Clypeal setae 22- 24; relative lengths of palp segments 12 : 11 : 38 : 40 : 56. Wing (Fig. a, below) length 1.50 - 1.61 mm, width 0.48 - 0.57 mm; VR 1.00 - 1.10. Leg proportions and ratios (units not stated):

|             | Fe | Ti | Ta1 | Ta2 | Ta3 | Ta4 | Ta5 | LR        | F/T  | BR       |
|-------------|----|----|-----|-----|-----|-----|-----|-----------|------|----------|
| <b>PI</b>   | 60 | 52 | 85  | 43  | 37  | 36  | 19  | 1.50-1.63 | 1.15 | No beard |
| <b>PII</b>  | 64 | 63 | 30  | 18  | 15  | 12  | 9   | 0.47      | 1.02 |          |
| <b>PIII</b> | 54 | 72 | 45  | 25  | 22  | 13  | 9   | 0.62      | 0.75 |          |

Fore tibial scale with 2 long setae.

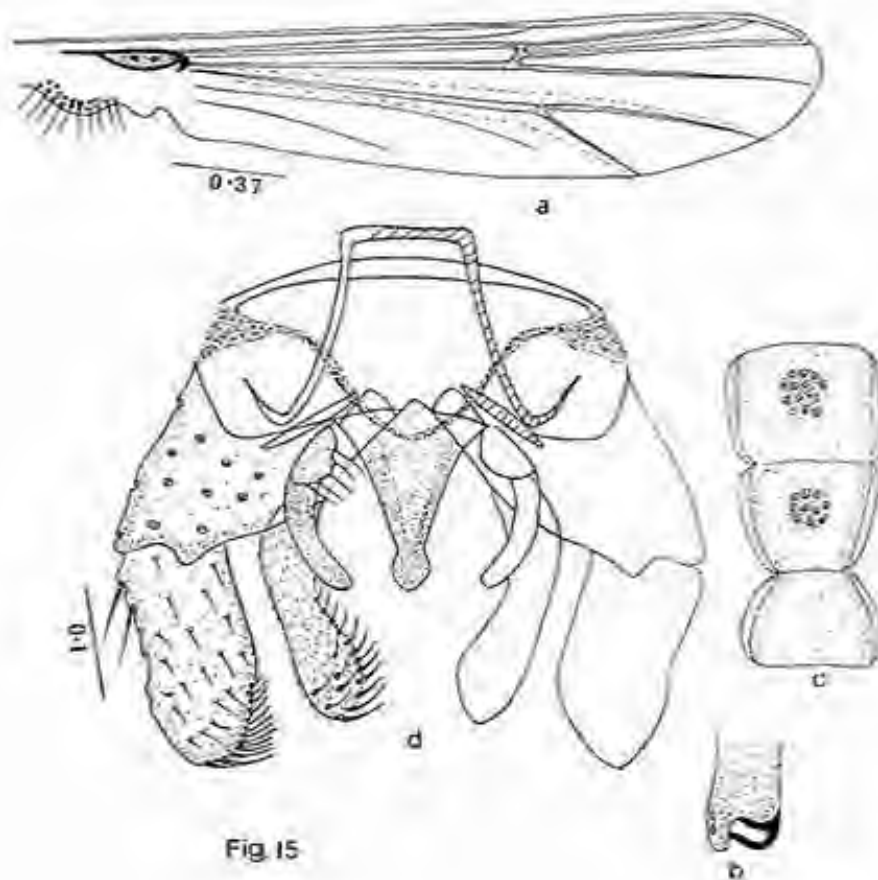


Illustration of adult characters of *C. nudipes* from Chaudhuri *et al.* 1992

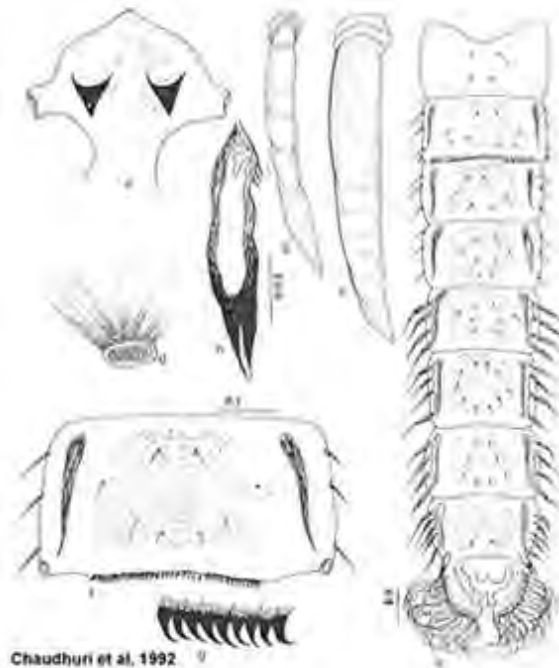
Abdomen brown, tergites VI-VIII with dark brown oval/round median spot (Fig. c, above). Hypopygium (Fig. d) as illustrated above: SVo bowshaped, IVo long, curved, expanded at the end with 12- 20 incurved setae along the inner margin.

Female: Unknown.

**Pupa:** Body length 6.09 (5.89-6.21) m in male, 5.58 (5.42-5.72) mm in female. Color brown but pale brown in exuvia, cephalothorax and abdomen pale brown. Frontal tubercles 0.11

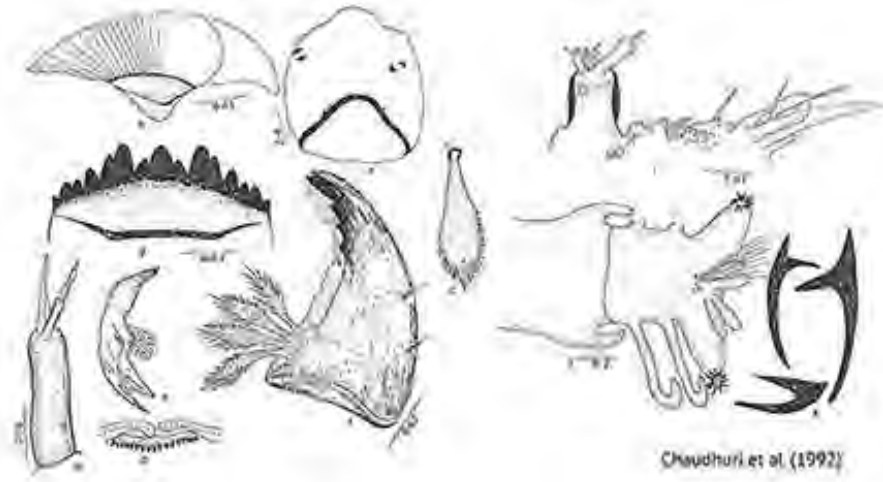
(0.1-0.13)  $\mu\text{m}$  long, 1.1 times longer than wide. Wing sheath 1.31 (1.28-1.34) long. Respiratory organ with an elliptical base, 0.12 (0.10-0.13)  $\mu\text{m}$  wide, 2 pairs of precorneal setae.

Abdomen with PSA on segments IV-VI, PSB caudolateral on segment II. Tergite I bare, tergite II with median shagreen and a caudal transverse row of 44-56 hooklets; tergite III-VI with median shagreen, tergite VII with subbasal transverse patches of shagreen, tergite VIII with 2 median patches of shagreen. Caudolateral spur of segment VIII with about 2 equal spines. Anal fin with numerous filamentous setae.



Pupa of *C. nudipes* from Chaudhuri *et al.* 1992

**Fourth instar larva:** a small, possibly plumosus-type, length about 6.53-9.38 mm; VT shown about equal length; AT about 240-250  $\mu\text{m}$  long, comprised of a single lobe. Head brown with dark occipital margin. VHL 0.30 (0.29-0.32). Mentum with 4<sup>th</sup> laterals reduced (type II), central tooth possibly of type IIA or III. Ventromentum with striae almost to anterior margin, about 1.6 times longer than deep. PE with 17 teeth (apparently type B). Premandible with two unequal teeth, inner about 1.75 times the width of the outer, outer slightly longer. Antenna with basal segment about 2.8–2.9 times longer than wide, RO just over 1/4 up from base (0.27-0.28); AR about 1.8 (1.6–1.9); segment proportions (units) 88 : 21 : 8 : 11 : 7 . Mandible about 160 $\mu\text{m}$  long, possibly type IIIB, furrows not shown, but 10 taeniae illustrated for PMA.



**Found:** INDIA – Purulia (23.33°N, 86.37°E), West Bengal.

**Type locality** – Calcutta, West Bengal.

This species appears closely related to *C. crassiforceps*, the most obvious differences being the lack of abdominal spots on that species and the relatively short posterior femur (only three quarters of the length of the tibia) of *C. nudipes*.

The synonym listed by Chaudhuri, *C. sp. Ikwma(sic)* from Ikema Island, Japan, is almost certainly *C. crassiforceps*.

Pal & Hazra (2107) collected specimens from Berhampur (24.23°N, 88.43°E), West Bengal which they attribute to *C. crassiforceps* but provide insufficient evidence to prove that it is not *C. nudipes*, given that it was collected in the same general area as the other specimens of the latter species.

***C. (Lobochironomus) ocellatus* (Hashimoto, 1985)**

Originally *Einfeldia ocellata*

Uncertain if any Barcode sequence in BOLD due to the high degree of misclassification of specimens in the broader “*Einfeldia*” groups.

**Adults**

Males: from Hashimoto’s original description.

Body length 5.5-7.0 mm. AR 4.0-5.0. LR 1.4-1.6. VR around 1.0.

Head blackish brown, frontal tubercles cylindrical and pubescent; antennae with scape dark brown, other segments pale grey. Palp proportions (segs. 2-5) 5 : 20 : 20 : 23.

Thorax brownish black to black, shiny; pronotum brown, moderately developed. with dorsal V-shaped emargination; mesonotum blackish brown with 3 black vittae. Thoracic setae – 10 acrostichals; 30+ dorsocentrals; 10-12 prealars; 20-25 short setae on scutellum which is dark brown; postnotum black.

Legs dark brown, tarsal segments more or less pale in color; anterior tibia without a beard; middle and hind tibiae with black combs and spurs.

Abdomen completely dark brown without marking; hypopygium blackish brown with 2 or 3 light colored ocellate spots, each with a central strong seta on median line of TIX; anal point black. long, spatulate and curved ventrally; gonocoxite

relatively short, gonostylus longer, rather thick and reducing gently over posterior quarter. SVo horn-like with a large basal lobe covered with minute setae and 2 or 3 long marginal setae; IVo long and somewhat expanded apically with more than 20 curved dorsal setae.



Hypopygium of *C. ocellatus* from Yamamoto et al. (2015)

Female: Body length 5.0-6.5 mm. Frontal tubercles rather conical. Antennae six segmented (including pedicel), proportions 7 : 15 : 11 : 12 : 10 : 21; AR about 0.44; A5/A1 about 1.4.

Structure and color similar to those of male. Seminal capsules large and oval; cercus large and nearly trapezoid in lateral view; marginally dark brown, covered with numerous setae on both inner and outer surfaces.

**Pupa:** Body length 5.5-6.5 mm. Frontal tubercles black and sharply pointed at tip with an apical seta. Thoracic horn white and plumose. Abdominal TII with an irregular row of hooklets on caudal margin spur of TVIII relatively short, black and heavily sclerotized. Anal lobe with a fringe of about 100 flattened setae.

**Fourth instar larva:** a small to medium sized, essentially plumosus- type larva, 11-13 mm in length. Hashimoto's drawing shows the lateral projections as quite short, while Yamamoto *et al.* (2015) show them relatively longer. Head capsule pale brown, only the postoccipital margin strongly chitinised, thick and black, with triangulum occipitale narrow and small. Frontal apotome with irregular rows of ripple-like transverse stripes near the cephalic margin, but no fenestra (i.e. not *Einfeldia*), clypeus without marking; S5 setae only slightly anterior to the "ring organ" of the dorsal head.

Antenna with 5 segments in proportions: 23 : 7 : 3 : 3 : 2; A1 about 3 times longer than wide; AR about 1.53 Segment 1 with ring organ in proximal third, antennal blade long, extending beyond middle of segment IV.

Mentum with 15 teeth, central tooth about type IIA in original description, but type IB in drawing of Yamamoto *et al.* (2015); fourth lateral reduced sometimes almost to level of fifth lateral (type I-II).

Ventromentum about 3 times longer than deep and 1.08 times the width of the mentum.

PE with about 16 teeth, but not noted whether there are smaller interstitial teeth

**Found:** Type locality: Japan – Komadorinoike, Senmaidake, Shizuoka Prefecture.

Types apparently discarded.

### ***C. okinawanus* Hasegawa & Sasa 1987**

Syns: *Chironomus okicontractus* Sasa, 1993: 125; Yamamoto & Yamamoto 2014: 313. [Holotype: male, No. 246:01; holotype missing?].

*Chironomus tokarabeceus* Sasa & Suzuki 1995 (Yamamoto & Yamamoto 2018)

#### Adults

Males

Female: Not described?

Pupa, Larva and Cytology: not described?

Yamamoto (2002) has suggested that this species should be in a separate subgenus

*Austrochironomus* along with *C. javanus*.

**Found:** Type locality - Okinawa, Japan.

### ***Chironomus* “orientalis”**

This species is related to *C. flaviplumus* in Japan, but requires a new name (Martin 2011b).

The name *C. orientalis* is suggested, as the species is widespread in Asia.

In BOLD Bin: [BOLD:AAV5954](#)

#### Adults

Males



*C. orientalis*: Male hypopygium (left) and superior volsella (right) - note the beaked appearance.

AR about 2.4-2.9. (Specimens from Japan have an AR of 3.5-4.0, and should probably be placed as *C. flaviplumus* – see also below under Cytology)

Frontal tubercles about 33 - 39  $\mu\text{m}$ .

Palp proportions: 44 : 53 : 189 : 222 : 315.

Wing length: 2.85 - 3.15 mm; wing width 0.30 - 0.67 mm.

VR about 0.95

Leg lengths (microns) and proportions as follows:

|             | <b>Fe</b>  | <b>Ti</b>  | <b>Ta1</b> | <b>Ta2</b> | <b>Ta3</b> |
|-------------|------------|------------|------------|------------|------------|
| <b>PI</b>   | 1350       | 975        | 1820       | 925        | 837        |
| <b>PII</b>  | 1305       | 1155       | 750        | 393        | 268        |
| <b>PIII</b> | 1478       | 1385       | 1180       | 595        | 448        |
|             | <b>Ta4</b> | <b>Ta5</b> | <b>LR</b>  | <b>F/T</b> | <b>BR</b>  |
| <b>PI</b>   | 712        | 362        | 1.82-1.96  | 1.35-1.44  | 1.7-2.2    |
| <b>PII</b>  | 168        | 125        | 0.62-0.67  | 1.11-1.17  |            |
| <b>PIII</b> | 262        | 152        | 0.81-0.92  | 1.05-1.09  |            |

The SVo is essentially a D(e)-type, although in some specimens of a beaked type not illustrated by Strenzke (1959), but possibly could be classed as an S-type, i.e. the SVo in this species is marginal between Strenzke's S- and D-types.

Setae near centre of 9th tergite: 9 - 12; some setae on IVo with simple or trifid fork.

Female:

Wing length 3.28 - 3.53 mm; width at cross vein 0.83 - 0.90 mm, VR 0.81 - 0.93. About 22 setae on squamal fringe.

Head with frontal tubercles about 14 µm long and 13 µm wide.; about 27 - 55 clypeal setae.

Antennal segments (microns): 190 : 127 : 147 : 121 : 215. AR about 3.2; A5/A1 about 1.13.

Leg proportions (micron):

|             | <b>Fe</b>  | <b>Ti</b>  | <b>Ta1</b> | <b>Ta2</b> | <b>Ta3</b>    |
|-------------|------------|------------|------------|------------|---------------|
| <b>PI</b>   | 1670       | 1190       | 2290       | 1255       | 1189          |
| <b>PII</b>  | 1588       | 1410       | 845        | 452        | 313           |
| <b>PIII</b> | 1727       | 1663       | 1338       | 706        | 557           |
|             | <b>Ta4</b> | <b>Ta5</b> | <b>LR</b>  | <b>F/T</b> | <b>Ta4/Ti</b> |
| <b>PI</b>   | 1189       | 405        | 1.91-1.92  | 1.37-1.42  | 0.97          |
| <b>PII</b>  | 196        | 152        | 0.58-0.61  | 1.11-1.14  | 0.13-0.15     |
| <b>PIII</b> | 317        | 190        | 0.79-0.82  | 1.02-1.06  | 0.19          |

Abdomen pale (probably greenish); about 4 setae on GP.

Fore Ta4 about same length as Ta3. About 91-96 Sensilla chaetica on hind tibia.

Differences from other members of the *C. samoensis/flaviplumus* group:

Important features of males are the AR of 2.4-2.9 (lower than that of *C. flaviplumus*, but similar to *C. samoensis*), the LR of about 1.8 - 2.0 and fore Ta5, which is about 0.35 - 0.4 length of Ti. In Australia, it is the only presently known species with a boot-shaped superior volsella (variant of S-type of Strenzke 1956).

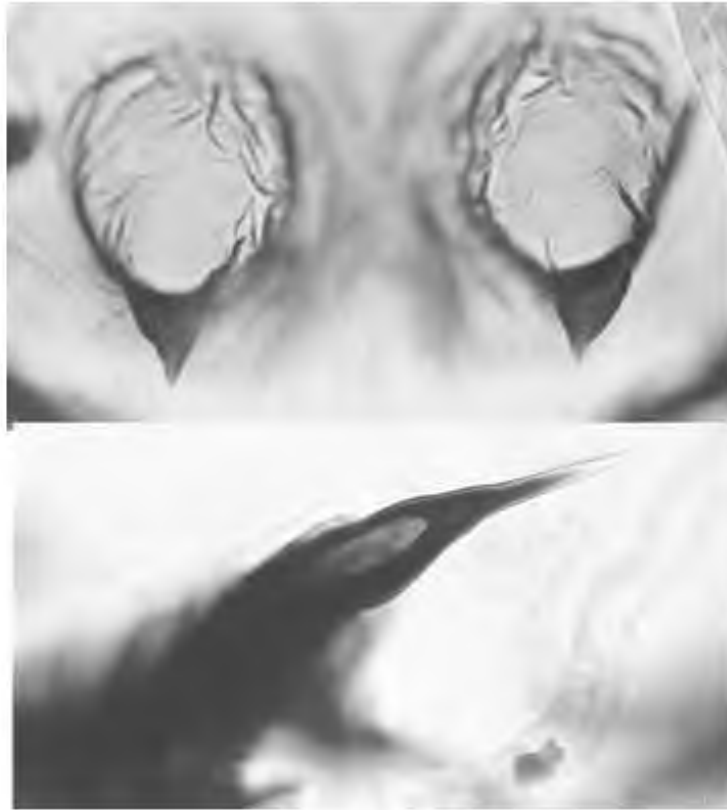
In the female the fore legs are very long, with LR about 1.9, and Ta3 and Ta4 are about equal in length, only a little shorter than Ta2, and Ta5 about a third of the length of the Ti.

**Pupa:** Exuviae length about 7.2-7.8 mm; inner margin of wing case 1.42-1.45 mm.

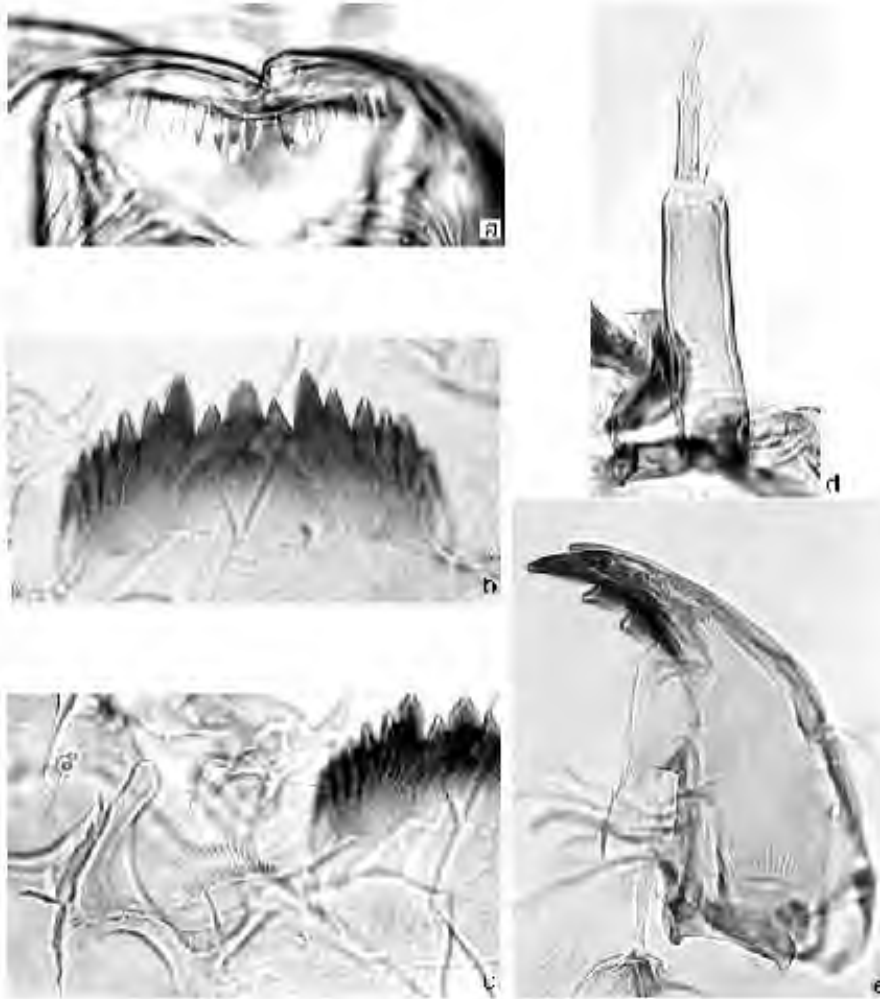
Cephalic tubercles (see below) variable, length from 23-121 µm, with subterminal setae about 60 µm long.

About 51-68 recurved hooks on abdominal segment II. Caudolateral spur (see below) of segment VIII with 1, 2 or sometimes 3 spines. Anal fringe with about 74-100 taeniae in multiple rows.





**Fourth instar larva:** a medium sized plumosus-type larva (length about 10.7-14.3 mm., lab. reared). Anterior VT (1.24-1.84 mm.) shorter than posterior pair (1.40-2.28 mm.). Gula pale or very slightly darkened on posterior third; FC pale to dark. Mentum (Fig. b, below) with square sharp teeth, c2 teeth of central trifid tooth well separated from c1 tooth (type III), 4th laterals only slightly reduced (type I). PE (Fig. a, below) with about 16-21 sharp teeth which become much smaller at the ends. Ventromentum (Fig. c, below) with about 29 - 34 striae; VMR about 0.29-0.35. Distance between the antennal bases about equal to the distance between the S4 setae. Antenna (Fig. d, below) with a moderately long basal segment, which is about 4-4.5 times as long as wide; AR about 1.70-1.96. Antennal proportions: 122 : 31 : 10 : 13 : 6. Mandible (Fig. e, below) with third inner tooth only slightly darkened (Type IA/B), and with about 12-14 grooves on outer surface near the base.



**Cytology:** 4 polytene chromosomes with the pseudothummi arm combination AE, BF, CD, G.

Nucleolus virtually terminal in arm G; well developed BR about one third from the other end, and a smaller BR close to this other end; closely paired. No nucleolus in long chromosomes of Australian specimens, but one near the characteristic bands of arm F in *C. fluviplumus*.

Arm A of Australian specimens differs from that of *C. fluviplumus* by a complex inversion, and arm F by possibly a simple inversion. Irradiation experiments indicated that the MD region was not on the CD chromosome.

“orl”A1: 1 - 2c, 10 - 12, 3 - 2d, 9 - 4, 13 - 19 *holomelas*

(Australia)

“orl”B1: Puff of group 7 just distal to the middle of the arm with dark bands distal of it.

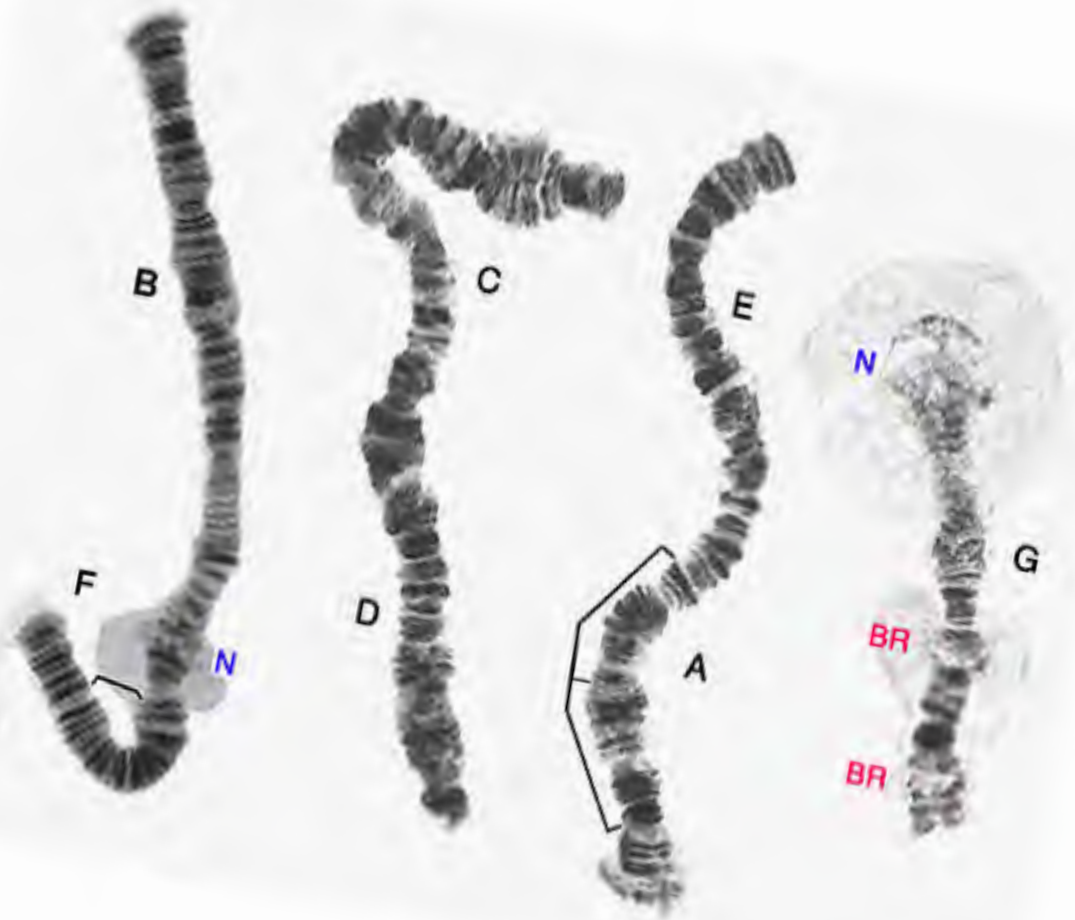
“orl”C1: Characteristic groups 3-4 about one third from distal end of the arm.

“orl”D1:

“orl”E1: 1 - 3e, 10b - 3f, 10c - 13 *as aprilinus, etc.*

“orl”F1: (possibly) 1 - 2a, 10a-d, 15 - 14e, 9 - 2b, 11 - 14d, 16 - 23 In14d-9  
from *fluviplumus*

“orl”G1: Subterminal nucleolus, median and distal BRs.



Polytene chromosomes of *C. "orientalis"*.

BR - Balbiani Ring; N - Nucleolus

Chromosome arms A, E and F of a "*C. samoensis*" were described by Wülker et al. (1989) based on Japanese specimens, but are probably *C. flaviplumus*. The sequences of arms A and F of Australian specimens are not the same, although closely related to the Japanese material.

A major difference to the cytology of specimens believed to be *C. samoensis* Edwards, from Tutuila, American Samoa, is the nucleolar position in arm G, which is medial in the Samoan specimens.

This species is probably most closely related to the Japanese *C. flaviplumus* Tokunaga. Aspects of the relationships between some of the members of this group, from a molecular perspective, are given by Pramual *et al.* (2016)

Material identified as *C. samoensis* from India is also cytologically distinct, one species has been renamed *Chironomus indiaensis* (Martin 2011b), and others are the widespread species PK2.

**Found:**

**Australia:** - Northern Territory - Radon Creek, Kakadu National Park (12.75oS, 132.93oE);  
Twin Falls, off Jim Jim Road, Kakadu area (13.00oS, 132.58oE)

Queensland - 3 km w. Sarina Beach.

China - Yangtze River basin (30.09°N, 115.12°E) (GeneBank)

Bangladesh - Chittagong (22.4685°N, 91.7808°E)(BOLD)

Malaysia - Botanical Gardens, Univ. Malaya, Selangor (3.1295°N, 101.656°E)(BOLD)

Thailand - Mahasarakham University (16.242°N, 103.260°E), and Ban Keab (16.250°N, 103.210°E), Kantharawichai Dist., Maha Sarakham; Ban Tha Reu (15.303°N, 103.392°E), Satuek Dist. Buri Ram.

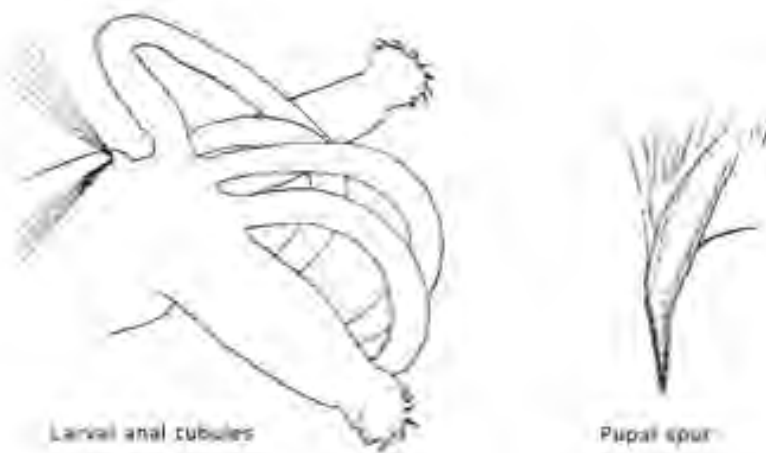
#### Molecular sequence

COI: There is sequence in BOLD and in GenBank

This species can be bred in the laboratory, as fertile egg masses were obtained from adults reared from wild collected larvae in Australia. The related Japanese species has also been maintained in a laboratory culture (Elbetieha and Kalthoff 1988).

#### *Chironomus palpalis* Johannsen 1932

##### Adult:



Illustrations of parts of the immatures of *C. palpalis* by Lenz 1937.

**Pupa:** Integument moderately pale, length about 7-8 mm. Caudolateral spur of segment VIII with only a single spine (see figure above).

**Fourth instar larva:** A small to moderate plumosus-type larva, about 13 mm long; long ventral tubules and long lateral tubule on segment 10; very long anal tubules, about twice as long as the proleg (see figure above).

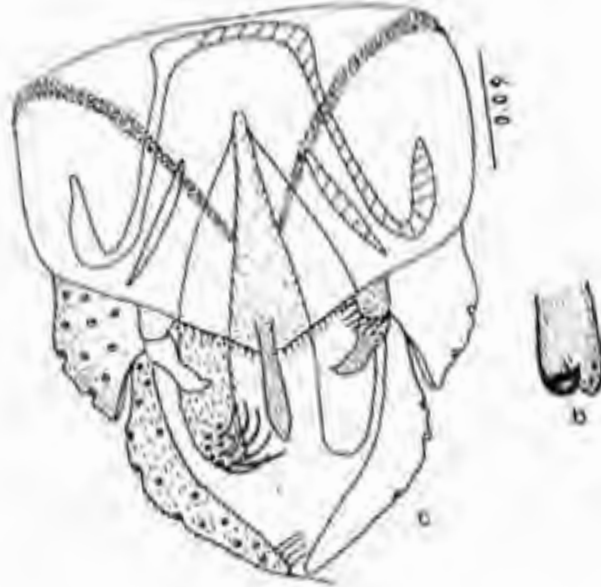
**Found:** Type locality – Tjurup and L. Ranua, Sumatra.

In lake at depth of 45 m.

Fourth instar larva and pupa described by Lenz 1937 from material collected by Johannsen.

***Chironomus pulcher* Wiedermann 1830**

**Adult:** (based on description of Indian specimens by Chaudhuri *et al.* (1992).



Male: Body length 4.78 - 4.85 mm; wing 3.19 mm long, 0.58 mm wide; VR abt 1.04. AR abt 3.43.

Head: Yellowish brown, antennae and palps brown; frontal tubercles present; clypeus with 18 - 20 setae. Ratio of maxillary palp segments: 8 : 12: 42 : 40 : 60.

Thorax: Greenish yellow, mesoscutum with 3 dark yellow vittae.

Setae: Achrostichals 16, dorsocentrals 14 - 15, humerals 2, prealars 4, scutellar 12.

Legs: Yellowish green, tarsal segments slightly darker at apices.

Fore tibia with blunt scale (see b above) with 2 long setae.

Anterior LR abt 1.54; mid LR abt 0.63, hind LR abt 0.69.

Abdomen: Tergites greenish yellow with slightly darker markings on the middorsal line.

Hypopygium as illustrated above, anal point narrow, slightly expanded subapically; SVo of D-type. GS narrows over posterior half.

**Pupa** (from Dejoux 1968): length about 9-10 mm. Spur with 1-2 spines.

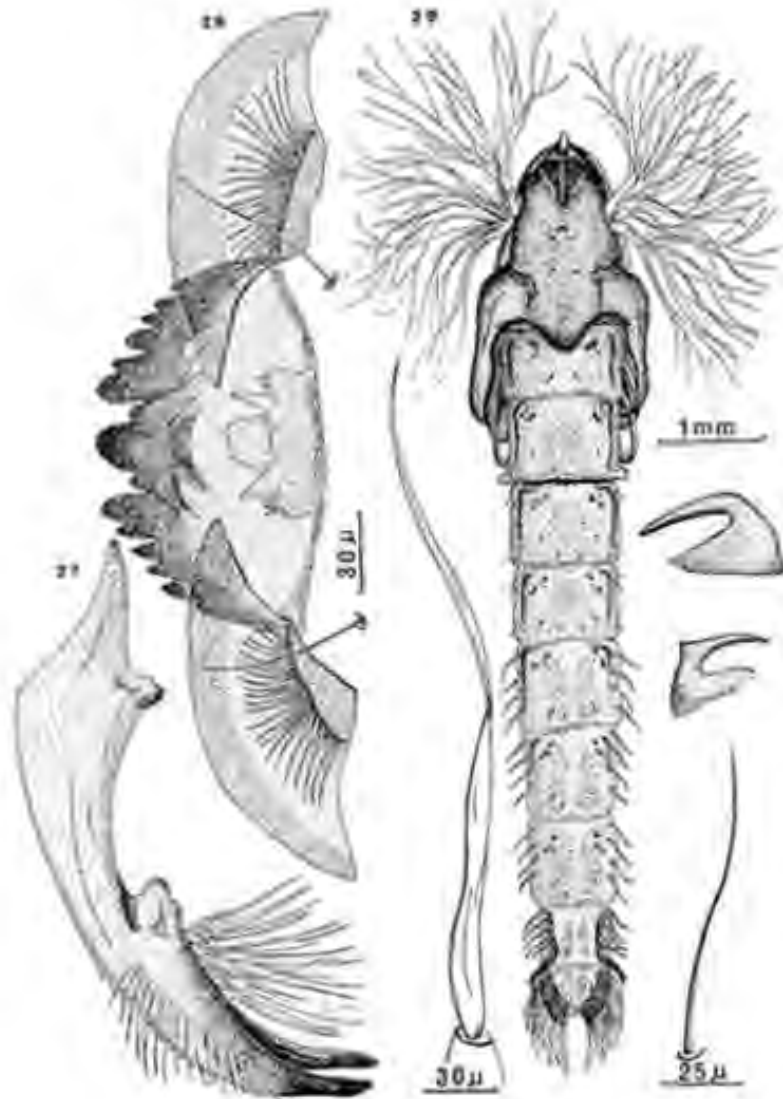


Fig. 27 *Chironomus pulcher*, prémandibule larvaire.  
 Fig. 28. *Chironomus pulcher*, labium et plaques paralabiales larvaires.  
 Fig. 29. *Chironomus pulcher*, nymphe en vue dorsale; à gauche, soie fine des premiers segments abdominaux; à droite, grande soie latérale des derniers segments abdominaux et crochets de l'armature chitineuse du deuxième segment abdominal.

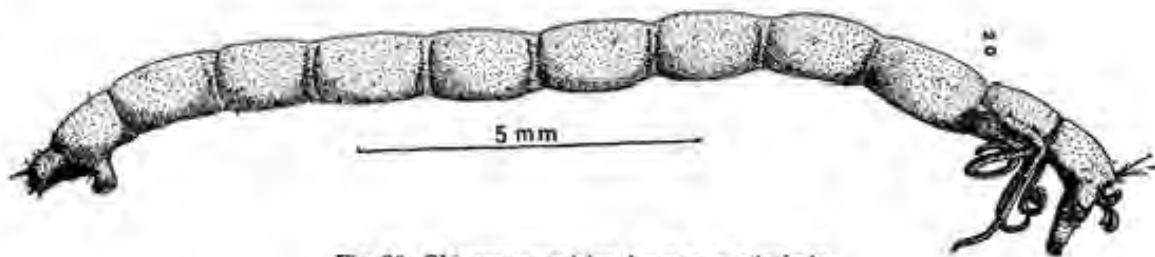


Fig. 20. *Chironomus pulcher*, larve en vue latérale.

**Fourth instar larva:** A plumosus-type larva. No other information on larvae from India or the oriental region known, so information from African specimens: Length 15-16 mm. Gula darkened. Lateral tubules about 0.8-1.0 mm long, ventral tubules coiled in the typical

plumosus-type manner, posterior pair longer. Anal tubules 1.5-1.8 mm long, dorsal pair with a constriction in the middle, ventral pair longer and more or less straight. Mentum with 4th laterals hardly reduced (type I), central trifold tooth probably of type III. Ventromentum about 2.6x longer than depth, Dejoux's figure suggests about 23 striae; VMR about 3. PE with about 13 broad sharp teeth (type B). Antenna with A1 about 3 times longer than wide, RO about a third up from the base; AR about 3.5, segment lengths (micron) 120 : 17 : 5 : 9; 3; the blade reaching to the last segment. Premandible with teeth about equal length, inner tooth perhaps 4 times wider than outer Mandible with 3rd inner tooth separated and darkened (type IIIC).

**Cytology:** Wülker et al. (2011) have given a description of the banding sequences of specimens tentatively described as *C. pulcher* from Kenya in Africa.

Three polytene chromosomes with the modified thummi cytochrome arm combination AE, CD, FEG.

Centromeric bands not heterochromatic, nucleolus terminal in arm F, but nucleolus-like bodies at the ends of arms A, B, and G.

pulA1: 1 - 3, 8 - 6, 16d - 17, 11e - 9, 4ab, 5 - 4c, 16c - 12, 18 - 19

pulB1: Characteristic bands near centromere, puff developed about 1/3 from distal end.

pulC1:

pucC2: Inversion of most of the arm.

pucD1: 1 - 3, 11 - 12, 10e-a, 13 - 19b, 4 - 9, 19c - 24

pulE1: 1 - 2, 6e - 4, 13 - 12, 3f-a, 6f - 11, 13

pulF1: 1 - 10, 19 - 11, 20 - 23(N)

pulG1: Large BR near site of fusion, small BR or puff in center of the arm, with a possible small nucleolus at the telomeric end.

**Found:** **India:** - Burdwan, West Bengal.  
**Kenya** - nr. River Athi, s. Nairobi (Wülker *et al.* 2011).  
**South Africa** - "Cape" (Type locality)

Morphology described by Chaudhuri et al. 1992. Possible cytology by Wülker et al. (2011).

***Chironomus ramosus* Chaudhuri et al. 1992**

Adult:

Male:

Wing length 2.33 (2.27-2.40), wing width 0.72 (0.70-0.76). VR 1.01 (1.00-1.03).

Head: AR 3.86 (3.72-3.94) Frontal tubercles small; ratio of palp segments: 14 : 11 : 47 : 48 : 66. Clypeal setae 20 (18-20).

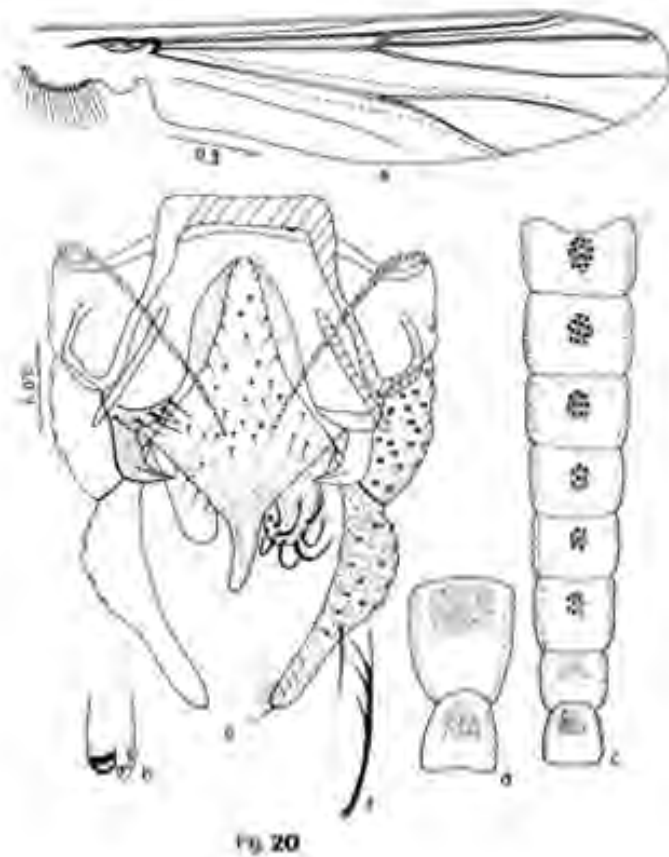
Mesonotum with 4 brown vittae; fore tibial scale with 4 long setae; tarsomeres of foreleg dark brown,

Leg proportions and ratios (units):

|  |           |           |            |            |            |
|--|-----------|-----------|------------|------------|------------|
|  | <b>Fe</b> | <b>Ti</b> | <b>Ta1</b> | <b>Ta2</b> | <b>Ta3</b> |
|--|-----------|-----------|------------|------------|------------|

|             |            |            |           |            |           |
|-------------|------------|------------|-----------|------------|-----------|
| <b>PI</b>   | 30         | 29         | 43        | 21         | 18        |
| <b>PII</b>  | 31         | 29         | 18        | 10         | 7         |
| <b>PIII</b> | 38         | 35         | 25        | 14         | 11        |
|             | <b>Ta4</b> | <b>Ta5</b> | <b>LR</b> | <b>F/T</b> | <b>BR</b> |
| <b>PI</b>   | 15         | 7          | 1.48      | 1.03       | no beard? |
| <b>PII</b>  | 4          | 3.5        | 0.62      | 1.07       |           |
| <b>PIII</b> | 6          | 4          | 0.72      | 1.09       |           |

Abdomen: Greenish yellow, tergites I-VI with brown oval spot medially; curved anal point, beak-like SVo (as in *C. samoensis*, *C. flaviplumus*, etc.); setae of IVo finely branched.



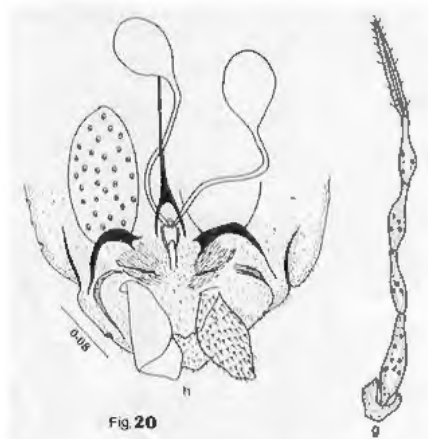
Adult male of *C. ramosus* (Chaudhuri, Das and Sublette 1992)

Female:

Wing length 2.59 (2.49-2.66), wing width 0.88 (0.82-0.95).

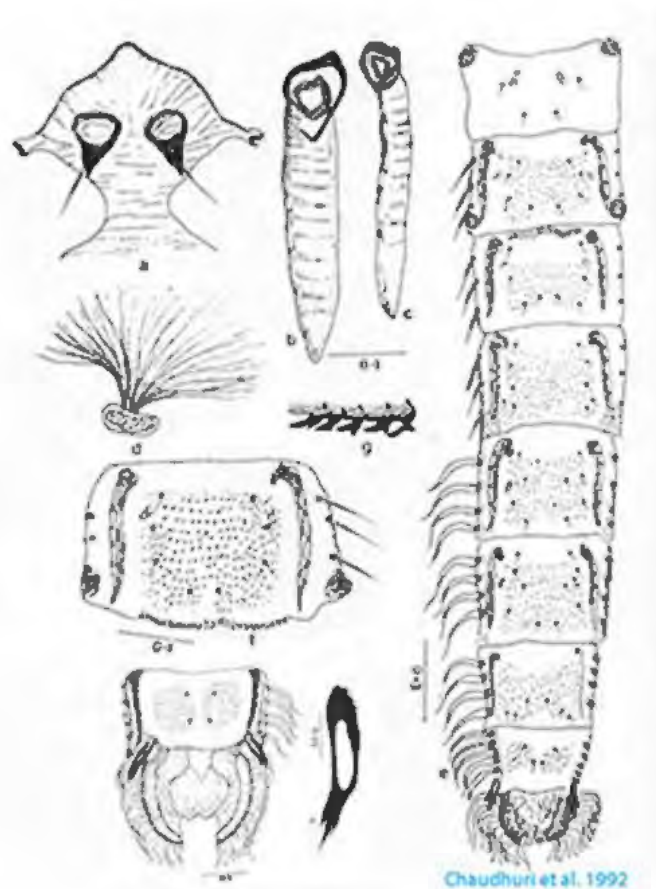
Antenna 5 segmented, relative lengths 10 : 7.5 : 7 : 6.5 : 12. AR 0.38, A5/A1 about 1.2.





Female genitalia and antenna of *C. ramosus* (Chaudhuri, Das and Sublette 1992)

**Pupa:** Length of male 6.67-7.64 mm, of female 6.52-8.86. Frontal tubercles about 0.09 mm long and 0.06 mm wide, with the subapical seta about 0.05 mm in length. Wing sheath 1.42-1.72 mm in length, respiratory base elliptical and about 0.15 mm wide. PSA caudolateral on segment IV-VI; PSB basolateral on segment I and caudolateral on segment II. Hook row on segment II comprised of about 46-58 hooklets. Shagreen pattern as shown in figure. Caudolateral spurs of segment VIII with 3 spines.



**Fourth instar larva:** a small to medium plumosus-type (length 8-13.2 mm). Anterior pair of VT shorter than posterior pair. AT 0.31 (0.29-0.33) mm long. Gula and FA apparently not

darkened.

Mentum with c2 teeth well separated and c1 broad (type IIA), 4th laterals slightly reduced. Ventromentum about 3.9 times longer than its depth; figure indicates numerous striae.

PE with about 20 teeth (type B). Premandible with two equal teeth.

Antenna with basal segment about 2.25 times longer than wide, RO less than 1/3 up from the base; AR 1.69 (1.53-2.10); ratio of antennal segments 23.1 : 6.7 : 2.2 : 3.1 : 1.6.

No information on mandible type or number of furrows on outer surface; or of number of tainiae in PMA.

**Cytology:** Four polytene chromosomes with the pseudothummi-cytocomplex combination BF, CD, AE, G.

Nucleolus in arm B (at 11B) (as in map of Nath and Godbole 1997), but may be developed in arm F (at 10D - abt. groups 22-23). Two BRs, about equally distant from each end, are on arm G.

No reported polymorphism.

Some points can be made by reference to the map of Nath & Godbole (1997) and comparison to the Keyl (1962) banding patterns for arms A, E and F:

ramA1: 1 - 2c, 10 - 12, 3- 2d, 9 - 4, 13 - 19 as *circumdatus* A2, *holomelas*, etc.

ramB1: Characteristic bands at 10F. Generally a nucleolus at 11B, as in *C circumdatus*.

ramC1: Developmentally stage specific puff at 6B. as C2 of *flaviplumus* type B

ramD1:

ramE1: 1a-i, 5 - 10b, 3e - 2, 4 - 3f, 10c - 13 i.e Inv2-5 from *aprilinus*, as *flaviplumus* type B

ramF1: 1 - 2a, 10 - 3d, 14c - 11, 2b - 3c, 14d - 23 as flaF1

Nucleolus sometimes about region 22-23, so distinctive bands not visible.

ram G1: BRs at 18C and 19C



Polytene chromosomes of *Chironomus ramosus*. N – nucleolus in arm F.

Photos courtesy of B. B. Nath.

**Found:** Type locality - Satgachhia, West Bengal, INDIA.

Other Indian localities: Hooghly, West Bengal; Pune; Cachar Hills, Assam.

Fourth instar larva, pupa and adult described by Chaudhuri, Das & Sublette (1992). Chromosomes described by Nath & Godbole (1997). In their map, chromosome I is comprised of arms D and C, chromosome II of arms F and B; chromosome III of arms A and E, and chromosome IV is arm G. As noted, the nucleolus in the map is at 11B in arm B, but in other specimens, the nucleolus is in arm F at 10D. Since the available specimens have all come from an inbred laboratory stock, it is not clear what the situation is in natural populations.

Morphologically close to the *C. samoensis* group; cytologically close to *C. flaviplumus* type B.

### ***Chironomus samoensis* Edwards 1928**

Although not found in Asia, this description is given here so that the differences of the Asian species can be understood

Tokunaga's (1964) description of *C. samoensis* seems to be the most reliable description of the adult with much more information than in the original description.

***Chironomus* (*Chironomus*) *samoensis* Edwards (fig. 12, a).**

*Chironomus samoensis* Edwards, 1928, *Insects of Samoa* 6 (2): 67.

*Chironomus dorsalis*, Tokunaga, 1940, *Philippine Jour. Sci.* 71: 220.

*Chironomus eximius* Johannsen, 1946, *B. P. Bishop Mus., Bull.* 189: 193.

Large yellow species, scutal vittae yellow; legs yellow, but all tarsal segments apically black or brown; frontal tubercles cylindrical or oblong; AR 2.7-3.09, LR 1.75-1.92, in female fore tarsus with segment 4 far longer than 3 and slightly longer than 2; wing with fR and r-m usually more brownish or fuscous than other veins; abdomen pale brownish yellow or yellow, tergites of basal segments 2 to 6 of male and 2 to 4 of female with round or rhombic pale fuscous spots; male hypopygium of *dorsalis* type.

*Male:* Body about 4.5 mm. long; wings 2.2-2.3 mm. by 0.59-0.61 mm. Almost entirely yellow. Head with mouthparts pale brownish yellow, eyes separated above by one-fourth length of eye, frontal tubercles subcylindrical and slightly shorter than width of two facets; palp five-segmented (about 15.7:14 62.7:69.3:100); antenna with scape yellowish brown, other segments brown, plumose hairs very pale brown, AR 2.86 (2.7-3.09). Thorax mainly yellow, scutum white, with vittae yellow, scutellum white, with 9 to 10 bristles along caudal margin and seven to nine small setae on anterior part, postscutellum faintly fuscous on middle part. Legs yellow, only dark or brown at distal ends of all tarsal segments; LR 1.81 (1.75-1.84), RL-FT 85:70. Halter yellowish white. Wing with fR and r-m usually somewhat fuscous, fMCu under origin of r-m, RL-V 72:49.5:81.5:75.2. Abdomen pale brownish yellow, basal segments 2 to 6 with oval or rhombic faint spots on tergites; hypopygium (fig. 12, a) of *dorsalis* type, anal point rather large, style normal, dorsal appendage setigerous (with eight to nine setae) on basal part and bare caudal projection stout and subtriangular, ventral appendage stout, with 12 to 18 strong apical bristles, some of these bristles bifid or trifid apically.

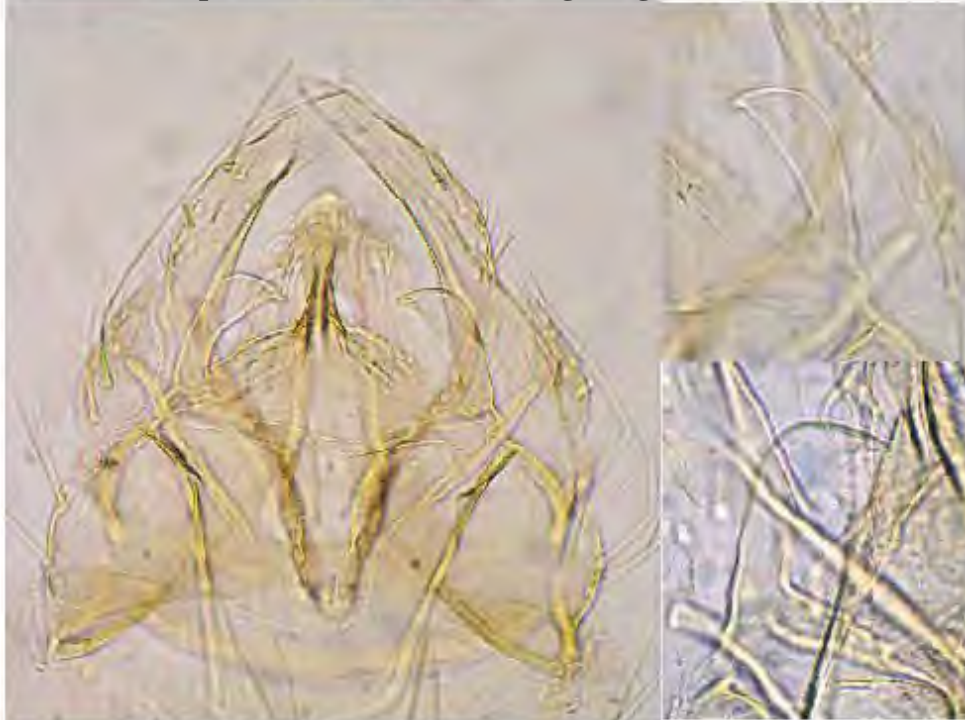
*Female:* Body 4.92 (4.68-5.07) mm. long; wings 2.88 (2.52-3.12) mm. by 0.84 (0.78-0.91) mm. Similar to male in color and structure with usual sexual differences. Head with eyes separated above by one-sixth length of eye, frontal tubercles oblong, palp five-segmented (13.5:12.5:57.5:79:87); antenna with scape and basal two-thirds of segment 2 yellow, other parts fuscous, neck parts rather long, six-segmented (22:49.5:38:39.5:37.3:55.3). Scutellum with 13 to 14 bristles and 8 to 11 small setae. LR 1.86-1.92, RL-FT 110:86.5, RL-T 163.5:84.5:81.5:88.5:38.5. Wing with fMCu under or just beyond origin of r-m, RL-V 85.3:67.3:110:92.7. Abdomen yellow, with tergal oval faint fuscous spots on segments 2 to 4.

Micronesia are probably *C. samoensis*, and the illustration is presumably intended to depict the somewhat beaked SVo seen in some specimens. The misinterpretation of this illustration may be partly responsible for the identification of *C. samoensis* in other locations, which have an S-type SVo. However, they also differ in other characters and are mis-identifications.

While the females are largely dismissed as “like the male apart from the usual sexual differences”, the relative lengths of the fore leg segments appear to be useful in separating the species of this group.

Tokunaga makes the important point that the fore tarsus has Ta4 far longer than Ta3, and slightly longer than Ta2, although examination of a paratype female from Tutuila, American Samoa, suggests that Ta2 and Ta4 can be about equal in length.

**Additional data from specimens from Tutuila, Pago Pago, American Samoa:**



Male hypopygium of *Chironomus samoensis* (left), superior volsella (right)  
 Note the appearance of a beak in the lower figure.

**Male**

Head: AR - 2.94 (2.51 - 3.23, 4); frontal tubercles 33 µm (29-38,4) long and 15µm (14-17,3) wide; palpal proportions (micron) - 46 : 46 : 193 : 234 : 354; clypeal setae 17-23.

Thoracic setae: Acrostichal - at least 14 or 15; dorsolateral - 17-21; prealar - 4-5; scutellar in two rough rows, ant. 5-12, post. 12-15.

Wing length 2.58 mm (2.40-2.68, 4), width 0.63 mm (0.60-0.66, 4), VR 1.03 (1.02-1.04, 4).

Legs, pale, tarsi slightly darker. Relative length of leg segments (micron) (4)

|             | <b>Fe</b>  | <b>Ti</b>  | <b>Ta1</b> | <b>Ta2</b> | <b>Ta3</b> |
|-------------|------------|------------|------------|------------|------------|
| <b>PI</b>   | 1107       | 1000       | 1507       | 810        | 750        |
| <b>PII</b>  | 1170       | 1040       | 675        | 365        | 245        |
| <b>PIII</b> | 1290       | 1245       | 1185       | 513        | 385        |
|             | <b>Ta4</b> | <b>Ta5</b> | <b>LR</b>  | <b>F/T</b> | <b>BR</b>  |
| <b>PI</b>   | 670        | 330        | 1.50-1.52  | 1.08-1.12  | 1.54-1.75  |
| <b>PII</b>  | 160        | 115        | 0.62-0.67  | 1.07-1.17  |            |
| <b>PIII</b> | 233        | 153        | 0.78-0.82  | 1.03-1.05  |            |

Abdomen pale, with darkening as described by Edward. Hypopygium (above) similar to that of *C. dorsalis*, with the SVo of the D type, similar to fig. e of Strenzke (1959), but sometimes with the development of a beak. The IV has mainly simple, curved setae, but a small number appear to have a small simple fork near the tip. About 4-6 setae on the 9th tergite near the base of the anal point.

Female:

No females are available amongst the material, but some characters could be obtained from a pupa with a pharate female. An important character is the relative proportions of the fore leg, particularly the tarsi, as Tokunaga (1964) notes that the Ta4 of specimens he assigned to *C. samoensis* was unusually long. The approximate lengths of these segments were measured (in micron) as: Fe 900 ; Ti 750 ; Ta1 1020 ; Ta2 620 ; Ta3 470 ; Ta4 610 ; Ta5 340; Ta4 about same length as Ta2, and about one third longer than Ta3.

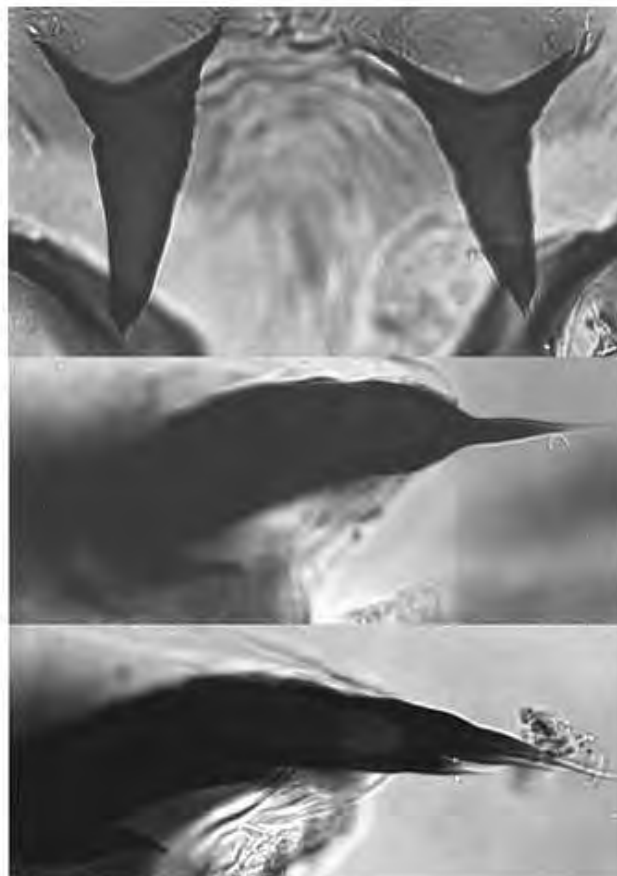
Other characters:

Head - frontal tubercles - length 23 $\mu$ m, width 13  $\mu$ m. Antennal segments ( $\mu$ m) 144 : 109 : 116 : 106 : 215. About 24 clypeal setae.

Thoracic setae: Acrostichal 14, dorsolateral 31, prealar 5, scutellar in two rows, ant. 14, post. 14.

Pupa:

Exuviae length (male) 6.8 (6.5-7.0, 3) mm (male), inner margin of wing case about 1.34 (1.27-1.42, 3) mm (male). Pale, with darkened caudolateral spurs. Cephalic tubules 93 (76-115, 4)  $\mu$ m long and 78 (56-94, 4)  $\mu$ m across the base, subterminal bristle about 68-80  $\mu$ m in length. Basal ring about 142 (129-164,5) by 68 (54-85,5)  $\mu$ m. About 67-77 hooks in row on segment II. Slight development of PSB on segment II, progressive development of PSA from segments IV to VI. Caudolateral spur of segment VIII with 1-3 spines. 78-88 taeniae on each side of the anal lobe of male.



Fourth instar larva:

A medium sized plumosus-type; length about 12.5-12.7 mm (female) and 10.8-11.8 mm (male); PLT about 280-360  $\mu\text{m}$ ; VT relatively long (anterior 1.76-2.16 mm; posterior 1.80-2.68 mm), posterior pair longer and coiled; AT moderately long (about 1.6-2.6 times longer than wide), dorsal pair (240-410  $\mu\text{m}$ ) slightly longer than ventral pair (215-370  $\mu\text{m}$ ). Head capsule pale with darkening of the posterior half of the gula, FC sometimes pale but mostly with slight darkening, ventral head length 261-318  $\mu\text{m}$ . Distance between antennal bases greater than the distance between the S4 setae.

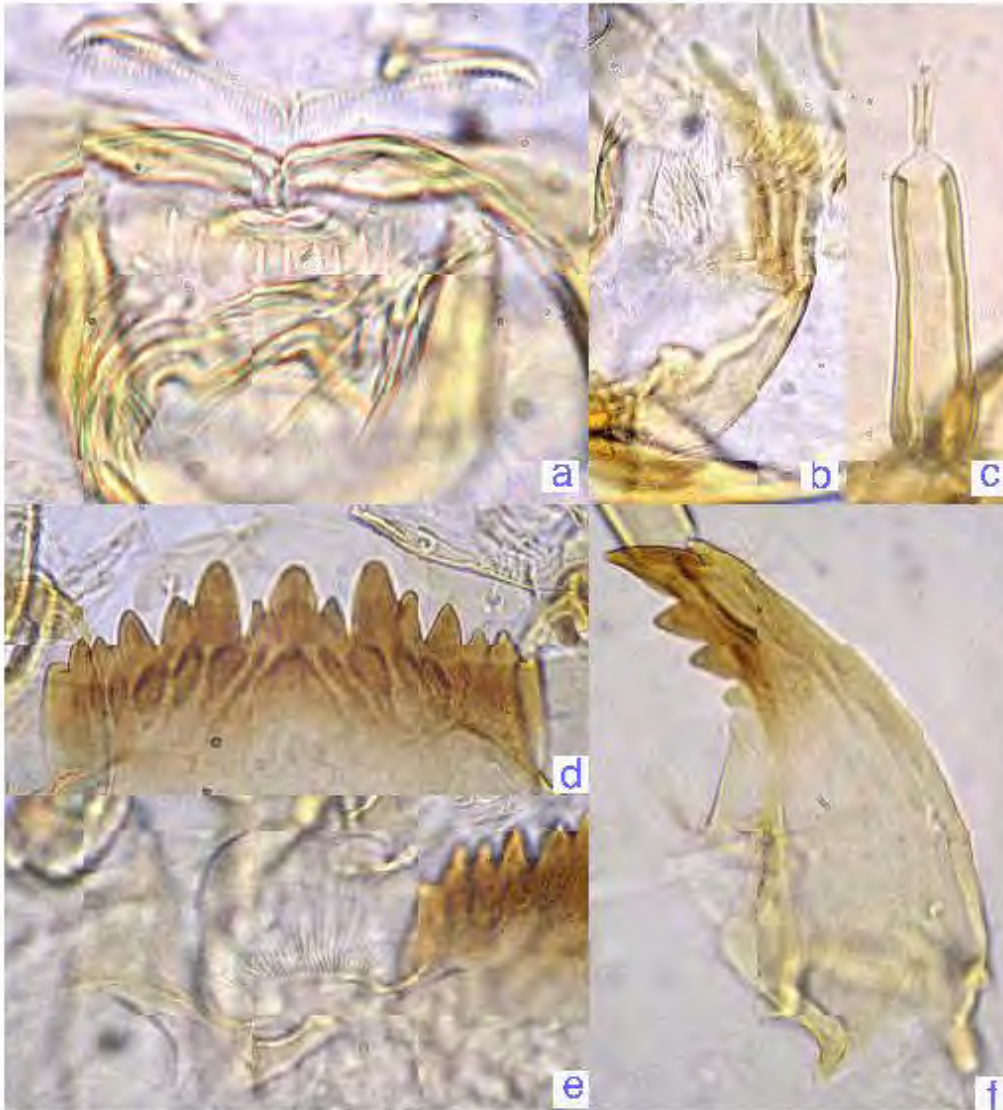
Mentum (Fig. d, below) wider than usual, about 0.6 of ventral head length; centre trifold teeth with c2 teeth well developed (essentially type IV); 4th laterals reduced to about the level of 5th laterals (type II), 6th lateral variable, sometimes arising at same level as other laterals but generally appearing to be at a slightly lower level, apparently due to wear.

Ventromental plates (Fig. f, below) separated by about 35-41% of the width of the mentum; each with about 32-35 striae; VMR about 0.36. PE (Fig. a, below) with about 13 (10-16, 8) sharp pointed teeth.

Premandible (Fig. b, below) with sharp teeth, outer tooth shorter than inner tooth, which is about twice as wide as the outer tooth.

Antenna (Fig. c, below) with moderately long A1, almost 4 times longer than wide, RO between 0.4 and 0.5 up from the base of the segment; relative length of antennal segments (micron) 110 : 24 : 6 : 11 : 7 ; AR 2.03-2.30.

Mandible (Fig. f, below) about 208-228 mm long, with 3rd inner tooth relatively pale and only partly separated (type IIA), about 13 (12-14,8) furrows on outer surface at base, PMA sparse, with about 8 (7-10,5) setae.



Larval head capsule characters of *C. samoensis*

**Cytology:** 4 polytene chromosomes with the pseudothummi arm combination AE, BF, CD, G.

Nucleolus medial in arm G; two Balbiani rings distal to the nucleolus.

A further nucleolus at about group 20 of arm F and there is a large puff in arm C that might also be a nucleolus.

All chromosomes closely paired. No polymorphism in the available specimens.

samA1: 1 - 2c, 10 - 12, 3 - 2d, 9 - 4, 13 - 19 as *holomelas*

samB1: Puff of group 7 near distal end of the arm with dark bands proximal to it.

samC1: Characteristic groups 3-4 just proximal to the large puff.

samD1:

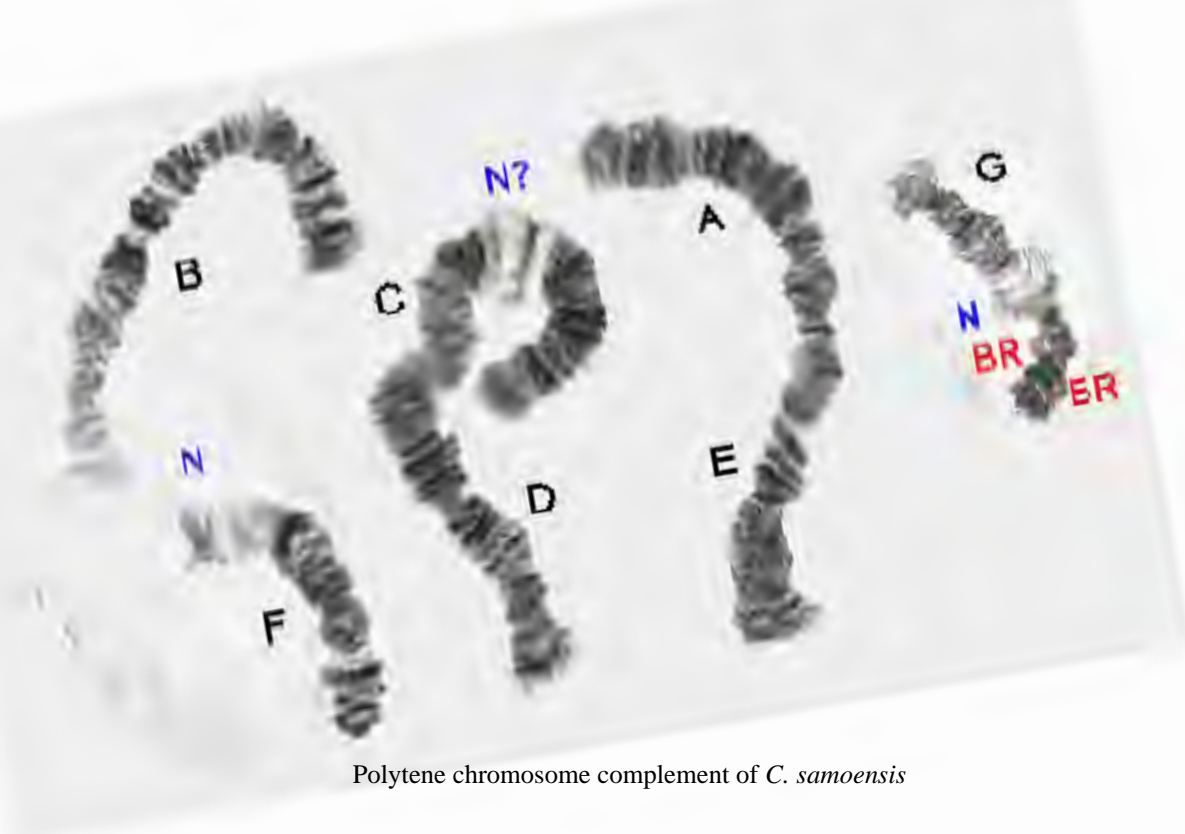
samE1: groups 11-13 near centromere.

samF1: Groups 20-23 near centromere, with nucleolus about group 20.

The polytene chromosomes of *C. samoensis* also differ from those described for the others species in the group. The arm combination is pseudothummi-cytocomplex, as in the other species, but the most obvious difference is that the nucleolus in arm G is near the middle of



the arm, rather than almost terminal. There is a second nucleolus near the diagnostic bands of arm F, and generally a large puff, which may be a nucleolus, near the middle of arm C.



#### Diagnosis

Based on these descriptions, diagnostic features of the species are: Frontal tubercles relatively long; LR about 1.50-1.52, fore Ta5 about one third of the length of the fore tibia, SV<sub>0</sub> of the D-type, or “beaked”; in female fore Ta4 longer than Ta3 and about the same length as Ta2. In larva, antennal segment 3 relatively short, usually shorter than A5. In the polytene chromosomes, the nucleolus in arm G is median, and there is a further nucleolus about region 20 of arm F and usually a large puff in arm C.

**Found:** Type localities - Apia, Western Samoa; Faratogo, Tutuila (now American Samoa); Tonga.

American Samoa - Mapusaga, Tutuila.

Micronesia - (Tokunaga 1964)

Specimens from other areas (Australia, Japan, and India) are related species, but not *C. samoensis*.

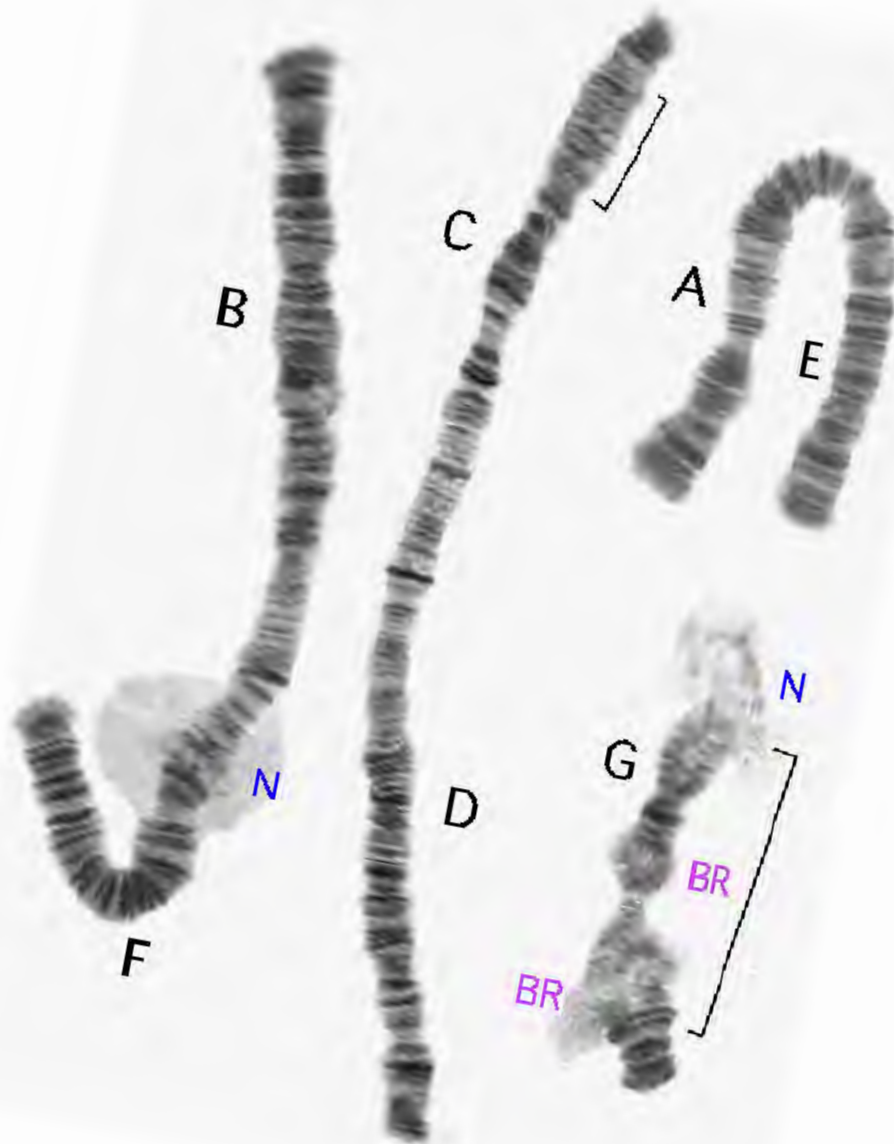
#### “*Chironomus samoensis*” (Japan)

A stock obtained from Dr. Hideo Yajima, Ibaraki University, Mito, Japan and called *C. samoensis* was studied genetically by Kuhn *et al.* (1987), Elbetieha and Kalthoff (1988) and for the polytene chromosome patterns of arms A, E and F by Wuelker *et al.* (1989).

Cytology: 4 polytene chromosomes with the pseudothummi arm combination AE, BF, CD, G. Nucleolus virtually terminal in arm G, but may not always be visible, or may be broken off; well developed BR about one third from the other end, and a smaller BR

close to this other end; closely paired. Nucleolus near the characteristic bands of arm F (abt group 18).

- ArmA1: 1a-i, 2k-d, 9 - 4, 13 - 14, 3h-i, 12 - 10, 2c - 1k, 3a-g, 15 - 19 complex  
inv from *holomelas*, etc.
- ArmB1: Puff near the middle of the arm with distal dark bands (gps. 8 - 7)
- ArmC1:
- ArmC2 Differs by a small terminal inversion, distal of characteristic band groups 3-4.
- ArmD1:
- ArmE1: 1 - 3e, 10b - 3f, 10c - 13 as *aprilinus*, etc.
- ArmF1: 1 - 2a, 10d-a, 15 - 11, 2b - 9, 16 - (nucleolus abt 18) - 23
- ArmG1:
- ArmG2: Inversion of central half of the arm from just distal of the nucleolus to just distal of the second BR.



Possible polytene chromosomes of "*C. samoensis*" (courtesy of W. Wuelker)  
The brackets indicate the approximate limits of known polymorphic inversions.

BR - Balbiani ring; N - Nucleolus

### Specimens identified as "*C. samoensis*" from Jammu and Kashmir:

#### Adult:

Male: Wing length 3.39 - 3.57 mm, width 0.73 - 0.88 mm. AR 2.85 - 3.05.

LR - 1.4; the fore Ta4 about 0.28 of the length of Ti.

Head: Frontal tubercles present, abt 18 - 28  $\mu$ m; abt 23 - 25 clypeal setae.

Palpal proportions (micron): 49 : 53 : 218 : 230 : 370

Thorax: Setae - Acrostichal 14 - 16; dorsolateral 11 - 19; prealar 5 - 6; scutellars in two or three rows, ant. row 6 - 10, posterior rows 14, and/ or 11 - 15.

Legs: Proportions (microns)

|      | Fe   | Ti   | Ta1       | Ta2       | Ta3 |
|------|------|------|-----------|-----------|-----|
| PI   | 1255 | 1198 | 1895      | 1035      | 760 |
| PII  | 1390 | 1263 | 750       | 412       | 305 |
| PIII | 1570 | 1553 | 1148      | 620       | 484 |
|      | Ta4  | Ta5  | LR        | F/T       | BR  |
| PI   | 680  | 400  | 1.59      | 1.02-1.10 | 4.3 |
| PII  | 203  | 158  | 0.58-0.62 | 1.09-1.12 | -   |
| PIII | 303  | 185  | 0.64-0.78 | 1.00-1.01 | -   |

About 9 - 10 sensilla chaetica on midTa1 and about 5 - 9 on Hind Ta1



The SVo is D-type, with an extended 'beak' (above); IVo with some forked setae; and tergite 9 has 12-19 setae (c.f. sp 5), GS moderately swollen and narrowing from about half way.

**Pupa:** Not known.

**Fourth instar larva:** larva a small to medium plumosus-type. Posterior third of gula dark, FA very dark. Anal tubules long, cylindrical, about 340 µm in length. Antenna with basal segment about 2.7 times longer than wide; AR 1.86; ratio of antennal segments (µm) 80 : 25 : 9 : 6 : 3.

**Cytology:** Four polytene chromosomes with the pseudothummi-cytocomplex combination BF, CD, AE, G. Nucleolus subterminal in arm G and also in arm F, a nucleolus sometimes developed in arm D.. Nucleolus in arm G may only appear as a large puff. Polymorphism in arm C, D and G. Although no polymorphism has been observed in arms A or B, two different homozygous sequences have been observed (associated) in different populations.

“sam”A1: 1 - 2c, 10 - 12, 3 - 2d, 9 - 4, 13 - 19 as *circumdatatus* A2, *holomelas*, etc.

- “sam”A2: 1 - 2c, 10 - 12, 3, 14c-13, 4 - 9, 2ed, 14d-19 (in 2d-14c c.f. *incertipennis* & “sam”A1) – probably *C. nr. flaviplumus*
- “sam”B1: Puff (gp 7) medial, with dark bands (gp 8) proximal.
- “sam”B2: Puff (gp 7) more distal, with dark bands (gp 8) distal.
- “sam”C1: Typical constriction (gp 3-4) proximal.
- “sam”D1:
- “sam”D2: Small inversion at distal end of arm.
- “sam”E1: 1-2c, 5-10b, 3e-2d, 4-3f, 10c-13 as *incertipennis*
- “sam”F1: 1a - 2a, 10d-a, 15 - 11, 2b - 9, 16 - 23 (not proven) as *flaviplumus*
- “sam”G1: two dark bands immediately distal to nucleolus.
- “sam”G2: inversion of middle third of arm.

**Found:** India - Bishnah wetland (A2,B2) Deoli Village (A2,B2); Gadigagh; Sangrampur village (A1,B1), Jammu region. Berhampore, Farakka, and Burdwan, West Bengal. Not identical to material from Japan, Korea, Java, Australia, Samoa & other Pacific Islands. Cytology differs most notably from *C. samoensis* by the position of the nucleolus in arm G, which is medial in *C. samoensis*. Some polytene chromosome sequences, are similar to those of *C. flaviplumus* from Japan, while the mtCOI sequences also indicate relationship.

It is likely that this species is a complex of closely related forms. The included specimens have very similar mitochondrial COI sequence (result of hybridization?), but the cytology differs (as noted above). All examined larvae have a darkened gula and FA.

### ***Chironomus simantobeeus* Sasa, Suzuki and Sakai 1998**

#### **Adult**

Male: Length 7.12 mm. Wing length 3.04 mm, width 0.88 mm.  
 AR 3.11. Frontal tubercles prominent, 48 µm long, 12 µm wide.  
 Clypeal setae 26.  
 Thoracic setae: 17 dorsocentral, 21 acrostichials; 7 prealars, 34 scutellars.

**Found:** Type locality – Shimanto River, Shikoku Island, JAPAN

### ***Chironomus sinicus* Kiknadze et al. 2005.**

#### **Adult**

Male: Length 8.64 – 9.67 mm.  
 Wing length 4.43 – 5.03 mm; VR 1.03 – 1.06. Squama with 13 – 21 setae.  
 AR 4.79 – 5.31. Frontal tubercles well developed, 52 – 83 µm long.  
 Relative length of palps (in µm) 66 : 82 : 244 : 232 : 298. Clypeus with 31 – 39 setae.  
 Thoracic setae: 16 – 19 dorsocentral, 9 – 14 acrostichials; 6 – 7 prealars, 35 – 42 scutellars.

Legs: Front tarsi bearded, BR 5.95 – 6.23. Leg ratios omitted from published description, but inserted below:  
Lengths (in mm) and proportions of legs:

|                | fe              | ti              | ta <sub>1</sub> | ta <sub>2</sub> |
|----------------|-----------------|-----------------|-----------------|-----------------|
| p <sub>1</sub> | 1.67-1.92, 1.81 | 1.70-1.94, 1.79 | 2.27-2.46, 2.32 | 1.40-1.51, 1.44 |
| p <sub>2</sub> | 1.84-2.08, 1.95 | 1.84-2.00, 1.92 | 1.03-1.11, 1.08 | 0.65-0.73, 0.68 |
| p <sub>3</sub> | 2.24-2.43, 2.33 | 2.35-2.51, 2.42 | 1.62-1.81, 1.70 | 1.00-1.11, 1.05 |
|                | ta <sub>3</sub> | ta <sub>4</sub> | ta <sub>5</sub> | LR              |
| p <sub>1</sub> | 0.86-0.95, 0.91 | 0.76-0.81, 0.78 | 0.34-0.41, 0.37 | 1.17-1.36, 1.30 |
| p <sub>2</sub> | 0.46-0.51, 0.48 | 0.30-0.35, 0.32 | 0.24-0.27, 0.26 | 0.55-0.58, 0.56 |
| p <sub>3</sub> | 0.76-0.84, 0.79 | 0.43-0.49, 0.47 | 0.27-0.30, 0.29 | 0.68-0.72, 0.70 |

**Pupa:**

Length 12.0 – 12.5 mm, wing sheath length 2.8 – 3.0 mm. Cephalic tubercles 220 - 250 µm high and 120 – 150 µm wide. Thoracic granulation well developed anteriorly. Pleura of segment IV smooth. Hook row of tergite II with 90 – 125 hooks and occupying 0.59 – 0.63 of total segment width. Caudolateral spur of segment VIII with 10 – 14 spines. Shagreen present on sternites III and IV and forms a longitudinal band on each side.

**Fourth instar larva** of the melanotus (semireductus)-type, length 17 – 22 mm. VT 0.82 – 1.25 mm (ant) and 0.75 – 0.98 mm (post), posterior pair curved anteriorly PLT about 160 – 238 µm long. Ventromentum with about 79 – 83 striae. PE with about 12 – 17 teeth. AR 1.55 – 2.28; antennal proportions (µm) 144 : 34 : 15 : 16 : 10 ; basal segment about 2.9 – 3.2 times as long as wide. Mandible about 310 – 350 µm, third inner tooth apparently darkened and well developed. Anal tubules about 440 – 530 µm long and 140 – 250 µm wide.

**Cytology:** Four polytene chromosomes with the thummi-cyto-complex combination: AB, CD, EF, G. Only nucleolus subterminal on arm G. Polymorphism in arms C and G. Additional B-chromosomes present in over a third of larvae examined.

sinA1: 1a – 2c, 10 – 12, 3 – 2h, 4d – 9, 2d-g, 4c-a, 13 – 19 as plumosus A1

sinB1: Puff towards the distal end of the arm

sinC1: 1a-c, 12 -11d, 6gh, 17a-16, 7d-a, 6f-c, 2c-1d, 13-15, 8-11c, 6b-2d, 17b-22

sinC2: 1a-c, 12 -11d, 6gh, 17a-16, 7d-a, 6f-c, 2c-1d, 13-15, 8-11c, 6b-4g, 18d-17b, 2d-4f, 18e-22

sinD1: 1 - 2g, 13a, 10a-8, 18d-a, 7-4, 10e-b, 13b-14, 3-2h, 12 - 11, 15 - 17, 18e-24

sinE1: 1 – 3e, 5 – 10b, 4 – 3f, 10c – 13 as plumosus E1

alternative E1; 1 – 3a, 4c-10b, 3e-b, 4b – 3f, 10c - 13

sinF1: 1a-d, 6e – 5d, 10d – 7a, 5c – 1e, 14f – 17, 14e – 11, 18 – 23

sinG1 and sinG2 differ by a small inversion near the distal BR.

**Found:** Type locality – Nankai University campus, Tianjin City, CHINA.

Cytology described by Kiknadze *et al.* (2005) as part of the original description.

***Chironomus sollicitus* Hirvenoja 1962**

In BOLD Bin: [BOLD:AAI4306](#)

**Adult** Described originally from Finland, on the basis of the adult male and female. Japanese material described by Yamamoto 1997, on the basis of the adult male only. Some additional data from original description

Male: Wing length 3.2 (3.93, 4.4-5.5) mm, width 0.9 mm., VR 1.09. AR 3.51-3.60 (3.69-4.29). L.R. 1.49-1.56 (1.36-1.58).

Coloration: Head brown, antennal pedicel dark brown. Thorax with antepnotum yellow, mesonotum ochreus, scutal vittae dark brown, postnotum dark brown.

Legs predominantly yellowish brown, apical part of ta1 and ta2 brown, other tarsi completely brown. Abdomen predominantly brown, anteromedial and lateral portions of TI, posterior margins of TII-VIII pale, genitalia entirely brown.

Head: Frontal tubercle small. Palpal proportions (micron) 65 : 80 : 180 : 240 : 370.

Clypeus with 33-34 setae, prementum with 1 seta.

Thoracic setae – 0-1 lateral antepnotal1; acrostichal - 18-23 (8-23); dorsolateral - (32 (25-53)); prealars 5-6 (5-9); supraalar – 1 (0-2); scutellar - 33-34 (29-55) irregularly triserial.

Leg lengths and proportions (micron):

|             | <b>Fe</b> | <b>Ti</b> | <b>Ta1</b> | <b>Ta2</b> | <b>Ta3</b> | <b>Ta4</b> | <b>Ta5</b> | <b>LR</b> | <b>F/T</b> | <b>Ta5/Ti</b> |
|-------------|-----------|-----------|------------|------------|------------|------------|------------|-----------|------------|---------------|
| <b>PI</b>   | 1350      | 1240      | 1890       | 980        | 780        | 680        | 310        | 1.49-1.56 | 1.09       | 0.25          |
| <b>PII</b>  | 1400      | 1350      | 850        | 500        | 350        | 250        | 150        | 0.65      | 1.04       |               |
| <b>PIII</b> | 1600      | 1750      | 1250       | 750        | 550        | 350        | 200        | 0.71      | 0.91       |               |

BR (Europe) 2.58 (1.83-4.00)

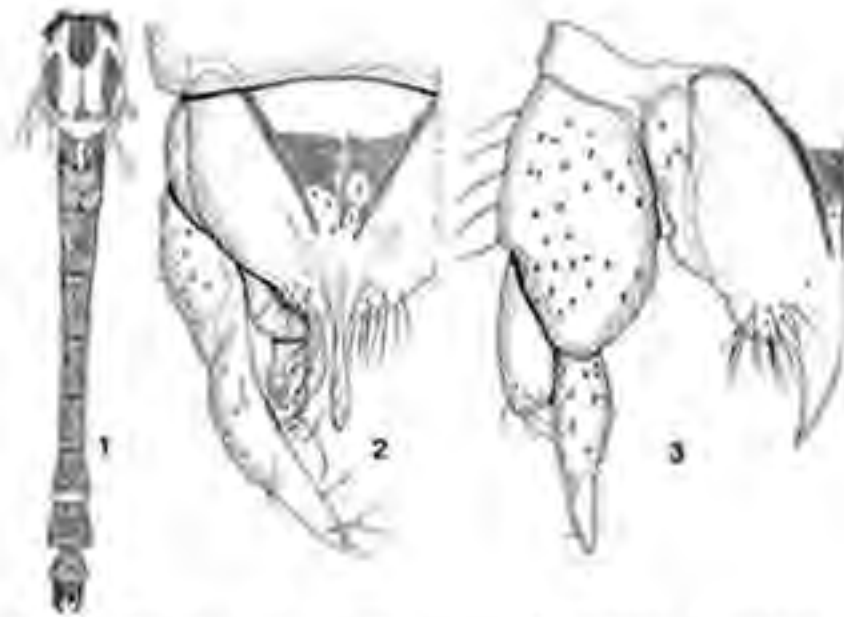


Fig. 1-3. *Chironomus sollicitus* (Hirvenoja). — 1. Body with genitalia in dorsal view; 2. Hypopygium in dorsal view; 3. Anal point and SVO in lateral view.

Hypopygium of *C. sollicitus* from Yamamoto 1997

TIX with 5 setae in multiple clear fields (5-13 setae in European specimens). Anal point long and slender, slightly expanded posteriorly and bill-like in lateral view, SVo of S-type of Strenzke (1959) with 7-9 setae on the base. IVo long, straight, nearly parallel-sided, extending to tip of anal point, with about 20 recurved setae on apical half, some of which are forked near the tip.

Female: Japanese specimens not known, data from European specimens of Hirvenoja (1962).

Coloration essentially as in male.

Wing length 5.2 (4.8-5.5) mm.

Thoracic setae: acrostichal – 24 (18-32); dorsolaterals – 47 (32-60); prealars – 7 (6-11); supraalars 1 (0-4); scutellars – 49 (39-65).

Fore leg measurements relative to length of tibia:

|    | Fe   | Ti  | Ta1  | Ta2  | Ta3  | Ta4  | Ta5  | LR        | F/T  | Ta5/Ti    |
|----|------|-----|------|------|------|------|------|-----------|------|-----------|
| PI | 1.19 | 1.0 | 1.57 | 0.75 | 0.62 | 0.57 | 0.24 | 1.48-1.68 | 1.19 | 0.21-0.26 |

BR 1.64 (1.43-2.17)

**Found:** JAPAN - Koshunai, Bibai, Hokkaido; Noboribetsu Hot Spr. (42.29°N, 141.08°E), Hokkaido (BOLD & GenBank),

**Type locality** – Riihimäki (60.83°N, 24.83°E), FINLAND

**Other record:** Rondane nasjonalpark (61.9814°N, 9.8048°E), Dovre, Oppland, NORWAY (BOLD).

Has similarities to *C. trinigrivittatus* but differs in the shape of the anal point and the SVo.

***Chironomus striatipennis* Kieffer 1910**



- as *Chironomus* (*Prochironomus*), on basis of adult female

-

Syn: *Chironomus kiiensis* Tokunaga, 1936. As currently used, this name is a junior synonym of *C. striatipennis* (Pramual *et al.* 2016). The location of type material is not recorded, so it is not certain whether the original specimens are identical to those currently recognized, since morphological and DNA data from Japan and Korea indicates the presence of a second species with similarly patterned wings.

However, considering the extensive use of the name for specimens of *C. striatipennis*, it is recommended that the name NOT BE USED, as its application to a different taxon would only cause further confusion.

*Chironomus pallidinubeculosus* - incorrect synonymy by Hashimoto *et al.* 1981, as this is a distinct species with similarly patterned wings.

- *Chironomus calipterus* – misidentification by Saxena (1995)
- *Chironomus strenzkei*, Fittkau 1968.

In Bold Bins: [BOLD:ABZ2474](#); [BOLD:AAD8160](#); and [BOLD:AAD8162](#)

Reflecting the geographic cline from Japan to India.

Note this also includes the bin in which most specimens identified as *C. kiiensis* have been placed.

Kieffer 1910, description of *Chironomus* (*Prochironomus*) *striatipennis*, sp. nov.  
(there are no figures)

**Female.** Brun; tête et antennes roussâtres, nodosités des antennes noirâtres; mesonotum d'un gris blanchâtre, avec 4 bandes d'un brun roux, les deux médianes séparées par une ligne et raccourcies en arrière, les deux latérales raccourcies en avant; scutellum d'un gris blanchâtre; balanciers blancs; pattes blanchâtres, extrémité des 3 ou 4 premiers articles tarsaux et le dernier ou les deux derniers en entier d'un brun noir. Antennes de 5 articles, dont le 2<sup>e</sup> est rétréci au milieu; 3-5 ellipsoïdaux, plus longs que leur col, sauf le 5<sup>e</sup>, dont l'appendice terminal est de moitié plus long que la nodosité; verticilles 2-3 fois aussi longs que l'épaisseur des articles. Ailes blanchâtres, avec des stries enfumées le long de la partie distale de la discoïdale, de la posticale et de ses deux rameaux, de l'anale et le long du bord du lobe anal; en outre, deux bandes longitudinales et étroites sont situées l'une distalement de l'autre, entre le cubitus et la discoïdale; nervures jaunâtres; transversale, base du cubitus et de la partie distale de la discoïdale noires et bordées de noirâtre; extrémité du radius également distante de l'extrémité des deux rameaux de la posticale; cubitus à peine arqué, non dépasse par la costale, distant du bord, aussi rapproché de la pointe alaire que la discoïdale; transversale oblique, située un peu en avant de la bifurcation de la posticale. Tibia antérieur égalant les trois quarts du fémur; métatarse double du tibia; 4<sup>e</sup> article tarsal plus de deux fois le 5<sup>e</sup>, celui-ci six fois aussi long que gros; aux pattes postérieures, le 4<sup>e</sup> article est de moitié plus long que le 5<sup>e</sup>, qui est 3-4 fois aussi long que gros. Abdomen presque deux fois aussi long que le reste du corps. Taille 4.5 mm.

**Translation:**

**Female.** Brown, reddish head and antennae, nodules of antennae blackish; mesonotum a whitish gray, with four bands of reddish brown, the median two separated by a line and shortened at the back, the two sides shortened at the front; scutellum of a whitish gray, white balancers, legs whitish, extremities of 3 or 4 first tarsal segments and the whole of the last of the two of a black brown. Antennae of 5 segments, including the second is narrowed in the middle; 3-5 ellipsoidal, longer than their collar, except the 5<sup>th</sup>, which is the terminal appendage which is half as long as the knot; whorls 2-3 times as long as the thickness of the

segments. Wings whitish, with smoky streaks along the distal portion of the discoidal, the posticale and its two branches, the anal and along the edge of the anal lobe, in addition, two longitudinal and narrow strips are located distally from one another, between the ulna and discoidal; veins yellowish; transversal, base of the ulna and the distal part of the discoidal black and borders of blackish; distal extremity of the radius also distant from extremity of the two branches the posticale; cubitus barely arched not exceeding the costal, distant from the edge, as close to the wing tip as the discoidal, transversal oblique, located just in front of the bifurcation of the posticale. Anterior tibia matching three-quarters of the femur; metatarsal twice the tibia; 4<sup>th</sup> tarsal segment more than twice the 5<sup>th</sup>, which is six times as long as wide; for the posterior legs, the 4<sup>th</sup> segment is half longer than the 5<sup>th</sup>, which is 3-4 times as long as wide. Abdomen almost twice as long as rest of the body. Length 4.5 mm.

i.e. for anterior legs LR = 2, F/T = 1.3

In Kieffer's key the defining character is two transverse dark bands on the wings.

Translation of Kieffer, J.J. Description de nouveaux Chironomides de l'Indian Museum de Calcutta. Records of the Indian Museum 6 (3): 134 (1911F)

*Chironomus striatipennis*, Kieff.

(Pl. vi, fig. 12, part of the pincer)

♂ ♀. The male, which was unknown so far, has the antenna of 12 segments, whose 2<sup>nd</sup> is longer than wide, 3-11 very transverse, 12<sup>th</sup> three times longer than the 10 preceding combined; plume tawny. Pronotum indented in the middle (♂ ♀). Mesonotum, scutellum and base of metanotum ash grey and dull, the three bands of the mesonotum brownish black, the median divided by a longitudinal line and posterior border by a brown line.

Posterior legs of male have hairs 2-3 times as long as their thickness, except the tarsi.

Lamella of the piners with a prolonged beak; terminal articles suddenly thinned in its distal half, which is cylindrical, hairless and provided with three long bristles on the inner side (fig. 12).

Kumaon (Uttarakand): Bhim Tal, at an altitude of 1500 m.; 27-ix-1906 (N. Annandale); 7♂ and 1 ♀. This species is neighbor to *calipterus*, Kieff.

The type in the Indian Museum was re-examined by Chaudhuri and Guha, but they did not redescribe it, while Chaudhuri *et al.* (1992) refer to a paratype male in the ZSI (Reg.no.980/15) but its status is not clear as there is only a single female in the type material, so it cannot be a Paratype, and the collector (G. Brown) was not named in the later description of the male.

**Diagnosis:** According to Chaudhuri *et al.* (1992):

Adult - scutellum with 14-18 setae; wing markings; tarsomeres I-III dark brown at apices; tergites II-V with brown median spot; hypopygium with bent anal point and curved SVO; and equal spheroidal seminal capsules.

Pupa - Frontal plate with triangular frontal tubercles; respiratory organ with a bunch of profusely branched filaments; tergite II with median shagreen and caudal row of 62-72 hooklets; tergite VIII with basal transverse patch of shagreen, caudolateral spur with 2 unequal points; G/F 1.05-1.08 in male and 0.69-0.82 in female.

Fourth instar larva - AR 1.6-2.0, triangular labral lamella; 2 pairs of chaetulae basales; PE a single plate with 16 teeth; premandible with subequal apical teeth and short premandibular brush; mandible with well developed pecten mandibularis; maxilla with 4 sensilla basiconica; mentum with short 4<sup>th</sup> and 6<sup>th</sup> lateral teeth; segment XI with 2 pairs of coiled ventral tubules; procercus with 8 anal setae.

**Adult:** Incorporating description of Chaudhuri *et al.* (1992):

Male:

Wing length = 1.98-2.84 mm.; width = 0.53-0.70) mm. VR = 1.04-1.08.

LR = 1.49-1.82;

Face yellowish brown, antennae and palps brown. AR about 2.47 – 2.97. Frontal tubercles about 41 (35 - 49)  $\mu$ m long and 14 (10-20)  $\mu$ m wide. Palpal proportions (micron) 50 : 44 : 160 : 164 : 240. Clypeal setae - abt 16 - 22.

Thorax pale brown with brown stripes, lateral stripes darker along the medial edge, and ending in a darker spot; postnotum and sternopleuron brown.

Setae: acrostichals - abt 17 (13 - 23); dorsocentrals - 19 (16 - 26); prealar - 5 (3-5); scutellar - 2 - 4 in anterior row, 8 - 14 in posterior row.

Wings with dark spot over the crossvein and with obvious dark clouds and seams, particularly in cell R5. 2 setae on brachiolum, abt 12-20 setae in squamal fringe.

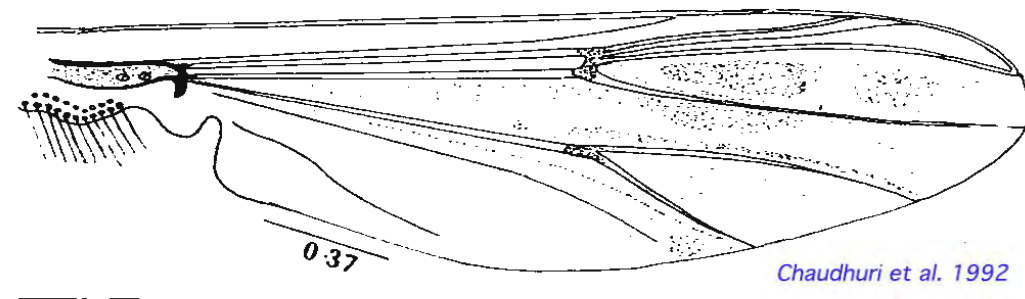
Haltere pale.

Relative lengths of leg segments ( $\mu$ m):

|             | <b>Fe</b>  | <b>Ti</b>  | <b>Ta1</b> | <b>Ta2</b> | <b>Ta3</b>    |
|-------------|------------|------------|------------|------------|---------------|
| <b>PI</b>   | 1088       | 994        | 1569       | 854        | 608           |
| <b>PII</b>  | 1139       | 1102       | 640        | 408        | 297           |
| <b>PIII</b> | 1279       | 1343       | 1012       | 604        | 455           |
|             | <b>Ta4</b> | <b>Ta5</b> | <b>LR</b>  | <b>F/T</b> | <b>Ta5/Ti</b> |
| <b>PI</b>   | 487        | 256        | 1.49-1.82  | 1.08-1.23  | 0.25-0.32     |
| <b>PII</b>  | 200        | 139        | 0.55-0.62  | 1.00-1.04  |               |
| <b>PIII</b> | 272        | 173        | 0.72-0.80  | 0.93-1.01  |               |

Ant. BR 4.5-5.0 Sensilla chaetica: Mid 5-7; Hind 7-8

Wings with dark clouds.





Male hypopygium (left) and superior appendage (right) of an Indian specimen of *C. striatipennis*

Abdominal tergites mostly dark, with a pale basal band on the anterior segments, paler in Japanese specimens. About 7-10 setae near middle of tergite IX. SVo of E type close to fig. h of Strenzke (1959). Setae of IV simple.

Female (based on Sasa 1978 and Chaudhuri et al. 1992):

Wing length 1.68- 2.8 mm. VR about 1.06. Cloudy patches as in male.

Antennal proportions (micron) 80, 147, 102, 105, 98, 170. AR 0.37-0.38

Frontal tubercles 43 µm long, 22 µm wide.

Palps (segs 2-5): 40, 130, 100, 230.

Leg lengths (microns) and proportions as follows:

|             | <b>Fe</b>  | <b>Ti</b>  | <b>Ta1</b> | <b>Ta2</b> | <b>Ta3</b>    |
|-------------|------------|------------|------------|------------|---------------|
| <b>PI</b>   | 1170       | 980        | 1610       | 880        | 710           |
| <b>PII</b>  | 1200       | 1170       | 660        | 380        | 270           |
| <b>PIII</b> | 1370       | 1440       | 1100       | 660        | 540           |
|             | <b>Ta4</b> | <b>Ta5</b> | <b>LR</b>  | <b>F/T</b> | <b>Ta5/Ti</b> |
| <b>PI</b>   | 660        | 320        | 1.65       | 1.19       | 0.33          |
| <b>PII</b>  | 200        | 150        | 0.56       | 1.03       | 0.13          |
| <b>PIII</b> | 320        | 200        | 0.76       | 0.95       | 0.14          |

**Pupa:** Length 5.4- 6.8 mm (male) 4.8-5.8 (female), posterior margin of wing case about 1.1

mm.

Head: Cephalic tubercles about 53-80  $\mu\text{m}$  long and about 40-65  $\mu\text{m}$  wide at the base, with a subterminal seta about 57  $\mu\text{m}$  long.

Thorax: Prealar tubercle present, not simple, but small, about 25  $\mu\text{m}$  long and 6  $\mu\text{m}$  wide.

Basal ring of respiratory horn with edge thicker at the anterior end, and pinched at the centre, about 126  $\mu\text{m}$  long and 60  $\mu\text{m}$  wide. There are about 3 rough short spines immediately anterior to the basal ring, and a large, possibly muscle scar just posterior to it.

Abdomen: About 62-72 recurved hooks on posterior margin of segment II, the hook row covering about 54% of the width of the segment. PSB on segment II, and PSA on segment IV, while those of segment V and VI are small and mainly identifiable by the spinules.

Caudolateral spur of segment VIII generally with 1 main spine (see below), but occasionally with 1 or 2 subsidiary ones.

Anal lobe with about 53 taeniae on each side, mostly in a single row.



**Fourth instar larva:** a small plumosus-type (length 7 - 12.3 mm (fem. 10.5-12.3 mm)).

Anterior VT bent and posterior VT coiled and about equal length or anterior longer (ant 0.96-1.56 mm, post 0.96-1.48 mm).

Gula from pale to dark, which may extend over posterior 2/3; and FA also from pale to dark.

Distance between antennal bases generally greater than the distance between the S4 setae.

Mentum (c, below) with c2 teeth of central tooth separated and sharp (type 3), 4th lateral reduced, sometimes only slightly, or down to level of 4th lateral. Pecten epipharyngis (a, below) with 12-18 teeth.

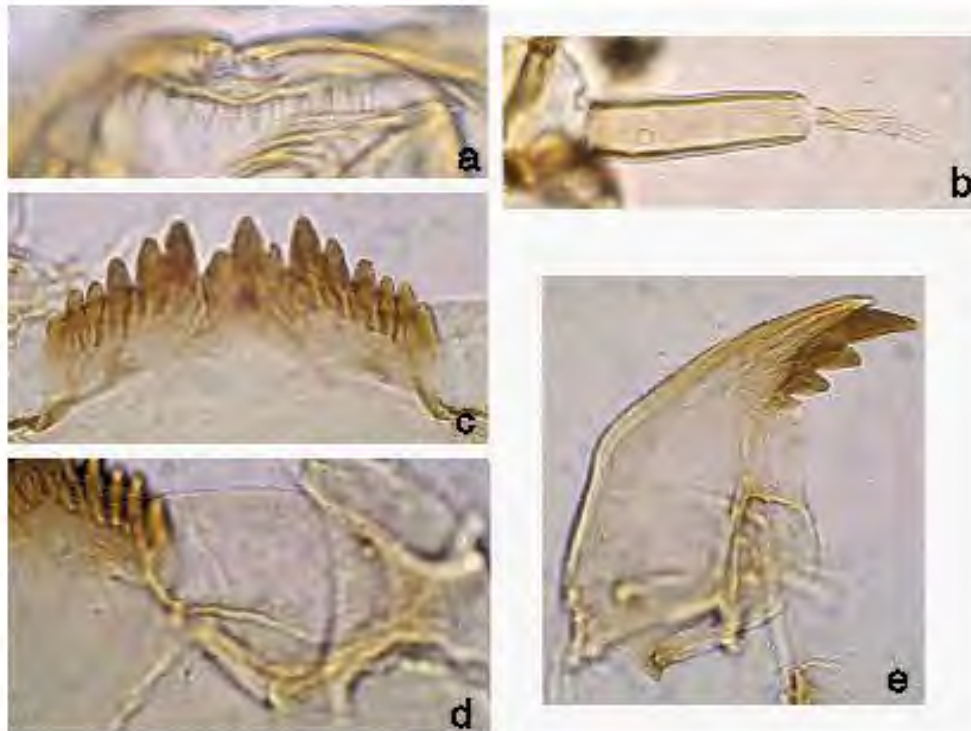
Ventromental plates (d, below) separated by 0.25-0.4 of the mentum width, about 19-46 striae reaching at least halfway to anterior margin, VMR about 0.28-0.36..

Premandibles with outer tooth slightly longer, but wear may make them equal or even leave the inner tooth slightly longer; inner tooth at least 1.5 and up to 2.5 times wider than the outer tooth.

Mandible (e, below) with third inner tooth partially or completely separated, and partially pigmented (i.e. type IIB or IIIB), with 12-20 furrows.

Antenna (b, below) with basal segment relatively long, 3.2-3.9 times longer than wide; RO from about 0.32-0.53 up from base of segment; AR about 1.63-2.14; proportions ( $\mu\text{m}$ ) 113 : 27 : 8 : 11 : 6.

Much of the variability in these larval characters comes from the different Indian samples.



(Currently also includes striatipennis type 2)

**Cytology:** Four polytene chromosomes with the pseudothummi-cytocomplex combination BF, CD, AE, G. Centromeres with some degree of heterochromatinization. Nucleolus essentially terminal on arm G, no nucleoli on long arms. End of arm G bearing nucleolus is typically unpaired, with BR near other end. Polymorphism in A, B, C, D, E, and F.

stpA1: 1 - 2c, 11 - 7, 4 - 6, 2d - 3, 12 - 19

stpA2: 1a-d, 10d - 12, 3 - 6a, 7 - 9, 4 - 6, 2i - 1e, 10a-c, 16 - 17, 13 - 15, 16 - 19

stpB1: Puff virtually terminal with only the dark bands distal.

stpB2: simple inversion of B1, shares proximal breakpoint with B4, B5, B6

stpB3: slightly longer inversion than B2, distal break at least 10 bands distal of B2 break.

stpB4: shares distal break with B2, proximal breakpoint shared with B5, B6 & B8.

stpB5: proximal breakpoint shared with B4, B6 & B8, distal with B3.

stpB6: proximal breakpoint shared with B4, B5 & B8, distal breakpoint shared with B7.

stpB7: proximal breakpoint closer to centromere, distal breakpoint shared with B6.

stpB8: proximal breakpoint shared with B4, B5 & B6, distal breakpoint just proximal to puff of group 7.

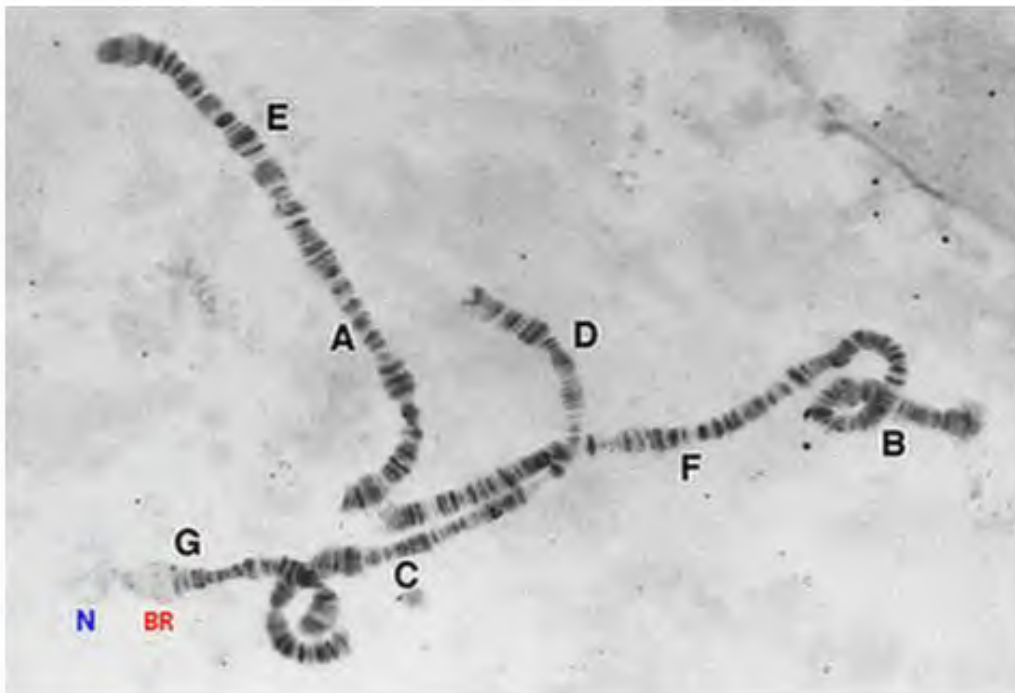
stpC1:

stpC2:

stpD1:

stpD2:

- stpE1: 1a - 13g ie. as *piger*
- stpE2: 1 - 2c, ~~8-2d~~, 9 - 13
- stpF1: 1 - 2a, 15 - 11, 2b - 10, 16 - 23 Inv15-10 from oppF1
- stpF2: 1a, ~~21c-16, 10-2b, 11-15, 2a-1b~~, 21d - 23 from stpF1 (from Saxena)
- stpF3: 1 - 2a, ~~15-14, 18-16, 10-2b, 11-13~~, 19 - 23 from stpF1 (from Saxena)
- stpF4: 1 - 2a, 15 - 14, ~~16f-a, 10-2b, 11-13~~, 16g - 23 from stpF1 (from Saxena)
- stpG1: nucleolus subterminal, A large BR may be developed in some localities, but not in others.



**Found:** India - Type localities - Bhim tal, Kumaon, Uttar Pradesh.

Other localities: Burdwan; Delhi – Lodi Gardens (28.53°N, 77.27°E); Yamuna River, Okhla (28.58°N, 77.22°E). Uttar Pradesh - Varanasi, Banaras (25.20°N, 83.10°E).

Jammu & Kashmir - Bishnah Wetlands (abt. 32.70°N, 75.00°E).

Japan – Otsu City, Honshu (35.00°N, 135.88°E). Many other localities as *C. kiiensis*, but uncertain which form they are.

Korea

Malaysia – Kuala Terengganu, Terengganu (5.33°N, 103.15°E).

Singapore – Bedok Canal (1.28°N, 103.83°E).

Thailand - Pattani, Pattani Province (6.87°N, 101.25°E); Maha Sarakham.

Brazil - Manaus, Amazonas (3.108°S, 59.975°W).

U. S. A. - El Segundo, Los Angeles Co., California (Sublette & Mulla (2000) as *C. strenzkei*).

Adult re-described and immatures described by Chaudhuri, Das & Sublette (1992) for Indian material, while Sasa (1978) and Sasa & Hasegawa (1983) re-described Japanese material as *C. kiiensis*. The population in Brazil appears to be a recent introduction, probably from somewhere around Japan (Amora *et al.* 2015) ; while the Brazilian and Californian

populations of *C. strenzkei* (Fittkau 1968; Sublette & Mulla 2000) are synonyms of *C. striatipennis*. Nath & Lakhota (1989) and Gupta & Kumar (1991) both describe the chromosomes, but it appears they reverse chromosomes I and II. Chromosome arms A, E and F were described by Saxena (1995) as *C. calipterus* and she also provided some other unpublished sequences.

**DNA sequence:**

Mt *COI* barcode sequence exists for some Indian specimens, and is similar to sequences from Japan, Korea, Singapore, Malaysia, Thailand attributed to *C. kiiensis*, but with an apparent cline of difference from west to east. Sequence from Brasil shows close relationship to Japanese sequences.

GenBank accession numbers: AB740241, AB838643, AB838645, AB838646, JF412086, JF412087, JF412088, JF412089, JQ350720, KT212990-994

BOLD numbers: COTW008, COTW009, COTW010, COTW011, COTW012

Many of these sequences are under the name *Chironomus kiiensis*.

***Chironomus striatipennis* Type 2**

In BOLD Bin: [BOLD:AAD8161](#)

**Adult:**

Male: The abdomen of the molecular Type 2 (see below) appears to have an abdomen similar to that of the Japanese Type 1 material.

Wing length about 2.62-2.64 mm, width 0.56-0.66 mm. VR - 1.08-1.13

AR about 2.2. Cephalic tubercles developed, about 35-46 µm long and 18-22 µm wide. 17-18 setae on clypeus; palpal proportions (µm) 50 : 38 : 152 : 157 : 240.

Thoracic seta: acrostichal - 10-13; dorsocentral - 15-18; prealar - 5; scutellar in two rows, anterior - 4-5, posterior - 9-11.

Wings with dark spot over the crossvein and with obvious dark clouds and seams, particularly in cell R5; abt 6-14 SCf on brachiolum in two clusters, abt 18 setae in squamal fringe.

Leg lengths (µm) and proportions:

|             | <b>Fe</b>  | <b>Ti</b>  | <b>Ta1</b> | <b>Ta2</b> | <b>Ta3</b> |
|-------------|------------|------------|------------|------------|------------|
| <b>PI</b>   | 1031       | 938        | 1390       | 760        | 613        |
| <b>PII</b>  | 1092       | 1048       | 735        | 366        | 266        |
| <b>PIII</b> | 1224       | 1270       | 987        | 557        | 430        |
|             | <b>Ta4</b> | <b>Ta5</b> | <b>LR</b>  | <b>F/T</b> | <b>BR</b>  |
| <b>PI</b>   | 413        | 249        | 1.32-164   | 1.10-1.11  | 2.3-3.5    |
| <b>PII</b>  | 175        | 136        | 0.60-0.82  | 1.01-1.07  |            |
| <b>PIII</b> | 256        | 170        | 0.78       | 0.96       |            |

Female:

**Fourth instar larva:** a small plumosus-type (length fem. abt 9.2 mm). Anterior VT bent and posterior VT coiled and posterior longer (ant 0.74 mm, post 0.781 mm).



Gula from pale to dark, which may extend over posterior 2/3; and FA also from pale to dark. Mentum with c2 teeth of central tooth separated and sharp (type 3), 4th lateral possibly slightly reduced, but broken on available specimen (type 1?). PE with 14 teeth. Ventromental plates separated by about 0.28 of the mentum width, about 38-40 striae reaching at least halfway to anterior margin. Premandibles with teeth approximately equal in length; inner tooth about 2x wider than the outer tooth. Antenna with basal segment relatively long, 3.2 times longer than wide; RO from about 0.37-0.42 up from base of segment; AR about 1.8; proportions (µm) 102 : 23 : 9 : 11 : 8. Distance between antennal bases generally greater than the distance between the S4 setae. Mandible with third inner tooth partially separated, and pale (i.e. type IIA), with 17-19 furrows.

**Cytology:** Centromeres only slightly heterochromatic in Malaysian specimen.

**Found:** Malaysia - Minden, Penang (5.13°N, 100.13°E).  
Singapore – Bedok Canal (1.367°N, 103.939°E).

The redescription of *C. kiiensis* by Al-Shami *et al.* (2012) probably refers to this material.

**Molecular:** The mitochondrial *COI* differs from that of Type 1, and this sequence is found in Japan and SE Asia, but has not been found in India.

BOLD accession numbers: COTW009, COTW010, COTW013

***Chironomus sulfurosus* Yamamoto, 1990**

In BOLD Bin: [BOLD:ACH4992](#)

This is the same Bin as *C. fusciceps*, which has 99.83% homology.

(based on Yamamoto 1990)

**Adult:** A dark species, similar in coloration to *C. acerbiphilus* and *C. fusciceps*.

Male

Wing length 2.3-2.6 mm, width 0.7-0.8 mm; VR 0.91 (0.90-0.93).

AR about 2.69 (2.54-2.92), LR 1.42 (1.32-1.52).

Head: Frontal tubercles 12.5-32.5 µm long, about 1.2-2 times longer than wide.

Clypeus with 30-39 setae. Mean palpal lengths (micron): 52 : 60 : 180 : 182 : 234.

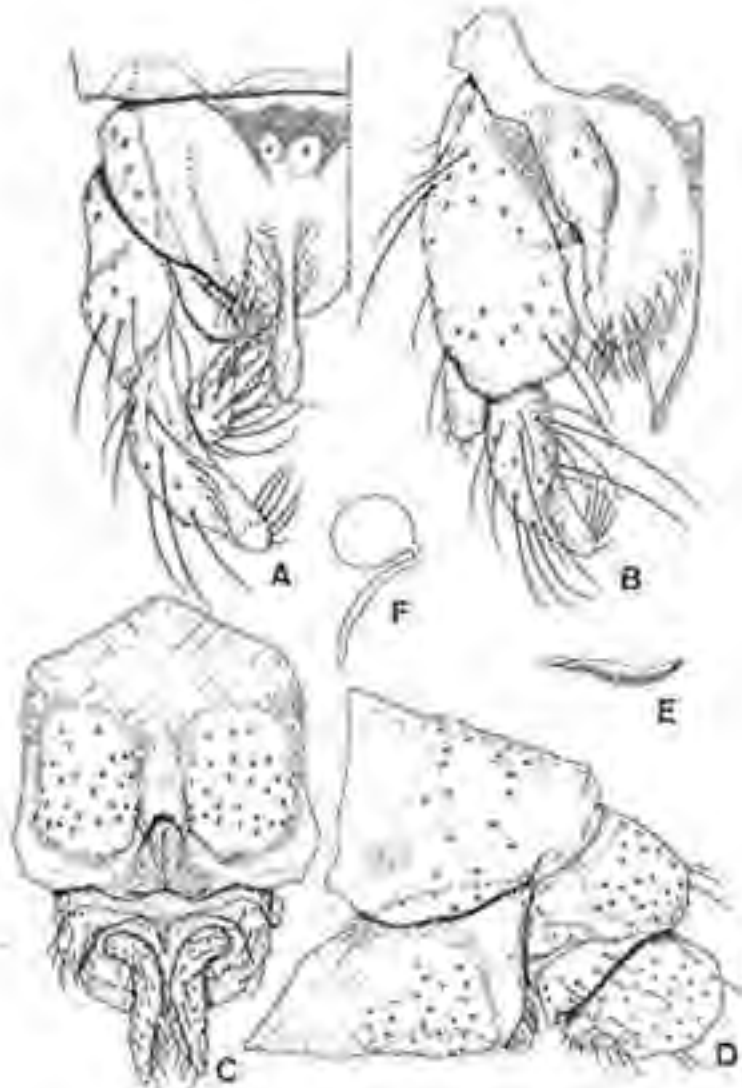
Thoracic setae: 15-22 dorsocentrals, biserial at anterior end; 4-6 prealars; 1 supraalar; 26-32 scutellars in about 3 rows.

Leg proportions (micron):

|             | Fe   | Ti   | Ta1  | Ta2 | Ta3 | Ta4 | Ta5 | LR        | F/T  | Ta4/Ta3   |
|-------------|------|------|------|-----|-----|-----|-----|-----------|------|-----------|
| <b>PI</b>   | 1270 | 1020 | 1500 | 750 | 630 | 480 | 270 | 1.32-1.52 | 1.25 | 0.73-0.77 |
| <b>PII</b>  | 1300 | 1110 | 620  | 350 | 270 | 190 | 150 | 0.53-0.58 | 1.17 |           |
| <b>PIII</b> | 1450 | 1310 | 880  | 500 | 400 | 250 | 100 | 0.66-0.70 | 1.11 |           |

antTa5/Ti – 0.26

About 2-11 setae at middle of tergite IX. SVo of S-type; GS narrowing sharply over posterior third.



Genitalia of *C. sulfurosus*: A: male -dorsal view; B: lateral view  
C: female -ventral; D: lateral view; F: spermatheca.

Female

Coloration almost the same as *C. fusciceps* female.

Wing length 2.5-2.9 mm, width 0.8-1.0 mm, VR 0.88 (0.84-0.89). Squama with 16-28 setae.

Leg proportions (micron):

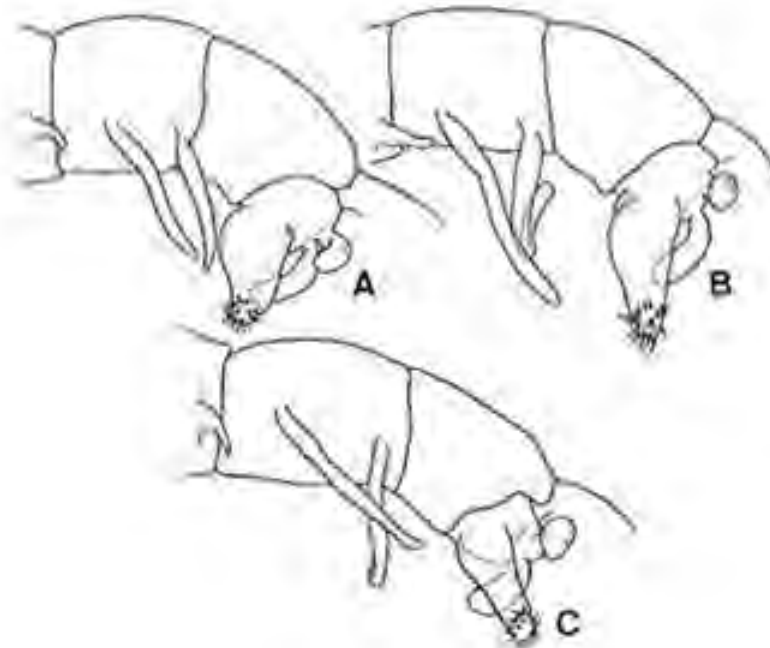
|             | Fe   | Ti   | Ta1  | Ta2 | Ta3 | Ta4 | Ta5 | LR        | F/T  | Ta4/Ti |
|-------------|------|------|------|-----|-----|-----|-----|-----------|------|--------|
| <b>PI</b>   | 1360 | 1020 | 1550 | 770 | 660 | 520 | 280 | 1.49-1.55 | 1.25 | 0.51   |
| <b>PII</b>  | 1370 | 1190 | 640  | 360 | 280 | 210 | 160 | 0.52-0.56 | 1.15 |        |
| <b>PIII</b> | 1500 | 1370 | 900  | 500 | 420 | 260 | 190 | 0.63-0.69 | 1.09 |        |

Ventral lobe of egg-guide more slender than those of *C. acerbiphilus* and *C. fusciceps*; and laterosternite smaller than in those species, separated from TIX by a narrow

membranous area and with 2-3 setae; post genital plate very slender and nearly linear. Segment X with 9-17 setae.

**Pupa:** not known.

**Fourth instar larva:** A small (length 8-12 mm) essentially melanotus-type larva, but sometimes posterior pair of VT tending to curl up. PLT short and slender. Anal setae of procercus fused into a single stout bristle. AT relatively stout, ventral pair longer than the dorsal pair. Head capsule orange-yellow, gula not pigmented.



Posterior segments of *C. sulfurosus* showing variation of ventral and anal tubules

Mentum of type I, center tooth of type IIA. PE with about 20 uneven teeth

Premandibles stout, outer tooth longer than the inner, which is about 1.7 times broader than the outer tooth.

Basal segment of antenna about 4 times longer than wide; RO about a quarter up from base; AR about 1.9-2.2; relative proportions of segments (units) 42 : 11 : 2 : 4 : 2.

Distance between antennal bases less than that between the S4 setae; 5th laterals in line with RO.

Mandible with 3<sup>rd</sup> inner tooth apparently well developed and darkened (type IIIC); PMa with 12 setae; no information on basal furrows.



*C. sulfurosus* larval head: A. dorsal, B. ventral view; C. antenna, D. hypopharynx, E. maxilla, F. mandible, G. mentum

**Cytology:** no information.

In highly acidic waters.

**Found:** Japan - Kurinodake, Onsen, Kagoshima Pref., Kyushu (**Type locality**).

**DNA sequence:** There is one accession from GenBank which could be this species.

Other sequences from GenBank or BOLD appear to be misidentified:

GenBank accession number AB704937 is actually for a species of *Kiefferulus*.

That in the BOLD database (BOLD Bin: [BOLD:ACH4991](#)) appears to be a species of *Glyptotendipes*, possibly *G. tokunagai*.

### ***Chironomus suwai* Golygina & Martin 2003**

In BOLD Bin: [BOLD:ACQ5553](#)

**Adult** and **Pupa** probably as that described by Sasa (1978), whose descriptions are summarised below.

**Male:**

Normally dark, but also a lighter form. In darker form the thorax is grey, with dark grey scutal stripes, scutellum brown and postnotum dark brown; abdomen largely

black or dark brown with narrow caudal pale bands, the dark areas on tergites II-IV have a median caudal projection. In the pale forms the scutal stripes are brown and the ground color yellow; with the abdomen the tergites are largely yellow, with a diamond shaped central dark area on segments II-IV.

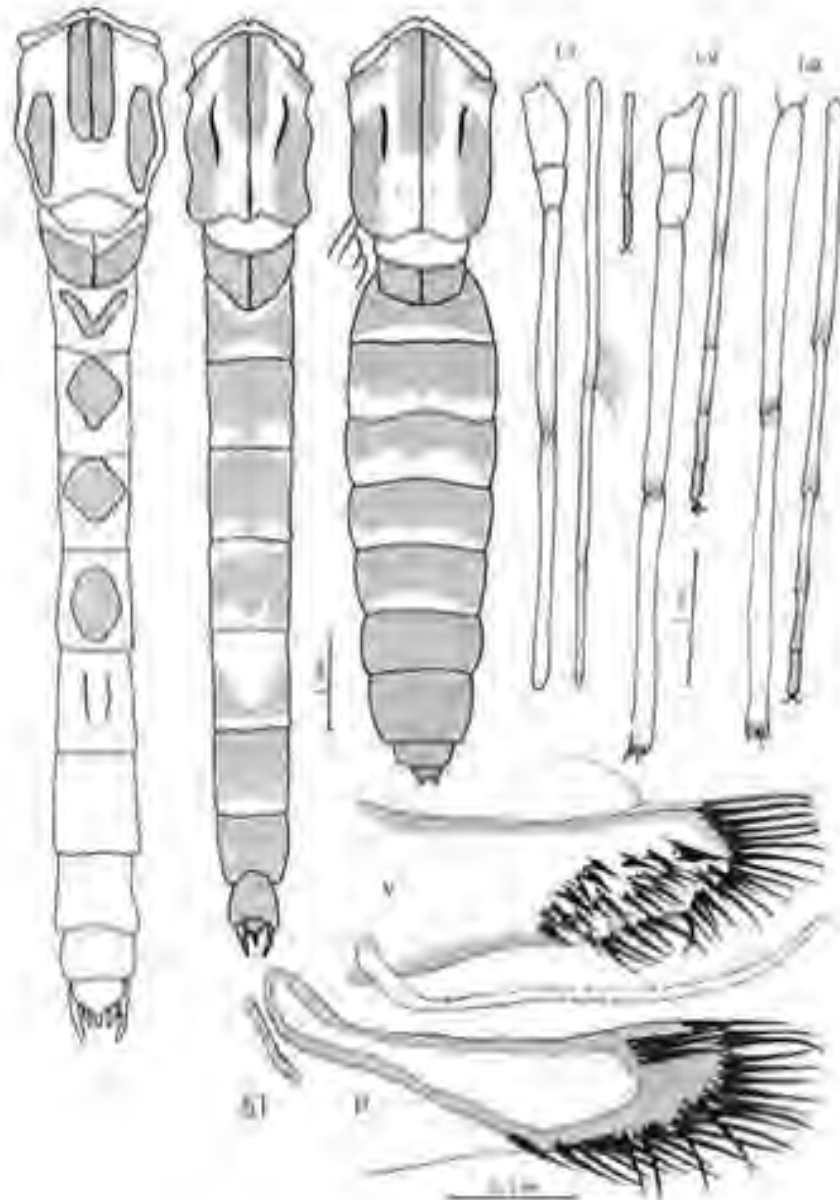
Wing length about 7.0 mm, posterior margin markedly concave at the end point of Cu(2)(also in female). Cross vein colored.

AR about 5.4. Frontal tubercles oval in shape, 45 x 29 µm. Palp proportions (segments 2-4)(micron) 120 : 310: 260 : 410.

Legs generally yellow, with dark knee joints, more conspicuous on fore legs; tarsi I-IV dark on distal 4/5, tarsus V completely dark. LR 1.2-1.3, beard conspicuous, BR 6.5. Leg proportions (micron):

|             | <b>Fe</b>  | <b>Ti</b>  | <b>Ta1</b> | <b>Ta2</b> | <b>Ta3</b>    |
|-------------|------------|------------|------------|------------|---------------|
| <b>PI</b>   | 1900       | 2030       | 2590       | 1560       | 960           |
| <b>PII</b>  | 2030       | 2000       | 1220       | 830        | 560           |
| <b>PIII</b> | 2490       | 2560       | 1980       | 1200       | 810           |
|             | <b>Ta4</b> | <b>Ta5</b> | <b>LR</b>  | <b>F/T</b> | <b>Ta5/Ti</b> |
| <b>PI</b>   | 860        | 410        | 1.28       | 0.93       | 0.20          |
| <b>PII</b>  | 370        | 290        | 0.61       | 1.02       | 0.15          |
| <b>PIII</b> | 510        | 340        | 0.77       | 0.97       | 0.13          |

Posterior edge of tergite IX is flat, anal point is slender, apically expanded. Superior volsella closest to E(g) type of Strenzke (1959). Gonstylus narrows relatively sharply over posterior quarter.



Adults (upper) and pupal spurs (below: 51 V & D) from Sasa 1978 (as *C. plumosus*)

Female:

Coloration also variable, the pale form having lighter ground color and the apical pale areas on the abdominal tergites are larger. Antennal proportions (micron) 230 : 140 : 180 : 150 : 340. AR 0.49; A5/A1 1.47; Frontal tubercles 45 x 26 μm.

Leg coloration essentially as in males; leg proportions (micron):

|             | <b>Fe</b>  | <b>T1</b>  | <b>Ta1</b> | <b>Ta2</b> | <b>Ta3</b>    |
|-------------|------------|------------|------------|------------|---------------|
| <b>PI</b>   | 2050       | 2240       | 2810       | 1540       | 950           |
| <b>PII</b>  | 2200       | 2390       | 1420       | 830        | 590           |
| <b>PIII</b> | 2850       | 2850       | 2200       | 1220       | 880           |
|             | <b>Ta4</b> | <b>Ta5</b> | <b>LR</b>  | <b>F/T</b> | <b>Ta4/T1</b> |
| <b>PI</b>   | 900        | 460        | 1.25       | 0.92       | 0.38          |
| <b>PII</b>  | 390        | 330        | 0.59       | 0.92       | 0.18          |
| <b>PIII</b> | 540        | 360        | 0.77       | 1.00       | 0.19          |

**Pupa:** Notes only that the caudolateral spur is unusual in that it has numerous short spines (see Fig. above) rather than the longer apical spines of most species.

**Fourth instar larva:** a medium to large plumosus-type. Length about 20 - 28 mm, VT from 0.5 - 3.0 mm; AT about 685-735  $\mu\text{m}$  and 2.5-2.76 times longer than wide. Gula darkened on posterior 2/3 with scalloped anterior margin.



Posterior end of *C. suwai* larva (*C. plumosus* of Sasa 1978)

Mentum (Fig. c, below) of available specimens very worn but appears the fourth laterals may be partly reduced (type II) and c2 teeth of central trifid tooth are relatively separated from a broad c1 tooth (type IIA).

Ventromental plates about 4.2-4.4 times longer than width to base of striae, separated by about 0.37-0.42 of the mentum width; about 77-107 striae; VMR about 0.33.

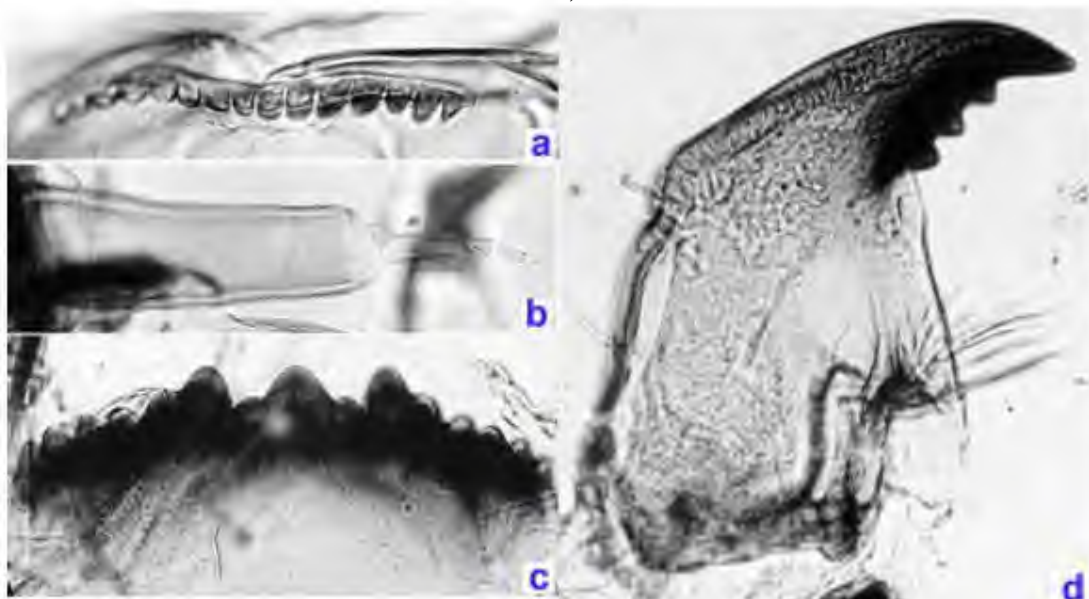
PE (Fig. a, below) with about 11-15 broad teeth (type B).

Distance between the antennal bases greater than that between the S4 setae which are separated by about 76% of the FC width at that point.

Antenna (Fig. b, below) with segment A1 about half of VHL and about 2.9-3.8 longer than wide (lower value may be due to squashing of the segment during slide mounting), RO about a third to almost halfway up from base of segment; AR about 2.71-2.81, segment proportions (micron) 211 : 41 : 13 : 15 : 8.

Premandible not visible in available specimens.

Mandible (Fig. d, below) with third inner tooth well separated and darkened (type IIIC), about 27-30 furrows on outer surface at the base; 12-16 setae in PMA.



**Cytology:** Four polytene chromosomes with the thummi-cytocomplex combination: AB, CD, EF, G. Only nucleolus subterminal on arm G. Polymorphism in arms A, B and E. A B-chromosome is sometimes present. The banding sequences of arms E and F were revised by Golygina and Kiknadze (2018).

suwA1: 1 - 2c, 10 - 12a, 13ba, 4a-c, 2g-d, 9 - 4d, 2h - 3, 12cb, 13c - 19

suwA2: from suwA1 by complex inversion.

suwB1: as B1 of borokensis

suwB2: as B2 of plumosus and borokensis

suwC1: 1-2c, 6c-7, 16-17a 6hg, 11d-12, 4-6b, 11c-8, 15-13, 3-2d, 17b-22

suwD1: 1-3, 10b-e, 4-7, 18a-d, 8-10a, 13a-11, 13b-17, 18e-24 as D2 of plumosus and borokensis

suwE1: 1 - 3a, 4c - 10b, 3e-b, 4b - 3f, 10c - 13 as E1 of plumosus and borokensis

suwE2: 1 - 3a, 4c - 10b, 3e-b, 4ba, 10e-c, 3f, 10f - 13

suwE3: 1 - 3a, 4c - 6d, 7c - 6e, 7d - 10b, 3e-b, 4b - 3f, 10c - 13 (from E1)

suwF1: 1a - 10d, 18c-a, 11a - 17d, 18d - 23 as F2 of borokensis

suwG1: as G2 of borokensis

Found: **Type locality - Lake Suwa, Honshu, JAPAN.**  
**Japan - Tsukuba.**

Species described on the basis of the polytene chromosome banding patterns by Golygina *et al.* (2003) who also give some larval characters. All life stages were described, at least briefly, by Sasa (1978) as *C. plumosus*.

### ***Chironomus trinigrivittatus* Tokunaga 1940**

Has similarities to *C. sollicitus* but differs in the shape of the anal point and the shape of the SVo.

### ***Chironomus yoshimatsui* Martin & Sublette 1972**

Synonyms: *C. daitoefeus* Sasa et Suzuki, 2001 (Yamamoto, unpubl.)  
*C. echizensis* Sasa, 1994 (Yamamoto, unpubl.)

In BOLD Bin: [BOLD:AAW3949](#)

### **Adult:**

Male

AR 2.85 (2.58 – 3.88) ;Wing length 3.44 (2.97-3.88) mm, VR 1.04 (1.00-1.07); LR 1.65 (1.57-1.85).

Head: Frontal tubercles 25 x 9 µm, palpal proportions (segments 2-5, units) 5 : 30 : 29 : 40. Clypeus as wide as the antennal pedicel, with 19 setae.

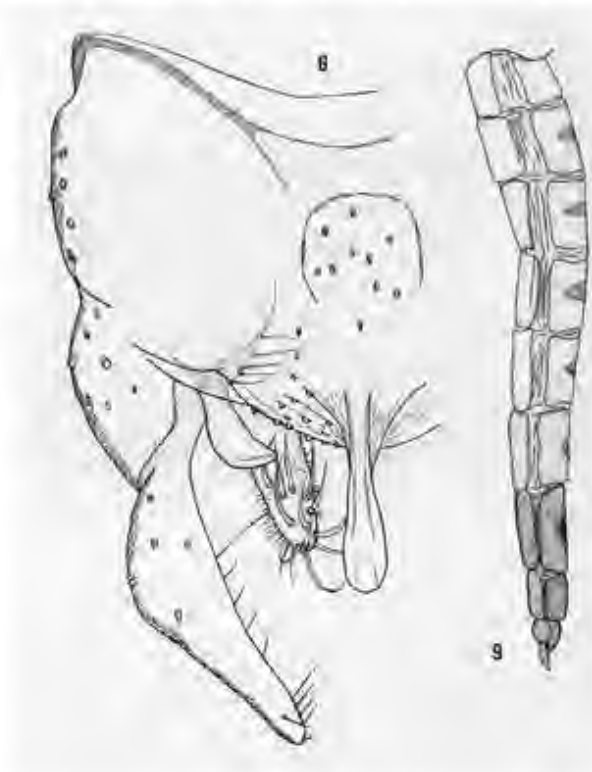


Thorax with vittae most of postnotum, and mesosternum yellowish brown, dark central spot on postnotum. Thoracic setae: acrostichal in one staggered row; dorsolateral about 24 in one to three rows; supra-alar 2; scutellar anterior row of 10 smaller setae, posterior row of 13 larger setae.

Wing with r-m slightly darkened, squama with 17 fringe setae in a partial double row. Legs yellowish, becoming darker on the tarsi, tarsal joints one to three infuscate with a narrow apical dark band, segments four and five almost completely dark. Foretarsus without a beard.

Leg proportions (units):

|             | Fe  | Ti  | Ta1 | Ta2 | Ta3 | Ta4 | Ta5 | LR        | F/T  | Ta5/Ti |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----------|------|--------|
| <b>PI</b>   | 88  | 75  | 120 | 60  | 52  | 45  | 19  | 1.57-1.85 | 1.17 | 0.25   |
| <b>PII</b>  | 89  | 82  | 49  | 26  | 19  | 17  | 10  | 0.57-0.64 | 1.08 |        |
| <b>PIII</b> | 100 | 100 | 73  | 40  | 30  | 25  | 10  | 0.63-0.75 | 1.00 |        |



From Holotype male (Martin & Sublette 1972)

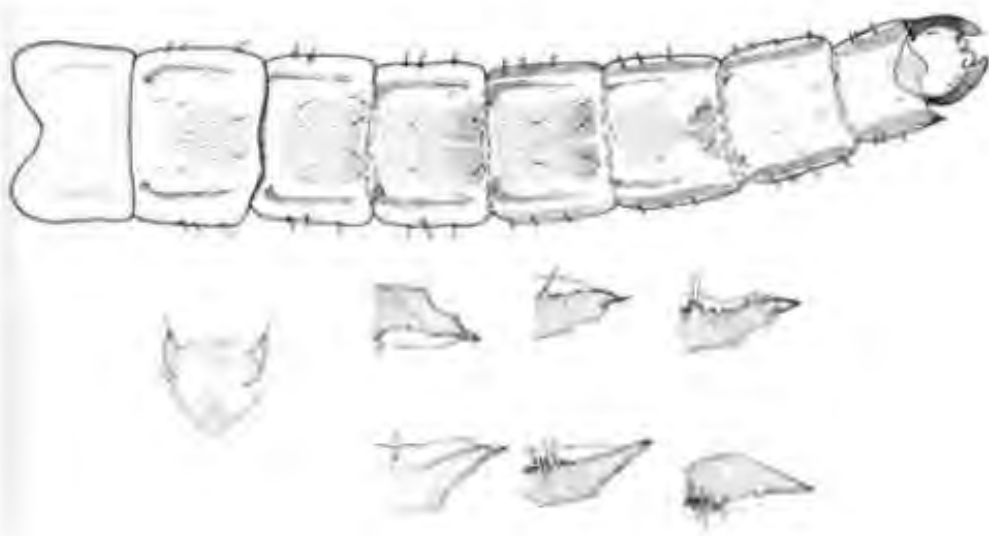
Abdominal tergites II-VI with a transversely elongated central spot, that of VII merges into background.



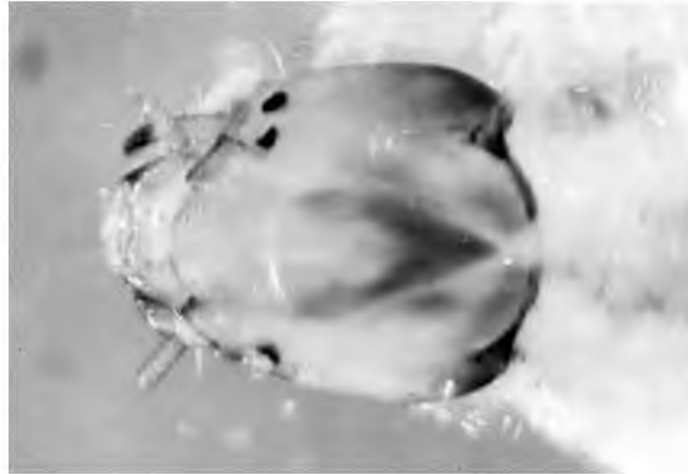
Style reduces gradually from about half way. SVo of type D(d-e) of Strenzke. IVo with simple setae.

**Pupa:**

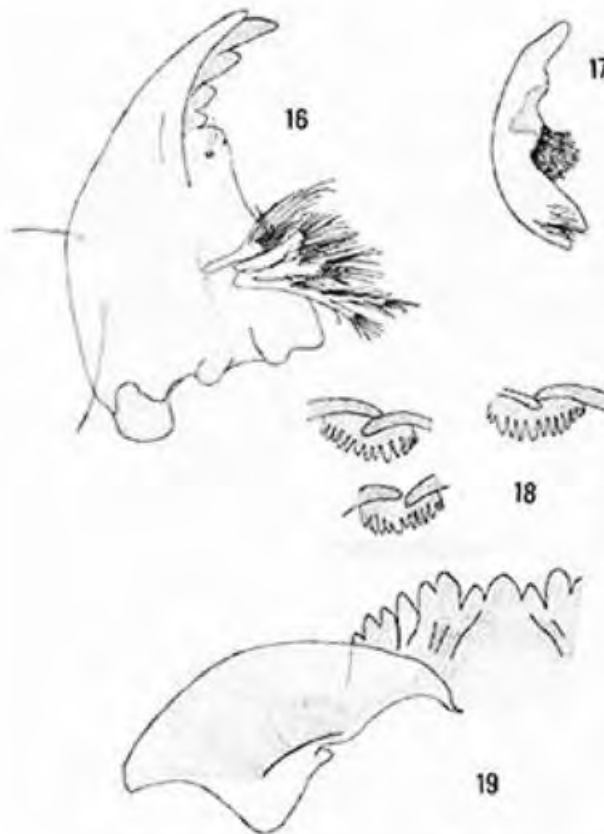
Total length females 7.90-9.99 mm; males 7.99-8.66 mm. Coloration generally darkish  
 Frontal tubercles (below) small and conical, with a subapical seta.  
 Base of respiratory organ 0.20 x 0.10 mm; above this base is an elongate, narrow, rugose patch; anterior to the base is a smaller rugose patch. Two *Oth* setae near the anterior rugose patch, four *Mth* setae in a longitudinal line parallel to and below the median raphe.  
 Recurved hooks on tergite II varying in number from 26-117 (mean abt 94). Posterolateral spur of segment VIII usually with a single spine, but varying up to four.  
 Swim fin with one dorsal and 61- 97 (mean abt 82) lateral bristles.



**Fourth instar larva:** A medium sized (len. 9.8 – 15.3 mm, females (mean 12.68 mm) generally longer than males (mean 11.43 mm) bathophilus-type – however Sasa (1978) notes that one larva had small PLTs, so this character may be polymorphic. VT relatively short, posterior pair generally longer (Ant.: 0.72 (0.30-1.16) mm; Post. 0.94 (0.48-1.36) mm.). Anal tubules fingerlike, length about 205-280 µm and 1.8-2.9 times longer than wide; ventral pair sometimes longer than dorsal pair.  
 Gula and FA darkened; FA generally darker along the edges and the posterior end.



Mentum with c2 teeth well separated (type IIA), and 4th laterals not reduced (type 1). PE with about 9–19 fine sharp teeth (type A of Proulx *et al.*) unless worn. Premandible with teeth about equal in length and inner tooth about twice the width of the outer tooth. Antenna with A1 about 2.8-3.4 times longer than wide, RO from a quarter to half way up from base of segment; AR 2.16-2.47; A2/A1 0.21-0.24; ratio of segment lengths (micron) 99 : 22 : 7 : 9 : 6; length of blade about 38-49  $\mu\text{m}$ . Mandible length about 205-233  $\mu\text{m}$ , third inner tooth partially separated and coloured (I-IIB); about 11-14 grooves on outer surface at the base; Pecten mandibularis with about 10-14 bristles. Some larvae showed abnormalities, possibly due to contamination in the habitats.



From Martin & Sublette (1972)

**Cytology:** Four polytene chromosomes with the pseudothummi-cytocomplex combination BF, CD, AE, G. Nucleolus terminal in arm G, and in groups 18-19 in arm F. Polymorphic in all arms.

- yosA1: 1 - 2c, 10 - 12, 3 - 2d, 9 - 4, 13 - 19 as holomelas A1
- yosA2: 1a-k, 2k-d, 9 - 4, 13a-f, 3d-i 12 - 10, 2c-a, 3a-c, 14 - 19 from holomelas A2
- yosA3: 1a-k, 11d - 12, 3i-d, 13f-a, 4 - 9, 2d-k, 11c - 10, 2c-a, 3a-c, 14 - 19
- yosB1: Puff near center of arm with distal dark bands (groups 8-7)
- yosB2: Puff near center of arm with proximal dark bands (groups 7-8)
- yosB3: Small inversion of the region of the puff.
- yosC1: 1 - 2g, 13e - 11d, 6e-h, 6d - 2h, 11c - 8a, 15 - 13f, 17a - 16a, 7d-a, 17b - 22
- yosC2: 1 - 2g, 13e - 11d, 6e-h, 8 - 11c, 2h - 6d, 15 - 13f, 17a - 16a, 7d-a, 17b - 22
- yosC3: 1a-e, 5d-6d, 6h-e, 11d-13e, 2g-1f, 5c-2h, 11c-8a, 15-13f, 17a-16a, 7d-a, 17b-22
- yosD1: 1 - 6c, 13g-a, 6d - 12, 14 - 24 2 inv from ST
- yosD2: 1 - 6c, 13g-a, 6d - 12, 14a-c, 19 - 14d, 20 - 24
- yosE1: 1 - 3e, 10b - 3f, 10c - 13
- yosE2: 1 - 2, 12c - 10c, 3f - 10b, 3e-a, 12d - 13
- yosF1: 1 - 2d, 9 - 2e, 10 - 23
- yosF2: 1 - 2d, 16e - 10, 2e - 9, 16f - 23
- yosG1: Virtually terminal nucleolus.
- yosG2: Simple inversion from yosG1, known only as heterozygote.
- yosG3: Complex inversion, known only as heterozygote.

**Molecular Data:**

mtCOI: Japanese specimen (AB740260), and Japanese Chironomid Barcode Database. There are sequences for Korean specimens under the name *C. flaviplumus* (accession numbers JF412075 - 077). These are very similar to those of *C. sp.* PK6 (see below).

Found in ditches in Japan, and rapid streams in Russia.

**Found:** Type locality - Yamaguchi; Hokkaido, JAPAN (Holotype male in U.S. National Museum Collection, No. 71268, March 1970, H. Yoshimatsu)

Also Honshu (possibly Otsu City), Japan

**Korea** - Shilim-dond, Kwanak-gu, Seoul and numerous other localities (as *C. flaviplumus*. Ree & Kim 1981).

**Russia:** Sakhalin Island; nr. Vladivostok (Kiknadze *et al.* 2003).

Adults redescribed by Ree & Kim (1981) under the name *C. flaviplumus*. Karyotype redescribed by Kiknadze *et al.* (2003).

Langton & Visser (2003) list this species as a synonym of *C. dorsalis* on the basis of pupal similarity, but the cytology and BARCODE data clearly show that this is incorrect.

***Chironomus* species DSC1**

This species is being described as *C.kangleipak*

Notable for an unusual larval type (yama-type). May be a new subgenus.

**Adult:**

Male:

AR about 2.13-2.38; Wing length about 2.76 (2.45-2.99) mm, width about 0.78 mm; about 15 setae on squamal fringe; abt 3 SCf on brachiolum. VR about 0.97; LR about 1.54 (1.51-1.58).

Head: frontal tubercles about 25-35 x 10-11 µm.

Palpal proportions (µm): 55 : 45 : 195 : 179 : 278.

Clypeal width about 0.75 that of the antennal pedicel, about 11 clypeal setae.

Thoracic setae: at least 13 acrostichal 10-11 dorsocentral; 4-5 prealar; 1 supra-alar; no anterior row, just 9 on scutellum.

Leg lengths and proportions (µm):

|             | Fe   | Ti   | Ta1  | Ta2 | Ta3 | Ta4 | Ta5 | LR        | F/T       | Ta5/Ti    |
|-------------|------|------|------|-----|-----|-----|-----|-----------|-----------|-----------|
| <b>PI</b>   | 1205 | 1020 | 1470 | 750 | 630 | 540 | 285 | 1.50-1.58 | 1.11-1.34 | 0.29-0.30 |
| <b>PII</b>  | 1215 | 1070 | 660  | 320 | 230 | 155 | 115 | 0.56-0.70 | 1.07-1.17 |           |
| <b>PIII</b> | 1350 | 1265 | 865  | 435 | 305 | 190 | 145 | 0.72-0.78 | 0.96-1.09 |           |

Abdomen with a band across the middle of the anterior tergites, which expands posteriorly on segments V-VIII; about 9 setae in centre of tergite IX. SVo closest to type E(h) of Strenzke; IVo setae simple. GS somewhat swollen proximally and tapering sharply over posterior third to quarter.

Female:

Wing length 2.35-3.85 mm, width 0.62-0.81 mm; about 9 (8-10) setae on squamal fringe, abt 2-3 SCf on brachiolum. VR 0.89-0.93.

Head: frontal tubercles small, about 20 (15-25) x 16 (10-23) µm. Antennal proportions (micron) 181 : 120 : 120 : 100 : 200; necks of segs 2-4 comprising 0.35, 0.275 and 0.4 of the segment length, respectively; AR 0.35-0.39; A5/A1 1.05-1.18.

Palpal proportions (µm) 56 : 66 : 170 : 185 : 300.

Clypeal width about 1.3-1.6 times that of the antennal pedicel, about 24-29 clypeal setae.

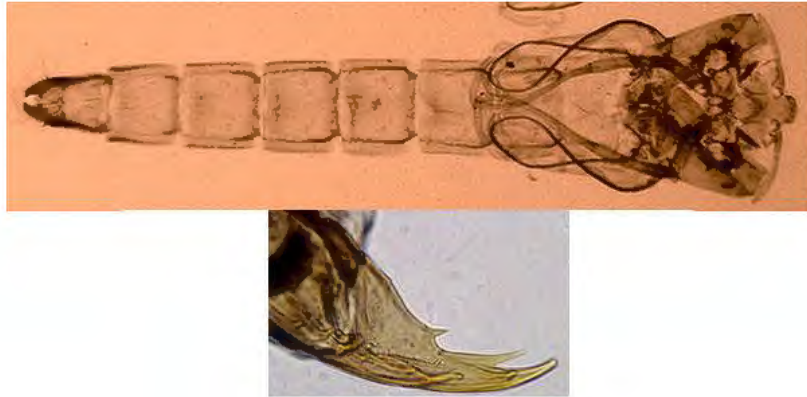
Thoracic setae: at least 10 acrostichal 10-11 dorsocentral; 4 prealar; 1 supra-alar; 2 in anterior row, 9 in posterior row on scutellum.

Leg lengths and proportions (µm):

|            | Fe   | Ti   | Ta1  | Ta2 | Ta3 | Ta4 | Ta5 | LR        | F/T       | Ta4/Ti |
|------------|------|------|------|-----|-----|-----|-----|-----------|-----------|--------|
| <b>PI</b>  | 1345 | 1180 | 1805 | 890 | 775 | 685 | 330 | 1.51-1.55 | 1.13-1.15 | 0.61   |
| <b>PII</b> | 1270 | 1175 | 635  | 315 | 215 | 140 | 125 | 0.53-0.56 | 1.06-1.11 |        |

|      |      |      |      |     |     |     |     |           |           |  |
|------|------|------|------|-----|-----|-----|-----|-----------|-----------|--|
| PIII | 1510 | 1515 | 1005 | 510 | 380 | 230 | 160 | 0.60-0.69 | 0.99-1.06 |  |
|------|------|------|------|-----|-----|-----|-----|-----------|-----------|--|

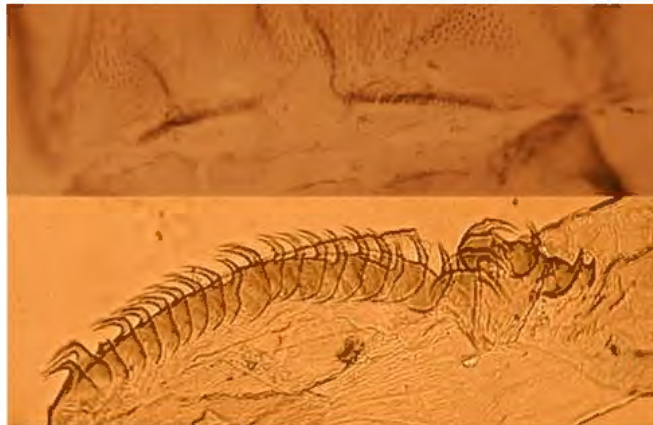
Abt 19 setae on abdominal Gc IX; abt 8-11 on GpVIII, which is wider than in other species of *Chironomus*.



**Pupa:** Length abt 8.4 mm (7-10 mm); inner margin of wing case about 17.5% exuvial length (1.3-1.6 mm). Cephalic tubules about 155-180  $\mu\text{m}$  long and 130-135  $\mu\text{m}$  wide at base, seta at least 40  $\mu\text{m}$  long.

Respiratory base about 130-140  $\mu\text{m}$  long and 60-80  $\mu\text{m}$  wide (i.e. 1.8-2.2 times longer than wide).

Hook row at posterior of abdominal segment II is interrupted into 2 parts (top fig. below), containing about 28-33 hooks (lower fig. below) on each side. Segment width about 970-1063  $\mu\text{m}$ , the total extent of the hook row being 180-202  $\mu\text{m}$  hooks, 100-278  $\mu\text{m}$  gap and a further 180-202  $\mu\text{m}$  hooks.



There are L-setae on the intersegments of III/IV and IV/V, but they are very difficult to see. That of seg IV/V is at the anterior of the conjunctive.

PSA of segment IV well developed, length (12-13  $\mu\text{m}$ , about 0.17 of the segment length (70-73  $\mu\text{m}$ ).

Armature of segments covering most of segment but with a clear spot at mid line of posterior region, larger on the anterior segments.

Posterolateral spur of eighth segment strong and curved with about 5 short spines and sometimes a further 2 very small 'teeth'.

About 69-78 taeniae on each side of the swim fin, mostly in a single row.



**Fourth instar larva:** A small 8.4 mm (7-10 mm) yama-type, i.e. no ventral or lateral tubules, anal tubules conical, in a “star”-arrangement, dorsal pair longer and wider than the ventral pair. Posterior prolegs about 4 times longer than width at base.

Gula and frontoclypeus slightly dark to dark, sometimes with slight darkening outside the frontoclypeus. This may be a difference between the two localities.

Clypeal aperture wider at mid-point with a curved ventral border, about 2.5 times longer than width at widest point.

Mentum with 4<sup>th</sup> laterals reduced almost to level of 5<sup>th</sup> laterals (type II), central trifid tooth of type IV.

VHL about 233-238  $\mu\text{m}$ , with mentum width about 0.63-0.66 of VHL (149-153  $\mu\text{m}$ ).

VM plates with about 37-39 striae; VMR about. PE with about 11-17 relatively broad teeth.

Premandibles with inner and outer teeth about the same width, outer tooth slightly shorter.

Distance between the S4 setae about the same, or slightly larger than that between the antennal bases.

Antennae relatively short, basal segment about 3-3.5 times longer than wide, RO generally less than a third up from base; AR about 2.53-3.11. Relative lengths of segments ( $\mu\text{m}$ ) 103 : 21 : 5 : 6 : 5.

Mandible with 3<sup>rd</sup> inner tooth at most partially separated and slightly darkened (type I-IIB); about 8-9 furrows on outer surface near the base, about 11-12 tainiae in PMA.



**Cytology:** Four relatively long thin polytene chromosomes with the pseudothummi-cytocomplex combination AE, BF, CD. G. Arm G with a terminal nucleolus and a BR about a third from the other end.





Arm F: 1 - 2a, 15 - 11, 7 - 2b, 8 - 10, 16 - 23

Inv2b-7 from *striatipennis*

**Found:** India - Delhi area.

Arms A, E and F described, with some errors, by Saxena (1995)

*Chironomus* species R&S

**Adult, Pupa and Fourth instar larva:** Not available

**Cytology:** No nucleolus in arm G, but possibly a nucleolus in both chromosomes I (on arm C) and II. The photographs are very poor but consistent with this being *C. circumdatus*.

**Found:** India - vicinity of Ujjain (or Gwailor).

From various papers by H.S Rathore and H. Swarup from 1980-1982, which refer to a chromosome map in a Ph.D. thesis of 1979.

*Chironomus* species PK4

(based on Kabeer Colony IN.6.1 photos from P. K.)

**Adult and Pupa:** Not currently known

**Fourth instar larva:** Morphology not known

**Cytology:** Four polytene chromosomes with the pseudothummi-cytocomplex combination BF, CD, AE, G. Arm G with three obvious BRs, one near distal end not always developed, but no obvious nucleolus. Nucleolus possibly on arm F, but this is not clear. Polymorphism in arms A, and C.

Arm A1:

Arm A2:

Arm B1: Puff (gp 7) slightly proximal of centre of arm with dark bands (gp 8) distal

Arm C1: Inverted near distal end compared to *striatipennis*

Arm C2: Inversion of about distal two thirds of the arm

Arm D:

Arm E:

Arm F: Bands 7,8,9 near distal end. Could be nucleolus in group 20.

Arm G1: may be similar to *C. flaviplumus* B.

**Found:** Jammu & Kashmir: Kabeer colony, Jammu.

Probably equivalent to *C. flaviplumus* type B.

*Chironomus* species PK5

A member of the *Chironomus dorsalis* group. Related to *C. alpestris*.

In BOLD Bin: [BOLD:AAW4001](#)

Adult:

Male: Wing length 3.60 mm, width, 0.82 mm. VR 1.08. AR 2.96.

Head: Frontal tubercles small, abt 18 µm. 26 clypeal setae.

Palps (microns) 55 ; 53 : 215 : 230 : 275.

Thoracic setae: Achrostichal - at least 9; Dorsolateral - 21 - 22; Prealar 8;

Supra-alar - 1; Scutellar in two rows - anterior 8, posterior 14.

Legs with dark knees, tibia and tarsi; no beard.

Proportions (micron)

|             | <b>Fe</b>  | <b>Ti</b>  | <b>Ta1</b> | <b>Ta2</b> | <b>Ta3</b> |
|-------------|------------|------------|------------|------------|------------|
| <b>PI</b>   | 1330       | 1140       | 1860       | 900        | 790        |
| <b>PII</b>  | 1410       | 1285       | 780        | 420        | 300        |
| <b>PIII</b> | 1570       | 1570       | 1050       | 600        | 440        |
|             | <b>Ta4</b> | <b>Ta5</b> | <b>LR</b>  | <b>F/T</b> | <b>BR</b>  |
| <b>PI</b>   | 650        | 280        | 1.63       | 1.17       | 3.2        |
| <b>PII</b>  | 190        | 145        | 0.65       | 1.10       | -          |
| <b>PIII</b> | 280        | 160        | 0.67       | 1.00       | -          |

About 10 fine hooked setae on mid tibia and at least 5 on the hind tibia.



Note the S-type superior volsella

The SVO (above) is a little 'beak-like' (S-type of Strenzke 1959), but beak is quite short; about 5 setae on tergite 9. Gc moderately expanded c.f. Gs, which narrows relatively slowly from about half way.

**Fourth instar larva:** a medium plumosus type. VT relatively long, anterior with elbows, posterior pair coiled. Head capsule relatively long and narrow, mentum relatively narrow, mentum width/VHL about 0.49 - 0.52. Gular region darkened over posterior 2/3, FA dark, also darkened outside clypeus.

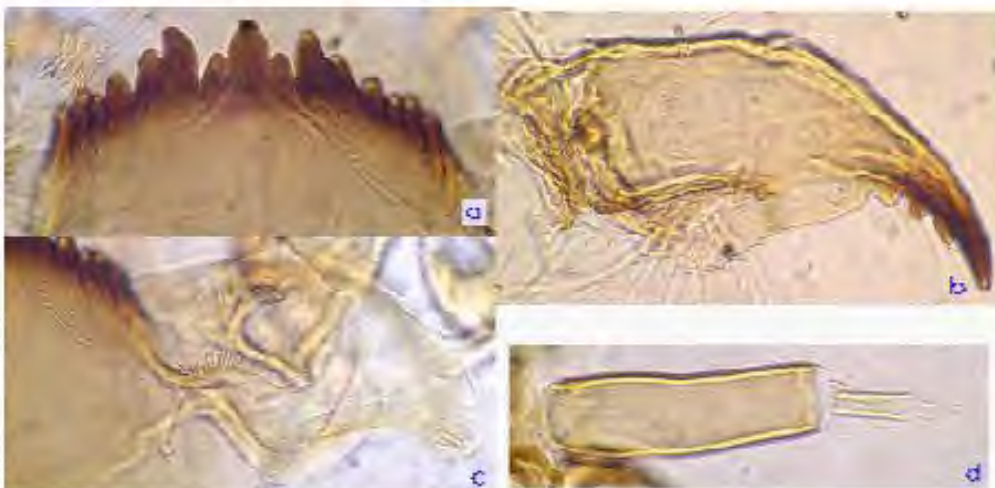
Mentum (a, below) with 4th laterals reduced to about the level of 5th laterals (type II), 1st laterals tending to curve outwards; centre trifid tooth with c2 teeth well separated (type III). Ventromental plates (c, below) separated by about 0.40 of the mentum width. PE with about 12 - 14 teeth.

Premandible with sharp teeth, the outer tooth longer; inner tooth about 1.5 to 2 times wider than outer tooth.

Antenna (d, below) with basal segment about 3.7 times longer than wide, ring organ about half way up from base; AR about 2 - 2.14, A3 quite short; segment proportions (microns) 123 : 30 : 7 : 11 : 6.

Distance between antennal bases may be greater than or about equal to that between the S4 setae.

Mandible (b, below) with 3rd inner tooth well developed, but only moderately colored (type IIIB); about 18 - 20 furrows on the outer surface at the base.



Mouthparts of *C. spPK5*. Note outward curving 1st lateral of mentum.

**Cytology:** Four polytene chromosomes with the pseudothummi-cytocomplex combination BF, CD, AE, G. Large almost terminal nucleolus in arm G, with a large BR about 1/3 from the other end of the arm. No nucleolus in the long chromosomes. No polymorphism in 5 specimens examined.

Arm A1: 1 - 2c, 4 - 9, 2d - 3, 12 - 10, 13 - 19 as *alpestris*

Arm B1: Puff distal of centre of arm with some dark bands distal.

Arm C1: Large puff about the middle of the arm.

Arm D1:

Arm E1: 1 - 2c, 8b - 6, 3 - 2d, 8 - 9, 4 - 5, 12a - 10, 12b - 13

i.e. In5-9 and In9-3 from *alpestris*

Arm F1: possibly 1 - 10, 15 - 11, 16 - 23 as *halophilus*

**Found:** **India** - Jammu & Kashmir: Kabeer colony, Jammu; Deoli Village; University of Jammu & Kashmir, Jammu.  
**Israel** - Mt. Hermon.

**DNA sequence**

Mitochondrial COI sequence indicates this species is related to *C. alpestris* and *C. dorsalis*.

*Chironomus* species PK6

Probably another member of the *C. flaviplumus* group.

**Adult and Pupa:** not currently known.

**Fourth instar larva:** a small-medium plumosus-type. Head capsule with gular region and FA pale.

**Cytology:** Four polytene chromosomes with the pseudothummi-cytocomplex combination BF, CD, AE, G. Nucleolus terminal on arm G, which may be unpaired in this region. Arm G also with two well developed BRs. Polymorphic in arms A and C.

Arm A1: 1 - 2c, 11 - 7, 12, 3 - 2d, 6 - 4, 13 - 19 as A1 of species SS?

A2: Inversion of approx distal half of arm, bringing "olive" near distal end

Arm B1: Puff about 1/3 from centromere, with dark bands distal (as sp. SS)

Arm C1: As species SS and large inversion c.f. *striatipennis*

Arm C2: Small inversion of about 6 bands just near distal end of arm.

Arm D1: Differs by simple inversion from species SS

Arm E1: 1 - 3c, 12b - 10c, 3f - 10b, 3ed, 12c - 13 inv3d-12b from *luridus*, etc.

Arm F1: Inv. cf. species SS?

**Found:** **India:** Jammu & Kashmir - Deoli village; Kabeer colony; Jammu;.  
**Pakistan:**

This species is close to, but not identical with, the *Chironomus* species (*C. sp. SS*, above) of Sumitra Saxena (1995).

**Molecular sequence:**

DNA BARCODE suggests it is probably another member of the *C. flaviplumus*-group. Probable conspecific specimen in BOLD cannot be accessed for Bin number.

***Einfeldia kanazawai* Yamamoto 1996**

Yamamoto *et al.* (2015) transferred it to *Chironomus* and suggest that it belongs to the same group as *C. ocellatus*, i.e. subgenus *Lobochironomus*. In the absence of

information on the larva, this placement appears incorrect and that it should remain in *Einfeldia*.

Adult:

Male:



Hypopygium of *E. kanazawai* from Yamamoto *et al.* (2015)

Female

Pupa, Fourth instar larva and Cytology: not known.

**Found:** Type locality – Kampira, Iriomotejima Is., Ryukyus, Japan;  
other localities – Honshu; Kyushu; Nago City, Kunen-mata; Kochi; Kunigami-son,  
Aha, Okinawa Island.

***Einfeldia pagana* (Meigen 1838)**

Synonym *Einfeldia synchrona* Oliver, 1971

The species relationships in *Einfeldia* are so confused that any designation of synonymy is tentative at best. While these two species are undoubtedly in *Einfeldia*, there is insufficient evidence to confidently define them as synonymous.

Unfortunately many specimens identified as *E. pagana* in GenBank and the BOLD database are really species of *Benthalia*. It is also possible that *E.pagana* does not occur in Japan and the material described here may need a new name (see below)

*Einfeldia pagana* is a Holarctic species.

North American material is in BOLD Bin: [BOLD:AAG5475](#)

A specimen from Japan identified as *Einfeldia pagana* is closest to BOLD Bin: [BOLD:AAW3454](#)

This bin also contains specimens identified as *B. dissidens*

From photograph the following can be obtained:

LR1 abt 1.8; LR2 abt 0.6; LR3 abt 0.7.

These data indicate that it is actually a specimen of *Benthalia*: See *Benthalia* sp. 3 (below)

Description by Yamamoto (1995):

This seems to be the best description of Japanese material in English. Yamamoto refers to a description in Japanese by Sasa (1993).

**Adult:**

Male: Wing length 3.4-3.9 mm, width 0.9-1.0 mm, 14-24 setae in squamal fringe. VR 0.92 (0.90-0.96); LR 1.72 (1.66-1.76); AR 3.35 (3.00-3.71).

Brownish black, with thorax largely blackish brown, vittae etc. brownish black; legs brown to dark brown. Abdomen uniformly brownish black.

Head: Frontal tubercles minute 2.5-5.0 µm long and 5 µm wide. Clypeal setae not given. Palp segment lengths (1-5) (µm): 67 : 94 : 275 : 198 ; 264.

Anteprenotum distinctly divided at middle by a conspicuous V-shaped notch, scutal tubercle indistinct, acrostichals normally developed. Thoracic setae: achrostichals 8-12 (biserial); dorsocentrals 11-14; prealars 6-8; supra alar 1; scutellars 15-23 (biserial).

Leg length and proportions (micron)

|             | Fe   | Ti   | Ta1  | Ta2  | Ta3 | Ta4 | Ta5 | LR        | F/T  | Ta5/Ti |
|-------------|------|------|------|------|-----|-----|-----|-----------|------|--------|
| <b>PI</b>   | 1530 | 1290 | 2000 | 1080 | 810 | 620 | 300 | 1.52-1.63 | 1.18 | 0.23   |
| <b>PII</b>  | 1560 | 1460 | 890  | 550  | 420 | 300 | 210 | 0.58-0.63 | 1.07 |        |
| <b>PIII</b> | 1690 | 1830 | 1230 | 770  | 580 | 390 | 230 | 0.65-0.70 | 0.92 |        |

Note: The LRs given by Yamamoto are clearly calculated in a different manner, so the values given by the usual formula (apparently his BV values) are provided.

Gonostyle inflated and abruptly constricted near the apex; anal point broad, SVo with a high base, the chitinised distal part arising below the top of the base and the appearance is not sickle shaped; IVo relatively thick and straighter than that of *E. sasai* (see below), bearing recurved setae at the distal end.

Female: Coloration almost the same as male, but anteprenotum and ground color of scutum ochreous, vittae black, scutellum pale brown.

Wing length 3.5-4.0 mm; width 1.0-1.2 mm.; VR 0.87 (0.85-0.90); 19-27 setae in squamal fringe.

Antennal proportions (µm): 173 : 113 : 122: 128 : 203; AR about 0.38, A5/A1 abt 1.17.

Frontal tubercle minute, 2.5-5.0 µm long and 2.5-7.5 µm wide. Clypeus with 35-55 setae. Palp segment lengths (1-5) (µm): 67 : 90 : 241 : 211 : 321.

Thoracic setae: Acrostichals 7-13 (biserial); dorsocentrals 12-16 (uniserial); supraalar

1.  
Leg length and proportions (micron) (values as for males)

|             | <b>Fe</b> | <b>Ti</b> | <b>Ta1</b> | <b>Ta2</b> | <b>Ta3</b> | <b>Ta4</b> | <b>Ta5</b> | <b>LR</b> | <b>F/T</b> | <b>Ta4/Ti</b> |
|-------------|-----------|-----------|------------|------------|------------|------------|------------|-----------|------------|---------------|
| <b>PI</b>   | 1590      | 1270      | 2020       | 1040       | 790        | 600        | 300        | 1.45-1.63 | 1.25       | 0.47          |
| <b>PII</b>  | 1640      | 1460      | 860        | 520        | 390        | 280        | 210        | 0.57-0.62 | 1.12       |               |
| <b>PIII</b> | 1650      | 1790      | 1150       | 700        | 540        | 340        | 320        | 0.62-0.66 | 0.92       |               |

Genitalia: Apodeme of VIII sternum well-developed, rounded postero-laterally, joined mesally; segment X with 4-5 setae. Cercus large, oblong.

**Pupa:** The only information for the pupa seems to be that for European specimens (e.g. Langton and Visser 2003):

Length of exuvia 7.5-9.0 mm. Cephalic tubercles large, conical, curved, 145-190 µm long and 120-155 µm wide.

Abdomen: Hook row of segment II entire, length of row 0.43-0.52x width of the tergite. Armament of tergites II-IV an undivided, usually extensive patch of strong points, on seg. II extending forward at least as far as setae D1. The patch on tergite VI is more or less reduced. Lateral tainiae of segments V-VIII: 4,4,4,5. Comb, or spur, of segment VIII of 4.5 (2-7) small teeth. Fringe of anal lobe with 63-86 taeniae.

**Larva:** In 2006, Yamamoto published some brief notes on the larva:

One pair of ventral tubules, In 2015, Yamamoto *et al.* further noted the large oblong fenestra in the frontoclypeal apotome, a feature noted and illustrated for European specimens by Pinder and Reiss (1983) and S5 setae well anterior to the “ring organ” of the dorsal head; the rugosity anterior to the fenestra has not been confirmed in Asian specimens.

The description of North American specimens gives the coloration of the mentum and frontoclypeus as pale.

Mentum with pointed teeth apart from central tooth which may be worn in the available specimen, c2 teeth little more than notches (type I); 4th laterals in line with other lateral teeth (type I).

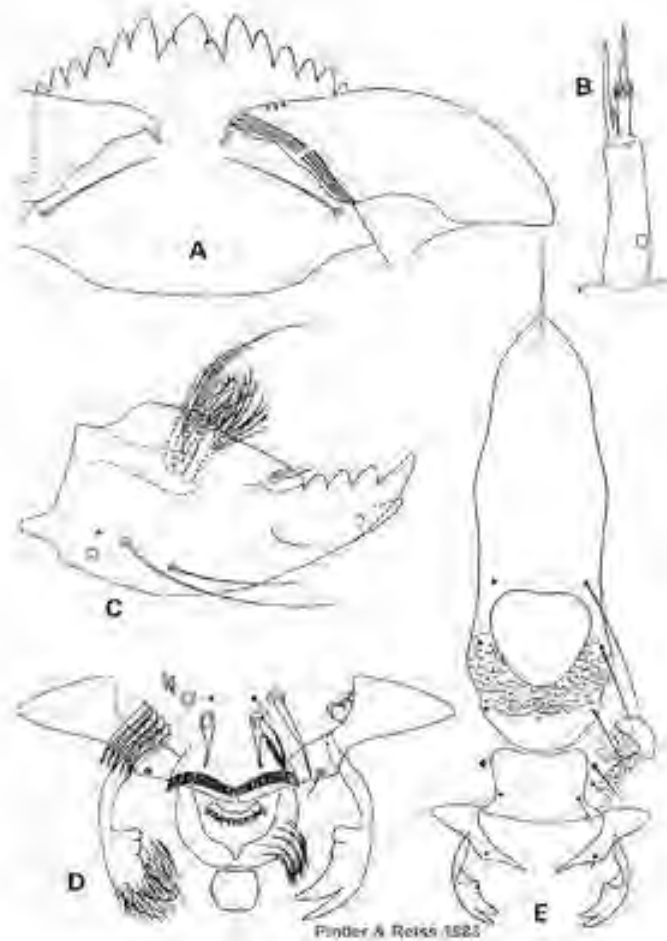
VM (A, below) with a sharply downturned inner edge and a wavy anterior margin. PE (D, below) with about 12 rather irregular teeth.

Premandible with two teeth of about equal length, inner tooth wider than outer tooth (see D, below).

Antenna (B, below) with basal segment relatively short, AR = 0.8, about 3.3x as long as wide; A3 relatively long, A4/A3 about 0.8.

Mandible (C, below) with pigmented and clearly separated third inner tooth (type IIIC). No furrows on outer surface near the base.





Larval headparts of European *E. pagana*: A. Mentum, B. Antenna, C. mandible, Labro-epipharyngeal region, E. Dorsal sclerites.

**Cytology:** Unfortunately no chromosome studies are available for Asian specimens, as these could help determine the identity of North American and Asian specimens

Other descriptions of *Einfeldia pagana* indicate that it is a paler species, but it appears that Yamamoto is justified in considering this to be a seasonal variation of color – his specimens were collected in May. However, there is doubt as to whether this material is actually *E. pagana*, since Yamamoto illustrates the anteprenotum to have a distinct V-shaped notch, while the Holarctic keys indicate that the anteprenotum is fused. This, together with the fact that there is no Oriental specimen in the same BOLD Bin as the North American specimens, suggests that this material requires a new name.

The presence of this darker form may help explain why the species is confused with the generally dark *Benthalia* species.

**Found:** - A Holarctic species.

**Japan** – Yamaguchi; Okinawa Island; Kyushu; Lake Hibera, Fukushima, Honshu.

There appear to be no specimens in the Chironomid DNA Barcode Database (at January 2020), nor does any Japanese specimen fall into the same BOLD Bin as the North American specimens (in the absence of any European specimens).

Holarctic distribution (Belgium - region of Liège; **Type locality**).

***Einfeldia sasai* Yamamoto & Yamamoto, 2018**

*Einfeldia pagana*, Sasa & Suzuki 2001 - misidentification

Adult:

Male: Wing length 2.34 mm., Wing length/width 0.28, VR 1.03. AR 3.0

Head, scutal stripes and postnotum brown, scutellum and legs yellow, abdominal tergites I to V with a brown area in the middle of the posterior margin, VI-VIII largely brownish yellow.

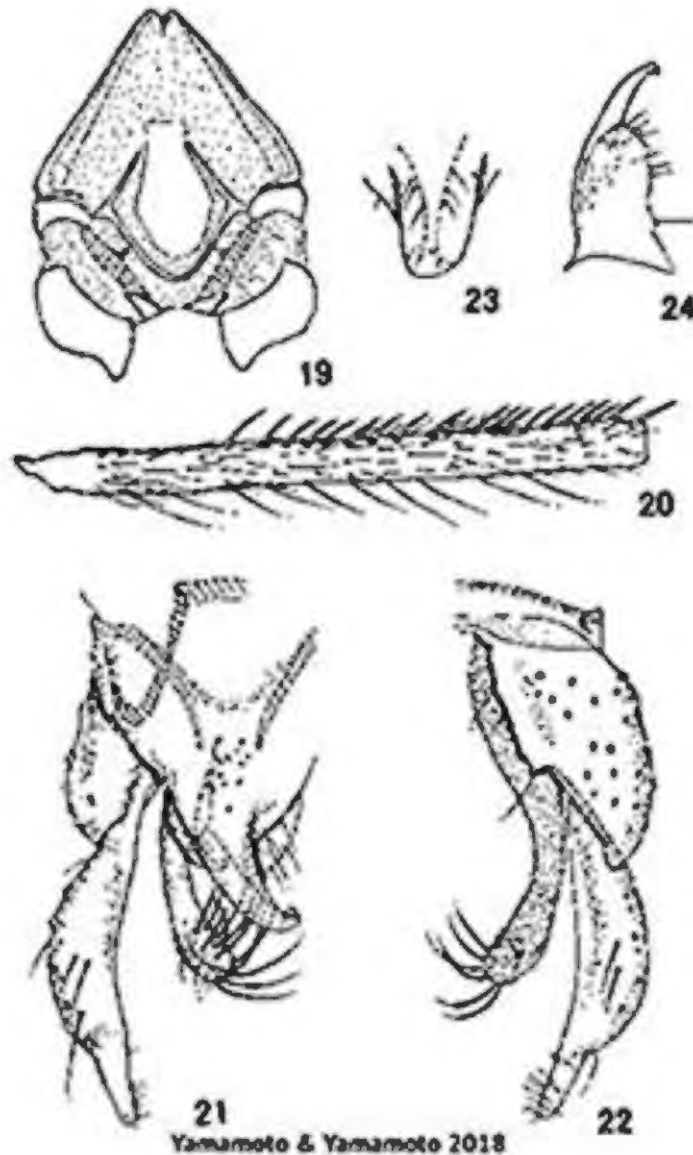
Frontal tubercles very small, nearly circular, only 8 µm in diameter. 12 clypeal setae.

Anteprenotum slightly separated (Fig. 19, below), without setae.

Thoracic setae: 23 acrostichals; 15-18 dorsocentrals, 5 prealar; 18 scutellar.

MidTa2-4 with 23 pseudospurs along the antero-dorsal margin, hindTa1-4 each with 2 pseudospurs on the apical portion; mid and hind Ta1 with several sensilla chaetica.

Hypopygium as in Figs 21-22, below; analpoint (Fig. 23, below) relatively broad, not narrowed at the base, with lateral ridges with 3 setae on each side. SVo (Fig. 24, below) sickle shaped with a very high base, chitinised distal portion arising from outer side of the base. IVo (Figs 21 & 22, below) long, finger-like, slightly expanded distally, with 28 recurved setae on it.



*Einfeldia sasai* from Yamamoto and Yamamoto 2018

**Found:** - Japan – Ouke, Minamidaite, Okinawa Prefecture, Ryukyus (**Type locality**)

May be separated from *E. pagana* by the distributional pattern of the temporal setae on vertex, mid-Tal bearing many pseudospurs, the lunate gonostylus with dorsal 1/4 constricted, the long slender IVo and the sickle shaped SVo.

***Benthalia carbonaria* (Meigen 1804) group**

Possible synonyms:

*Benthalia dissidens* (Walker 1856) – listed as synonym in Fauna Europaea

*Benthalia dystenus* (Kieffer 1916) - listed as synonym in Fauna Europaea but types in Hungarian Museum and hence lost.

*Einfeldia thailandicus* (Hashimoto 1981)

There are other possible synonyms, but they have not been recorded in the Oriental region.

The relationship of Oriental specimens to the described European species is currently unclear, to some extent because of the variety of names that have been applied to specimens (e.g. *Einfeldia pagana*, *Einfeldia dissidens*, *Fleuria dissidens*, *Benthalia dissidens*, *Benthalia dystenus*), but none seem to be synonyms of *Benthalia carbonaria* or *B. dissidens* and, in the absence of types, the identity of *B. dystenus* is uncertain.

In various BOLD Bins, but specimens from Japan, Korea or China are in BOLD Bins: [BOLD:AAW3454](#); [BOLD:ACB4917](#) and [BOLD:ACD8351](#), and not in the same Bins as the European specimens.

Since *B. dystenus* was described from Takao, Formosa, Kieffer's 1916 description as a species in *Tendipes*, is given:

11. *T. dystenus*

A dark reddish brown. Vertex and the two frontal lobes brown. Black brown palps. Brownish antennae, of 12 segments, with tawny plume, articles 8—11 transverse, the first 2—3 times as wide as long, then less than twice, 12 segment 3 times as long as the previous ten combined. Shiny mesonotum, with traces of three darker bands. White halteres, end of the club darkened. Hyaline wings, transverse barely darker than the other veins, bifurcation of the posterior barely distal of the transverse. Legs yellowish, 5 darkened tarsal segments, anterior metatarsus almost twice as long as the tibia, segments 2—4 not bearded, gradually slightly shortened, broad pulvilli. Black brown abdomen, the last two segments enlarged and much wider than the segment which carries the forceps. Tongue of the pliers (anal point) finished in point; terminal segments much longer than the basals, weakly arched, pubescent and with long sparse hairs, glabrous distal quarter, gradually slightly thinned, armed with 4 rigid bristles aligned at the end of the median side, these bristles at least longer than the width of the segment in the distal quarter, a shorter seta is located at the end of the article; superior appendages straight, cylindrical and pubescent, their third suddenly and strongly thinned, glabrous, exceeding the first fifth of the terminal article, curved in a hook at the end; inferior appendages reaching the middle of the terminal segments, straight, pubescent, a little thinner than the base of the superior appendages, terminal third enlarged in club and provided dorsally with long arched setae.

L. 5 mm. Takao.

From this: AR about 3; LR almost 2; no foretarsal beard.

The description of the anal point as 'pointed' is not typical for a species of *Benthalia* and may indicate it being turned down so only the narrower basal part was visible.

This description is insufficient to reliably connect it with any of the presently known species and the type has been destroyed.

*Benthalia* species 1:

**Adults** of Japanese specimens were described by Sasa (1985b) as *Chironomus dissidens*, drawing on information in Sasa & Hasegawa (1983), as *Chironomus (Einfeldia) dissidens* – the larval mentum indicates that this is not the species in BOLD Bin: [BOLD:AAW3454](#) (see below).

**Adult:**

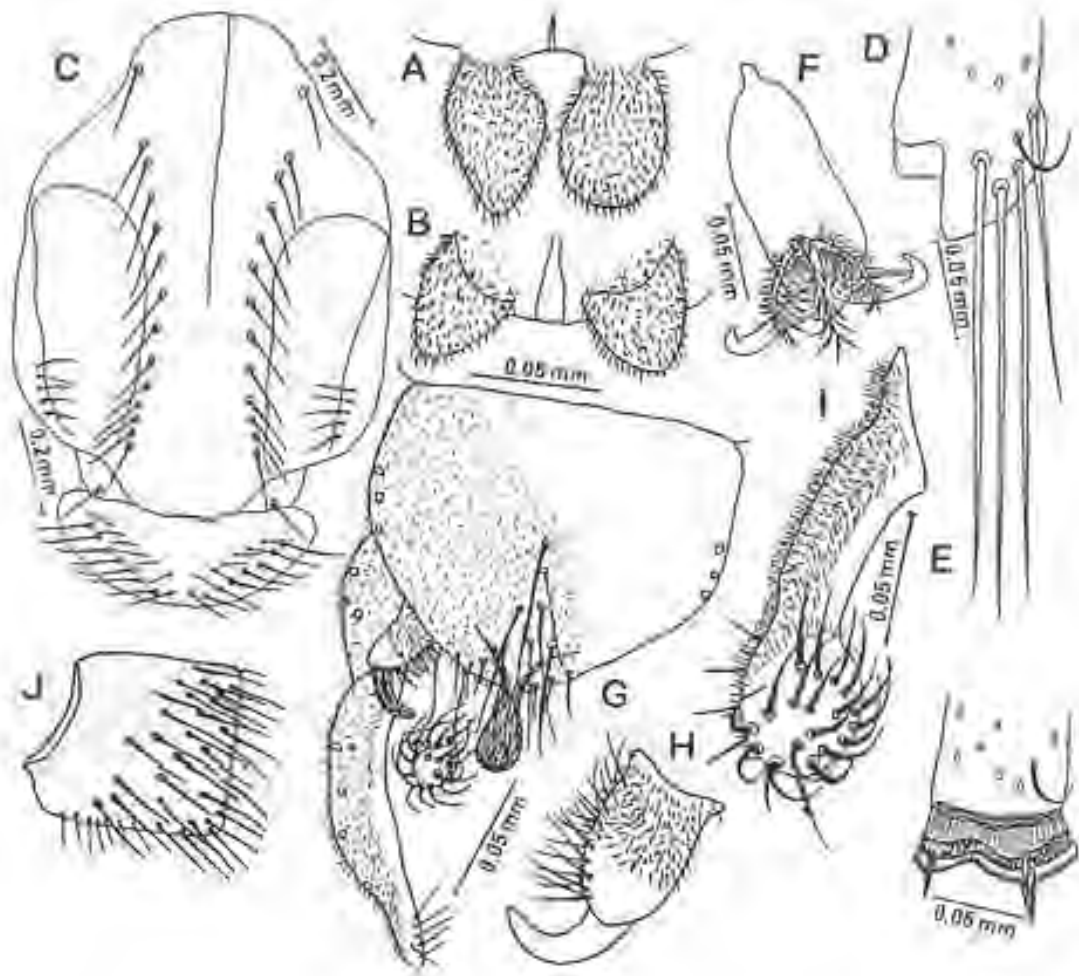
Male: Ground color of dark brown or nearly black, vittae shining black, scutellum dark brown, postnotum black; wings unmarked; femora, tibia and tarsi I of all legs yellow, tarsi II-V brown; abdominal tergites uniformly dark brown or nearly black. Wing length 2.40 (2.23-2.53) mm., 15.8 (13-19) setae in squamal fringe. AR 2.64 (2.60-2.68); 15.8 (13-19) setae in squamal fringe. Frontal tubercles (fig. A) prominent 48 µm long and 18 µm wide.

Thoracic setae: Anteprenotals absent; acrostichals – none; dorsocentrals 15.3 (12-18); prealars 5 (4-7); scutellar 15 (13-19) in two rows.

LR1 1.85 (1.84-1.86), Ta5/Ti 0.29; LR2 0.56 (0.54-0.58); LR3 0.73 (0.71-0.75).

No tarsal beard: BR1 2.1; BR2 3.1 (1.9-4.0); BR3 3.8 (3.2-4.1).

Hypopygium as in figure, SVo comprised of a high setigerous basal portion with a bare, hook-like apical process (very similar to that of *Einfeldia*); IVo expanded apically, with short recurved setae.



Morphology of adult male and female of *B. dissidens* from Sasa 1985

Female: Coloration essentially as in male. Wing length 2.75 mm; squamal fringe with 19-20 setae.

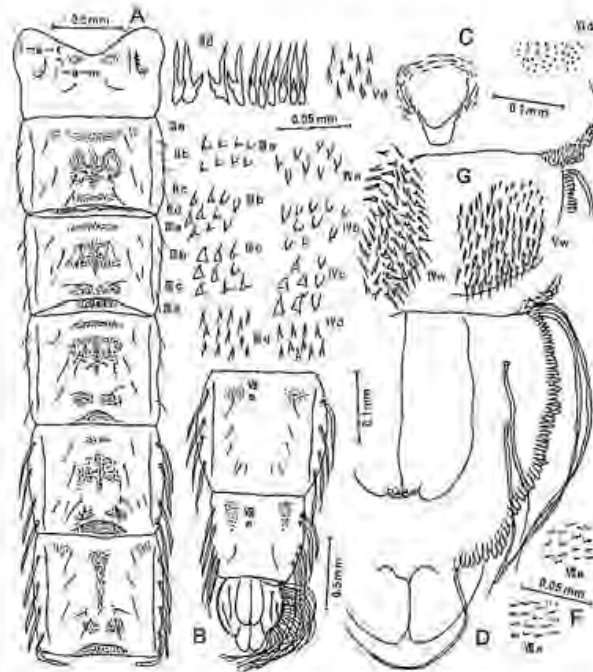
Frontal tubercles (fig. B) prominent, nearly conical 40  $\mu$ m long, 32  $\mu$ m in diameter.

Thoracic setae: Anteprenotals absent; acrostichals – none; dorsolaterals 14-15; prealar – 5; scutellar 18 in two transverse rows.

LR1 1.81, Ta5/Ti 0.24; LR2 0.56; LR3 0.73. Tarsal hairs short: BR1 1.3; BR2 2.0; BR3 3.2.

Cerci (Fig. J above) nearly square with rounded corners 62 $\mu$ m long and 60  $\mu$ m wide.

**Pupa:** Length of abdomen 4.90 mm. Pupal cuticle generally almost colorless, but slightly brown in parts. Respiratory organs as in *Chironomus*. Distribution of spines, spinules and hairs as in figure A, B, below; the number of spines and shape of the patches differ considerably by the segments. Segment VIII without a scale or spur, anal fringe of 78-92 taeniae.



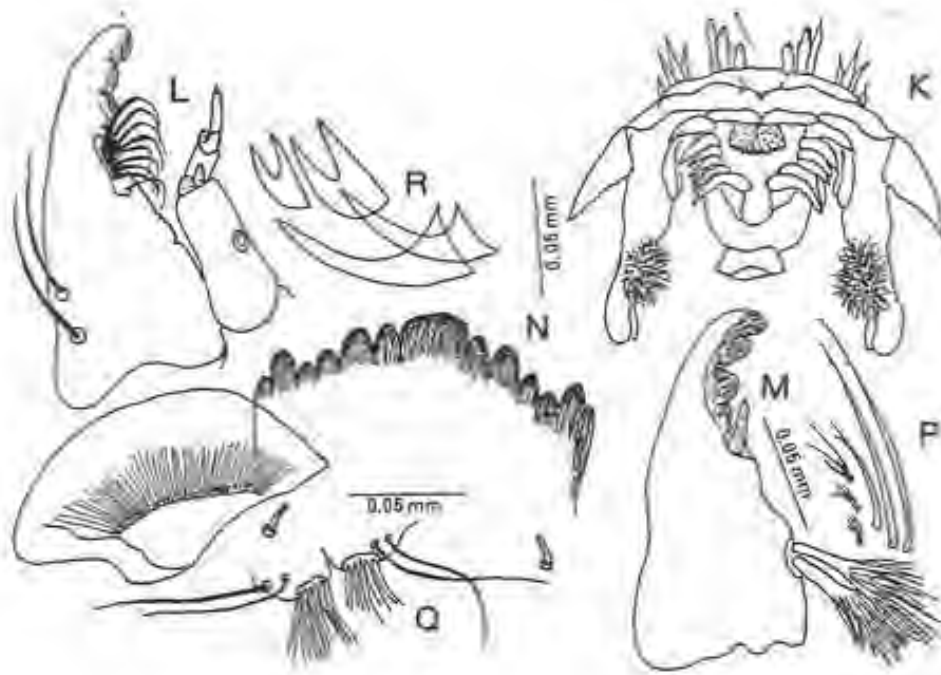
Pupa of *B. dissidens* from Sasa 1985

**Larva:** Gross morphology not described, but likely it has only 1 pair of ventral tubules. No information on anal tubules, but base of preanal hair tuft low and flat with 2 long slender setae, while preanal hair tuft comprises 7 on each side.

Mentum (Fig. N, below) 144  $\mu\text{m}$  wide with 13 teeth, c1 highest and widest, 4<sup>th</sup> laterals narrower and shorter than neighbours. Ventromentum (Fig. N, below) fan shaped, 138  $\mu\text{m}$  wide and 70  $\mu\text{m}$  deep; the figure shows about 55 striae.

Antenna 4 segmented, but figure (L below) shows 5; lengths segs 1-4 (micron): 60 : 28 : 6; 16; RO about middle of segment 1; antennal blade at base of seg. 2 about 1/3 length of that segment.

Mandible 142  $\mu\text{m}$  long, with a comb near the tip. Figure (K, below) shows numerous very small teeth in PET, and premanible with very short teeth (very worn?).



Larval mouth parts of *B. dissidens* from Sasasa 1985.

**Found:** - Shore of Lake Ikeda (31.23°N, 130.57°E), Kagoshima Prefecture, Kyushu; Yoshimi, Shimonoseki, Yamaguchi Pref., and Toyama Pref., both Honshu; Okinawa Island (both Sasa 1985b); Lake Shoji, Mt Fuji region, both Honshu.

Also considered the same species as collected by Sasa and Hasegawa (1983) from Okinawa and Ryukyu Islands, and associated with polluted waters.

This form described by Sasa seems so far apparently only recorded from Japan. However, it is not clear what its true identification should be.

#### *Benthalia* species 2

In BOLD Bin: [BOLD:ACB4917](#)

This species was collected at the same time and in the same lake as *Benthalia* sp. 3. Both species had larvae late enough in 4th instar to be able to be sexed, suggesting they breed at about the same time. However it is not known whether they were sampled from different places in the lake, or on different substrates, potentially even from different depths.

**Adult:** There are photographs of two male specimens in the public BOLD Bin, but only the color can be noted: one is almost completely black or blackish brown, with yellowish legs. The other also has yellow legs but also the thorax has more lighter color and a dull yellowish green background to the abdomen.

**Fourth instar larva:** No details of the larva are available, as the specimen from which the DNA sequence was obtained was probably destroyed in the process. However, in general morphology it was similar to that of species 3, i.e. one pair of VT.

**Found: Japan:** - Lake Suwa (36.03°N, 126.10°E), Honshu; Hatozaki (35.991°N, 140.351°E), Miho-mura, Ibaraki Prefecture (CDBD); Zenbo Junior Highschool (34.884°N, 134.825°E), Kasai-shi; Heiso Reservoir (34.793°N, 134.843°E), Kakogawa-shi; Ohike Pond (Ono City Office)(34.851°N, 134.935°E), Ono-shi, all Hyogo Prefecture (CDBD); Lake Kojima (34.557°N, 133.938°E), Tamano-shi, Okayama Prefecture CDBD).

**South Korea:** - Specimens in GenBank but locality recorded only as to country.

*Benthalia* species 3:

In BOLD Bin: [BOLD:AAW3454](#)

This species was collected at the same time and in the same lake as *Benthalia* sp. 2. Both species had larvae late enough in 4th instar to be able to be sexed, suggesting they breed at about the same time. However it is not known whether they were sampled from different places in the lake, or on different substrates, potentially even from different depths.

**Adult:**

Males: Some details of the males can be determined from the photographs in the CDBD, since those specimens are placed in the same BOLD Bin.

Color dark brownish black, legs yellowish, but darkening on tarsi; but some specimens have a yellowish base color of the thorax and more dull green on abdominal segments I-VII, but posterior end of segment VII, and segments VIII and IX almost black. Mid F/T about 1.1; Hind LR about 0.7, F/T about 0.9-0.94.



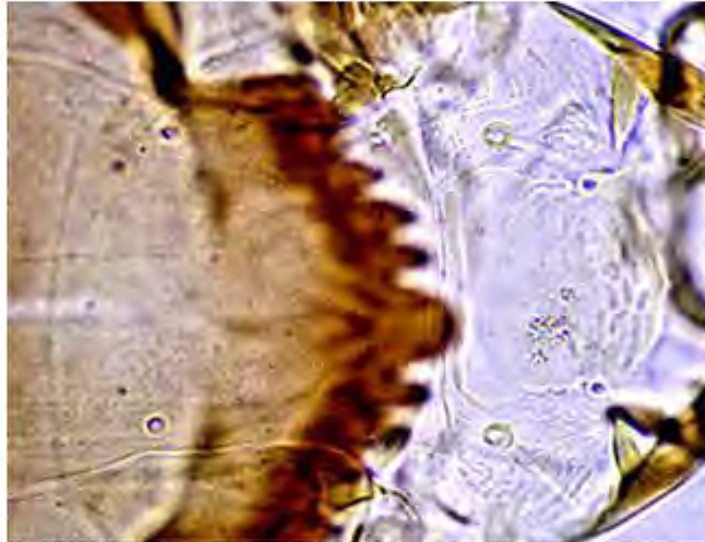
JpnD0258[1]+1439484302 (NIES)

Incorrectly identified in BOLD database as *C. longipes*.

**Fourth instar larva:** Gula region darkened over posterior half. VHL 220 µm; Mentum 152 µm wide with 13 teeth, c1+2 tooth narrower than that described by Sasa (see sp.1), 4th laterals reduced;

Clypeal aperture roughly trapezoidal, 81 µm long, 25 µm wide (3.2 times longer than wide). Frontoclypeus without a fenestra, but with rugosity on the anterior margin of the frons.





Mentum 152  $\mu\text{m}$  wide with 13 teeth, c1+2 tooth narrower than that described by Sasa (see sp.1), 4th laterals reduced (Type II-III).

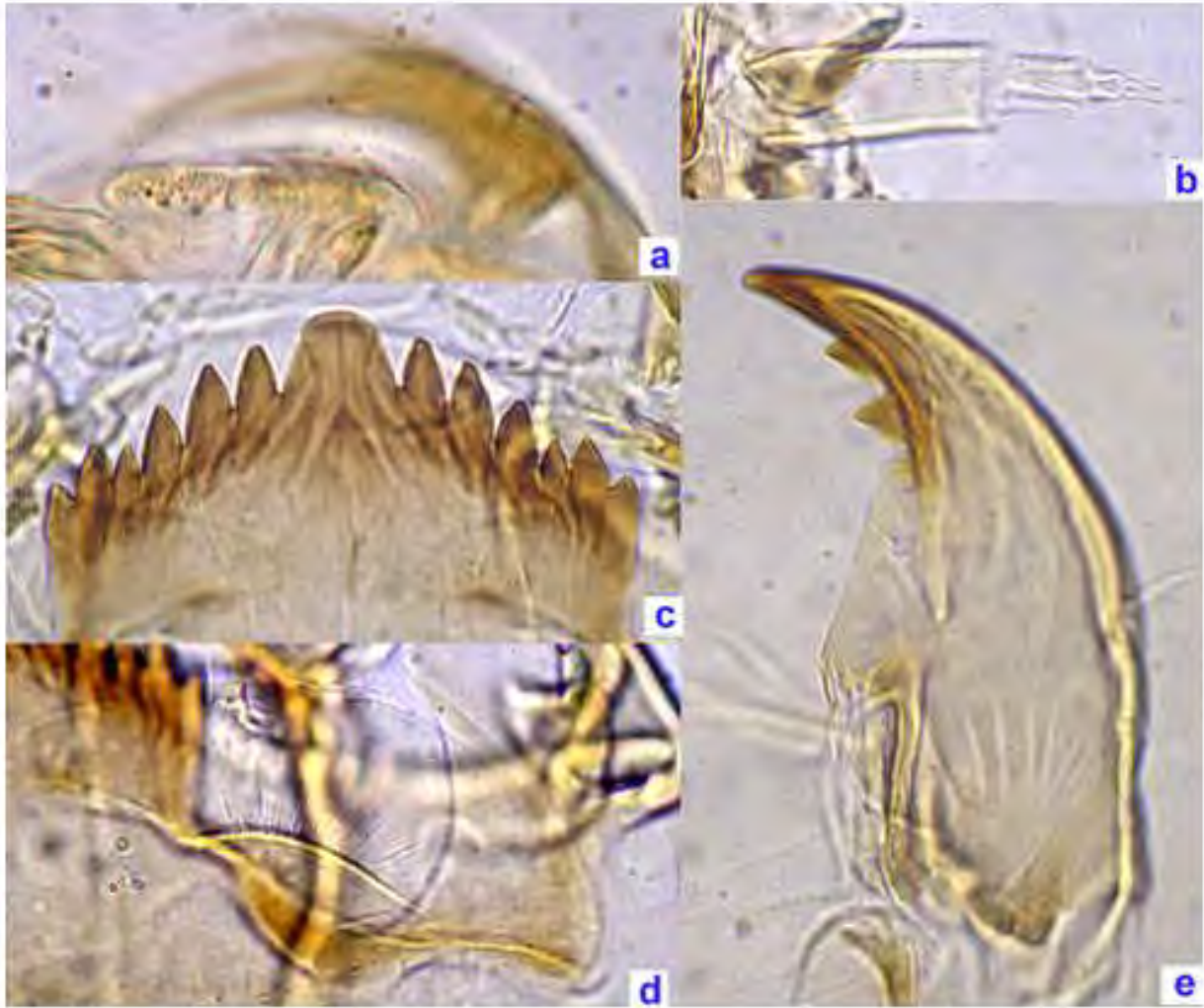
Ventromentum (Fig. d, below) 4 times longer than wide, 1.15 times the mentum width; with about 47 striae.

PE (Fig. a, below) roughly triangular, with many small teeth. PreM (background of Fig a, below) with inner tooth about 5x width of outer tooth (because outer tooth is very narrow). Distance between antennal bases greater than that between S4 setae, which are separated by 0.8 of the frontoclypeal width at that point.

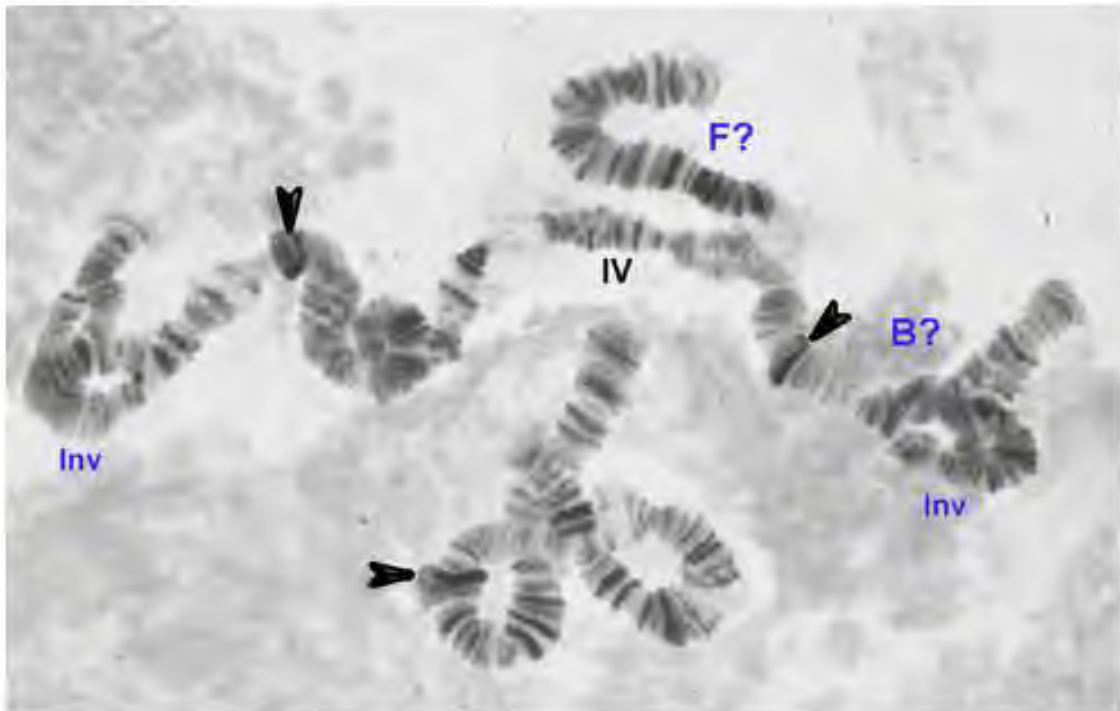
Antennal bases separated by 104  $\mu\text{m}$ , wider than the distance between the S4 setae (91  $\mu\text{m}$ , which is 0.88 of the Frontoclypeal width at that point).

Antenna with 5 relatively short segments, A1 about 2.25 times longer than wide and only about a quarter the VHL, RO about 0.41–0.52 up from base; AR 1.18; proportions (micron) 57 : 21.5 : 6 : 14 : 6.

Mandible length 187  $\mu\text{m}$ , essentially Ty. IIB; 7 widely separated furrows, 12 taeniae in PMA; MTR - 0.36.



**Cytology:** Four polytene chromosomes. All long chromosomes with heterochromatic centromeres, 2 quite heavily heterochromatic but the third, which looks like arms B and F of the *Chironomus* karyotypes has thinner centromeric band., it may also contain the nucleolus. No apparent nucleolus in chromosome IV, and no obvious heterochromatic centromere. A large simple inversion was present in what could be arm B and in one arm of a another long chromosome.



Chromosome complement of *Benthalia* sp. 3

IV - small chromosome IV; arrows – heterochromatic centromeres; B? & F?- arms possibly homologous to *Chironomus* arms B & F; Inv – heterozygous inversions.

**Found:** **Japan:** - Lake Suwa (36.03°N, 126.10°E), Honshu; Wakaguri 36.144°N, 140.083°E Tsukuba, Kanto (NIES) (as *C. longipes*).

*Benthalia* species 4:

In BOLD Bin: [BOLD:ACD8351](https://www.boldsystems.org/#ACD8351).

Based on 2 incomplete males from China:

Color: Thorax dark brown, abdominal segments largely dark brown with a narrow darker band at the posterior margin of most segments, legs apparently yellowish.

AR and LR1 not known. Wing length 2.66-3.00 mm; width 0.63-0.70 mm; VR about 0.99-1.00; 2-3 SCf on brachiolum, about 18 setae in squamal fringe.

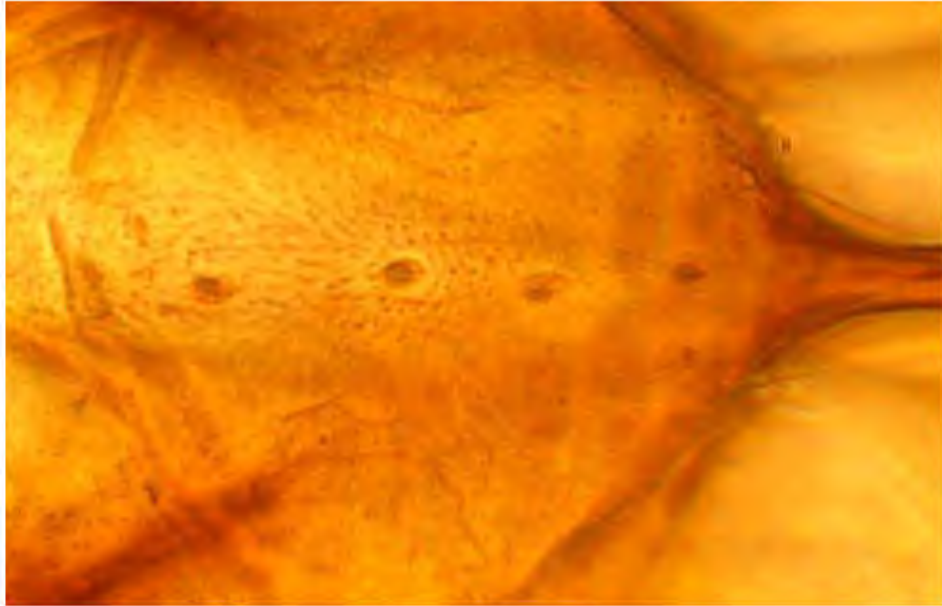
Head: Antennae missing on both specimens. Frontal tubercles 40 µm long and 20 µm wide at base. clypeus width about 0.97 the diameter of the antennal pedicel; The palpal proportions (micron) 44 : 37 : 134 : 158 : 700.

Clypeal width about 0.94-0.97 the diameter of the antennal pedicel; 12-18 clypeal setae.

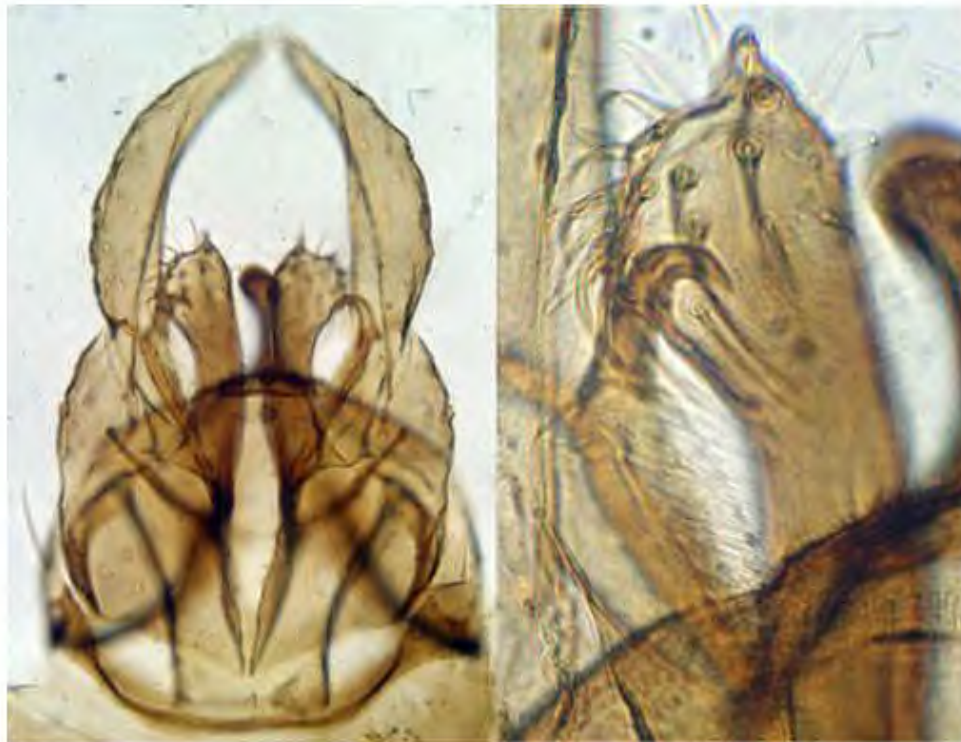
Thoracic setae – 1-2 acrostichals as common for the genus; 11-12 dorsocentrals; 5 prealars; 1 supraalar, 20-23 scutellars in two rows, 7-12(?) in anterior row, 11-13 in posterior row.

Legs: Lengths and proportions (micron):

|             | Fe   | Ti   | Ta1 | Ta2 | Ta3 | Ta4 | Ta5 | LR        | F/T       |
|-------------|------|------|-----|-----|-----|-----|-----|-----------|-----------|
| <b>PI</b>   | 940  | 763  | -   | -   | -   | -   | -   | -         | 1.24-1.28 |
| <b>PII</b>  | 998  | 905  | 512 | 278 | 210 | 120 | 118 | 0.55-0.59 | 1.09-1.12 |
| <b>PIII</b> | 1050 | 1115 | 800 | 425 | 330 | 180 | 135 | 0.70-0.73 | 0.92-0.96 |



4 setae along the mid-line of tergite IX and a lateral seta on each side at the base of the anal point.



Male hypopygium (left) and volsellae (right) of *Benthalia* sp. 4

SVo not like any of the Strenzke 1959 types, with the base extending distally from which the sclerotised part arises partway down the inner side; IVo club-like, setae simple. Gonostylus only moderately swollen and reducing only on posterior third or nearer tip; anal point narrower at its base.

**Found:** China: - Hainan Island,

*B. carbonaria* group species from Kyushu:  
(based on a single incomplete adult male)

This may be a specimen of species 1, based on the small almost globular frontal tubercles.

Color: Thorax dark brown, abdominal segments largely darkened (brown?), legs apparently yellowish.

Wing length 2.28 mm., width 0.58 mm; VR about 1.09; 11 setae in squamal fringe, 2-3 SCf on brachiolum.

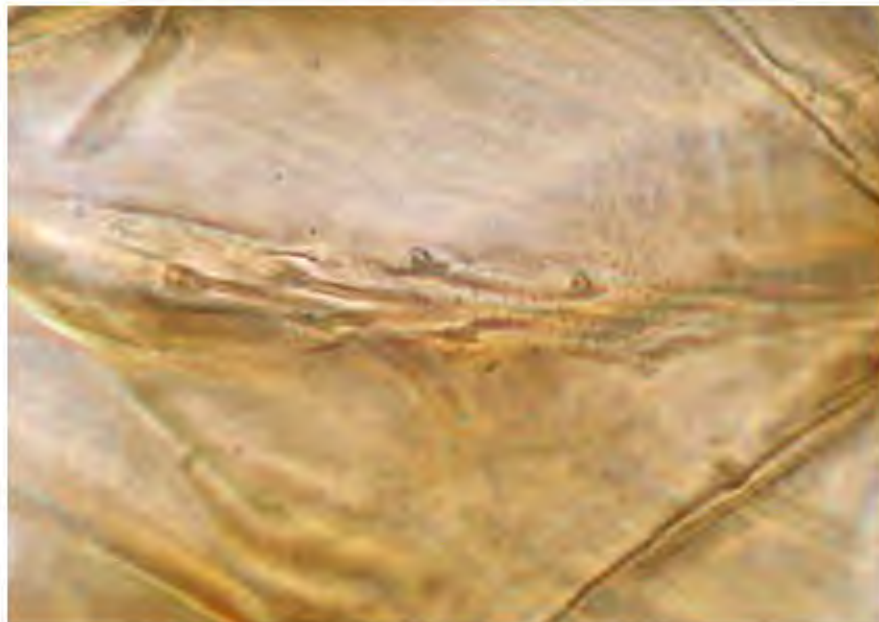
Head: Antennae missing; frontal tubercles almost globular 30 x 24 µm; clypeus width about 0.77 the diameter of the antennal pedicel, 18 clypeal setae; palpal proportions (µm) 43 : 43 : 164 : 177 : missing.

Thoracic setae – acrostichal – none obvious; dorsocentrals 12-14 in a single row; prealars 5-6; supraalar 1; scutellar with setae in 2 rows, anterior row 6, posterior row 13.

Legs: Lengths and proportions (micron):

|             | Fe  | Ti  | Ta1 | Ta2 | Ta3 | Ta4 | Ta5 | LR   | F/T  |
|-------------|-----|-----|-----|-----|-----|-----|-----|------|------|
| <b>PI</b>   | 860 | 900 | -   | -   | -   | -   | -   | -    | 0.96 |
| <b>PII</b>  | 910 | 785 | 450 | 245 | 165 | 105 | 85  | 0.57 | 1.16 |
| <b>PIII</b> | 915 | 950 | 710 | 355 | 290 | 180 | 150 | 0.75 | 0.97 |

Abdominal segments relatively dark with a darker narrow band at the posterior end of segments I-IV; 8 setae in double row on midline of tergite 9.



SVo on relatively long basal section and with long curving distal part; setae of IVo simple, gonostylus moderately swollen and reducing gently

**Found:** Japan: Shimobaru, Fukuokashiigashiku, Fukuoka Prefecture, Kyushu.

Sasa notes that the Lake Shoji specimens occurred in eutrophicated water, while Hashimoto noted that his specimens from Japan did not occur in highly polluted waters.

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