



Morphology and Cytology of Oriental *Chironomus* species

Jon Martin

Melbourne, Victoria, Australia
jonmartin8@bigpond.com

This version 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, as 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*, but there is much confusion as to which genus the species actually belong.

The situation is also not helped by an increasing tendency to publish new species descriptions in journals where they are not subject to critical review. Some species described as *Chironomus* obviously do not belong in that genus, and species from the Nearctic are claimed to occur in the Orient.

I am very much indebted to numerous people who have provided me with material from these areas. Much of the original research reported here was carried out at the University of Melbourne, for which I am grateful.

thummi-cyto-complex species

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

C. javanus Kieffer 1924

C. novosibiricus Kiknadze, Siirin, Kerkis & Aimanova 1993

C. "annularius" sensu Strenzke?

C. plumosus Ty.A Tripathi, Sharma & Khanna 2002 (incorrect complex placement; probably

C. flaviplumus Ty.B)(see pseudothummi-cyto-complex, below)

?*C. pulcher* Weidemann 1830

C. riparius Meigen 1804

C. salinarius Kieffer 1915

C. sinicus Kiknadze *et al.* 2005

C. stigmaterus (not Say) – misidentification by Chavan *et al.* 2013

C. suwai Golygina & Martin 2003

C. vitellinus Freeman 1961

C. okicontractus Sasa, 1993 – see *C. vitellinus*

pseudothummi-cyto-complex species

C. acerbiphilus Tokunaga 1939

- C. alpestris* Goetghebuer 1934
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
C. flaviplumus Type C (from China) see '*C. orientalis*'
C. nr flaviplumus (from India)
C. fusciceps Yamamoto 1990
C. kiiensis Tokunaga 1936 - [previously junior synonym of *C. striatipennis*](#)
C. kiiensis form MYTh
 “*C. kiiensis*” sensu Gunjal & Chavan 2018
C. nr kiiensis – see below
C. magnivalva Freeman 1962 - not Oriental but included to clarify the differences from *C. crassiforceps*, with which it has at times been synonymised.
C. nippodorsalis Sasa 1979
C. 'orientalis' – manuscript name.
C. plumosus Ty.A Tripathi, Sharma & Khanna 2002 (probably *C. flaviplumus* Ty.B)
C. plumosus Ty.B Sharma et al. 2004 (probably *C. flaviplumus* Ty.B)
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 – incorrect identifications (*C. nr. samoensis*, India)
C. setonis Tokunaga 1936 - see *C. circumdatus*
C. strenzkei Fittkau 1968 - [formerly incorrectly as synonym of *C. striatipennis* or *C. kiiensis*](#)
C. striatipennis Kieffer 1910
C. striatipennis Type 2 (Pramual et al. 2016) = *C. strenzkei* Fittkau 1968
C. sulfurosus Yamamoto 1990
C. transvaalensis Kieffer 1923 - not an Oriental species, but included here to clarify the differences from the closely related Oriental material.
C. c.f. transvaalensis not Kieffer 1923
C. yoshimatsui Martin & Sublette 1972
C. species I Sharma *et al.* 1990 - probable member of the *C. flaviplumus*-complex (see Type B)
C. species II Sharma *et al.* 1995 – probable member of the *C. flaviplumus*-complex (see Type B)
C. sp. DSC1 ‘*C. kangleipak*’
C. sp. PK6 (probable member of the *C. flaviplumus*-complex)
C. sp. PK8 (related to *C. flaviplumus* Ty. B)
C. sp. R&S (possibly conspecific with *C. circumdatus*)
C. sp. SS (related to sp. PK6?)

camptochironomus-cytocomplex

- C. biwaprimus* Sasa & Kawai 1987
C. mongolabeus Sasa & Suzuki 1997
C. mongolbeceus Sasa & Suzuki 1997
 ‘*C. tentanus*’ sensu Gunjal and Chavan 2018

commutatus-cytocomplex

No Oriental members of this complex reported

Unknown cytocomplex

- C. acutus* Das, Majumdar and Hazra 2016 (junior homonym of *C. acutus* Goetghebuer 1928 - [New name required](#))
- C. aguzza* - suggested replacement name for *C. acutus* Das *et al.* 2016, since the original name refers to the shape of the SVo.
- C. alternus* Das, Majumdar and Hazra 2016
- C. (Lobochironomus) arcuta* – recommendation by Spies pers. comm. 2024
- C. atrosignatus* Kieffer 1911
- C. bharati* Singh & Kulshrestha 1976
- C. (Lobochironomus) bifidus* Pal & Hazra 2017 – descriptions indicate this is not *Chironomus*. Suggested by M. Yamamoto that it might be a synonym of *Kiefferulus nodulosus* Hashimoto (in Hashimoto *et al.* 1981) (see below)
- C. bipunctus* Johannsen 1932
- C. brevistylus* Guha *et al.* 1985
- C. callichirus* – Kieffer 1911 – Uncertain Chironomini (Sublette & Sublette 1973)
- C. calligaster* Kieffer 1911 – *Kiefferulus* (Chaudhuri & Ghosh 1986)
- C. callimorphus* Kieffer 1911 – *Polypedilum* (Sublette & Sublette 1973)
- C. chlorogaster* Kieffer 1911 – see *C. glaucogaster* (New name)
- C. chlorophorus* Kieffer 1912 - Uncertain Chironomini (Sublette & Sublette 1973)
- C. chlorostolus* Kieffer 1912 - Uncertain Chironomini (Sublette & Sublette 1973)
- C. choricus* Kieffer 1911 - Uncertain Chironomini (Sublette & Sublette 1973)
- C. claggi* Tokunaga 1964
- C. clavatipes* Kieffer 1910 - Uncertain Chironomini (Sublette & Sublette 1973)
- C. clavipenis* Das *et al.* 2016
- C. concomitatus* Johannsen 1932 – as *Chironomus (Polypedilum)* – syn. *P. vectus* (Hashimoto *et al.* 1981)
- C. confectus* Das *et al.* 2016
- Tendipes coniger* Kieffer 1913 - Uncertain Chironomini (Sublette & Sublette 1973)
- C. conjungens* Kieffer 1914 - Uncertain Chironomini (Sublette & Sublette 1973)
- C. crucifer* Kieffer 1922 - Uncertain Chironomini (Sublette & Sublette 1973)
- C. cubiculorum* Doleschall 1856 - Uncertain Chironomini (Sublette & Sublette 1973)
- C. culterus* Das *et al.* 2016
- C. curtitarsis* (as *Tendipes*) - Uncertain Chironomini (Sublette & Sublette 1973)
- C. daitoabeus* Sasa & Suzuki 2001 – syn. *C. crassiforceps* (Kobayashi & Endo 2008)
- C. daitobeceus* Sasa & Suzuki 2001 – syn. *Polypedilum nubifer* (Kobayashi & Endo 2008)
- C. daitocedeus* Sasa & Suzuki 2001 – probable synonym of *C. vitellinus*
- C. daitodecus* Sasa & Suzuki 2001 – likely a member of the *flaviplumus*-group
- C. daitoefeus* Sasa & Suzuki 2001 – synonym of *C. circumdatus* (Yamamoto & Yamamoto 2018) or *C. yoshimatsui* (Yamamoto, unpubl.)
- C. digraphis* Kieffer 1911 (as *Tendipes*) – *Paratendipes* (Sublette & Sublette 1973)
- C. dolens* Kieffer 1910 (as *C. Prochironomus*) – *Paratendipes* (Sublette & Sublette 1973)
- C. enteromorphae* Tokunaga 1936 – *Dicrotendipes* (Yamamoto, unpubl.)
- C. famiabeus* Sasa 1996 – syn. *Glyptotendipes (Caulochironomus) biwasecundus*
- C. flavitibia* Johannsen 1932
- C. filitarsis* Kieffer 1911 - – uncertain Chironomini (Sublette & Sublette 1973)
- C. formosae* Kieffer 1912 – as *Tendipes. Chironomus* (Sublette & Sublette 1973)

- C. formosicola* Kieffer 1912 – uncertain Chironomini (Sublette & Sublette 1973)
C. fortibracchius Das *et al.* 2016
C. fortistylus Chaudhuri *et al.* 1992
C. fujiprimus Sasa 1985 (transferred to *Lipiniella* by Hirabayashi *et al.* 2007)
C. fujisecundus Sasa 1985
C. fujitertius Sasa 1985 (the “lowland form” of *C. nipponensis*)
C. fusciceps (new name for *C. lugubris* Tokunaga 1938) Yamamoto 1990
C. gelhausi Bouchard, Hayford & Ferrington 2023 – possibly nr. *Benthalia*.
C. glaucogaster Kieffer 1912 – as new name for *C. chlorogaster*. Nomen dubium (Sublette & Sublette 1973)
C. hemicyclius Das *et al.* 2016
C. inaabeus Sasa, Kitami & Suzuki 2001 – syn. *C. nippodorsalis* (Yamamoto & Yamamoto 2018)?
C. inabeceus Sasa, Kitami & Suzuki 2001 – not *Chironomus*, syn. *Glyptotendipes biwasecundus* (Yamamoto & Yamamoto 2018)
C. incertipenis Chaudhuri & Das 1996 (formerly *C. niger* Chaudhuri *et al.* 1992).
C. incertipenis auctt. ?nec Chaudhuri & Das 1996? – see *C. flaviplumus* Ty. B.
C. incertus Kieffer 1924, as *Camptochironomus*. (secondary homonym of *C. incertus* Walker 1856)
C. inermifrons Kieffer 1916 - currently a nomen dubium as known only from female, and types destroyed
C. indiaensis Martin 2011 (formerly *C. samoensis* sensu Chattopadhyay *et al.* 1991)
C. 'javanus' sensu Karunakaran
C. jangchungensis Ree 2012 – not a typical *Chironomus* (description not seen)
C. kagaensis Sasa 1994 - syn, *Glyptotendipes tokunagai* 1979 (Yamamoto & Yamamoto 2018)
C. nr. kiiensis - [clearly a distinct species, but no information on morphology](#)
C. lasiochirus (Kieffer 1911) – *Kiefferulus* (see below)
C. lucernarum Kieffer 1911 – nomen dubium (Sublette & Sublette 1973)
C. lurilatus Das *et al.* 2016
C. mayri Majumdar, Mazumdar & Chaudhuri 2009
C. melanophorus Kieffer 1911 – uncertain Chironomini (Sublette & Sublette 1973)
C. mongolcedeus Sasa & Suzuki 1997
C. mongoldecus (or *mongoldeceus*?) Sasa & Suzuki 1997 (see below)
C. mongolefeus Sasa & Suzuki 1997
C. mongolfegeus Sasa & Suzuki 1997
C. mongolgeheus Sasa & Suzuki 1997
C. mongolheius Sasa & Suzuki 1997
C. niger Chaudhuri *et al.* 1992 – see *C. incertipenis*
C. nipponensis Tokunaga 1940 (the “highland form”)
C. nudipes Kieffer 1911
C. okinawanus Hasegawa & Sasa 1987
C. okicontractus Sasa & Suzuki 1995 – syn. *C. okinawanus*
C. okisiroia Sasa 1993 (as *Einfeldia*) – see “samoensis”
C. palpalis Johannsen 1932
C. prasiogaster Kieffer 1911 – uncertain Chironomini (Sublette & Sublette 1973)
C. psilochirus Kieffer 1911 – *Kiefferulus* (see below)
C. quadratus Johannsen 1932
C. rostratus Kieffer 1911 – *Kiefferulus* (see below)
C. securis Konar 2018 (also spelled *secures*) – (see under *Kiefferulus* below)

- C. semiflavus* Kieffer 1911 – syn. *Kiefferulus barbatitarsus* (see below)
- C. semiviridis* Kieffer 1911 – *Dicrotendipes* (Sublette & Sublette 1973)
- C. sexpunctatus* Kieffer 1911 - uncertain Chironomini (Sublette & Sublette 1973)
- C. sp.* “simantoabeus” Sasa, *et al.* 1998 (intersex of ‘nippodorsalis-group’)
- C. simantobeceus* Sasa *et al.* 1998 – syn. *C. claggi*.
- C. sollicitus* Hirvenoja 1962
- C. stigmaterus* not Say – misidentification by Chavan *et al.* 2013
- C. tokarabeceus* Sasa & Suzuki 1995 – syn. *C. okinawanus*
- C. trinigrivittatus* Tokunaga 1940
- C. tusimaabeus* Sasa & Suzuki 1999
- C. toyamabiceus* Sasa 1996 – syn. *Kiefferulus umbraticola* (Yamamoto & Yamamoto 2018)
- C. uncinus* Konar 2018 – (see under *Kiefferulus* below)
- C. uttarpradeshensis* Singh & Kulshretha 1976
- C. viridiventris* Kieffer 1911 – uncertain Chironomini (Sublette & Sublette 1973)
- C. yangtzensis* Hongtsu – only details of type location known.

Subgenus *Chaetolabis*

- C. (?Chaetolabis) echizensis* Sasa 1994 – syn. *C. yoshimatsui* (Yamamoto & Yamamoto 2018)
- C. (Chaetolabis) macani* Freeman 1948

Subgenus *Lobochironomus*

See entries above (*arcuta*, *dorsalis/longipes*)

- C. (Lobochironomus) ocellatus* (Hashimoto, 1985) (originally as *Einfeldia*)
- Trichotendipes insulus* Guha *et al.* 1985 – suggested to be *Lobochironomus* by Martin Spies
- C. (Lobochironomus) bifidus* Pal & Hazra 2017 - possibly *Kiefferulus nodulosus* Hashimoto 1981 (see under possible *Kiefferulus*, below)

Genus *Daitoyusurika*

- D. daitofegea* Sasa & Suzuki 2001 - syn. *C. crassiforceps*

Genus *Yaesecondus*

- Y. iriobeceus* Sasa & Suzuki 2000 – syn. *C. crassiforceps*

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. arcuta* Majumdar & Mazumdar 2008 - *C. (Lobochironomus)*. (see above)
- 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* - as also considered by Epler *et al.* 2013).
- E. nodulosus* Hashimoto *et al.* 1981 – transferred to *Kiefferulus* by Hongtsu (pers. information)
- E. ocellata* Hashimoto 1985 – *C. (Lobochironomus)*. (see above)
- C. okisiroia* Sasa 1993 – Transferred to *Chironomus* by Yamamoto 1996 (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*. At least some of the Japanese material requires a new name, see *E. sasai* (below).
- E. pritiensis* Singh & Rawal 2016.

E. sasai Yamamoto & Yamamoto, 2018.

?*Einfeldia thailandicus* Hashimoto 1981 - Yamamoto *et al.* 2015 class this as so-called *Einfeldia dissidens* group which would place it as *Benthalia*, but it does not seem to belong in that genus.

?*Einfeldia nojiriprima* Sasa - Yamamoto *et al.* 2015 class this as so-called *Einfeldia*, but Cranston *et al.* (2016) suggest it may be *Glyptotendipes* (*Heyotendipes*).

Benthalia

Epler *et al.* (2013) consider that *Benthalia* should be returned to *Chironomus*, purely on the basis that there are furrows on the mandible in at least some species, However there are other differences between the two genera in other species

Currently there are two species accepted as occurring in this region:

B. carbonaria Meigen 1804 - but this should be considered to be just a group name (see below).

B. dissidens Walker 1856 – but this may be a synonym of *B. carbonaria* (or a member of the *carbonaria*-group?). Also noted to be similar to North American *B. brunneipennis* (Johannsen)

B. dystenus Kieffer 1916 (description insufficient to identify the species)

Four species can be recognised from data in the BOLD database:

B. species 1.

B. species 2.

B. species 3.

B. species 4.

Species described as *Chironomus*, but now considered to be, or more likely to be, *Kiefferulus* (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).

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*-Hypopygs (♂). a—c S-Typ (a *halophilus*, b *thummi thummi*, c *luridus*), d—f D-Typ (d, e *dorsalis*, f *striatus*), g—i E-Typ (g *cingulatus*, 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 (TLt) 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 TLt:

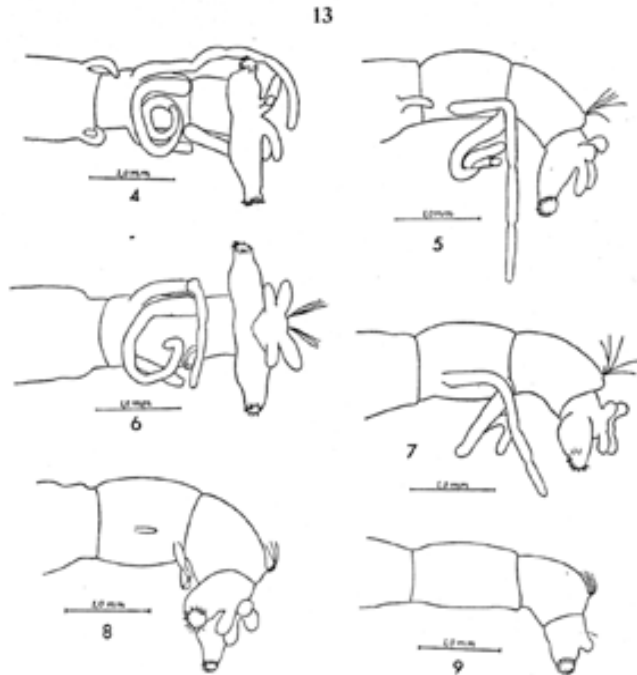
halophilus - anterior VT very short or absent, posterior VT short
bathophilus – moderate to long, essentially straight VT.
fluviatilis - VT slightly curved and coming to a point at ends. (often hard to distinguish from bathophilus-type, particularly in some fixed material)

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

Possessing TLt:

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.



Figs. 4–9. Hind parts of larvae.

4. plumosus type (total length 15 cm; loc. 12; 13.VII.1943); ventral view; right tubuli cut off.
5. as 4, but seen from the left; left tubuli only drawn.
6. thummi type (total length 17 cm; loc. 1; 5.VII.1944) ventral view; right tubuli cut off.
7. as 6, but seen from the left; left tubuli only drawn.
8. halophilus type (total length 12 cm; the fjord; 27.IV.1942); seen from the left, slightly from the ventral side.
9. salinarius type (total length 15 cm; the fjord; 27.IV.1942); seen from the left.

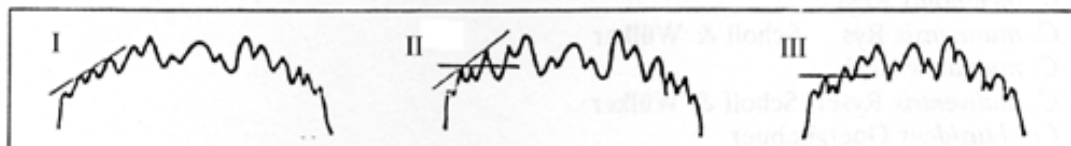
Reference is also made to the mentum and mandible types originally devised by Webb & Scholl (1985), Vallenduuk & Moller Pillot (1997) and Proulx *et al.* (2013). These classifications were made for relatively small numbers of species, but with the much larger number of species they do not cover all the 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 trifold tooth**:

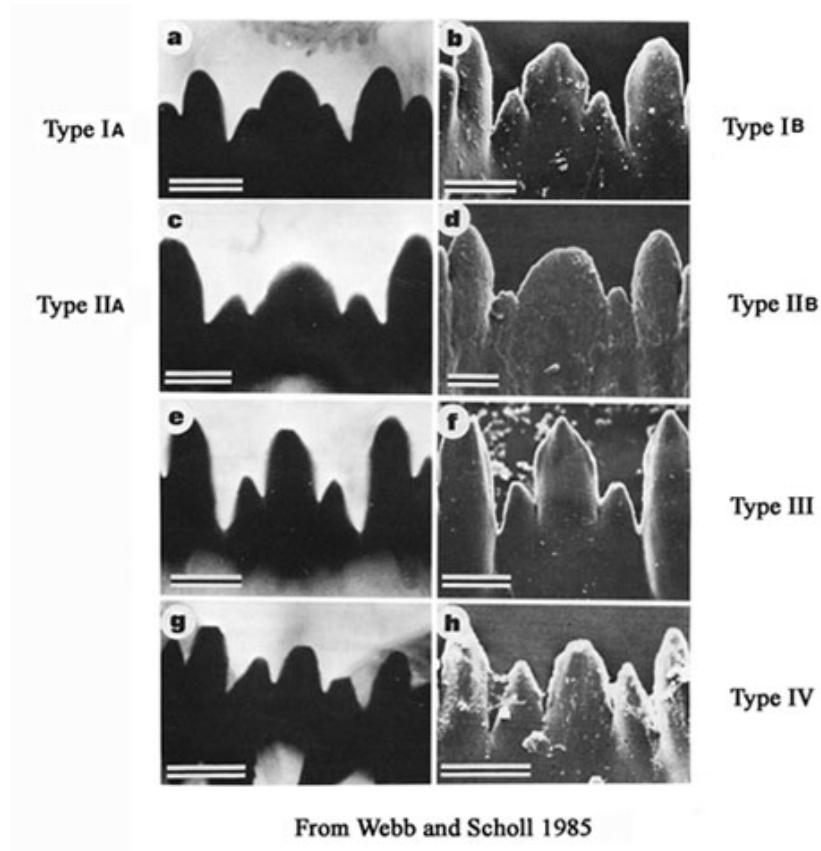
Type IA - c2 teeth only partially separate from c1, i.e. as shoulders on c1. (figure a)

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).



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;

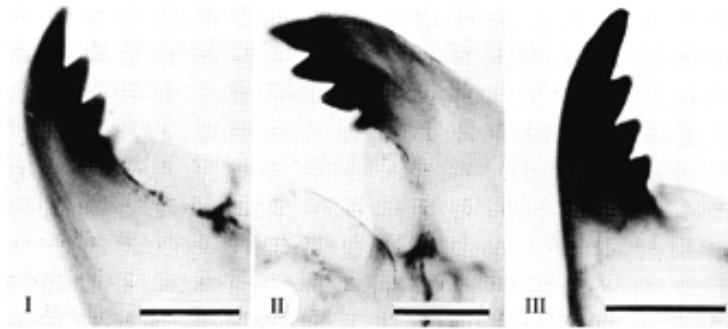
Type III - 3rd tooth completely separate.

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:

Mandible length is measured from the heel to the tip of the apical tooth.



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).

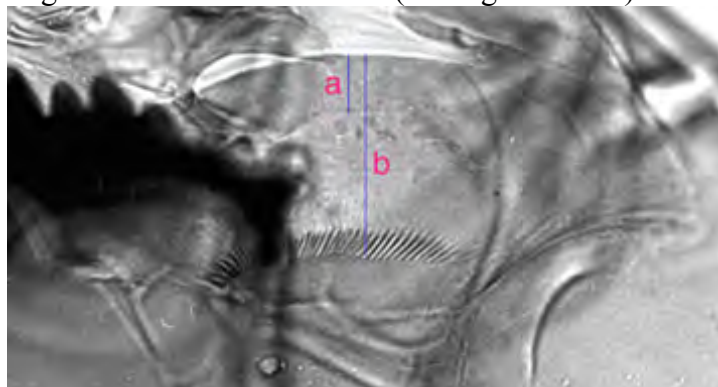


However for different sized species it may be preferable to divide this value by the length of the inner tooth row (black line in figure above) to obtain the MTR.

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).

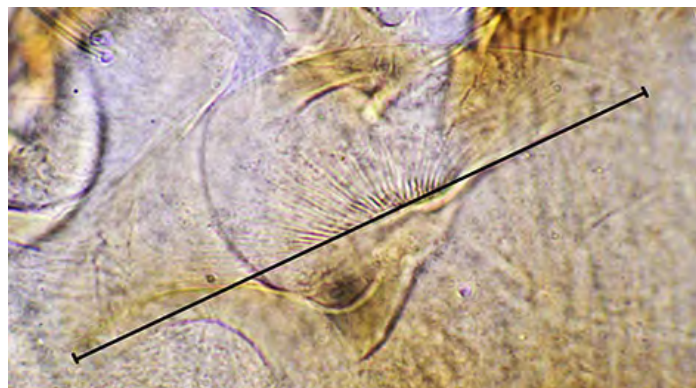


$$\text{VMR} = a/b$$

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:



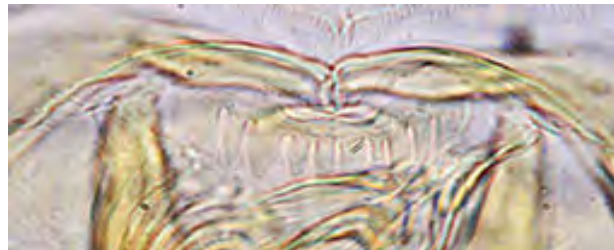
This seems preferable to the sometimes used 'horizontal length' which can be subject to parallax error and to the effects of rotation of the plates under pressure during slide mounting.

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.



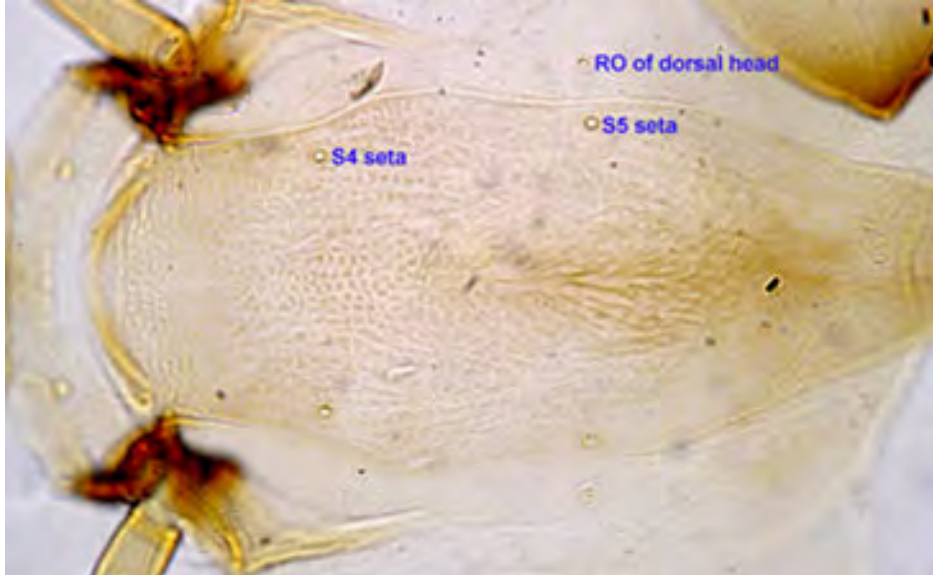
Type D - rounded teeth with smaller teeth interspersed (generally found in the subgenera *Lobochironomus* or *Chaetolabis*).



[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*.

Premandible

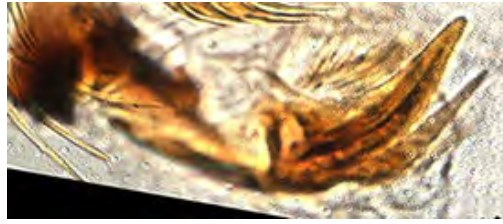
Assessment of the premandible can be difficult due to quite excessive wear and distortion in mounting. Where they are in good condition and lying flat, they can be categorised into 5 groups based on the relative widths of the teeth and whether they come to a sharp or a broad point. The teeth are measured as close as possible to their bases.

Type A: Both teeth narrow and coming to a fine point.



Type B: inner tooth moderately broad, about 3-5 times wider than, outer tooth. This can be split into 2 subgroups:

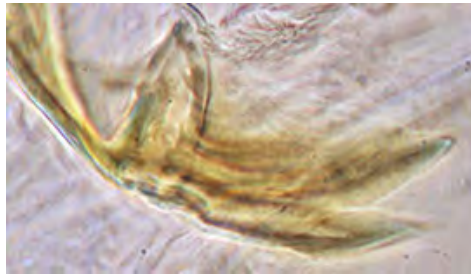
B1 – both teeth come to relatively fine points.



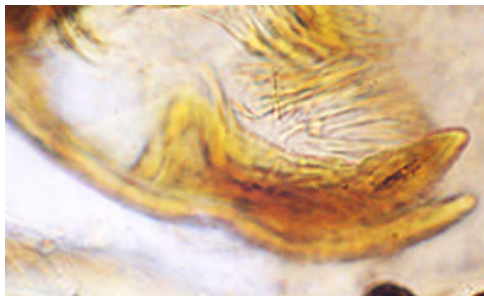
B2 – the inner tooth comes to a relatively broad point.



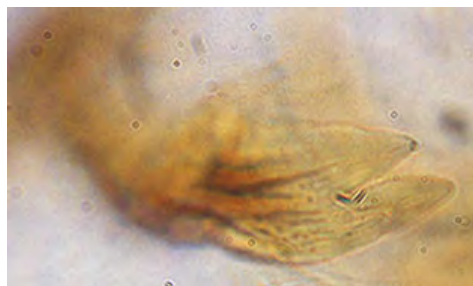
Type C: Both teeth are moderately broad, coming to relatively broad points.



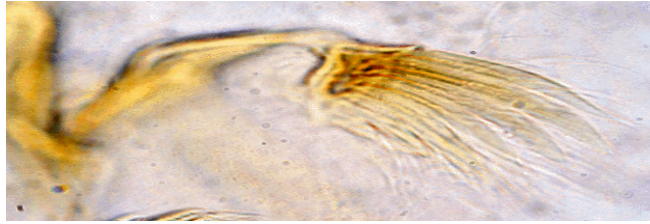
Type D: Inner tooth very broad, outer tooth moderately broad.



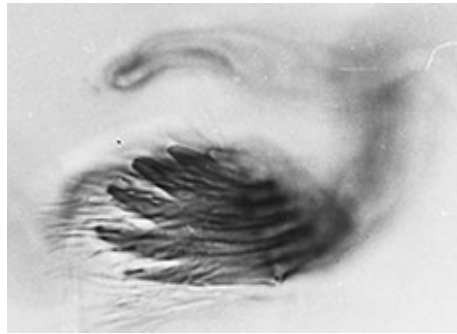
Type E: Both teeth very broad and often quite short.



Type F: A five (sometimes 6) toothed premandible



Species of *Kiefferulus* also have a five-toothed premandible, but it is broader



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

CT – Cephalic tubercles (pupa)

FC – Frontoclypeus (more correct for *Chironomus* than Frontal apotome, FA)

FT – Frontal tubercles

GC – Gonocoxite IX

GP – Gonopophesis VIII

GS – Gonostylus

Gula - Submentum

IPD – Inter-plate distance i.e. distance between the Ventromental Plates

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 (larval)

Pe – Preepisternum (adult)

PM – Premandible

PMa – Pecten manibularis

PSA – Pedes spurii A

PSB – Pedes spurii B

SAL – Salivarium (or Salivary reservoir outlet)

SCf - Sensilla campaniformia (on brachiolum)

RO - Ring organ

SV – “Schenkel-Scheine-Verhalnis” – ratio of femur+tibia/metatarsus

SVo - Superior volsella

TLt - Posterolateral tubules

TO – Triangulum occipitale of larva

VHL - Ventral Head Length (i.e. length from tip of central tooth of mentum to ventral margin of head capsule)

VM – Ventromentum

VMR – Ventromental Plate Ratio

VT - Ventral tubules.

♣ - occurrence not confirmed

Species of the thummi-cytocomplex:

***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 but 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)

Incorrect synonymy *Chironomus yoshimatsui* Martin & Sublette 1972 – Langton & Visser 2003 on basis of pupal similarity. However cytology and mtCOI sequence show this is incorrect

The name *Chironomus dorsalis* was misapplied to a *Chironomus* (*s.s.*) species by Edwards (1929). After re-examination of the type specimen (see below), *C. dorsalis* Meigen was placed in *Einfeldia*, but later recognized as a member of the new subgenus *Lobochironomus* of *Chironomus* by Ryser, Wuelker and Scholl (1985).

The status of the name “*dorsalis*” is most confused as it has been used in at least six different ways and it is not always clear in the literature as to which species it refers. It has included the amazing suggestion that the name *C. dorsalis* should be restricted to *C. dorsalis sensu* Edwards because there was no valid name for that species, and that the Meigen species should be called by the junior synonym *C. longipes*!

I have only been able to find one description of the female but, although I have included some information, it is not clear which species it refers to as there is no statement of the author of the name.

In BOLD Bin: [BOLD:AAW4008](#)

Also 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)



Chironomus (*Einfeldia*)
dorsalis MEIG.
Museum Paris

Male terminalia drawn from type specimen in the Paris museum
(drawing courtesy of W.F. Wülker).

Adults of North American specimens were described by Townes (1945) as *Tendipes* (*Einfeldia*) *dorsalis*:

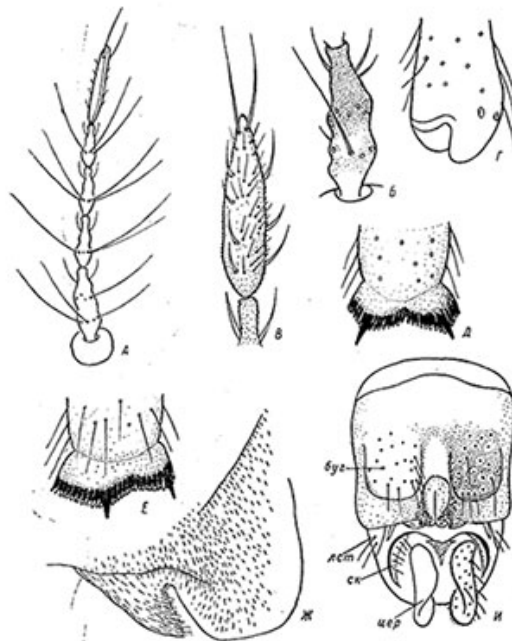
Male: Wing length 3.2 mm; LR 1.7; AR 3.0, FT minute, fore tarsus without beard. Pale green, with thoracic markings, etc., ochraceous; apical segments of tarsi brown; abdominal tergites each with a central brown mark over most of the length of the

segment, apical tergites entirely brown. About 9 setae in a single triangular area on tergite IX. SVo on a triangular base with the chitinised apical part with a sharply bent end; D-type (by definition) of Strenzke (1959). IVo, with simple setae, about as long as the anal point and reaching to about the middle of the moderately swollen gonostyle, which narrows over the posterior half to third; abt 5+1 setae at tip.

Female: Similar to male except for the usual sexual differences.

Only description found is that of Rodova (1978) although it is not clear which form she is describing (She mentions *Einfeldia* but does not identify to which species this refers). Length 6-7 mm, wing length about 5 mm.

Antennal ratios (units) 17 (neck 0.3) : 11 : 11 : 9 : 18; AR about 0.38; A5/A1 about 1.06.



From Rodova 1978

Tergite X long and narrow like a crescent moon. Cercus appears to have a curved ventral margin with a basal bulge, posterior margin curved.

Pupa: (from Langton & Visser (2003): Length 5.0-5.4 mm.

Cephalic tubercles 75x55 µm, frontal setae 43 µm.

Basal ring of thoracic horn 78-97 x 33-40 µm; HR 2.36-2.43. Thoracic granulation well-developed anteriorly and along suture, evanescent elsewhere.

Abdomen: Hook row of segment 2 complete, 50-66 hooks in row 0.45-0.48 of the width of the segment.

Abdomen colorless with sooty markings. The point patches are strong points, increasing in size posteriorly, and increase in extent from tergite II to V, but is reduced on VI. Spur of Segment VIII with 1 stout tooth and occasionally a small accessory tooth. Anal lobe with a fringe of 43-50 taeniae.

Fourth instar larva a medium (female about 7.2 mm) melanotus-type (with small

lateral tubules to about 160 μm) and well developed VT, anterior pair shorter (ant. 1.2 mm; post 1.36 mm). Gula and FC not darkened. AT about 250 μm , 3 times longer than wide. SAL(1 specimen) abt 70x15 μm , abt 4.7 times wider than deep.

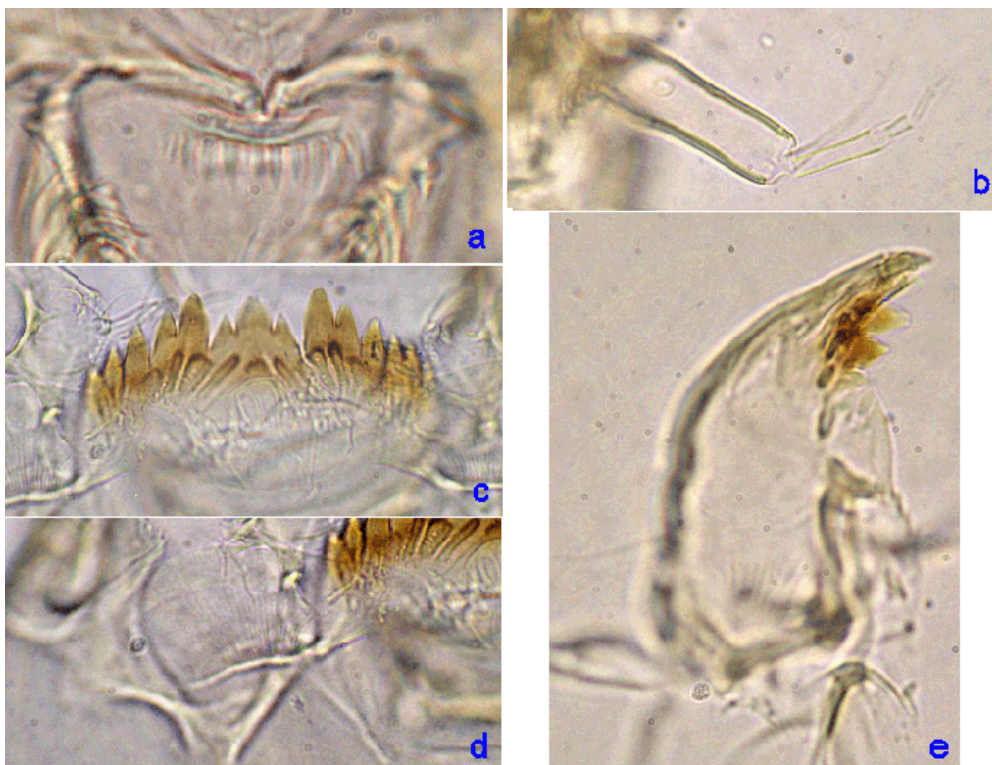
Mentum (c, below) with 4th lateral slightly reduced (type I-II), c1 relatively narrow and tall, with c2 teeth relatively well separated (type III).

Ventromental plates (d, below) about 3.6-3.7 times wider than deep; separated by about 37-47% of mentum width; with about 42-47 closely spaced striae; VMR about 0.35.

PE (a, below) with about 20-21 teeth (14 normal teeth, the others thinner teeth interspersed between the normal teeth – closest to type D). Premandible teeth sharp (type B2), inner tooth 3.3-4 times wider than outer tooth.

Antenna (Fig. b, below) with basal segment 3.25-3.85 times longer than wide; A2 quite long compared to A1 (A1/A2 only about 2.8); AR about 1.18-1.35; ratio of segments (micron) 90 : 32 : 8 : 13 : 6.

Mandible (e, below) with third inner tooth partly separated and slightly darkened (type IIB), and with 12-15 furrows on outer surface at base.



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. A specimen from China has a simple inversion on arm A just distal to bands 15-19, while another has a complex inversion in arm B involving the majority of the arm.

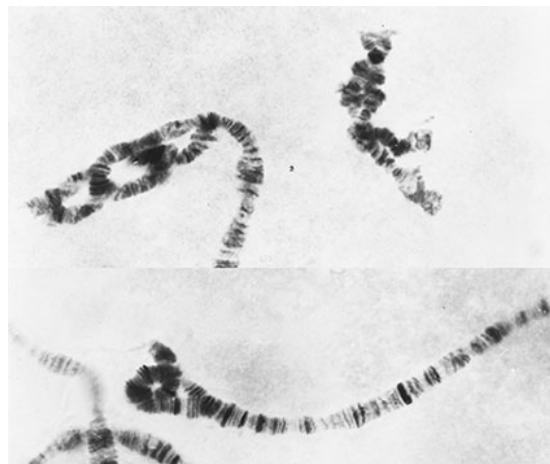
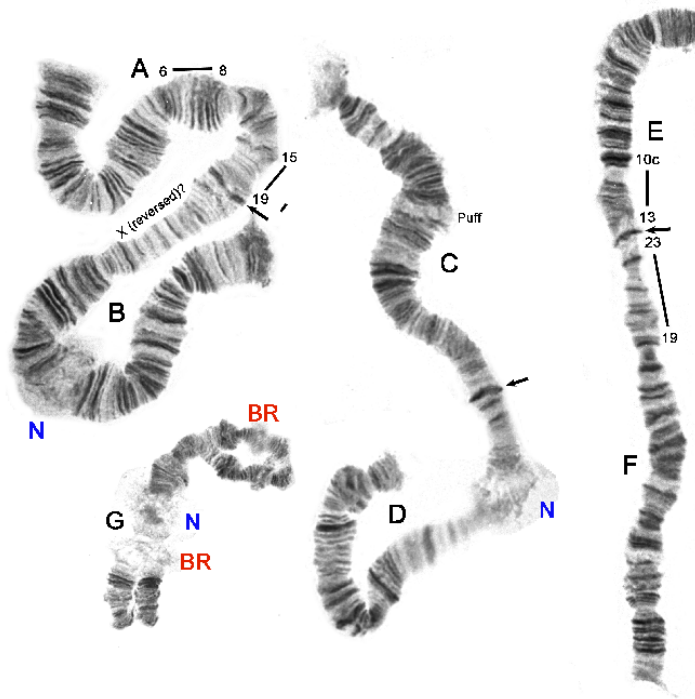
dlsA: Only a few bands of the Keyl system can be recognized, such as 15-19 proximally.

dlsB: Nucleolus (could be the “BR” found in other *Lobochironomus* species) near middle of the arm (not apparent in Chinese specimens), typical bands 24-28 slightly removed from the centromere (region “X” of Ryser *et al.* (1985) reversed?).

dlsC: Large puff about one third from distal end.

dlsD: Nucleolus near the centromere.

- dlsE: possibly 1-3c, 9-10a, 8i-a, 3ed, 10b, 5-7, 4-3f, 10c-13.
 dlsF: Bands 8-9 about one third from centromere.
 dlsG: subterminal nucleolus with close BR and further distal BR.



Heterozygosity in Chinese specimens: Complex heterozygote in arm B (plus arm G) above; and simple inversion in arm A, below

Found: Type locality - not given (?France).

Type locality (*C. longipes*) – Denmark

CHINA – Hangzhou, Zhejiang (30.27°N, 120.15°E)

INDIA – Madurai, Tamil Nadu (9.925°N, 78.12°E); also in BOLD (needs to be confirmed)

JAPAN - (as *C. longipes*) Oze, Honshu; Tsukuba, Kanto (NIES) (see above)

also Wakaguri (36.444°N, 140.083°E), but really *Benthalia* sp. 3;

***Chironomus novosibiricus* Kiknadze et al. 1993**

In BOLD Bin: [BOLD:AAW4007](#)

Originally described from Siberia, the presence of this species in China was demonstrated by Song *et al.* (2022).

This species has previously been placed in the camptochironomus-cyto-complex but molecular data from Guryev *et al.* (2001) points to the conclusion that this species has a different origin related to the thummi-cyto-complex (see below).

Adult:

Based on Siberian specimens:

Male. Medium size, length 6-7 mm. AR-3.7. Thorax yellowish, bands and scutellum dark brown or black, postnotum dark; abdominal segments II-V with a broad blackish brown band at base and a distal yellowish band; segments VI-IX completely dark. Legs yellowish, knees and tarsi slightly darkened, LR about 1.4. Thoracic setae: dorsocentral - 29 (26-36); prealar - 6.5 (5-6); scutellar - 35 (33-49). Unlike other species with the camptochironomus chromosome arm combination, this species has a normal hypopygium structure (below).



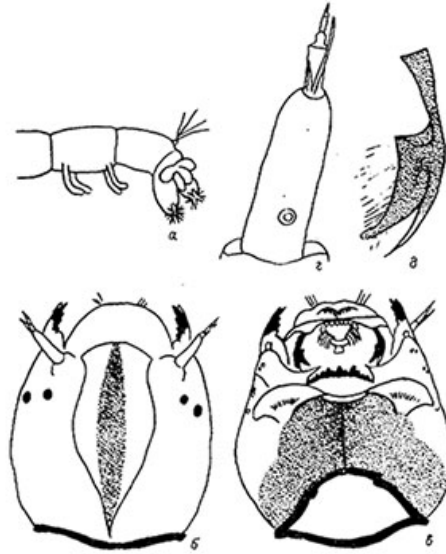
From Song *et al.* 2022

Tergite IX with about 9-10 setae in several pale areas. Anal point broad, SVo broad, E-type of Strenzke (1959); IVo curved slightly outwards, longer than anal point and reaching about to middle of the gonostyle which is moderately broadened and narrows over distal third.

Female and Pupa: No information.

Fourth instar larva: (from Russian specimens) Length about 11-13 mm. Some details can be determined from the figure (below). A bathophilus-type larva with short ventral tubules (not as long as the hind prolegs), anal tubules short without median constriction. Gula darkened over most of its length, wider than mentum and lower at edges, widest at the posterior margin. Clypeus with dark central stripe. Antenna with RO in basal third, AR about 1.84; A1 about 3 times longer than wide.

Premandible with sharp teeth, inner tooth about 4 times wider than the outer, which narrows markedly along its length (type B2).



From Kiknadze *et al.* 1993

Cytology: Three polytene chromosomes with the modified arm combination AB, CF, DEG. This is unlikely to have derived by the modification of the camptochironomus-cytocomplex. The cytology of the Chinese specimens is not known, but it is assumed that it is essentially similar to that of the Siberian populations. The following description is for those Siberian populations.

Chromosomes AB and CF are metacentric, while DEG is submetacentric with the centromere at the junction of the arms D and E. The single nucleolus is on arm G near the fusion with arm E; the arm also has two BRs near its distal end. The large puff on arm B is distal with dark bands (groups 7-10?) proximal. Siberian populations are polymorphic for inversions in all arms except F and G.

novA1: 1a-2c, 12c-11a, 14h-13a, 4-9c, 2d-3, 10e-9d, 14i-19

novA2: 1a-2c, 6d-9c, 2d-3i, 12c-11, 9d-10, 6c-4a, 13a-19

novB1: not mapped

novB2: inversion of about half the arm with one break about 12 bands from the centromere.

novC1: 1a-3c, 15e-14, 10-8, 12-13, 11a-h, 6b-4, 6gh, 17a-16, 7d-a, 6f-c, 17b-22

novC2: 1a-3c, 4-6b, 11f-a, 13-12, 8-10, 14-15a, 6gh, 17a-16, 7d-a, 6f-c, 17b-22

novD1: 1a-3, 18d-a, 8-10c, 14hg, 19e-18e, 17-15, 14f-10d, 4-7, 19f-24

novD2: 1a-3, 18d-a 8a-10c 14h-10d 4-7, 15-17, 18e-24

novD3: not mapped

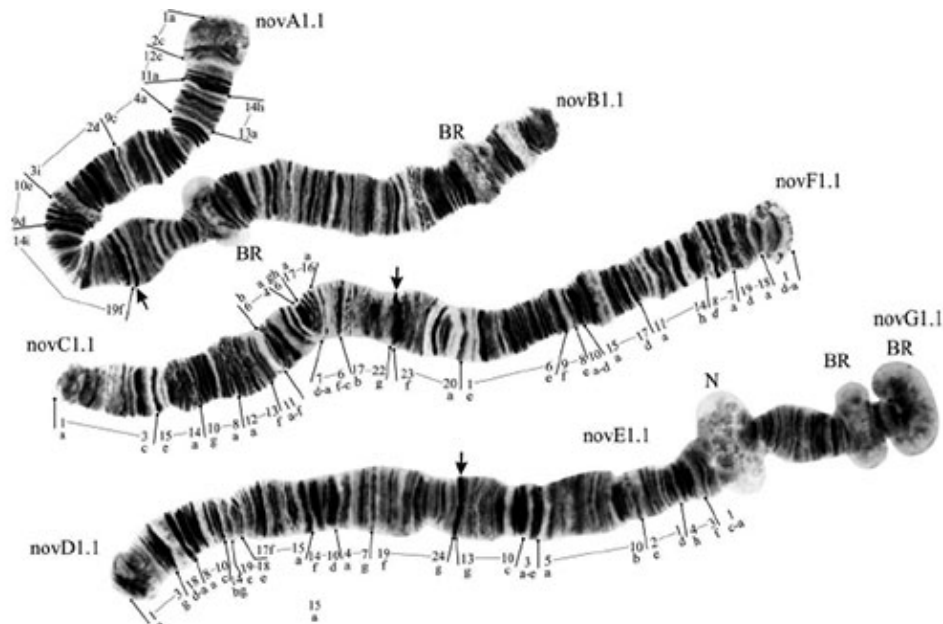
novE1: 1a-c, 3f-4, 1d-2, 10b-5, 3e-a, 10c-13

novE2: 1a-c, 10b-5, 3e-a, 2e-1d, 4-3f, 10c-13

novF1: 1a-d, 18-19, 7-8d, 14-11d, 17-15, 10d-a, 8e-9, 6e-1e, 20-23

novG1: not mapped

(from Kiknadze *et al.* 2016)



Polytene chromosomes of European *C. novosibiricus*.
From Kiknadze *et al.* (2016)

Found:– **SIBERIA**, Novosibirsk Province. (Type locality)
CHINA – Zhenxing, Dandong, Liaoning (40.1217°N, 124.392°E)
RUSSIA – Numerous localities in the Urals; Novosibirsk Province; Tomsk Province; Altai Territory and Republic of Altai; Republic of Tyva; Kazakhstan.

DNA sequence:

MtCOI: As noted above there is a sequence in the BOLD database. Additional sequence for mtCOI from Siberian populations is in GenBank and also in the BOLD database, including from Guryev *et al.* (2001), who also studied sequence for *gb2B*. This latter sequence cast doubt on any relationship between *C. novosibiricus* and the species of the camptochironomus-cytocomplex as the latter lack the intron of the *gb2B* gene, while *C. novosibiricus* contains the type-2 intron found in many thummi-cytocomplex species. On the basis of this, Guryev *et al.* (2001) suggested that *C. novosibiricus* is instead derived from a species with a modified thummi-cytocomplex arm combination – probably *C. tuvanicus*, to which it is closely related, or a common ancestor to both.

‘Chironomus tentanus’ Gunjal and Chavan 2018

(Appears to be a mis-spelling of *C. tentans*)
 Nomen dubium in *Chironomus*

No description of basic larval structure or of size.
 Gula shown as slightly darkened on basal third.
 Mentum trifid, with median teeth, usually 12 lateral teeth (?). PE simple with 12 teeth.
 Mandible (teeth) four in number and three dark inner teeth. “Antennal segment 3”.
 Premandibles with two subequal teeth and well developed brush. Vm plates separated by 1/3 width of mentum (i.e. IPD).
 Karyotype: claimed to be CF, AB, DE, G but no detail of banding pattern visible. NOR shown near middle of the AB chromosome, and a BR terminal on arm D. Arm G stated to be telocentric.

Found: INDIA- Khelana River, Aurangabad district (20.03°N, 75.65°E) and Shivana River, Gautala wildlife sanctuary, Ajanta Hills, both Maharashtra.

***Chironomus* “annularius” sensu Strenzke 1959?**

Chironomus annularius is attributed to Meigen 1818 (but may be a misspelling of *Tipula annularis* De Geer 1776, which is also a misidentification).

Redescribed by Strenzke (1959) but his material comprised more than one species. Not surprisingly, then, material identified as *C. annularius* in the BOLD data base appears to comprise several species (Bolshakov, pers. comm.). There is GenBank sequence for specimens from China which appears closely related to material from Finland and Germany, but the correct name and author attribution is unclear. Spies and Sæther (2004) outlined the problems with the identity of specimens attributed to this species and recommended an author attribution referring to whose version of *C. annularius* is being used. Since species with similar Barcode sequences also occur in Germany, it is likely that this is one of Strenzke’s variants.

In BOLD Bin: [BOLD:AAU4046](#)

The nearest neighbor Bin is BOLD:AAU4047 – also identified as *C. annularius* from Sweden and Finland – suggesting two different species are present in the Finnish material.

Adult:



“*C. annularius*” from BOLD Bin [BOLD:AAU4046](#)
[ZMUO.026135+1468510234](#)

Male: (based on above specimen from BOLD database)

Yellowish species, thoracic vittae and Pe dark brown, abdomen yellow with increasing brown saddle spots; legs yellow (tarsal segments may be darkened).



“*C. annularius*” from BOLD Bin BOLD:AAU4046
ZFMK_2587074+1499868020

Female: (based on above specimen from BOLD database)
Coloration basically as in male. Tarsal segments darkened; Fore Femur/Tibia about 1.

Pupa & fourth instar larva: No information.

Cytology: Some information on the polytene chromosomes of German material is given by Keyl and Keyl 1959 and Keyl 1962: Arm F contains the male determining gene(s), while there are nucleoli on arms C, E and G. Also large puff distal of the nucleolus on arm E.

annA1: 1 – 2c, 10 – 2h, 4d – 9, 2d-g, 4c-a, 13-19 as plumosus A1

annA2: 1 – 2c, 10 – 12a, 13ba, 4a-c, 2g-d, 9 – 4d, 2h – 3, 12cb, 13c – 19 as plumosusA2

annB1: Puff near middle of the arm with dark bands distal

annE1: 1 – 3e, 5 – 4h, 10b – 6, 4f- 3f, 10c – 13 Inv 4g-6 from plumosus

annF1: 1- 4b, 8c – 4c, 17 – 8d, 18 – 23 as melanotus, anthracinus F1

annF2: 1- 4b; 8c – 4c, 17 – 9c, 8ed, 18 – 23 Inv 4c-8c from anthracinus F2

annG1: BR terminal on left end, nucleolus about 1/3 from the other end, right end slightly heterochromatic.

Found: CHINA: - Xinjiang Uygur Zizhiqu (GenBank & BOLD)
GERMANY: - Goettingen, Muenden, Werra, Wilhelmshaven (Keyl 1962), The Westhavelland Nature Park, Brandenburg (GenBank & BOLD)
FINLAND: - (GenBank & BOLD)

DNA sequence:

MtCOI: As noted above there is sequence in GenBank and the BOLD database.

***Chironomus pulcher* Wiedermann 1830**

It is likely that, as presently recognised, it is comprised of more than just one species.

Possible synonyms:

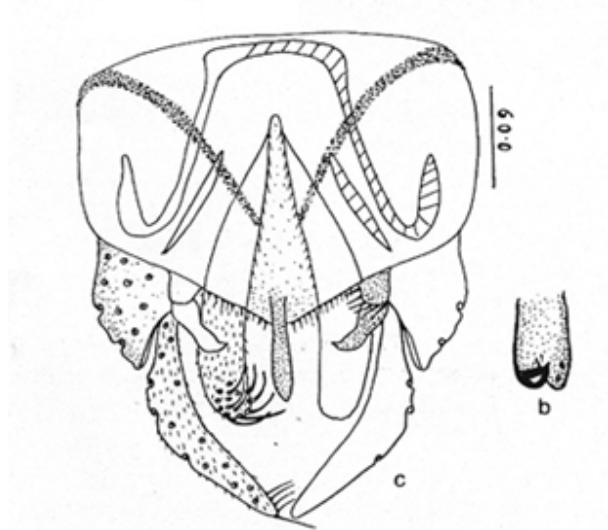
C. congolensis Goetghebuer 1936

C. linearis Kieffer 1911

Freeman (1957) listed a number of species as synonyms:

C. tripunctatus Kieffer 1908, *C. nairobi* Kieffer 1913, *C. sensualis* Kieffer 1914, *C. schwetzi* Goetghebuer 1936

Adult: (based on description of Indian specimens by Chaudhuri *et al.*, 1992, with additional information from Dejoux, 1968).



Male terminalia of *C. pulcher* From 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; FT present; clypeus with 18-20 setae. Ratio of maxillary palp segments: 8 : 12: 42 : 40 : 60 - P5/P4 1.5; P5/P3 1.43. Thorax: Greenish yellow, mesoscutum with 3 dark yellow vittae.

Setae: Acrostichals 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. TIX with about 6 setae

Hypopygium as illustrated above, anal point narrow, slightly expanded subapically; SVo of D-type of Strenzke 1959; IVo extends beyond anal point to about middle of the GS, which narrows gently over posterior half (although Dejoux, 1968 shows one side narrowing gently but the other quite abruptly).

Female not known.

Pupa (from Dejoux 1968): length about 9-10 mm. Spur about 250 μ m long, with 1-2 spines.

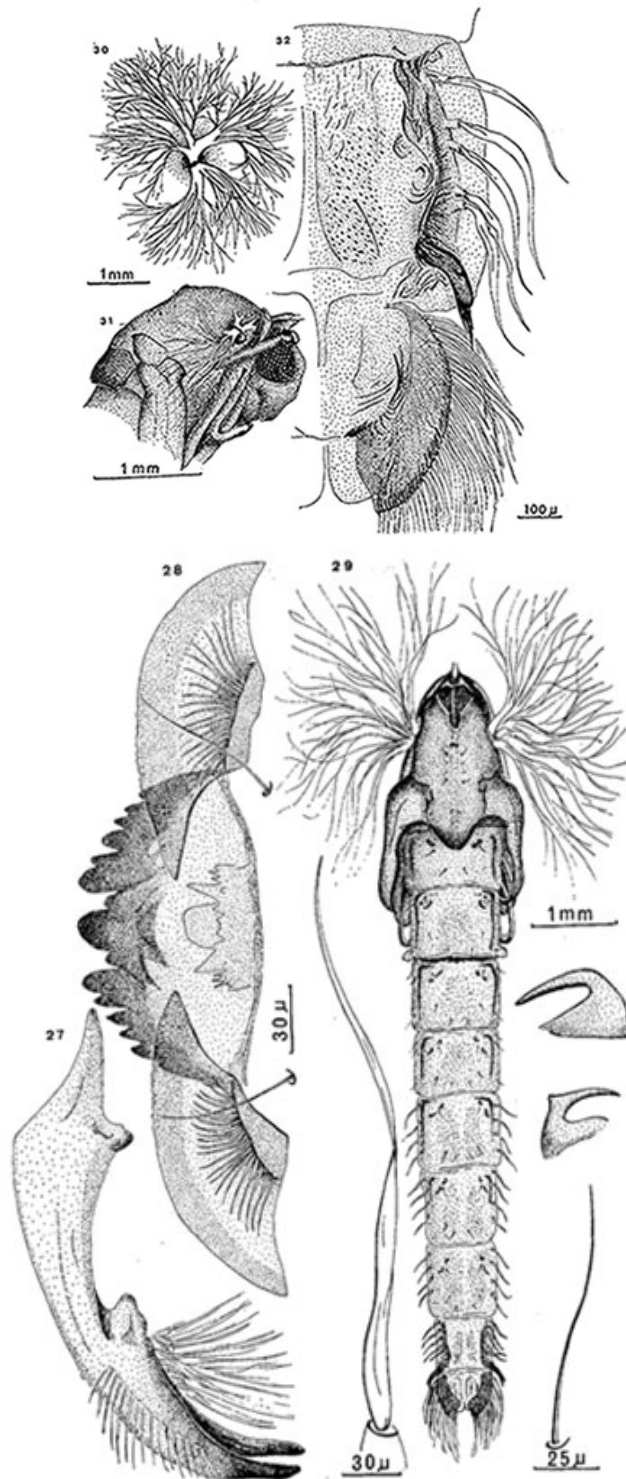


Fig. 27 *Chironomus pulcher*, prémandibule larvaire.

Fig. 28. *Chironomus pulcher*, labium et plaques paralabiales larvaires.

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

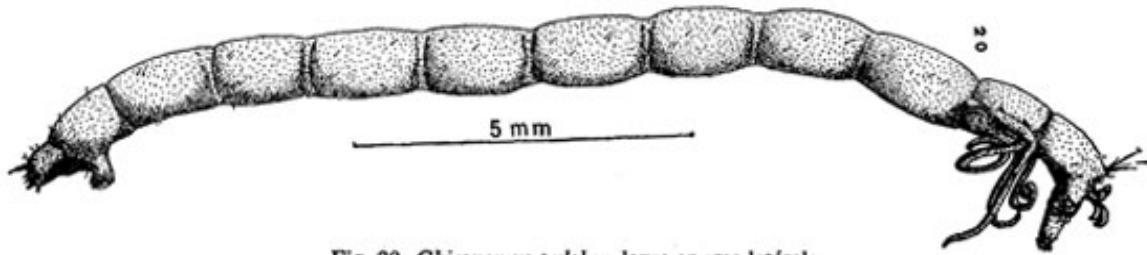


Fig. 20. *Chironomus pulcher*, larve en vue latérale.

Dejoux 1968

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 trifid 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 coming to relatively sharp points (ty. A, or poss. B1), inner tooth perhaps 4 times wider than outer

Mandible with 3rd inner tooth separated and darkened (type IIIC), MTR perhaps 0.47.

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 complex arm combination AB, CD, FEG.

Centromeric bands not heterochromatic, nucleolus terminal in arm F (quite unusual in *Chironomus*), 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

4 inv steps from *piger* A1

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

pulC1: No information

pulC2: Inversion of whole central part of the arm.

pulD1: 1 - 3, 11 - 12, 10e-a, 13 - 19b, 4 - 9, 19c - 24

5 inv steps from *piger* D1

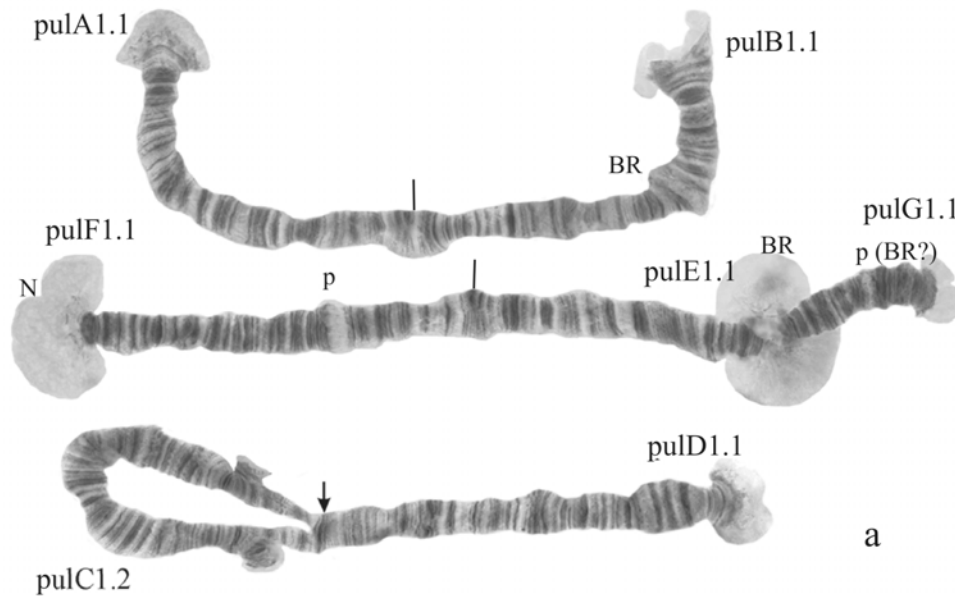
pulE1: 1 - 2, 6e - 4, 13 - 12, 3f-a, 6f - 11, 13

3 inv steps from *piger* E1

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

Inv 11a - 19d from *piger* F1

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.



Possible karyotype of *C. pulcher* from Wülker *et al.* 2011

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) and African specimens by Dejoux (1968). Possible cytology by Wülker *et al.* (2011). However, it is likely that there is more than one species currently included under this name.

***Chironomus riparius* Meigen, 1804**

Synonym: *C. thummi thummi* Meigen - [Credland \(1973a\)](#)

- C. serus* Malloch, 1915
- C. cristatus* Branch 1923
- C. militaris* Johannsen 1938

Possible synonym – *Chironomus ginzanabeus* & *Chironomus ginzanbeceus* Sasa & Suzuki (2001), (Yamamoto & Yamamoto 2018)

Incorrect synonym – *Chironomus lugubris* Tokunaga 1938 (Sasa & Yamamoto 1977)

This species is in BOLD Bin: [BOLD:AAA7263](#)

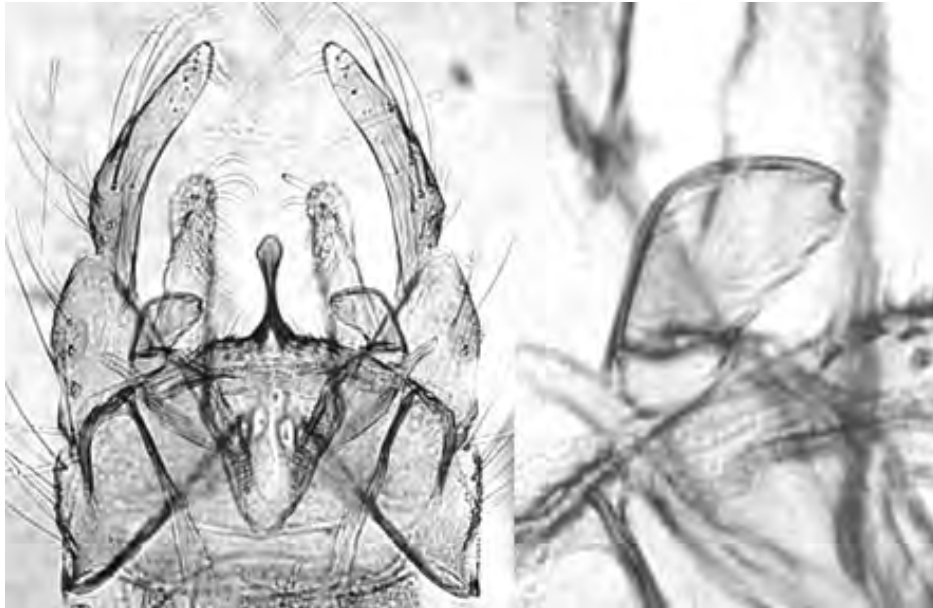
Adult (based on U.S. material)

Male: Wing length about 3.7-4.3 mm., width abt. 1.05 mm. AR 3.2–3.6. LR about 1.6-2.95. Ground color pale to dark brown, thoracic markings red-brown to blackish brown; legs pale green to light brown towards their bases, tarsal segments darker; abdomen brown to blackish, apical 0.25 of each tergite pruinose and pale. Specimens from colder habitats are darker. Head: FT small 10-30 x 15 µm (l/w 1.5-2), clypeus rather small (0.66-0.72 of diameter of antennal pedicel) with 34-39 setae. Palpal proportions (micron): 69 : 69 : 129 : 130 : 191 (P5/P4 & P5/P3 – 1.47).

Some thoracic setae: Dorsocentral – 27-33; Prealar – 6-7; Supraalar - 1-2; Scutellar - about 24 setae; 9 in 2 rough anterior rows and 15 larger setae in posterior row.
 Leg lengths (micron) and proportions (1 specimen):

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	BR
PI	1530	1465	2005	1745	825	760	340	2.95	1.04	2.05-2.95
PII	1595	1595	925	530	385	260	185	0.58	1.0	
PIII	1870	1975	1330	810	610	365	220	0.67	0.95	

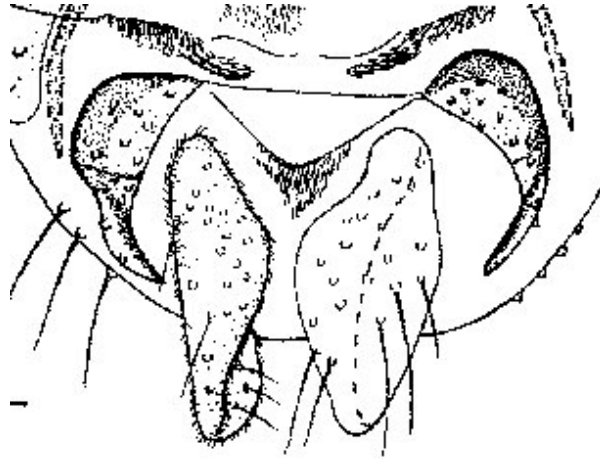
M sensCh 13-14; H sensCh 12-14



Terminalia of adult male

About 3–10 setae in individual pale spots (which may be closely packed) on tergite IX. The SVo is Strenzke’s S(b) type. IVo long, reaching to about middle of gonostyle, with simple setae. Gonostyle only moderately swollen and narrows gently from about midpoint or more rapidly over posterior 2/3. Anal point narrow at base and widening at distal end.

Female: According to Townes (1945), similar to male except for usual sexual differences. About 13 setae on the crescent shaped segment X, which is about 3.3 times longer than the greatest width. Morisch & Wülker (1987)’s Fig. 1 shows the cercus to have a relatively pointed posterior end, with a significant ventral bulge.



From Morisch & Wülker 1987

Pupa: (partly from Nearctic and the Palearctic material of Langton & Visser, 2003).

Length of exuvia 8.1-10.0 mm long; inner margin of wing case 2.02-2.05mm.

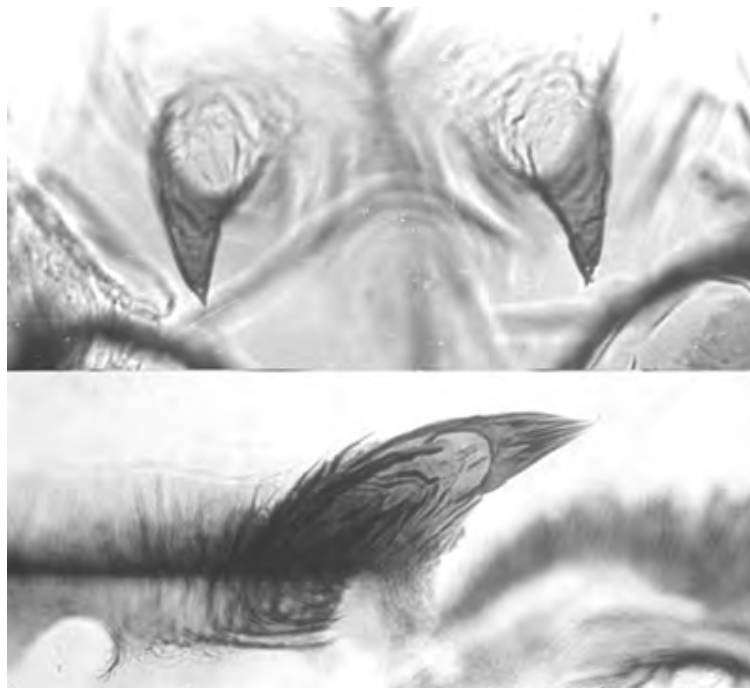
Color brown to dark brown.

Cephalic tubercles conical, narrower in males than in females, 95x85-137x107 μm (Nearctic sizes about the mean of this range, male 106x67 μm); frontal setae 33-37 μm . Lacking frontal warts.

Basal ring 133-180x63-89 μm (Nearctic specimens near largest measures); HR 1.91-2.33.

Hook row entire, length row 0.51-0.65 of segment width, 87 (67-97) hooks.

Armament of tergites II-VI in the form of an undivided patch of strong points, the points in each segment increasing in size posteriorly. The point patches increase in size from TII-V, but on TVI the patch is more or less reduced. Armament of TII-VI not strongly waisted and with posterior transverse patch not successively increasing in extent to TVI, usually reduced on VI.



Pupal cephalic tubules, and caudolateral spur of segment VIII

Spur of segment VIII with 1-5 (mostly 3-4) closely appressed spines.

Anal lobes weakly rounded; 130 (97-164) (mean 149 in N.A.) taeniae in up to four rows.

Fourth instar larva (from Chavan et al. 2013): A thummi-type larva, length up to 5.4 mm. Most of description just generic for *Chironomus*. Frontoclypeus and gula darkened, gula over posterior half and widest at posterior margin. Ventromentum about same width as the mentum, VMR about 0.25. Central tooth of mentum type 1B. Premandible of type B2. PE with 13 teeth.

Cytology: 4 polytene chromosomes with the thummi arm combination AB, CD, EF, G. Centromere regions distinctly heterochromatic.

Arm G normally paired with a subterminal nucleolus and generally with 2 Balbiani rings near the centre, the second followed by a constriction and a dark band. No nucleoli in long arms. Sequences described in Europe as *C. thummi* (= *riparius*). MD located about 2a on arm F (Haegeler 1985, Kraemer & Schmidt 1993), although it could be closer to the centromere at about F11-15, the site found in some individuals of the Australian *C. oppositus* (Martin 2010).

No chromosomal polymorphism reported.

ripA1: 1 - 19

ripB1: 1 - 28

ripC1: 1 - 22

ripD1: 1 - 24

ripE1: 1 - 13

ripF1: 1 - 23

Found: **INDIA** - unconfirmed record from Kasar Lake, Dharur (18.92°N, 76.20°E), Bindusara River, Beed (18.90°N, 75.73°E), both Maharashtra (Chavan *et al.* 2013). **JAPAN** - Ginzan, Yoichi, Kamikawa (Sasa & Suzuki (2001); Lake Akan, Kushiro, Akan National Park; Shizunai River, Hidaka Gun, Tokachi, Obihiro; all Hokkaido. **RUSSIA** - Novosibirsk Province and other localities in Eastern Russia (Kiknadze et al. 2016).
Type locality – Europe.

***Chironomus stigmaterus* (not Say 1823 – misidentification by Chavan, Gaikwad, Shinde, and Sonune, 2013)**

Only **larva** described. Description mostly just generic for *Chironomus* – either plumosus- or melanotus-type.

Larva very small, fourth instar only 4 mm long (North American specimens are about 14 mm in length). Head capsule with darkened frontoclypeus and gular region darkened over posterior half, wider than the mentum and widest at the base. Ventromentum wider than the mentum. PE with 13 teeth.

Found: **INDIA** - Kasar Lake (18.92°N, 76.20°E), and Kasaba Lake (18.92°N, 76.28°E), Dharur; Bindusara River, Beed 18.90°N, 75.73°E), all Maharashtra.

***Chironomus salinarius* (Kieffer 1921)?**

This species may not be identical to the European and African species (see below)

From Sasa (1978):

Adult:

Male: Wing length 4.5 mm, width 0.21 of length; VR 0.92. AR 3.4

Colour almost entirely brown, thoracic scutae hardly visible; legs uniformly dark brown, fore tarsus with long beard. Cross vein of wing conspicuously pigmented.

Head: FT 50 x 19 (2.63) μ m. Palps (segs. 2-5) 90 : 250 : 250 : 320; P5/P4 & P5/P3 = 1.28.

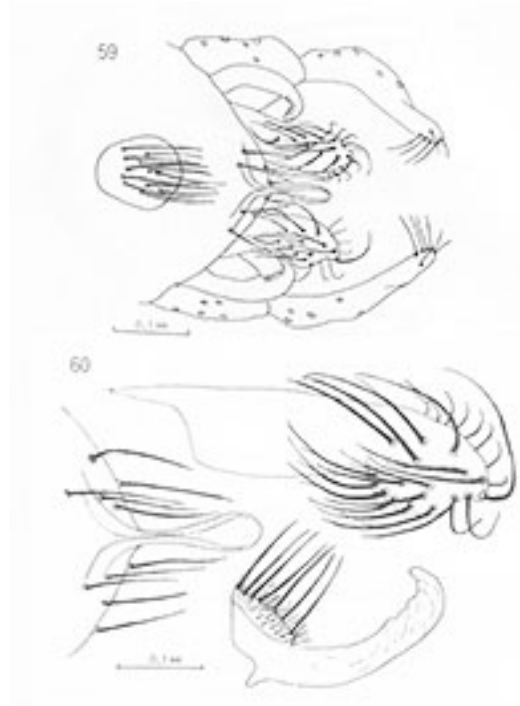
Thoracic setae not listed.

Leg lengths (micron) and proportions:

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	Ta5/Ti	BR
PI	1560	1590	2050	1170	920	760	340	1.3	0.98	0.21	4.6
PII	1760	1710	980	630	460	320	230	0.59	1.03	0.15	
PIII	1950	2030	1510	900	680	410	250	0.74	0.96	0.12	

Abdominal tergites almost entirely black, TI-II with inconspicuous apical pale bands, TIII-V with a faint pale band along caudal margin. TIX with about 12-19 setae in a single patch. Anal point narrow at base; SVo E-type of Strenzke (1959); IVo, with simple setae, reaching beyond the end of the end of the anal point to about the middle of the gonostylus, which is moderately expanded and narrows sharply over posterior third, about 4+2 setae at tip.

Sasa (1978) compares the coloration to *C. acerbiphilus*, but notes that it can be distinguished because *C. acerbiphilus* is shining black.



From Sasa 1978

Female: Wing length 5.4 mm, width 1.35 mm, VR 0.94; body coloration dark as in male.

Antennal proportions (μ m) 60 : 150 : 110 : 110 : 210. AR 0.49, A5/A1 3.5.

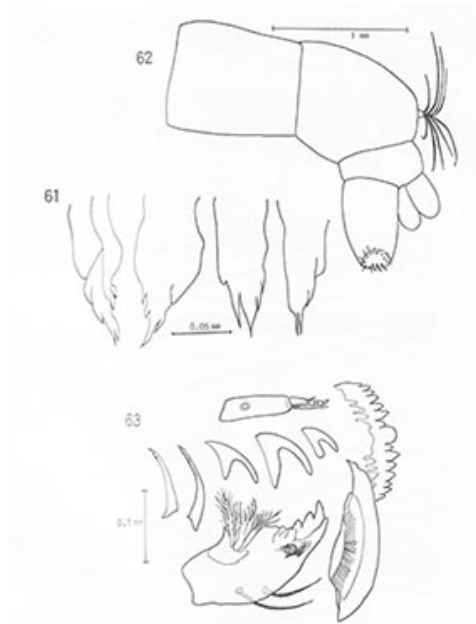
Leg lengths (micron) and proportions:

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	Ta4/Ti
PI	1660	1610	2200	1100	880	760	370	1.36-1.37	1.03	0.47
PII	1880	1830	1000	590	440	300	230	0.55	1.03	0.16

PIII	2030	2100	1460	880	660	390	270	0.70	0.97	0.19
-------------	------	------	------	-----	-----	-----	-----	------	------	------

Abdominal tergites almost entirely black, TI-II with inconspicuous apical pale bands. Sasa (1978) compares the coloration to *C. acerbiphilus*, but notes that it can be distinguished because *C. acerbiphilus* is shining black.

Pupa: Only information is that the spurs of segment VIII have several (1-5) (Fig. 61, below) very short but pointed spines.



From Sasa 1978

Fourth instar larva: A salinarius-type larva (62, above); Length 1 fem (14.3 mm), anal tubules short, less than one-half of the length of the posterior pseudopods. Mentum type I and center tooth type IIA. Gular region pale, frontoclypeus darkened.

Antenna with basal segment about 2.9-3 times longer than wide, RO about a third up from base; relative segment lengths (units) 85 : 21 : 6 : 10 : 6.; AR about 1.98-2.14.

Ventromentum long and narrow, 4.5 times wider than deep, and 1.08-1.28 times the mentum width; VMR about 0.44.

Premandible with inner tooth about 5 times wider than outer tooth (ty. B1).

Mandible type IIB, MTR about 0.3-0.4; PMan about 10-12.

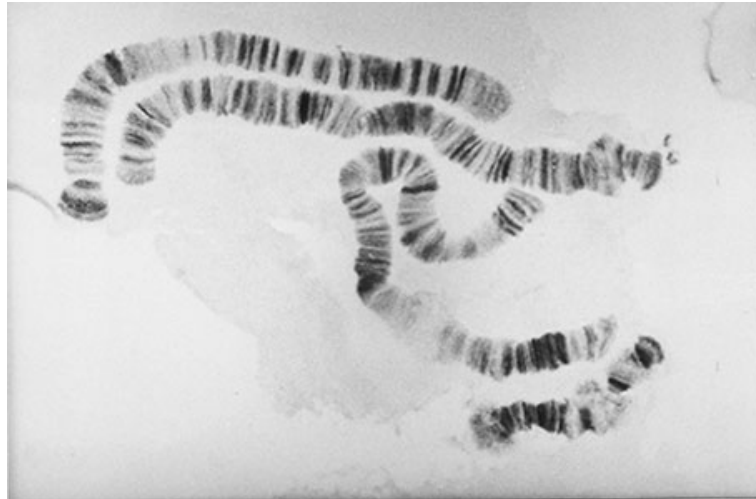
Cytology: Information only for European and Israeli specimens. Figured by Keyl & Keyl (1959).

Four polytene chromosomes, possibly with the thummi-group chromosome combination AB, CD, EF, G, although some arms not easy to recognize (Keyl 1962).

Nucleolus probably in arm C. Arm G closely paired with a large BR about one third from left end (as designated by Keyl & Keyl 1959), another smaller BR near each end. Puff of arm B near distal end. A large subterminal inversion has been recorded in arm E.

Keyl (1962) mapped only arm E:

sal E1: 1a-c, 3b-e, 10b - 4g, 3a - 1c, 4f-a, 3f, 10c - 13



Whole chromosome complement of *C. salinarius* from Bulgaria
Upper, chromosome EF, then AB, then CD (with nucleolus) and lowest, arm G.

DNA sequence:

MtCOI sequence: Sequence for a specimen from Otsu City has about 98% homology to sequence for *C. salinarius*. This may indicate that the Japanese specimen is closely related to the European and African material. There is no data for the specimens from Israel. Michailova et al. (2009) hybridized the conserved *Cpy/Cty* gene (clone Cla1.1) to near the centromere of arm F.

Found: **JAPAN** - Tokushima City; Okunosu, both Tokushima Pref., Shikoku; Lake Toufutsu, Abashiri, and Sorachi River, Kamikawa, Hokkaido; Nakamura, Kochi Prefecture, Shikoku; Noubu, Tsushima Island, Nagasaki Prefecture, Kyushu; Lake Inawashiro, Fukushima Prefecture; Otsu City (35.00°N, 135.88°E), Shiga Prefecture, Honshu.
BULGARIA- Sosopol.
ISRAEL- Akko (32.92°N, 35.05°E); Jerusalem (31.78°N, 35.22°E); Maagan Mikhael (32.33°N, 34.92°E).

***Chironomus sinicus* Kiknadze et al. 2005.**

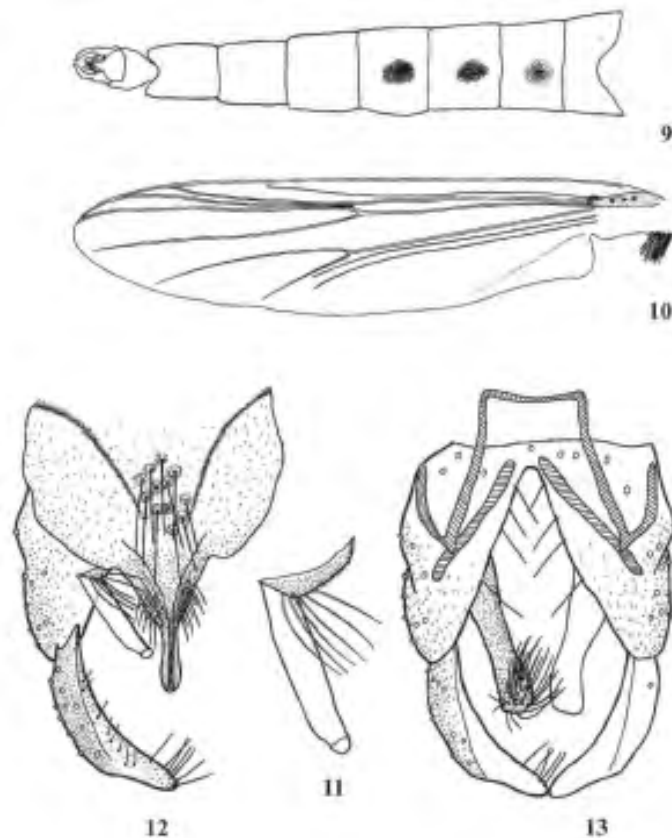
A member of the plumosus sibling group (initially referred to as *C. plumosus*).

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. FT well developed, 52–83 µm long.
Relative length of palps (in µm) 66 : 82 : 244 : 232 : 298; P5/P4 1.28; P5/P3 1.22
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:

	fc	ti	ta1	ta2
p1	1.67-1.92, 1.81	1.70-1.94, 1.79	2.27-2.46, 2.32	1.40-1.51, 1.44
p2	1.84-2.08, 1.95	1.84-2.00, 1.92	1.03-1.11, 1.08	0.65-0.73, 0.68
p3	2.24-2.43, 2.33	2.35-2.51, 2.42	1.62-1.81, 1.70	1.00-1.11, 1.05
	ta3	ta4	ta5	LR
p1	0.86-0.95, 0.91	0.76-0.81, 0.78	0.34-0.41, 0.37	1.17-1.36, 1.30
p2	0.46-0.51, 0.48	0.30-0.35, 0.32	0.24-0.27, 0.26	0.55-0.58, 0.56
p3	0.76-0.84, 0.79	0.43-0.49, 0.47	0.27-0.30, 0.29	0.68-0.72, 0.70

Abdomen with dark central spots on TII-IV
 TIX with about 11 setae, possibly in individual areas.
 Anal point narrower at base; SVo possibly of D-type of Strenzke (1959), IVo long, reaching beyond the tip of the anal point to about the midpoint of the gonostyle, which is moderately swollen and narrows over distal third.



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, TLt about 160–238 μ m long. Anal tubules short, about 440–530 μ m long and 140–250 μ m wide. Gula darkened over most of length, widest about midpoint (Fig. 14, below). Width between antennal bases about the same as that between the S4 setae. Ventromentum with about 79–83 striae. PE with about 12–17 teeth. AR 1.55–2.28; antennal proportions (μ m) 144 : 34 : 15 : 16 : 10 ; basal segment about 2.9 – 3.2 times as long as wide. Mandible about 310–350 μ m long, third inner tooth apparently darkened and well developed (ty. 3c).



Larva of *C. sinicus* (Kiknadze e al. 2005)

Cytology: Four polytene chromosomes with the thummi-cytocomplex 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

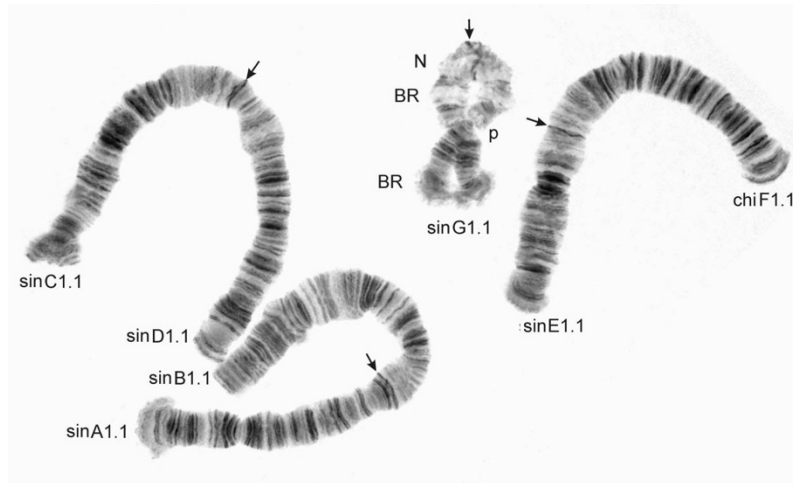
sinE1: 1 – 3e, 5 – 10b, 4 – 3f, 10c – 13

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.



Karyotype of *C. sinicus* from Kiknadze et al. 2005

Found: CHINA– Nankai University campus, Tianjin City. (Type locality)
 Holotype male (BDN #21352); paratypes 3 males, as holotype.

Cytology described by Kiknadze *et al.* (2005) as part of the original description.
 This species is smaller than *C. suwai*.

***Chironomus suwai* Golygina & Martin 2003**

In BOLD Bin: [BOLD:ACQ5553](#)

As *C. plumosus* (misidentifications, as all Oriental specimens are not in same Bin as true *C. plumosus*)

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 colour yellow; with the abdomen the tergites are largely yellow, with a diamond shaped central dark area on segments II-IV.

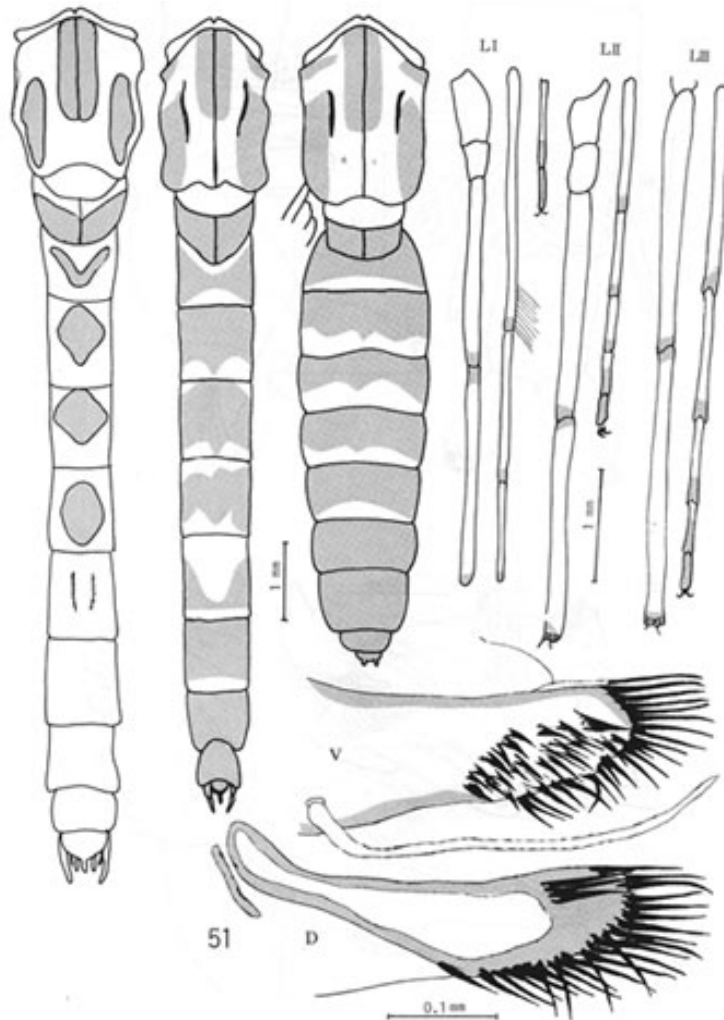
Wing length about 7.0 mm, posterior margin markedly concave at the end point of Cu(2)(also in female). Cross vein coloured.

AR about 5.4. FT oval in shape, 45 x 29 µm. Palp proportions (segments 2-4)(micron) 120 : 310: 260 : 410; P5/P4 = 1.58; P5/P3 = 1.32.

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 lengths (micron) and proportions:

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	Ta4/Ti
PI	1900	2030	2590	1560	960	860	460	1.25	0.92	0.38
PII	2200	2390	1420	830	590	390	330	0.59	0.92	0.15
PIII	2490	2560	1980	1200	810	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). Gonostylus 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 colour 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; FT 45 x 26 µm.

Leg lengths (micron) and proportions

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	Ta4/Ti
PI	2050	2240	2810	1540	950	900	460	1.25	0.92	0.38
PII	2200	2390	1420	830	590	390	330	0.59	0.92	0.18
PIII	2850	2850	2200	1220	880	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. 51 above) rather than the longer apical spines of most species.

Fourth instar larva: a medium to large plumosus-type. Length about 21.2-26.2 mm (fem 24.2-26.2; m 21.2-22.5), anterior VT generally longer (ant. 1.41 (1.20-1.88); post. (1.20-1.80) mm; TLt from 280-380 μ m; AT about 685-735 μ m and 2.7-2.9 times longer than wide. Gula darkened on posterior 2/3 with scalloped anterior margin. SAL about 92 (78-106) μ m wide and 3.3 (2.4-4.2) times wider than deep.



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 trifold tooth are relatively separated from a broad c1 tooth (type IIA).

Ventromental plates with jagged edge as in *C. plumosus*; separated by about 0.37-0.42 of the mentum width; about 270 μ m wide and 4.0-4.4 times wider than deep and about same width as the mentum; about 82 (77-91) striae; VMR about 0.33.

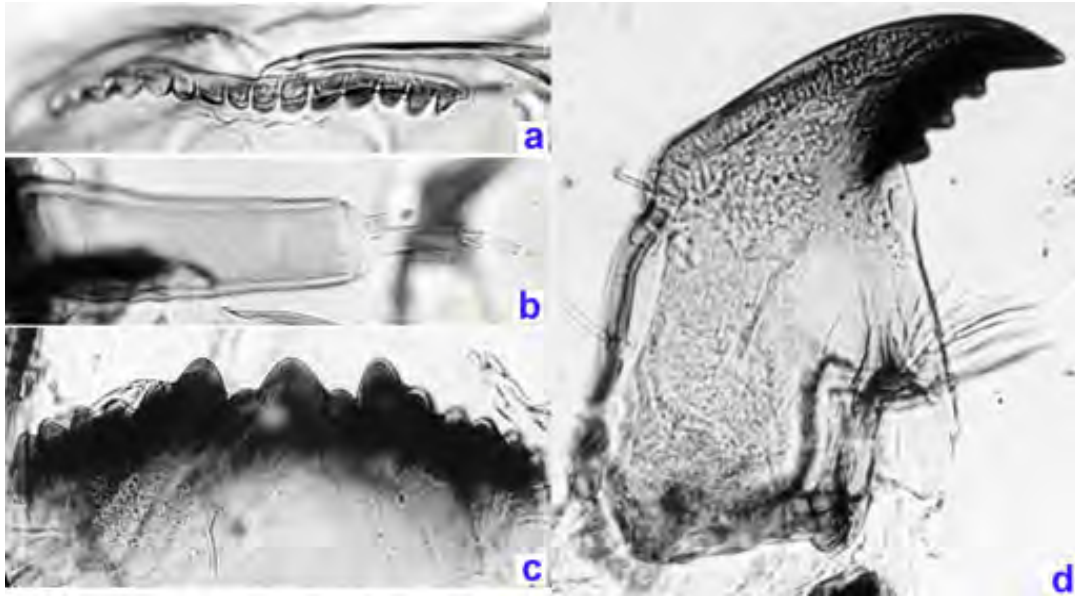
PE (Fig. a, below) with about 13.7 (11-15) broad teeth (type B).

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 most available specimens but one specimen had inner tooth 3.25 times the width of the outer tooth.

Mandible (Fig. d, below) with third inner tooth well separated and darkened (type IIIC), about 28.7 (27-30) furrows on outer surface at the base; 12.75 (12-14) taeniae in PecM; Mdt-Mat about 35 μ m, MTR 0.33.



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 (36.05°N, 138.05°E), Suwa-Shi, Nagano-Ken, 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 javanus* Kieffer 1924**

- Syn.: All suggested synonyms are doubtful as most probably refer to *C. vitellinus*.
Chironomus daitocedeus Sasa & Suzuki, 2001 (Yamamoto & Yamamoto 2018) (Fig. 3i indicates it is actually *C. vitellinus*)
Chironomus prasinellus - Tokunaga 1940 (misidentified) but Sasa & Kikuchi, 1995.

Chironomus vitellinus Freeman 1961 (Chaudhuri *et al.* 1992) – incorrect synonymy (see *Chironomus vitellinus* below)

Yamamoto (2002) had suggested that this species should be in a separate subgenus *Austrochironomus*, as type of the subgenus. However there is doubt that there is a consistent set of characters for the species he included.

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

There is no meaningful nearest neighbor to this bin.

Most specimens in the Bin are actually *C. vitellinus*, with only a few *C. javanus*.

C. javanus and *C. vitellinus* are closely related although there are clear morphological differences between them (Martin & Epler 2024).

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, 4th segment matching the previous two segments combined, 2nd shorter than 3rd, 1st much longer than wide [these are actually segments 2–5]. Antenna 2nd 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, 5th 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 : 3²/₃ ; 2 : 1¹/₂ : 2 : 3¹/₄ [i.e. LR = 1.80], the 4th segment is longer than 3rd, 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 5th tarsal segment black. Anterior tarsus broken. Eyes separated by 1.5 times their terminal width. Terminal articles of the genitalia ('pincer') 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 (gonocoxite), weakly curved and ending in a point; inferior appendages large, pubescent, just exceeding the basal article and bearing dorsally the usual long and thick curved setae. Anal point long and thin. L. 4.5 mm.

Many specimens attributed to *C. javanus* are actually *C. vitellinus*, and *C. javanus* appears to have a relatively restricted distribution in India, Java, and Malaysia.

Male:

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

Other than the original description, the only reliable further descriptions for this species are those of Johannsen (1932) and Chaudhuri *et al.* (1992) (whose specimens appear to be larger, possibly due to being reared in laboratory), plus a specimen from Penang and another from India. Measurements can vary considerably, which may be due to different means of measuring or due to variations in the climate in which the specimen has developed.

Thorax yolky colour, dull with practically no pruinosity, Chaudhuri *et al.* (1992) describe the coloration as more brown than yellowish – perhaps resulting from being reared under laboratory conditions. Anal point narrow, pencil like, not expanded at the distal end.

Wing length 1.96 (1.92-2.03) mm, width 0.62 (0.56-0.63) mm; VR 0.94 (0.92-0.95); brachiolum with 1 or 2 SCf; 14 (8-18) setae in squamal fringe.

Head: FT present, abt 32x18 µm (1.8 times longer than wide); about 16.8 (14-22) clypeal setae; AR 3.3 (2.70-3.82).

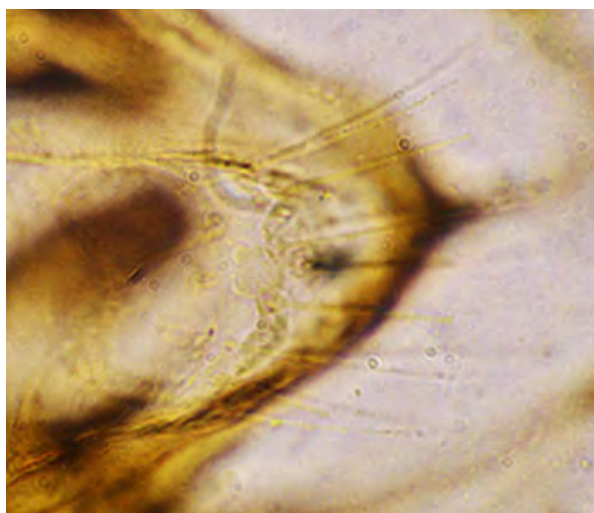
Palpal proportions (segs. 1-5): 42 : 36 : 155 : 166 : 260; P5/P4 1.38-1.58; P5/P3 1.53-1.60.

Thoracic setae: abt 8-10 acrostichals; 14.3 (12-16) dorsocentrals; 4.3 (2-6) prealars; 1 supraalar; abt 5 (3-7) small setae in anterior row, about 9 larger setae in posterior row; total 10 (8-12).

Leg proportions and ratios (micron):

Male	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	BR
PI	1088	968	1120	955	840	770	350	1.60	1.12-1.14	no beard
PII	1180	990	680	353	263	168	128	0.64-0.74	1.16-1.18	
PIII	1273	1280	1015	555	423	268	150	0.77-0.82	0.99-1.00	

Tergite IX (see Johannsen figure, below) usually illustrated without setae but a New Delhi and a Penang male have two rows of long setae across the tergite – 7 in an anterior row and 6 in a more posterior row (below). If these setae were lost in preparation it is possible the tergite would appear to have lacked setae.



TIX showing the rows of setae

Note the abdomen is squashed to the lower right. The brown bodies to the left are the displaced IVo's

Hypopygium with long tubular anal point, strongly turned down. SVo well developed and curved, perhaps closest to E(h) of Strenzke (1959); IVo quite stout, with simple

setae, reaching just beyond the end of the SVo, about 1/3 of gonostylus length, with 12-14 simple setae. Gonostylus quite swollen and conspicuously narrowed over posterior third to half with about 1+2+1 or 1+4+1 setae at tip.

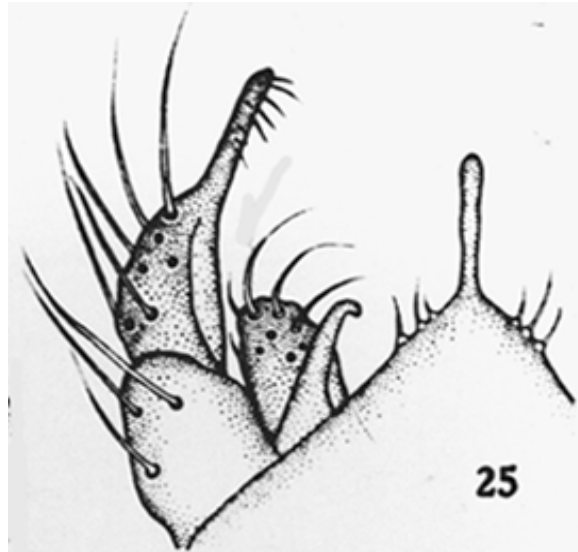


Illustration of the hypopygium of *C. javanus*. From Johannsen (1932)

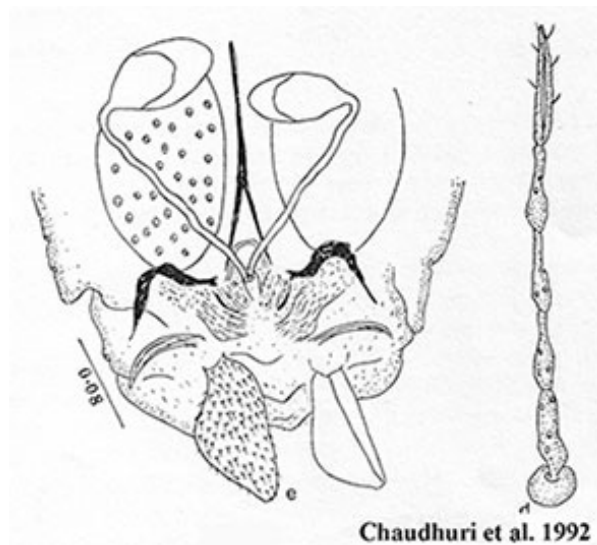
Female

The female has hardly been described as Kieffer gave few metrics, so the only information appears to be from Chaudhuri *et al.* (1992):

Body length 3.69 (3.57-3.89) mm. Wing length not given.

Antennal segments (micron): 10: 7 : 8 : 9 : 13; AR 0.38; A5/A1 1.3. Necks of segments 2-4 about 50%.

No information on palps, clypeus, thoracic setae or legs. Kieffer gives abdomen as green, unmarked. Segment X shown as narrow and curved, cercus almost pointed at posterior end, with a short dorsal/posterior margin and a long ventral margin.



Pupa: The only description reliably attached to *C. javanus* is by Chaudhuri *et al.* (1992). Length: Male 6.40 (6.38–6.70) mm; female 7.01 (6.90–7.14) mm (6–7 mm in Lenz 1937). Brown; exuviae grey. Cephalic 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.

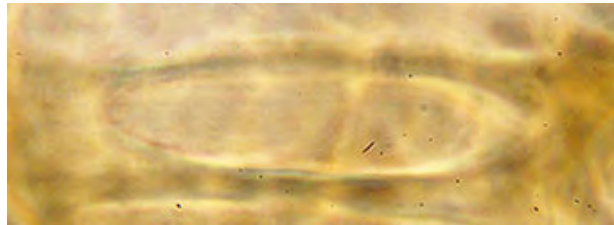
Tergites II-V with median shagreen; tergite VII with complete shagreen and segment VIII with median shagreen interrupted medially.

Caudolateral spur of segment VIII with 1 long and 1 short spines. Swim fin with numerous taeniae apparently in a single row.

Fourth instar larva: Information from Chaudhuri *et al.* (1992) supplemented by data of 3 larvae from India.

Medium sized essentially melanotus-type larva (length 11.6 (10.3-13.7) mm (10), although TLt are more ventrally placed than in other species. Chaudhuri *et al.* (1992) show the VT arising very close together, which may be diagnostic for the larvae of this species. Anal tubules variable about 300 (210-370) micron long with no constriction, ventral pair longer and narrower (3.1 times longer than wide).

VHL 322 (310.5-335.5) μm . Gula sometimes slightly darkened, wider than the mentum and widest at the base. SAL (below) about 73 (68-78) μm wide and 3.9-4.4 times wider than deep.



Mentum (Fig. d, below) with the central trifid tooth of type IIA, i.e. c1 tooth quite broad and c2 teeth markedly separated from c1 tooth; 4th laterals usually not reduced (type I). but are in the specimen from Madurai. Although basically similar to that of *C. vitellinus*, the central trifid tooth does not arise noticeably below the 1st laterals.

Ventromental plates (Fig. e, below) separated by about 0.30-0.39 of the mentum width; about 186.5 (176-199) μm wide and 3.8 (3.66-4.02) times wider than deep and about same width as the mentum; about 33.5 (32-35) relatively widely spaced striae; VMR about 0.33.

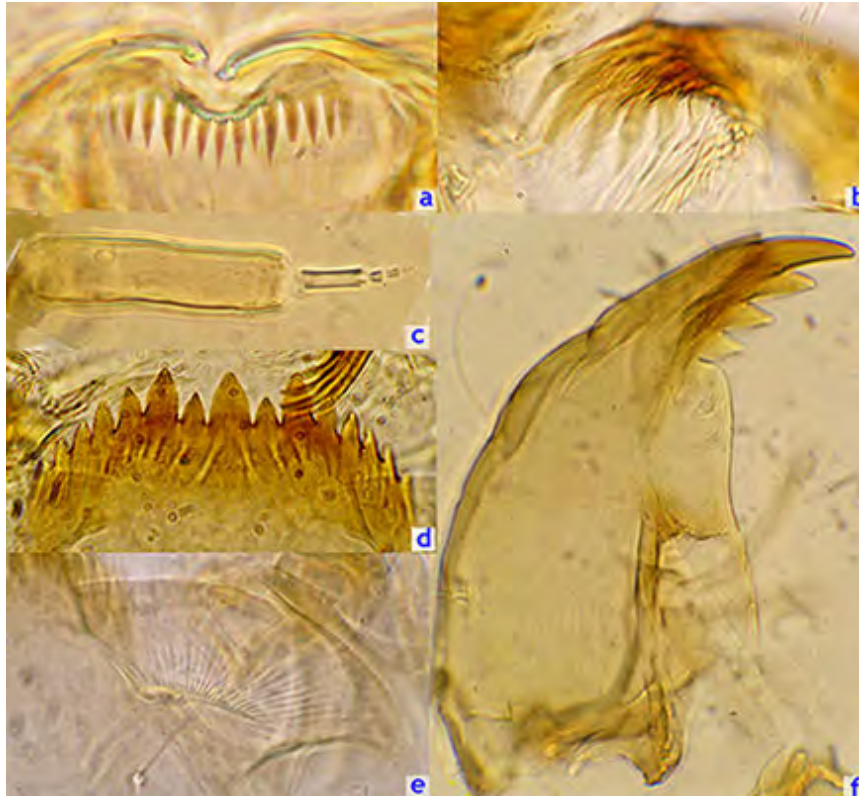
PE (Fig. a, below) with about 15.6 (14-17) teeth (type A, although the illustration of Chaudhuri *et al.*, suggests they are type B).

Distance between the antennal bases less or similar to that between the S4 setae which are separated by about 82-84% of the FC width at that point.

Antenna (Fig. c, below) with the basal segment 1/3 of VHL, about 2.8-3.6 times longer than wide; AR about 2.35 (1.95-2.67), ratio of segments 109 : 27.5 : 5 : 6 : 6. Ring organ about 26-37% up from base of segment 1.

Premandible (Fig. b, below) with 6 teeth, reducing in size from outer to inner.

Mandible (Fig. f, below) about 207 (190-230) μm long with third inner tooth mostly completely separated but only slightly darkened (type ii-IIIA), about 14.2 (13-15) furrows on outer surface at base; 11 (9-12) taeniae in PecM, Mdt-Mat 26.2 (22.5-28) μm , MTR 0.39 (0.33-0.46).



Larval mouthparts of a larva of *C. javanus* from Jammu, India

The larva is most readily recognized by the unusual premandible, which has 6 teeth (above), rather than the usual two, the unusually short 3rd segment of the antenna (shared with *C. vitellinus*) and the teeth of the mandible (type II-III A vs type III C). It is possible that the anterior and posterior VT arising close together is also diagnostic.

Cytology: The chromosomes of *C. javanus* have not been studied, but there is a photograph which is probably this species (below): Four polytene chromosomes with the thummi-cytocomplex combination, AB, CD, EF, G. Centromeres are obvious but not heterochromatic. Essentially terminal nucleolus in arm G, possibly with a BR close to it. A large puff is developed about one third from the distal end of arm B. No reported polymorphism



Molecular: Mitochondrial *COI* barcode sequence is available in GenBank and in the BOLD database. Although the sequences in BOLD are in a single Bin, there is a suggestion that the distribution is bimodal, with the few *C. javanus* specimens separated to the right of the main group. The BARCODE sequences differ by about 47 base positions (this does not include some rare polymorphisms where one or two *C. vitellinus* specimens carry the sequence present in *C. javanus*). and the majority are in the 5' region (as is common for differences between closely related *Chironomus* species):

```
vitellinus A T A T A A/G A C T C T T A/G A T T C C/T C T A T A T C T T C T C/T T T A T C T T G C T A T T A G A T C
javanus   T A G A T T C T C T A C C G A A T A T A T A T C T A A T A A A A T A T A A C A G C G G A T C T
```

Comments:

The present measurements differ in some significant details from those of Kieffer's description, although the other details of colour and the unusual genitalia correspond. The males are easily recognised by the unusual genitalia, particularly the tubular anal point, and the larvae by the 6-toothed premandible. The pupa is fairly typical for *Chironomus*. Males can be separated from the relatively similar *C. vitellinus* by the tubular anal point rather than expanded at the distal end (see above) and the placement of the setae on TIX, although that species has been regularly misidentified as *C. javanus* as can be readily seen from the figures of the male hypopygium. The larvae can be separated by the number of teeth on the premandible (6 vs. 7 – so the excellent photograph of the premandible in Cranston (2007) is *C. vitellinus*, not *C. javanus*) and the teeth of the mandible (type II-III A vs type III C).

Found: **INDONESIA** - **Buitenzorg, Java**, (Type locality), also **Sumatra** (Johannsen 1932).
INDIA – Bankura, Chinsura, Dhaniakhali, all West Bengal (Chaudhuri et al. 1992); Madurai (9.925°N, 78.120°E), Tamil Nadu; ponds at University of Jammu Campus (as sp. PK3)(32.73°N; 74.87°E); Kasar Lake (18.82°N, 76.20°E); Lodi Gardens, New Delhi, Delhi (28.53°N, 77.27°E); Manipur: Central Agricultural University Campus; Kolkata.
INDONESIA – Sumatra.

MALAYSIA - Minden (5.13°N; 100.13°E) and Bukit Merah Agricultural Experimental Station (BMAES) Permatang Pauh, Penang (5.13°N, 100.13°E), Tregganu; Parit, Perak.

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).

CENTRAL AFRICA - Blantyre, Malawi.

U.S.A. – Florida: - Gainesville (29.65°N, -82.33°W), Alachua Co.; Port Charlotte (26.98°N, - 82.10°W), Charlotte Co., and Wakulla Co.

PUERTO RICO

Possibly limited distribution in Java, Malaysia, India and parts of Africa, in rice paddies and small temporary water bodies, even sewage works.

The redescription of adults and immatures from Malaysia by Al-Shami *et al.* (2012) clearly refers to *C. vitellinus* but they did also collect at least one specimen of *C. javanus* (figure above).

Dr. Midya has an alternative species from India identified as *C. javanus* (below) and L. Karunakaran described another species as *C. javanus* in an unpublished thesis (below)(Martin 2022).

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

Fourth instar larva: Not seen. This may be a larva with a standard *Chironomus* premandible.

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 (now Kolkata) area.

***Chironomus javanus* (sensu L. Karunakaran)**

Adult:

Bright green species with unmarked abdomen, pale legs and both ends of tarsal segments brown.

Male: Body length 3.1 mm. wing length 2.0 mm; AR nearly 3, LR 1.75.

Gonostyle moderately swollen, narrowing markedly over the distal third; SVo possibly close to D(f) of Strenzke (1959).

Female: Body length 3.1 mm., wing length 1.9 mm.

Pupa: Length 6 mm., exuvia hyaline, segments II-V largely shagreened, seg. VI with 2 patches of spinules arranged transversely. Seg VIII with a fused compound spur with one

main spine and perhaps 2 very small spines near the base of the main spur. 62-65 taeniae on anal fringe.

Fourth instar larva: a small pale plumosus-type about 12-13 mm long. Head 490 x 630 µm; premandible with 2 teeth (and hence not *C. javanus* s.s.); mentum with 1st laterals separated from center tooth (possibly type IB) and anterior margin depicted as relatively flat. TTI very long, reaching beyond half the length of seg. XI; 2 pairs VT, the anterior pair longer.

The true identity of this species is not currently known.

Found: SINGAPORE.

***Chironomus vitellinus* Freeman 1961**

Placed as a synonym of *C. javanus* by Chaudhuri *et al.* 1992, but this is incorrect as the anal point of the adult males is expanded at the end; there is a difference in tooth number of the larval premandible and there are significant differences in the BARCODE sequences (Martin & Epler 2024).

Possible synonym:

Chironomus daitoceedeus Sasa & Suzuki 2001 (Yamamoto & Yamamoto 2018 as syn. *C. javanus*, but the Fig. 3i indicates it is *C. vitellinus*)

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

as *C. javanus*, but most specimens are actually *C. vitellinus*.

Adult:

This is a rather variable species across its wide distribution. This is likely due to different selection pressures in different habitats but also, in some cases, to genetic drift if island populations are established by a small number of founders.

Original Description of Freeman (1961)

Thorax of yolky colour, dull with practically no pruinosity; legs whitish especially on tibiae, tarsal segments black at joints; abdomen without dark markings but quite strongly pruinose at incisures and on segments 5 and 7; anal point narrow at base in side view. The white legs with dark marked tarsi and the pale abdomen make this species easily recognised; the hypopygium is also characteristic.

Wing length 2.5-3.0 mm.

Male. – Head., mouthparts, and antennae yellowish brown, plumes paler, FT present. AR about 4.5. Thorax a dull reddish yellow, yolky colour, very slightly pruinose near the front; shoulders and immediate areas slightly tinged with greenish; dorsocentral bristles only present in posterior half of thorax. Legs with femora very pale green, tibiae and tarsi whitish, the tarsi have definite black markings across the joints between segments; anterior tarsi not bearded, LR about 1.8. Wings pale, crossvein darkened. Abdomen yellowish green, lacking definite dark markings; incisures and segments 5 and 7 with quite strong pruinosity; hypopygium with anal point narrow at base, curved and finger-like in lateral aspect; appendage 2 (IVo) short and stout, styles broad at base and rather sharply narrowed at apex.

Female. – Resembles male; sensory hairs on apical antennal segment longer than usual.

Further description:

Male: (including from a Paratype male from Mafulu, Papua New Guinea):

Wing length 2.81 (2.54-3.08) mm, width about 0.61 mm, VR about 1.05; 18 (11-26) setae in squamal fringe; 2 SCf on brachiolum.

Head: AR 3.04 (2.78-3.46). FT about 40 (30-45.5) μ m; 16.5 (11-21) clypeal setae

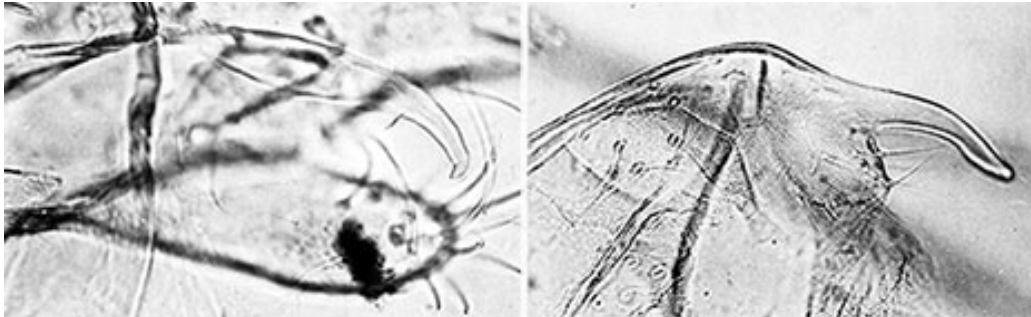
Palpal proportions (μ m) 44 : 45.5 : 157 : 196 : 275; P5/P4 1.38-1.45; P5/P3 1.78-1.82

Thoracic setae: 3 (0-5) acrostichal; 8.4 (5-15) dorsocentral; 4.1 (3-7) prealar; 1 supraalar: 0.67 (0-2) in anterior row, 10.32 (5-16) in posterior row, total 10.7 (10-16) scutellars.

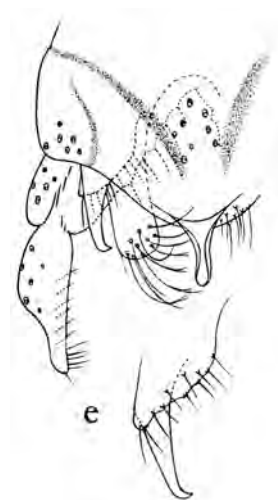
Leg lengths (micron) and proportions:

Male	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	BR
PI	1265	975	1320	930	825	755	355	1.60-1.93	1.16-1.27	2.1-2.5
PII	1210	1060	705	365	270	180	130	0.63-0.68	1.11-1.17	-
PIII	1325	1330	1065	575	430	265	150	0.77-0.83	0.99-1.00	-

TIX with 8.5 (7-10) setae in individual patches. Anal point narrow but expanded at distal end, narrow in lateral view (see figure below); SVo closest to E-type (g) of Strenzke (1959); IVo short and very stout, not reaching the end of the anal point, but to about 1/3 of the gonostylus length, with simple setae; gonostylus quite swollen (not always as much as in the Tokunaga figure below) and decreasing markedly over posterior third.



SVo and IVo (left) and lateral view of anal point (right) of paratype male of *C. vitellinus*



Male hypopygium and SVo of *C. vitellinus* from Tokunaga 1964

Female:

Coloration essentially as in male.

Wing length 2.81 (2.08-2.93) mm, width 0.83 (0.66-0.96) mm; VR 1.09 (1.07-1.11); 2 Scf on brachiolum; 15.6 (13-16) setae in squamal fringe.

Head: FT present 28.1 (7.5-35) μ m long and 1.0-2.8 times longer than wide. Antennal segments (micron) with percentage neck in brackets: 169 (28) : 115 (46) : 124 (49) : 126 (49) : 200; AR 0.37 (0.33-0.43); A5/A1 1.10 (1.07-1.17).

Palpal segments (micron): 54 : 50 : 180 : 220 : 335; P5/P4 1.53; P5/P3 1.86. Clypeus heart-shaped, about 1.28-1.55 wider than antennal pedicel; abt 23 (16-39) setae.

Thoracic setae: – 11.5 (9-16) acrostichals; 3.6 (3-5) humerals, mostly linear but may be grouped (e.g. as a triangle); 15.2 (9-260) dorsocentrals; 18.7 (13-30) including the humerals (lower in Pacific Islands); 5 (4-8) prealars; 2.2 (0-6) in anterior row and 10 (8-13) in posterior row (total 8-19) for scutellars.

Leg lengths (microns) and proportions as follows:

Female	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	Ta4/Ti
PI	1345	950	1715	975	825	875	390	1.69-1.92	1.16-1.65	0.80-0.99
PII	1240	1160	690	335	245	180	125	0.58-0.65	1.04-1.13	
PIII	1365	1460	980	500	415	270	150	0.63-0.77	0.90-0.99	

Anterior Ta4 longer than Ta3.

GcIX with 3.7 (2-6) setae; segment X usually a half-oval 91-177 μ m wide and 2.99 (2.1-5.36) times longer than greatest width, with about 11.4 (10-13) setae. Sasa & Hasagawa (1983) note that the cercus is roughly rhombic, 112x152 μ m; usually with a ventral basal bulge.

Pupa: Illustrated by P.S. Cranston in his Electronic Guide to Chironomidae of Australia, (below):

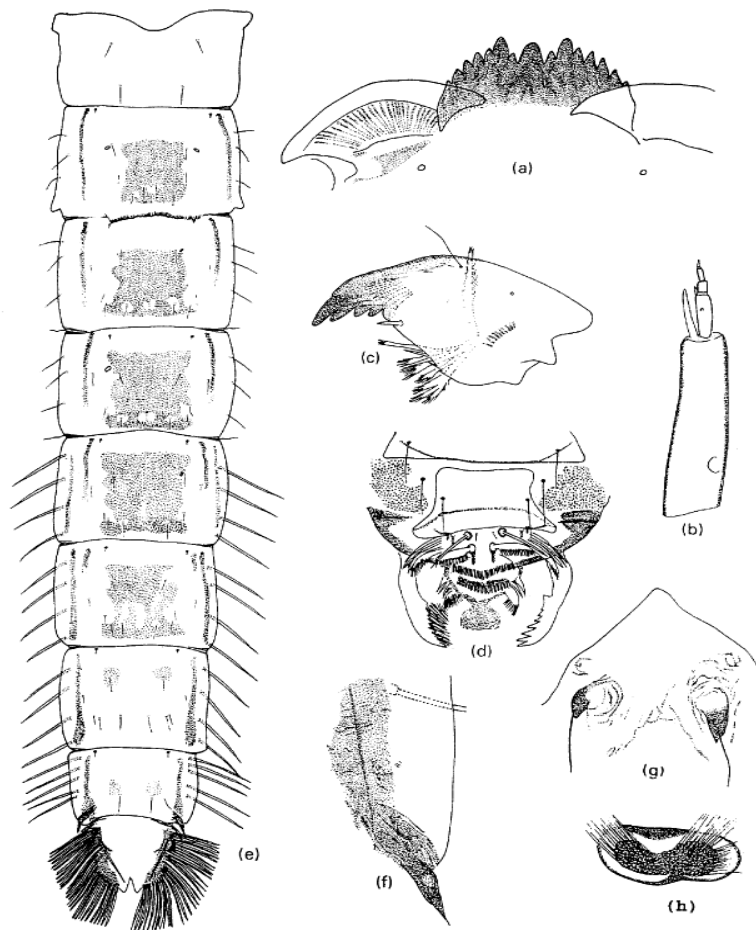
Length: Male 6.38 (6.38–6.70) mm; female 7.01 (6.90–7.14) mm. Exuviae grey. Cephalic tubercles 86.3 (81-110) μ m long and 56.5 (51-70) μ m in diameter, subapical seta about 56 (38-90) μ m long, i.e. about as long as the FT.

It is possible there is slight development of frontal warts (see Cranston figure g below).

Respiratory base about 132.7 (119-157) x 62.25 (51-81) μ m wide; HR 2.16 (1.94-2.35). 2 pairs of precorneal setae.

Abdomen with PSA caudolateral on segments IV-VI, that on segment IV about 145 (116-157) x 89 (71-111) μ m wide and about 22 (18-24)% of the segment length; PSB basolateral on segment I and small caudolateral on segment II, which also bears a caudal row of about 66.2 (54-81) hooks which occupy 58-68% of the segment width.

Caudolateral spur of segment VIII usually with 1+2sm (1-4) spines, although commonly only 1 is long. Swim fin with about 70.29 (61-78) taeniae in two rough rows (particularly distally).



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

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

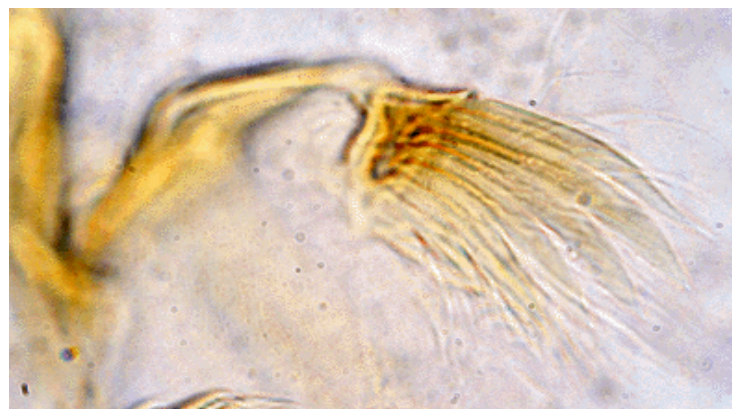
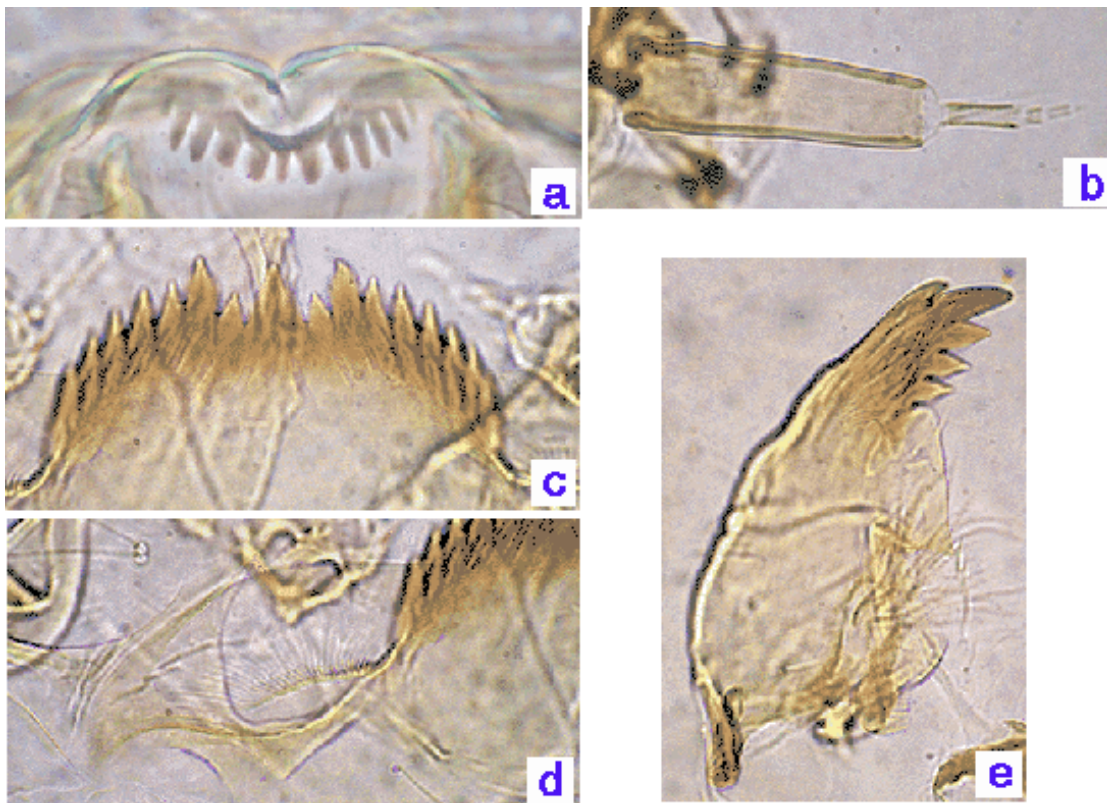
Fourth instar larva: a medium sized, essentially plumosus-type larva, although TLt (437 (320-800) μm long are more ventrally placed than in other species. Length 11.5 (9.2-13.7)(female) 9.75 (9-13.7)(male) μm and VT long, anterior pair 1.49 (0.8-2.48) μm generally longer than posterior pair 1.28 (0.70-2.16) μm . AT with median constriction, dorsal about 500 μm long and 3.6 times longer than wide; ventral 330 (220-440) μm long and 3.4 times longer than wide. SAL 76 (56-88) x 18 (15-20) μm and 4.2 (3.1-5.3) times wider than deep.

Gula pale (in Malawi) or slightly darkened on posterior third (in other areas), slightly wider than mentum width and widest at the posterior margin; FC pale.

Mentum (c, below) with the central trifid tooth set below the 1st laterals (although not always obvious if the 1st laterals are worn), and the c2 teeth markedly separated from c1 tooth (type IIA) and pointed towards it; 4th laterals at most slightly reduced (type I). PE (a, below) with about 16.2 (15-17) teeth (type B) or sometimes irregular teeth (Type D).

Ventromental plates (d, below) about 171.4 (159-183) μm wide and 3.81 (3.6-4.0) times wider than deep and 1.15 (1.10-1.21) times the mentum width; separated by about 0.39 of the mentum width, with about 33.6 (31-36) striae; VMR 0.27 (0.20-0.33).

Antenna (b, below) with the basal segment about 3.4 (2.9-3.4) times longer than wide and about a third of the ventral head length; AR about 2.46 (2.34-2.57); ratio of segments 108.5 : 25 : 4.5 : 8 : 5. Distance between the antennal bases, 143 (129-152) μm , larger than that between S4 setae, 124 (106-143) μm . S5 setae mostly slightly posterior to nearby RO. Premandible (below) with 7 progressively reducing teeth – although Japanese specimens may have only 6 teeth (Hashimoto 1984) – as do the Florida populations. There is an excellent photo of the premandible in Cranston 2007, although mislabelled as *C. javanus*. Mandible (e, below) about 215 (201-243.5) μm long, with third inner tooth darkened and completely separated (type IIIC), with three spines on inner margin, and about 10.7 (10-12) furrows on the outer surface at the base; Mdt/Mat about 24 (12-28) μm , MTR 0.42 (0.31-0.47).



Premandible of *C. vitellinus* with 7 teeth (7th only about 1/3 the length of the longest teeth)

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.

vitA1:

vitB1: Puff (gp. 7) about one third from distal end of the arm with dark bands distal.

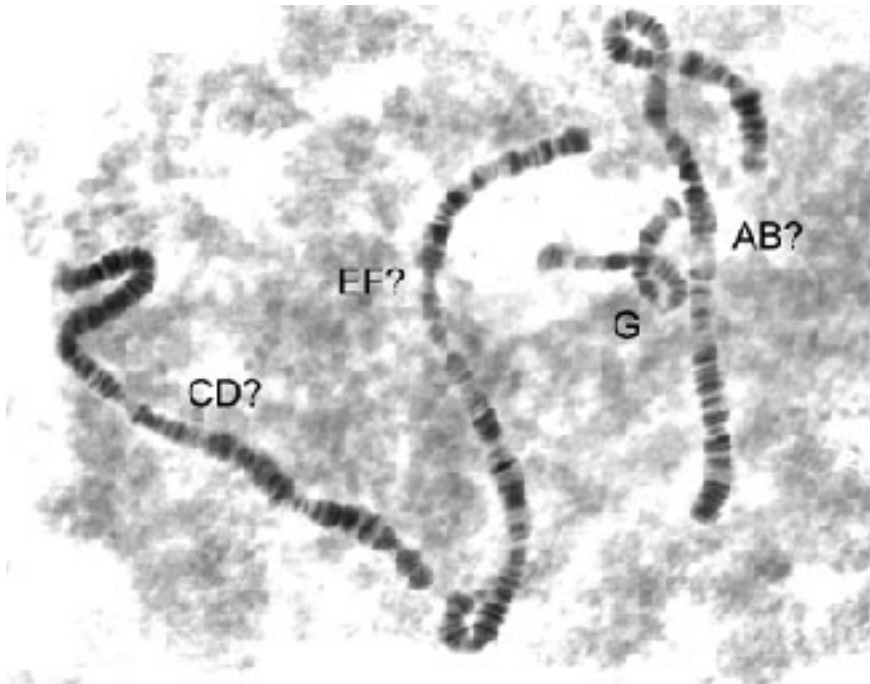
vitC1:

vitD1:

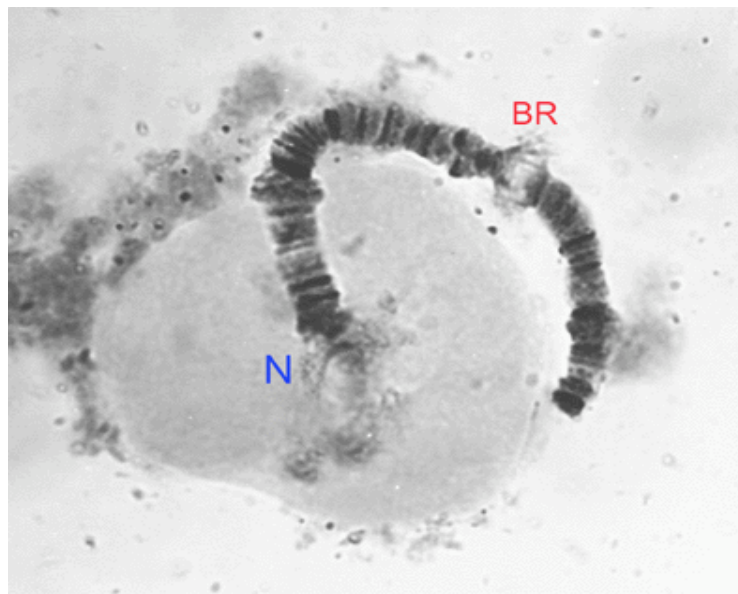
vitE1:

vitF1:

vitG1: Nucleolus subterminal, BR about one third from other end; closely paired.



Whole complement from Sarina, Queensland.



Arm G. Shizuoka, Honshu, Japan JHO.3.5 12F

The adult male was described from Thailand by Hashimoto *et al.* (1981); adults from Ryukyu Islands, Japan (Sasa & Hasegawa 1983); all stages for specimens from Japan (Hasagawa and Sasa 1987); from Micronesia by Tokunaga (1964) and from Penang by Al Sharmi *et al.* 2012, all as *C. javanus*. The expansion at the tip of the male anal point and the 7 toothed premandible clearly show that these descriptions refer to the present species (and supported by the BARCODE data which show that *C. vitellinus* is more common and more widely distributed). The cytological description given here is based on Australian, Papua New Guinea and Japanese specimens.

Some larval characters have been illustrated by P.S. Cranston in his Electronic Guide to Chironomidae of Australia. These are reproduced above (with permission).

Molecular: Mitochondrial *COI* barcode sequence appears to be in the BOLD database under the name *C. javanus* and is much more numerous than those of *C. javanus*. The BARCODE sequences of the two species differ at about 47 base positions (this does not include some rare polymorphisms where one or two *C. vitellinus* specimens carry the sequence present in *C. javanus*) and the majority are in the 5' region (as is common for differences between closely related *Chironomus* species):

```
vitellinus A T A T A A/G A C T C T T A/G A T T C C/T C T A T A T C T T C T C/T T T A T C T T G C T A T T A G A T C
javanus   T A G A T T C T C T A C C G A A T A T A T A T C T A A T A A A A T A T A A A C A G C G G A T C T
```

Found: AUSTRALIA - - Darwin, Northern Territory. (Type locality)

JAPAN – Shizuoka (34.989°N; 138.38°E), Shizuoka Prefecture, Honshu; Tamagusuku, Okinawa; Otsu City (35.00°N, 135.88°E), Shiga Pref., Honshu; Minamidaito Island (abt.25°N, 131°E), Okinawa.

CHINA – Lingshui City (18.50°N, 110.03°E), Hainan; Shanghai (31.22°N, 121.47°E).

KOREA – locality not specified.

BANGLADESH – Chittagong (22.4685°N, 91.7808°E).

MALAYSIA – Minden (5.13°N; 100.13°E); and Bukit Merah Agricultural Experimental Station (BMAES) (5.13°N, 100.13°E), University of Malaysia; Penang; Seberang Prai (Al-Sharmi *et al.* 2012, as *C. javanus*).

SINGAPORE – Pandan and Bedok Reservoirs.

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, may not all be *C. vitellinus*); Tambon Talad (16.33°N, 103.50°E) Mueang Maha Sarakham District., coastal regions (Cranston 2007).

Other regions:

Papua New Guinea - Mafulu (1200 m)(Paratype).

Fiji – Nadi (-17.67°S, 177.50°E); Suva (-18.13°S, 178.45°E), both Viti Levu.

Malawi – Blantyre (-15.78°S, 35.00°E).

Micronesia - Caroline Islands and Marshall Islands (Tokunaga 1964).

U.S.A – Port Charlotte (26.98°N, -82.10°W) and Gainesville (29.65°N, -82.33°W), Florida (Martin & Epler 2024)

***Chironomus okinawanus* Hasegawa & Sasa 1987**

Syns: *Chironomus* sp. “Okinawa-yusurika” Sasa & Hasegawa 1983.
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 (From Sasa & Hasegawa 1983 as *Chironomus* ‘Okinawa’):
 Length 6.02 (5.32-6.89) mm. Wing length 2.81 (2.50-3.01), 15.0 (13-20) squamal setae; AR 3.28 (3.07-3.51).

Antennal hairs brown, shaft dark brown; ground colour of scutum yellow, scutal stripes reddish brown, scutellum yellow, postnotum dark brown, halteres yellow; wings unmarked, r-m dark brown; 20.3 (16-23) clypeal setae.

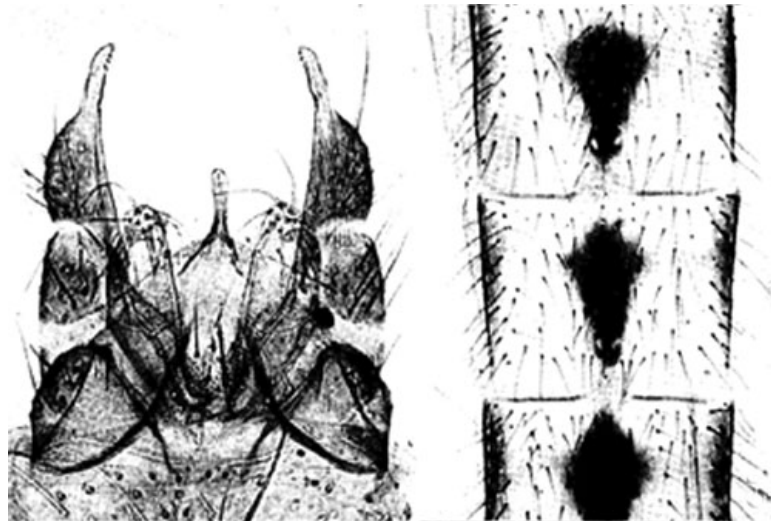
In all legs, femur and tibia are entirely yellow, tarsi I, II and III largely yellow and each with an apical dark ring, tarsi IV and V largely dark brown; LR1 1.53 (1.49-1.56); LR2 0.64 (0.62-0.66); LR3 0.75 (0.73-0.78); BR2.5 (2.3-2.6), i.e. no beard.

Ground colour of abdominal tergites greenish yellow, tergites I to VII each with a large central dark patch which is almost triangular in tergites II to IV (Fig. below) ; tergites VIII and hypopygium dark brown.

Head: FT well developed, about twice as long as wide (Fig. 1 C-4); AR 3.28 (3.07-3.51); 20.3 (16-23) clypeal setae.

Lateral pronotal setae absent. Thoracic setae: 19.1 (12-23) acrostichal; 17.8 (15-24) dorsocentral; 5.1 (4-6) prealar; 16.6 (12-23) total scutellar setae);

Hypopygium (in Fig. 1 C-1). TIX with 12-16 long setae in the middle, possibly in individual pale spots. Anal point slender and slightly expanded apically. SVo (Fig. I below) composed of a relatively high, triangular base bearing several long setae, and a hook-like apical process, i.e. D -type of Strenzke (1959). IVo (Fig. 1, below) relatively short, stout and almost parallel-sided, with 14 long and simple recurved setae arising from apical 1/5. Gonostylus abruptly narrowed at about apical 1/3.

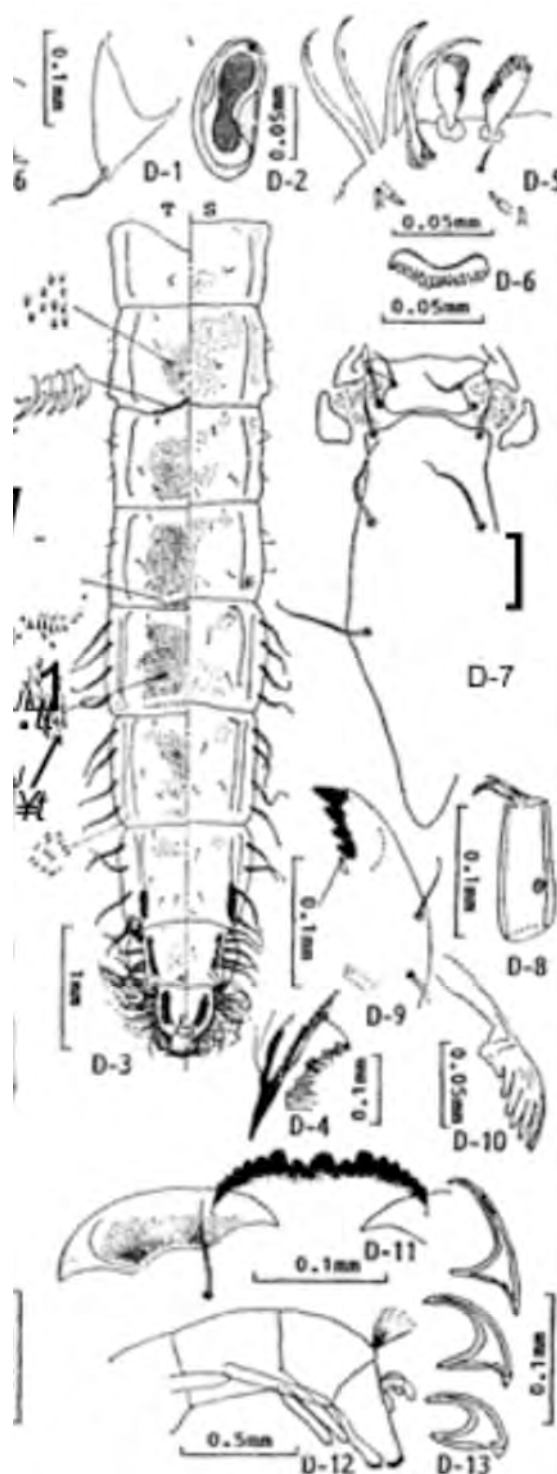


Male hypopygium (left) and abdominal tergites (right) of *C. okinawanus*
 From Sasa & Hasegawa 1983.

Female (From Sasa & Hasegawa 1983):

Coloration as in male, presence of a large dark patch on each of abdominal tergites I to VI is also a differentiating character of this species in female. FT prominent, widest at base and tapering, 54 μm long and 18 μm diameter, 48 μm apart from each other. Antenna 6 segmented, segments II to V each with a long neck, last segment with long and curved sensory setae. Spermathecae faint in contour 100 μm long and 74 μm wide in one, 90 μm long and 82 μm wide in another. Cercus roughly rhombic, 176 μm high and 120 μm long.

Pupa: (from Hasegawa & Sasa (1987) (Fig. 2, D1-4, below) Exuviae brown in colour, thorax, lateral margins of abdomen and anal lobes darker than the rest part. Length of abdomen 4.2 to 6.6 (mean 5.7) mm. Cephalic tubercles conical, each with a preapical seta which is about half the length of the cephalic tubercle. Thoracic respiratory organ and chaetotaxy as in usual *Chironomus* forms. Tergite I without spines and spinules; II to VI each with a central spinose area, and that on VI sometimes divided into anterior and posterior groups; VII with a pair of anterolateral spinulose areas; VIII with a pair of mid-lateral spinulose areas; a row of relatively small recurved spines present on caudal margin of tergite II, lateral spines of this row simple but median ones with accessory spikes. Spinules also present on caudolateral corners of tergites V to VII. Intersegmental spinulose areas present on caudal margins of tergites IV to VI. Sternite I with a pair of anterolateral spinulose areas and a caudo-medial spinulose area; II with spinules widely in the central area and along lateral margins; III with a large central spinulose area, which sometimes divided into the anterior and the posterior groups, and with spinules in anterior part of lateral margins; IV with a T-form spinulose area and a pair of caudo-lateral whirl-like spinose areas; V with a pair of anterolateral spinulose areas and caudal spinulose area; VI and VII each with anterolateral spinulose areas which often confluent medially forming a transverse band; VIII without spinules. Caudolateral scales of abdominal segment VIII elongated and apically divided into 1 to 4 pointed spurs. Anal lobe with 75 to 113 (mean 92.8) fringe hairs.



Fourth instar larva (Fig. 2: D-5 to 13, above). (Apparently a melanotus-type larva). Body 11.1 (8.8 to 13.2) mm long, red in colour. Two pairs of eyes present. Head structure closely resembles that of *C. javanus*. Premandible with 6 teeth. Relative length of antennal segments, 47: 12: 3: 3: 2: ring organ in proximal 1/3 of basal segment of antenna. Anterior and posterior pseudopods as in *C. javanus*. Abdominal segment VII with a pair of caudolateral processes reaching middle of segment VIII. Two pairs of simple and straight blood gills present on segment VIII, the anterior pair longer. Preanal hair tuft composed of 7 long and 2 short minute hairs on small tubercle. Anal gills slender, almost the same in length.

Cytology: not described.

Adults were reared from larvae collected in sewage streams and eutrophic ponds, plus one from a rice paddy.

Hasegawa & Sasa (1987) note that the adult is closest to *C. praeapicalis* Tokunaga (1964) (not supported by the figures of the respective male hypopygia, and the absence of information on the larva of *C. praeapicalis* does not help); while the pupa is similar to *C. circumdatus* in having a pair of spinulose areas in place of transverse band of spinules on the anterior part of tergite VII, but differs in possessing spinulose areas on the antero-lateral corners of sternite I. Yamamoto (2002) has suggested that this species is related to *C. javanus* (or *C. vitellinus*?) and aspects of the description suggest it is most closely related to *C. vitellinus*.

Found: JAPAN - - Okinawa, Okinawa Prefecture, Ryukyus. (Type locality) (In Toyama Medical and Pharmaceutical University, Toyama, Japan); Shinri Beach, Kume Island (26.35°N, 126.70°E), Shika & Arakawa, Ishigaki Island, all Okinawa Prefecture.

THAILAND- 23. Tambon Talad (16.33°N, 103.49°E), Mueang Maha Sarakham District, Maha Sarakham Province.

Species in the pseudothummi-cytoplex

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.

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

Ratio of palpal segments (µm) 59 : 64 : 203 : 199 : 254; P5/P4 1.28, P5/P3 1.25. 36-48 setae on clypeus.

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

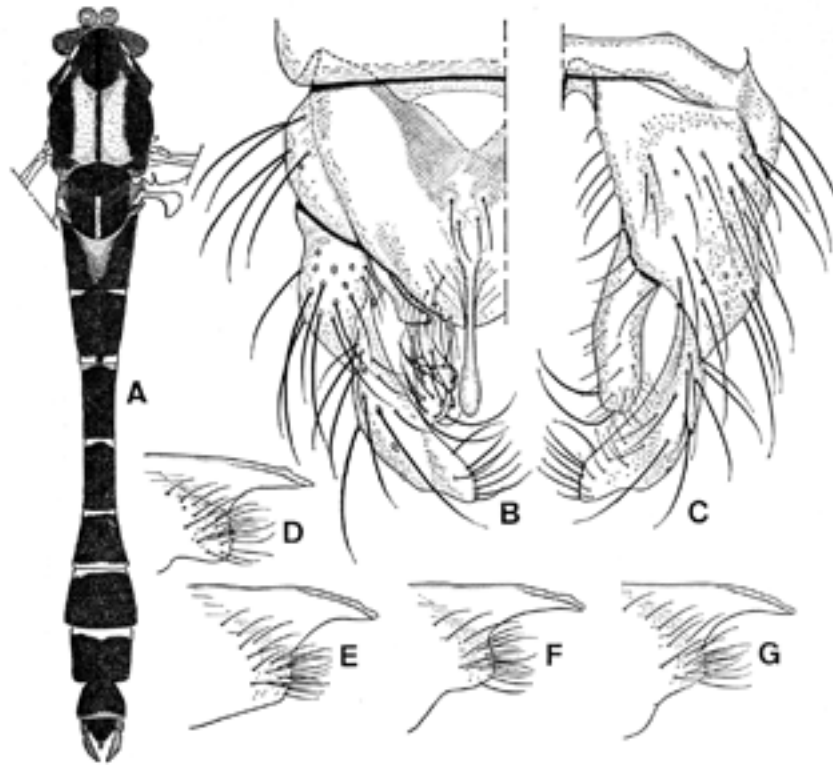


Fig. 1. *Chironomus acerbiphilus*, ♂. A: Dorsal view of the body. B: Genitalia in dorsal view. C: Ditto, ventral view. D-G: anal point in lateral view.

From Yamamoto 1986

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):

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

Abdominal tergite IX with about 2-5 setae in individual pale spots. Hypopygium as in figure above. Anal point narrow and slender, slightly expanded at distal end. SVo 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, while Jablonska-Barna *et al.* (2012) record the Poland specimens as S-type; reaching just beyond tip of anal point. IVo apparently simple.

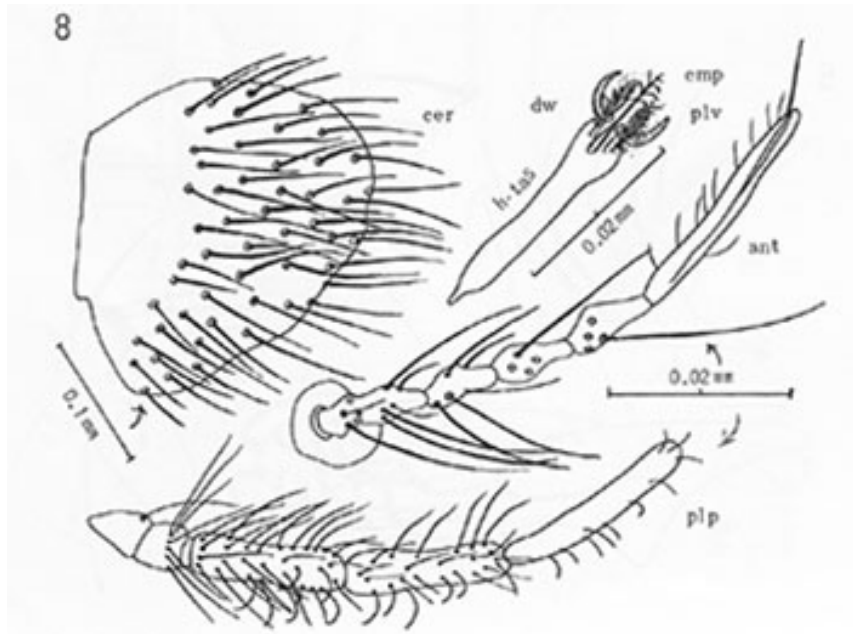
Female:

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 (µm) 148 : 98 : 104 : 104 : 292: AR 0.62 (Sasa 78)-0.64 Yamamoto 1986). FT 15-38 µm long, 10-24 µm wide.

Ratio of palpal segments (µm) 66 : 66 : 202 : 208 : 260 (Yamamoto); 40 : 50 : 200 : 200 : 250 (Sasa): P5/P4 1.25; P5/P3 1.25-1.29. 49-57 setae on clypeus.



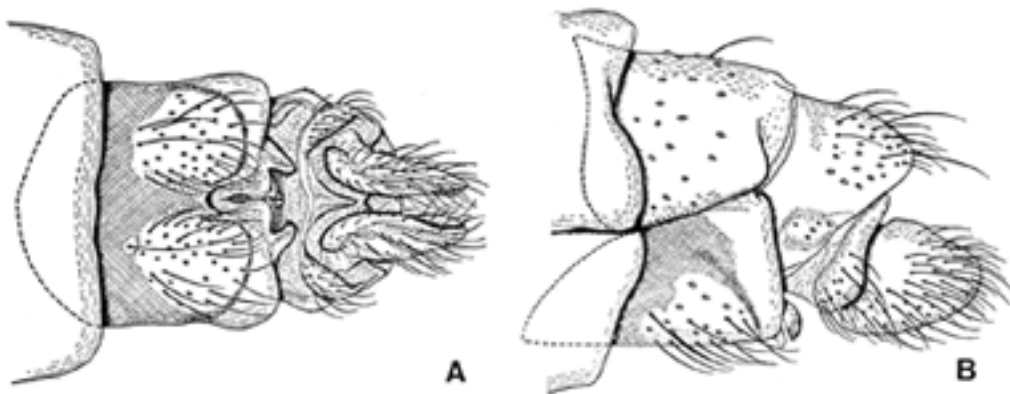
Cercus (upper left), Ta5 (upper right), Antenna (center), Palp (bottom) of *C. acerbiphilus* (Sasa 1978)

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)(μm):

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



Female genitalia of *Chironomus acerbiphilus*. 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. Segment X wider ventrally and narrowing almost to a point dorsally, about 3.3 times longer than its widest point. Cercus somewhat “hat-like” with a gently rounded posterior margin, ventral margin longer than dorsal one.

Yamamoto shows a gently rounded base to ventral margin while Sasa (1978) shows a basal bulge.

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 place shagreen. The hook row is entire, but Jablonska-Barna et al. (2012) note that in Poland it is broken in some specimens; with 42-66 hooks in Europe. Caudolateral spur of segment VII with 1-3 spines, most commonly with 2 (Sasa 1978).

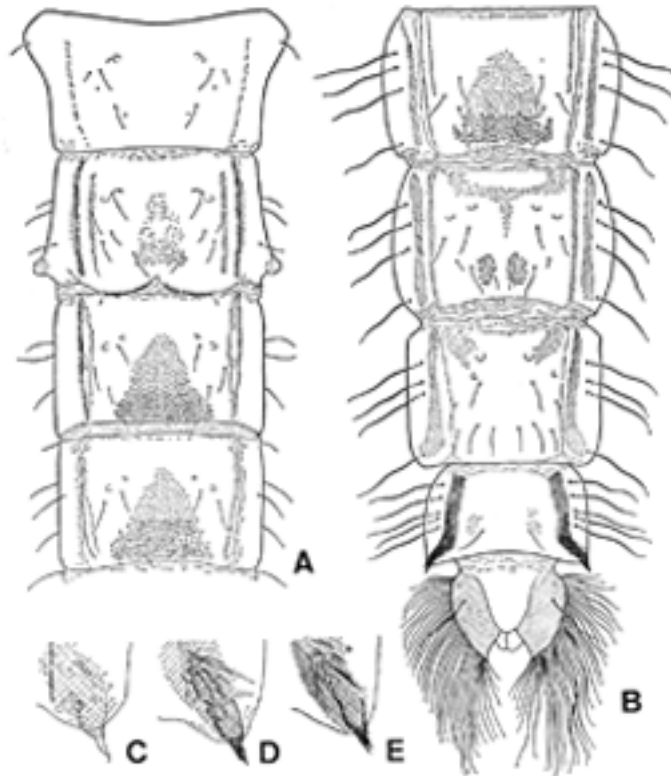


Fig. 5. Pupa of *Chironomus acerbiptilus*. A-D: Dorsum of abdomen. C-E: Postero-lateral spurs of segment VIII.

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, anterior almost straight, posterior coiled.

Head capsule generally brownish; gula and FC sometimes slightly to moderately darkened. Labral setae simple. SAL long and narrow about 78 (71-83) μm long and 6.0 (5.5-6.4) times longer than wide.

Mentum (c, below) width about half the VHL; C1 teeth relatively broad, with c2 teeth well separate and sharp (generally type III); Sasa (1978) shows a small notch near the top of C1, but this would only be seen where the teeth are not worn; lateral teeth sharp, 4th laterals hardly reduced (type I) with 5th laterals slightly above the graduated level of the other lateral teeth.

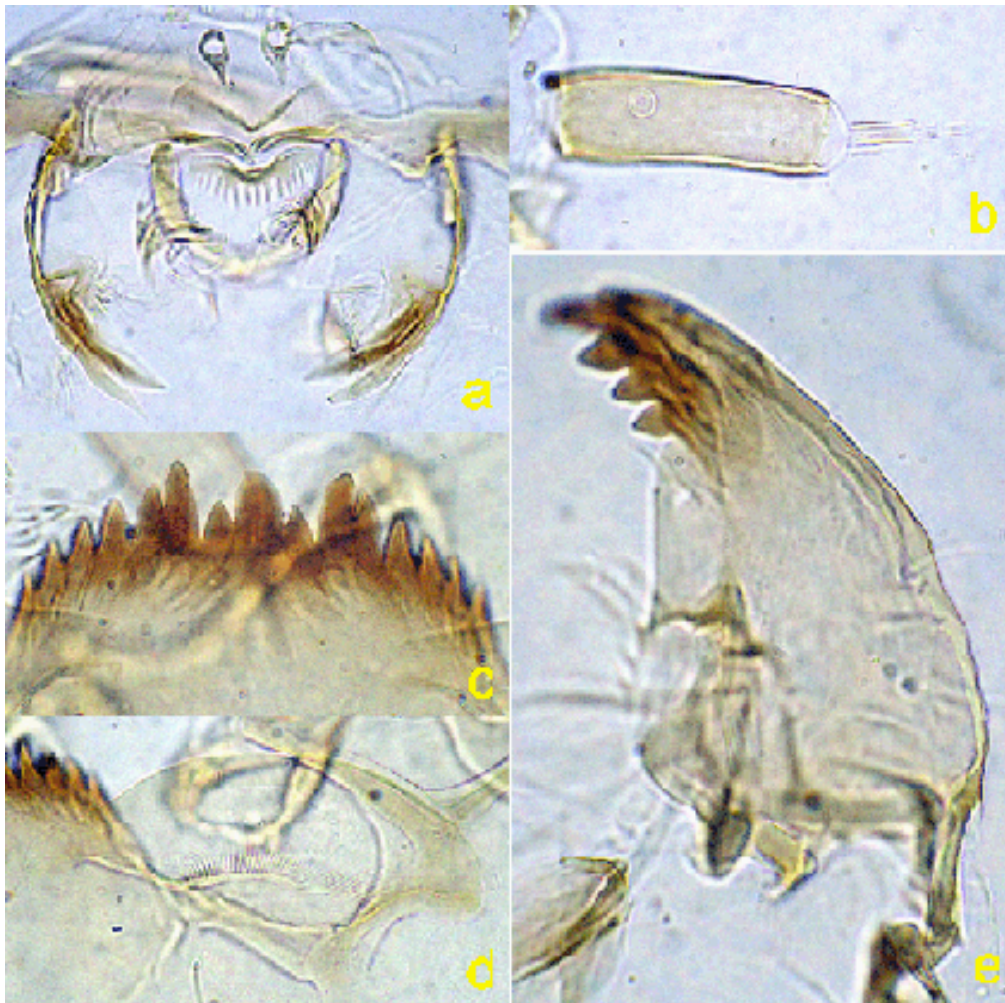
Ventromental plates (d, below) about 180-195 μm wide and 3.64-4.05 times wider than deep; IPD about 37-40% of mentum width; with about 47.6 (39–45) striae; VMR about 0.34 (0.21-0.45).

PE (a, below) with about 22.5 (17-26) sharp graded teeth (although Yamamoto describes them as uneven).

Antenna (b, below) with basal segment relatively long, about 3.5 times longer than wide; RO about 1/3 to almost 1/2 up from base of segment; AR about 2.35 (2.22-2.66); segment 3 short, may be same length as segment 5; relative length of segments (μm) 122.5 : 23 : 8 : 10 : 5.5. Distance between antennal bases usually greater than that between the S4 setae, which are separated by about 75% of the FC width at that point. S5 setae posterior to nearby RO.

Premandibles (a, below) of type B1 with two narrow teeth, inner tooth about 3-3.5 times wider than outer tooth.

Mandible (e, below) with 3rd inner tooth defined and darkened (type IIIC), about 14.3 (12–16) furrows on outer surface near the base; 13.2 (12-16) taeniae in the PecM; Mdt-Mat 19-20 μm , MTR 0.31-0.35.



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

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.* 2010), 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

aceB1: banding not clear, but probably 22-28 near centromere.

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)

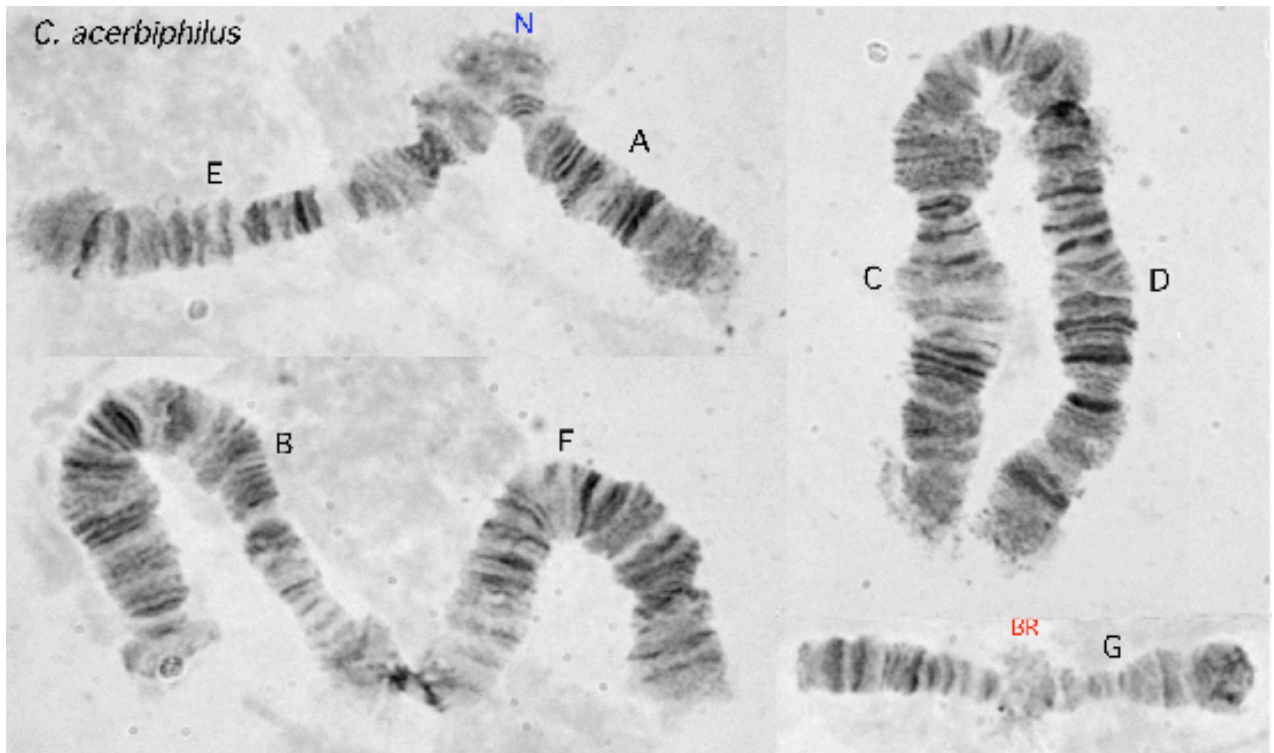
aceE1: 1 - 3e, 10b - 3f, 10c - 13 i.e. as *halophilus*, *acidophilus*, *frommeri*, *whitseli*, etc.

Jablonska-Barna *et al.* (2010) also consider the arm as identical to the *aprilinus* sequence but list a proximal inversion 13-11.

aceF1: 1, 12p - 11, 2 - 6 14 - 12q, 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, 18-23 (clarified from Jablonska-Barna *et al.* 2010)

aceG1: BR near middle of arm.



DNA sequence: MtCOI sequence is in the BOLD database and in GenBank (DQ648201).

Sequence of North American specimens is also in the BOLD database. BOLD places them in a separate Bin ([BOLD:AAL9507](#)). This could simply be due to geographic isolation, but the differences in color and the fact that the Japanese specimens have a different nearest-neighbor Bin, suggest that they may be different species. A comparison of the base sequences shows that they differ at 35 bases in the Barcode region (below):

	Base differences																																		
USA	A	A	T	G	G	T	T	T	A	A	T	T	C	T	A	T	T	A	C	A	C	G	G	T	A	C	T	T	G	G	A	T	G	T	A
Japan	G	G	A	A	A	C	C	C	G	G	C	C	T	C	G	C	C	G	T	T	T	A	A	A	G	T	C	A	A	A	T	C	A	C	G

The critical information is missing to determine the specific status of these forms. The adults and pupae of North American specimens are not known, and the Barcode sequence of the European synonym *C. crassimanus* is unknown, data which are required before a proper decision can be made as to whether they are separate species or only sub-species. Jablonska-

Barna *et al.* (2012) note that the morphology, even within Europe is variable, but the cytology is consistent.

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); Sukayu Spa, Aomori Pref. Honshu.
 also found in **Europe** - Reinbeck, Germany (Keyl 1962 as **Type locality** of *C. crassimanus*, synonymy by Wülker, unpubl.); Łuk Mużakowa Landscape Park, Poland (Jablonska-Barna *et al.* 2010)
 probably also in North America: **California; Wyoming**- Nymph Creek, Yellowstone National Park (but see above).

In acidic waters (pH 1.4–4.3), 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 fusciceps* Yamamoto 1990**

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

Also called *Chironomus thmini* (misspelling of thummi?) Tokunaga 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). FT about 12.5-30 µm long, 10-15 µm wide.

Palpal proportions: 52 : 62 : 164 : 164 : 208; P5/P4 and P5/P3 1.27. Clypeus with 30-39 setae.

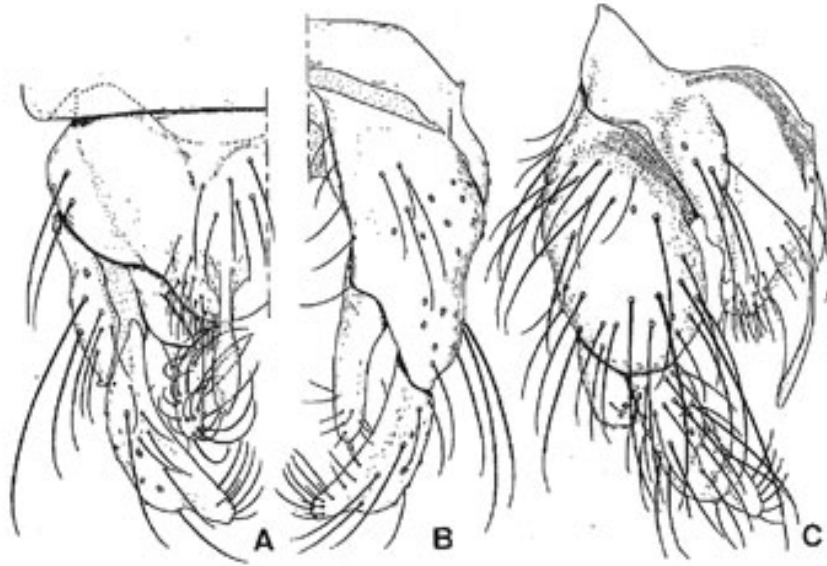
Wing length 1.8-2.6 mm, width 0.6-0.8 mm. VR 0.91 (0.88-0.93). Squama with 10-20 setae.

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

Leg lengths (mm) and proportions:

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	Ta5/Ti
PI	1280	980	1460	730	610	470	270	1.43-1.52	1.31	0.28
PII	1290	1100	570	340	270	200	170	0.51-0.53	1.17	
PIII	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. (Yamamoto 1990)

Genitalia resembling that of *C. acerbiphilus* but S-type SVo much stouter with 6-8 setae on base;; anal point narrower at base; IVo with 20-29 long recurved setae on apical half (shown as simple); gonostyle moderately swollen and narrowing markedly over distal third, with 6-8 apical setae.

Female:

Coloration almost the same as the male. Cercus brown.

Body length 2.0-3.0 mm.

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

FT 12.5-17.5 µm long and 10.0-15.0 µm wide.

Palpal proportions (µm): 56 : 68 : 172 : 170 : 232; P5/P4 1.36; P5/P3 1.35.

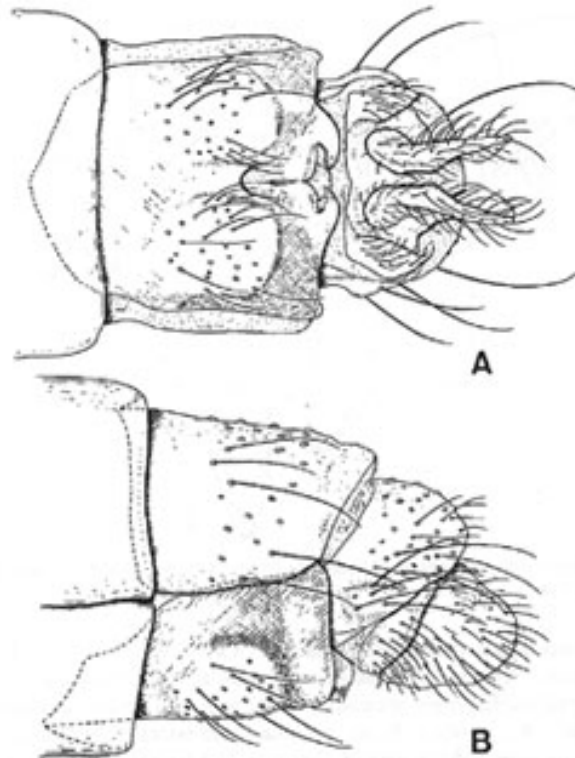
Vertex with 23-25 setae; Clypeus with 29-40 setae.

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 (not known if this includes the humerals); prealars 6-9; supraalar 1; scutellars 21-41.

Leg lengths (micron) and proportions:

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

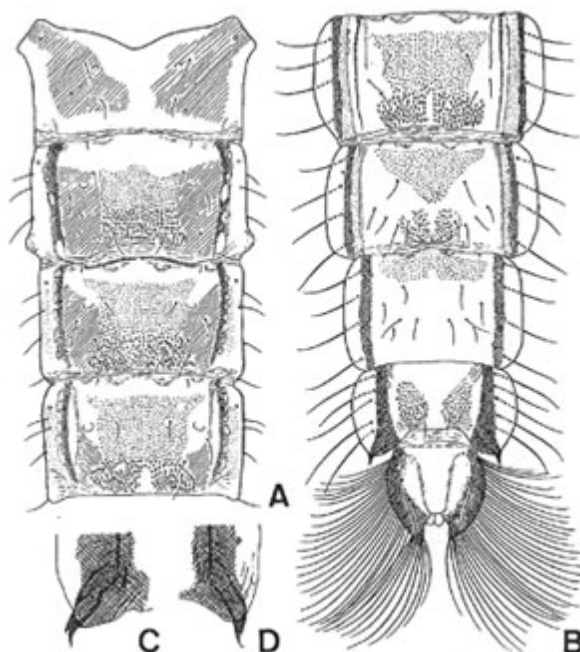


C. fusciceps female genitalia: A. ventral view; B. lateral view. (Yamamoto 1990)

Genitalia resembling that of *C. acerbiphilus*, but segment X separated from TIX by a slender membranous area. Laterosternite with 3-7 setae, Segment X with 9-18 setae. Cercus with rounded outline and a basal swelling on each side at the base.

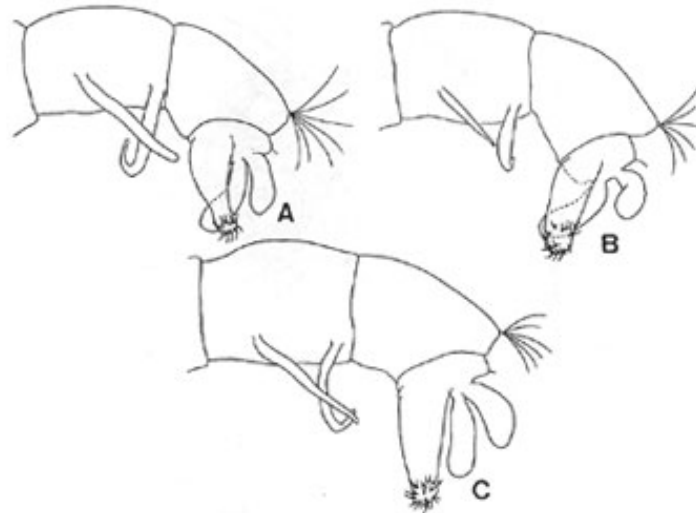
Pupa: Body dark brown, length 4.5-6.5 mm. Cephalic tubercles acutely pointed, with subapical spine.

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).

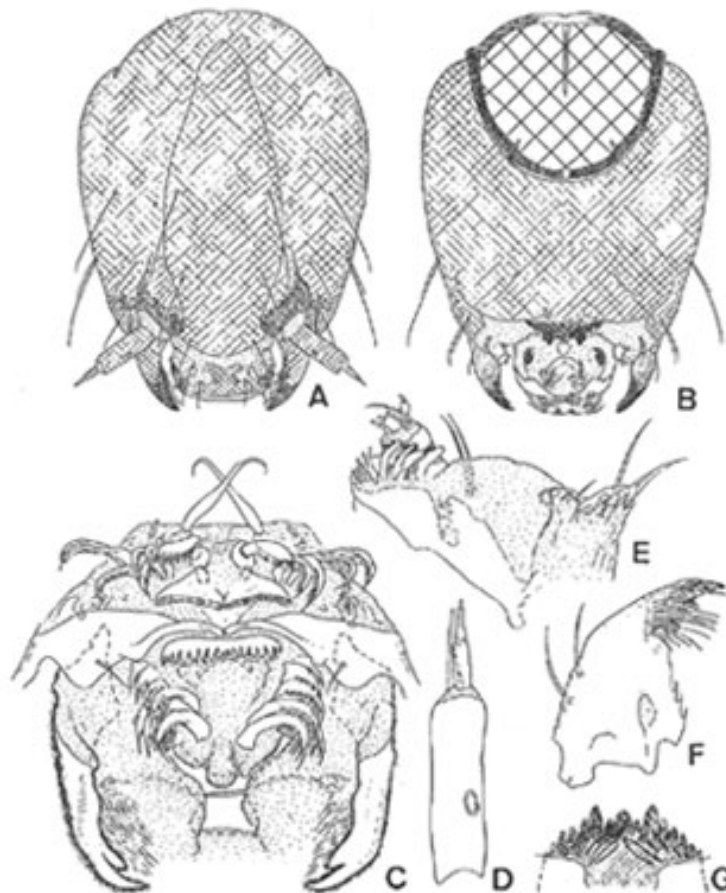


C. fusciceps pupal abdomen: A anterior; B posterior; C & D spurs (Yamamoto 1990)

Fourth instar larva: A small (length - 10 mm) thummi(?) - or bathophilus-type larva, i.e. lacking lateral tubules. Ventral tubules relatively short (not reaching end of hind prolegs). 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 (Yamamoto 1990)



C. fusciceps larval head. A. dorsal; B. ventral; C. hypopharynx; D. antenna; E. maxilla; F. mandible; G. mentum (Yamamoto 1990)

Mentum of type I, in fact Yamamoto's illustration suggests that the 5th and 6th laterals are reduced, central tooth could be type IB. 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 which is 3-4 times wider.

Antenna with 5 segments, relative lengths of segments: 42 : 10 : 2 : 4 : 2 ; segment A1 with a ring organ at basal 2/5; AR about 2.3. 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 recorded; 3 spines on inner margin; PMa with 10 taeniae; MTR about 0.27.

Cytology: no information, but as related to *C. acerbiphilus* is likely to be in the pseudothummi cytocomplex.

Found: JAPAN. Type localities – Mount Unzen, Nagasaki Prefecture, and 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:

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

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

***Chironomus sulfurosus* Yamamoto, 1990**

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

This is the same Bin as *C. fusciceps*, with 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: FT 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, P5/P4 – 1.29, P5/P3 – 1.30.

Thoracic setae: 15-22 dorsocentrals, biserial at anterior end; 4-6 prealars; 1 supraalar; 26-32 scutellars in about 3 rows.

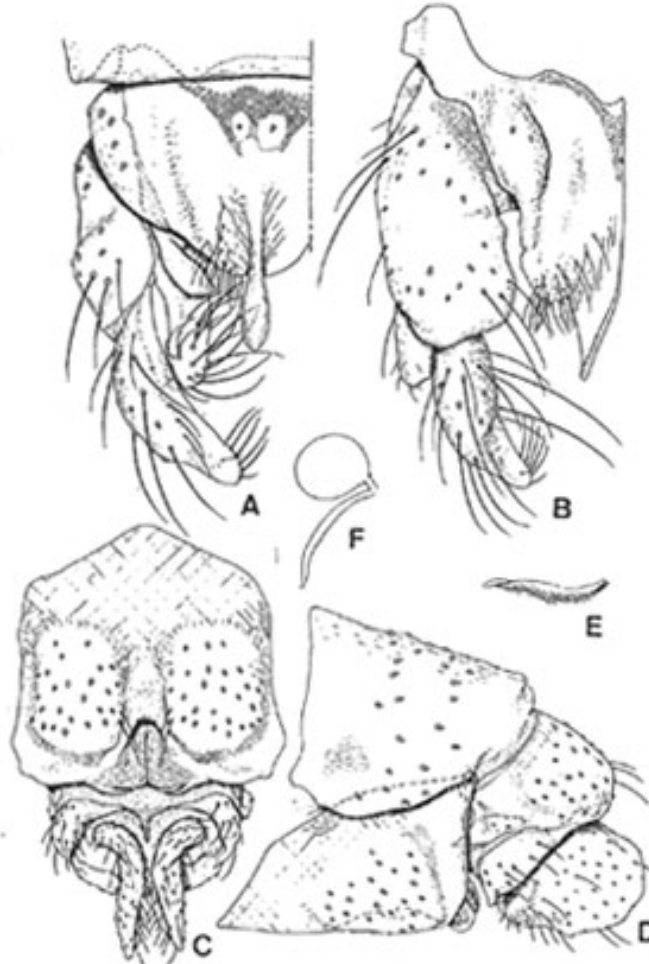
Leg proportions (micron):

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	Ta4/Ta3
PI	1270	1020	1500	750	630	480	270	1.32-1.52	1.25	0.73-0.77

PII	1300	1110	620	350	270	190	150	0.53-0.58	1.17	
PIII	1450	1310	880	500	400	250	100	0.66-0.70	1.11	

$$\text{antTa5/Ti} - 0.26$$

About 2-11 setae in individual pale areas at middle of tergite IX. SVo of S-type; IVo slightly curved outwards, longer than the anal point and reaching about to the middle of the GS, which is relatively swollen, narrowing 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):

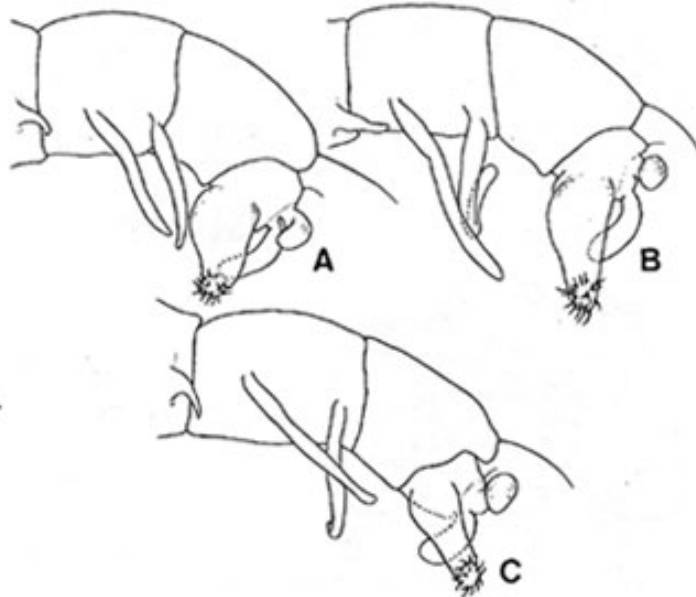
	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	Ta4/Ti
PI	1360	1020	1550	770	660	520	280	1.49-1.55	1.25	0.51
PII	1370	1190	640	360	280	210	160	0.52-0.56	1.15	
PIII	1500	1370	900	500	420	260	190	0.63-0.69	1.09	

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. TLt 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

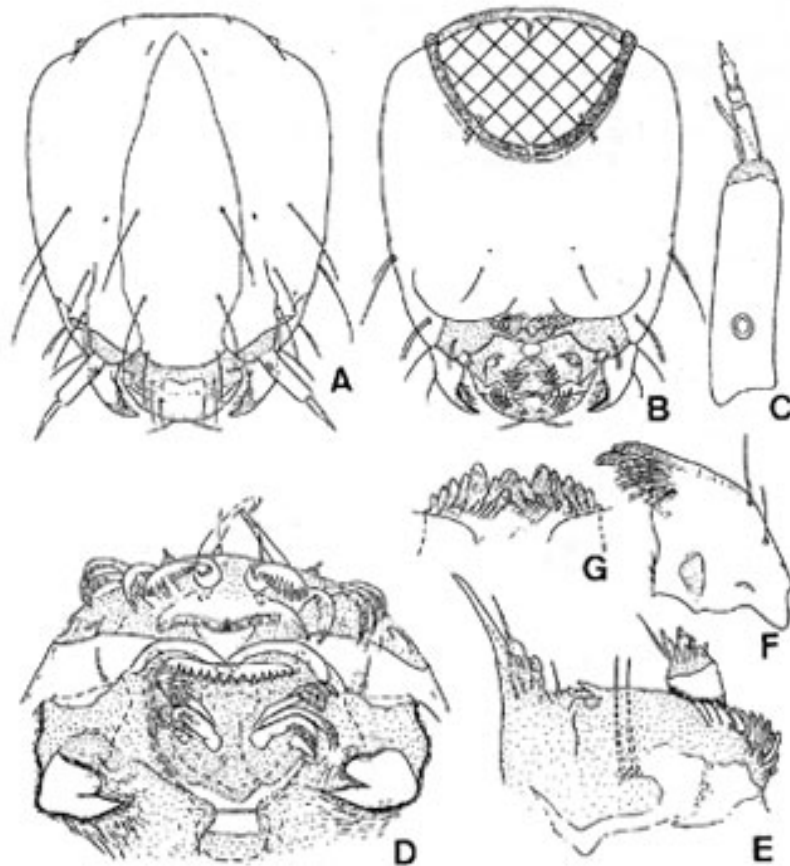
Mentum of type I, centre tooth of type IIA. PE with about 20 uneven teeth

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 3rd 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, but as related to *C. acerbiphilus* is likely to be in the pseudothummi cytocomplex.

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* c.f. *transvaalensis* (not Kieffer 1923)**

In BOLD Bin: [BOLD:AAW3995](#)- members of the *C. transvaalensis* complex but few if any *C. transvaalensis*
 Also claimed to be in [BOLD:AEZ9767](#) - but these specimens are clearly not *C. transvaalensis*

Entries in the BOLD database suggest that *C. transvaalensis* is common and occurs from southern Africa to Pakistan. In fact virtually none of these specimens are actually *C. transvaalensis*. The species is very poorly described, with only the original relatively uninformative description based on females, and Freeman's (1957) note on the anal point and gonostylus. Based on an identification by Freeman, McLachlan (1969) described the larvae and pupae. DNA extracted from these larvae differs significantly from the sequences in the BOLD database, suggesting none of that material is actually *C. transvaalensis*, rather pointing to *C. transvaalensis* being a member of a group of related species – a situation seen in other continents, such as the *C. decorus* complex in North America and the *C. alternans* group in Australia. The present species, described below, is a member of this complex, currently known from Israel and Pakistan.

For completeness, the original description of Kieffer is given below, along with the basics of the Freeman (1957) description:

Type

Described on basis of adult female:

Translation of the Kieffer (1923) type description of the female:

Head yellowish. Eyes separated by less than their terminal width, slightly thinned at the top, this part less long than wide. Frontal lobes very small. Palps long, the 4th article longer. Antennae brownish yellowish, 6th segment brown black, twice as long as the 5th, 2nd narrowed in the middle, neck a little longer than wide, 3-5 with neck a little shorter than the knot (pedicel?). Mesonotum whitish, like the scutellum, three shortened bands, vitelline metanotum and mesosternum, median band divided in its posterior half into two parallel parts and brown black. Halteres greenish white. Wing hyaline, crossvein not darkened, cubital likewise as close to the wing tip as the discoidal, bifurcation beneath the transversal. Legs yellowish white, 5th tarsal segment and the extremity of 1-3 brown black, anterior metatarsus a half longer than the tibia (i.e. LR 1.5), 2-4 sub-equal, 4th twice the length of the 5th. Abdomen brown black, straight, first two segments light greenish. L. 5mm. Transvaal: Mabolli, Lydenburg.

Kieffer, J. J. 1923 Chironomariae de l'Afrique du Sud, par l'Abbé, p.386

Specimens identified as *C. transvaalensis* in Pakistan are an identified member of this group, but the COI sequence differs so much from that of southern African specimens (88 base differences) that it cannot be the same species. It is very likely the same species as that identified as *C. transvaalensis* from Israel, as the COI sequences differ at only 5 base positions.

Hence the following description of the male is probably appropriate also for the Pakistan species – however there appears to be no current name for this species.

A single male from Tivon, Israel was available for examination:

Wing length 3.65 mm long, 850 µm wide, VR 1.03; 4-5 Scf on brachiolum, about 41-42 setae in squamal fringe.

AR about 3.4. Frontal tubercles about 56-66 µm long and 3.7-4 times longer than wide. Palpal proportion (µm) 50 ; 47 : 240 ; 235 ; 260+ (shrivelled). Clypeus about 0.69 of the width of the antennal pedicel with 28 setae.

Thorax very damaged, so numbers of most setae not clear: acrostichal not seen; at least 16 dorsolaterals; 5 prealar; 2 supra-alar; scutellars in 2 rows, at least 6 in the anterior row and 3 in the posterior row, but total would be much higher.

Lengths (microns) and proportions as follows:

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	BR
PI	1370	1220	1842	895	763	710	360	1.51	1.13	2.8
PII	1524	1425	762	420	320	195	160	0.53	1.07	-
PIII	1665	1675	1207	685	540	305	200	0.72	0.99	-

Ta5/Ti = 0.29 PI Ta4&5 darkened

Abdomen unmarked other than a central dark spot on segments II-IV. About 8 setae in individual pale spots in a long narrow region of TIX.



Male terminalia of Israeli specimen of "*C. transvaalensis*"

SVo closest to D(e) type of Strenzke (1959); IVo reaching part way up the anal point and to basal third of the gonostylus, which is moderately swollen and narrows markedly over the distal half with 4+1-5 setae at the tip. Anal point twisted but appears to be narrower at the base and expanded at the end as noted by Freeman.

Adult female and Pupa: No information for this species.

Fourth instar larva: Two female larvae were available for study. The larvae were plumosus-type although no metrics were recorded. The anal tubules are not enlarged as in *C. transvaalensis*, but the ventral pair of one larva were 304 µm long and about 2.5 times longer than wide. Ventral head length about 280-320 µm.

The head capsule has a darkened gula region, covering the posterior 2/3 and at its widest about half-way down from the anterior edge; the frontoclypeus is also darkened. The SAL is 58-71 µm long and 3.8-4 times wider than deep. Mentum width 165-173 µm, 0.54 of the ventral head length; central tooth type III; 4th laterals only slightly reduced in height; IPD about 61-65 µm.

VML about 174-230 µm, width/depth 3.81-4.05, and 1.05-1.23 times the mentum width; with 41-46 striae; VMR 0.26-0.30.

Antenna with basal segment about a third of the VHL and 2.7-3 times longer than wide, with RO about a third to a fifth up from the base; segment proportions (µm) about 95 : 25 : 6 : 11 ; 6. AR 1.84-2.1.

PE comprised of 13-14 sharp pointed teeth (i.e. Type A of Proulx *et al* 2013).
Premandible with inner tooth about 3.3-4 times wider than the outer tooth, teeth coming to a relatively sharp point (type B1).
Width between antennal bases greater than width between S4 setae.
Mandible about 211-230 μm in length, 4th inner tooth darkened but only partly separated (ty. IIC); with perhaps 12-18 furrows on the outer surface at the base; 11-12 taeniae in the PecM; Mdt-Mat 25-28, MTR 0.3-0.43.

Cytology:



Whole complement of polytene chromosomes of *C. c/f transvaalensis* from Israel.

Four polytene chromosomes with the pseudothummi-arm combination AE, BF, CD, G. The sequences show considerable similarity to those of the African *C. transvaalensis*: nucleolus sub-terminal in arm C, puff in arm B subterminal with dark bands on distal side, chromosome AE may have a similar banding pattern in the two species, arm A perhaps close to that of *C. dorsalis*; arm E perhaps similar to *C. holomelas*. BF may also have similar sequences. CD also appears similar, although there is an inversion around the region of the nucleolus that has not been observed in the African population.

However the sequences of arm G are different - no nucleolus but 2 obvious BRs in the Israeli species, while the African species has a nucleolus about a third from one end and three BRs.

For information, McLachlan's (1969) description of the immatures of *C. transvaalensis* is provided:

Pupa: Length 6 mm. Spur of segment VIII with a single straight point. Number of hooks at base of segment II not given. Tergites III-VI with roughly square patches of shagreen, coarser towards the posterior margin in tergites IV and V. Shagreen begins to disappear on TVI. (see Figs. 1e-g below)

Fourth instar larva: McLachlan states that the larva of this species is the largest in the Southern African region (Length 15 mm). His figures (1a-d & 1h) indicate that the larva is probably a plumosus-type. Anal tubules very long (see 1h, below).

The mentum appears very curved in 1b (below) 148 μ m wide with the usual 15 teeth, central tooth closest to type 1B. Antenna short (100 μ m long) with 2nd segment quite long, AR about 1. Mandible shown with pale 4th inner tooth (type 1A); total distance over teeth 70 μ m.

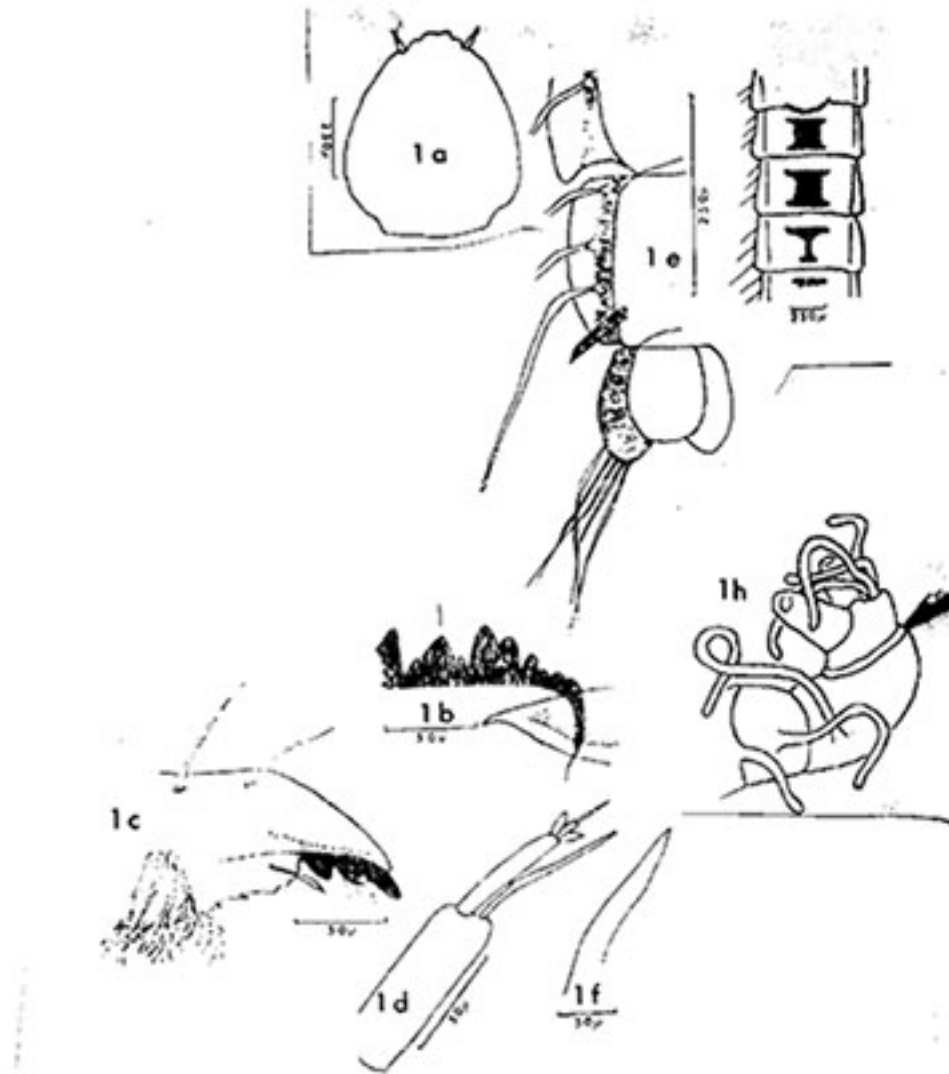


FIG. 1. (1) *Chironomus (Chironomus) transvaalensis*. Larva: (1a) head capsule, dorsal aspect; (1b) labial and paralabial plate; (1c) detail of labial and paralabial plate; (1d) antenna. Pupa: (1e) abdominal segments and anal fin; (1f) tip of filament from respiratory organ; (1g) abdominal tergites 2 to 6.

Illustration of immature morphology from McLachlan (1969)

Cytology: Wuelker, Devai & Devai (1989) and Wuelker et al (2011) published the chromosome banding sequences for Kenya populations:
 Four polytene chromosomes with the pseudothummi-arm combination AE, BF, CD, G.
 The sequences show considerable similarity to those of the African *C. transvaalensis*:
 No heterochromatin at centromeres, nucleoli in arms C and G, inversion polymorphism in arms C and G

transA1: 1-2c, 10-12, 3i-c, 5-9, 2d-3ab, 4d-a, 13-19

transB1: – not mapped, but puff subterminal with dark bands on distal side

transC1: 1-2e, 11d-12b, 2f-6b, 13-15, 8-11c, 6gh, 17a-16, 7d-a, 6f-c, 17b-22 (including nucleolus)

cfransC2: inversion around nucleolus, not known from Africa

transD1: 1-2, 4b-7ec, 12-7f, 19h-a-13, 4a-3, 20-24

transE1: 1-2b, 5-10b, 3e-2c, 4-3f, 10c-13

transF1: 1-2a, 10-3f, 14f-16, 14e-11, 2b-3e, 17-23

c.f.trans G1 – not mapped, but nucleolus not present in Israel/Pakistan specimens, and only 2 obvious BRs (c.f. 3 in Africa)

The African and Israeli species are obviously closely related but have been isolated for long enough for differentiation of *COI* sequence and cytology (at least of arm G) to occur.

Found:

C. transvaalensis

Transvaal (now South Africa) – Maboki, Lydenburg (Type locality).

Kenya – actual location uncertain (Wuelker et al. 1989)

Malawi – Blantyre (-15.78°S, 35.00°E)

Tanzania – pool east of Lake Victoria, Kikuwi River (Wuelker et al. 2011)

C. c.f. transvaalensis

PAKISTAN – BUITEMS, Quetta, Baluchistan (30.1909°N, 66.9612°E) (from BOLD database)

ISRAEL – Tivon Sewage Ponds, Kiryat Tiv'on, Haifa Dist.(31.20°N, 35.75°E)

***Chironomus alpestris* Goetghebuer 1934**

Syn: *Chironomus dorsalis* sensu Strenzke 1959.

Chironomus nippodorsalis Sasa 1979 (Yamamoto and Hashimoto, unpubl.) – incorrect synonymy

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

Along with *C. nippodorsalis*

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*. Specimens, previously called Sp. PK5, from India and Israel are in the same BOLD Bin and differ from *C. alpestris* only in the presence of a complex inversion of arm E.

Given the low heterozygosity of European populations (heterozygosity only of arm G) this could represent a very closely related species.

By 2018, Yamamoto and Yamamoto had decided that *C. nippodorsalis* was not a synonym of *C. alpestris* due to differences in larval morphology.

There also appears to be a difference in the SVo, which is D-type in *C. alpestris* but S-type in *C. nippodorsalis*.

Male: partly from Strenzke (1959):

Wing length 3.3 (3.07-3.60) mm., width 0.82 mm, VR 1.08. AR 3.18 (2.96-3.38); LR 1.61 (1.56-1.66); BR 2.4 (2.27-2.53).

Ground colour of head and thorax grey-yellow, thoracic vittae black, postnotum uniformly black. Legs with tarsal segments dark brown.

Thoracic setae: Acrostichals 10.3 (8-13); dorsocentrals 24.4 (21-28); prealar 5.5 (4-8); supra-alar 1.4 (1-2); scutellar 22.9 (19-26).

Lengths (microns) and proportions as follows:

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	BR
PI	1330	1140	1860	900	790	650	280	1.56-1.66	1.0-1.17	3.2
PII	1410	1285	780	420	300	190	145	0.61-0.65	1.10	-
PIII	1570	1570	1050	600	440	280	160	0.67	1.00	-

$$Ta5/Ti = 0.26$$

Abdominal coloration similar to *C. nippodorsalis*, i.e. ground colour whitish-yellow, and each segment has a dark brown band: posterior on tergite I, but anterior on other tergites, produced posteriorly on segments II and III.

8-10 setae in pale patches (1-2/patch) on tergite IX.



Hypopygium (left) and SVo (right) of *C. alpestris*

Anal point narrow at base; SVo closest to D(e)-type of Strenzke (1959); IVo reaching almost to end of anal point or about 1/3 of gonostyle and with simple setae; anal point narrow at base and expanded at tip; gonostyle only moderately expanded and narrows over posterior half.

Female: (from Strenzke, 1959):

Wing length 3.5 (3-4) mm. Thoracic setae: Acrostichal 14.0 (11-17); dorsocentral 33.7 (29-39); prealar 5.9 (5-7); supraalar 1.7 (1-2); scutellar 32.2 (28-36).

Relative length of Fore leg segments cf. tibia length: Fe 1.24 ; Ti 1.0 : Ta1 1.65 ; Ta2 0.77 ; Ta3 0.70 ; Ta4 0.60 ; Ta5 0.26. BR 1.9 (1.7-2.1).

Abdomen largely grey brown, pale areas at posterior of segments slightly larger than those of *C. nippodorsalis*.

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 medium plumosus-type larva, with VT relatively long and of equal length. Head capsule relatively long and narrow, mentum relatively narrow, mentum width/VHL about 0.49-0.53. Gular region darkened at centre of posterior two thirds, frontoclypeus usually dark but may be lighter, also darkened outside V.

Clypeal chaetae characteristically fringed at the ends; salivarium about 53-58 μm , and 2.6-7.3 times longer than wide.

Mentum (Fig. a) with 4th laterals reduced to level of 5th (type II-iii); width 44-58 μm . 1st laterals tending to curve outwards; centre trifid tooth with c2 teeth well separated (type III).

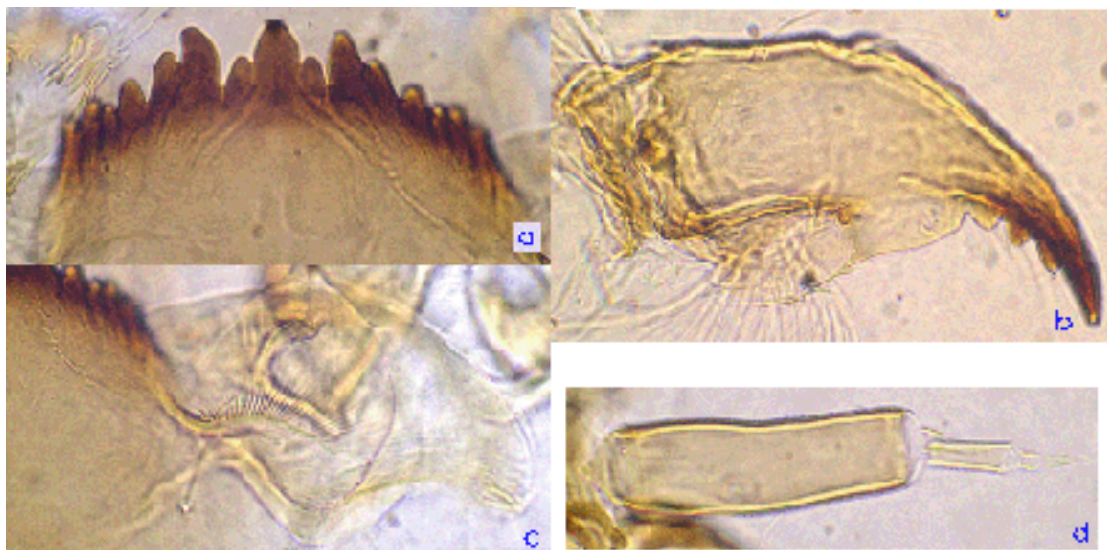
VM (Fig. c) about 282 (255-325) μm wide, separated by about 0.40 of mentum width (IPD) with 39.6 (35-42) striae (Webb et al. 1985).

Pecten epipharyngis with about 12-14 teeth (Webb & Scholl 1985 give 13-16 for European specimens). Premandible with sharp teeth, inner tooth about 1.5 to 2 times wider than outer tooth (Ty. B1).

Antenna (Fig. d) with basal segment about 3.7 times longer than wide, RO about half way up from base; AR about 1.82-2.14, A3 quite short; segment proportions (microns) 123 : 30 : 7 : 11 : 6 (Webb & Scholl, 1985, give slightly different relative lengths, but their measurements are taken from SEM photographs which may give a different view, particularly of segment 1).

Distance between antennal bases may be greater than or about equal to that between the S4 setae.

Mandible (Fig. b) with 3rd inner tooth partly separated and coloured (Type IA-IIB); about 18-20 furrows on the outer surface at the base; 9-10 taeniae in PE.



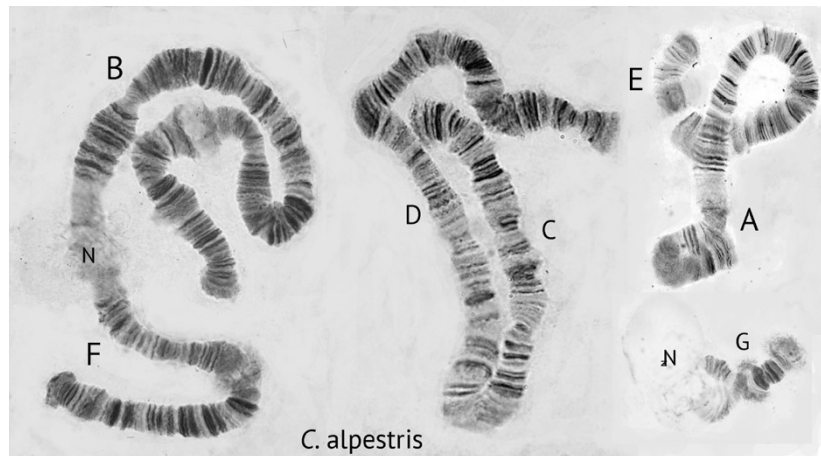
Mouthparts of *C. alpestris*. Note outward curving 1st lateral of mentum.

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. Indian material differs from Russian specimens by the presence of a nucleolus in arm B.

Chromosomal polymorphism is known in arms C (terminal) and 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. Nucleolus near centromere.
 alpC1: 1 - 2f, 11c - 10, 16 - 17a, 6 -2g, 11d - 15, 9 - 7, 17b - 22
 alpC2: simple inversion at distal end of the arm.
 alpD1: 1a(b), 17d - 19d, 10d - 1c(b), 17c - 10e, 19e - 24
 alpE1: 1 - 2c, 8b - 2d, 8c - 9b, 12b - 9c, 12c - 13 i.e. 2 inv. from *nippodorsalis*
 alpF1: 1 - 10, 15 -11, 16 - 23 as *halophilis*, *nippodorsalis*
 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.



C. alpestris
 Karyotype of *C. alpestris*

All mapping from Kiknadze *et al.* 2016 (as *C. dorsalis* sensu Strenzke with *C. alpestris* as a synonym). The Indian material differs from the Russian material in the development of a nucleolus in arm B. Other studies of the cytology have been made by a number of authors.

The synonymy of *C. nippodorsalis* with *C. dorsalis* Strenzke was claimed by Yamamoto and Hashimoto in 1976, and, while this conclusion is supported by the DNA analyses of Kondo *et al.* (2016) based on K2P distance (i.e. same BOLD Bin), and Langton and Visser (2003) list this as a synonym of *C. dorsalis*, there are differences in larval morphology (clypeal chaetae fringed at end, VT of equal length) and cytology that support the recognition of *C. nippodorsalis*. As well, an analysis of actual base similarity by Dr. Kondo showed 8-10 consistent base differences.

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

other locations – JAPAN– Tohoko-chiho, Minamisma and Lake Inawashiro (type locality of *C. inaabeus*), both Fukushima Pref.; Experimental Pond, NEIS, Ibaraki; Shinano River, Honshu (Hirabayashi *et al.* 2007).

INDIA - Jammu: Kabeer colony (32.70°N, 75.00°E); Deoli Village (32.70°N, 75.00°E).

ISRAEL - Mt. Hermon (33.42°N, 35.86°E) (see *C. nippodorsalis*); Matzuva (32.33°N, 35.55°E).

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, although the

distance plot does suggest some specimens have a greater percentage difference.) Dr. Kondo claimed 8-10 consistent base differences in Japanese specimens, while my limited analyses showed no consistent differences, rather a number of unique polymorphisms in each species.

***Chironomus* nr. *alpestris*?**

A single larva from Israel appears to be close to *C. alpestris*, but differs in a number of characters. No gross measurements are available, and the chromosomes were of poor quality.

Fourth instar larva: Probably a plumosus-type larva but no gross measurements located. Head capsule relatively dark; virtually all gula very dark and coloration widest at the base. Ventral head length 411 μm . Clypeal chaetae fringed at ends as in *C. alpestris*; salivarium about 86 μm , and 3.4 times longer than wide.

Mentum with teeth quite worn; 4th laterals not reduced (type I), central trifold tooth with c2 teeth well separated, possibly type III? Ventromental plates about 280.5 μm in width and 4.01 times wider than deep; IPD about 0.40, with at least 46 striae. PE with 15 long pointed teeth (type A).

Premandible with sharp teeth, inner tooth about 4-5 times wider than outer tooth (ty. B2).

Antenna with basal segment relatively wide, about 2.3 times longer than wide, ring organ about 0.4 up from base; AR about 2.24; A1/A2 3.94; A3 quite short, abt 0.54 length of segment 4; segment proportions (micron) 140 : 35.5 : 7.5: 14 : 5.5.

Distance between antennal bases (231 μm) slightly greater than that between the S4 setae (223.5 μm), which are separated by 0.77 of the mentum width; S5 setae abt. level with nearby RO.

Mandible with 3rd inner tooth well developed and quite dark (type IIIC); about 46 furrows on the outer surface at the base; 12 taeniae in PMA; MTR 0.34.

Cytology: There are 4 polytene chromosomes, but their poor condition made it impossible to determine the arm combination. Arm G has an essentially terminal nucleolus, apparently the only one in the karyotype.

Found: ISRAEL – Matzuva (32.33°N, 35.55°E), Western Galilee.

The most obvious differences from *C. alpestris* are the much larger number of striae on the ventromental plates and furrows on the mandible (abt. twice the number in *C. alpestris*). The head is probably relatively wider than the narrow one of *C. alpestris*.

It differs from *C. nippodorsalis* (below) by those same VM and mandibular characters, as well as the fringed clypeal setae.

***Chironomus nippodorsalis* Sasa 1979**

As new name for *C. strenzkei* Sasa 1978 – name preoccupied.

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

C. sp. “shimantoabeus” Sasa, Suzuki & Sakai 1998 (sometimes spelt “simantoabeus”)

Incorrectly placed as a synonym of *C. alpestris*, to which it is closely related, but M. Yamamoto has noted some differences in the larva, and there is at least one different sequence in the polytene chromosomes and some different polymorphic base pairs in the Barcode sequence (see below).

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

Along with *C. alpestris*.

Adult:

Male: Wing length 3.40-3.60 mm, width, 0.82 mm. VR 1.08. AR 2.96-3.1. BR 2.0. Coloration generally brown to yellow, with dark brown markings on thorax and abdomen. Vittae almost uniformly dark brown; scutellum yellowish brown, postnotum dark brown.

Head: FT small, abt 18-24 µm. 26 clypeal setae.

Palps (microns) (segs II-IV): 90 : 250 : 260 : 390 (Sasa 1978): P5/P4 1.50; P5/P3 1.56.

Indian specimens: 55 ; 53 : 215 : 230 : 275; P5/P4 1.20; P5/P3 1.28.

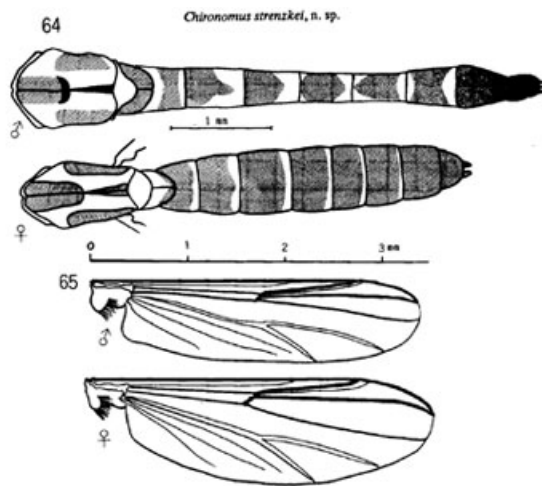
Thoracic setae: Acrostichal - at least 9; Dorsocentral - 21-22; Prealar - 8;

Supra-alar - 1; Scutellar in two rows - anterior 8, posterior 14 (total 22).

Legs with dark knees, tibia and tarsi; no beard.

Lengths (micron) and proportions

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	BR
PI	1330	1140	1860	900	790	650	280	1.63-1.75	1.17-1.18	2.0-2.6
PII	1410	1285	780	420	300	190	145	0.60-0.61	1.10-1.11	
PIII	1570	1570	1050	600	440	280	160	0.67-0.72	1.00-1.03	



From Sasa 1978 (as "*C. strenzkei*")

Abdominal colour pattern (see above) noted as key diagnostic character: ground colour yellow/greenish-yellow, and each segment has a dark brown band: posterior on tergite I, but anterior on other tergites, produced posteriorly on segments II and III.

About 5 setae on tergite IX.

Anal point slender, expanded distally; SVO is a little 'beak-like' (S(b) type of Strenzke 1959), but beak is quite short; IVO with about 13 simple, recurved setae. Gc moderately expanded c.f. Gs, which narrows relatively slowly from about half way.

Female:

Coloration generally as in male, except that the abdominal segments do not have the conspicuous pale bands. Thoracic ground colour grey, with vittae black or dark brown, scutellum brown, postnotum nearly black. Leg coloration as in male. Abdominal tergites almost entirely black.

Wing length 3.6 mm, width 1.1 mm.

Antennal proportions (micron): 110 : 110 : 130 : 130 : 240. AR 0.5; A5/A1 2.18.

FT small 15 µm long and 13 µm wide.

Palp proportions (segs 2-5) (micron): 60 : 220 : 240 : 350: P5/P4 1.46; P5/P3 1.59.

Leg lengths (micron) and proportions:

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	Ta4/Ti
	1830	1440	2760	1420	1320	1270	450	1.92	1.27	0.31
PII	1810	1730	1000	540	390	220	190	0.58	1.05	
PIII	2030	2030	1440	810	630	370	210	0.71	1.00	

No details of female genitalia.

Pupa: Sasa notes only that the spurs of segment VIII have 3-4 spines.

Fourth instar larva: a medium plumosus type. VT relatively long, anterior with elbows, posterior pair coiled; anterior pair longer. Head capsule relatively long and narrow, mentum relatively narrow, mentum width/VHL about 0.49-0.52. Gular region darkened over posterior 2/3, FC dark, also darkened outside clypeus. Labral chaetae smooth in outline; salivarium about 89-91 µm, and 5.8-7.3 times longer than wide.

Mentum with 4th laterals reduced to about the level of 5th laterals (type II), 1st laterals tending to curve outwards; central trifold tooth with c2 teeth well separated (type III).

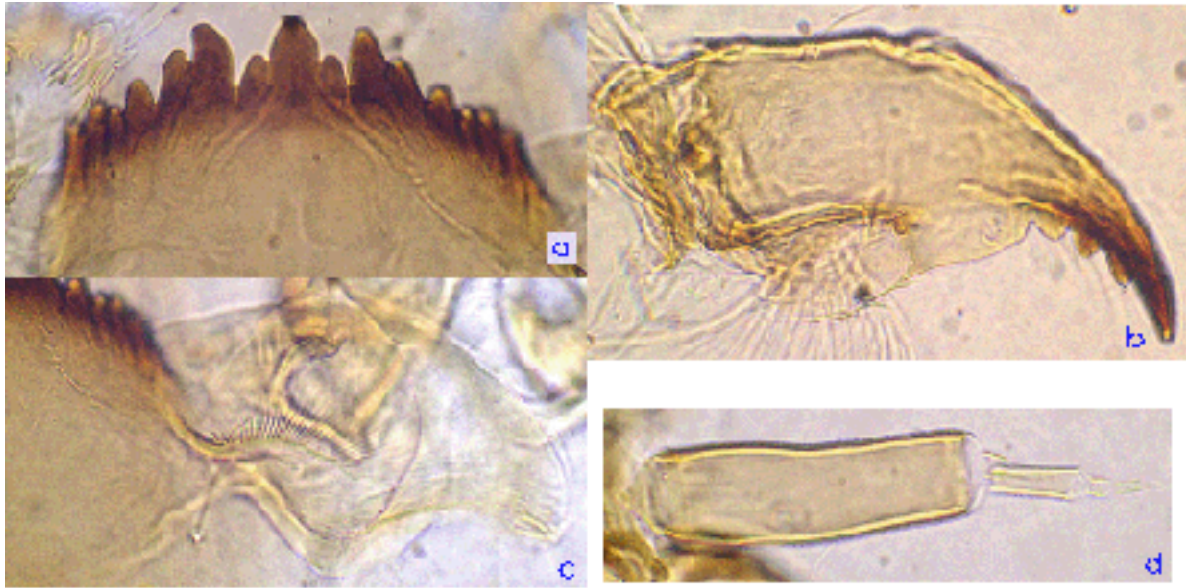
Ventromental plates about 197.5 (189-203.5) µm wide and 3.83 (3.67-4.03) wider than deep, IPD about 60 (56-66) µm (0.40 of the mentum width), with about 31.1 (19-51) striae. PE with about 12-14 long pointed teeth (type A) when not worn.

Premandible with sharp teeth, inner tooth about 2.4-3.2 times wider than outer tooth (Ty. B1 or B2).

Antenna with basal segment about 3.2-3.4 times longer than wide, ring organ about a third to half way up from base; AR about 1.6-2.3, A3 quite short; segment proportions (microns) 107 : 27 : 7 : 16 : 6.

Distance between antennal bases may be greater than or about equal to that between the S4 setae, which are separated by 0.75 of the mentum width; dorsal RO very slightly posterior to S5 setae.

Mandible with 3rd inner tooth well developed, but only moderately coloured (type IIIB); about 19.3 (16-22) furrows on the outer surface at the base; 11.6 (10-13) taeniae in PMA; Mdt-Mat 18-29; MTR 0.28-0.36.



Mouthparts of *C. nippodorsalis* larva
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, which is closely paired and has three BRs, the largest about 1/3 from the other end of the arm. No nucleoli in the long chromosomes.

No polymorphism in 5 specimens examined. Very similar to *C. alpestris* but differs by a complex inversion in arm E.

nidA1: 1 - 2c, 4 - 9, 2d - 3, 12 - 10, 13 - 19	as <i>alpestris</i>
nidB1: Puff (gp.7?) distal of centre of arm with some dark bands distal	as <i>alpestris</i> ?
nidC1: possibly 1 - 2f, 11c - 10, 16 - 17a, 6 - 2g, 11d - 15, 9 - 7, 17b - 22	as <i>alpestris</i> ?
nidD1: possibly 1a(b), 17d - 19d, 10d - 1c(b), 17c - 10e, 19e - 24g	as <i>alpestris</i> ?
nidE1: 1 - 2c, 8b - 6, 3 - 2d, 8c - 9, 4 - 5, 12a - 10, 12b - 13	i.e. In5-9 and In9-3 from <i>alpestris</i>
nidF1: possibly 1 - 10, 15 - 11, 16 - 23	as <i>halophilus</i> , <i>alpestris</i>
nidG1: large terminal nucleolus and at least 1 BR in distal part of arm	

Found: JAPAN – NIES, Ibaraki, Tsukuba, Honshu (type locality)
Lake Inawashiro, Fukushima Prefecture (type locality of *C. inaabeus*)
INDIA – Deoli Village (32.56°N, 74.80°E); ponds at University of Jammu, (as sp. PK5) (32.73°N, 74.87°E); Kabeer colony (32.70°N, 75.00°E); all Jammu.
ISRAEL - Mt. Hermon (33.42°N, 35.86°E); but could be *C. alpestris*.

Yamamoto and Yamamoto consider *C. nippodorsalis* differs from *C. alpestris* in the length of the VT (about equal in *C. alpestris* but anterior pair much longer in *C. nippodorsalis*). As well, the labral chaetae, which are serrated on the anterior portion in *C. alpestris*, are quite smooth in *C. nippodorsalis* (Yamamoto, pers. comm., and see above)

Molecular:

MtCOI sequence from *Chironomus nippodorsalis*, *C. dorsalis* sensu Strenzke 1959 and *C. alpestris* is in GenBank and the BOLD databases (where all are in the same BIN). However, the identification of many specimens is dubious.

***Chironomus bicoloris* Tokunaga 1964**

There is doubt that this species does occur in the oriental region. Karunakaran claimed to have specimens, but it is more likely that she had an undescribed species.

***Chironomus (Chironomus) bicoloris* Tokunaga, n. sp. (fig. 10, f).**

Large yellow species, allied to *plumatisetigerus*, but distinguished from it by smaller frontal tubercles (at most as long as two facets) and dark brown subtriangular or oval markings of scutal vittae. AR about 3.1; LR 1.6-1.7; frontal tubercles small, only as long as 1.5 times of diameter of facet in male and two facets in female; scutal vittae of thorax yellow and with four dark-brown spots, two of these spots elongate subtriangular on posterior half of median vittae and other two on anterior parts of lateral vittae; legs with knee parts dark brown, but knee joints very narrowly pale and usually posterior two pairs with knee parts faintly brownish, rarely tibial base without brown marking; tibial apical ends usually brownish, but in fore leg very faint and sometimes quite pale.

Male: Body 6.18-6.24 mm. long; wings 2.96-3.15 mm. by 0.8-0.82 mm. Head yellowish brown or yellowish pale brown, with mouthparts more brownish, frontal tubercles small, at most as long as 1.5 times diameter of facet, eyes separated above by one-seventh to one-eighth length of eye; palpal segments about 22.5: 17.5: 70.5: 84.5: 112.5; antenna with scape yellowish brown, flagellum and plumose hairs brown, AR 3.1 (3.08-3.11). Thorax mainly yellow, scutum pale yellow, with four yellow vittae and four subtriangular dark brown spots on vittae, scutellum pale yellow, with 15 to 17 bristles along caudal margin and 19 to 27 small setae scattered on anterior part, postscutellum dark brown on anterior half and yellow on caudal half. Legs mainly yellow or pale brownish yellow, but all knee parts dark brown and joints very narrowly pale, all tarsal segments apically brown, last one or two segments somewhat more brownish, fore tibia sometimes pale brown at tip, other tibiae usually more brownish at distal ends and sometimes basal brownish bands absent; LR about 1.69, RL-FT about 115: 99.5. Wing with veins very pale, but fR and r-m dark and covered by small dark spot, fMCu under end of r-m, RL-V 94.3: 70: 110: 94.3. Halter white or yellowish white. Abdomen pale brown, gradually fuscous brown caudad, tergites with somewhat T-shaped basal bands; hypopygium (fig. 10, f) brown, anal point slender, style slender, apical half suddenly tapered, dorsal appendage with basal pubescent part oval and setigerous, bare caudal projection not distinctly swollen or curved at tip, ventral appendage almost straight, slightly clavate, with 13 to 15 long curved apical bristles, some of these bristles finely plumose apically.

Female: Body about 6.76 mm. long; wings about 3.33 mm. by 0.98 mm. Generally similar to male, but lateral scutal vitta more brownish. Head with eyes separated above by one-sixth to one-seventh length of eye, frontal tubercles small and about as long as two facets; palpal segments about 25: 25: 85: 99: 143; antenna almost entirely pale brownish yellow, neck parts of intermediate flagellar segments as long as half of segments, six-segmented (25: 64: 45: 50: 41: 69). Scutellum with about 20 bristles along caudal margin and about 25 small setae scattered on anterior part. Leg with RL-FT about 130: 111. Wing with fMCu under origin of r-m, RL-V about 96: 87: 135: 102. Abdomen almost uniformly very pale brown or pale brownish yellow, anterior tergites 2 to 6 with very faint broad fuscous clouds, ultimate segment and cerci brown.

Tokunaga's (1964) description of *C. bicoloris*.

Type data: holotype USNM US66552 adult male, paratype(s) USNM 2 adult males.

Type locality: Dugor, Weloy, Yap Island.

Australia

Additional information on this species, including the immatures, is known only from northern Australia.

Adult:

Male:

Wing length: 3.34-3.76 mm; wing width 0.82-0.86 mm; VR about 1.0. Brown spot over crossvein; usually 4, or 3, Scf on brachiolum; 22-23 setae on squamal fringe. AR about 3.10-3.16.

FT longer than in Micronesian specimens - about 50-60 micron and 2.5-2.8 times longer than wide - longer than the width of two eye facets. Clypeus width about 157-170 µm, about 0.75 of diameter of antennal pedicel; with about 27-33 setae.

Palp proportions (micron): 66 : 64 : 253 : 249 : 436; P5/P4 1.75; P5/P3 1.72.

Thorax green, vittae, postnotum and sternopleuron reddish brown, vittae with 2-3 darker markings; setae - about 19 acrostichal; 26-30 dorsocentral; 1 prealar; 6-7 prealars; 28-37 scutellar – 12-17 in 1 or 2 anterior rows and 16-20 in posterior row. Legs with femur and tibia greenish, tarsi yellowish with at least slight darkening of knees and at tips of tarsi.

Lengths (microns) and proportions as follows:

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	BR
PI	1460	1405	2275	-	-	-	-	1.62	1.04	-
PII	1540	1485	940	530	390	215	150	0.63-0.67	1.06	-
PIII	1675	1825	1355	750	600	350	155	0.73-0.75	0.93-0.94	-

Abdomen greenish proximally, anterior segments with proximal dark band which becomes larger in the more posterior segments until whole segment is darkened.



C. bicoloris: Male hypopygium (left) and superior volsella (right)

Setae on tergite IX: 14.3 (13-16) in individual pale patches within a larger pale patch. IVo reaching to about the end of the anal point; setae forked. SVo of the E-type (see above) (most like ‘h’ of Strenzke 1959) but with what appears to be slight folds at the tip; gonostylus usually slender and tapers gently over posterior half, with 4 long and 1 shorter setae at the distal end.

Female: Based on a single specimen from near Sarina Beach, Queensland (AQ.66.1).

Colour yellowish, with brown vittae; legs as in males.

Wing length 3.42 mm., width 0.89 mm.; VR 0.91. 3-4 Scf on brachiolum; 17-18 setae on squamal fringe.

Relative length of antennal segments (micron) (proportion of neck in brackets): 164 (0.25) : 109 (0.38) : 124 (0.44) : 118 (0.45) : 182; AR 0.35, A5/A1 1.11. FT about 22 µm long and 2.5 times longer than wide. Clypeus about 1.7 times the diameter of the antennal pedicel, with 35 setae. Palpal proportions (micron) 63 : 48 : 188 : 250 : 385 (P5/P4 1.54; P5/P3 2.05).

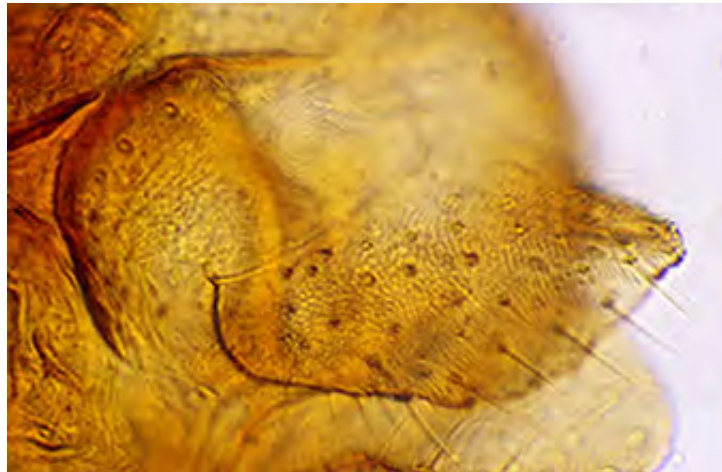
Thoracic setae: Acrostichal abt 14; Humeral 5-6 linear; Dorsocentral 22 (Humeral+dorsocentral 27-28); Prealar 3; Supraalar 1; Scutellar with 2 rows – 7 in anterior row and 10 in posterior row (total 17).

Leg lengths (micron) and proportions:

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	Ta4/Ti
PI	1315	935	1770	860	760	705	340	1.89	1.41	0.73
PII	1265	1140	660	350	250	190	135	0.58	1.11	-
PIII	1355	1380	950	510	410	270	160	0.69	0.98	-

BR 1.52

Segment X crescent shaped, about 3.9 times longer than its greatest width and with 9 setae.



Cercus and segment X (at left) of *C. bicoloris*

Cercus shorter on the dorsal margin, posterior margin slightly curved towards ventral end and merging into the longer ventral margin with a basal bulge.

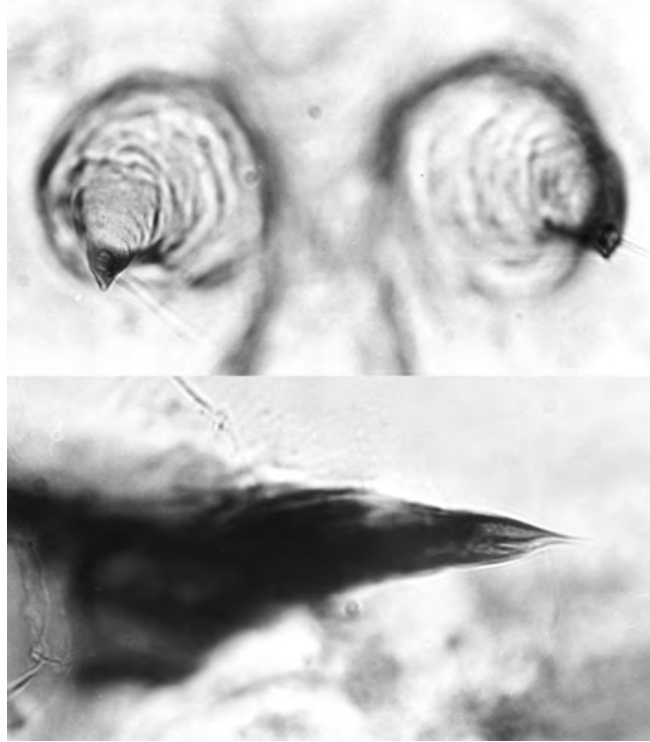
Pupa: Not previously described. One male and one female exuviae are available. Colour yellow brown, with darker yellow brown cephalothorax and muscle scars. Shagreen sparse in centre of TI, on posterior 2/3 of TII, posterior 3/4 on TIII and TIV, 5/6 on TV, more midline constrained on TVI, mainly on centre line of TVII but with gap along midline, and sparse on anterior with gap in midline of TVIII.

Length about 6.75 mm (male) and 7.07 mm (female), inner margin of wing case 1.42 (f)-1.59 (m) mm. Cephalic tubercles small, 53 x 46 µm (male) (below); 45x50 µm (female), with subterminal seta at least 43-53 µm. Female antennal sheath about 660 µm.

Basal scar about 122 x 68 µm, slightly narrowed in middle, and respiratory base filling almost whole space; HR about 1.71-1.96. Irregular patch lateral/ventral of scar, about 150x75 µm in size.

L-seta at anterior margin of intersegment of III/IV not seen, on IV/V about 56 µm long. Hook row of segment II occupying about 76-79% of segment width, 92-94 simple recurved hooks.

PSB relatively large on segment II, small on segment III; large PSA on segment IV (abt 151-177 x 101-110 µm) about 26-32% of the segment length. PSB on segment V still relatively large; that on segment VI small with just spines.



Cephalic tubercles and spur of segment VIII of male pupa

Caudolateral spurs of segment VIII have 1-2 spines. About 72 (male) – 83 (female) taeniae, initially uniserial, then partly biserial, with some places triserial, on each side of swim fin.

Fourth instar larva: a medium sized plumosus-type larva (length (female) about 15.2 mm). Anterior VT (1.06 mm) shorter than posterior pair (1.40 mm); TLt about 320 µm. Gula pale or sl. dark over post 1/2; FC pale or very slightly darkened. Clypeal aperture about 99x15 µm, i.e. 6 times longer than wide.

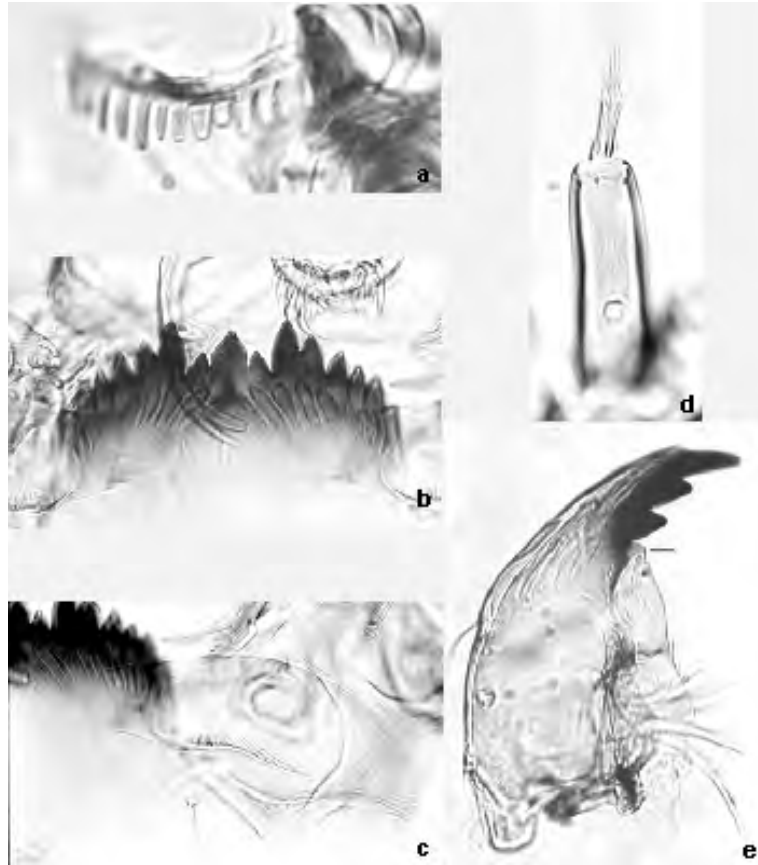
Mentum (b, below) with sculpturing along ventral surface and relatively sharp broad teeth; c2 teeth of central trifold tooth well separated from c1 tooth (type IB-IIA), 4th laterals slightly reduced (type I-II).

PE (a, below) with about 16-18 teeth (type B). Ventromentum (c, below) about 4.3 times longer than deep; with about 36-39 striae; distance between VM plates about 0.28-0.38 of mentum width; VMR about 0.32-0.33.

Distance between the antennal bases probably greater than that between the S4 setae, which are separated by about 70% of FC width at that point.

Antenna (d, below) with basal segment about 3.5 times as long as wide, RO just over a third up from the base; AR about 2.43-2.54; A2/A1 about 0.19-0.20; antennal proportions: 127 : 24 : 7 : 13 : 6.

Mandible (d, below) with third inner tooth only slightly separated and darkened (Type IA-B), and with about 13-20 furrows on outer surface at the base and about 7-10 taeniae in PMA, which appears to run down and away from the inner teeth (just visible in d, below).



Larval mouthparts of *C. bicoloris*

a. Pecten epipharyngis; b. Mentum; c. Ventromental plate; d. Antenna; e. Mandible.

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

Arm G closely paired with a small subterminal nucleolus. Main nucleolus near middle of arm C. Polymorphism at least in arm A.

bicA1: 1 - 2c, 10 - 12, 3i - 2d, 9 - 4, 13 - 19

as *holomelas*?

bicA2: approx 1 - 2c, 10 - 12, 3ih, 6 - 9, 2d - 3g, 5 - 4, 13 - 19

bicB1: typical bands (groups 23-28) near centromere, puff (group 7) near middle of the arm

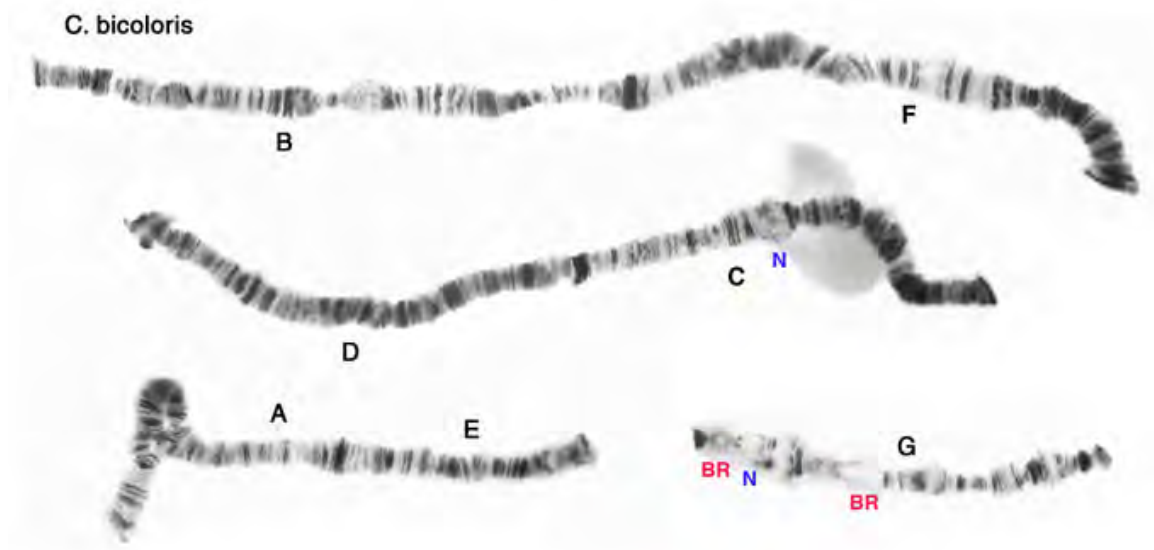
bicC1: NOR near middle of the arm with groups 3-4 immediately distal to it

bicD1:

bicE1: possibly 1 - 3a, 5 - 10b, 4h - 3f, 10c - 13 i.e. as in *aprilinus*, *atrella*, *athalassicus*

bicF1: Groups 9-7, 14-15 about 1/3 from end of arm.

bicG1: Small subterminal nucleolus, with a BR between the NOR and the centromere, and another just proximal of the middle of the arm.



Polytene chromosome complement of *C. bicoloris*
Note arm A is heterozygous A1.2

The arrangement of the PMA on the larval mandible appears to be unique among *Chironomus* species. The other distinguishing features are the male SVo and the darker markings on the thoracic vittae.

Found: **Micronesia** - Caroline Islands: Pelau Islands and Yap Island.

Also found in **Queensland** - Lake Boemingen and Lake Wabby (25.27°S; 153.80°E), Fraser Island (H. Burton, light trap) (25.15°S, 153.10°E); 3 km w. Sarina Beach (21.40°S; 149.25°E).

***Chironomus palpalis* Johannsen 1932**

Adult:

Johannsen's 1937 description of the adults:

38. *Chironomus palpalis* n. sp.

Male. Yellowish species, perhaps greenish in life; mesonotum with three ferruginous vittae; tergites each with a broad, transverse pale brown fascia, the last two segments more or less wholly pale brown; hypopygium yellowish; legs bicolored. Eyes separated on the front by a distance nearly equal to a fifth the width of the head; frontal tubercles lacking; twelfth antennal segment over 3.5 times as long as segments 2–11 combined; palpi broken off. Pronotal collar slightly though distinctly emarginate. Spur of ninth tergite produced beyond the tips of the inferior appendage, the latter rounded and enlarged at the ends with recurved hairs; superior appendages short and stout, curved, bare, scarcely attaining the end of the basistyle; dististyles with about four short stiff hairs on inner mesal margin near apex (fig. 22). Legs yellow; basal fourth of fore tibia and extreme apices of all of them, brown; apices of tarsi and tips of the first three or four tarsal segments of the middle and hind feet, dark. Empodium nearly as long as the claws; pulvilli large and broad; both combs of each tibia of middle and hind legs, bearing a short spur, fore tarsi broken off. Wing hyaline; crossvein not dark, posterior branch of the radius ends about as far in front of the wing tip as the media does behind it; cubitus forks distad of the crossvein. Squama with fringe. Halteres pale. Length 3.5 mm. Reared from a larva collected in the water of a hollow bamboo stump, in the forest of Tjurup, South Sumatra, June 7.

A teneral male specimen reared from a larva taken in Lake Ranau, at a depth of 45 meters, South Sumatra, January 26. In this specimen the fore basitarsus is 1.7 times as long as the tibia and the fore tarsi are not bearded.

A female specimen from the same source has a six-segmented antenna with intermediate segments flask-shaped, with necks as long as the bulbous part. In it the crossvein is slightly darkened.

Male:

Yellowish species, perhaps greenish in life. AR about 3.5; LR about 1.7, foretarsus without beard. Length 3.5 mm.

Head lacking frontal tubercles, palpi broken off.

Thoracic vittae ferruginous; Abdominal segments with transverse brown fascia, final two segments almost wholly pale brown, hypopygium yellowish.

Wing hyaline, crossvein not darkened.

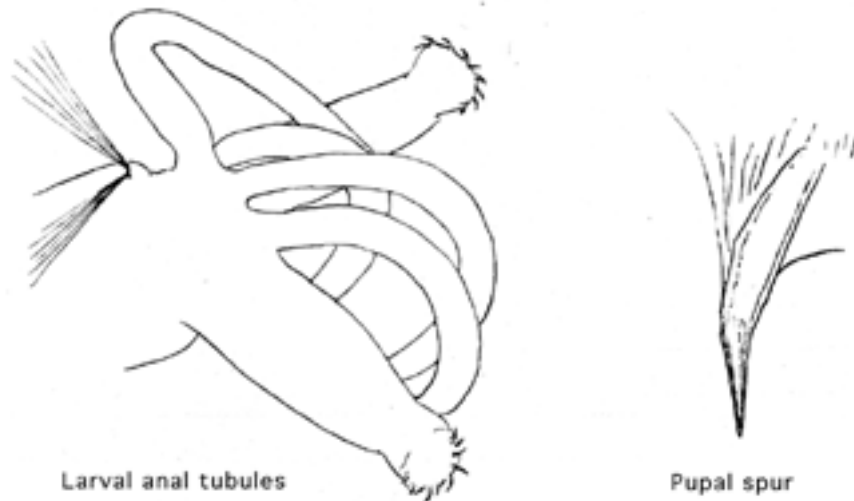
Genitalia briefly described as:

SVo short and stout of S-type, closest to 'b' of Strenzke (1959). Anal point with slightly expanded tip, extending slightly beyond the IVo which is shown with simple setae. Gonostyle relatively narrow and narrowing gently over posterior half, with 4 setae at tip.

Female:

Only briefly mentioned in original description as having a six segmented antenna with intermediate segments flask-shaped, with necks as long as the bulbous part. Crossvein of wing slightly darkened.

Immatures described 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).

Larva: a medium sized [plumosus-type](#) larva, about 13 mm long; long ventral tubules and long lateral tubule on segment 10; very long anal tubules (see figure above).

Larva collected from water in a hollow bamboo stump, and a male and female reared from larvae collected at 45 m in Lake Ranua.

Found: SUMATRA Type locality – Tjurup and Lake Ranua.

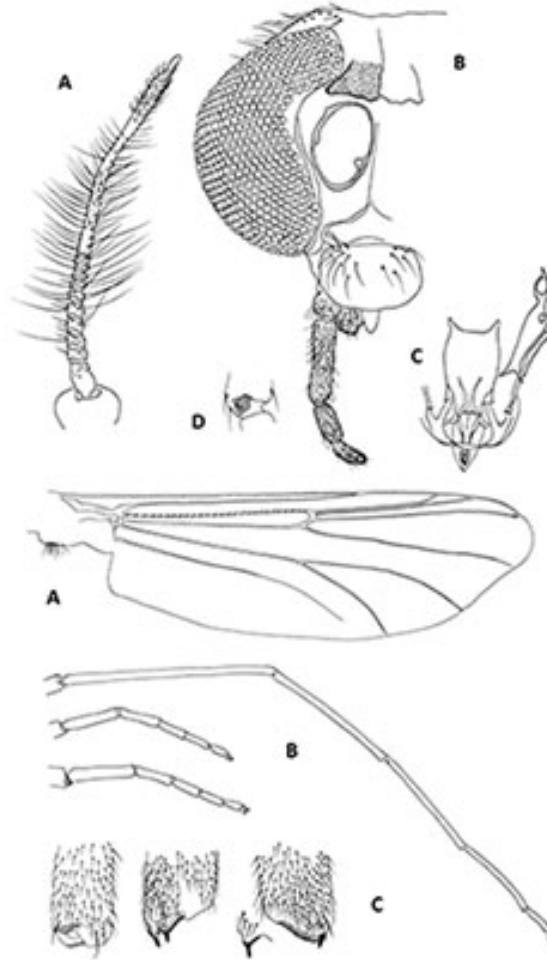
***Chironomus gelhausi* Bouchard 2022**

Adult:

Male:

Total length 9.80 (8.40-13.47) mm. Wing length 4.15 (3.79-4.32) mm. Wing length/length ant. femur 4.48 (3.99-6.09).

Colouration: Head brown to pale brown, wings hyaline and without markings; apical tip truncated; VR 1.07 (1.02-1.11); 4 (3-5) Scf on brachiolum; 18 (13-29) setae on squamal fringe; apical tip truncated.



From Bouchard et al., 2022

Head: Antenna with 11 segments but antennal plume reduced; AR 1.54 (1.27-1.70). Temporal setae: 3-8 inner verticals; 6-14 outer verticals and 7-16 postorbitals. Clypeus with 16 (5-22) setae. F/T 114 x139 μm (i.e. 12% wider than long). Palp segments (means) 92 : 75 : 235 : 141 : 131; P5/P4 0.55-0.97, P5/P3 0.56-0.57. Thorax with well-developed tubercle. Anteprepronotum with no setae. Thoracic setae: acrostichals 6, short & decumbent; Dorsocentrals 15 (10-19); prealars 9 (7-11); scutellars 10 (6-15). Legs: Mid and hind legs reduced in length. Spur of hind tibia reduced or missing on some specimens. No beard on anterior tarsi.

Lengths (in μm) and proportions of legs of *Chironomus gelhausi* male (n = 15).

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	BV	SV	BR
PI	1982-2405	1896-2276	1998-2426	1290-1711	1055-1425	817-1173	361-490	1.02-1.13	1.42-1.76	1.82-2.02	0.52-0.90
PII	1790-2986	1825-2195	611-734	361-466	320-386	250-310	226-264	0.30-0.36	3.51-4.49	5.49-7.69	0.37-0.54
PIII	1954-2393	1848-2320	649-854	404-473	310-379	250-303	225-264	0.30-0.38	3.72-4.20	5.49-6.41	0.34-0.60

TIX covered with microtrichia, with no median setae anterior of the anal point and 50 (39-61) setae on each side of the base of the anal point; anal tergite bands forming a shallow “U” and not reaching the base of the anal point. Anal point broad, parallel sided and rapidly constricting to a small point. Transverse sternapodeme nearly straight. SVo perhaps closest to S-type E of Strenzke (1959) but unusual in having

setae on ventral surface; IVo very long and narrow with simple setae. Gonostyle essentially an extended triangle, not reaching the end of the IVo. The hypopygium is rotated up to 180° in all specimens examined.

Female:

Total length 8.79 (8.53-9.24) mm. Wing length 5.11 (5.02- 5.24) mm. Wing length/length profemur 4.63 (4.32-5.07). Colouration as in male.

AR 0.57 (0.51-0.67). Flagellomere length (µm): 245 : 127 ; 117 ; 133 ; 353 : A5/A1 1.44. FT 76 x 96 µm, i.e. length 79% of width. Clypeus with 28 (22-33) setae. Palpal segments (µm) 92 : 68 : 251 : 129 : 155: P5/P4 1.06-1.20; P5/P3 0.62-1.03.

Thorax with well-developed tubercle, antepnotum with no setae. Setae: no apparent acrostichals; dorsocentrals 15 (13-19) (no indication as to whether any humerals); prealars 8 (7-9); Scutellar 11 (7-16) uniserial.

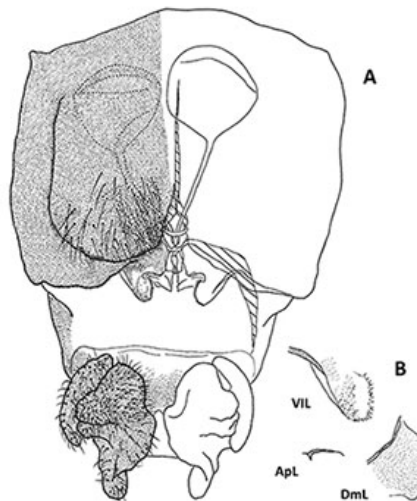
Wing with apical tip truncated as in male; VR 1.10 (1.08-1.11). 4(3-4) Scf on brachiolum; 16 (14-17) setae on squama.

Legs: Mid and hind legs reduced in length.

Lengths (in µm) and proportions of legs of *Chironomus gelhausi* n. sp. female (n = 3).

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	BV	SV	BR
PI	1821	1817	1766-1839	973	728-771	609-648	322-336	0.97-1.01	1.93-2.01	1.98-2.10	0.81-0.99
PII	1958	2017	738-768	479	404-405	313	230	0.35-0.38	3.31-3.32	5.18	0.61-0.99
PIII	2165	2260-2288	1276	853	671	471	266	0.56	2.47-2.53	3.38-3.49	0.75-0.76

The original data for this table seems confused so there is no guarantee that it is accurate



From Bouchard et al., 2022

Abdomen: TVIII with 34 (32-37) setae; Sternite VIII with 149 (122-179).

Genitalia: Gonocoxite IX without setae; tergite IX with 53 (51-56) setae.

Gonocoxapodeme rounded and not joined mesally. Cercus 393 (355-424) µm long.

Gonopophys VIII divided into a dorsomesal lobe and well-developed ventrolateral lobe: apodeme lobe weak, without microtrichia; Segment X expanded forming a collar around basal half of cerci.

Pupa and Larva unknown.

Chironomus gelhausi is difficult to place within the genus *Chironomus* because of the many specializations related to surface mating. It shows some similarity to *Fleuria* and others to *Benthalia*. However, currently, it is best to place it within the broad context of the genus *Chironomus*.

Found: MONGOLIA - Hovsgol Aimag, Moron Soum, Tunamal Nuur, 5.5 Km west of Arbulag, (49.899°N, 99.394°E) (type locality).

***Chironomus* species R&S**

It is possible that this is the same species as PK7, but too little information to be certain. **Adult, Pupa and Fourth instar larva:** Not available, only polytene chromosome descriptions.

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* if the small nucleolus on arm G could not be distinguished. On the other hand, if there is no nucleolus on arm G, it could be *C. ramosus*.

Found: India - vicinity of Ujjain and Gwailor (abt. 23.20°N, 76.00°E), Madhya Bharat, India.

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.

DNA sequence: No BARCODE sequence available.

***Chironomus bharati* Singh & Kulshrestha 1976**

Has been listed as a synonym of *C. circumdatus*, but the anal point as described by Maheshwari (1989) from the original material, is quite different. – see below. Redescribed by Maheshwari, 1989, who notes that the original description actually described the female of *C. uttarpradeshensis* by mistake.

Adult:

Male:

Head light brown, antenna yellow. Thoracic vittae yellowish-brown; antepnotum light brown; scutum and scutellum pale green, postnotum light brown.

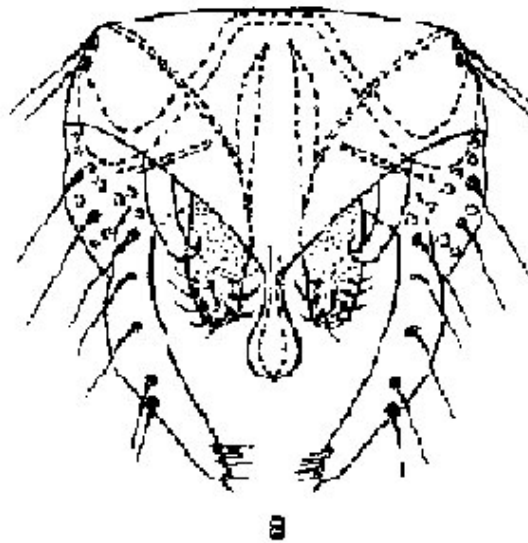
Wing with crossvein r-m dark. Wing length 3.12 mm, VR 1.07-1.10

Legs yellowish green, anterior tibia darker at proximal end; mid femora with apical hook-like projection; each tarsal segment with 5-18 prominent setae at distal ends.

Leg lengths (micron) and proportions:

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	Ta5/Ti
PI	1320	1200	2080	970	850	730	360	1.73	1.10	0.30
PII	1320	1230	740	430	290	180	140	0.60	1.07	
PIII	1560	1530	1120	600	450	270	170	0.73	1.02	

Abdominal terga II-V with well-marked brown median spots; genitalia brown.



Male terminalia of *C. bharti* from Maheshwari (1989)

Hypopygium with spatulate anal point. IVo extending about to distal swelling of anal point and shown with simple setae.. Gonostylus 1.44 time the length of the gonocoxite, with setae at distal end; only moderately swollen and narrowing gently from about the midpoint. SVo pointed at tip and strongly curved distally, perhaps closest to D(e) type of Strenzke 1959, base not broad. No setae shown on TIX.

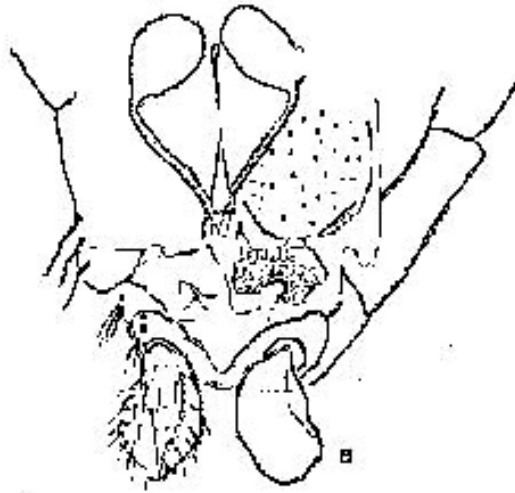
Female (from Maheshwari, 1989): Colour similar to male but relatively weakly marked spots on tergites.

Wing length 2.70 mm, VR 1.06.

Head with FT stated to be 35 mm long, but presumably should be 35 μ m; antenna with 5 segments, lengths not given. Palp proportions 9 : 15 : 59 : 63 : 91; P5/P4 1.44; P5/P3 1.54.

Leg lengths (micron) and proportions:

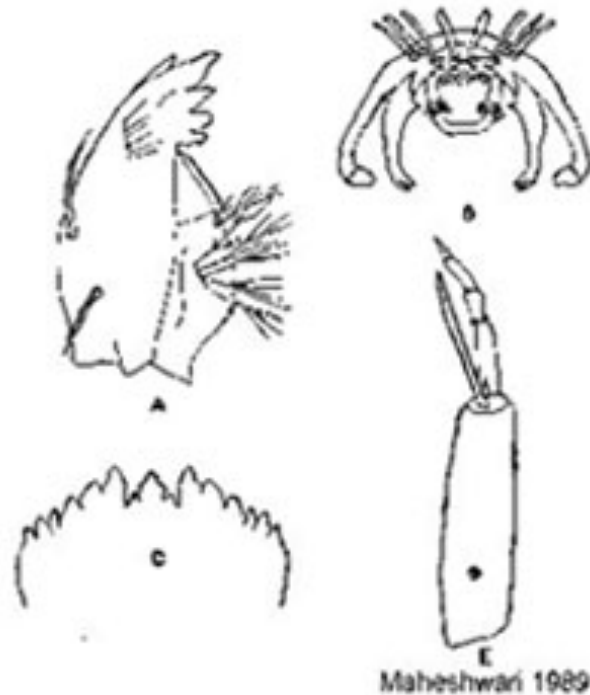
	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	Ta4/Ti
PI	1030	860	1050	870	600	520	270	1.70	1.20	0.60
PII	1080	1080	600	360	240	150	130	0.55	1.00	
PIII	1200	1240	910	520	400	240	160	0.73	0.97	



Genitalia: Sternite VIII does not form floor under vagina. Length of notum 224 µm. Length of gonocoxal apodeme 132 µm, 17-19 setae on segment X, 5-6 setae on gonocoxite 6. Labia sword shaped, 20.5 µm long. Cercus relatively wide, with curved dorsal margin, rounded posterior margin and with the posterior of the ventral margin swollen, length 191 x 63 µm.

Pupa: Body length 6.10 (6.00-6.20) mm. General body colour dark brown, changing to silvery white near emergence. Respiratory organ divided into two conspicuous multi-filamentous anterior and posterior trunks. Wing sheath well developed. Spicules present. No information on number of hooks on segment II, the number of spines on the spur of segment VIII or the taeniae of the swim fin.

Fourth instar larva: Body length 9.20 (9.00-9.40) mm. Two pairs of ventral tubules. Head capsule length 0.63 mm, width 0.48 mm. RO 31 µm up from base of A1; antennal blade extends to near the distal end of A4; AR 1.56. PE with single row of teeth, partly obscured, premandible with normal 2 teeth. Mentum with 15 teeth, possibly Type II (4th lateral reduced almost to level of 5th lateral) centre tooth possibly Type III. Ventromentum not illustrated. Illustration suggests that mandible is type III and MTR about 0.33.



Mouthparts of *C. bharati* larva

Cytology: Not known.

Found: INDIA— Khanari Agricultural Farm, Agra, Uttar Pradesh. (Type locality)

Larvae are found among algal colonies.

The position of this species in the pseudothummi cytocomplex is uncertain, but the apparent relationship to *C. circumdatus* suggests that this is where it would belong.

***Chironomus crassiforceps* (Kieffer 1916)**

Synonyms

Tendipes grandilobus Kieffer 1916

Chironomus esakai Tokunaga 1940

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

Chironomus sp. Ikema-yusurika Sasa et Hasegawa 1983 – synonymised by Hasegawa et Sasa (1987)

Yaesecundus iriobeceus Sasa et Suzuki, 2000 - Todashi Kobayashi (personal information)

Chironomus daitoabeus Sasa et Suzuki 2001 - Kobayashi & Endo (2008)

Daitoyusurika daitofeiga Sasa et Suzuki, 2001 - Todashi Kobayashi (personal information)

Possible synonym

Chironomus nudipes Kieffer 1911 – note: if this synonymy is confirmed, it would become the senior synonym.

Incorrect synonym:

Chironomus magnivalva Kieffer 1917 - Guryev *et al.* (2001) and Peck *et al.* (2002).

In BOLD Bin: [BOLD:ACC5271](https://www.boldsystems.org/?term=BOLD:ACC5271)

The nearest neighbor Bin is [BOLD:AAJ4269](#) which contains *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 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 pulvilli, 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)



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

I am indebted to the late Todashi Kobayashi for much of the following information.

Male

Length 5.96 mm. Wing length 2.43 (2.28-2.72) mm, width abt 0.64 (0.60-0.68); VR 0.91 (0.85-0.97). AR 1.90 (1.48-1.98).

Frontal tubercles very large (277 x 18 µm)

Palp proportions segs. 2 -5 (microns): 41 : 158 : 159 : 205 ; (P5/P4 1.07-1.50; P5/P3 1.11-1.50); Clypeal setae 23-28.

Thoracic setae: acrostichal abt. 12-19; dorsocentral 11-25; prealar 5-7; supra alar 1; scutellar in approx. 2 rows ant. 5-8. post. 9-12 (total 16-20).

Leg lengths (micron) and proportions:

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	BR
--	-----------	-----------	------------	------------	------------	------------	------------	-----------	------------	-----------

PI	1305	1070	1795	880	755	741	349	1.56-1.81	1.18-1.27	1.73-3.5
PII	1318	1279	633	360	290	209	168	0.45-0.59	1.00-1.18	
PIII	1520	1473	909	498	451	262	189	0.49-0.63	1.00-1.07	



No central clear area on tergite IX, but from 0-8 setae (most clearly seen in the illustration of Tokunaga (1964).

Hypopygium: Anal point stout with Y-shaped median ridge, gonostylus large with a more-or-less rounded end, SVo long and slender (E-type of Strenzke 1959, closest to type g), IVo slightly curved, much longer than anal point and to about 2/3 of the length of the gonostylus, which is swollen with a rounded end (see above).

Female

Wing length 2.36 (2.08-2.77) mm; width 0.72 (0.60-0.83) mm.

Head: Antennal proportions 114 : 80 : 81 : 75 : 152; necks of intermediate segments about a third of segment length; AR 0.44 (0.39-0.48); A5/A1 1.32 (1.28-1.42). FT prominent 46 µm long and 20 µm in diameter.

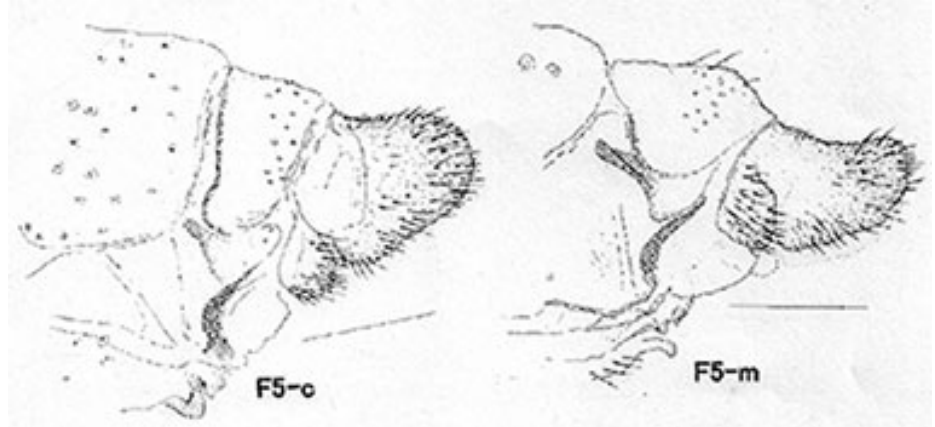
Palpal proportions 38 : 38 : 133 : 148 : 213; A5/A4 1.43 (1.29-1.44); A5/A3 1.60 (1.35-1.92). Clypeus about 1.5 times the diameter of the antennal pedicel; 21.8 (20-24) clypeal setae.

Thorax: Scutal vittae brown, rest brownish. Setae – Acrostichal 8-12; Dorsocentral (incl. Humeral) 16-24; Prealar 5-6; Supraalar-1; Scutellum with 7-11 small anterior setae and 8-13 in posterior row (total 19 (16-24)).

Leg proportions and ratios

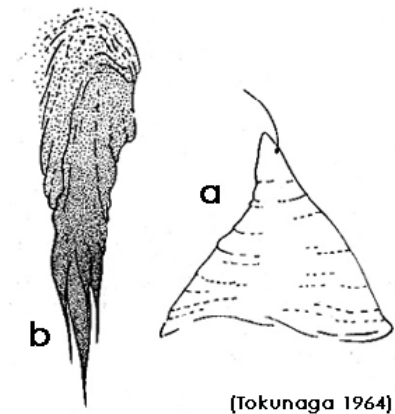
	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	Ta4/Ti
PI	968	808	1500	730	640	630	310	1.15-1.86	1.15-1.22	0.67-0.71
PII	972	956	540	307	233	167	153	0.53-0.68	1.10-1.12	
PIII	1140	1144	770	430	350	-	-	0.63-0.67	0.96-1.03	

Abdomen largely yellow or yellowish-brown, darker at posterior. Cercus and segment X (below) very similar to that of *C. magnivalva*, i.e. a generally rounded outline with some indication of a bulge at the base of the ventral margin, while segment X has an enlarged, relatively rounded base. Sasa & Hasagawa (1983) describe the cercus as “ear-shaped, 216 μm long and 376 μm high”.



Variation of the cercus in specimens from Japan. (Drawing by T. Kobayashi)

Pupa: (from Tokunaga 1964) Body length 5.9 (5-6) mm. Cephalic tubercles (a) triangular, as long as the basal length, with small apical seta. Abdominal tergite II with a caudal row of 77 hooklets and PSB present; PSA lateral on tergite IV; caudolateral spur of segment VIII (b) usually with 3 or 4 spines but may be only one.



Fourth instar larva a medium sized plumosus-type larva; length about 7–12.3 mm. Anterior ventral tubules (1.68 mm) generally slightly shorter than the posterior pair (1.72mm); anal tubules 320-480 μm long and 2.7-3.4 times longer than wide, without a constriction. Ventral head length 263-335.5 μm .

Gular region slightly darkened to dark on posterior third to half, slightly wider than the width of the mentum, widest at posterior border; FC also darkened, and slight darkening elsewhere on dorsal surface. SAL (Fig. d, below) 75.1 (58-96) μm wide and 4.7 (4.0-5.2) times wider than deep.

Mentum (Fig. e, below) with 4th laterals only slightly reduced (essentially type I), and c2 teeth partly separated from c1 (mostly type IB, but occasionally type III); width about 50-60% of the VHL.

Ventromentum (Fig. f, below) width about 170.4 (153-190) μm and 3.52 (3.39-3.79) times wider than deep; with about 36.1 (31-47) striae; IPD about 41-61 μm (about 0.30-0.35 of mentum width); VMR 0.26 (0.21-0.30). PE (Fig. a, below) with about 15.8 (14-19) teeth, mostly type B when not worn.

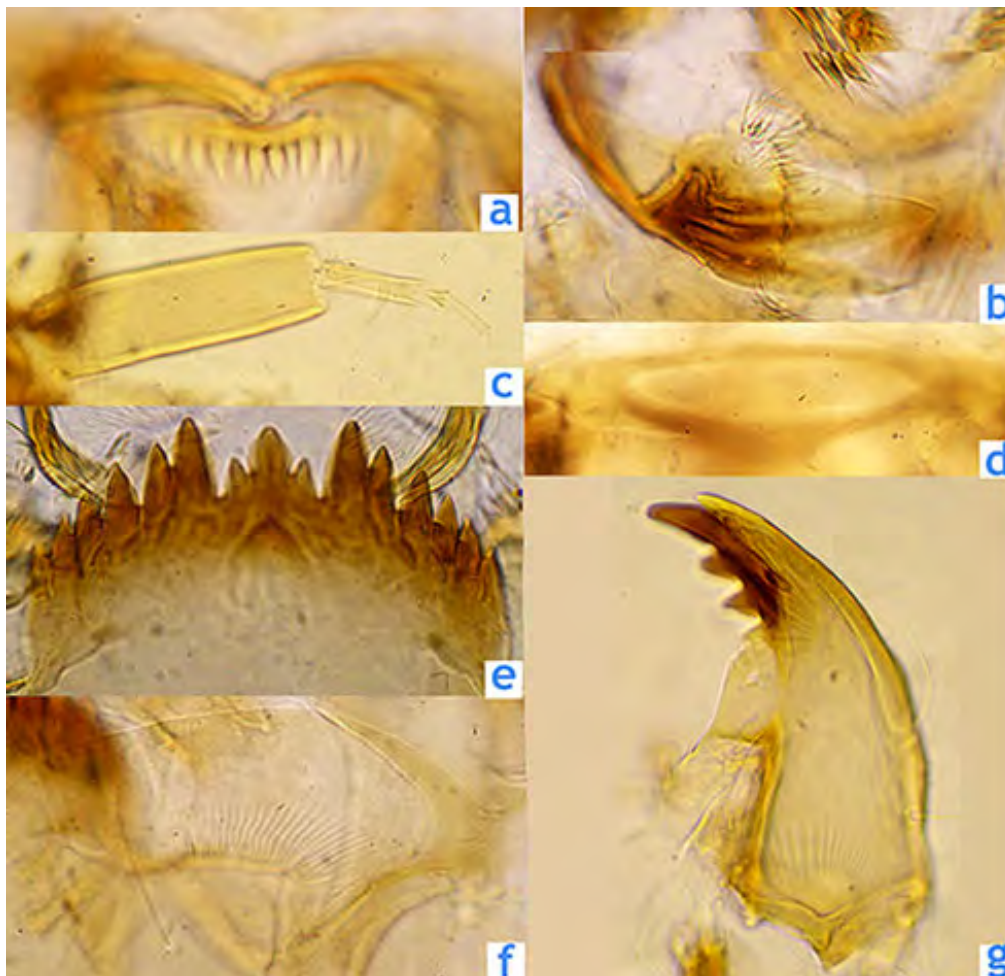
Premandible (Fig. b, below) with inner tooth about 3.5-4.5 times wider than the outer tooth, both reducing to a point, sometimes to a sharp point (Ty. B1), others to a broader point (as

Fig b, below)(Ty.D) (not clear whether this is due to natural polymorphism, wear or simply differences in mounting).

Antenna (Fig. c, below) with relatively long basal segment, about a third of the VHL and 3.3 (3.1-3.7) times longer than wide, RO about 0.31 (0.25-0.37) up from the base; AR about 1.91 (1.55-2.24), segment lengths (micron) 103 : 26 : 9 : 11.5 : 7.

Distance between antennal bases (132.4 (119-159)) generally greater than that between the S4 setae (121.3 (109-147)), which are separated by 76-85% of the FC width. S5 setae about level with the nearby RO.

Mandible (Fig. g, below) about 218.6 (195-237) μm long, with 3rd inner teeth only slightly separated and showing some colour (type I-IIA); about 18.9 (17-20) furrows on outer surface near the base; 12.5 (12-14) taeniae in PMA; Mdt-Mat 29.5 (25-35) μm , MTR 0.4 (0.36-0.45).



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

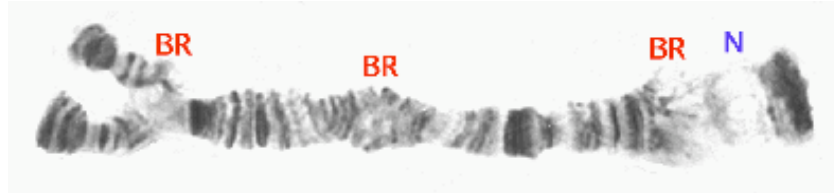
craB1: Large puff with distal dark bands (groups 7-8) near distal end of arm

as magnivalva

craC1: the distinctive groups 3-4 are about one quarter of the arm length from the centromere

as magnivalva C1

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: TAIWAN, – Tainan (abt 23.0°N, 120.0°E), (Republic of China) Type locality.

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; Ouike, Minamidaito Island (abt.25°N, 131°E); Yonakuni Island; Iriomote Island; Fukuoka Prefecture, Kyushu;

BANGLADESH – Chittagong (22.4685°N, 91.7808°E) (BOLD).

PAKISTAN – Sialkot (BOLD).

PHILIPPINES - Sozan, Taihoku.

?**MICRONESIA**: S. Mariana Island, Palau, Yap Hill, 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); Ban Nong Sim, Chaturaphak Phiman Dist., Roi Et Province (Pramual *et al.* 2016).

?**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 geographic isolation means that there has been no selection for differentiation between *C. crassiforceps* and *C. magnivalva*, only random mutation – these have been sufficient in the BOLD mtCOI sequences for the species to be distinguished.

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), as noted above, if synonymy were confirmed, *C. nudipes* would become the senior synonym.

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). In this latter character, *C. crassiforceps* seems to be similar to *C. nudipes* but differs in lacking the dark spots on tergites VI-VIII (although these are only mentioned in the Chaudhuri *et al.* redescription). *C. crassiforceps* and *C. nudipes* have both been recorded from the same area in West Bengal.

***Chironomus magnivalva* Kieffer, 1917**

Placed in the subgenus *Camptochironomus* by Cranston & Martin 1989, but this is an artificial grouping of species that mate on the substrate and have enlarged male terminalia.

Returned to *Chironomus* by Bugledich *et al.* (1999).

Synonyms: *Chironomus crassiforceps* - incorrect synonymy by Guryev *et al.* (2001) and Peck *et al.* (2002).

Not recorded in the Oriental region.

In BOLD Bin: [BOLD:AAJ4269](#)

Adult

A greenish brown species with an enlarged hypopygium, typical of species that mate on substrate.

CHIRONOMUS (CHIRONOMUS) MAGNIVALVA Kieffer

Chironomus magnivalva Kieffer, 1917, p. 219.

Antennae and legs rather short, thorax greenish, stripes brown, abdomen somewhat flattened, male hypopygium not unlike *tepperi* at first sight, but appendage 2 of a more normal, elongate form. This species seems allied to *tepperi* on account of the shape of the styles; it is readily recognized from Kieffer's figure and appears only to be known from Townsville.

Wing length.—2.4–2.5 mm.

Male.—*Head* and mouthparts greenish, antennae browner, A.R. about 2.5, antennae rather short. *Thorax* greenish, stripes either brown or partially brown, dorsocentral bristles not arising from very distinct pits, thorax slightly shining.

Legs darkened at the knees, somewhat shorter than in most species but not as short as in *tepperi*; L.R. 1.7, posterior L.R. about 0.5, whole posterior tarsus less than one and a half times length of tibia. *Abdomen* rather flattened, brownish green. Hypopygium similar at first sight to *tepperi*, but examination shows resemblance confined to anal point, appendage 1, and styles; appendage 2 not swollen, but of normal elongate form, styles not rounded as they are in *tepperi*.

Female.—Resembles male in colour and general appearance.

Type.—Holotype ♂ from Townsville, Qld., was in the Hungarian National Museum.

Specimens seen.—Townsville, Qld., A. K. O'Gower, 22.i.1959–12.ii.1959, 31 ♂♂, 16 ♀♀.

From Freeman (1961)

Male:

Antennal ratio (AR): Kieffer gave the AR as about 2, while Freeman pushed this up to about 2.5. However in one specimen that he measured, it is only about 1.5. AR here is measured from slide mounted specimens: 1.66 (1.46-1.80). Wing Length: 2.54 (2.32-2.83) mm; wing width 0.64 (0.48 - 0.68), VR 1.08 (0.94-1.15); 2.3 (2-3) Scf on brachiolum; 11.1 (10-13) setae on squamal fringe.

Head: FT about 23-36 µm in length, generally columnar, and about twice as long as wide; 28.6 (19-44) clypeal setae. Palpal proportions (micron): 48 : 46 : 155 : 147 : 213; P5/P4 1.42 (1.20-1.75); P5/P3 1.37 (1.15-1.57).

Thoracic setae: Acrostichals 12.1 (10-13); Dorsocentrals 17 (15-21); prealars 5 (4-6); scutellars in two rough rows, 4-9 in anterior row, 8-11 in posterior row, total 15.3 (13-17).

LR about 1.59 (1.6-1.72).

Mean leg measurements (microns) and proportions as follows:

Male	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	BR
PI	1143	1021	1615	800	699	695	341	1.46-1.74	1.04-1.29	1.27-1.67
PII	1172	1149	569	329	266	192	161	0.47-0.52	0.94-1.08	-
PIII	1323	1338	791	446	396	234	187	0.55-0.69	0.97-1.00	-

Ant Ta4/Ti – 0.68; FeI/FeII – 0.92-1.03

C. magnivalva, Sarina, Qld., Australia.

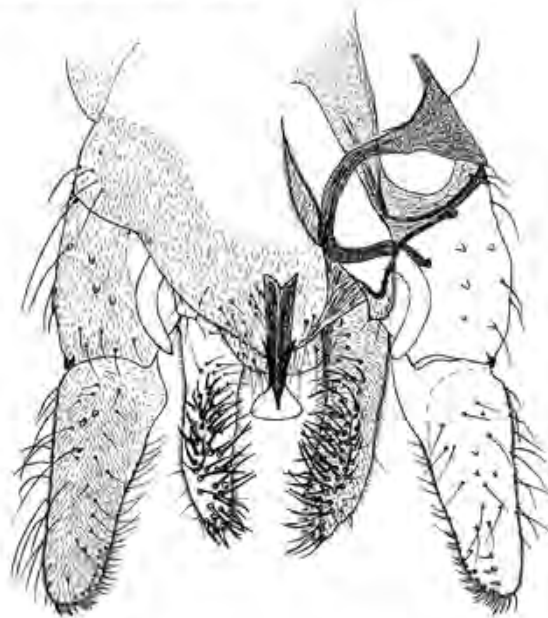


Illustration of the hypopygium of *C. magnivalva*

No setae on TIX; anal point downturned with a flattened triangular tip. SVo normal, closest to E(i) type of Strenzke (1959); IVo also relatively normal, with simple setae on

inner margin only, and extending to mid-point or tip of gonostylus. Gonostyle normally broadest at base, but sometimes quite swollen, narrowing slightly and evenly along its length; with numerous spines rather than setae at the tip.

Female:

Coloration essentially as in male; brownish green darkening over the abdominal tergites. Specimens from Fiji and Tahiti, collected in the wild, were smaller than the laboratory reared Australian specimens.

Wing length 2.97 (2.48-3.44) mm, width 0.95 (0.81-1.01) mm; VR 1.05 (1.03-1.13); 2.8 (2-3) Scf on brachiolum; 16.3 (13-20) setae on squamal fringe.

Head: FT about 25-40 µm long and 11-18 µm wide, about twice as long as wide; antennal proportions (micron, with percentage of neck in brackets) 129 (26) : 91 (39) : 98 (39) : 97 (45) : 170. AR about 0.40 (0.37-0.45); A5/A1 1.33 (1.15-1.60). Palpal proportions (micron): 48 : 43 : 146 : 168 : 231; P5/P4 1.37(1.13-1.50); P5/P3 1.60 (1.37-1.74): In a Tahitian specimen P3 and P4 were fused.

Thoracic setae: about 13 (10-17) acrostichals; 3.85 (3-6) linear humerals; 20.7 (14-27) Dorsocentrals (+ humerals); 5.1 (4-6) prealars; 1 supraalar; scutellars in two rows – 6.2 (3-8) in anterior row and 10.6 (9-13) in posterior row; Total 17.0 (13-19).

Mean leg measurements (microns) and proportions as follows:

Female	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	Ta4/Ti
PI	1138	954	1513	715	631	645	323	1.50-1.69	1.13-1.24	0.57-0.78
PII	1160	1150	600	325	250	185	155	0.52-0.53	1.00-1.02	-
PIII	1300	1370	860	470	405	230	190	0.62-0.65	0.94-0.97	-

BR 1.38-1.62. FeI/FeII 0.96-0.99

GcIX with about 4 setae; segment X larger than usual and oval in shape with about 19.5 (14-24) setae. Cercus (below) essentially oval/rectangular with at best a very small basal extension on dorsal side.



Cercus and segment X of *C. magnivalva*

Found:

Australia:

Northern Territory - Island Lagoon, Magela Creek, Alligator Rivers region (-12.57°S, 132.88°E).

Queensland - Noosaville; Sarina (-25.36°S, 149.20°E); South Townsville (-19.43°S, 146.80°E); Common, Townsville (-19.36°S, 146.70°E); Townsville (**Type locality**).

Also: Motu Kō. Pukapuka, Cook Islands (-10.88°S, 165.5°W) (E.H. Bryan Jr., Bishop Museum).

Cytologically identical material has been collected from Lautoka (-17.67°S, 177.50°W) and Laucola Bay (-18.25°S, 178.33°W), Viti Levu, Fiji and Punaauia, Tahiti (-17.53°S, 149.57°W).

***Chironomus nudipes* Kieffer 1911**

Redescribed by Chaudhuri *et al.* (1992)

This could be a senior synonym of *C. crassiforceps* Kieffer 1916, although there do seem to be differences. Unfortunately there is no BARCODE data for comparison.

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 ferruginous 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 wider than long, 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 (now Kolkata), 10-viii-1907 (N. Annandale).

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

Male: Body length 3.64 (3.49-3.72) mm; wing 1.54 (1.50-1.61) mm long, 0.50 (0.48-0.57) mm wide; VR abt 0.95 (0.90-1.0). AR 2.06 (2.03-2.09).

Clypeal setae 22-24; relative lengths of palp segments 12 : 11 : 38 : 40 : 56; P5/P4 1.40; P5/P3 1.47. FT well developed.

Wing (Fig. a, below) length 1.50-1.61 mm, width 0.48-0.57 mm; VR 0.90-1.00; Scf on brachiolum 2, Squamal fringe with 16 (16-18) setae.

Thorax: Yellow, mesoscutum with 3 yellow to brown vittae. Setae: 12 uniserial Acrostichals; 20 irregularly biserial dorsocentrals; 4 prealars; 1 supra-alar; 18 scutellar.

Leg proportions and ratios (units not stated):

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	BR
--	-----------	-----------	------------	------------	------------	------------	------------	-----------	------------	-----------

PI	60	52	85	43	37	36	19	1.63-2.0	1.15	No beard
PII	64	63	30	18	15	12	9	0.47	1.02	
PIII	54	72	45	25	22	13	9	0.62	0.75	

Fore tibial scale (Fig. b, below) with 2 long setae.

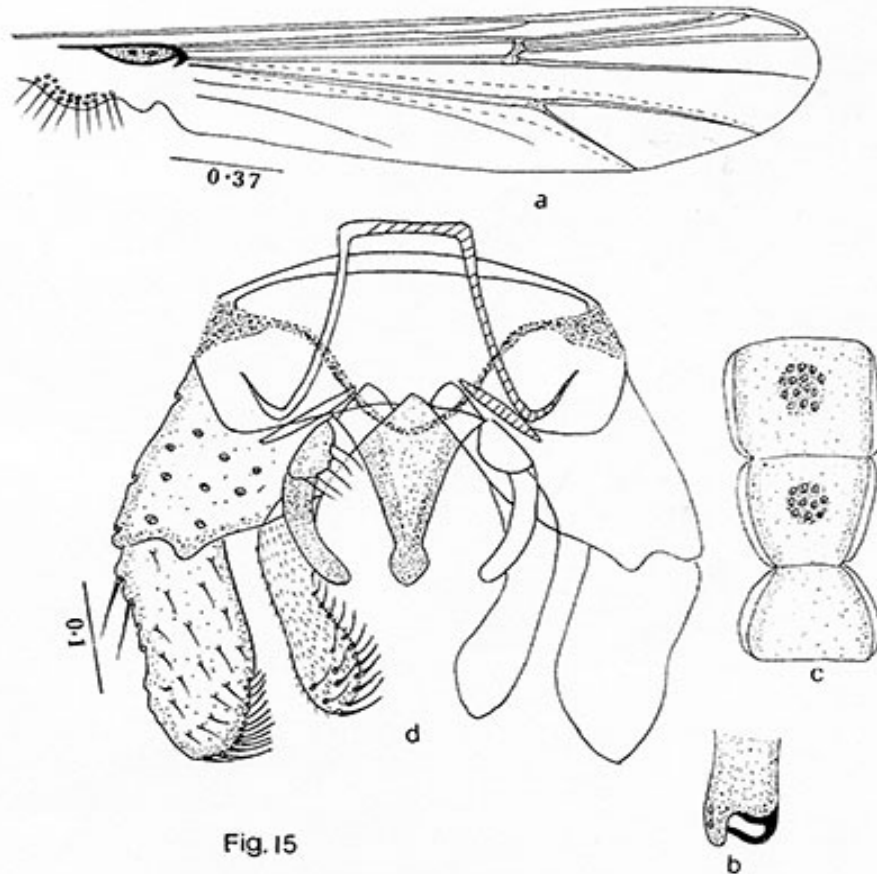


Fig. 15

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) (N.B. these spots are not mentioned in the original description). Apparently no setae on TIX.

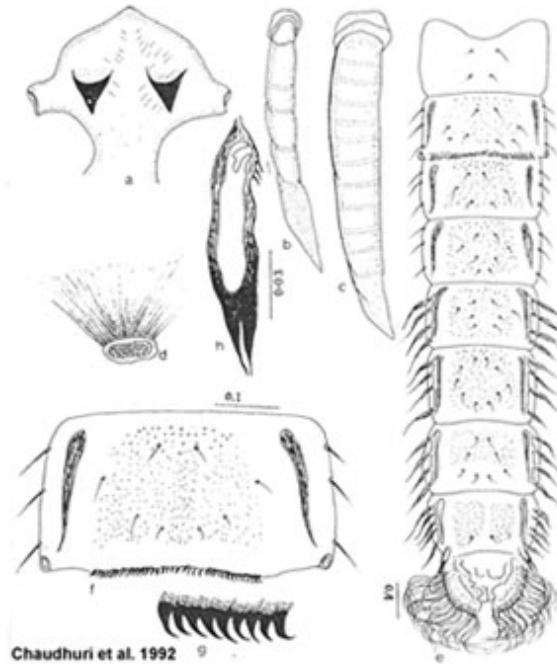
Hypopygium (Fig. d) as illustrated above: Anal point stout blunt and arrow shaped. SVo bow shaped, IVo long, curved, expanded at the end with 12-20 incurved setae along the inner margin, almost as long as the gonostylus which has a blunt apex.

Female: Unknown.

Pupa: Body length 6.09 (5.89-6.21) mm in male, 5.58 (5.42-5.72) mm in female. Colour brown but pale brown in exuvia, cephalothorax and abdomen pale brown. Cephalic tubercles 0.11 (0.1-0.13) μ 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) μ 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 sub basal transverse patches of shagreen, tergite VIII

with 2 median patches of shagreen. Caudolateral spur of segment VIII on a long base, 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 melanotus-type (posterior ventral tubules shown as not coiled), length about 6.53-9.38 mm; VT shown about equal length; AT about 240-250 μm long, comprised of a single lobe.

Head brown with dark occipital margin. VHL 0.30 (0.29-0.32) μm .

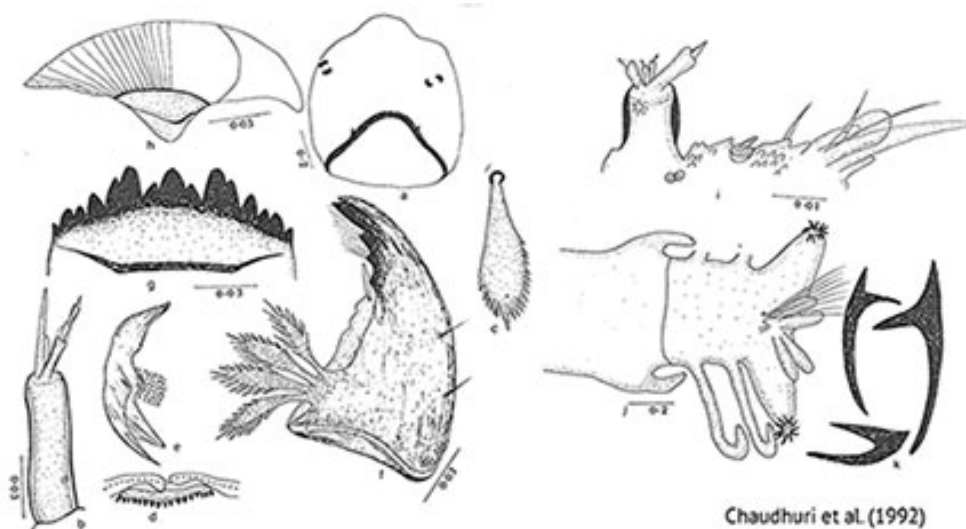
Mentum with 4th laterals reduced (type II), central tooth possibly of type IIA or III.

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 3 times the width of the outer, both narrowing to a point (Ty. B1).

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 μm long, possibly type III B, furrows not shown, but 10 taeniae illustrated for PMA.



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

Type locality – Calcutta (now Kolkata), 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, but only noted as “a little shorter” by Kieffer) of *C. nudipes*. In short, the two major differences suggested by the Chaudhuri *et al.* description are both characters that differ from or are not noted in the original description of *C. nudipes*.

There are currently no BARCODE data for specimens attributed to *C. nudipes*.

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

Pal & Hazra (2017) 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* which is recorded from the same area.

***Chironomus magnivalva* Kieffer, 1917**

Placed in the subgenus *Camptochironomus* by Cranston & Martin 1989, but this is an artificial grouping of species that mate on the substrate and have enlarged male terminalia.

Returned to *Chironomus* by Bugledich *et al.* (1999).

Synonyms: *Chironomus crassiforceps* - incorrect synonymy by Guryev *et al.* (2001) and Peck *et al.* (2002).

In BOLD Bin: [BOLD:AAJ4269](#)

The nearest neighbour is [BOLD:ACC5271](#) which contains *C. crassiforceps*.

Adult

A greenish brown species with an enlarged hypopygium, typical of species that mate on substrate.

CHIRONOMUS (CHIRONOMUS) MAGNIVALVA Kieffer

Chironomus magnivalva Kieffer, 1917, p. 219.

Antennae and legs rather short, thorax greenish, stripes brown, abdomen somewhat flattened, male hypopygium not unlike *tepperi* at first sight, but appendage 2 of a more normal, elongate form. This species seems allied to *tepperi* on account of the shape of the styles; it is readily recognized from Kieffer's figure and appears only to be known from Townsville.

Wing length.—2.4–2.5 mm.

Male.—*Head* and mouthparts greenish, antennae browner, A.R. about 2.5, antennae rather short. *Thorax* greenish, stripes either brown or partially brown, dorsocentral bristles not arising from very distinct pits, thorax slightly shining.

Legs darkened at the knees, somewhat shorter than in most species but not as short as in *tepperi*; L.R. 1.7, posterior L.R. about 0.5, whole posterior tarsus less than one and a half times length of tibia. *Abdomen* rather flattened, brownish green. Hypopygium similar at first sight to *tepperi*, but examination shows resemblance confined to anal point, appendage 1, and styles; appendage 2 not swollen, but of normal elongate form, styles not rounded as they are in *tepperi*.

Female.—Resembles male in colour and general appearance.

Type.—Holotype ♂ from Townsville, Qld., was in the Hungarian National Museum.

Specimens seen.—Townsville, Qld., A. K. O'Gower, 22.i.1959–12.ii.1959, 31 ♂♂, 16 ♀♀.

From Freeman (1961)

Male:

Antennal ratio (AR): Kieffer gave the AR as about 2, while Freeman pushed this up to about 2.5. However in one specimen that he measured, it is only about 1.5. AR here is measured from slide mounted specimens: 1.66 (1.46-1.80). Wing Length: 2.54 (2.32-2.83) mm; wing width 0.64 (0.48 - 0.68), VR 1.08 (0.94-1.15); 2.3 (2-3) Scf on brachiolum; 11.1 (10-13) setae on squamal fringe.

Head: FT about 23-36 µm in length, generally columnar, and about twice as long as wide; 28.6 (19-44) clypeal setae. Palpal proportions (micron): 48 : 46 : 155 : 147 : 213; P5/P4 1.42 (1.20-1.75); P5/P3 1.37 (1.15-1.57).

Thoracic setae: Acrostichals 12.1 (10-13); Dorsocentrals 17 (15-21); prealars 5 (4-6); scutellars in two rough rows, 4-9 in anterior row, 8-11 in posterior row, total 15.3 (13-17).

LR about 1.59 (1.6-1.72).

Mean leg measurements (microns) and proportions as follows:

Male	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	BR
PI	1143	1021	1615	800	699	695	341	1.46-1.74	1.04-1.29	1.27-1.67
PII	1172	1149	569	329	266	192	161	0.47-0.52	0.94-1.08	-
PIII	1323	1338	791	446	396	234	187	0.55-0.69	0.97-1.00	-

Ant Ta4/Ti – 0.68; FeI/FeII – 0.92-1.03

C. magnivalva, Sarina, Qld., Australia.

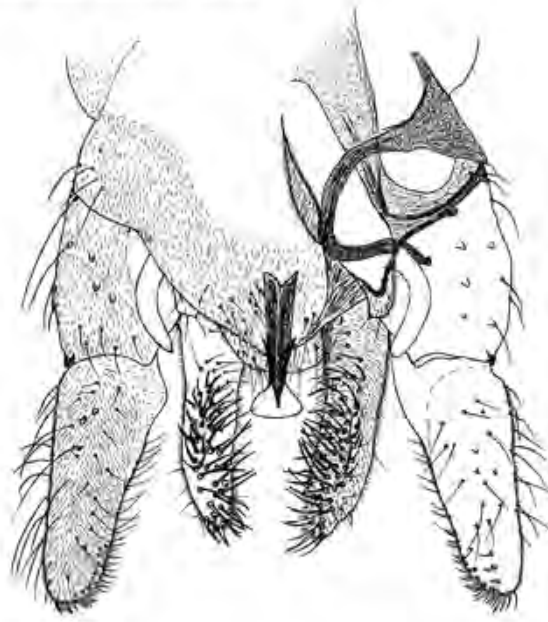


Illustration of the hypopygium of *C. magnivalva*

No setae on TIX; anal point downturned with a flattened triangular tip. SVo normal, closest to E(i) type of Strenzke (1959); IVo also relatively normal, with simple setae on inner margin only, and extending to mid-point or tip of gonostylus. Gonostyle normally broadest at base, but sometimes quite swollen, narrowing slightly and evenly along its length; with numerous spines rather than setae at the tip.

Female:

Coloration essentially as in male; brownish green darkening over the abdominal tergites. Specimens from Fiji and Tahiti, collected in the wild, were smaller than the laboratory reared Australian specimens.

Wing length 2.97 (2.48-3.44) mm, width 0.95 (0.81-1.01) mm; VR 1.05 (1.03-1.13); 2.8 (2-3) Scf on brachiolum; 16.3 (13-20) setae on squamal fringe.

Head: FT about 25-40 µm long and 11-18 µm wide, about twice as long as wide; antennal proportions (micron, with percentage of neck in brackets) 129 (26) : 91 (39) : 98 (39) : 97 (45) : 170. AR about 0.40 (0.37-0.45); A5/A1 1.33 (1.15-1.60). Palpal proportions (micron): 48 : 43 : 146 : 168 : 231; P5/P4 1.37(1.13-1.50); P5/P3 1.60 (1.37-1.74): In a Tahitian specimen P3 and P4 were fused.

Thoracic setae: about 13 (10-17) acrostichals; 3.85 (3-6) linear humerals; 20.7 (14-27) Dorsocentrals (+ humerals); 5.1 (4-6) prealars; 1 supraalar; scutellars in two rows – 6.2 (3-8) in anterior row and 10.6 (9-13) in posterior row; Total 17.0 (13-19).

Mean leg measurements (microns) and proportions as follows:

Female	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	Ta4/Ti
PI	1138	954	1513	715	631	645	323	1.50-1.69	1.13-1.24	0.57-0.78
PII	1160	1150	600	325	250	185	155	0.52-0.53	1.00-1.02	-
PIII	1300	1370	860	470	405	230	190	0.62-0.65	0.94-0.97	-

BR 1.38-1.62. FeI/FeII 0.96-0.99

GcIX with about 4 setae; segment X larger than usual and oval in shape with about 19.5 (14-24) setae. Cercus (below) essentially oval/rectangular with at best a very small basal extension on dorsal side.



Cercus and segment X of *C. magnivalva*

The *Chironomus flaviplumus* complex:

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 doubtful (Sasa 1978) and *C. samoensis* in the sense of Edwards does not occur in the Oriental region.

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; AR is about 3.5 and larger than the 2.9 of *C. dorsalis* (Sasa assumes this is *C. yoshimatsui*). The hypopygium is also noted as similar to *C. dorsalis*.

A 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. Sasa also notes a difference in the distribution of *C. flaviplumus* and the Japanese "*C. samoensis*", in that *C. flaviplumus* has a more northerly, cooler, distribution (although Sasa & Hasagawa (1983) later tentatively synonymised *C. flaviplumus* with *C. samoensis* on the basis of specimens collected on the Ryukyu Islands in southern Japan, while noting the similarity of the specimens to *C. flaviplumus*).

However, the "*C. samoensis*" used as a laboratory organism and from which the cytology of Japanese specimens was obtained (see below) is clearly different from that of *C. samoensis* Edwards, probably one of the *C. flaviplumus* varieties. Referred to here as *C. flaviplumus* Ty. A.

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 sequences in GenBank and the BOLD database: two in Japan, one in China, and the Korean material of Ree & Kim (1981), which is actually *C. yoshimatsui*. This indicates that there are a number of species which are closely related and constitute the “flaviplumus complex”.

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 member of the *C. flaviplumus* complex.

The three types of *C. flaviplumus* are here referred to as Type A (probably the valid *C. flaviplumus*), Type B for which there is no definite valid name, and Type C from China. They comprise a very closely related group of species, showing cytological differences (where known) and small differences in the BARCODE sequences. Aspects of their relationship are discussed by Martin (2022).

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 *C. yoshimatsui*.

***Chironomus flaviplumus* Sasa (type A).**

This variant was described by Sasa (1978). This is more likely to be *C. flaviplumus* sensu Tokunaga as it was collected in northern Japan and has the higher AR.

Sasa lists important features as the AR of 3.5-4.0; LR of about 1.6–1.8 and the relatively long anterior Ta5, which is about 0.35-0.4 length of anterior Ti. The proportions of palp segments 2-5 are 70 : 250 ; 280 : 400; P5/P4 1.43, P5/P3 1.60.

In a later paper, Sasa and Hasegawa (1983) give a much broader range of values (including WL 2.84(2.65-3.08); AR 3.10 (2.80-3.34); 22.5(19-26) clypeal setae; Ta5/Ti values of only 0.25; body length: 6.19 (6.33-7.04); abd segs II-VI with transverse dark band; Ant TaV less than 0.3 times ant tibia length) and synonymised *C. flaviplumus* with *C. samoensis*. However, the synonymy is incorrect and it is more likely that they had a mixture of species.

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

Adult

Male: AR about 3.5-4.0.

Colour: Antenna with yellow hairs; thorax pale yellow to yellowish green, scutellum yellow, vittae and post notum orange yellow. Leg segments largely yellow brown, some darkening at distal ends of tibiae and tarsi, with Ta5 almost entirely dark.

Head: FT about 20-39 µm long and 13 µm wide. Palp proportions: 44 : 53 : 189 : 222 : 315; P5/P4 1.42, P5/P3 1.65.

Thoracic setae not recorded.

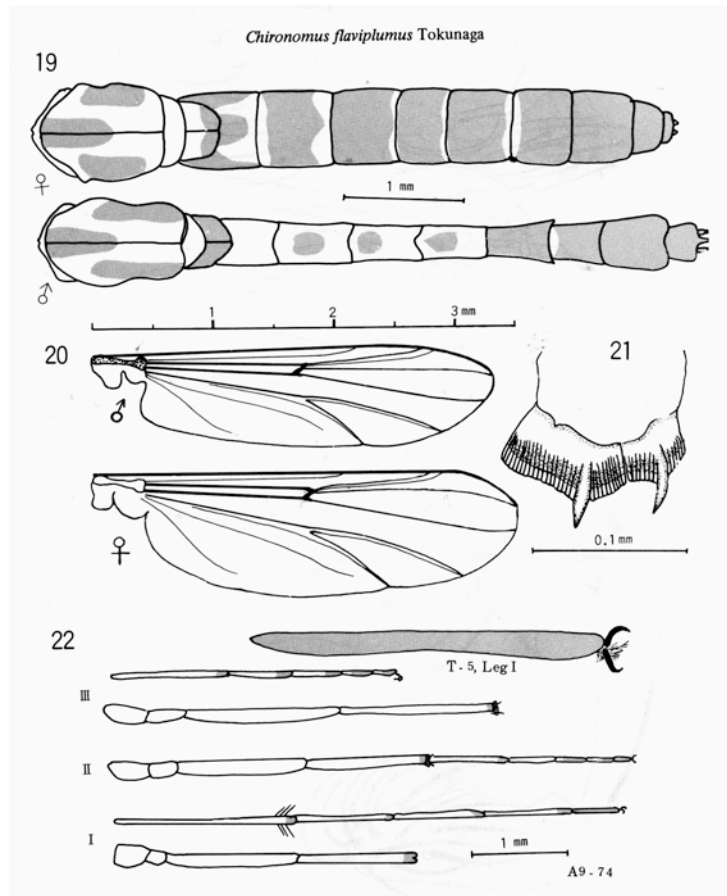
Wing length: 2.85-3.30 mm; wing width 0.60-0.78 mm., VR about 1.0. Wing milky white with crossvein dark.

Leg lengths (microns) and proportions as follows:

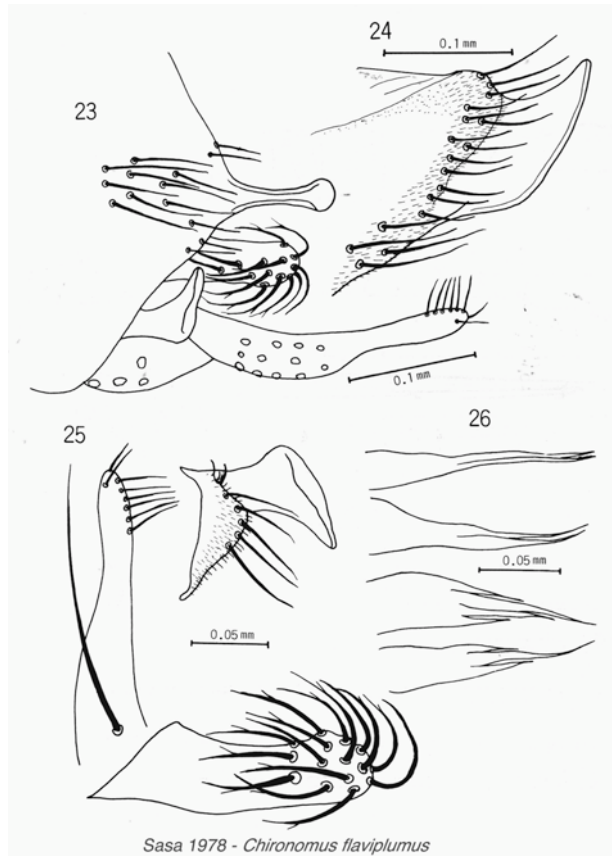
	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	BR	Ta5/Ti
PI	1390	1240	2030	1020	930	880	500	1.63	1.12	2.1	0.40
PII	1460	1290	810	460	340	190	130	0.62	1.31		
PIII	1660	1660	1240	660	490	280	175	0.75	1.00		

Ant Ta5/Ti – 0.40.

Abdomen yellow to greenish yellow; tergites II-IV with a dark central oval spot, tergites V-VIII almost uniformly dark brown. Setae on tergite IX: 9-12.



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



Sasa's (1978) illustrations of *C. flaviplumus*: Male hypopygium (top) and SVo (right) (note boot shape – S-type). Also Gs (25, left) and IVo (below)

SVo “beaked”, S-type, closest to Fig. a of Strenzke (1959). IVo not reaching the end of the anal point, but to about the midpoint of the gonostyle, which is only moderately swollen and reduces relatively sharply from about half way. Setae of IVo branched.

Female

Head: Antennal proportions (micron): 180 : 130 : 140 : 140 : 250, AR 0.42, A5/A1 1.39.

FT about 26 µm long and 12 µm wide.

Palp proportions (micron): - : 60 : 250 : 250 : 370; P5/P4 & P5/P3 1.48.

Thorax coloration as in males, although postnotum only dark at posterior end. Setae not recorded.

Wing length: 3.5 mm; wing width 1.1. Crossvein darkened.

Leg lengths (microns) and proportions as follows:

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

Abdomen largely brown, except for a pale area posterior on segments II-VI; II and III with a broader band, with an extension of the brown area in the midline. No information on segment X or the cercus.

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 (see Fig. 26 above).

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 μm , 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; FC pale.

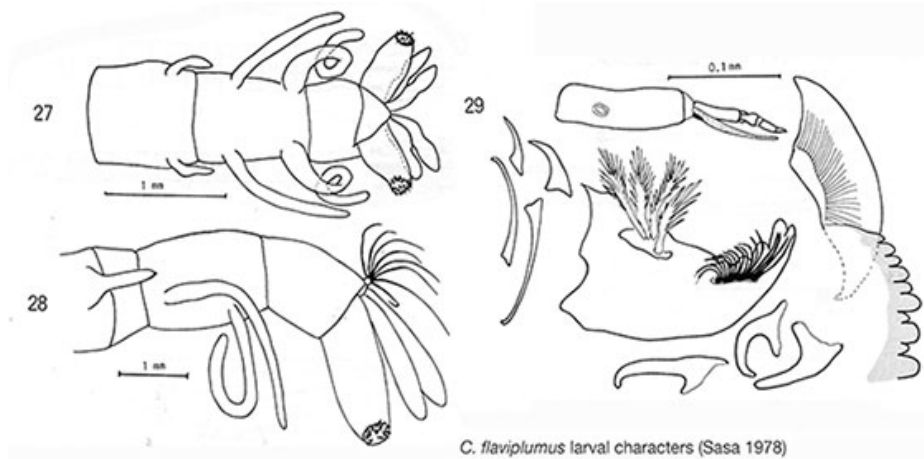
Mentum (Fig. 29, below) with square sharp teeth when not worn, c2 teeth of central trifid tooth well separated from c1 tooth (type III), 4th laterals slightly reduced (type I-II).

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 longer than 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, as opposed to that of *C. flaviplumus* B where it is at least 10 bands from the end; 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 "*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.

- | | | |
|----------|--|---------------------|
| flaA A1: | 1a-i, 2k-d, 9e - 4a, 13a - 14i, 3h-i, 12c - 10a, 2c - 1k, 3a-g, 15 - 19 | (Japan) |
| flaA B1: | Puff with distal dark bands (groups 8-7?) about the middle of the arm | |
| flaA C1: | Characteristic band groups 3-4 about one quarter from distal end. | |
| flaA C2: | Differs by a small terminal inversion, distal of characteristic band groups 3-4. | |
| flaA D1: | | |
| flaA E1: | 1 - 3e, 10b - 3f, 10c - 13 | as halophilis, etc. |
| flaA F1: | 1 - 2a, 10d-a, 15 - 11, 2b - 9, 16 - 23 | |

- flaA G1: Virtually terminal nucleolus, two BRs as noted above.
 flaA G2: Simple inversion of most of the chromosome, bringing the large BR close to the nucleolus.

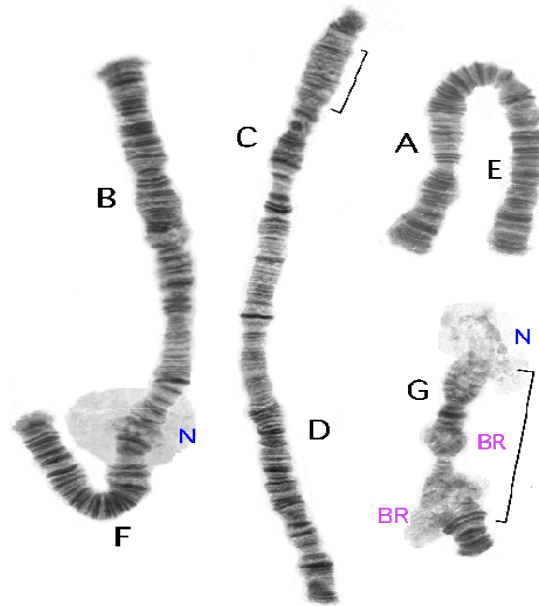


Photo courtesy of the late W.F. Wülker

Chromosome arms A, E and F were described by Wülker *et al.* (1989) as *C. samoensis*, but arm G, although not published, is clearly different from that of *C. samoensis*, most noticeably in the position of the nucleolus (terminal, *c.f.* medial in *C. samoensis*). Some sequences of *C. orientalis* 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 FT are only about 18-25 micron. The Indian material is also cytologically distinct. However the mtCOI sequences are very similar to those of *C. flaviplumus* Type B, and a specimen from Bishnah wetlands, Jammu is particularly close.

Important features are the central oval spots on abdominal tergites II-IV, the LR of about 1.8-2.0 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; The Creek, Minamidaito Island, Okinawa (abt.25°N, 131°E) (Sasa & Suzuki 2001); Ryukyu: Mt Omotodake, Ishigaki City, Ishigaki Island, Yaeyama Islands, Okinawa Prefecture.

INDIA: Bishnah wetlands, Jammu (32.70°N, 75.00°E)

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

It is not clear whether there is a valid name for this species as names that have been applied to this taxon do not fit the morphology and other species are insufficiently described to be safely applied.

Uncertain synonym: *C. incertipenis* auctt.– but not Chaudhuri *et al.* (1992)

C. ramosus sensu Laviad-Shirit *et al.* (2020) and Sela *et al.* (2021) - not as Chaudhuri *et al.* (1992)

Korean specimens under the name *C. flaviplumus* (GenBank accession numbers JF412075 - 077) are *Chironomus yoshimatsui*.

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

Given the wide distribution, it is not surprising that there are variations in coloration.

Previously called *C.* species PK2 or PK4 and PK7 in earlier versions of this document. Also *C. apicatus sensu* Karunakaran (1969) but the Johannsen description is insufficient to clearly associate his specimens with this species as they have a higher LR and are associated with occurrence in warm, acidic pools, so they are probably another member of the *C. flaviplumus*-group. The “*C. ramosus*” of Laviad-Shirit *et al.* (2020) and Sela *et al.* (2021) are this species and do not fit the original description of *C. ramosus* Chaudhuri *et al.* (1992), which has a higher AR and a lower LR (see below). PK7 refers to this original *C. ramosus*.

This species is in BOLD Bin: [BOLD:AAW3997](#)

Adult:

Male

AR 2.91 (2.85-3.05), LR 1.65 (1.59-1.75).

Wing length 3.46 (2.82–3.86) mm., width 0.77 (0.68–0.88) mm., VR 0.97 (0.95-1.0); squamal fringe 20.7 (12-27); SCf on brachiolum 2-3.

Head: FT 38.9 (15-51) x 13.3 (10-18) μ m, (l/w 1.15-4.3); palpal proportions (μ m) 52 (48-65) : 55 (50-60) : 214 (200-240) : 224 (205-235) : 323 (265-371); P5/P4 1.43-1.61; P5/P3 1.39-1.81. Clypeus, width 0.61 (0.53-0.63) diameter of the antennal pedicel, with 21.9 (19-24) setae.

Thoracic vittae, scutellum and postnotum pale (yellowish?).

Thoracic setae: acrostichal about 11.7 (10-15) in double staggered row; dorsocentral about 18.3 (14-26) in one to three rows; supra-alar 1; prealar 5.5 (5-6); scutellar in two or three rows: anterior row of 10.5 (8-12) smaller setae, sometimes including about 2 in a further anterior row, posterior row of 13 (11-15) larger setae (total setae 21-28).

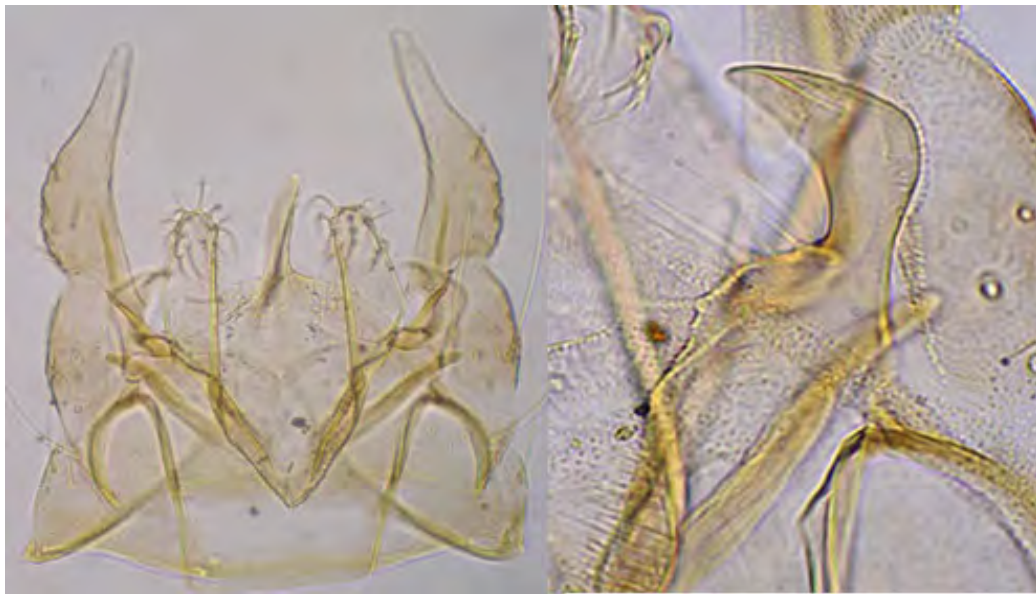
Legs yellowish, becoming darker on the tarsi. Foretarsus without a beard (BR 1.35-2.2).

Leg lengths and proportions (μ m):

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	Ta5/Ti
PI	1237	1140	1805	962	825	735	350	1.59-1.75	1.02-1.20	0.24-0.35
PII	1338	1187	743	402	292	187	139	0.58-0.69	1.06-1.17	
PIII	1520	1482	1100	610	457	286	169	0.64-0.83	1.00-1.06	

BR 1.35-2.2; Sensilla chaetica: Mid Ta1 – 6-10; Hind Ta1 – 5-9.

Abdomen with darker oval markings on tergites III-V or VI with others light brown. About 13 (5-19) setae in multiple pale areas on TIX.

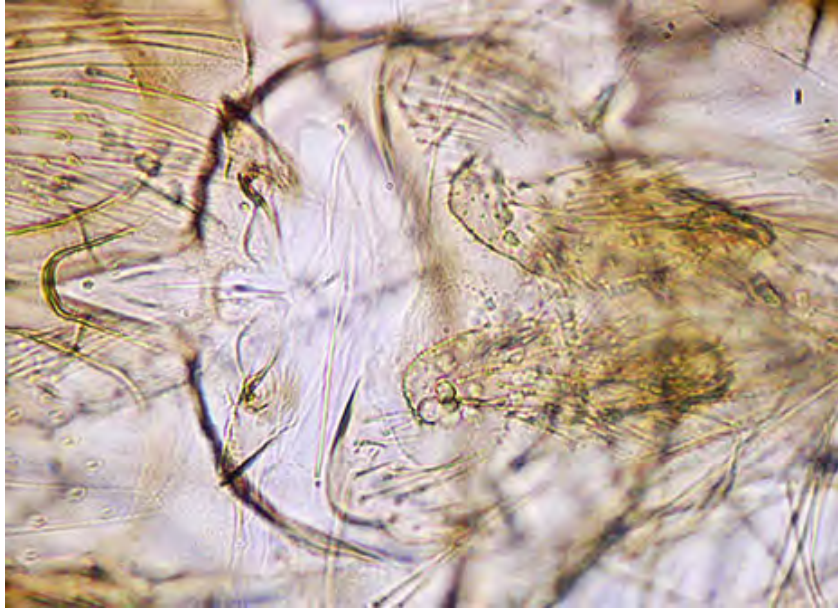


Male hypopygium and superior volsella of *C. flaviplumus* Ty. B
Note that the anal point is not dark and the SVo is strongly bent and “beaked”

SVo beaked and not easily fitted into the scheme of Strenzke (1959), but essentially an S-type and also seen in some other Oriental species. IVo not reaching to end of anal point but to about 1/3 of gonostylus length, with simple setae. Anal point narrow at base and does not appear to be darkened or sharply downturned. Gonostylus moderately swollen and narrows markedly over about posterior half, with 5, 5+1 or 6+1 setae at the tip.

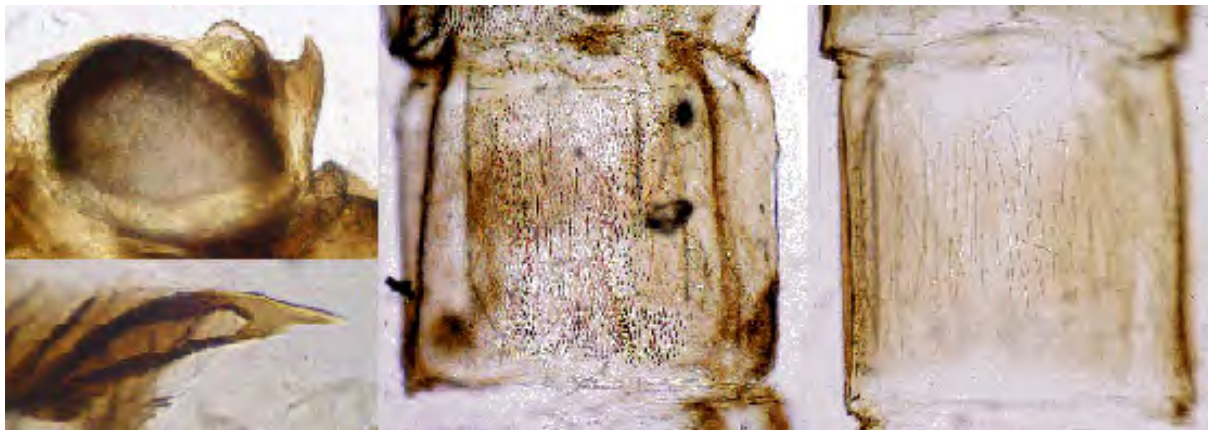
Female:

Some information for antenna from a pupa, and for genitalia from a paratype female:
Antennal segments 2-5 (proportion of neck in brackets) – 105 (0.33) : 135 (0.65) : 130 (0.46) : 200; AR and seg. V/I not known. TX about 1.67x longer than greatest width, with 14 setae; cercus with straight dorsal margin coming to a curved posterior transition to posterior margin, which merges to curved ventral margin.



Genital region of pharate female

Pupa: Exuvia grey/brown. Length of male 6.51 (5.99-6.61) mm, of female 7.35 (7.01-7.53) mm. Cephalic tubercles about 75 μ m long, 57 μ m wide (male) and 43 x 66 μ m in female. Antennal sheath of female about 540 (540-560) μ m long. Thorax rugose; inner margin of wing sheath 1.69 (1.42-1.72) mm in length, respiratory base elliptical and about 320 x 150 μ m, slightly narrow in middle; HR abt. 2.56. PSA caudolateral on segment IV and brownish (see figure below), about 138 μ m long and 88 μ m wide, occupying about 0.11 of the segment length; those of segments V and VI comprising spines; PSB basolateral on segment I and caudolateral on segment II. Hook row on segment II comprised of about 46(?) -86 hooklets. Shagreen pattern (see figure below) darker across the middle of segments II-IV, then even on V-VII, only anterior on VIII. Caudolateral spurs of segment VIII with 1, or 1 large and 1 small spine.



Female pupa of *C. flaviplumus* Ty. B

Cephalic tubercles (left, above), spur (below); segment IV showing darkened PedSp.A (middle) and shagreen of segment VII (right)

Fourth instar larva: A small to medium plumosus-type (length 9.0-14.8 mm; (fem) 12.0-13.5 mm; (male) -9.0-10.5 mm. Anterior VT about 1.54 (1.04-2.44) mm; posterior pair about 1.77 (1.32-2.64) mm; much shorter in Japanese larvae. Anal tubules about 250-480 μ m (upper);

250-520 μm (lower) long and about 2.3-3.3 times longer than wide. SAL 78.8 (68-96) μm wide and 4.2 (3.1-5.6) times wider than deep. VHL 302.75 (268-360) μm .

Gular region pale in some Japanese populations, slightly dark to dark over posterior 1/3-1/2 in others. FC dark to very dark, particularly towards the rear.

Mentum (Fig. c, below) abt. 170 (152-180) μm wide (0.54-0.63 of VHL) with c1 tooth tall, c2 teeth well separated (type III), 4th laterals slightly reduced (type I-II).

Mentum with c2 teeth of the central trifid group moderately well separated (type Ib-III), 4th laterals slightly reduced (type I-ii). Width central tooth 19 μm ; 30 μm between C2 teeth; central trifid tooth 43 μm ; and between 1st laterals 58 μm .

Ventromentum (d, below) with about 43 (37-49) striae, VMR about 0.24 (0.21-0.25). PE with about 14 (13-16) even sharp teeth (Ty. A).

Antenna with basal segment about 3.25-3.5 times longer than wide, RO about a third to half from base of segment, AR about 1.84 (1.73-2.0); relative lengths of segments 99 : 26 : 8.5 : 12 : 6.

Premandible with relatively narrow sharp teeth, inner tooth about 3.7x width of outer tooth (Ty. B1).

Mandible abt. 214.5-225 μm long; 3rd inner tooth partially separated and colored (type IIB); about 15.8 (14-19) striations on inner surface near base, PecM with about 13 (12-15) taeniae; MTR about 0.32 (0.24-0.37).

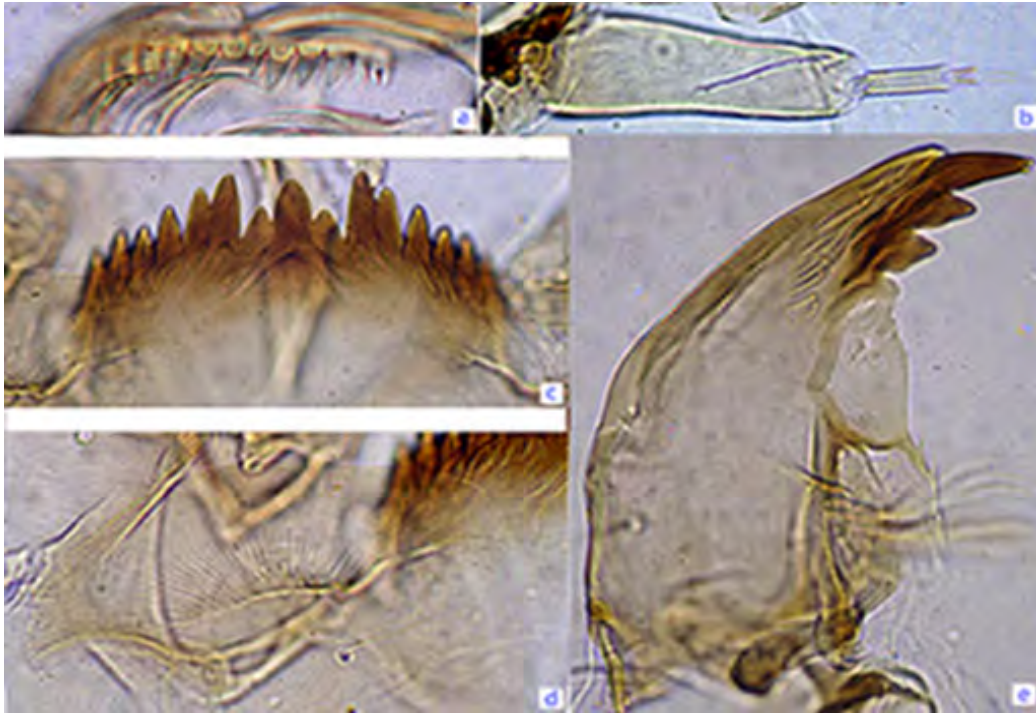
Ventromentum (Fig. d, below) about 194.4 (183-220) μm wide, about 38 (33-45) striae; ICD 57.5 (45.5-71) μm (0.30-0.40 of mentum width); VMR 0.29 (0.24-0.38).

PE (Fig. a, below) with 12.5 (11-16) broad sharp teeth (type B). Premandible with outer tooth coming to a relatively narrow point, inner tooth coming to a broad point and 2.7-6.7x wider (Ty. B2).

Antenna (Fig. b, below) with basal segment 3.25 (2.5-4.0) times longer than wide, RO about one third to almost halfway up from base; 3.36-4.18 times longer than A2; A4 1.13-1.47 times A3; AR about 2.08 (1.87-2.44); segments lengths (μm) 110 : 29 : 9 : 11 : 6.

Distance between the antennal bases (125-159 μm) generally greater than that between the S4 setae (117-143 μm), although may be about equal; S4 setae separated by about 0.74-0.88 of the fronto-clypeus width at that point.

Mandible (Fig. e, below) with 3rd inner tooth partly or sometimes almost fully separated, and partly darkened (type II-IIIB), with about 15 (10-24) furrows on the outer surface at the base; PecM with about 12.5 (10-16) taeniae; Mdt-Mat 25-30 μm ; MTR 0.33 (0.25-0.39).



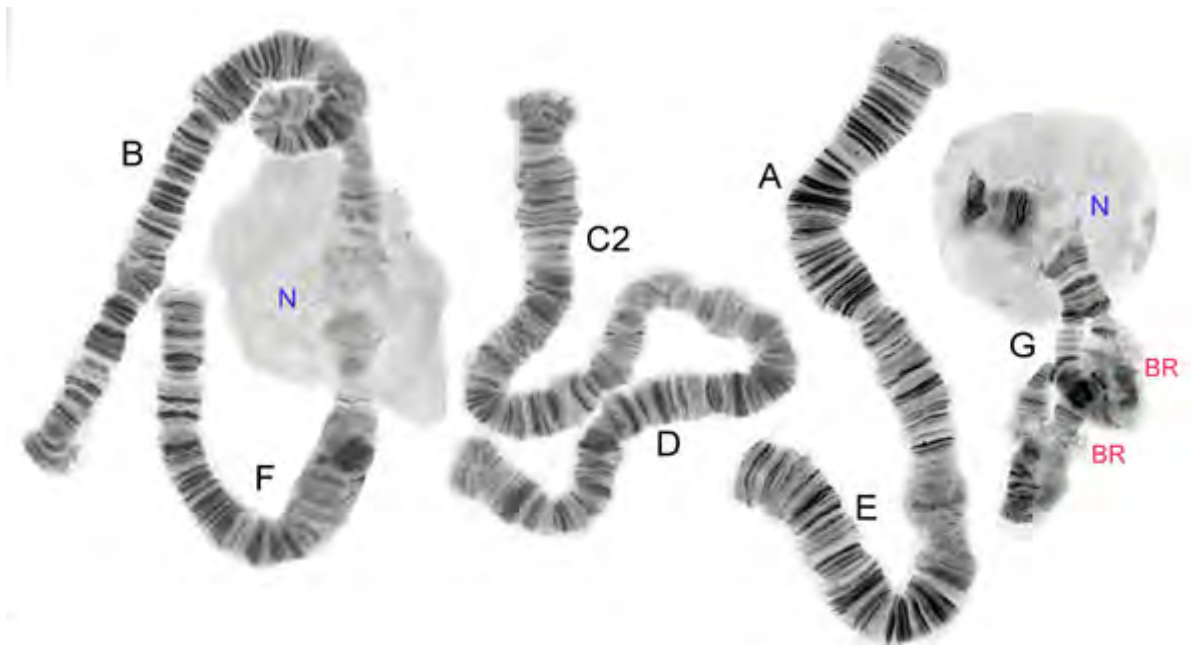
Cytology: Four polytene chromosomes with the pseudothummi-cytocomplex combination BF, CD, AE, G.

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). A small nucleolus may also be present subterminal on arm G. Two BRs, about equally distant from each end, are on arm G.

Limited polymorphism present in arms A, C and G.

Some points can be made by comparison to the Keyl (1962) banding patterns for arms A, E and F:

- flavB A1: 1 - 2c, 10 - 12, 3-2d, 9 - 4, 13 - 19 as *circumdatus* A2, *holomelas*, etc.
- flavB B1: Characteristic bands at 10F; a nucleolus at 11B, as in *C circumdatus*.
- flavB C1: Developmentally stage specific puff at 6B.
- flavB C2: Inversion of about two thirds of the arm,
- flavB D1:
- flavB E1: 1a-i, 5 - 10b, 3e - 2, 4 - 3f, 10c - 13 i.e. Inv2-5 from *aprilinus*
- flavB F1: 1 - 2a, 10 - 3d, 14c - 11, 2b - 3c, 14d - 23 Nucleolus about region 22-23, so distinctive bands not visible.
- flavB G1: BRs at 18C and 19C
- flavB G2: Inversion of about 1/3 of arm around the central BR.



Other probable descriptions of the cytology are: De & Gupta (1994) as “*C. niger*”; *Chironomus* species I by Sharma *et al.* (1990), *C. species II* of Sharma *et al.* (1995), and *C. plumosus* form A (although it has no relationship whatever to *C. plumosus*) of Sharma *et al.* (2004) and incorrectly placed in the thummi-cytocomplex (Tripathi *et al.* 2002), and the similarly incorrect form B (Sharma *et al.* (2004) are very likely also this species. The chromosome maps attributed to *C. ramosus* by Laviad-Shirit *et al.*, (2020) and Sela *et al.* (2021) are actually this species.

Some of the variability between samples may be due to samples that have been reared in the laboratory where the temperature range may differ from natural temperatures, and the quality of feeding may not have been as nutritious.

It is uncertain that this species is conspecific with *C. incertipenis* as suggested by entries in the BOLD Bin. 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”.

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 and sharply downturned, cf. the more usual yellow brown of *C. ramosus*, and 2. the SVo of *C. incertipenis* is described as gently curved while that of the present species is strongly curved and beaked (S-type, closest to Fig. a of Strenzke, 1959). A re-examination of the type is required to confirm the accuracy of the original description as *C. niger*, as it is possible that its hypopygium is distorted.

Found: INDIA- Jammu: Deoli Village (32.70°N, 75.00°E); Farooq Nagar (abt. 28.30°N, 76.80°E), Kabeer colony (32.70°N, 75.00°E); Bishnah wetlands (32.70°N, 75.00°E); Gadhighargh (33.00°N, 74.92°E); Sangrampur village (abt 32.70°N; 75.00°E); ponds at Univ. Jammu (32.73°N, 74.87°E), Jammu;
JAPAN - Kyushu: Nabikimatsu (33.60°N, 130.33°E), Koge-Machi, Chikujyo-gun, Fukuoka Pref.; Ryukyu: Mt Omotodake, Ishigaki City, Ishigaki Island (24.33°N, 124.15°E), Ishigaki City, Ishigaki Island, Yaeyama Islands, Okinawa Prefecture.
MALAYSIA – University of Malaya, Selangor (3.1295°N, 101.657°E) (BOLD)
PAKISTAN– Islamabad (33.6863°N, 73.0763°E) (BOLD)

SINGAPORE – University of Singapore (1.367°N, 103.939°E); Bedok Canal (1.367°N, 103.939°E).

THAILAND – Mahasarakham University (14.85°N, 103.26°E), Kantharawichai District, Maha Sarakham Province; Ban Tha Reu (15.33°N, 103.56°E), Satuek District, Buri Ram Province; Ban Keab (16.26°N, 103.22°E), Kantharawichai District, Maha Sarakham Province; Ban Khi (16.27°N, 103.23°E), Chiang Yuen District, Maha Sarakham Province (16.27°N, 103.23°E).

also

ISRAEL - Mt. Hermon (33.40°N, 35.85°E).

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: There is sequence in Genbank (e.g. MN370037 & MN934313) from Laviad-Shirit *et al.* (2020) and Sela *et al.* (2021) as *C. ramosus*. These sequences have been mined into the BOLD database where they are included in the Bin along with specimens from India or Singapore which do not fit the description of *C. ramosus*.

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

Chironomus species PK6

Probably another member of the *C. flaviplumus* group.

Adult:

Not currently known.

Pupa: Not currently known but there are two characters from a prepupa:

At least 85 taeniae on swim fin, in 2 or 3 rows distally. Spur with 3 spines, center one marginally longer.

Fourth instar larva: a small-medium plumosus-type. Head capsule with gular region and FC pale. SAL about 73.5 x 16.5 μm , 5.15 times longer than deep.

Mentum (Fig. c, below) width abt. 0.53-0.59 of VHL; 4th lateral reduced slightly (Ty. I-ii), 6th lateral arising from a lower level, center tooth probably Ty. IB. Ventromental plates (Fig. d, below) about 190-195 μm wide, separated by about 0.35 of the mentum width, 3.41-3.85 times wider than deep and 1.07 times the mentum width; with 41 (40-43) striae; VMR about 0.38.

PE (Fig. a, below) with 10-17 teeth of type B. Premandible with inner tooth about 4.5 times wider than the outer tooth, both coming to relatively sharp points (type B1).

Antennal segments (Fig. b, below) (micron): 109 : 31.5 : 10 : 12.5 : 8. A1 about 1/3 of VHL and 2.8-3.3 times longer than wide; RO about 0.32-0.45 up from base of segment. AR 1.76-1.78.

Distance between the antennal bases greater than that between the S4 setae, which are separated by 77-82% of the FC width at that point.

Mandible (Fig. e, above) abt. 238-243 μm long, 3rd inner tooth only partly separated and not darkened (I-IIA); about 14-16 furrows on outer surface at the base; 10-12 taeniae in PecM; Mdt-Mat 20-25, MTR 0.26-0.34.

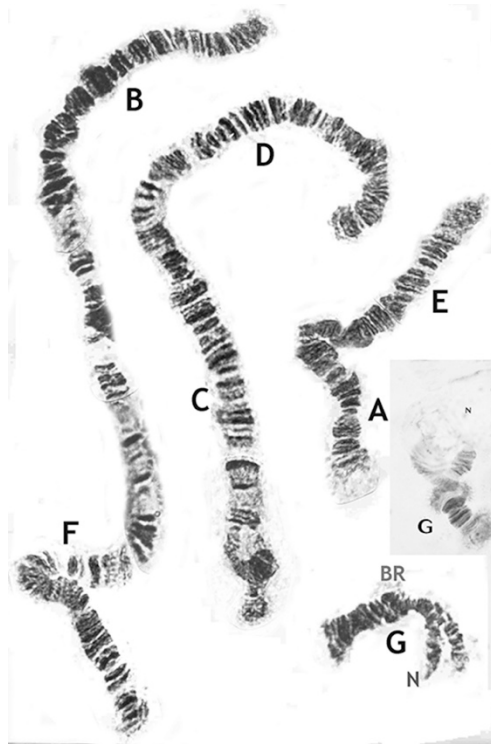
Hooks of posterior prolegs dark.



Larval mouthparts of species PK6 from Deoli Village, Jammu

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 terminal inversion
- 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?
- Arm G1: Terminal nucleolus and two BRs, one medial, the other distal.



Polytene chromosome complement of *C.* species PK6 (courtesy S. Saxena)

Found: INDIA: Delhi area (abt. 28.53°N, 77.27°E); Jammu - Deoli village (32.70°N, 75.00°E); Kabeer colony (32.70°N, 75.00°E); Indira Nagar (32.07°N, 74.83°E), Jammu & Kashmir.
PAKISTAN: (BOLD)

This species is close to, but not identical with, the *Chironomus* species (*C.* sp. SS) of Sumitra Saxena (1995).

Molecular sequence:

DNA BARCODE suggests it is probably another member of the *C. flaviplumus*-group. A probable conspecific specimen in BOLD cannot be accessed for Bin number or collection locality.

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

Incorrect identification: *C. ramosus sensu* Laviad-Shirit et al., 2020 = *C. flaviplumus* Ty. B (Martin 2022).

This species is in BOLD Bin: [BOLD:AAW3997](#)

This species has been recorded as *C.* sp.PK7 in previous versions of this work.

Original description:

Adult:

Male:

Body 5.77 (5.62-5.89) mm. Wing length 2.33 (2.27-2.40), wing width 0.72 (0.70-0.76). VR 1.01 (1.00-1.03); about 15 setae shown in squamal fringe.

Head: AR 3.86 (3.72-3.94). FT small; ratio of palp segments: 14 : 11 : 47 : 48 : 66; P5/P4 1.38; P5/P3 1.40. Clypeal setae 20 (18-20).

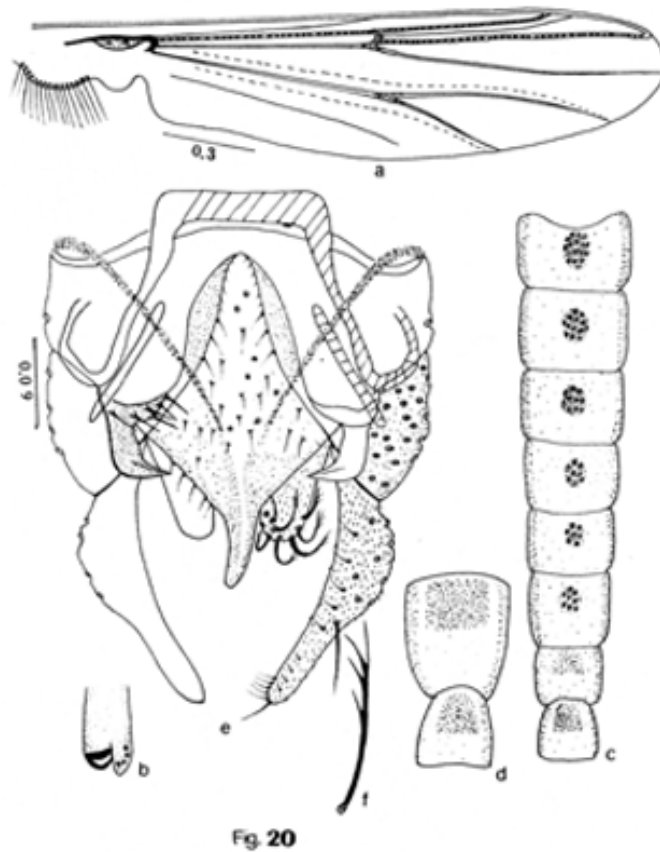
Thorax yellow, postnotum pale brown; 2 antipronotal setae. Mesonotum with 4 brown vittae; Acrostichals 18 (17-20); dorsocentrals 19 (18-19), uniserial; prealars 5 (2-6); supraalars 1; scutellars 26 (26-28).

Legs yellow, fore tibial scale with 4 long setae; tarsomeres of foreleg dark brown, Ta1-3 of mid and hind legs brown at apex, Ta4 & 5 brown.

Leg proportions and ratios (units):

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	BR
PI	30	29	43	21	18	15	7	1.48	1.03	no beard?
PII	31	29	18	10	7	4	3.5	0.62	1.07	
PIII	38	35	25	14	11	6	4	0.72	1.09	

Abdomen: Greenish yellow, tergites II-VI with brown oval spot medially; VII & VIII with broad brown patch.

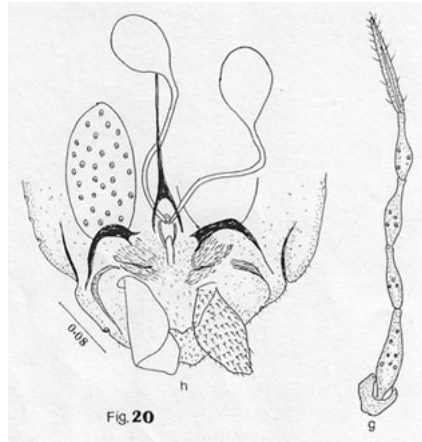


Adult male of *C. ramosus* (Chaudhuri, Das and Sublette 1992)

About 12 setae on TIX. Curved anal point figured as tapering to end, beak-like SVo (as in *C. samoensis*, *C. flaviplumus*, etc.), S-type, closest to Fig. a of Strenzke (1959); IVo not reaching the end of the anal point, about to basal third of gonostylus, setae finely branched. Gonostylus moderately swollen, narrowing rapidly at posterior half to third.

Female:

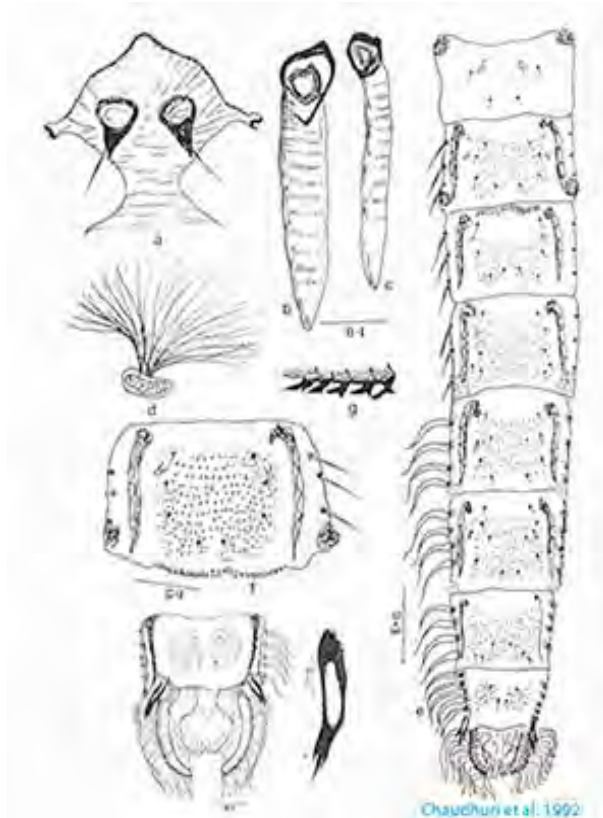
Body 4.68 (4.53-5.12) mm. Wing length 2.59 (2.49-2.66), wing width 0.88 (0.82-0.95). Antenna 5 segmented, relative lengths 10 : 7.5 : 7 : 6.5 : 12. AR 0.38, A5/A1 about 1.2.



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

TX shown as long, curved, but inner region with setae not shown; other specimens show it is about 1.67x longer than greatest width, with 14 setae; Cercus with short dorsal margin, then curved around to ventral base; no obvious basal bulge.

Pupa: Colour brown, but exuvia grey. Length of male 6.60 (5.99-7.64) mm, of female 7.25 (6.52-8.86). Cephalic tubercles about 75-90 μ m long and 57-60 μ m wide, with the subapical seta about 0.05 mm in length. Antennal sheath of female about 540 (540-560) μ m long. Wing sheath 1.54 (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 1-3 spines.



Fourth instar larva: a small to medium plumosus-type (length 8-13.2 mm). Anterior pair of VT shorter than posterior pair. AT 310 (290-330) μm long. Gula and FC apparently not darkened.

Mentum with c2 teeth well separated and c1 broad (type IB), 4th laterals slightly reduced (Ty.II).

Ventromentum about 3.9 times longer than its depth; figure indicates numerous striae.

PE with about 20 teeth (type B) – other populations have 12-16 teeth. Premandible shown with two equal teeth, but normally the inner tooth is 2-3 times wider than the outer tooth (perhaps Ty.D).

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.

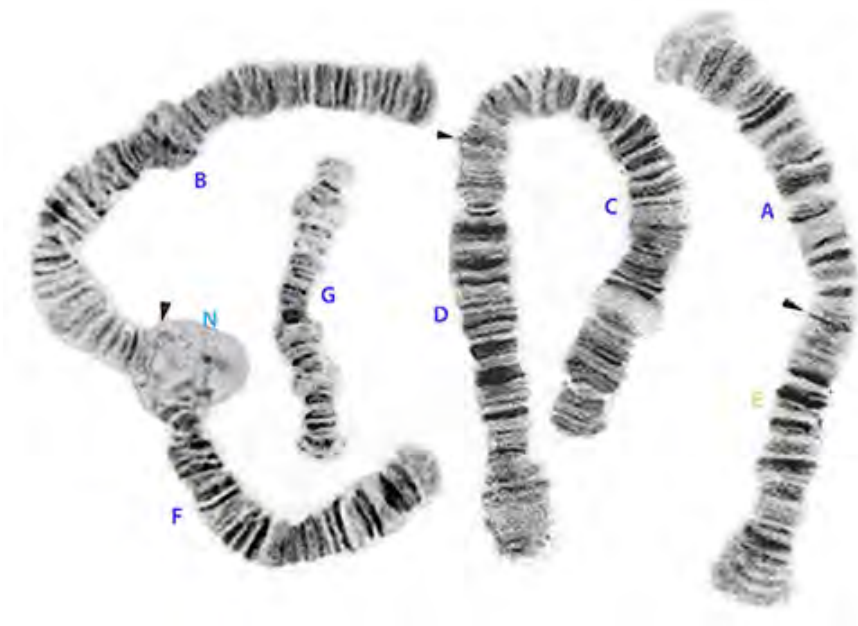
Mandible figured as type IIB; no information on number of furrows on outer surface; or number of taeniae in PMA; MTR perhaps about 0.33.



C. ramosus larval parts from Chaudhuri *et al.* 1992

Cytology: Four polytene chromosomes with the pseudothummi-cytocomplex combination BF, CD, AE, G. Although later specimens attributed to *C. ramosus* (e.g. Laviad-Shirit *et al.*, 2020; Sela *et al.* 2021) are actually *C. flaviplumus* Ty. B, the original description by Nath & Godbole (1997) is *C. ramosus*. 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. There are two nucleoli, although the one in arm C is development stage specific. The other is in arm B at 11B. Two BRs, about equally distant from each end, are on arm G. Band identifications as in Nath & Godbole (1997):

- ramA1: 1 - 2c, 10 - 12, 3- 2d, 9 - 4, 13 - 19. as circumdatus A2, holomelas, etc.
- ramB1: Characteristic bands at 10F, nucleolus at 11B
- ramC1: Developmentally stage specific nucleolus at 6B. as C2 of incertipenis?
- ramD1:
- ramD2: Simple inversion towards end of arm
- ramE1: 1a-i, 5 - 10b, 3e - 2, 4 - 3f, 10c - 13 i.e. as incertipenis; Inv2-5 from aprilinus,
- ramF1: 1 - 2a, 10 - 3d, 14c - 11, 2b - 3c, 14d - 23
- ramG1: BRs at 18C and 19C
- ramG2: Simple inversion involving the proximal BR



Chromosomes of *C. ramosus*, courtesy of B. B. Nath. N – nucleolus

Found: INDIA Type locality - Satgachhia, West Bengal.

Other localities: INDIA - Hooghly, West Bengal; Pune; Cachar hills, Assam.

***Chironomus flaviplumus* Type C**

(see also *C. orientalis*, below)

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](https://www.boldsystems.org/index.php/AABAB:AAV5954)

Fourth instar larva: The larvae of this species are a plumosus-type larva, very similar to those of *C. flaviplumus* (Genbank 2015).

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. This taxon has been given the manuscript name of *C. orientalis* (see below).

Found: CHINA – Yangtze River basin
THAILAND - Maharakham 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 (15.30°N, 103.303°E).
AUSTRALIA – Queensland and Northern Territory

Other members of the *C. flaviplumus*-group:

“*Chironomus orientalis*”

This species is related to *C. flaviplumus* in Japan and was identified as *C. flaviplumus* from China (see *C. flaviplumus* Ty. C, above) but requires a new name (Martin 2011b). The name *C. orientalis* is suggested, as the species is widespread in Asia, although the only adults available are from Australia.

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

Adults

Males

Proposed holotype male

Generally greenish, with light brown thoracic vittae and postnotum, legs unmarked, abdomen with brown saddle spots on segments II-V, then mostly brown. Legs pale. Wings clear.

Abdomen pale, greenish, with a brown band on posterior third to half of segments II-VI, then largely brown.

Wing length 2.84 mm; width 0.67 mm; VR 0.95; 14 setae on squamal fringe, 3 SCf on brachiolum.

Head: AR 2.44. FT about 33 µm and 2.5 times longer than wide; clypeal width about 0.65 of diameter of antennal pedicel with 15 setae; palp proportions (micron) 45 : 50 : 188 : 208 : 308; P5/P4 1.48; P5/P3 1.64.

Thoracic setae: Acrostichals – about 18; 16-17 dorsocentrals; 5 prealars; 1 supraalar; scutellars in two rows, 6 in anterior row, 12 in posterior row.

Leg lengths (micron) and proportions:

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	BR
PI	1320	970	1905	950	855	725	335	1.96	1.36	2.20
PII	1290	1155	720	380	270	175	120	0.62	1.12	-
PIII	1445	1350	1120	575	435	260	145	0.83	1.07	-

abt 12 Sch on hind Ta1

9 setae on tergite IX in individual clear spots. SVo beaked, between S(d and e) types of Strenzke (1959); IVo reaching close to distal end of anal point (about middle of gonostyle, i.e. where it begins to narrow); some setae appear bifid. Anal point slightly broader at distal end.

Pupa. Exuvia length 7.8 mm; inner margin of wing case 1.45 mm. Shagreen at centre rear of seg. II; over rear 2/3 of segs. III-V but with central gap on seg. V; only vague on seg. VI except around posterior setae, and not obvious on segs. VII-VIII; spicules in intersegments V-VI and VI-VII.

Cephalic tubercles, 23-25 µm long and width at the base about 30-40 µm, with subterminal setae up to 75 µm long. Basal ring of respiratory horn kidney shaped, about 133 µm long and 65 µm wide, HR about 2.0. About 72 recurved hooks at rear of segment II, occupying about 78% of the segment width. Pedes spurii small on segment II; pedes spurii large on segment IV – about 132 µm long and 78 µm wide, about 18% of the segment length; about 75 µm on

seg V; 70 μm on seg VI. Spur of segment VIII with 3 spines (2 large and 1 small); about 86 taeniae on each side of swim fin.



Adult from Queensland, Australia (photo by Graeme V. Cocks)

Other 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)

Wing length: 2.85-3.15 mm; wing width 0.30-0.67 mm, 2-4 SCf on brachiolum, 12 (9-14) setae on squamal fringe. VR about 0.95 (0.93-0.95).

FT about 33-39 μm and 2.5-3 times longer than wide. About 11-22 clypeal setae.

Palp proportions: 44 : 53 : 189 : 222 : 314; P5/P4 1.42, P5/P3 1.66.

Thorax: Setae – acrostichal about 10-18; dorsocentral about 13-18; prealar about 5-6; supra alar 1; scutellar in 2 approximate rows, 6-7 in anterior row, 11-17 in posterior row (total 17-24).

Leg lengths (microns) and proportions as follows:

Male	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	BR
PI	1350	975	1820	925	837	712	362	1.82-1.96	1.35-1.44	1.7-2.2
PII	1305	1155	750	395	268	168	125	0.62-0.67	1.11-1.17	-
PIII	1478	1385	1180	595	448	262	152	0.81-0.92	1.05-1.09	-

Setae near centre of TIX: 9-12 in individual clear spots. 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. IVo not reaching to end of anal point but to mid-point of gonostyle; some setae on IVo with simple or trifid fork. Gonostyle narrows gently or sharply from about the midpoint.

Female:

Only three damaged specimens have been available for study, two with the head missing. Wing length 3.3 (3.28-3.53) mm; width at cross vein 0.87 (0.83-0.90) mm, VR 0.87 (0.81-0.93). About 2.6 (2-3) Scf on brachiolum and about 16 (14-18) setae on squamal fringe.

Head with FT about 14 µm long and 13 µm wide.; about 21 clypeal setae.

Antennal segments (microns) (fraction of neck in brackets): 190 (0.24) : 127 (0.51) : 147 (0.54) : 121 (0.48) : 215. AR about 0.37; A5/A1 about 1.13. Only palpal segments 1 and 2 were present, lengths 78 and 61 µm.

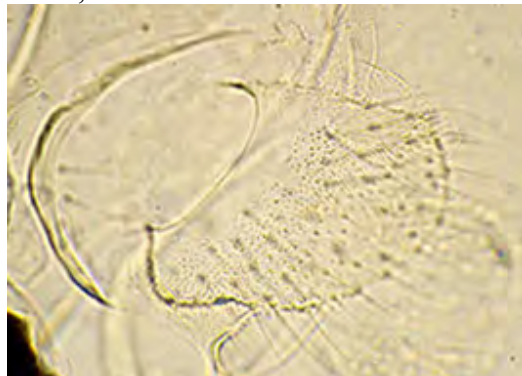
Thoracic setae - acrostichal about (16) 13-17; humeral 7 (6-8) in approx. zigzag; dorsocentral about 29 (23-36) (Humeral+DCs 36 (29-46)); prealar about 5.5 (5-6); supra alar 1; scutellar in two approximate rows, 5 (5-6) in anterior row; 11 (11-12) in posterior row. (Total 16.6 (16-18)).

Leg lengths(micron) and proportions:

Female	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	Ta4/Ti
PI	1640	1180	2290	1347	1102	1112	410	1.91-1.92	1.37-1.42	0.90-0.97
PII	1565	1400	828	438	309	192	143	0.58-0.61	1.11-1.14	-
PIII	1703	1640	1322	695	544	311	185	0.79-0.82	1.02-1.06	-

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

Abdomen pale (probably greenish); segment X crescent shaped, about 4.2-4.5 times longer than its greatest width, with about 4-7 setae.



Cercus and segment X (at left) of *C. 'orientalis'*

Cercus roughly oval, posterior margin curved, dorsal margin longer and with a basal bulge at the ventral base.

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

Important features of males are the AR of 2.4-2.9 (lower than that of *C. flaviplumus*), 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 1959).

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: (5 males) Exuviae length about 7.4 (7.2-7.8) mm; inner margin of wing case 1.80 (1.42-2.81) mm.

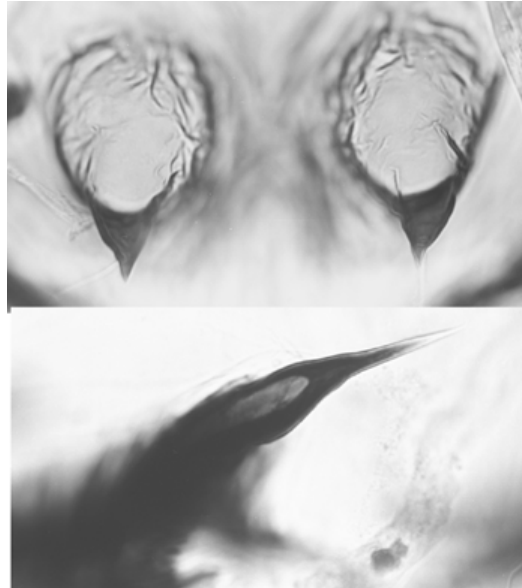
Cephalic tubercles (see below) variable, length from 23-38 μm , slightly less than base width: with subterminal setae about 64 (56-75) μm long. No indication of frontal warts.

Basal ring of respiratory horn kidney shaped, about 131 (130-137) μm long and 64 (56-68) μm wide, HR 2.0-2.2.

Small Pedes spurii B and about 74 (68-85) recurved hooks on abdominal segment II; well-developed Pedes spurii A on segment IV, about 86-166 μm long and 61-93 μm wide (l/w 1.4-2.8) and about 0.20 (0.18-0.26) of the segment length.

Caudolateral spur (see below) of segment VIII on an elongated base with narrowed (paler) center, with 1.8 (1, 2 or sometimes 3) spines, the additional spines reduced in size.

Anal fringe with about 76 (44-100) taeniae initially in a single row, but increasing to two, or sometimes 3, rows at distal end.



Pupal cephalic tubercles and spur of *C. orientalis* from Australia.

Fourth instar larva: a medium sized plumosus-type larva (length about 11.8 (9-14.3)(female), 10.9 (10.7-11)(male) mm., lab. reared). Anterior VT 1.49 (1.24-1.84) mm., shorter than posterior pair 1.72 (1.40-2.48) mm.

Gula pale or very slightly darkened on posterior third; FC pale to dark. Clypeal aperture about 3.64 (2.60-4.43) times longer than wide.

Mentum (Fig. b, below) with square sharp teeth, c2 teeth of central trifid tooth well separated

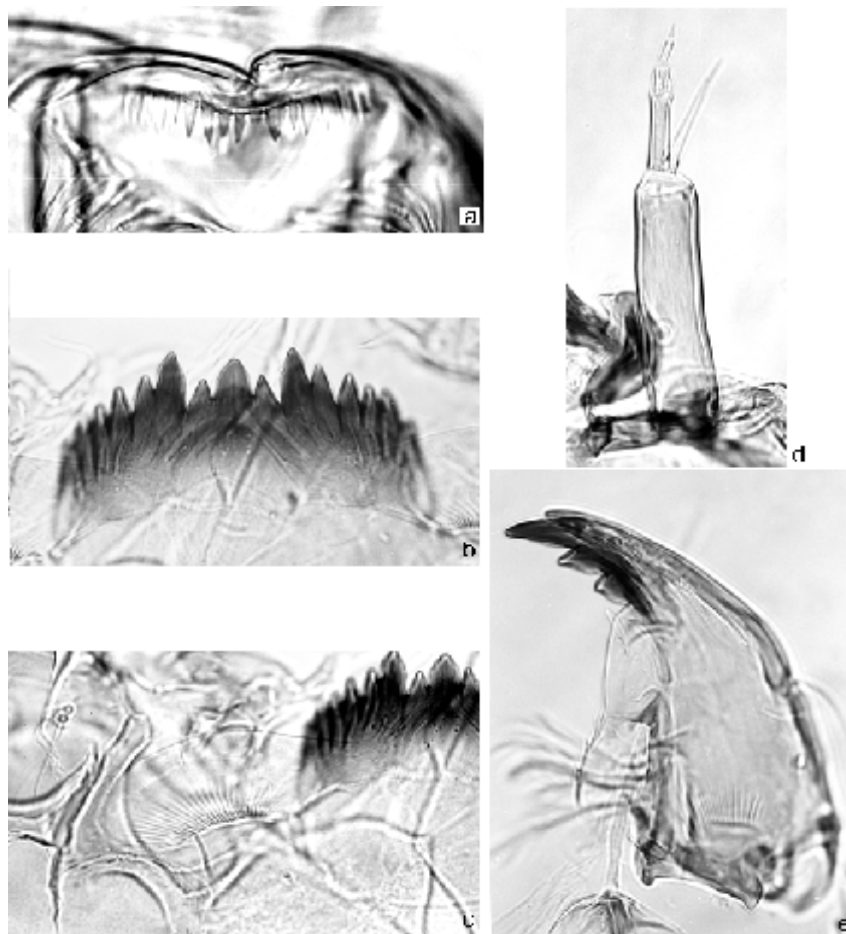
from c1 tooth (type III), 4th laterals slightly to moderately reduced (type I-II); about 0.53-0.59 times the VHL. PE (Fig. a, below) with about 16-19 sharp teeth which become much smaller at the ends.

Ventromentum (Fig. c, below) about 183 (180-185) μm long and 3.87 (3.72-4.05) times longer than deep, with about 34.2 (31-38) striae; VMR about 0.29 (0.25-0.32); about 1.17 (1.13-1.22) times the mentum width.

Distance between the antennal bases slightly larger than the distance between the S4 setae, which are separated by about 0.82-0.87 of the width of the mentum at that point.

Antenna (Fig. d, below) with a moderately long basal segment, which is about 3.74 (3.62-4.03) times as long as wide; AR about 1.87 (1.62-2.05). Antennal proportions: 116 : 34: 9 : 12 : 8.

Mandible (Fig. e, below) with third inner tooth only slightly darkened (Type IA/B), and with about 13.1 (12-14) grooves on outer surface near the base; MTR about 0.35 (0.32-0.38); 11.8 (10-13) taeniae in PMA. MTR abt 0.27.



Larval mouthparts of *C. orientalis* from Australia.

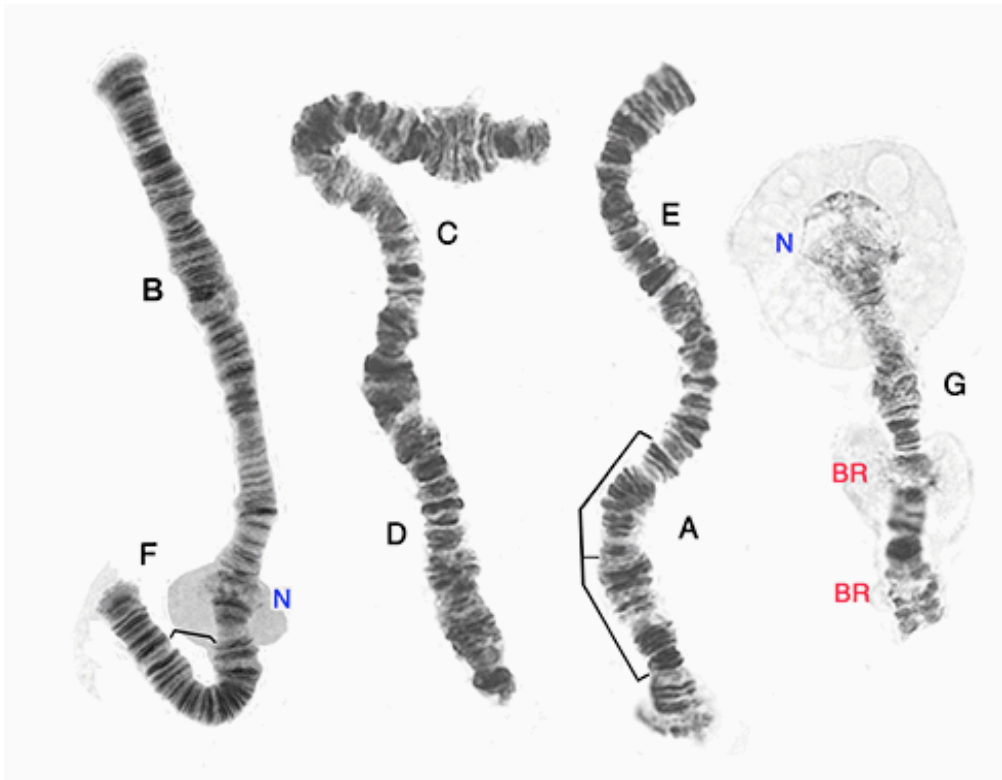
Cytology: 4 polytene chromosomes with the pseudothummi arm combination AE, BF, CD, G.

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. flaviplumus*.

Arm A of Australian specimens differs from that of *C. flaviplumus* 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 *flaviplumus*
 “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 of *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 (*C. flaviplumus* Ty. B).

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 (i.e. *C. flaviplumus* Ty. B).

Proposed type series: Holotype male: Radon Creek, Kakadu National Park, Northern Territory, Australia ANT.15.3 Egg mass #3, reared male 3. Allotype female: details as holotype, female 1.

Found:

AUSTRALIA: - **Northern Territory** - Radon Creek, Kakadu National Park (12.75°S, 132.93°E); Twin Falls, off Jim Jim Road, Kakadu area (13.00°S, 132.58°E)
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 (15.30°N, 103.38°E).

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* nr. *flaviplumus

This species is a member of the “*C. flaviplumus*-group”

Adult:

Male: (based on one specimen)

AR about 3, LR not known. Wing length about 3.4 mm; width about 0.73 mm; VR about 1.05.

FT relatively small, 18x13 µm; Palp proportions (µm) 48: 60 : 240 : 225 : (shrivelled). Clypeal setae about 24.

Thoracic setae: acrostichals - abt 14; dorsocentrals - 14-15; prealar - 6; scutellar - 8 in anterior row, abt 29 in posterior row (of which 14 are in an intermediate row).

Wing with 2 setae on stem vein and about 20-22 on the anal fringe.

Leg lengths (microns) and proportions as follows:

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T
PI	1240	1189	-	-	-	-	-	-	1.04
PII	1365	1250	720	415	305	210	160	0.58	1.09
PIII	1520	1505	1105	610	480	290	190	0.74	1.01

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

About 19 setae on tergite IX. SVo beaked, of D-type, between d and e of Strenzke (1959). Setae of IVo forked.

Pupa: Not currently known.

Fourth instar larva: a medium sized plumosus-type larva (female abt 12.2 mm). Anterior ventral tubules shorter (abt 2.44 mm) than the posterior pair (abt 2.64 mm); lateral tubules well developed (abt 400 μ m).

Gula slightly darkened, frontoclypeus dark, particularly at posterior of head.

Mentum with 4th laterals reduced almost to height of 5th laterals (type II), 6th laterals originating slightly below the level of other teeth; teeth relatively sharp; centre trifold tooth with c2 teeth well separated, tending to type IV. SAL abt. 76 x 14 (l/w 5.5).

Pecten epipharyngis with about 16 sharp teeth. Ventromental plates separated by about 30% of the mentum width, with about 42-44 striae.

Premandible relatively broad and blunt, teeth about equal in length, inner tooth about 1.5-2 times the width of the outer tooth.

Antenna with a moderately long basal segment, which is about 4 times as long as wide; AR about 2.06; ring organ just under half way up from base. Antennal proportions: 130 : 29 : 8 : 13 : 6.

Mandible with 3rd inner tooth well developed but only slightly darkened (type IIIB), about 14-15 striae on inner margin at base.

Cytology: 4 pairs of chromosomes with the pseudothummi arm combination AE, BF, CD, G. Does not appear to be a nucleolus in arm G, but a large medial BR. Nucleolus in arm F probably at about group 19. Polymorphism at least in arms D and G.

Arm A1: 1 - 2c, 10 - 12, 3, 14c - 13, 4 - 9, 2ed, 14d - 19 as "sam" A2

Arm B1: Puff (group 7) about one third from distal end, with dark bands (group 8) distal to it. possibly as cirB1

Arm C1:

Arm D1:

Arm D2: Small simple inversion near the middle of the arm

Arm E1: 1 - 2c, 5 - 10b, 3e - 2d, 4 - 3f, 10c - 13 as *incertipenis*, *flaviplumus*

Arm F1: possibly 1 - 2a, 10d-a, 15 - 11, ??, 19-23

Found: INDIA - Jammu: Bishnah wetlands (32.70°N, 75.00°E); Deoli Village (32.70°N, 75.00°E); Farooq Nagar (28.20°N, 75.00°E); Gadhigargh (33.700°N, 74.92°E); Sangrampur Village (abt 32.70°N; 75.00°E).

Molecular Data:

The mtCOI sequence is very similar to that of *C. flaviplumus*, and also close to that of *C. nr. samoensis*.

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

Syn.: *C. basitibialis* Tokunaga 1936 (Yamamoto 2013)

C. bharati Singh & Kulshretha 1976 (doubtful synonymy – see description above)

C. costatus sensu Karunakaran 1969 (mtCOI - Wong, unpubl.; cytology - Martin 2022)

C. plumatisetigerus Tokunaga, 1945 (Martin & Saxena 2009)

C. setonis Tokunaga 1936 (Yamamoto 2013)

Probable Syn: *C. costatus* Johannsen 1932 (see *C. costatus*)

C.

Sasa & Suzuki 2001 (possible synonym – Yamamoto & Yamamoto 2018 – but SVo is quite different, & setae of IVo are simple)

A member of the broader “*C. flaviplumus* complex”

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

Adult:

Male

AR about 3.33 (3.0-3.8). The high value comes from Japanese material (Sasa 1978), Indian specimens are less than 3.5. Kieffer value about 3.5 (Formosa)

FT about 29.7 (25-43) µm long, 10-17 µm wide (L/W 1.53-3.07). Palpal proportions (µm) 56 : 53 : 211 : 217.5 : 334, P5/P4 1.40-1.68; P5/P3 1.44-1.68. Clypeal setae – 28.7 (18-37).

Thorax greenish, scutal stripes conspicuous with dark brown margins; scutellum pale yellow, postnotum dark brown. Thoracic setae: acrostichals – 22.2 (13-31); dorsocentrals - 18-27; prealar - 5-6; scutellar - 8-14 in anterior row, 13-26 in posterior row (a male from Delhi had a double row of large setae, with an intermediate row of 12 setae) total scutellars 28.2 (21-34).

Wing length: 3.04 (2.72-3.41) mm; wing width 0.72 (0.67-0.74) mm. VR about 0.95-1.0. Wings without darkening of the crossvein. 2-3 Scf on brachiolum, 27.3 (22-36) setae in squamal fringe.

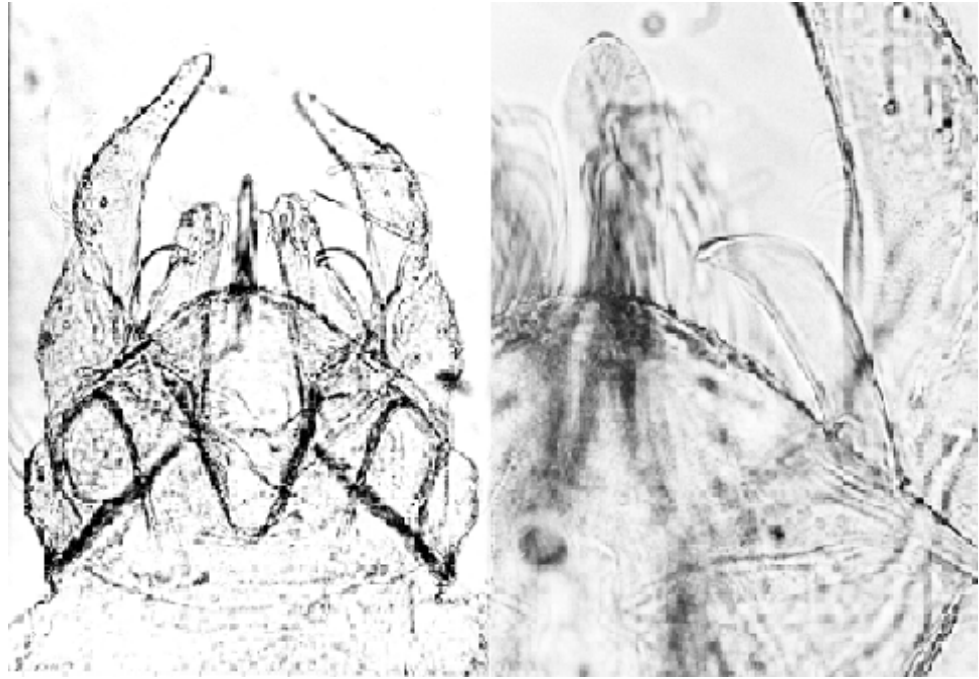
Legs pale, with darkening at distal ends, also on distal half of Ti4 and all of Ta5.

Leg lengths (microns) and proportions as follows:

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	BR
PI	1165	1058	1590	865	765	660	335	1.40-1.67	1.04-1.18	1.64-2.4
PII	1230	1110	705	395	295	165	135	0.62-0.66	1.05-1.13	
PIII	1350	1350	1000	560	475	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. TIX with about 9 setae (Yamamoto & Yamamoto 2018, as



Male terminalia of *C. circumdatus*

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

Anal point narrow at base; 5-13 setae in individual pale spots on tergite IX. SVo of the D(e)-type 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. Setae on IVo forked.

Female (based on Sasa 1978 and Australian specimens):

Wing length 2.73-2.8 mm. , width 0.82, VR 0.93; 2 SCf on brachiolum, at least 21 setae on squamal fringe.

Head: FT 38 µm long, 11 µm wide (3.3 times longer than wide).

Antennal proportions (approx. % of neck in brackets) (µm): 138 (28) : 103 (37) : 114 (40) : 113 (45) : 164, AR 0.27; A5/A1 1.21.

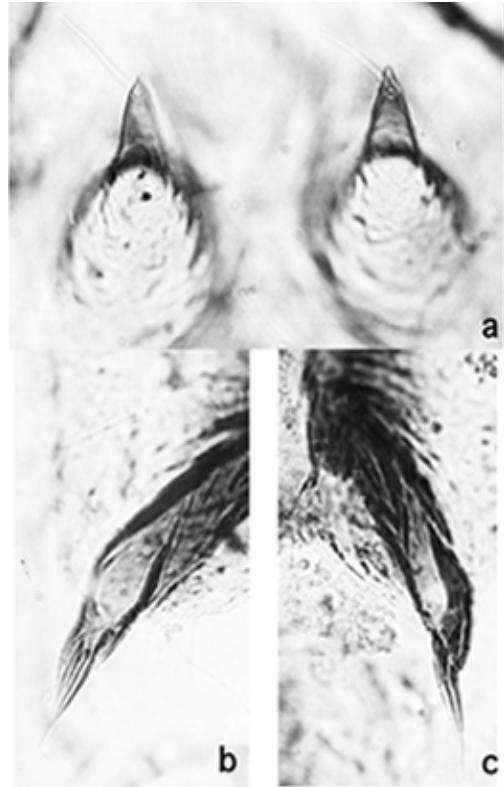
Palpal proportions (µm): 89 : 56 : 205 : 230 : 540; P5/P4 1.69-2.34; P5/P3 2.14-2.34.

Leg lengths (microns) and proportions as follows:

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	Ta4/Ti
PI	1440	1150	2050	1000	930	880	410	1.79	1.25	0.58
PII	1630	1340	810	410	290	180	150	0.60	1.22	0.13
PIII	1490	1490	1150	560	460	270	180	0.77	1.00	0.18

Abdominal tergites brown, with narrow apical pale bands or spots on tergites I to VI.

Pupa: Brown. Exuviae pale brown. Body about 6.6-7.7 mm (male) and 6.5-7.6 mm (female). Cephalic tubercles (a, right) about 70-100 μm , with a subapical seta (40-80 μm). 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 8.7-14.3 mm; females 12.9 (11.0-14.3) mm; males 11.8 (11.0-12.5) mm), lateral tubules well developed (about 350 (220-480) μm). Posterior pair of VT (2.30 (1.52-2.76) mm) generally longer than anterior pair (1.84 (1.36-2.48) mm) and coiled. Anal tubules may vary in size in different areas, from about twice as long as wide (Allahabad) to more than three times as long as wide (Jammu & Singapore), length 290-440 μm , width 80-165 μm ; with a medial constriction. SAL about 46-63 μm long and 2.6-3.9 times longer than wide.

Gular region darkened on posterior third to half, FC 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) about 215 μm wide and 3.8 times wider than deep, about 1.14 times the mentum width, with about 38 (30-42) striae. PE (a, below) with about 11.6 (12-14) teeth, often more worn than pictured.

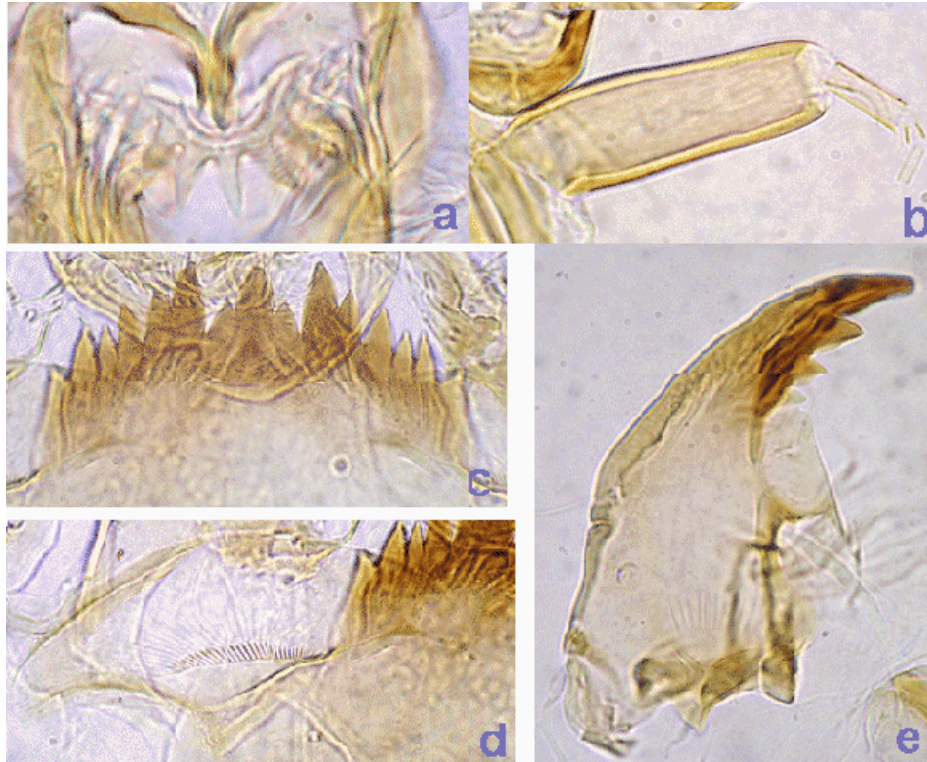
Premandible with inner tooth about 2-3.5 times the width of the outer, coming to a fine point (type B1).

Antenna (b, below) with basal segment about 2.8-3.8 times as long as wide, RO about a quarter to halfway up from the base; A2/A1 about 0.24-0.3; A5/A3 about 0.67-1.6. AR about 2.42 (2.21-2.67); relative segment lengths (micron) 112 : 25 : 6 : 10.5 : 6.5.

Distance between antennal bases, 141.4 (124-164) μm , greater than that between the S4 setae, 135 (128-142).

Mandible (e, below) with third inner tooth slightly darkened and only partly separated (type I-IIB); about 12.5 (11-15) furrows on outer surface near the base; 2 spines; PecMand with about 11 taeniae; Mdt-Mat about 30, MTR 0.12.

Hooks of posterior prolegs yellow.

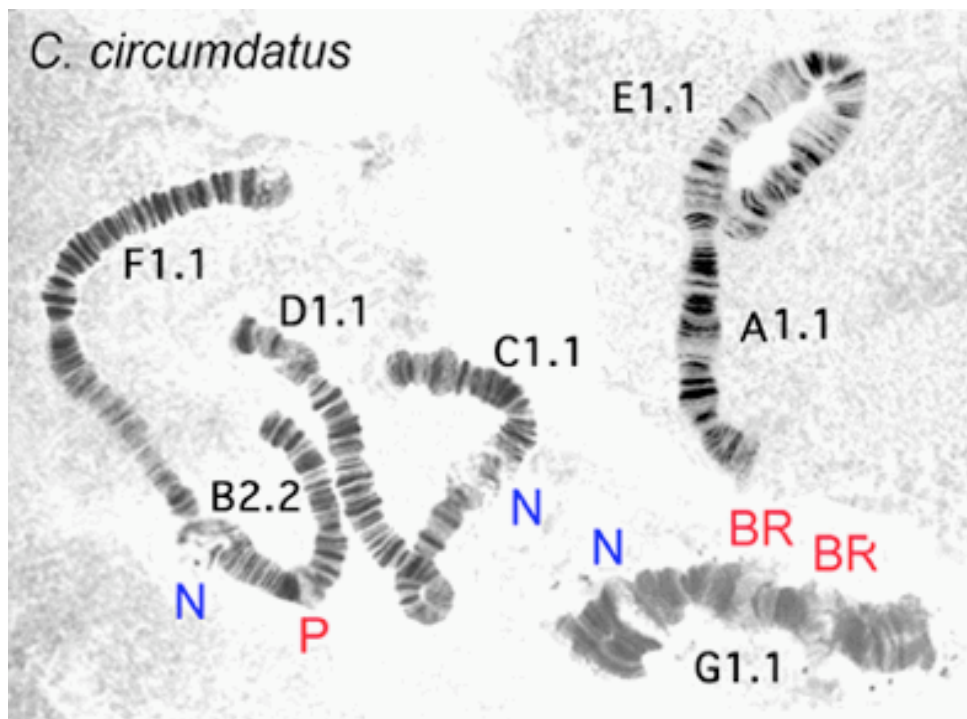


Cytology: Four polytene chromosomes with the pseudothummi-cytochrome combination BF, CD, AE, G. Nucleoli in arm B and C, with a small one also present subterminal in arm G (which is not always present/active). Arm G closely paired with generally 3 obvious BRs from near the nucleolus to the opposite end, depending upon the sequence.

Polymorphism in arms A, B, C, D and G, although Pramual *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: FORMOSA Type locality – Tainan (abt 23.0°N, 120.0°E), Yentempo, (formerly Takao Prefecture), (TAIWAN).

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

INDIA - University of Jammu (32.73°N, 74.87°E); Bishnah wetland 32.70°N, 75.00°E); Farooq Nagar (28.3°N, 76.80°E); Jammu abt 76°50'E (76.80°E); Madurai, Tamil Nadu (9.91°N, 78.00°E); Varanasi (25.20°N, 83.03°E), Banaras; Allahabad (now Prayagraj) (25.43°N, 81.84°E) Uttar Pradesh; Jaisamand and Rajsamand Lakes, Rajasthan, India.

INDONESIA - Kampung Damai, Balikpapan (-1.25°S, 116.82°E), Kalimantan.

JAPAN - Okinawa Island, Miyako Island and Ishigaki island, Okinawa Prefecture, Ryukyus; Tama River, Noborito and Yoroi bridge, Tokyo Metropolitan, Honshu.; Tokushima City, Tokushima Prefecture, Shikoku; Maekawa, Tamagusuku-son, Okinawa Island; Mukue River, Kochinda-cho, Okinawa island; Natatsu, Ishigaki Island; all Okinawa Prefecture, Ryukyus (and many other localities in .

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; Changhan; 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).

Also from **Australia, Papua New Guinea and Micronesia**,

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*.

Closely related to *C. ramosus*.

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. JQ287751), 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).

The Barcode sequence of this species differs by at least 54 bases from that of *C. flaviplumus* B.

***Chironomus yoshimatsui* Martin & Sublette 1972**

Synonyms: *C. daitoefeus* Sasa et Suzuki, 2001 (possible synonym by Yamamoto, unpubl.) – illustration of SVo is different (E(h)-type) and setae of IVo not illustrated as forked.

C. echizensis Sasa, 1994 (Yamamoto & Yamamoto 2018)

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: FT 25 x 9 µm, palpal proportions (micron) 48 : 49 : 250 : 246 : 350; P5/P4 1.43; P5/P3 1.41. Clypeus 0.7-1.0 times as wide as the antennal pedicel, with 19-31 setae.

Thorax with vittae most of postnotum, and mesosternum yellowish brown, dark central spot on postnotum. Thoracic setae: 10 acrostichal in staggered row; dorsocentral about 18-24 in one to three rows; prealar 5-6; supra-alar 1-2; scutellar anterior row of 7-10 smaller setae, posterior row of 12-13 larger setae (total 19-23 setae).

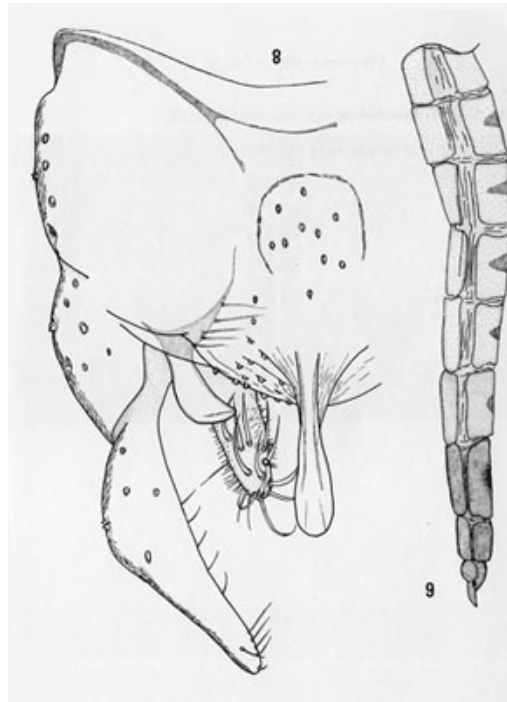
Wing with r-m slightly darkened, 2 Scf on stem vein; squama with 16-17 fringe setae in a partial double row.

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 lengths (micron) and proportions:

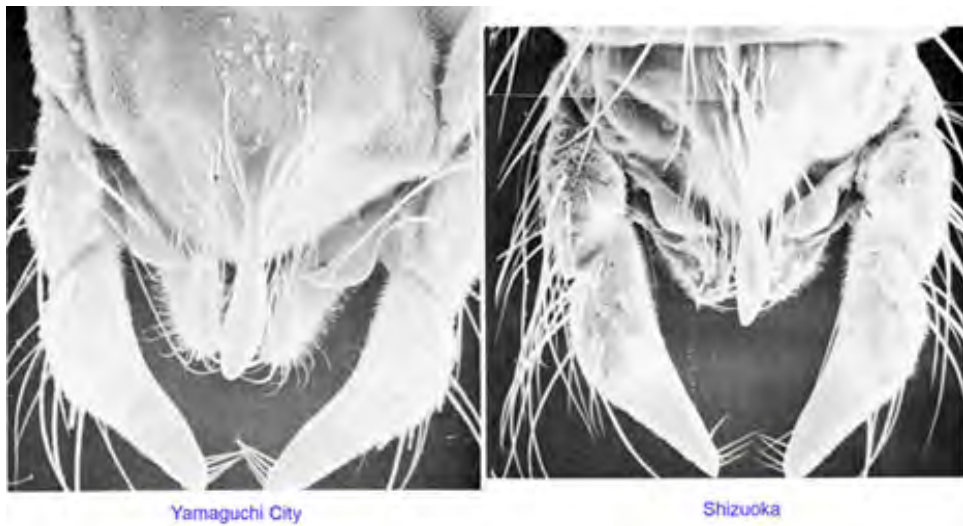
	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	Ta5/Ti
PI	1500	1235	1980	1040	890	770	340	1.08-1.85	1.17-1.26	0.25-0.30
PII	1530	1155	815	445	325	195	145	0.57-0.64	1.16-1.48	
PIII	1690	1655	1195	675	515	295	175	0.63-0.73	1.00-1.04	

BR abt 2.15



From Holotype male (Martin & Sublette 1972)

Abdominal tergites II-VI with a transversely elongated central spot, that of VII merges into background. TIX with about 10-17 setae in single spots within a larger patch.



Gonostyle moderately swollen, reducing gradually from about half way, with about 4+1 setae at tip. Anal point narrow at base. SVo of type D(d-e) of Strenzke (1969). IVo with weakly bifid setae, reaching almost to end of anal point or a third to half way along the gonostylus.

Female (mostly Allotype):

Wing length 4.44 (3.39-4.44) mm, VR 1.09 (1.06-1.09); squama with 38 setae in a partial double row.

Antennal proportions: 10 : 30 : 34 : 31 : 44. AR = 0.42; A5/A1 = 4.4. FT 25 x 11 µm, i.e. 2.27 times longer than wide. Palpal segments (P2-P5) 15 ; 55 ; 57 ; 98 ; P5/P4 1.72. P5/P3 1.75. Clypeus 1.36 times the diameter of the antennal pedicel, with about 40 setae. About 33 postocular setae in 1-3 rows.

Mesonotum with a conspicuous median tubercle. Acrostichal setae in a staggered row; 5 humerals in a sparse clump, 28 dorsocentral (humeral plus dorsocentrals – 33); 5 prealars; 1 supra-alar; scutellum with a slightly staggered posterior row of larger setae and anteriorly with a row of about 16 slightly smaller setae.

Leg lengths (micron) and proportions:

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	Ta4/Ti
PI	1180	960	1430	780	680	630	260	1.45-1.50	1.23	0.66
PII	1240	1100	600	310	220	150	110	0.53-0.57	1.13	
PIII	1350	1350	-	-	-	-	-	0.55	1.00	

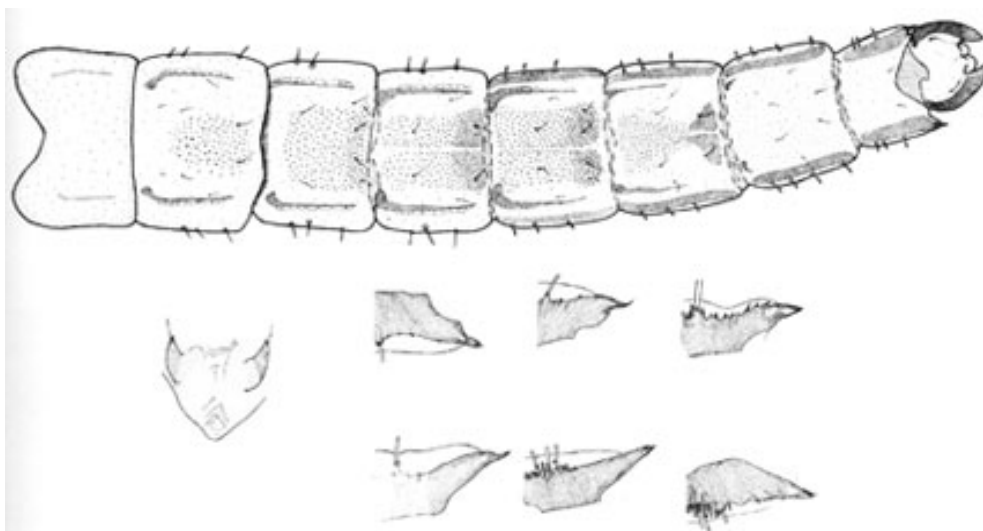
Cercus with rounded margin, ventral margin longer and with a prominent basal bulge.

Pupa: Total length females 7.90-9.99 mm; males 7.99-8.66 mm. Coloration generally darkish. Cephalic tubercles (below) small and conical, with a subapical seta.

Base of respiratory organ 200 x 100 µm., HR=2; 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 variable 94 (26-117). Posterolateral spur of segment VIII usually with a single spine but varying up to four.

Swim fin with one dorsal and 82 (61-97) lateral taeniae.



According to Langton & Visser (2003) the pupa is very similar to those of *C. dorsalis*.

Fourth instar larva: A medium sized (length 12.1 (9.8-15.3) mm; females 12.68 (10.2-15.3 mm); males 11.4 (9.8-12.8) mm) bathophilus-type – however Sasa (1978) notes that one larva had small TLts, 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 finger like, length about 205-280 μm and 2.2-2.9 times longer than wide; ventral pair sometimes longer than dorsal pair.

Gula and FC darkened; FC generally darker along the edges and the posterior end.



Mentum (Fig. c) with c2 teeth well separated (type IIA), and 4th laterals not reduced (type 1). PE (Fig. a) 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 up to five times the width of the outer tooth (Ty.D).

Ventromentum (Fig. d) about 3.4 times wider than deep and about the same width as the mentum, with about 44 striae; VMR about 0.28.

Antenna (Fig. b) with A1 about 2.8-3.4 times longer than wide, RO from a quarter to half way up from base of segment; AR 2.33 (2.16-2.46); A2/A1 0.21-0.24; ratio of segment lengths (micron) 99 : 22.5 : 8 : 10 : 6; length of blade about 38-49 μm .

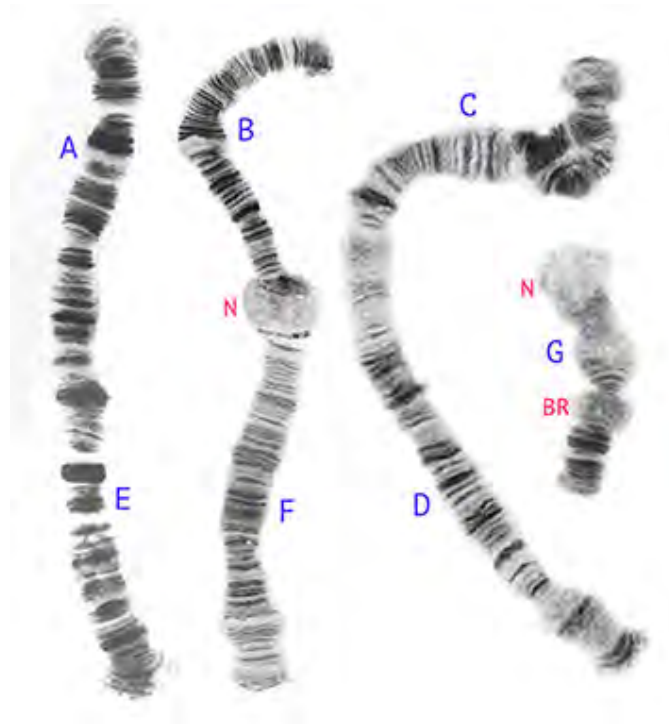
Mandible (Fig. e) length about 205-233 μm , third inner tooth partially separated and coloured (I-IIB); about 11-14 furrows on outer surface at the base; PecM with about 10-14 setae; MTR about 0.33.

Some larvae showed abnormalities, possibly due to contamination in the habitats.



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: JAPAN Type locality – Yamaguchi City (34.17°N 131.50°E), Hokkaido (Holotype male in U.S. National Museum Collection, No. 71268, March 1970, H. Yoshimatsu) Also Honshu (Shinano River – Hirabayashi *et al.* 2007; & possibly Otsu City), Japan Yamashiro Spa, Ishikawa Pref., Honshu (type locality of *C. echizensis*)

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 not correct.

***Chironomus costatus* Johannsen 1932**

This species as recognized by Karunakaran (1966, 1969) is a synonym of *Chironomus circumdatus* Kieffer 1916 – but see notes under “Fourth instar larva”.

It could be a member of the *C. flaviplumus*-complex.

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; FT 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. Fe/Ti abt 1.22; 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 over about posterior half, with some short stiff, inwardly directed bristles near apex; inferior appendages with the usual curved bristles (shown as simple); SVo bare, curved, pointed, reaching the base of the spur (anal point) of the ninth tergite, the spur extending almost as far caudad as the tip of the inferior appendage (IVo). No setae shown at the base of the anal point. Superior appendage difficult to interpret from illustration, but possibly S-type of Strenzke 1959 or narrow, and reaching to base 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, but Lenz (1937) (see below) describes 4 larval types for this species, three of which are plumosus-type, of length 10-13 mm, with ventral tubules either long or not very long. The fourth type is a thummi-type with long ventral tubules and moderately long anal tubules which are swollen at the base.

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: INDONESIA Type locality - Buitenzorg, BOGOR.

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 apicatus* Johannsen 1932**
as variety of *C. costatus* Johannsen

Possibly a member of the *C. flaviplumus*-group

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.

Anal point narrow at base; IVo not reaching to the end of the anal point, but to about the middle of the gonostylus, which is illustrated as only moderately swollen and narrowing gently over about the distal half. No information on the abdominal coloration but in view of Johannsen's statement that it is similar to *C. costatus*, it probably has a large brown transverse oval spot on most segments.

Fourth instar larva: A small plumosus-type, length about 9.0–10.5 mm (males). Lateral projections about 170–240 µm, posterior pair of ventral tubules usually longer (ant. 0.83–1.04 mm; post. 0.90–1.08 mm). Gular region and frontoclypeus pale to v. slightly darkened. Anal tubules long with a constriction near centre. Mentum with generally sharp teeth, c2 teeth well separated (type II), 4th laterals hardly reduced (type I-II). About 13–15 teeth in pecten epipharyngis. 3rd inner tooth of mandible almost completely separated (type II-III). Described by Lenz 1937 only as “Plumosus-type”.

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

Also Sigaol, Samosir.

Singapore?

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

Possibly the correct name for some of the 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). See also *C. flaviplumus* Ty. B.

Chironomus species PK6

Probably another member of the *C. flaviplumus* group.

Adult and Pupa: not currently known.

Fourth instar larva: (2 specimens) a small-medium plumosus-type; VT long. Head capsule with gular region and FC pale. SAL about 74 (71-76) x 16.5 (10-23) µm, 5.15 (3.3-7) times longer than deep. VHL 310.5-340.5

Mentum (Fig. c, below) width abt. 182 µm wide and 0.5-0.6 of VHL; 4th lateral reduced slightly (Ty. I-ii), 6th lateral arising from lower level, center tooth probably Ty. IB.

Ventromental plates (Fig. d, above) about 190-195 µm wide, separated by about 0.35 of the mentum width, 3.41-3.85 times wider than deep and 1.07 times the mentum width; with 41 (40-43) striae; VMR about 0.38.

PE (Fig. a, below) with 10-14 teeth of type B. Premandible (Fig. c, below) with inner tooth about 4.5 times wider than the outer tooth, both coming to relatively sharp points (type B1).

Antennal segments (Fig. b, below) (micron): 109 : 31.5 : 10 : 12.5 : 8. A1 about 1/3 of VHL and 2.8-3.3 times longer than wide; RO about 0.32-0.45 up from base of segment. AR 1.76-1.77.

Distance between the antennal bases greater than that between the S4 setae on available specimens (abt. 154µm c.f. 148µm), which are separated by 77-82% of the FC width at that point.

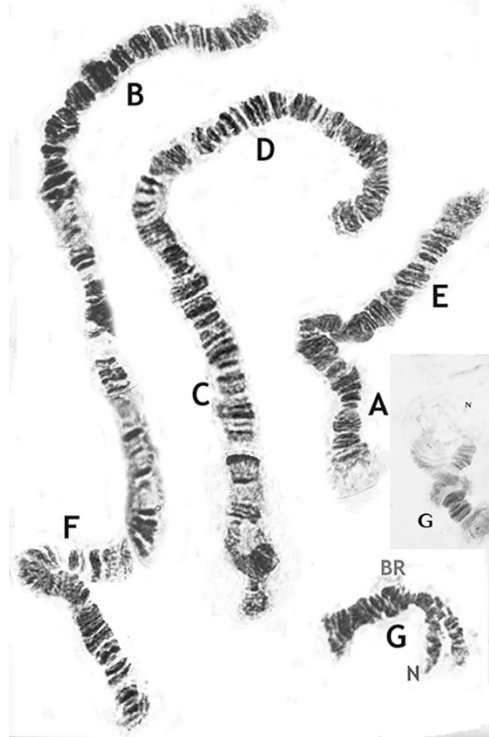
Mandible (Fig. e, above) abt. 238-243 µm long, 3rd inner tooth only partly separated and not darkened (I-IIA); about 14-16 furrows on outer surface at the base; 10-12 taeniae in PecM; Mdt-Mat 20-25, MTR 0.26-0.34.



Larval mouthparts of species PK6 from Deoli Village, Jammu

Cytology: Four polytene chromosomes with the pseudothummi-cytoplex 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
(Inv4-12 from *striatipennis*)
- 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: Inversion of about a quarter of the arm near distal end.
- 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?
- Arm G1: Terminal nucleolus and two BRs, one medial, the other distal.



Found: **INDIA:** Jammu - Deoli village (32.70°N, 75.00°E); Kabeer colony (32.70°N, 75.00°E); Indira Nagar (32.07°N, 74.83°E), Jammu & Kashmir.
Pakistan: (BOLD)

This species is close to, but not identical with, the *Chironomus* species (*C. sp. SS*) 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 or collection locality.

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. FT well developed.

Clypeus with 28 setae. Relative length of palpomeres 1-5: 7 : 6 : 22 : 25 : 31; P5/P4 1.24; P5/P3 1.41.

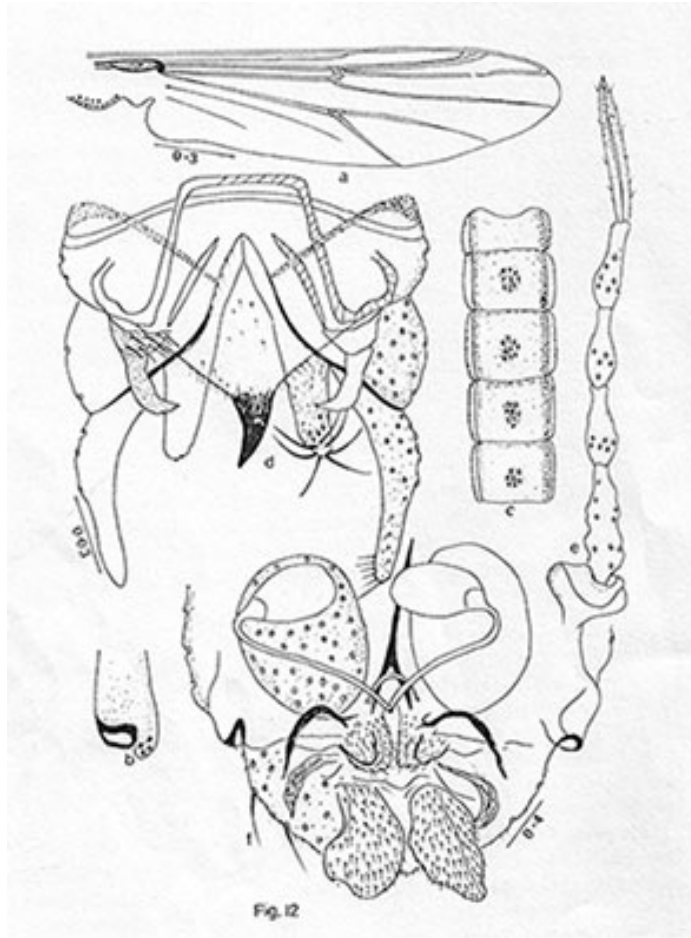
Thorax yellow with 3 dark brown vittae. Setae: Acrostichal - 17 biserial; dorsocentral – 24 biserial; prealar – 4; supraalar – 1; Scutellar – 26-28.

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

Leg proportions and ratios:

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	Ta5/Ti
PI	55	47	79	42	38	32	16	1.67	1.17	0.34
PII	56	51	32	19	14	8	6	0.63	1.10	0.12
PIII	64	62	49	27	21	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, perhaps closest to e-type of Strenzke (1959). GS only moderately swollen and narrows significantly over posterior half. Anal point dark brown and widest at base - a diagnostic characteristic (although it may be twisted to the right to show the lateral view). Some other records suggest that this needs to be re-examined to confirm it is not an artefact as it has not been recorded from any other specimens.



C. incertipenis adults, from Chaudhuri et al. 1992

Female

Body length 5.75 (5.61- 5.98) mm; Wing length 2.79 (2.89-2.87) mm, width 0.99 (0.96-1.06) mm.

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

Gonopophysis IX ovoid, Coxosternapodeme well developed and bow shaped.

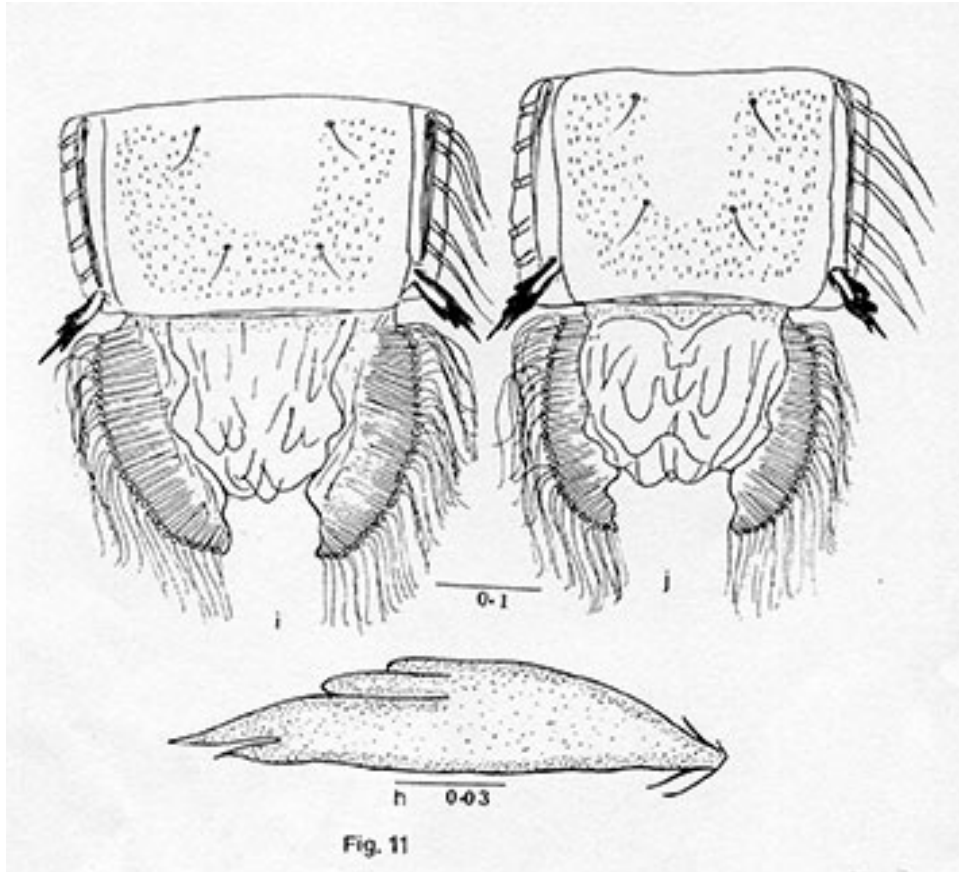
Gonopophysis VIII divided into an elongated dorsomesal lobe and a stout ventrolateral lobe, apodeme lobe prominent; Postgenital plate broad. Segment X a narrow crescent; Cerci stout and finely setose, margins curved and possibly a basal bulge on ventral margin.

Pupa: Exuviae grey. Length 6.22-6.62 mm (fem.); 6.98-8.04 mm (male). Cephalic 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 (larger values probably females).

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.

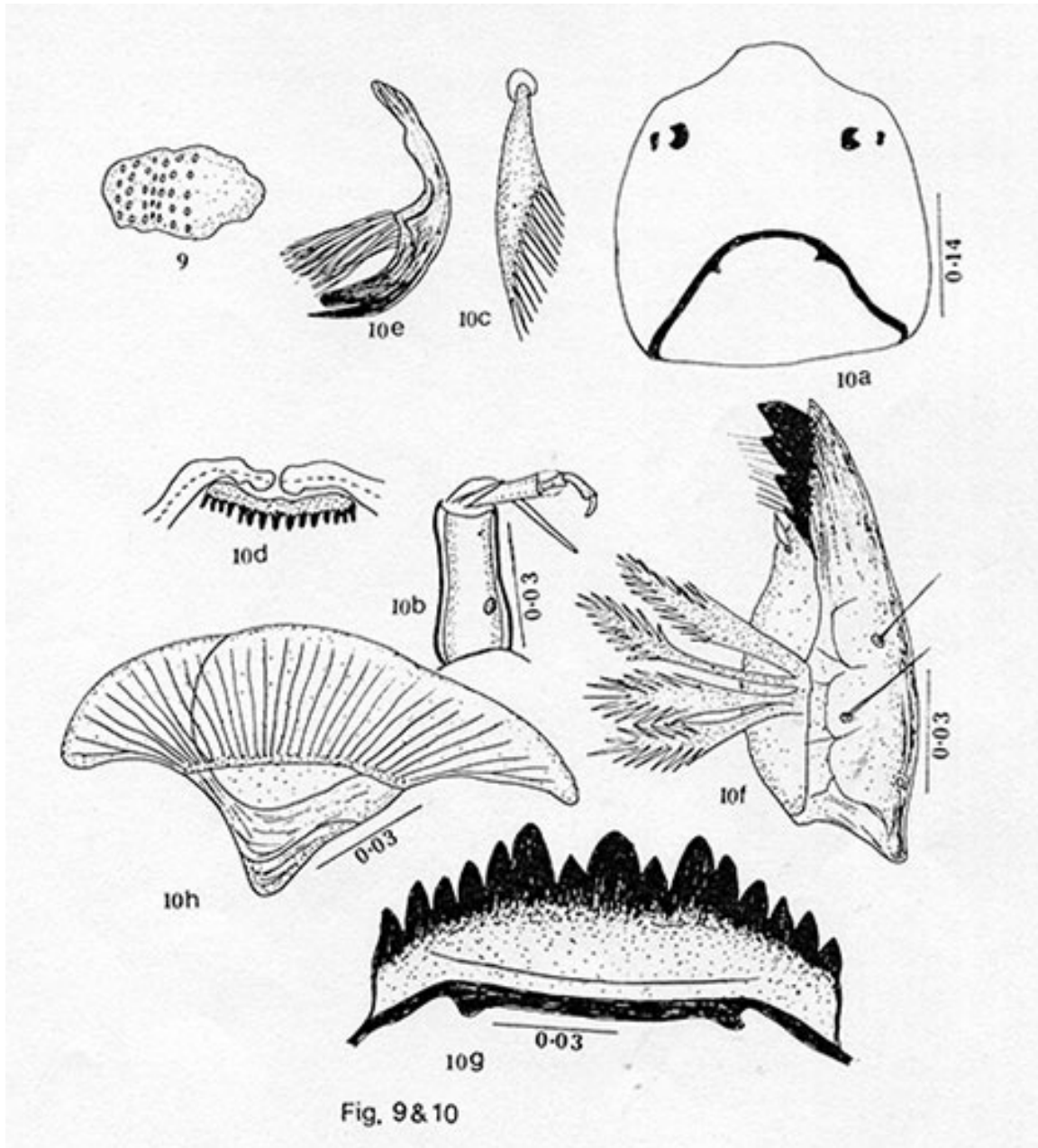
Mentum (Fig.10g) with 4th laterals hardly reduced (type I), centre trifid tooth with c2 teeth well separated (either type IIa or III).

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 (but granular margin not shown).

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 (or broken?)(Ty.A or B1?).

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



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: INDIA - Type locality - Barasat, West Bengal. (Type no. B.U. Ent 143; Allotype female and Paratypes, same data as Holotype).
Other Indian localities: Varanasi - Banaras Hindu University.
Singapore, and Japan, but all other than type locality may be misidentifications

All life stages described by Chaudhuri *et al.* (1992) as *C. niger*. *C. incertipenis* may be the correct name for *C. flaviplumus* B, which is often given that name, but the type needs to be reviewed to clarify whether the hypopygium has been distorted (Martin 2022). The original Chaudhuri *et al.* (1992) name related to that dark anal point.

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

A widespread species from India, Pakistan, Singapore, Japan, etc., has been called *C. incertipenis*.

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 does not appear to be dark as noted by Chaudhuri and Das to be characteristic in *C. incertipenis*. However hypopygium of that type may be distorted.

Probably equivalent to *C. flaviplumus* Ty. B (Martin 2022) (but see *Chironomus incertipenis*, above)

***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:

Chironomus (s. str.) *samoensis*, sp. n.

Male Female; *Head* ochreous, palpi and antennal flagellum rather darker; plumes of male antennae pale. Frontal tubercles present, of moderate size. Last segment of m antennae quite three times as long as 2-11 together. *Thorax* greenish; scutum with three reddish-orange stripes, the areas between the stripes dusted with silvery-grey. Postnotum not darker than the scutal stripes. Pronotum slightly emarginate in middle. *Abdomen* of male (when not discoloured) green, tergites 2-4 each with a more or less diamond-shaped brown spot near base, 5 brownish, 6-8 darker brown, hypopygium pale. Seen very obliquely from in front the segments are rather distinctly silvery-grey at the base; seen obliquely from behind the silvery dusting is on the posterior margins of 2-5 and nearly the whole of 6-7. Hypopygium with anal point moderately long and slender; claspers slender, not much enlarged at base; upper basal appendage rather small with a downward curved point; the structure almost as figured by Kieffer for *Ch. imberbis*. *Abdomen* of female without distinct markings. *Legs* greenish-yellow; tarsi a little darker, first two segments narrowly and rather indistinctly brown at tip. No darkening on femora, nor on front tibiae. First segment of front tarsi about 1.8 times as long as tibiae. No tarsal beard. *Wings* hyaline; *r-m* slightly darkened; venation as in other members of the dorsalis group. Halteres pale.

Length of body (male) 4.5-5 mm.; wing 3-3.5 mm.

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 fuscus 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 fuscus 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 fuscus 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 fuscus, 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.

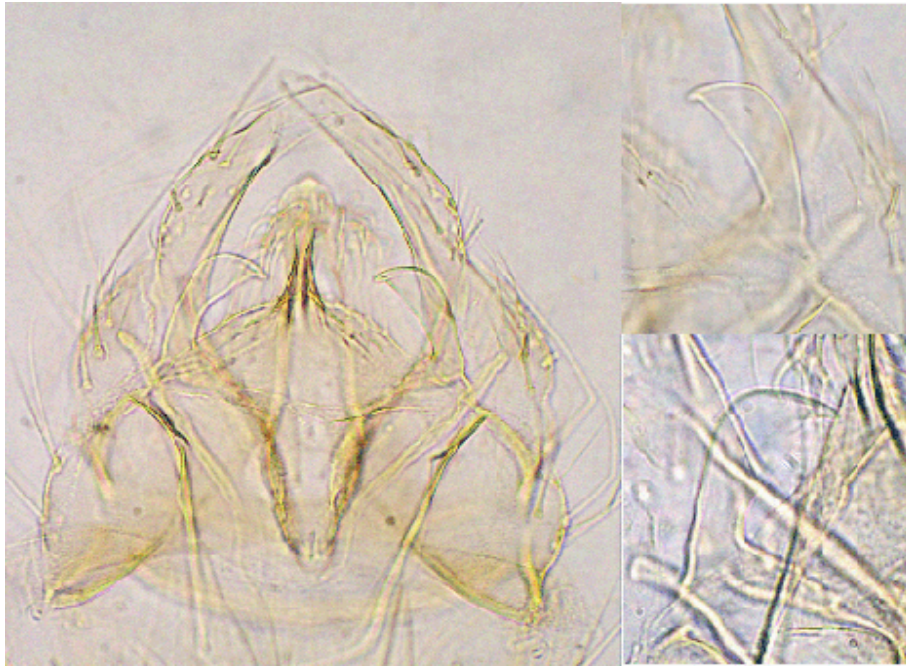
Female: Body 4.92 (4.68-5.07) mm. long; wings 2.88 (2.52-3.12) mm. by 0.84 (0.78-0.91) mm. Similar to male in color and structure with usual sexual differences. Head with eyes separated above by one-sixth length of eye, frontal tubercles oblong; palp five-segmented (13.5: 12.5: 57.5: 70: 87); antenna with scape and basal two-thirds of segment 2 yellow, other parts fuscus, 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 fuscus spots on segments 2 to 4.

Specimens from Micronesia are probably *C. samoensis*, and the illustration is presumably intended to depict the somewhat beaked SVo seen in some specimens. While re-examination of Tokunaga's specimens would be required, it is possible that he had a mixed sample. The misinterpretation of this illustration may be partly responsible for the identification of "*C. samoensis*" which have an S-type SVo, in other locations. 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 SVo of left hand figure.

Male

Head: AR - 2.94 (2.51-3.23, 4); FT 33 (29-38, 4) μm long and 15 (14-17, 3) μm wide; palpal proportions (μm) 46 : 46 : 193 : 234 : 354; P5/P4 1.51, P5/P3 1.83. Clypeal setae 17-23.

Thoracic setae: Acrostichal - at least 14 or 15; Dorsocentral - 17-21; Prealar - 4-5; Scutellar in two rough rows, ant. 5-12, post. 12-15 (total 17-25).

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)

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	BR
PI	1107	1000	1507	810	750	670	330	1.50-1.52	1.08-1.12	1.54-1.75
PII	1290	1155	720	380	270	175	120	0.62	1.12	-
PIII	1445	1350	1120	575	435	260	145	0.83	1.07	-

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 IVo has mainly simple, curved setae, but a small number appear to have a small simple fork near the tip. About 4-6 setae in individual pale areas 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, about one third longer than Ta3, and 0.81 of the Ti length.

Other characters:

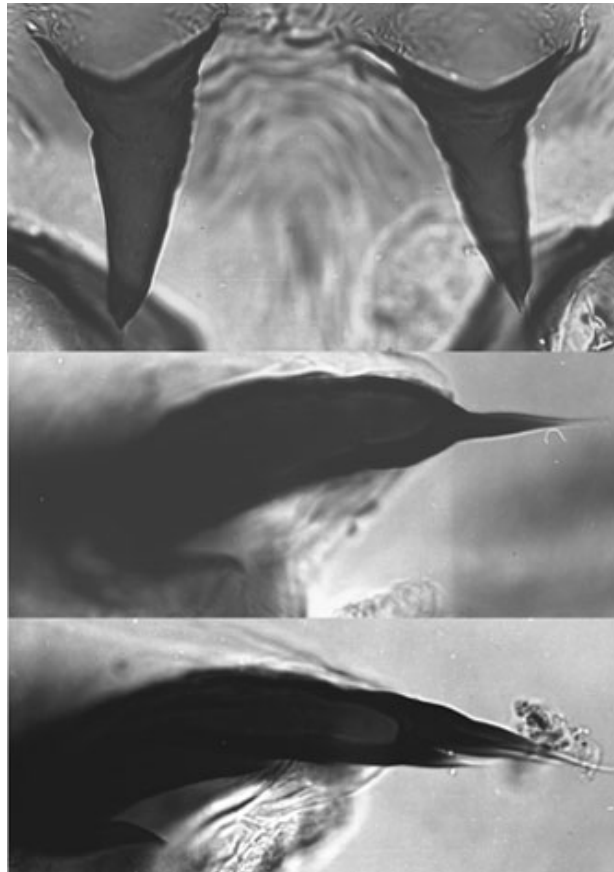
Head - FT - length 23 μm , width 13 μm , 1.8 times longer than wide. Antennal segments (μm) 144 : 109 : 116 : 106 : 215. About 24 clypeal setae.

Thoracic setae: Acrostichal 14, Dorsocentral 31, Prealar 5, Scutellar in two rows, ant. 14, post. 14 (total 28).

Pupa:

Exuviae length (male) 6.8 (6.5-7.0, 3) mm., 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) μm long and 78 (56-94, 4) μm across the base, subterminal bristle about 68-80 μm in length.

Basal ring about 142 (129-164,5) by 68 (54-85,5) μm . About 67-77 hooks in row on segment II. Slight development of PSB on segment II, PSA largest in segment IV, reducing in segments V and VI. Caudolateral spur of segment VIII about 180 μm and 1-3 spines. About 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); TLt about 280-360 μm ; 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 μm) slightly longer than ventral pair (215-370 μm). 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 μm . Distance between antennal bases greater than the distance between the S4 setae.

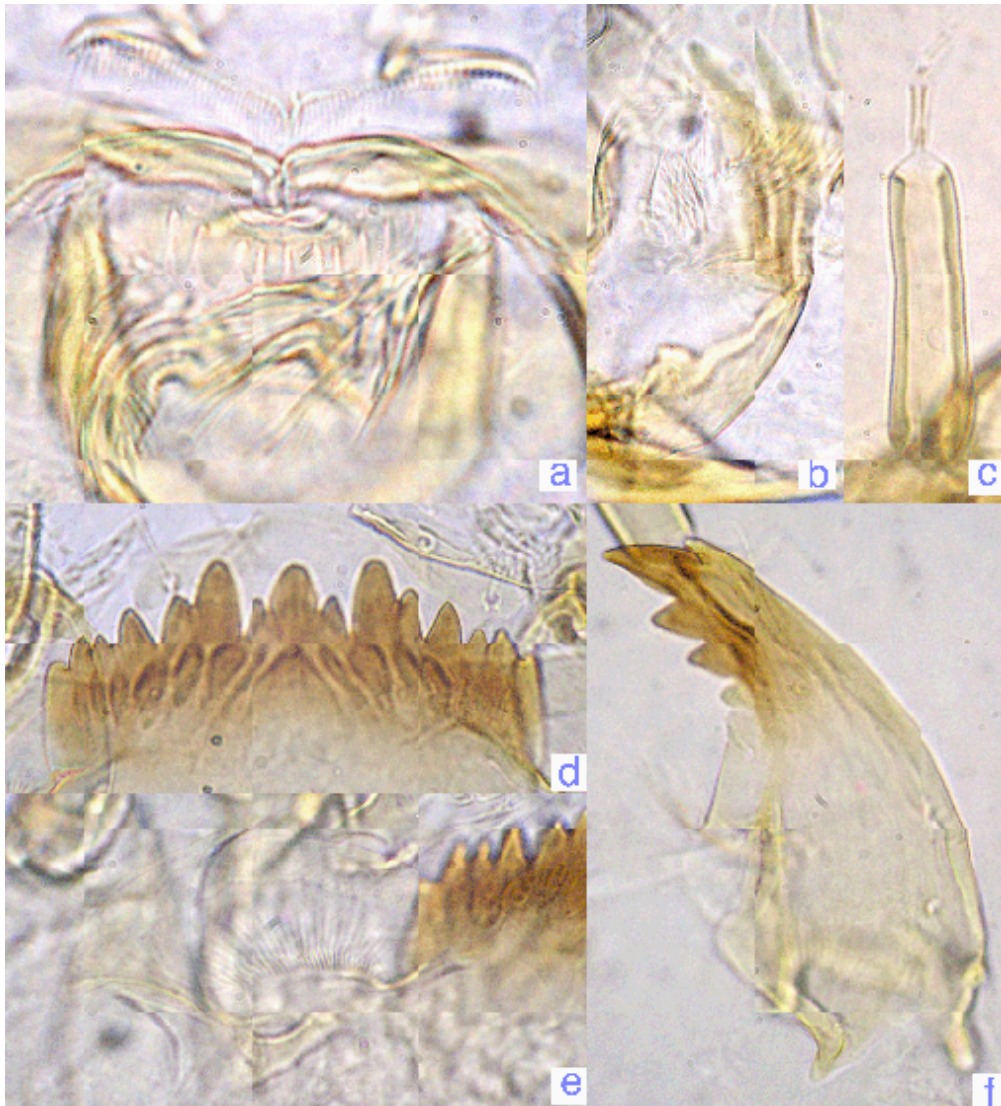
Mentum (Fig. d, below) wider than usual, about 0.6 of ventral head length; centre trifold teeth with c2 teeth well developed (essentially type IV); 4th laterals reduced to about the level of 5th laterals (type II), 6th lateral variable, sometimes arising at same level as other laterals but generally 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 μm 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; MTR abt. 0.44.



Larval head capsule characters of *C. samoensis*

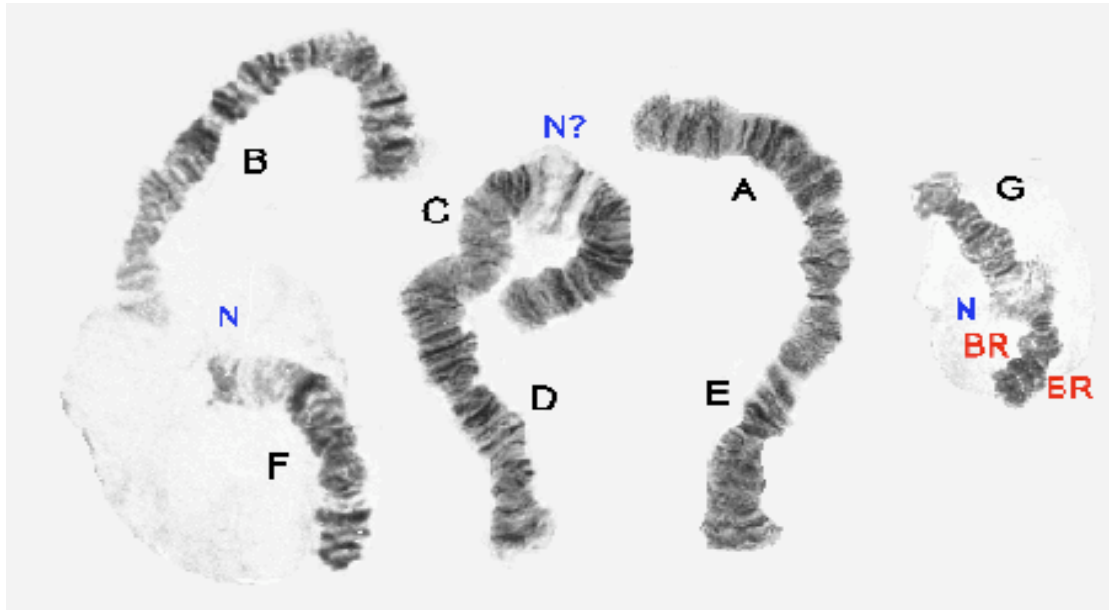
Cytology: 4 polytene chromosomes with the pseudothummi arm combination AE, BF, CD, G.

Nucleolus medial in arm G; 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.
 samG1: two Balbiani rings distal to the nucleolus.

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.



Polytene chromosome complement of *C. samoensis*

Diagnosis

Based on these descriptions, diagnostic features of the species are: FTs relatively long; LR about 1.50-1.52, fore Ta5 about one third of the length of the fore tibia, SVo 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*.

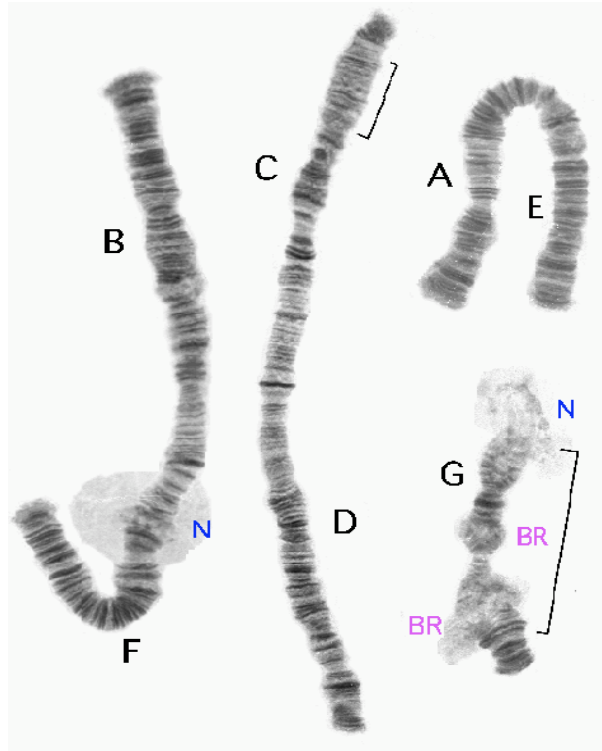
“*Chironomus* nr. *samoensis*” Japan

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). However, the morphology and cytology indicate that this is not the same species as described by Edwards (1928) or Tokunaga (1964).

The location of specimens reared by Prof. Wülker is uncertain, but from his notes (provided by Martin Spies from the Museum in Munich) there is very limited information on the larvae which suggests they were a plumosus-type with a slightly to dark clypeus and a pale gula. However, the polytene chromosomes clearly indicate that this is not *C. samoensis* Edwards.

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 inversion 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.



Polytene chromosomes of the Japanese form of “*C. samoensis*” (courtesy of W. Wuelker)
The brackets indicate the approximate limits of known polymorphic inversions.

BR - Balbiani ring; N - Nucleolus

It is not clear how this material relates to the ‘*C. samoensis*’ collected by Sasa & Suzuki (2001) from Ouike, Minamidaito Island, Okinawa (abt.25°N, 131°E), South Japan.

“*C. samoensis*” of Sasa & Suzuki (2001)

Sasa and Suzuki also describe specimens of *C. samoensis* from Ouike and the Creek, Minamidaito Island, with a wide range of morphological values (see below). It is not clear how they vary from the above species as no physical description is given (and no illustrations included), and the wide range of values suggest that more than one species might be included:

Body length 5.92-6.69 mm; wing length 2.14-2.92 mm (both noted as highly varied according to collection site). AR 2.77 (2.55-3.13; 17.7 (16-20) clypeal setae.
Thoracic setae: Acrostichal 19.5 (15-23); Dorsolateral 18.8 (15-21); Prealar 5.0 (4-6); Scutellar 20.0 (16-20).
Wing bare, squama with 18.2 (16-20) setae.; VR 1.05 (1.03-1.08).
Leg ratios: Anterior 1.71 (1.67-1.76); mid 0.65 (0.63-0.67); hind 0.83 (0.79-0.88); BR 3.7 (2.5-4.6).

Found: – JAPAN: Ouike and The Creek, Minamidaito Island (abt.25°N, 131°E), Okinawa

Specimens identified as “*C. nr.samoensis*” from Jammu and Kashmir, India:

There is currently more than one species under this name through the Oriental region. The material dealt with here is referred to as *C. nr. samoensis*.

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 0.25-0.28 of the length of Ti.

Head: FT present, abt 18-28 µm; abt 23-25 clypeal setae.

Palpal proportions (micron): 49 : 53 : 218 : 230 : 370: P5/P4 1.61, P5/P3 1.70.

Thorax: Setae - Acrostichal 14-16; dorsocentral 11-19; prealar 5-6; scutellars in two or three rows, ant. row 6-10, posterior rows 14, and/ or 11-15.

Legs: Lengths (microns) and proportions:

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	BR
PI	1255	1198	1895	1035	760	680	400	1.59	1.02-1.10	4.3
PII	1390	1263	750	412	305	203	158	0.58-0.62	1.09-1.12	-
PIII	1570	1553	1148	620	484	303	185	0.64-0.78	1.00-1.01	-

About 9-10 sensilla chaetica on midTa1 and about 5-9 on Hind Ta1



Male terminalia of *C. nr. samoensis*

The SVo is D-type, with an extended 'beak' (above); IVo with some forked setae reaches part-way along the anal point and about 1/3 along the GS; and tergite IX has 12-19 setae in individual clear spots (c.f. sp. PK5), GS moderately swollen and narrowing from about half way.

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 µm long and 57 µm wide at base. 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.

Caudolateral spurs of segment VIII with 2 - 4 spines.

Fourth instar larva: larva a small to medium (8.4 - 9.8 mm) plumosus-type. Posterior third of gula dark, FC very dark. Anal tubules long, cylindrical, about 340 µm in length. Antenna with basal segment only 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, with a nucleolus sometimes developed in arm D. Nucleolus in arm G may only appear as a large puff. Polymorphism in arms 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 <i>circumdatatus</i> A2, <i>holomelas</i> , etc.
“sam”A2:	1 - 2c, 10 - 12, 3, <u>14c-13</u> , 4 - 9, <u>2ed</u> , 14d-19	(in 2d-14c c.f. <i>incertipenis</i> & “sam”A1) – probably <i>C. nr. flaviplumus</i>
“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 <i>incertipenis</i>
“sam”F1:	1a - 2a, 10d-a, 15 - 11, 2b - 9, 16 - 23 (not proven)	as <i>flaviplumus</i>
“sam”G1:	two dark bands immediately distal to nucleolus.	
“sam”G2:	inversion of middle third of arm.	

Not identical to material from Japan, Korea, Java, Australia, Samoa or 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.

Found: INDIA - **Bishnah wetland** (32.70°N, 75.00°E)(A2,B2), **Deoli Village** (32.70°N, 75.00°E), (A2,B2); **Gadigagh; Sangrampur village** (abt 32.70°N; 75.00°E) (A1,B1); all **Jammu region**.

It is likely that this species is part of 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 FC.

Indian specimens described by Chattopadhyuy *et al.* (1991), however, are not the same species. While the adult has many similar characteristics, the larvae differ in antennal characteristics and notably in that the head capsule has been described as brown with no mention of any darkening of areas other than the margin. It was therefore renamed *C. indiaensis* by Martin (2011).

Species described as, or moved to, *Kiefferulus*

Kiefferulus securis (Konar 2018)

originally *Chironomus securis* Konar 2018

Described as *Chironomus* on the basis of adult, pupa and larva. However it is not a species of *Chironomus*, rather a species of *Kiefferulus*.

i.e. *Kiefferulus securis* (Konar 2018).

Adult:

Male:

Total length 6.4-6.9 mm, wing length 2.20-2.26 mm. Wing length/length ant. femur 2.56-2.59. AR 5.4-5.6.

Coloration: Golden brown. Anteprenotum brown. Ant. pedicel golden yellow. Antenna except base light-dark brown. Palp light yellow.

Legs brownish towards apices. Hypopygium golden brown.

Head: Eyes bare, 112-120 µm long with parallel-sided extension; 15-16 temporal setae. Clypeus with 19-21 setae on each side. Tentorium 152-159 x 38-44 µm at sieve plate. Palpal segments (µm) 40-44; 92-96; 120-126; 72-78; 140-144: P5/P4 1.79-2.0; P5/P3 1.11-1.20.

Thoracic setae: 10-12 acrostichals; 12-14 dorsocentrals, irregularly biserial; 4-6 prealars; 18020 biserial scutellars.

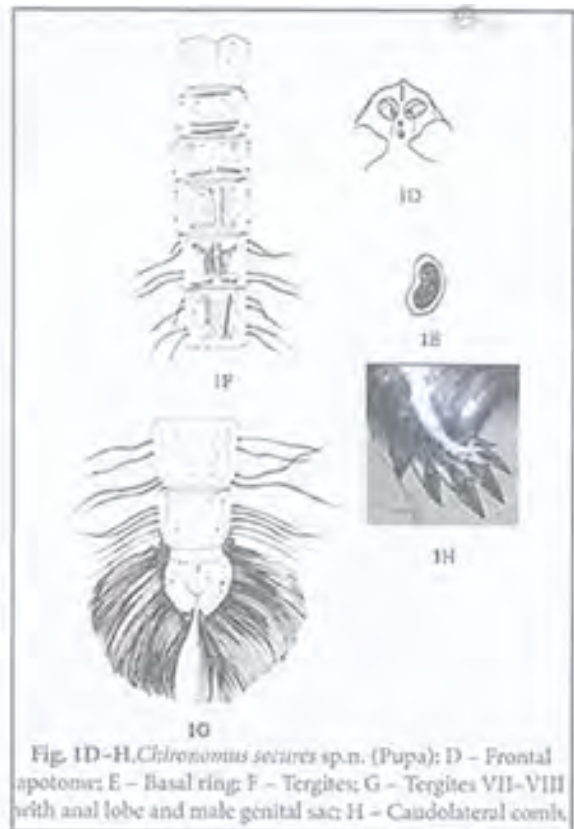
Wing (Fig. 1a) without markings. 2 Scf on brachiolum; 11-14 setae in squamal fringe; CR 0.96-0.98; VR 1.07-1.10.

Leg proportions as below:

Lengths (µm) and proportions of leg segments of *K. securis* (Konar 2018) Adult male).

	Fe	Ti	ta ₁	ta ₂	ta ₃	ta ₄	ta ₅	LR	BV	SV	BR
P ₁	53-55	50-53	73-76	43-46	40-42	37-39	18-21	1.43-1.46	1.24-1.27	1.41-1.42	1.77-1.79
P ₂	60-63	65-69	30-33	20-22	16-19	10-13	08-11	0.46-0.47	2.53-2.87	4.00-4.16	2.00-2.02
P ₃	72-77	77-83	43-46	28-31	27-32	16-19	11-14	0.55-0.56	2.14-2.34	3.46-3.48	2.27-2.29

Hypopygium (Fig. 1c): Anal point elongate with 8-10 basolateral setae. SVo digitiform, closest to D(f) type of Strenzke (1959). IVo “chopper-like”, extending well beyond the anal point and widening at the apex, with 46-50 setae on apical half. Gonostylus stout, bulbous basally, rather abruptly tapering over terminal quarter, medially bearing 6-7 stout setae and 5-6 inner apical setae.



Pupa: - Total length 6.8-7.4 mm. Coloration pale brown. Pale yellow margin at wing sheath, origin of antenna and margin of tergites. Frontal apotome (Fig. 1D) triangular, 23-27 μm long and 15-19 μm wide, without frontal warts. Cephalic tubercles parabolic, 72-84 μm long and 48-51 μm wide at base, with 0.05-0.07 μm long subapical frontal setae. Basal ring of thoracic plume (Fig. 1E) oval, 192-197 μm long and 94-98 μm wide. Antennal sheath 0.99-1.22 μm long (male?). Wing sheath 1.63-1.79 μm long.

Abdomen (Fig. 1F): tergite I bare, TII with anterior and posterior transverse band of shagreen and posterior row abt. 43-47 hooklets occupying 0.57-0.59 of segment width; TIII with posterior transverse band & two anterior bands of shagreen; TIV-TVI with continuous medial longitudinal field of shagreen; TVII & TVIII with anterior patches of shagreen.

Pedes spurii B present on TII, but no mention of PSA. Caudolateral spur (Fig. 1H) deep brown with 3-4 stronger spines and 1-2 smaller subsidiary spines; 72-81 on anal fringe (Fig. 1G), dorsal seta absent.

Larva: Total length 5.79-6.88 mm; head 0.96-0.99 mm long and 0.64-0.68 mm wide.

Mentum, mandible and postoccipital margin slightly dark brown in color.

Antenna: base 106-116 mm long, blade 64-67 μm long.

Length ratio of segments (I-V) (μm) 88-91: 36-38; 24-25; 23-24; 8-10. AR 1.22-1.32

Labro-epipharyngeal complex – see Fig. 1K. PE (Fig. 1K) with 16-19 teeth, possibly type B or worn type C.

Premandible (Fig. 1L) 73-77 μm long with 5 teeth (typical for *Kiefferulus*).

Mentum (Fig. 1M) 208-211 μm wide with trifold median teeth and 6 pairs of lateral teeth, ventromental plate 14-15 μm wide, IPD 72-80 μm .

Mandible 244-256 μm long; MTR abt. 0.23. No mention of furrows on base (but none would be expected in *Kiefferulus*)

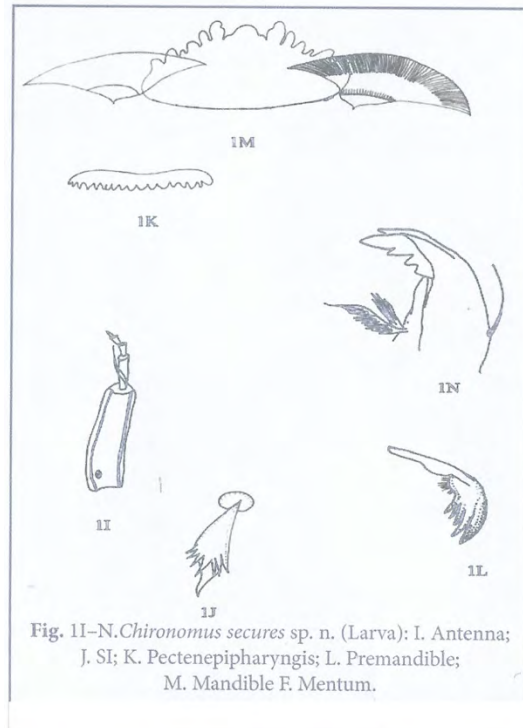


Fig. 11—*N. Chironomus secures* sp. n. (Larva): I. Antenna; J. SI; K. Pectenepipharyngis; L. Premandible; M. Mandible F. Mentum.

Found: INDIA - Type localities – Kangsabati River, Narajole (22.48 °N, 87.32 °E), Mednipur, West Bengal.

Holotype male with larval and pupal exuvia [reared] (Type no. B. U. Ent. 290), Paratypes 6 males, same data as holotype.

Kiefferulus uncinus (Konar 2018)

originally *Chironomus uncinus* Konar 2018

However it is not a species of *Chironomus*, rather a species of *Kiefferulus*.

Described on the basis of adult only.

Adult:

Male: Length 4.16-4.30 mm. Wing length 1.92-1.98 mm; 2-3 Scf on brachiolum; 9-11 in squamal fringe. VR 1.02-1.03. LR not given.

Color: Golden brown, pedicel light brown; maxillary palp light yellow. Legs brownish towards apices; hypopygium light brown.

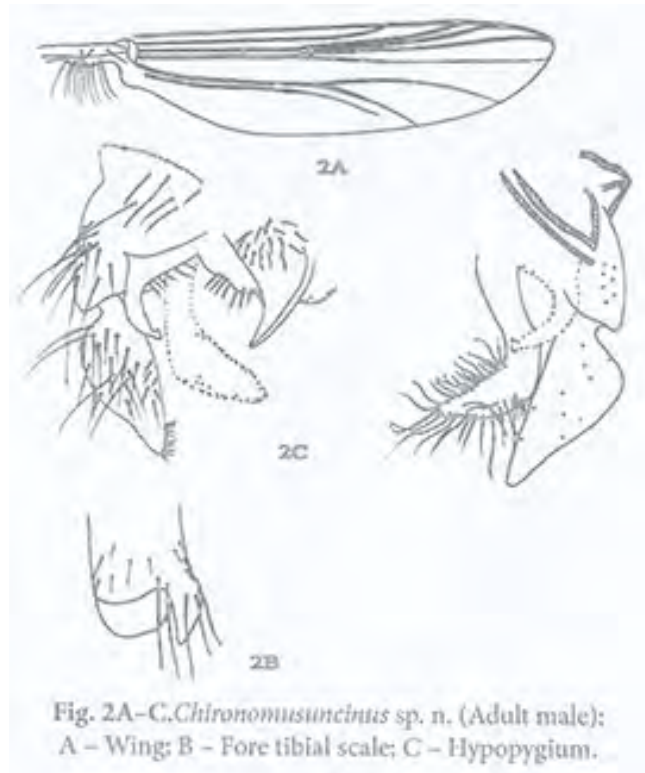
AR 2.28-2.97. Clypeus with 20-22 setae on each side (i.e. 40-44 setae in total?)

Palp segments (µm) 9-10 ; 9-10 ; 17-18 ; 25-26 ; 27-28; P5/P4 1.04-1.12; P5/P3 1.56-1.65.

Thoracic setae: 10-12 acrostichals; 7-9 dorsocentrals; 3-4 prealars; 4-5 scutellars.

Leg lengths (µm?) and proportions:

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	BR
PI	57-61	52-54	62-65	40-43	37-40	32-35	16-19	1.19-1.20	2.33-2.40
PII	54-57	52-55	25-27	20-23	15-18	10-13	9-11	0.48-0.49	1.25-1.32
PIII	61-64	64-68	38-40	25-29	23-25	15-19	9-13	0.58-0.59	3.66-3.70



Adult characters of *K. uncinus* (Konar 2018)

Anal point broad basally, pointed towards apex, with 6-8 basolateral setae. Anal tergite band V-shaped with 15-18 setae. Gonocoxite with 17-20 setae. Gonostylus stout, bulbous with 9-10 setae on inner apex. SVo perhaps closest to E-type of Strenzke (1959): IVo extending well beyond the anal point, with long apparently simple (not recurved) setae. HR 1.10-1.11; HV 1.92-1.95.

Female, pupa and larva: Unknown.

Found: INDIA - Type locality – Gour River (23.32°N, 87.93°E), Kaligram, Burdwan, West Bengal.

Holotype male (Type no. B.U.Ent. 291), Paratypes 4 males, data as holotype.

Species not formally described

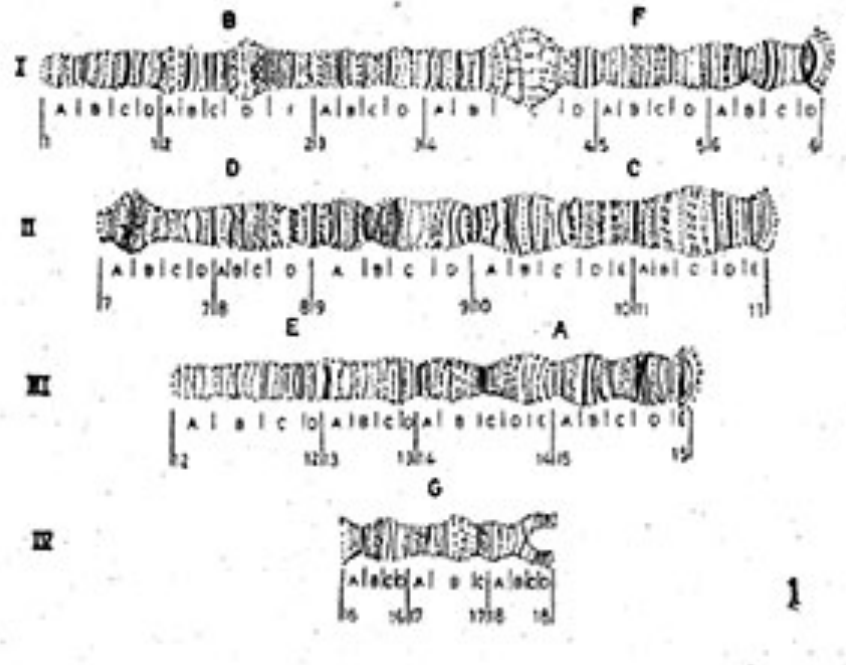
Chironomus species I, Sharma, Gupta and Gandotra (1990)

All life stages were obtained, but only the chromosomes were described.

Cytology: Four polytene chromosomes with the pseudothummi-cytocomplex combination BF, CD, AE, G. The chromosomes were mapped following the system of Martin (1969), but without homology of bands. Nucleolus on arm F at 4C, and a large puff at 2D, with the centromere possibly at 4B.

Chromosome II sometimes shows desynapsis in 7A and B, a constriction at 9B and a large swelling in segment 11, which is a useful identification feature.

Chromosome III is medium sized with 3 swellings in arm A (one of which will be the ‘olive’ – perhaps 15B?) and 3 closely placed dark bands in 13A, 14C, and 15D.
 Chromosome IV is arm G, with a small puff in 16B (a BR? but not clear) and two swellings at 17B and 17C; often desynapsed at the right end.



Found: INDIA – ponds on campus of University of Jammu, (32.73°N; 74.87°E), Jammu

Chironomus species II, Sharma, Gupta and Gandotra (1995)

Described only by the polytene chromosomes. However it is very likely that it has a larva of the plumosus-type.

Cytology: 4 polytene chromosomes with the pseudothummi arm combination, in size order BF, DC, EA, G. The chromosomes were mapped following the system of Martin (1969), but without homology of bands. Centromeres only slightly heterochromatic – they are just visible in the photographs although they cannot be identified in the map. Arm B with a large puff in region 2D, the nucleolus is in arm F at 4C, with the centromere possibly at 4B. Chromosome II sometimes shows asynapsis in 7A and B, a constriction at 9B and a large swelling in segment 11, which is a useful identification feature.

Chromosome III is medium sized with 3 swellings in arm A (one of which will be the “olive”; - perhaps 15B?)

Chromosome IV is arm G, with a small puff in 16B and 17B (BRs?) but not clear; often desynapsed at the right end.

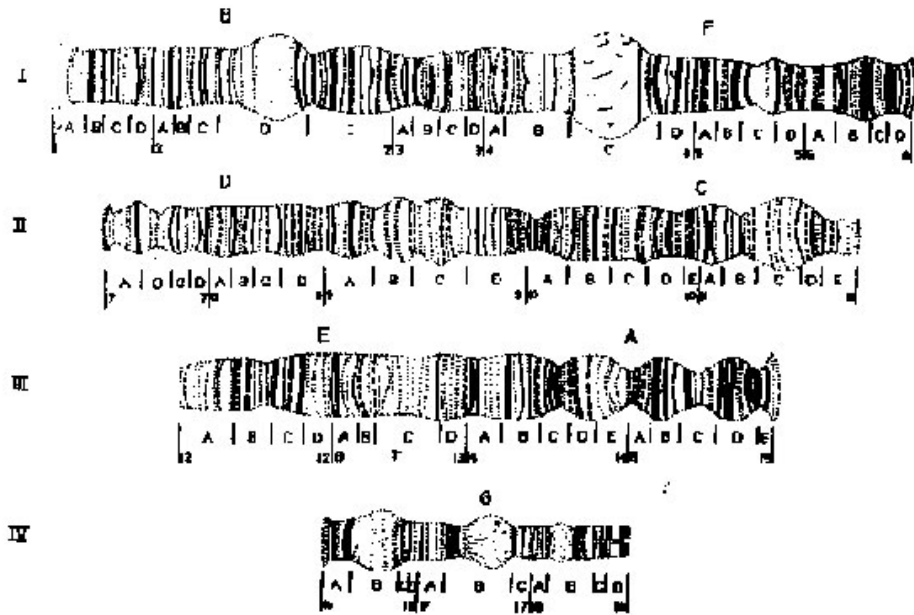
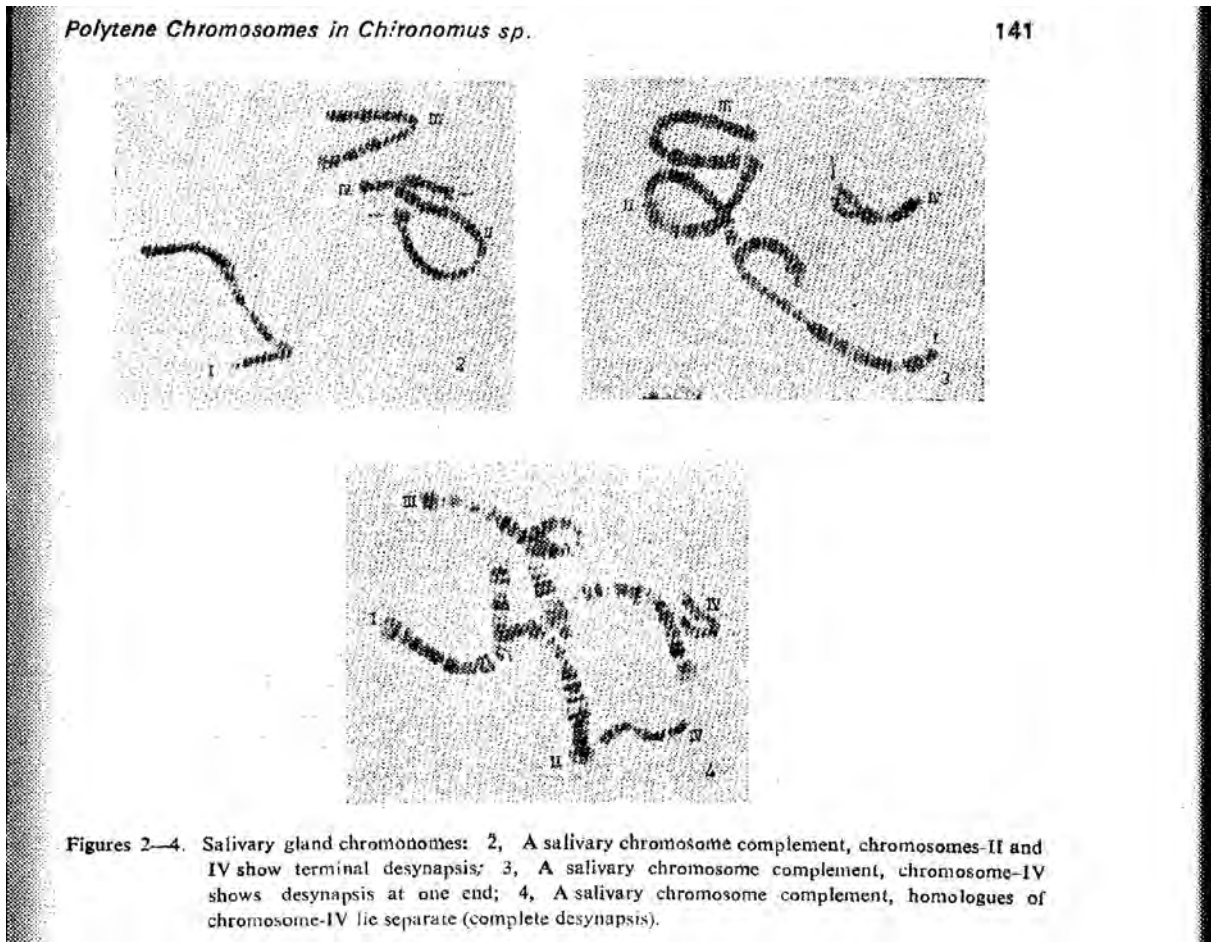


Fig. 1. The salivary chromosome bands of *Chironomus* species II.



Found: INDIA – ponds on campus of University of Jammu, (32.73°N; 74.87°E), Jammu

The *Chironomus striatipennis* species complex:

***Chironomus striatipennis* Kieffer 1910**

- as *Chironomus (Prochironomus)*, on basis of adult female

It has been generally assumed that *C. striatipennis* is a widely distributed species throughout Asia, from India to Singapore and in South America and southern U.S.A. However, while this appears to be the situation based on morphology, the results of Pramual et al. (2016) suggested the existence of a number of a number of groups in their samples that had been identified as *C. striatipennis*. Even so, because the analysis was a comparison based on the specific name applied to them, this decision led to the results appearing to confirm that *C. kiiensis* was a synonym of *C. striatipennis*. However a more detailed analysis of the BARCODE *COI* sequences from specimens with the characteristic wing pattern (see below) across this region, without prior reference to their species name, clearly indicated that this is a group of more or less related species. Since *C. striatipennis* was originally described from India, this name is applied to the species that occurred in India. There are possible names for some of the other groups, while others have no formal name.

The following description will deal only with Indian material, with those of other areas considered under other available names.

Syn: There are no confirmed synonyms.

Incorrect synonymies: *Chironomus kiiensis* Tokunaga, 1936. Incorrect synonymy, as DNA analyses indicate that the Indian material is distinct from specimens from other regions (see under *C. kiiensis* below).

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 and Bugledich et al. 1999.

Chironomus strenzkei Fittkau 1968 (incorrect synonymy by Amora et al. 2015, not confirmed by examination of additional samples).

In Bold Bins: [BOLD:ABZ2474](#); [BOLD:AAD8160](#); and [BOLD:AAD8162](#)

Mostly misidentifications.

Note this also includes the bin in which most specimens correctly 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^e est rétréci au milieu; 3-5 ellipsoïdaux, plus longs que leur col, sauf le 5', 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^e article tarsal plus de deux fois le 5^e, celui-ci six fois aussi long que gros; aux pattes postérieures, le 4^e article est de moitié plus long que le 5^e, 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 grey, 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 grey, 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 5th, 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; 4th tarsal segment more than twice the 5th, which is six times as long as wide; for the posterior legs, the 4th segment is half longer than the 5th, 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 2nd is longer than wide, 3-11 very transverse, 12th 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 pincers 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.

(This gives an AR of 3.)

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 cephalic 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 (G/F is not defined).

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 4th and 6th 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 – 2.45 (1.98-2.90) mm.; width - 0.67 (0.70-0.73) mm. VR - 1.04-1.09 (or 0.95 (0.92-0.96).

LR = 1.62 (1.49-1.82).

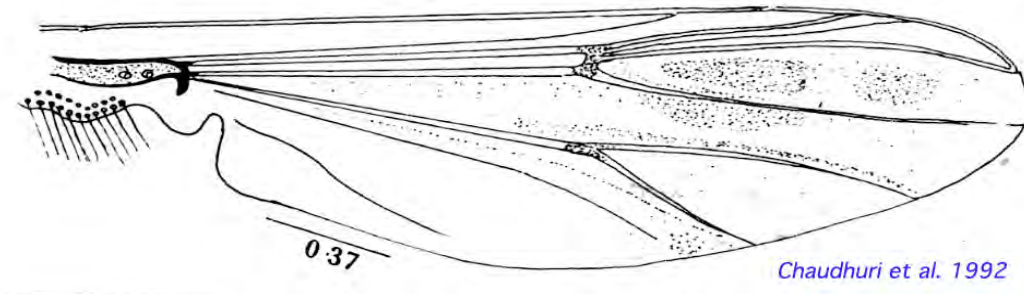


Illustration of the wing with dark clouds.

Face yellowish brown, antennae and palps brown. AR about 2.78 (2.47–3.00). FT about 42 (37-49) μm long and 14 (10-20) μm wide. Palpal proportions (micron) 45 : 43 : 158 : 160 : 247; P5/P4 1.33-1.63 (1.33); P5/P3 1.33-1.59 (1.47). Clypeal setae - abt 21.3 (19-22).

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 10.7 (8-15); dorsocentrals – 16.8 (15-19); prealar – 5.14 (5-6); supraalar 1; scutellar – 2.8 (2-4) small in anterior row, 9.0 (8-10) in posterior row; total 11.8 (11-12).

Wings with dark spot over the crossvein and with obvious dark clouds and seams, particularly in cell R5 (see figure below). 1-2 setae on brachiolum, abt 13.8 (12-18) setae in squamal fringe.

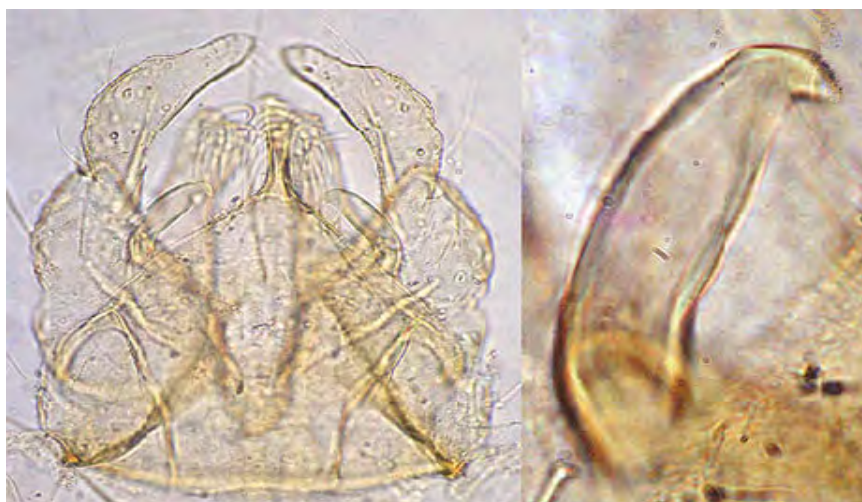
Haltere pale.

Relative lengths and proportions of leg segments (μm):

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	Ta5/Ti
PI	1110	1000	1564	845	615	482	255	1.49-1.82	1.08-1.23	0.25-0.32
PII	1145	1095	645	407	293	198	143	0.58-0.62	1.00-1.09	
PIII	1278	1339	1002	590	446	270	173	0.74-0.76	0.93-0.97	

Ant. BR 3.45 (2.4-5.3) Sensilla chaeticae: Mid 5-7; Hind 7-8

Abdominal tergites mostly dark, with a pale basal band on the anterior segments. About 7-10 setae in individual pale areas within an oval patch on tergite IX.



Male hypopygium (left) and superior appendage (right) of an Indian specimen of *C. striatipennis*

SVo of E type closest to fig. h of Strenzke (1959). IVo reaching about to end of anal point with simple setae. Gonostylus quite swollen at base and reducing markedly over posterior third and about 4+1 - 5+1 setae at tip; Anal point slightly narrowed near base.

Female based on Chaudhuri et al. 1992):

Wing length 1.68-2.8 mm. VR about 1.06. Cloudy patches as in male.

Antennal proportions (including pedicel) (micron) 80, 147, 102, 105, 98, 170. AR 0.37-0.38 ; A5/A1 1.16.

FT 43 µm long, 22 µm wide.

Palps (segs 2-5): 40, 130, 100, 230; P5/P4 2.3, P5/P3 1.8.

Leg lengths (microns) and proportions as follows:

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	Ta4/T1
PI	1170	980	1610	880	710	660	320	1.49-1.82	1.08-1.23	0.67
PII	1200	1170	660	380	270	200	150	0.56	1.03	
PIII	1370	1440	1100	660	540	320	200	0.76	0.95	

Genitalia: Notum 0.24 (0.20-0.26) µm long. Cerci well developed, finely setose, illustrated as having a curved ventral margin and relatively pointed posterior margin.

Pupa: Length 6.5 (5.4-7.6) mm (male) 5.3 (4.8-5.8) (female), posterior margin of wing case about 1.09-1.28 mm. Again the size of the Chaudhuri et al (1992) specimens is lower. Dark brown, exuvia pale brown.

Head: Cephalic tubercles about 62 (40-80) µm long and about 48 (40-65) µm wide at the base (the Chaudhuri et al (1992) data cannot be interpreted), with a subterminal seta about 57

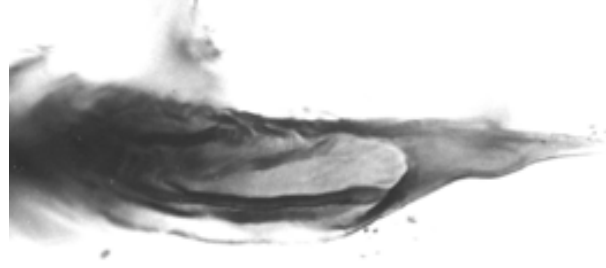
µm long.

Thorax: Prealar tubercle present, not simple, but small, about 25 µm long and 6 µm wide. Basal ring of respiratory horn with edge thicker at the anterior end, and pinched at the center, about 129.5 (126-133) µm long and 62 (60-64) µm wide; HR about 2.17.

Abdomen: About 67 (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, on seg V these spines run all along the edges of the segment.

Caudolateral spur of segment VIII generally with 1 main spine (see below), but occasionally with 1 or 2 subsidiary ones or a broad shoulder.

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. 10.9 (9.7-12.3) mm); specimens of Chaudhuri et al (1992) (7.0-8.2 mm) but this may be due to being reared in a laboratory. Anterior and posterior VT about equal length or anterior longer (ant 1.20-1.56 mm, post 1.24-1.48 mm); LP about 300 (280-320) µm. AT about 303 (250-380) µm long, and 2.7 times longer than wide. SAL about 53-55.5 µm wide and about 3 times wider than deep.

Gula from pale to (mostly) slightly darkened over the posterior third; and FC also from pale to occasionally dark, generally the darker specimens are from Uttar Pradesh.

Distance between antennal bases (142.8 (124-163) µm) generally greater than the distance between the S4 setae (137 (127-145) µm).

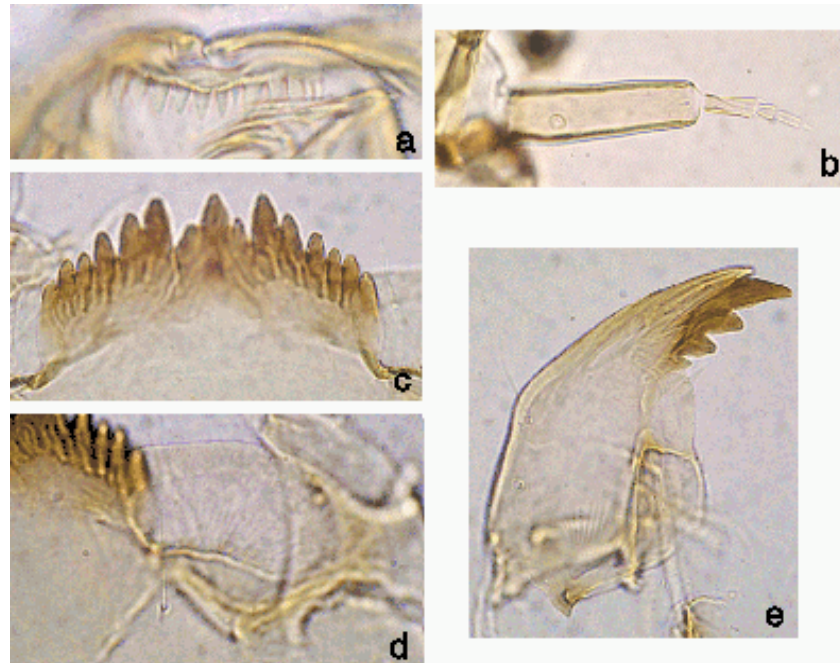
Mentum (c, below) with c2 teeth of central tooth separated and sharp (type IB-III), 4th lateral reduced, sometimes only slightly, or down to level of 4th lateral, i.e. I-ii; width abt 157.6 (137-172) µm (0.55 (0.50-0.59) of VHL). Pecten epipharyngis (a, below) with 14.3 (11-17) teeth (type B).

Ventromental plates (d, below) separated by 0.27 (0.22-0.32) of the mentum width (ICD), about 38.5 (32-46) striae, VMR about 0.26 (0.22-0.29).

Premandibles with inner tooth about 4.64 (3.6-6) times wider than the outer tooth; outer tooth to fine point, inner to moderate point (Ty. 2B).

Antenna (b, below) with basal segment relatively long, 2.7-3.7 times longer than wide; RO from about 0.3-0.45 up from base of segment; AR about 1.91 (1.6-2.1); proportions (µm) 93 : 23 : 9 : 11 : 6.

Mandible (e, below) with third inner tooth usually partially or completely separated, and partially pigmented (i.e. type IIB or IIIB, but may be IA or IIA in Jammu & Kashmir), with 15.7 (13-18) furrows, 12 (11-14) taeniae in PecM; Mdt-Mat abt. 28 µm; MTR about 0.35 (0.30-0.37).



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. Saxena also recorded a tandem fusion between arm A and B, and a small deletion near the distal end of arm B. The polytene chromosomes are illustrated by Sarkar et al. (2011 & 2018) who investigated aberrations in arm G from a variety of polluted localities. However, given the large number of inversions found in other studies, it is difficult to know if the heterozygous inversions shown are natural or the result of the experimental treatments.

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 (6a-f, 7ab) 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: Characteristic groups 3-4 about 1/3 from centromere.

stpC2: Simple inversion of almost the whole arm. Shares proximal breakpoint with C3.

stpC3: Shares proximal breakpoint with C2 and distal breakpoint with C4.

stpC4: Shares distal breakpoint with C3 and proximal breakpoint with C5. (India, Japan & Brazil).

stpC5: Shares proximal breakpoint with C4.

stpD1: Bands 12a - 13a near middle of arm due to a large inversion of perhaps 3 - 17 c.f. *piger*.

stpD2: Small simple proximal inversion.

stpD3: Simple inversion of distal 2/3 of arm. Shares distal breakpoint with D4.

Appears to occur in India, Japan and Brazil. Could this be close to *piger* Std?

- stpD4: Large inversion of about 3/4 of the arm. Shares distal breakpoint with D3
 stpE1: 1a - 13g i.e. as *piger* (Standard)
 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 (e.g. Bishnah, below).



Polytene chromosomes of *Chironomus striatipennis* from photographs of Sumitra Saxena
 Note heterozygous inversion in arm B



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); Bishnah Wetlands (abt. 32.70°N, 75.00°E), Jammu; West Bengal – Haldia & Kolaghat on East Midnapore; Dhulagarh, Howra; Durgapur, Burdwan district; Dhapa of Kolkata area, and Dankuni; (Sarkar et al. 2011, 2018).

Adult re-described and immatures described by Chaudhuri, Das & Sublette (1992). 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*: Limited barcode sequence exists for Indian specimens, and differs to sequences of specimens from Japan, Korea, China, Singapore, Malaysia, and Thailand attributed to *C. kiiensis* and *C. strenzkei*.

The available sequences are one in GenBank and two in the BOLD database:

GenBank accession number: KT212990-994, and BOLD numbers: COTW011, COTW012

***Chironomus striatipennis* Type 2 = *C. strenzkei* Fittkau 1968**

In BOLD Bin: [BOLD:AAD8161](#)

The taxon ‘*C. striatipennis* Ty. 2’ was first recorded by Pramual et al. (2016). Subsequent analysis of the BARCODE COI sequence revealed that it was identical to that of *C. strenzkei*. As there was no other valid name for this material, it becomes *C. strenzkei*, which is not a synonym of *C. striatipennis* or *C. kiiensis* as previously claimed (although closely related).

Adult:

Male: The abdomen of *C. strenzkei* (see below) is similar to that of *C. striatipennis* and *C. kiiensis*. The laboratory reared specimens from the Plön colony are larger than those collected in the wild.

Wing length about 2.27 (1.56-2.64) mm, width 0.64 (0.55-0.73) mm. VR - 1.08 (1.04-1.14).

AR about 2.49 (2.10-2.95). FT developed, about 62 (35-68) µm long and 18.3 (15-22) µm wide; i.e. 1.9-4.5 x longer than wide. 17-18 setae on clypeus; palpal proportions (µm) 52 : 38 : 139 : 154 : 243; P5/P4 1.53-1.63; P5/P3 1.58-1.96.

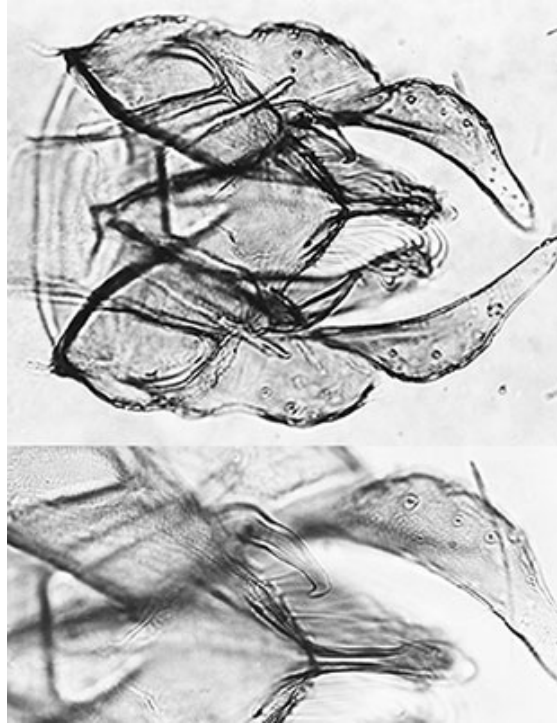
Thoracic seta: acrostichal - 10-13; dorsocentral - 16-18; prealar – 4-5; supraalar 1; scutellar in two rows, anterior - 4-7, posterior - 9-11 (total 14-16).

Wings with dark spot over the crossvein and with obvious dark clouds and seams, particularly in cell R5, as in *C. striatipennis*; abt 6-14 SCf on brachiolum in two clusters, abt 18 setae in squamal fringe.

Leg lengths (µm) and proportions:

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	BR
PI	1031	938	1390	760	613	413	249	1.32-1.64	1.10-1.11	2.3-3.5
PII	1092	1048	735	366	266	175	136	0.60-0.82	1.01-1.07	
PIII	1224	1270	987	557	430	256	170	0.78	0.96	

Setae of tergite IX possibly in individual pale areas (possibly triangular). SVo of the E(h)-type of Strenzke (1959). Anal point narrow at base and expanded at tip. IVO reaching about to end of anal point. Gonostylus moderately swollen and reducing markedly over distal half.

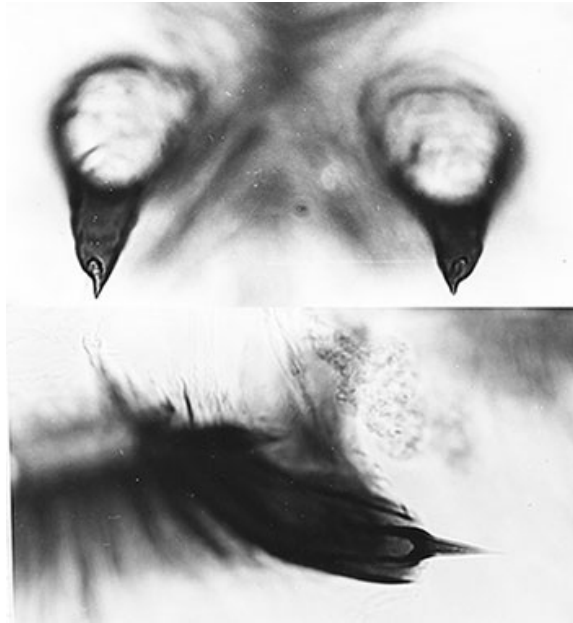


Male hypopygium (above) and details of the IVo and anal point (below)

Female not described.

Pupa: Length 5.5-7.5 (Fittkau 1968). A single male pupal exuvia from the Plön culture was available for more detailed analysis.

Length 6.26 mm; posterior margin of wing case 1.35 mm.; CT 85 x 65 μm . Respiratory base 133x63.5 μm ; HR 2.1-2.2, with a line of irregular small humps lateral to it. About 85 recurved hooks, occupying 0.76 of the segment width, at the posterior margin of segment II. PSB laterally on segment II; PSA on segment IV about 131x89 μm , abt. 0.24 of segment length; caudolateral spur of segment VIII with 1 & 1+1 small spines, the single spine with a broad shoulder. Swim fin with 75-95 taeniae, initially in a single row, then up to 3 rows. Shagreen light over whole of segments II-V, waisted on VI, pale anterior on VII, 2 lateral segments on VIII.



Pupal cephalic tubercles (above) and spur (below) of *C. strenzkei*

Fourth instar larva: a small plumosus-type of length 9.2-10.8 mm (fem. abt. 9.2 mm; male 9.5-10.8). Anterior VT bent and posterior VT coiled with posterior longer (ant 0.74 mm, post 0.78 mm); the length varies considerably presumably related to rearing conditions and shortest in the laboratory-raised Plön sample. Lateral tubules 312.5 (280-360) μm ; anal tubules rel. long: Means - dorsal 350 x 120 μm (l/w 2.9); ventral 380 x 120 μm (l/w 3.2), but much shorter in the laboratory reared specimens.

Gula moderately dark, generally over posterior third, but may extend to posterior 2/3 and widest at base; FC generally pale, but may have varying degrees of darkening.

Mentum (Fig. c), width about 0.60 of the VHL, with c2 teeth of central tooth separated and sharp (type III, or IB if worn), 4th lateral slightly reduced (type i-ii). PE (Fig. a) with 14.5 (11-17) teeth, probably type B. Salivary reservoir about 81 (68-11) μm ; l/w 4.2 (3.4-5.5).

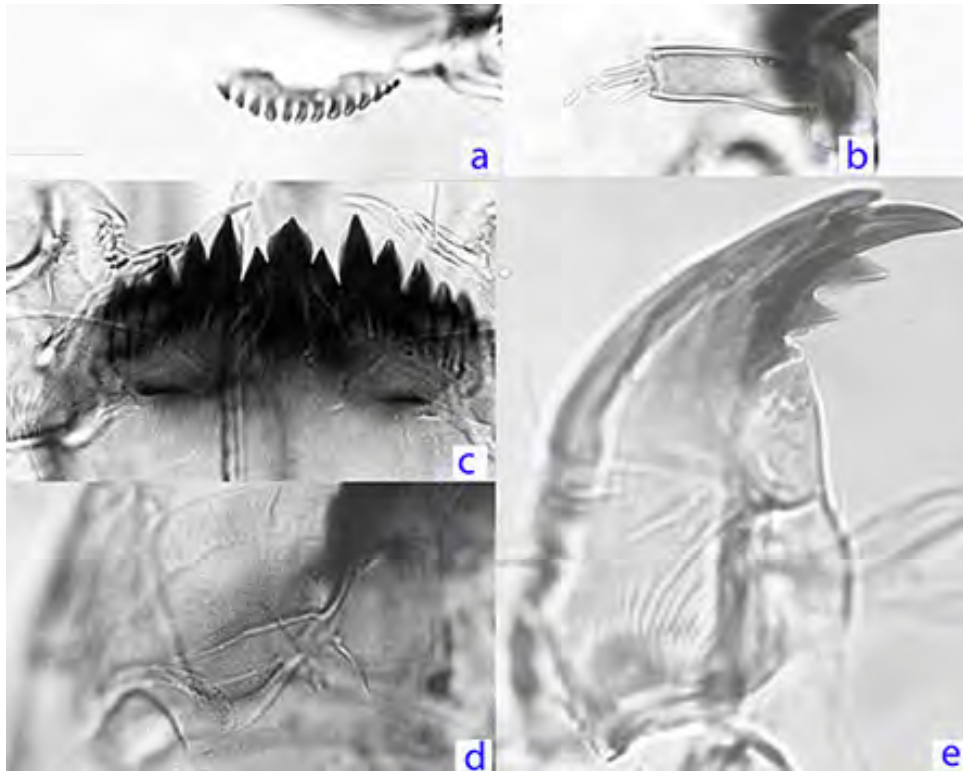
Ventromental plates (Fig. d) 175 μm wide and 3.45 times wider than deep; separated by about 0.28 of the mentum width, about 38-40 striae, VMR 0.28; 1.08 times the mentum width.

Premandibles with inner tooth coming to a rounded point, outer to a sharp point (type B1); inner tooth about 3.2x wider than the outer tooth.

Antenna (Fig. b) with basal segment relatively long, 3 times longer than wide; RO from about 0.36-0.42 up from base of segment; AR about 1.8 (1.77-1.84); proportions (μm) 87.5 : 19 : 8.5 : 12.5 : 7.5.

Distance between antennal bases (130.5 μm) about equal to that between the S4 setae (132.3), which occupy about 0.80 of width of FC at that point.

Mandible (Fig. e) with third inner tooth partially separated, and slightly darkened (i.e. type IIB), with 16.3 (15-23) furrows; 12.3 (10-15) taeniae in PecM; Mdt-Mat 29.4 μm ; MTR 0.38 (0.33-0.5).



Larval mouthparts of *C. strenzkei* from the Plön colony

Cytology: Four polytene chromosomes with the pseudothummi-cytocomplex combination BF, CD, AE, G (Wülker & Morath 1989). While obviously close to *C. striatipennis*, there are some significant differences.

Nucleolus near end of arm G. Centromeres of the longer chromosomes slightly heterochromatic. No other details clear.

Arm G closely paired with a subterminal nucleolus, which may have a very close BR. No nucleoli in the long chromosomes. In Asia, the species is highly polymorphic.

stzA1: 1 - 2c, 11 - 7, 4 - 6, 2d - 3, 12 - 19

stzB1: Bulb of group 7 not obvious but possibly a puff at distal end.

stzC1: no sequence available.

stzD1: no sequence available.

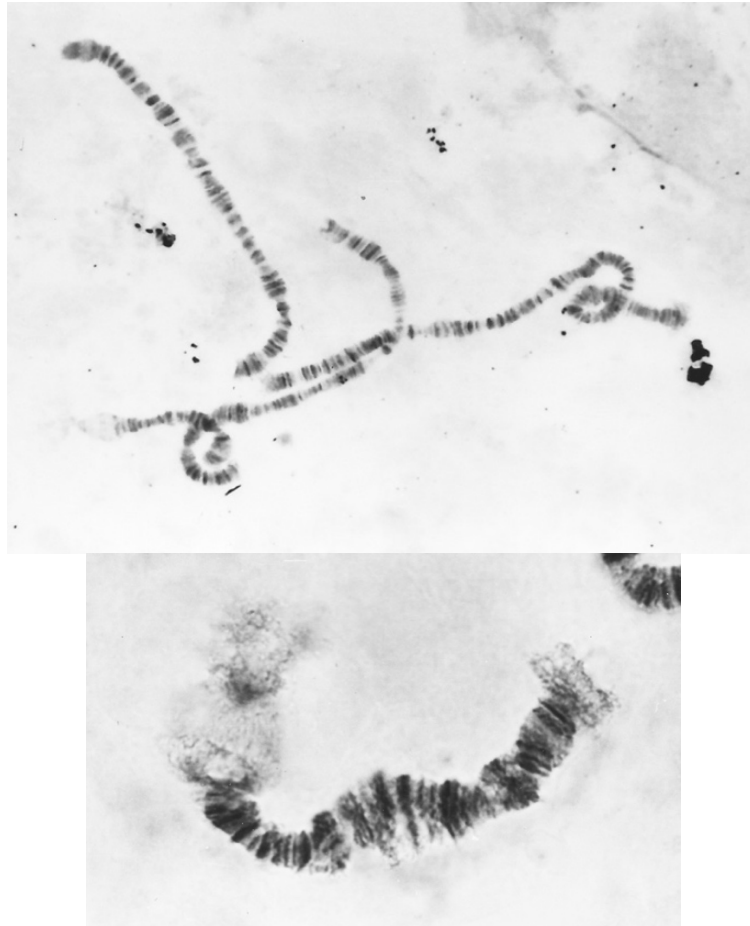
stzE1: 1a - 13g

i.e. Standard (as *striatipennis*)

stzF1: 1 - 2a, 15e - 11f, 2b - 15f-a, 11a-e, 16 - 23

stzG1: subterminal nucleolus, with BR nearby; no other BRs visible in available specimens.

The BR does not appear to be present in *C. striatipennis*



Polytene chromosomes of *C. strenzkei*:
Whole complement (above); arm G (below)

The population in Brazil appears to be a recent introduction, probably from somewhere around Japan (Amora *et al.* 2015). This may well also apply to the Californian population. The Brazilian and Californian populations were identified as *C. strenzkei* (Fittkau 1968; Sublette & Mulla 2000). There are some differences in features for some characters between the Asian and Brazilian specimens. There are two possible reasons for this: genetic drift due to the small number of founders of the Brazilian population, or some degree of divergent evolution during the time the populations in the two regions have been isolated. It might be noted that there have been many studies of aspects of the biology of *C. strenzkei*.

Found: BRAZIL – Manaus, Amazonas (Type locality)
MALAYSIA - Minden, Penang (5.13°N, 100.13°E).
SINGAPORE – Bedok Canal (1.367°N, 103.939°E).
JAPAN - Lake Kaiwaguchi, Honshu (39.00°N, 141.00°E)

The redescription of *C. kiiensis* by Al-Shami *et al.* (2012) possibly refers to this species, as do the studies of Lacerda *et al.* 2014.

Molecular: The mitochondrial *COI* differs from that of both *C. striatipennis* and the sequence of the common form of *C. kiiensis*, as well as the recently identified taxa *C. nr. kiiensis* and *C. kiiensis* MYTH. The sequence is found in Japan and SE Asia, but has not been found in India. The sequence of *C. strenzkei* is identical to that of this species, and

since this taxon has no formal name, it becomes *C. strenzkei* (i.e. that name is not a synonym of any other member of this group).

GenBank accession numbers: KJ424334–KJ424336. BOLD accession numbers: COTW009, COTW010, COTW013.

The *COI* sequence differs from that of *C. striatipennis* at 7 bases, from *C. kiiensis* at 11 bases, from *C. kMYTH* at 11 bases, and from *C. nr. kiiensis* at 31 bases.

***Chironomus kiiensis* Tokunaga 1936**

This name has been considered a junior synonym of *C. striatipennis* Kieffer 1910, including by Pramual et al. (2016). However those conclusions were biased by the assumption that the previous species identifications were correct when, in fact, many specimens of *C. kiiensis* were incorrectly identified as *C. striatipennis*. Additional data and analysis of the *COI* sequences without prior assumption of identity, indicated that this synonymy was not supported, rather there was a complex of probably four species.

The location of the 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 other probable species with similarly patterned wings. However, as used here, the most common form has been called *C. kiiensis*.

Several names have been synonymised with *C. kiiensis*, but these are 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. There is a precedent from *Drosophila* for species to show the same wing pattern as a result of independent mutations of the same same gene (Prud'homme et al. 2006).

In Bold Bins: [BOLD:ABZ2474](#); [BOLD:AAD8160](#); and [BOLD:AAD8162](#) incorrectly as *C. striatipennis*.

Adult:

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

CHIRONOMUS (CHIRONOMUS) KIENSIS sp. nov.

This species is commonly found at Seto and females are often captured at light ashore in summer.

Male.—Body slender, ground color yellow, about 5 mm long.

Frontal tubercles present, small; antennæ 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; frontoclypeus with many long brown setæ.

Scutum with distinct reddish brown vittæ; 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 mesosternepisternum reddish brown; mesonotepisternum, mesonotepimeron, and mesosternepimeron each with a reddish brown spot near base of wing articulation; supra-alar setal group represented by five to seven small setæ.

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 setæ near basis of anal point slender; anal point strongly chitinized, bare, curved ventrad, not trilobed apically; coxites slightly constricted, each with five slender setæ on its ventromesal ridge; styles distinctly narrowed on apical one-third, each provided with six, small, strong setæ on apex and about thirteen, small, slender setæ 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 setæ on its basal pubescent area; ventral appendages large and straight, extending far beyond middle of styles, provided with many, strong, recurved setæ and a few slender setæ on apical one-third.

Legs yellow in ground color; coxæ 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; fore 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 nebulæ in cell R_{3+4} , a narrow nebula in cell M_2 along vein M_{1+2} , narrow nebulæ 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_1 , and R_{3+4} brown, setigerous. Halteres yellow.



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 Strenzke (1959), but end more sharply curved (although this can vary with mounting – note the difference in the two in the above figure). Data from Sasa (1978), Sasa & Hasagawa (1983) are also incorporated. Sasa & Hasagawa note that SVo has a high basal pad, resembling the *Einfeldia*-group

Male:

Body length about 6.5 (6.12-6.79) mm. AR 3.03 (2.79-3.28).

Wing length 2.74 (2.36-2.90) mm; width 0.64 (0.55-0.73); abt 3 Scf on brachiolum; 20 setae in squamal fringe. VR 1.09.

24 (21-33) clypeal setae.

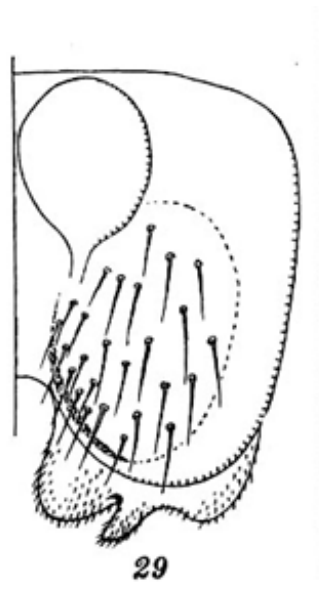
Thoracic setae: 15-23 (18) acrostichal; 20 (16-26) dorsocentral; 4-8 (5) prealar; 14-26 scutellar.

LR 1.71 (1.55-1.8); LR2 0.57 (0.53-0.58); LR3 0.76 (0.72-0.80). BR 3.9 (2.4-5.3) (Sasa & Hasagawa 1983)

About 8 setae in a single pale area on TIX.

Female:

Body length 6.46 (6.12-6.79) mm. Wing length 2.82 (2.76—2.86) mm. AR 3.03 (2.79-3.28).



Pupa: (based on specimens from other populations)

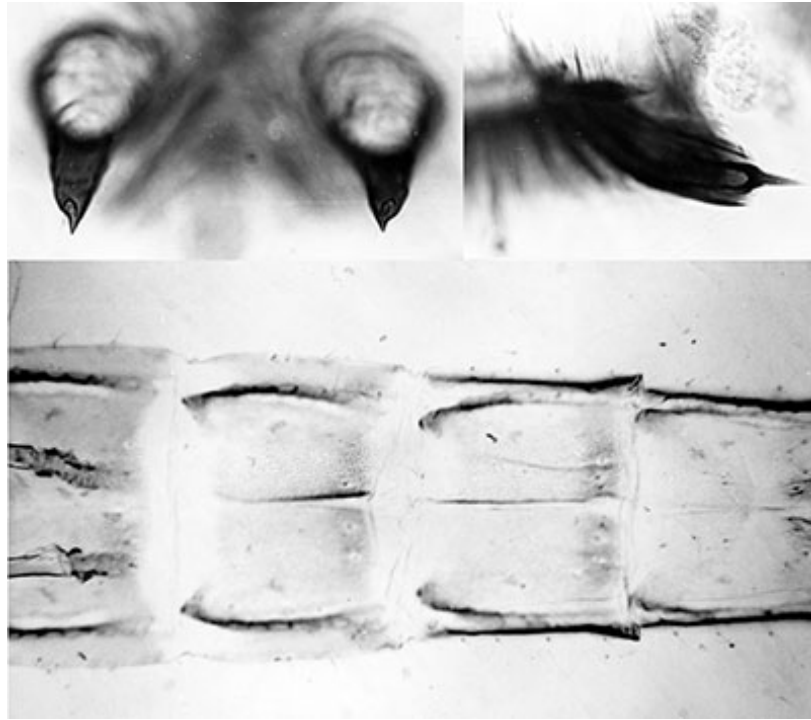
Length 5.5–9.8 mm. Exuvia dark brown, shagreen darker on posterior of tergites IV-VI.

Cephalic tubercles about 80 μ m long and 65 μ m in diameter at the base.

Prealar tubercle present, not simple, but small, about 25 μ m long and 6 μ m wide. Basal ring of respiratory horn with edge thicker at the anterior end, and pinched at the center, about 119-126 μ m long and 60-63 μ m wide (HR 1.98-2.0). There are about 3 rough short spines immediately anterior to the basal ring, and a large, possible muscle scar, just posterior to it.

Abdomen: About 62-72 recurved hooks on posterior margin of segment II, the hook row covering about 55% of the width of the segment. Pedes spurii B on segment II, and pedes spurii A on segment IV, while those of segment V and VI are small and mainly identifiable by the spinules.

Caudolateral spur of segment VIII with usually 1 main spine, but also one or two small lateral spines. Anal lobe with about 53-72 taeniae on each side, mostly in a single row.



Cephalic tubercles, spur and abdominal tergites of *C. kiiensis*.

Fourth instar larva a small plumosus-type, length about 10.5-10.8 mm.

TLt about 200-210 μ m, VT rel. short and equal length (0.6-0.96) mm; Anal tubules relatively short (len 280; wth 70-90).

Head capsule with sl. darkened post 1/4-1/3 gula (widest at base) and sl. darkened frontoclypeus.

Mentum with c2 teeth of the central trifold group moderately well separated (type Ib-III), 4th laterals slightly reduced (type I-ii).

Ventromentum (d, below) with about 43 (37-49) striae, VMR about 0.24 (0.21-0.25). PE with about 14 (13-16) even sharp teeth (Ty. A).

Antenna with basal segment about 3.25-3.5 times longer than wide, RO about a third to half from base of segment, AR about 1.84 (1.73-2.0); relative lengths of segments 99 : 26 : 8.5 : 12 : 6.

Premandible with relatively narrow sharp teeth, inner tooth about 3.7x width of outer tooth (Ty. B1).

Mandible abt. 214.5-225 mm long; 3rd inner tooth partially separated and colored (type IIB); about 15.8 (14-19) striations on inner surface near base, PecM with about 13 (12-15) taeniae; MTR about 0.32 (0.24-0.37).

Cytology: 4 pairs of chromosomes with the pseudothummi arm combination AE, BF, CD, G. Nucleolus virtually terminal in arm G, with very large BR adjacent?, separated by only 4-5 bands; closely paired. No nucleolus in long chromosomes. Little information from Asian populations so most comes from the Brazilian culture in Plön.

kiiA1: 1 - 2c, 11 - 7, 4 - 6, 2d - 3, 12 - 19 Puff near the end of the arm with the dark bands distal (in all sequences?)

kiiB1: Puff near the end of the arm with the dark bands distal (in all sequences?)

kiiB2: inversion of 1/3-1/2 of the arm near the middle of the arm (Brazil)

kiiC1:

kiiD1:

kiiD2: Simple inversion of distal 2/3 of arm. as D3 of *C. striatipennis*
Appears to occur Japan and Brazil.

kiiE1: 1 – 13 as *piger*, *striatipennis*, etc.

kiiF1: 1 - 2a, 10 - 6, 15 - 11, 2b - 5, 16 – 23 from *oppositus* F1 by Inv15 – 5

kiiF2: simple inversion of about half the arm in middle of the arm.

kiiF3:

kiiF4:

kiiG1: inversion of abt 10 dark bands in middle of arm from *striatipennis*

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 presumably refer to *C. kiiensis* (e.g. Otsu City, Hoshu), but whether these are the original *C. kiiensis* cannot be determined. Specimens include NIESD0405, NIESD0412, NIESD0414, NIESD0501, gg276; gg277; gg278; gg279; KOR-D4-002; GeumR4; NIGLAS TIL; NIGLAS DYH-6AC.

The GenBank accession numbers are: JQ350720 (Korea), AB740240 (Ibaraki, Miho, Yogoiri headrace), AB838642 (Japan), AB838644 (Japan) and BOLD accessions COTW008, COTW009, COTW010.

The common form of *C. kiiensis* differs from *C. striatipennis* at 12 bases; from the *C. kiiensis* MYT (Thailand population) at 19 bases; from *C. nr. kiiensis* at 30 bases and from *C. strenzkei* at 11 bases.

Found: JAPAN - Seto, Wakayama Prefecture (Type locality); Ibaraki, Miho, Yogoiri headrace (Genbank); Otsu City, Shiga Prefecture, Honshu (Genbank as *C. striatipennis*); others identified only as “Japan”.

KOREA –Yeongsan; many sequences only identified as “South Korea”.

There is indication of a variant form (*C. striatipennis* Ty. 2 of Pramual et al., 2016 = *C. strenzkei*, see above), and another three sequences from Japan and Korea in GenBank that differ from them by about 9% (see *C. nr. kiiensis*, below).

Chironomus nr. kiiensis

As noted above, 3 specimens in GenBank identified as *C. kiiensis* have a COI barcode sequence that differs from that of the other known members of the “*C. striatipennis* group” (and particularly, the *C. kiiensis* group). No morphological data available but the bodies may be preserved in Japan.

However it might be expected that the adult males would have a similar wing pattern to the other members of the *C. striatipennis/kiiensis*-group.

Molecular: The mitochondrial COI is in GenBank accessions AB838642, AB83864 (Japan) and JQ350720 (Korea).

The BARCODE sequence differs by 31 bases from *C. striatipennis*; 30 bases from the most common form of *C. kiiensis*, 31 bases from *C. strenzkei* and 30 bases from *C. kiiensis* form MYTh.

Found: JAPAN - no locality – perhaps Ibaraki?

KOREA –no locality.

***Chironomus kiiensis* form MYTh**

This form comprises two adult male specimens from the Pramual et al. 2016 analysis. These specimens were identified as *C. striatipennis*, but are equally distant in *COI* sequence from both *C. striatipennis* and *C. kiiensis*.

No morphological data is available other than that the wings are patterned.

Molecular: .

The BARCODE sequence differs by 11 bases from *C. striatipennis*; 19 bases from the most common form of *C. kiiensis*; 30 bases from *C. nr. kiiensis*. and 14 bases from *C. strenzkei*.

Found: THAILAND: Kantharawichai District, Maha Sarakham Province.

The specimens were deposited in the Lee Kong Chian Natural History Museum, National University of Singapore.

“*Chironomus kiiensis*” sensu Gunjal & Chavan 2018

The identity of this material is unknown. It is described on the basis of a brief description of the larval head and from polytene chromosomes. These descriptions are inadequate and incorrect. They refer to plates, but there are none in the PDF version.

Fourth instar larva: The head capsule has darkening of the gular region covering most of the region and widest just up from the posterior margin. It is likely that the frontoclypeus is also darkened. The larval antenna is claimed to have 3 segments, mentum 19 teeth, premandible two teeth and ventromentum smooth.

Cytology: The arm combination is stated to be pseudothummi complex but this cannot be confirmed from the illustration, particularly since the AE chromosome is longer than the CD chromosome. Noted as heterozygous in arm F. The nucleolus is about medial on the BF chromosome, with a terminal BR on arms C and E. Inversion polymorphism is noted for the CD chromosome and arm F. Arm G is stated to possess a terminal ‘nucleus’ but is not marked on the illustration.

The identification as *C. kiiensis* is dubious as this species has not been confirmed to occur in India.

Found: INDIA Khelana River, Aurangabad district (20.03°N, 75.65°E) and Shivana River, Gautala wildlife sanctuary, Ajanta Hills, both Maharashtra.

***Chironomus* sp. PK8**

Although adults were collected or reared with this sample, there were a number of different species included and there is no confirmation that any are associated with these larvae. Similarly, the larvae were a mixed sample, including those of the related *C. flaviplumus* Ty.B. In reality only the cytology could be confirmed as this species, as they are based on

photographs of squashes made and identified by Pragya Khanna herself. However, one larva with cytology as the P. Khanna specimens has been found.

Pupa: Two pupal characters were observed in a prepupal larva.

Pupal spur with 4 spines, taeniae on edge of swim fin from 1 to 2 rows posteriorly.

Fourth instar larva: Length not recorded. Essentially a plumosus-type larva. Tlt well developed, ant. pair with elbows, post. pair coiled. Head capsule pale.

Mentum 183 μm wide (0.56 of VHL), with c2 teeth of the central trifold group moderately well separated (type III), 4th laterals not reduced (type I). Width central tooth 23 μm ; 32 μm between C2 teeth; central trifold tooth 46 μm ; and between 1st laterals 60 μm .

Ventromentum abt 198 μm wide and 3.47 times wider than deep with about 54-58 striae, Abt 1.08 times the mentum width. VMR about 0.24 (0.21-0.25). PE with about 18 even sharp teeth (Ty. A).

Antenna with basal segment about 3.1 times longer than wide, RO about 0.33-0.41 of segment length from base of segment, AR not known, relative lengths of segments 115 : 37 : 9.5 : 11.5 : -.

Premandible with moderately sharp teeth, inner tooth about 3.3-3.7x width of outer tooth (Ty. B2).

Mandible abt. 476 μm long; 3rd inner tooth partially separated and colored (type IIB).

Striations near base not visible, PecM with 12 taeniae; MTR about 0.38.

A number of characters differ from those of larvae of *C. flaviplumus* Ty. B, but are quite closely related.

Cytology:

4 polytene chromosomes with the pseudothummi arm combination AE, BF, CD, G. Nucleoli in arm F about 1/3 from the centromere and probably in arm D, but not in arm G. BR about middle of arm G which is closely paired. Photographs of the chromosomes supplied by Pragya Khanna indicate that heterozygous inversions occur in arms B, C, D, E and G.

Arm A1: possibly 1a-i, 2k-d, 9e - 4a, 13a - 14i, 3h-i, 12c - 10a, 2c - 1k, 3a-g, 15 - 19 i.e. as the *C. flaviplumus* ty. A from Japan.

Arm B1: puff with dark bands distal near middle of arm,.

Arm B2: inversion near distal end

Arm C1: Large inversion about 1/3 from distal end.

Arm D1: Possibly small nucleolus about middle of arm, small inversion near middle of arm.

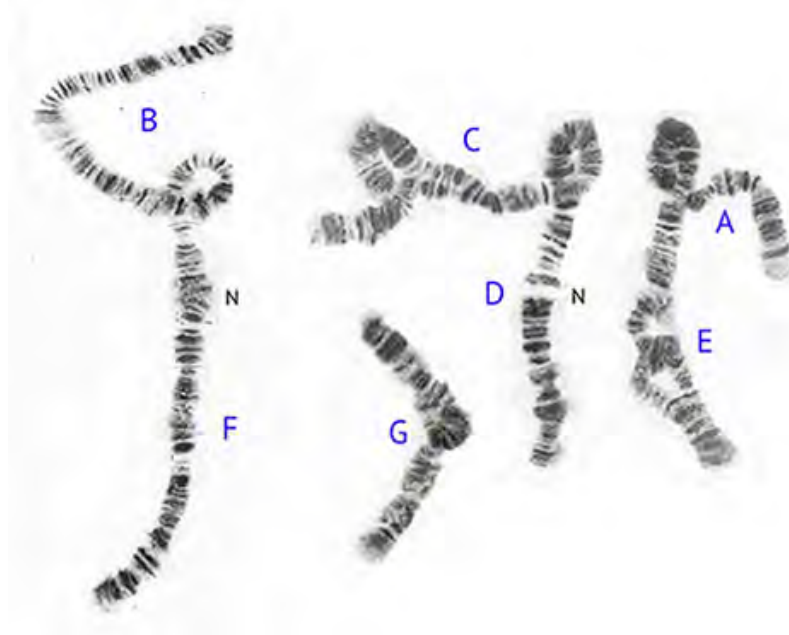
Arm E1: 1 - 2e, 10 - 12, 3-2d, 9 - 4, 13 - 19 small inversion near middle of arm
i.e. as *holomelas*?

Arm F1: Nucleolus about 1/3 from centromere, distal end 15d - 23.

Arm F2: Small inversion near middle of arm,

Arm G1: No nucleolus.

Arm G2: Small inversion in middle of arm, but may also be a more extensive complex inversion. i.e. at least 3 sequences?



Polytene chromosomes of *C. sp. PK8* (from Pragma Khanna)

The karyotype can be identified by the absence of a nucleolus in arm G while nucleoli are developed in arms D and F. (Other species lack the nucleolus in arm G, but do not have nucleoli in both arms D and F).

Found: INDIA – Bishnah wetland (32.70°N, 75.00°E), Jammu.

Species in the *camptochironomus* cytocomplex:

Chironomus biwaprimus Sasa & Kawai 1987

In BOLD Bin: [BOLD:AAW4005](https://www.boldsystems.org/#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.

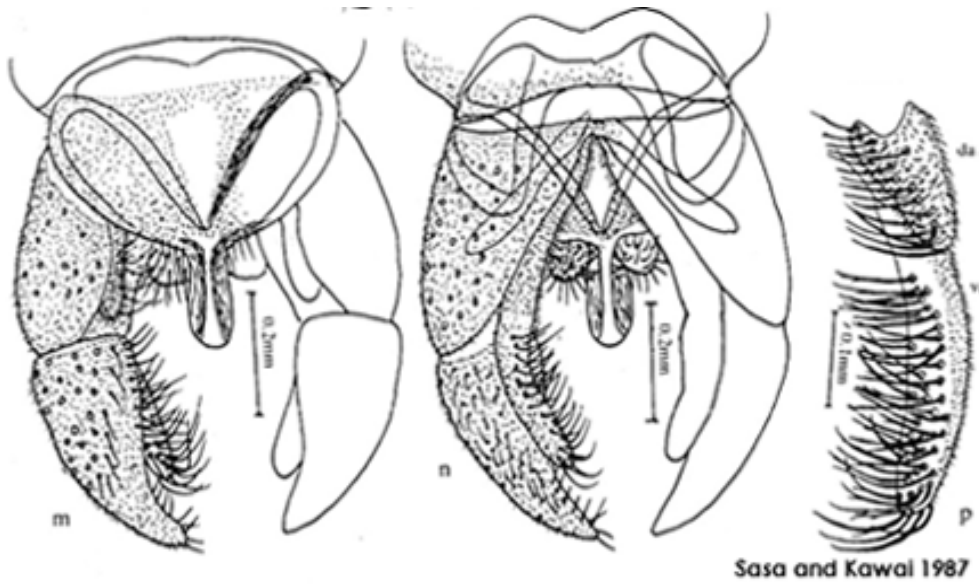
Coloration unusual - antennal shaft brown, hairs brownish yellow; ground color of scutum greenish yellow or pale yellow, vittae dark brown; legs with femur and tibia largely yellow with a narrow apical dark ring; tarsi darkening from brown to dark brown.

Head with relatively small FT 22 µm long, 14 µm wide.

Thorax: Anteprepronotum united and expanded in the middle, without lateral setae.

Setae: Acrostichal 6-14; dorsocentral 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. Details of leg segments not given, only LR and BR (no beard).



Male hypopygium: (left) dorsal view; (mid) ventral view and (right) gonostylus
From Sasa and Kawai (1987)

Hypopygium (above) typical for the members of the camptochironomus-group, apparently closest to *C. tentans*. No setae shown in centre of TIX. Anal point parallel sided, possibly ridged, reaching just past the base of the gonostyle; SVO essentially straight, not easily fitted into the Strenzke (1979) types, and not reaching the end of the anal point; IVO long and gently curved with thick setae along the inner margin of the distal third, reaching two thirds along the dististyle, which is broad and narrows from about the distal third of its length.

Female:



Possible female of *C. biwaprimus*
Photo by T. Iwasawa

I have been unable to obtain a copy of a description of the female, only copies of figures.

Coloration probably similar to that of the male.

A photograph identified as a female of this species from Sagamihara, Japan shows a greenish yellow patch on each side at anterior of thorax.

Antennal proportions (approx): 20 : 14 : 13 : 13 : 20; A5/A4 abt. 1, AR 0.33.

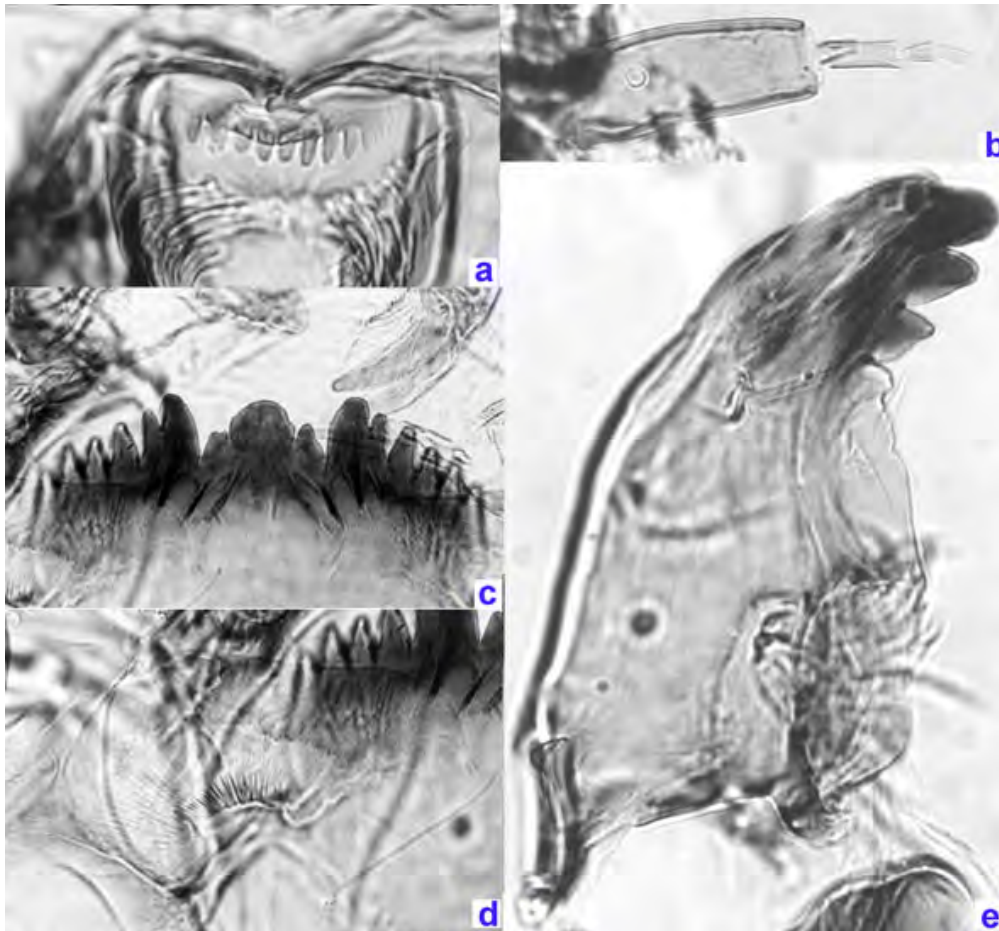
Frontal tubules not shown (but would be small)

Palpal proportions (approx): 14 : 5 : 19 : 17 : 30 ; P5/P4 abt 1.8; P5/P3 abt 1.6.

Clypeus shown with about 34 setae.

Legs with tibia and femur yellowish, tarsi brown.

Abdomen probably with a pale band at posterior of each segment.



Cytology: Four polytene chromosomes with the *Camptochironomus* cytochrome complex 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:

DNA sequence:

Mt *COI* & *CytB*: These mitochondrial gene sequences were included in the molecular analysis of phylogenetic relationships in the genus *Chironomus* by Guryev et al. 2001.

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

Possible locality: JAPAN -Sagamihara (35.59°N, 130.28°E), Kanagawa, Honshu

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

Adults

Males

Wing length 4.58 (3.42-4.92) mm.; VR 0.90–0.94.

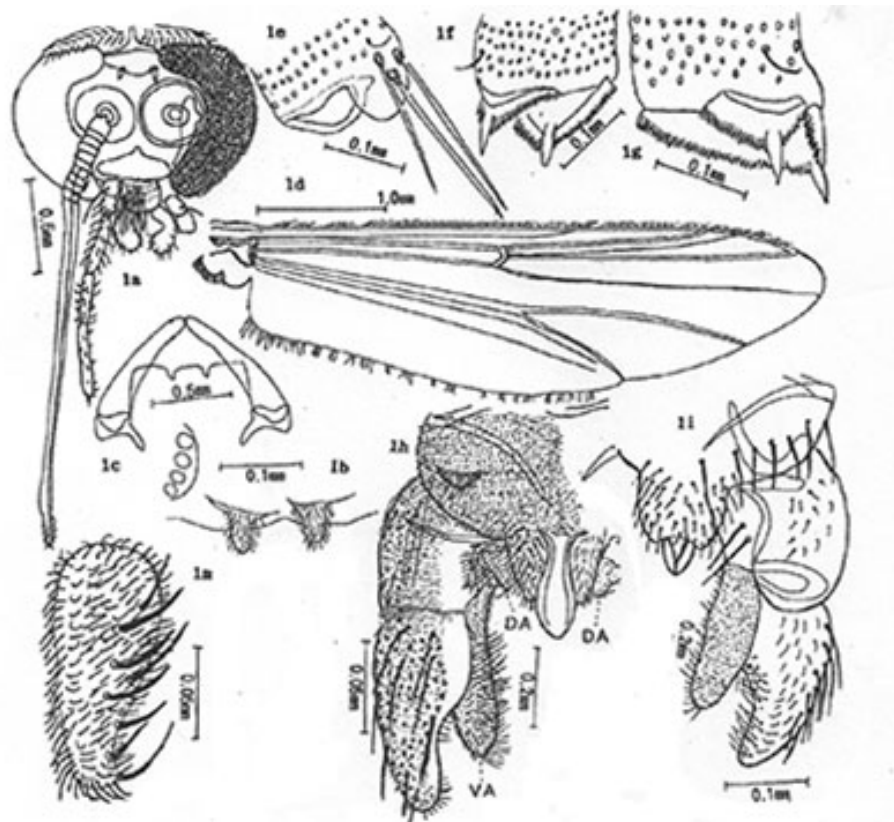
AR 3.67 (2.90-4.05).

LR 1.31-1.57; BR 1.1-5.2.

Head with FT prominent, almost cylindrical, 43 µm long x 18 µm wide; 56.4 (46-70) clypeal setae.

Thoracic setae: 16-36 Acrostichal; 24-36 Dorsocentral; 8-11 Prealar; 36-56 Scutellar.

Ground colour of scutum yellow, stripes brown, scutellum yellow, postnotum dark brown; femora & tibia entirely yellow, Ta1 & Ta2 largely yellow with apical portion brown, others brown. Abdomen almost entirely brownish yellow, hypopygium brown.



Illustrations of adult male of *C. mongolabeus* (Sasa & Suzuki, 1997)

Tergite IX with long process flanking the anal point which is flanked by a V-shaped lobe reaching almost to the end of the anal point;

Female



Possible female of *C. biwaprimus*
Photo by T. Iwasawa

I have been unable to obtain a copy of a description of the female, only copies of figures.

Coloration probably similar to that of the male.

A photograph identified as a female of this species from Sagami-hara, Japan shows a greenish yellow patch on each side at anterior of thorax.

Further information from original description:

Antennal proportions (approx): 20 : 14 : 13 : 13 : 20; A5/A4 abt. 1, AR 0.33.

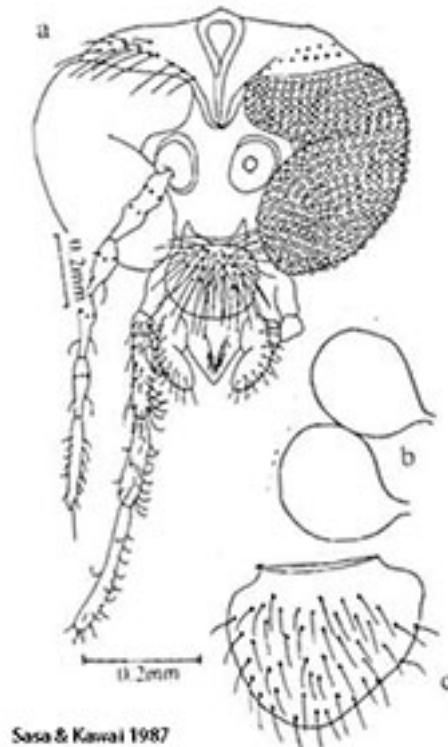
Frontal tubules not shown (but would be small).

Palpal proportions (approx): 14 : 5 : 19 : 17 : 30 ; P5/P4 abt 1.8; P5/P3 abt 1.6.

Clypeus shown with about 34 setae.

Legs with tibia and femur yellowish, tarsi brown.

Abdomen probably with a pale band at posterior of each segment.



Head (a), spermathecae (b) and cercus (c) of *C. biwaprimus* female
Sasa & Kawai (1987).

Pupa - Not described

Fourth instar larva: Four polytene chromosomes with the *Camptochironomus* cytochrome 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:

Cytology:

Found: JAPAN - (Type locality) Lake Biwa (35.33°N, 136.17°E), Honshu.

The descriptions suggest there may be two species involved, as 1 specimen is much smaller than the 4 others.

Lake Kasumigaura (36.42°N, 140.39°E); NEIS, Tsukuba (36.08°N, 140.08°E), Yatabe, Ibaraki.

Possible locality: Sagami-hara, Kanagawa (35.59°N, 139.28°E), Honshu.

(

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

Adults

Male:

Known from a single specimen.

Wing length 4.46 mm, width 0.28 mm.; VR 1.06 (or 0.94).

AR 4.28;

fLR 1.28; BR 1.4; mLR 0.50; hLR 0.59. Pulvilli large and brush-like.

Distinct dark and pale rings on tibiae and tarsi.



Frontal tubercles and male hypopygium of *Chironomus mongolbeceus*.

(Sasa & Suzuki, 1997)

Posterior lobe of TIX is as long as the anal point, apparently no central patch of setae. Anal point flanked by a V-shaped lobe reaching just to the end of the anal point; Gonostylus and IVo similar to those of *Camptochironomus*, but the SVo is quite different, constricted at the base then expanded to a broad triangular lobe bearing numerous long setae and microtrichia.

Female: Not known.

Pupa, Larva and Cytology: not known.

Found: MONGOLIA – (Type locality) Bogd.

Species, other than *Camptochironomus*, with unknown cytology:

***Chironomus bipunctus* Johannsen 1932**

Adult

Male:

Length 6.5 mm. AR abt. 2.5.

Thorax pale yellow; vittae deeper yellow; abdomen greenish-yellow, tergites with a large brownish transverse spot, divided longitudinally, more so on posterior segments.

Proportions of fore leg: 60 : 63 : 86 : 45 : 38 : 39 : 21. LR abt 1.3.

Wings hyaline, costa not produced; crossvein not clouded; VR about 1.

Halteres yellow.

About 8 setae possibly in a single area on TIX.

Anal point long and narrow, rounded at distal end. SVo closest to D(e) of Strenzke (1979); IVo reaching about 3/4 along the length of the anal point, or half way along the gonostyle, which is only moderately swollen and reduces markedly from about halfway along its length.



Male hypopygium of *C. bipunctus* from Johannsen 1932

Female: Coloring like male. Antenna six segmented (i.e. including pedicel), A5/A4 about 2; intermediate segments with a neck almost as long as the basal part.

Brown spots on tergites not longitudinally divided in available specimen.

Adults bred from larvae found in a spring pool.

Pupa: Brownish, about 6 mm 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. asl.

Sublette and Sublette (1973) accepted this as a distinct *Chironomus* species.

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

***Chironomus acutus* Das, Majumdar and Hazra 2016**

(junior homonym of *C. acutus* Goetghebuer 1928 - [New name required.](#)) Since the name refers to the shape of the SVo, *Chironomus aguzza* is suggested.

Adult:

Male: Total length 4.52-4.70 mm. Wing length 2.08-2.50; width 0.64-0.76. AR 2.95-3.02.

Head and thorax light brown, wing light yellow, veins brown; postnotum dark brown. Legs and abdomen pale yellow; tergites II-IV with faint spots.

FT 82-90 µm long and 34-40 µm wide; clypeus 170-180 µm long and 34-40 µm wide, with 18-20 setae. Ratio of papal segments: 68-85 : 34-51 : 170-187 : 255-227; P5/P4 abt. 1.45-1.5; P5/P3 abt 1.33-1.36.

Thoracic setae: 10-12 acrostichals; 12-14 dorsocentrals; 6-8 prealars; 16-18 biserial scutellars.

2 Scf on brachiolum, 16-18 setae on squamal fringe; VR 0.96-0.98 (or 1.12-1.14).

Leg lengths (µm) and proportions:

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	BR
PI	1120-1160	960-1000	1560-1640	840-920	760-800	640-680	320-360	1.59-1.62	1.16-1.17	2.62-2.65
PII	1080-1120	960-1000	640-720	320-360	200-280	160-220	120-160	0.64-0.67	0.96-1.12	4.2-4.23
PIII	1000-1040	1200-1260	880-920	480-520	320-360	240-320	120-160	0.69-0.73	0.83	2.63-2.67

Lacks a beard

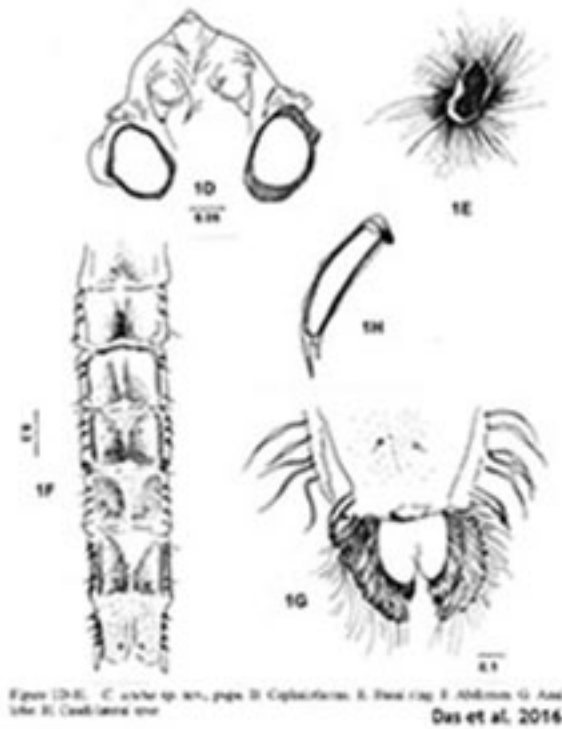
Abdomen pale yellow, Tergites II-IV faint spots; Tergite IX with 15-17 setae, some possibly in clear pale spaces.

Anal point 82-87 µm long with an expanded end; SVo somewhat sickle shaped, of D-type of Strenzke (1959); IVo reaching about to end of anal point (1/3 of length of gonostylus), with 10-12 incurved setae near apex; gonostylus only moderately swollen and narrowing markedly from about midpoint.

Female – not described.

Pupa: Length 5.56-6.92 mm.; wing sheath 1.36-1.44 mm long. Yellowish, exuviae grey. Frontal apotome triangular with subapical frontal setae 30-38 µm long. Cephalic tubercles cone-shaped 86-92 µm long and 64-69 µm wide. Basal ring of thoracic horn bean shaped. Abdomen yellowish brown, tergites II-VI with median shagreen, VII with a single semicircular patch of basomedian shagreen, VIII with little shagreen. Hook row comprising 52-56 hooklets. Segment II with caudolateral PSB (69-72 x 52-56 µm), segment IV with a PSA (77-82 x 65-69 µm).

Caudolateral spur with two spines. 160-166 taeniae in multiple rows on anal lobe.



Fourth instar larva: Deep red in color, 5.68-8.60 mm long, VT 880-1120 μ m long, anal tubules 560-880 μ m long. There is no mention of lateral projections or indication of whether the ventral tubules are coiled or straight.

Mentum 163-184 μ m wide, possibly of type I with the central trifid tooth of type IA.

Ventromentum 52-66 μ m wide with a serrated margin, distance between them 73-84 μ m.

Premandible illustrated with inner tooth narrower than the outer tooth. Pecten epipharyngis with 12-14 teeth, two apical ones dark brown.

Mandible 220-238 μ m long, with pale apical tooth and the inner teeth dark (type IIIC); MTR perhaps 0.29.

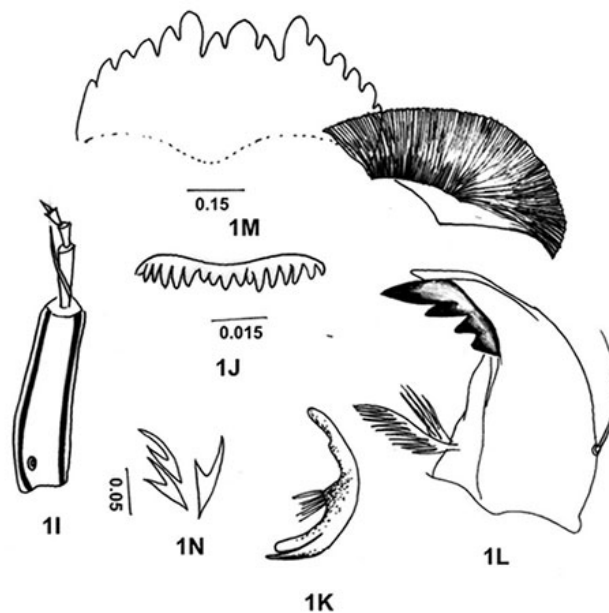


Figure 1I-N. *C. acutus* sp. nov., larva. I. Antenna. J. Pecten epipharyngis. K. Premandible. L. Mandible. M. Mentum. N. Claw.

Das et al. 2016

Noted as close to *C. incertipenis* and *C. ramosus* in structure, but thoracic chaetotaxy is quite different.

Found: INDIA - **Type locality** – Itanagar (27.03°N, 93.065°E. 440 m a.s.l.), Arunchal Pradesh.

***Chironomus alternus* Das, Majumdar and Hazra 2016**

Adult:

Male:

Total length 4.6-5.0 mm. Wing length 2.48-2.64 mm, width 0.62-0.68 mm.

Head brownish yellow; thorax yellowish, postnotum dark; wing membrane brown with dark veins; legs brownish yellow.

Head: AR 2.22-2.64. FT 82-89 µm long and 39-47 µm wide i.e. 1.9-2.1 times longer than wide. Clypeus with 16-17 setae. Palpal proportions rather unusual, with the terminal segment shorter than the preceding two segments (not noted as being shrivelled) 51-68 ; 34-51 ; 187-204; 170-187 ; 136-153; (if correct, both P5/P4 and P5/P3 both less than 1) segment V with alternate bands.

Thoracic setae: acrostichals 14-16; dorsocentrals 12-14; prealars 12-14; scutellars 10-12.

Wing with 1 Scf on brachiolum, squama with 16-18 setae; VR 1.06-1.08 (or 0.92-0.94).

Leg lengths and proportions (micron)

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	BR
PI	880-920	880-940	1280-1320	680-720	560-600	480-520	200-240	1.40-1.45	1.78-1.81
PII	1000-1140	840-880	480-540	280-320	160-200	120-160	100-120	0.57-0.61	
PIII	1160-1200	1040-1080	720-760	360-380	280-300	120-160	120-140	0.69-0.70	

Abdomen yellow, tergites II-V with dark median spots (as in the “flaviplumus-group”). Tergite IX with about 7 medial setae, possibly in individual pale areas.

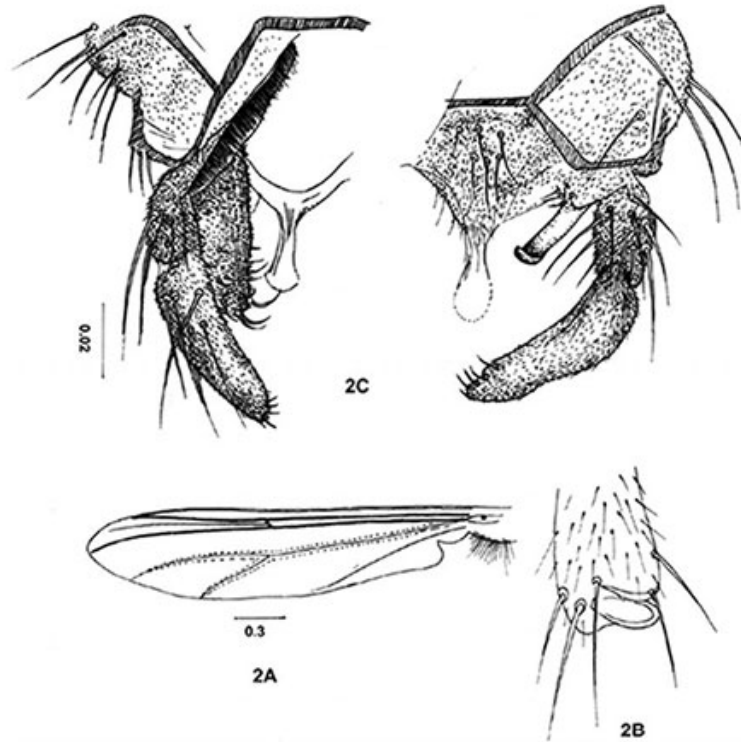


Figure 2A-C. *Chironomus alternus* sp. nov., male imago. A. Wing; B. Fore tibial scale. C. Hypopygium. **Das et al. 2016**

Anal point described as straight but shown with a narrow base. IVo with branched setae, reaching beyond end of anal point and to about the middle of the gonostylus, which is hardly narrowed over distal third.

Female: not described.

Pupa:

Length 5.96-6.08 mm. Yellowish brown in color.

Frontal apotome triangular; cephalic tubercles 20-21 μm long and 30-31 μm wide at base.

Antennal sheath 680-684 μm long and 85-87 μm wide at the base. 2 pairs of precorneals

Thorax rugose, basal ring oval, HR about 1.6. Wing sheath 1.24-1.25 mm long.

Abdomen yellowish brown. Tergite I bare, tergites II-VI with median shagreen, VII-VIII with faint shagreen; segment I with baso-lateral and II with a caudo-laterals PSA;

IV with PSA (58-60 x 68-69) μm . Lateral muscle marks obvious on segments II-VIII. Hook row of

segment II with 40-42 hooks, claimed to be separated into two equal halves although not

obvious in figure. Caudolateral spur 180-182 μm long with 4 spines, all pointing to one side.

Anal lobe 290-291 μm long with 128-132 taeniae in multiple rows. ALR 1.88-1.9.

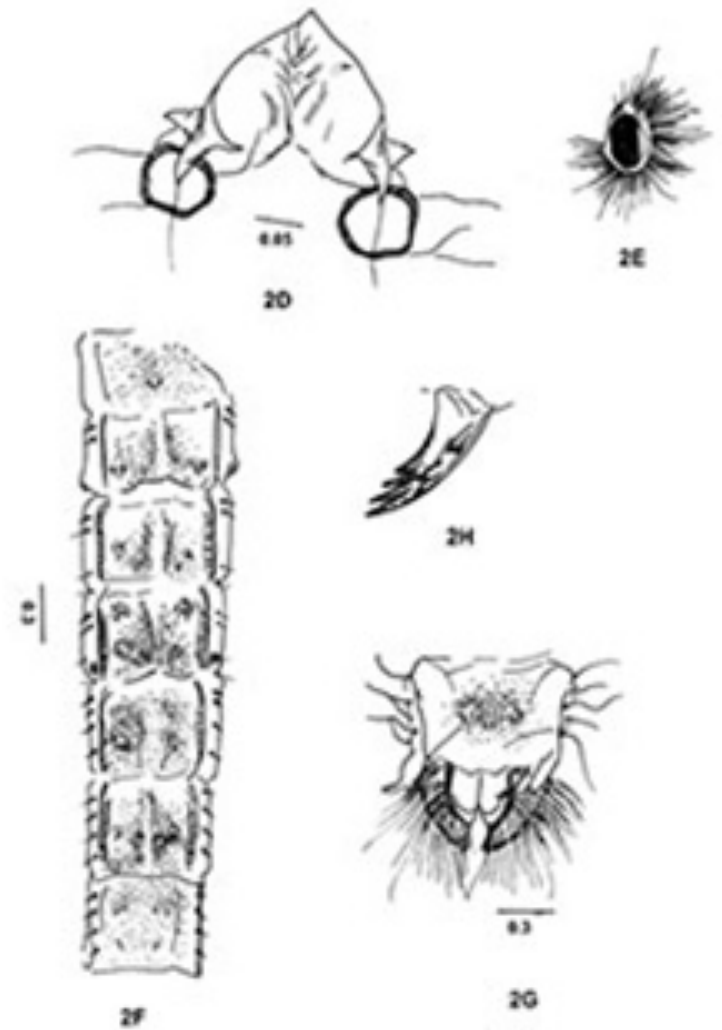


Figure 2D-E. *C. alternus* sp. nov., pupa. D. Cephalothorax. E. Basal ring. F. Abdomen. G. Ant. lab. H. Gonostylus spm.
Das et al. 2016

Fourth instar larva: Length 6.88-9.52 mm. Deep red in color. No information on larval type and no mention of lateral projections. Ventral tubules 1.24-1.44 μ m in length. The mentum 180-186 μ m wide; appears to be type II (although described as having gradually decreasing teeth) and the central tooth type III. Ventromentum about the same width as the mentum, but the inner margin appears unusual (actual inner margin not shown?) margin serrated, IPD 112-121 μ m. Maxillary palpus well developed with lacinial setae. PE with 14-16 teeth. Antenna with basal segment 86 μ m long, RO about 1/3 from base. Ratio of antennal segments: 86-90 ; 21.5-25.8 : 8.6 : 4.3 : 4.3 ; AR 2.10-2.22. Premandible with five teeth and a minute setose globular structure at their base. Mandible 156-160 μ m long and 49-52 μ m wide. The drawing of the mandible is difficult to interpret but possibly a pale apical tooth and 4 distinct dark inner teeth (Ty. IIC?); no mention of presence of furrows or the number of taeniae in the PecM.

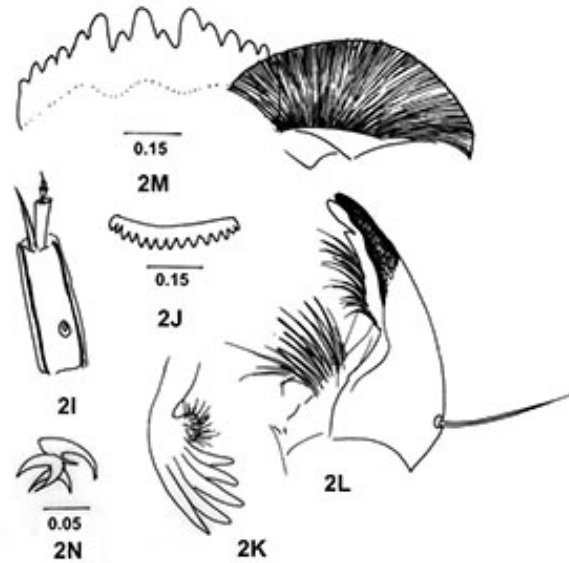


Figure 2I-N. *C. alternus* sp. nov., larva. I. Antenna. J. Pecten epipharyngis. K. Premandible. L. Mandible. M. Mentum. N. Claw. **Das et al. 2016**

Found: INDIA - **Type locality** – Namdapha (27.29° N, 96.23°E. 720 m a.s.l.), Arunchal Pradesh.

Noted as showing relationship to the group of species *C. circumdatus*, *C. ramosus*, *C. striatipennis* and *C. incertipennis* but this is in regards to certain specific characters including the presence of dark median spots on tergites II-V and an anal point narrowed at the base. For these reasons it is tentatively included with the species of the “*flaviplumus* group”. The five branched premandible of the larva does not seem to indicate a relationship to *C. javanus*.

***Chironomus atrosignatus* Kieffer 1911F**

Adult:

Male:

Female: Abdomen black, femur and tibia yellowish; LR about 2.
Further information in Chaudhuri and Guha 1987.

Found: INDIA - **Type locality** – Calcutta (now Kolkata).

Sublette & Sublette (1973B) classed it as a nomen dubium but Chaudhuri & Guha (1987) returned it to *Chironomus*.

***Chironomus brevistylus* Guha, Das, Chaudhuri & Choudhuri 1985**

Adult:

Male:

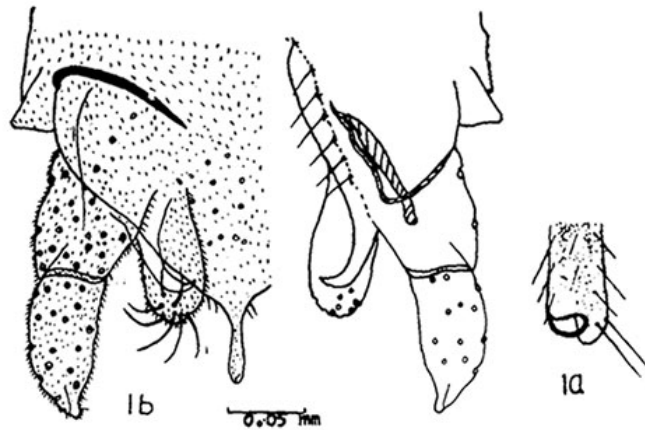
Length 4.73 mm, Wing length 2.1 mm, width 0.57 mm, antenna missing.
Head yellow, thorax and abdomen yellow; legs with femur and tibia of all legs yellow; tarsi stated to have an apical brown band, rest brown. LR1 2.1; LR2 0.68; LR3 0.64.
Frontal tubercles well developed.

Palp ratios 10 : 11 : 40 ; 50 : 64 ; P5/P4 1.28; P5/P3 1.63. Clypeus with 20 setae. Anteprepronotum without v-shaped emargination. Thoracic setae: 2 acrostichals; 9 dorsocentrals; 4 prealars; 10 scutellar; postnotum yellow.

Ta4 of anterior legs noted as unusually long (from paratypes).

Wing with r-m covered by a dark spot; VR 1.05 (0.95); brachiolum with 2 setae; squama with 13 setae. Haltere yellow.

TIX shown with about 13 setae, not in a pale area. Anal point shown as narrow and slightly narrower at base; SVo perhaps closest to E(h) of Strenzke (1959); IVo with simple setae, broad and reaching only part way along the anal point or basal third of the gonostylus, which is short, stout with the apex attenuated (hence the name).



from Guha et al. 1985

Female: Length 4.07 mm. wing length 2.07 mm, width 0.66 mm. “Similar to male with usual sex differences”

Antenna pale, segment proportions 9 : 7 : 7 : 8 : 12; i.e. AR 0.26; A5/A1 1.33.

Femur & tibia brown, tarsi 1-3 with brown apical band, rest brown on all legs.

Coxosternapodeme incurved, gonapophysis VIII divided into a broad posteriorly directed dorsomesal lobe, hooked ventral lobe and a needle like apodeme lobe.

Gonocoxite IX with 4 setae on each side; post genital plate protruded and pointed at apex. Seminal capsules oval, measuring 0.06 mm by 0.039 mm, ducts bent and open separately.

Pupa: (5 males) Exuvia length about 7.4 (7.2-7.8) mm; inner margin of wing case 1.8 (1.45-2.81) mm. Cephalic tubercles (see below) variable, length from 23-38 μ m, with subterminal setae about 64 (56-68) μ m long. Basal ring of respiratory horn kidney shaped, about 124-137 μ m long and 56-68 μ m wide, HR 2.0-2.2.

Small Pedes spurii B and about 74 (68-85) recurved hooks on abdominal segment II, covering about 78-80% of segment width; well developed Pedes spurii A on segment IV, about 86-166 μ m long and 61-93 μ m wide (l/w 1.4-2.8) and about 0.20 (0.18-0.26) of the segment length. Caudolateral spur (see below) of segment VIII on an elongated base with narrowed (paler) center, with 1.8 (1, 2 or sometimes 3) spines, the additional spines reduced in size. Anal fringe with about 76 (44-100) taeniae initially in a single row, but increasing to two, or sometimes 3 rows at distal end.

Fourth instar larva: Length 6.88-9.52 mm. Deep red in color. No information on larval type and no mention of lateral projections. Ventral tubules 1.24-1.44 μ m length.

The mentum 180-186 µm wide; appears to be type II (although described as having gradually decreasing teeth) and the central tooth type III.

Ventromentum about the same width as the mentum, but the inner margin appears unusual (actual inner margin not shown?) margin serrated, IPD 112-121 µm.

Maxillary palpus well developed with lacinial setae. PE with 14-16 teeth.

Antenna with basal segment 86 µm long, RO about 1/3 from base. Ratio of antennal segments: 86-90 ; 21.5-25.8 : 8.6 : 4.3 : 4.3 ; AR 2.10-2.22.

Premandible with five teeth and a minute globular structure at its base.

Mandible 156-160 µm long and 49-52 µm wide. The drawing of the mandible is difficult to relate to the description of a pale dorsal tooth and 4 distinct dark inner teeth (Ty. IIIC?); no mention of presence of furrows or the number of taeniae in the Pecten mandibularis.

Found: INDIA - Type locality - Andaman Islands (6.14°N, 92.67°E); old wandor (Type no. 129, B.U.Ent.); allotype female and paratypes collected at same locality.

***Chironomus fortistylus* Chaudhuri Das & Sublette 1992**

Adult:

Male:

Length 4.17 (4.58-4.71) mm; wing 2.75 mm long and 0.73 mm wide.

Head chocolate red, vertex dark brown with 7 setae; palp brown, segment ratios: 3 : 3 : 9 ; 9; 13 : P5/P4 & P5/P3 1.4. Eyes bare, reniform, dorsal extension 0.16 long. Antenna brown, AR 4.1. Clypeus with 18 setae, clypeal ratio 1.8. FT present.

Thorax red, with dark bands; thoracic setae: 12 acrostichals in pairs; 31 dorsocentrals; 8 prealars, 18 scutellars in 2 rows; postnotum dark red.

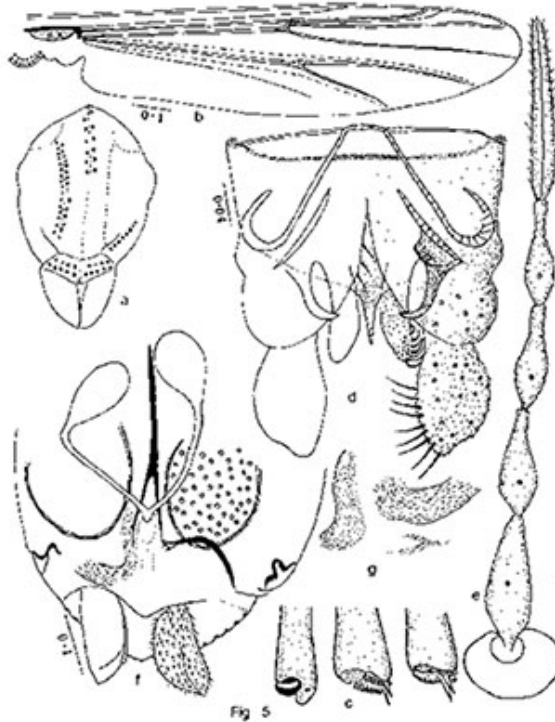
Wing light brown with brown conspicuous veins, brachiolum with 2 Scf, squamal fringe with 16 setae; r-m proximal to f-cu. Halteres dark brown. VR 1.08.

Legs reddish brown, fore tibial scale blunt.

Leg lengths and proportions:

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	BR
PI	25	22	36	15	13	11	6	1.64	1.23	no beard?
PII	29	26	17	7	6	5	4	0.65	1.12	
PIII	29	29	14	9	10	5	4	0.48	1.00	

Abdomen red to dark red. No setae shown on TIX.



Morphology of *C. fortistylus* Chuadhuri et al. 1992

Anal point well developed, narrowed down with subacute apex. Gonostyle short, stout and narrowed sharply at the tip, and bearing 9-10 setae at inner margin (Fig. 5d); SVo E-type of Strenzke (1959), closest to 'h'; IVo reaching beyond the end of the anal point to about a quarter of the gonostylus length, setae shown as simple.

Female:

Length 4.38 (3.36-5.5.41) mm; wing length 2.29 (2.25-2.55) mm long and 0.73 (0.69-0.75) mm wide.

Similar to male with usual sexual differences. Palps brown, segment ratios 2 : 2 : 12 : 13 : 20 ; P5/P4 1.54; P5/P3 1.67.

Antenna dark brown ratio of segment lengths: 37 : 25 : 26 : 27 : 43; from figure 5e, the proportion of narrowed tips of segments 2, 3, 4 are seg. 2 (0.38); seg. 3 (0.32); seg. 4 (0.38); A5/A1 1.33. AR 0.38.

Chaetotaxy not clear as reference is to Fig. 5f, which is the terminal segments.

Seminal capsule unequal, oval with or without a slight neck. Gonapophysis VIII divided into large elongated dorsomesal lobe and a broad quadrangular ventrolateral lobe; apodeme lobe bifurcated (fig. 5g). Tergite IX with about 40 setae, tergite X normal with about 20-30 setae.

Cerci shown as long and relatively narrow, dorsal edge coming almost to a point posteriorly and ventral surface curved, 20-22 setae.

Pupa and Larva: Not known.

Found: INDIA - **Type locality** – Darjeeling, West Bengal (Holotype (No. B.U.Ent. 70); Allotype female, same data; paratypes 23-27-IX-1977; Kurseong, and Jorbangla, West Bengal.

***Chironomus confectus* Das, Mazumdar & Hazra 2016**

Adult:

Male:

Length 5.52-6.32 mm, Wing length 2.48-2.76 mm; width 0.71-0.78 mm. AR 2.8-2.9. head yellowish brown, antenna brown. Thorax yellowish brown, antepnotum dark brown. Wing membrane brown with dark veins. Legs yellow. Abdomen brown with faint median spots on tergites II-IV.

FT 64-77 µm long and 38-50 µm wide. Cypeus 1.22-1.34 times the diameter of the antennal pedicel, with 22-24 setae. Palp segments 153-170 ; 42.5-51 ; 170-187 ; 153-170 ; 255-272.

Thoracic setae: 10-12 acrostichal; 10-12 dorsocentrals; 6-8 prealars; 16-18 biserial scutellar.

Wing with 2 setae on brachiolum, squama with 14-15 setae, VR 0.83-0.84.

Leg legs (micron) and proportions:

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	BV	SV	BR
PI	1120-1200	960-1000	1520-1560	720-760	640-700	560-600	280-320	1.56-1.58	1.58-1.62	2.82-2.87	3.50-3.52
PII	1200-1240	1000-1040	600-640	280-300	200-220	160-180	120-140	0.60-0.62	3.61-3.66	7.81-7.85	2.14-2.17
PIII	1280-1320	1240-1320	840-880	400-440	280-320	200-220	200-220	0.68-0.66	3.31-3.35	6.23-6.29	2.63-2.65

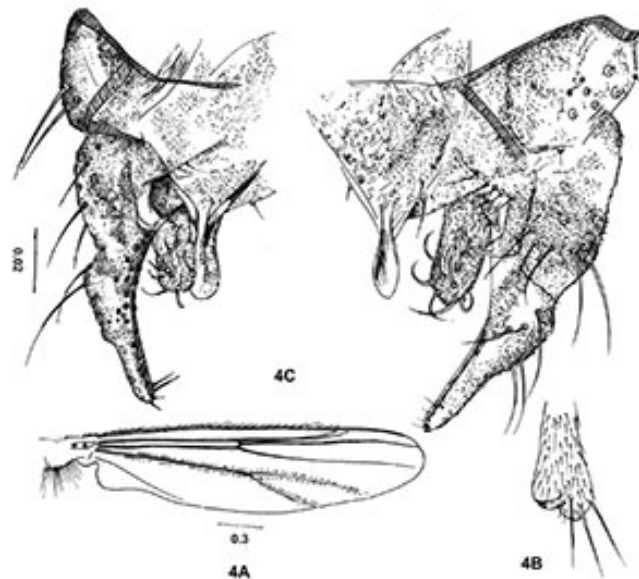


Figure 4A-C. *Chironomus confectus* sp. nov., male imago. A. Wing. B. Fore tibial scale. C. Hypopygium. Das et al. 2016

TIX with 10-12 setae apparently in individual spots. Anal point narrow at base. Gonostyle relatively swollen basally and narrowing markedly over distal half. SVo closest to S-type(d) of Strenzke (1959); IVo reaching about to end of anal point or basal third of the gonostyle.

Female – not described.

Pupa: (Males) Length 5.72-6.68 mm, wing sheath 1.15-1.17 mm long. Yellowish brown, exuviae grey. Cephalic tubercles 86-92 μm long and 43-53 μm wide at base; antennal sheath 1.04-1.08 mm long. Thorax rugose. Respiratory base not measured, but illustrated (4E, below) not constricted and with HR about 1.3.

Abdomen yellowish brown, shagreen pattern shown in figure 4F. Hook row of 44-48 hooklets, separated in mid-line. PSB on segment II (65-70 x 43-48 μm) and segment III, PSA on segment IV (73-78 x 65-70 μm). Caudolateral spur of segment VIII (4H, abovecycl) 138 μm long with 5 sharp spines, median one strongest. 104-108 taeniae on anal lobe.

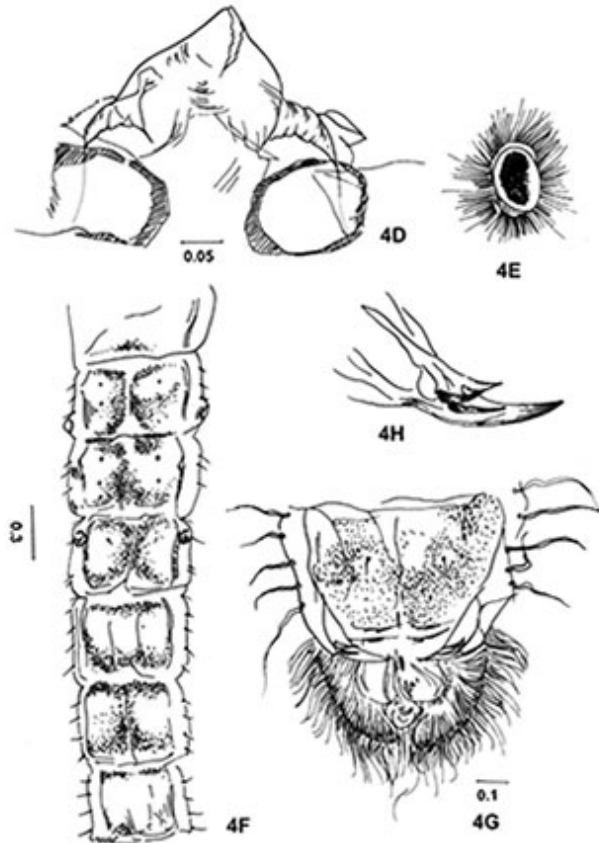


Figure 4D-H. *C. confusus* sp. nov., pupa. D. Cephalothorax. E. Basal ring. F. Abdomen. G. Anal lobe. H. Caudolateral spur. Das et al. 2016

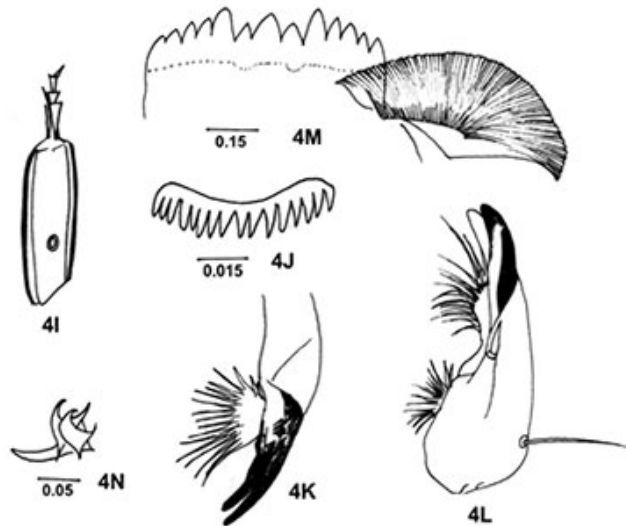


Figure 4I-N. *C. confectus* sp. nov., larva. I. Antenna. J. Pecten epipharyngis. K. Premandible. L. Mandible. M. Mentum. N. Claw. **Das et al. 2016**

Fourth instar larva: Length 7.72-8.60 mm. No details of head coloration or larval type given. Antenna with basal segment about 3.3 times longer than wide, RO about a third up from the base of the segment. Length of segments (micron): 77.4-81.7 ; 17.2-21.5 ; 8.6-12.9 ; 10.75-12.9 ; 4.3-6.45. AR 1.9-2.1.

Mentum with 15 teeth, of type I, center trifid tooth lower than lateral teeth, possibly type IIA. VM with serrated margin and slightly wider than the mentum, number of striae not recorded. Premandible dark brown with teeth narrow and coming to relatively sharp point (ty. A). PE with 12-16 teeth (ty. B).

Mandible 190-200 μm long with pale apical tooth, dorsal and inner teeth dark. PMa with about 13 taeniae, no mention of basal furrows.

Found: INDIA - **Type locality** – Bomdila (27.25°N, 92.04°E, 2217m a.s.l.), Arunchal Pradesh.

The authors note various components with similarity to a variety of species, but the apparently S-type SVo of Strenzke (1959) is rare in India and suggests a connection to the *C. flaviplumus*-group. However others characters raise a query as to whether this species belongs in *Chironomus* s.s.

***Chironomus glaucogaster* Kieffer 1912**

as new name for *Chironomus chlorogaster* Kieffer 1911 (junior homonym)

Adult

Male: Green. Head, antenna and thorax yellow brown, wings subhyaline. Abdomen twice as long as the rest of the body. LR abt 1.3. Length 2.5 mm

Female, pupa and larva not known.

Found: BURMA - **Type locality** – Mandalay

Sublette & Sublette (1973B) classed it as a nomen dubium.

***Chironomus fortibracchius* Das, Majumdar & Hazra, 2016**

The name derives from the strong claws of the legs.

Adult

Male: Total length 4.3-5.8 mm. Wing length 2.38-2.86 mm; width 0.52-0.63 mm., ratio of wing length and length of anterior femur 2.20-2.55. AR 3.16-3.18.

Head & antenna dark brown, thorax yellowish brown, wings light yellow; postnotum brown.

Frontal tubercles 52-59 µm long and 30-37 µm wide, i.e. 1.59-1.73 times longer than wide; Eyes bare, vertex with 18-22 setae. Clypeus 170-181 µm long and 102-112 µm wide, with 24-26 setae. Ratio of papal segments: 51-68 : 34-51 : 170-187 : 136-153 : 153-170; P5/P4 1.11-1.25; P5/P3 0.90-1.0. Antenna dark brown.

Thoracic setae: 8-10 acrostichals; 10-12 biserial dorsocentrals; 4-6 prealars; 14-16 scutellars.

2 Scf on brachiolum, 16-17 setae on squamal fringe; RM dark distal to FCu; VR 0.90-0.95.

Legs pale yellow and abdomen yellowish brown; tergites II-IV with median dark spots.

Leg lengths (µm) and proportions:

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	BV	SV	BR
PI	1080-1120	920-960	1680-1720	800-840	720-760	680-720	360-400	1.79-1.81	1.35-1.44	2.48-2.50	1.78-1.80
PII	960-1000	1000-1040	640-680	360-380	240-300	240-280	120-160	0.62-0.64	2.87-2.95	5.37-5.40	3.71-3.74
PIII	1160-1200	1240-1280	1000-1020	560-580	400-440	240-280	160-200	0.53-0.56	2.47-2.50	4.25-4.27	2.68-2.70

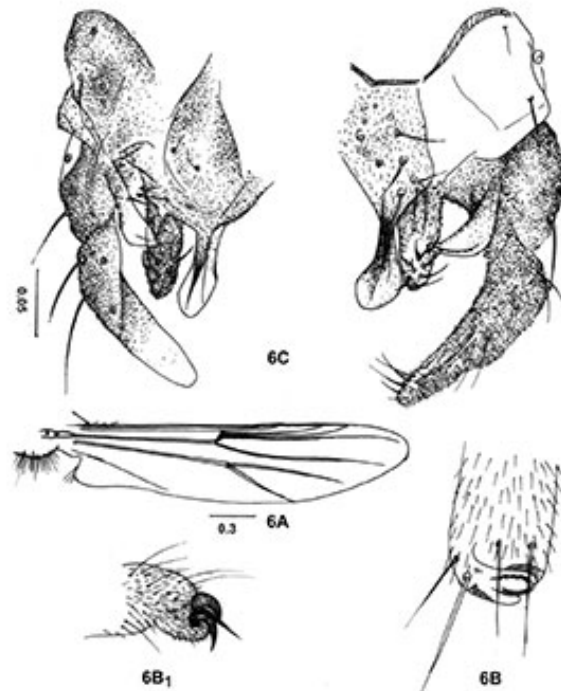


Figure 6A-C. *Chironomus fortibracchius* sp. nov., male imago. A. Wing. B. Free tibial scale. B₁. Claws of leg. C. Hypopygium.

Das et al. 2016

About 10 setae on TIX apparently in individual spots.
 Hypopygium with anal point narrow at base and widened (spoon-like) at tip. SVo S(a)-type of Strenzke (1959); IVo reaching almost to the end of the anal point and about 1/3 along the gonostylus, which is quite swollen and narrows relatively gently over distal third, with about 4 setae at the end.

Female: Not known.

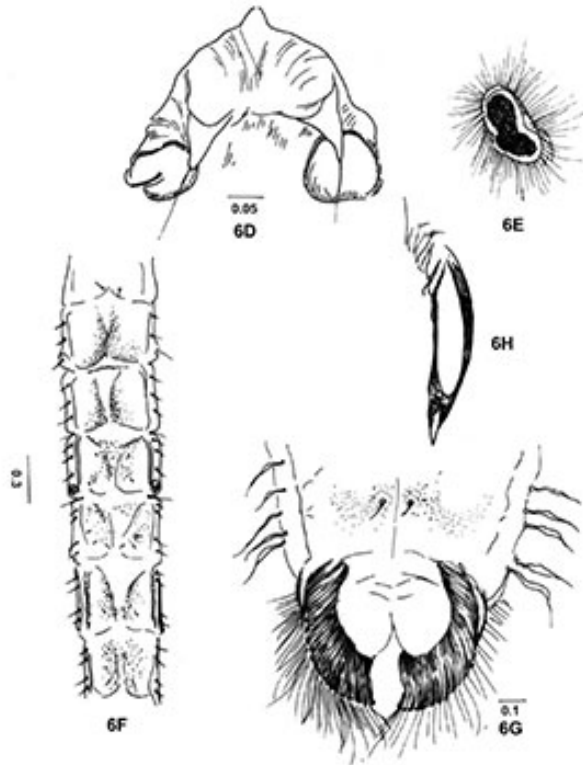


Figure 6D-H. *C. fortisvacillans* sp. nov., pupa. D. Cephalothorax. E. Basal ring. F. Abdomen. G. Anal lobe. H. Caudolateral spur. Das et al. 2016

Pupa: Total length 6.68-7.92 mm., wing sheath 1.47-1.49 mm long. Yellowish brown, exuviae grey. Cephalic tubercles 73-78 μm long and 71-74 μm wide at base; antennal sheath 714-731 μm long. Thorax rugose. Respiratory base not measured, but illustrated (6E, below) as constricted in the middle and with HR about 2.

Abdomen yellowish brown, shagreen pattern shown in figure 6F: tergite I bare, tergites II-IV with median shagreen, V little dark, VI with one small light median and 2 small patches of dark baso-median shagreen. Hook row of 68-74 hooklets, separated in mid-line. PSB on segment II (65-69 x 52-56 μm), PSA on segment IV (69-74 x 60-65 μm). Caudolateral spur of segment VIII (6H, below) 142-147 μm long with a sharp spine. 172-178 taeniae on anal lobe.

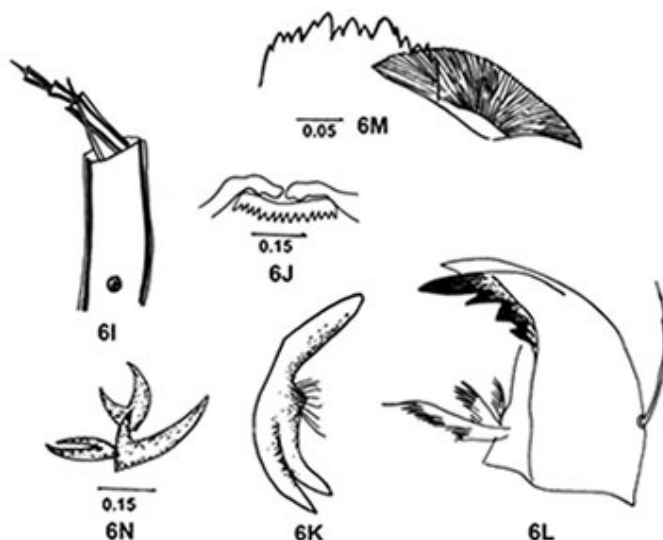


Figure 6I-N. *C. fortibracchius* sp. nov., larva. I. Antenna. J. Pecten epipharyngis. K. Pre-mandible. L. Mandible. M. Mentum. N. Claw. Das et al. 2016

Fourth instar larva: Total length 6.76-7.04 mm; deep red in colour. No details of head coloration or larval type given.

Antenna with basal segment about 3.3 times longer than wide, RO about a thrd up from the base of the segment. Length of segments (micron): 107.5-111.8 ; 34.4-38.7 ; 12.9-17.2 ; 8.6-10.75 ; 4.3-6.45. AR 1.78-1.80. RO about a third up from base of segment.

PE with 14-16 teeth, perhaps type A. Mentum of ty. 2 with center trifid tooth lower than lateral teeth, possibly type IIA.

Premandible with 2 relatively narrow teeth, possibly Ty. 1(?).

Mandible 111-115 µm long, of ty. IIIC; no information on PecM or basal striae, MTR about 0.3.

Ventral tubules 150-160 µm long, anal tubules 116-125 µm long.

Found: INDIA - **Type locality - Kalimpong** (27.06°N. 88.47°E, 1247 m a.s.l.) **West Bengal.**

Shows relationship to *C. fortistylus* in wing and venation pattern, but it might have some relationship to *C. bipunctus* which also occurs at high elevations.

***Chironomus hemicyclius* Das, Majumdar and Hazra 2016**

Adult:

Male (n=2):

Total length 4-74-4.92 mm. Wing length 2.4-2.7 mm; width 0.48-0.56 mm.

Colour: Head brownish black; palps yellowish brown; thorax yellow, antepnotum brown; postnotum brown. Wing pale, veins brown. Abdomen yellowish brown, TII-IV with median light brown spots; tarsi brown.

Thoracic setae: 12-14 acrostichal, biserial; 14-16 dorsocentrals, biserial; 3-6 prealars; 16-18 scutellars.

Wing: 1 Scf on brachiolum, 11-12 setae on squamal fringe. VR 0.98-0.99.

Leg lengths (micron) and proportions:

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	BV	SV	BR
PI	1080-1120	840-880	1520-1560	800-840	720-760	600-620	280-300	1.77-1.81	1.41-1.43	2.38-2.40	1.60-1.62

PII	1120-1160	960-1000	600-620	360-380	240-280	160-180	80-100	0.62-0.63	2.97-3.19	5.68-5.78	5.10-5.12
PIII	1200-1240	1200-1240	880-900	480-500	320-340	200-220	120-140	0.72-0.73	2.93-3.19	4.96-5.00	4.00-4.10

TIX shown with 7 setae and no indication of any pale area. Anal point short, apparently narrow at base; SVo probably D(e) type of Strenzke (1959); IVo longer than anal point (reaching about 1/3 of gonostylus length with 7-8 simple curved setae. Gonostylus only moderately swollen and narrowing gently over posterior half, 4+1 setae at tip.

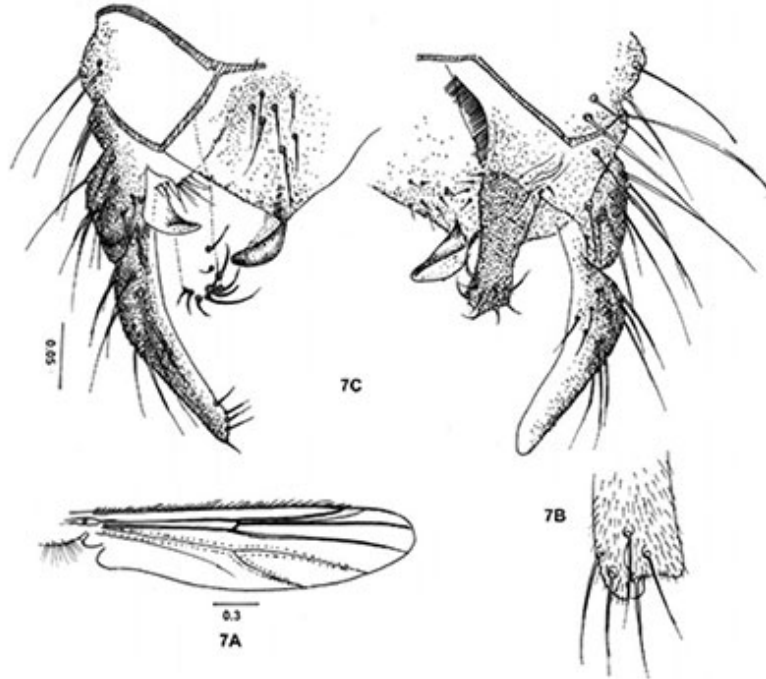


Figure 7A-C. Adult of *Chironomus hemicyclius* sp. nov., male imago. A. Wing. B. Fore tibial scale. C. Hypopygium. **Das et al. 2016**

Female: Not identified.

Pupa: (Males) Yellowish brown in colour, exuvia grey. Length 7.04-7.92 mm. Frontal apotome (Fig. 7D) triangular with subapical frontal setae 52-56 µm long. Funnel shaped CT 64-72 µm long and 30-34 µm wide at base, with 1 seta. Antennal sheath 765-795 µm long; wing sheath 1.40-1.48 mm long. Thoracic horn plumose, with elliptical ring at base (Fig. 7E), HR perhaps 1.9.

Tergite I bare, II-V with median shagreen, VI with two semicircular median basolateral shagreen, VII with subbasal and subcaudal light patches of shagreen, VIII with very faint mediolateral shagreen; segment II with basolateral PSB, segment IV with caudolateral PSA (62-69 x 50-56).

Hook row with 72-76 hooklets, stated to be divided but figure only shows it could be compressed anteriorly in midline as commonly occurs during mounting.

Caudolateral spur of segment VIII (Fig. 7H) long, with 3 appressed spines. Anal lobe (Fig. 7G) with 144-150 setae in rows.

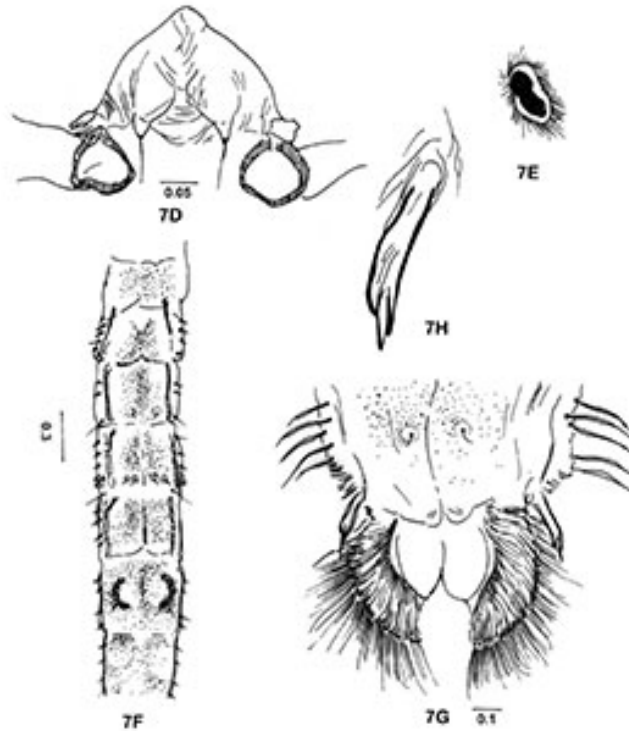


Figure 7D-H. *C. homicyclus* sp. nov., pupa. D. Cephalo-thorax. E. Basal ring. F. Abdomen. G. Anal lobe. H. Caudolateral spur. **Das et al. 2016**

Fourth instar larva: Length 8.3-8.9 mm. Deep red in colour. Larval type not clear – there is no mention of lateral projections, but while the length of the VT is given (150-162 μ m), it is not indicated whether they are straight or if posterior pair are coiled. AT 116-125 μ m long. Antenna (Fig. 7I) with long narrow basal segment, RO about a third up from base. Antennal proportions 52-55; 21.5-26 : 8.5-13 : 13-17 : 6.5-8.5. AR 1.04-1.06. PE (Fig. 7J) with 8-10 teeth (type B?). Premandible with 2 teeth, inner shown as only slightly wider than outer and coming to a relatively blunt point (possibly type B2). Mentum 107-some 115 μ m wide, possibly Ty I, but 4th lateral may be slightly reduced; central trifold tooth possibly Ty IIA. Width of Vm unclear as claimed to be only about 1/3 of the width of the mentum but illustration shows them to be about the same width; anterior margin serrated. Mandible 116-135 μ m long, of type IIIC; Pecmand with 12-14 taeniae.

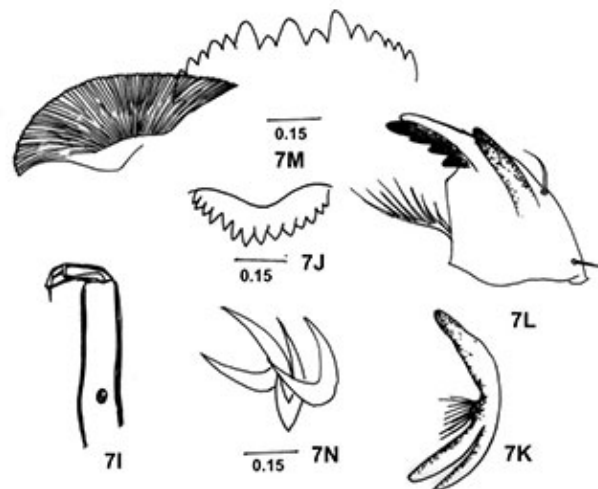


Figure 7I-N. *C. homicyclus* sp. nov., larva. I. Antenna. J. Pecten epipharyngis. K. Premandible. L. Mandible. M. Mentum. N. Claw. **Das et al. 2016**

Found: INDIA - Type locality – Kalimpong (27.04°N, 88.28°E 1247 m a.s.l.), West Bengal.

Noted as similar to *C. circumdatus* in some characteristics. However, some critical characters for identification are not provided.

***Chironomus lurilatus* Das, Majumdar & Hazra, 2016**

Adult

Male: Wing length 2.44-2.64 mm; width 0.68-0.76 mm. AR 2.59-2.81. Ratio of wing length and length of anterior femur 2.26-2.28.

Head brownish-yellow, antenna brown; eyes bare; vertex with 22-26 setae.

Frontal tubercles 71-81 x 39-45 µm, 1.8 times longer than wide.

Clypeus with 19-20 long setae; palp segments (1-5) 42.5-51 ; 51-68 ; 187-204 ; 153-161.5 ; 136-153; P5/P4 0.89-0.94; P5/P3 0.73-0.75.

Thorax yellow with light brown antepnotum and dark postnotum.

Setae: Acrostichals 12-13 in two irregular rows; dorsocentrals 15-16; prealar 9-10; scutellars 12-14, no information as to whether scattered or in rows.

Wing pale with brown veins, 2 Scf on brachiolum. 12-13 setae on squama.

Legs brownish yellow.

Lengths (µm) and proportions:

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	BV	SV	BR
PI	1120-1160	1000-1040	1560-1600	800-820	720-800	560-600	280-300	1.54-1.56	1.51-1.56	2.65-2.68	1.50-1.54
PII	1200-1240	1240-1280	880-820	440-500	320-360	200-240	120-160	0.71-0.72	2.73-3.07	5.04-5.55	2.11-2.14
PIII	1320-1360	1160-1200	840-880	440-480	360-400	240-280	120-140	0.72-0.73	2.65-2.86	5.33-6.64	2.78-2.81

Abdomen pale yellow, tergites II-IV with faint grey median spots.

TIX with 9-11 setae, possibly with 1 or 2 in a single paler area.

Anal point narrow at base and a bulb-like apex. SVo closest to D(e) type of Strenzke (1959). IVo reaching beyond the end of the anal point and almost to the beginning of the narrowing of the gonostylus. Gonostylus swollen and narrows markedly over about posterior third, with 4+1 setae at tip.

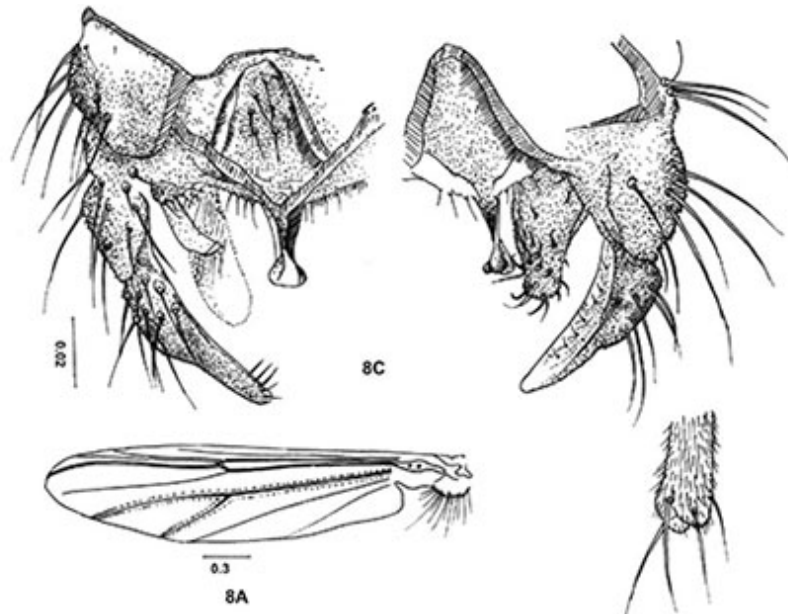


Figure 8A-C. *Chironomus lurilatus* sp. nov., male imago. A. Wing. B. Fore tibial scale. C. Hypopygium. **Das et al. 2016**

Female: Not described.

Pupa: Total length 6.48-6.52 mm. Frontal apotome (Fig. 8D) triangular with 2 subapical frontal setae. Cephalic tubercles cone shaped, 60-68 μm long and 21-24 μm wide at base. Thorax rugose. Wing sheath 1.36-1.44 mm long (measured from where?). HR about 2.4 (Fig. E).

Abdomen (Fig. 8F) yellowish brown, TI bare, II-VI with median shagreen, VII bare, VIII scattered shagreen. Caudo-lateral PSB on TII, PSA (60-69 x 76-81 μm) on TIV. Conjunctives III/IV and IV/V with a pair of short L-setae. Hook row, separated consisting of 46-48 hooklets. Caudolateral spur (Fig. 8H) with a trifid pointed apex. Anal lobe (Fig. 8G) with a fringe of 146-150 taeniae.

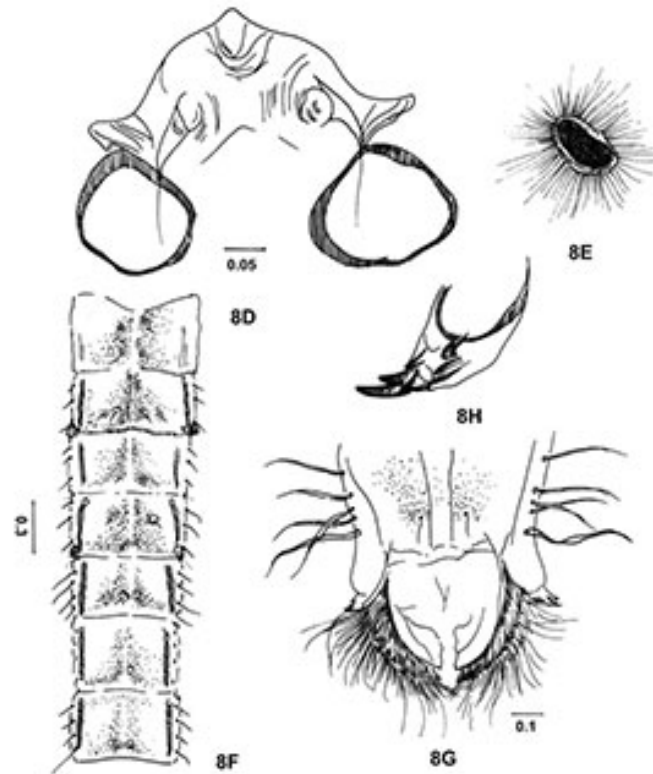


Figure 8D-H. *C. hirtana* sp. nov., pupa. D. CephaloCoxae. E. Basal ring. F. Abdomen. G. Anal lobe. H. Caudolateral spur. Das et al. 2016

Fourth instar larva: Total length 7.80-8.86 mm. Ventral tubules 1.28-1.48 mm, but not clarified that there are 2 pairs. Anal tubules 0.96-1.20 mm. No details of head coloration. PE (Fig. 8J) with 12-16 teeth. Mentum, 142-148 μm wide, illustrated as Ty. 1, central trifid tooth lowered and Ty. 4 (Fig. 8M), as in *C. vitellinus*. Ventromental plates 47-51 μm wide, with serrated margin, ICD 95-100 μm .

Premandible (Fig 8K) with 5 teeth, outer tooth shown as shorter than the other teeth.

Antenna (Fig 8I) with RO about one third up from base. Segment lengths 107.7-111.8 ; 25.8-30.1 ; 12.9-17.2 ; 8.6-12.9 ; 4.3-6.45; AR 1.69-2.08; blade not extended beyond flagellum.

Mandible 176-186 μm long, 1 pale dorsal, 1 dark apical and 3 distinct dark inner teeth.

Pecten mandibularis prominent, but not counted.

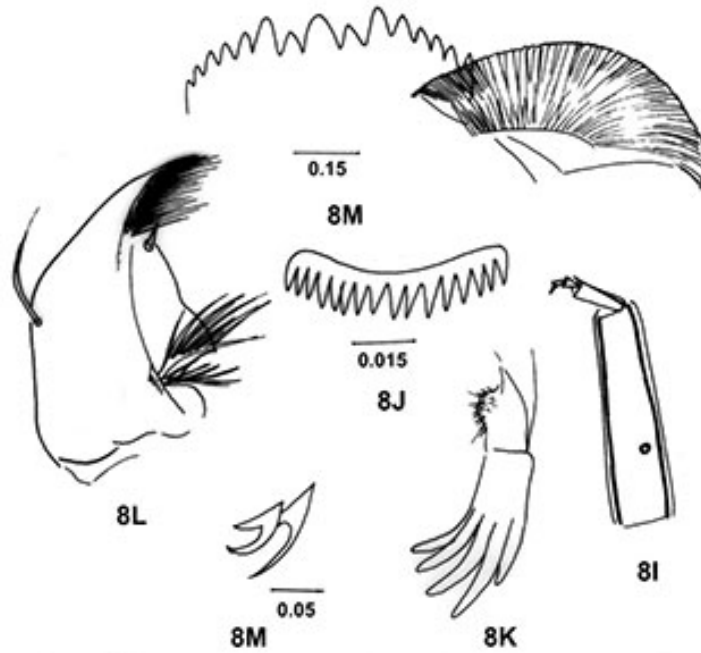


Figure 8I-N. *C. horilaris* sp. nov. I. Antenna. J. Pecten epipharyngis. K. Premandible. L. Mandible. M. Mentum. N. Claw.

Das et al. 2016

Found: INDIA - **Type locality** Pasighat (28.12°N, 95.55°E, 153 m a.s.l.) Arunachal Pradesh.

The relationships of this species are not clear, but it might have some relationship to *C. bipunctus* which also occurs at high elevations. Some characters suggest that it might not be *Chironomus* (s.s.), although others suggest it may be related to *C. vitellinus*.

***Chironomus claggi* Tokunaga 1964**

Syn: *Chironomus simantobeceus* Sasa, Suzuki and Sakai 1998 (Yamamoto & Yamamoto 2018)

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

Adult:

(based on Tokunaga (1964))

Large yellow, dark brown or brown species,

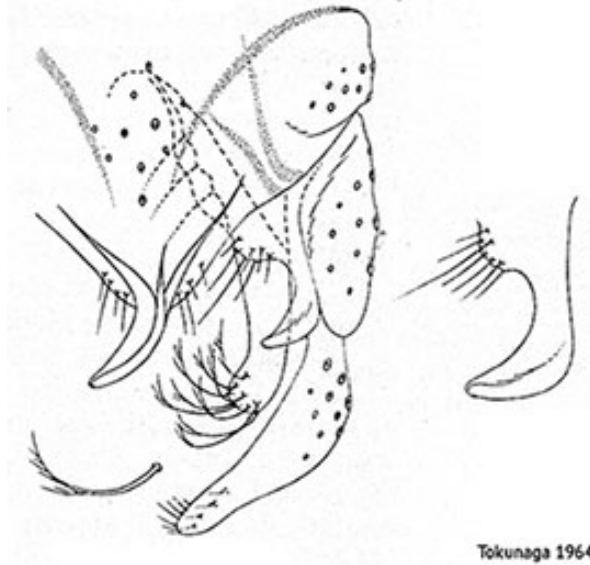
Male: Body length 5.33 (5.01-5.66) mm, Wing length 2.67-2.69 mm; width 0.68-0.72 mm., crossvein not darkened, VR about 1.

FT cylindrical about the length of 2 eye facets. Palps brown, segment lengths: 15.5 : 16.5 : 70.5 : 70.5 : 84; P5/P4 & P5/P3 1.19. AR 2.7 (2.5-2.85).

Thorax widely yellow, vittae entirely yellow, scutum white. 9-11 small setae in anterior row and 10-11 larger setae in posterior row (total 19-22) on scutellum.

Legs with coxae and trochanters usually yellow, all femurs mainly yellow but apically brownish, fore tibia mainly dark but other tibiae dark only on basal parts; fore tarsi entirely black or dark brown, other tarsal segments pale or yellowish brown on basal 1 or 2 segments but apical part black or more brownish on following segments; LR 1.7 (1.66-1.77); Fe1/Ti1 1.22.

Abdomen mainly very pale brown, but TII-VI with basal bands brown and broad, other segments uniformly brown. TIX with about 10 setae in a pale area.



SVo a boot shape closest to S-type of Strenzke (1959), similar to that of *C. indiaensis*. IVo long, to half way along gonostylus, setae bi- or trifurcate apically; gonostylus moderately swollen and reduces gradually over posterior third. Anal point narrowed at base.

Female:

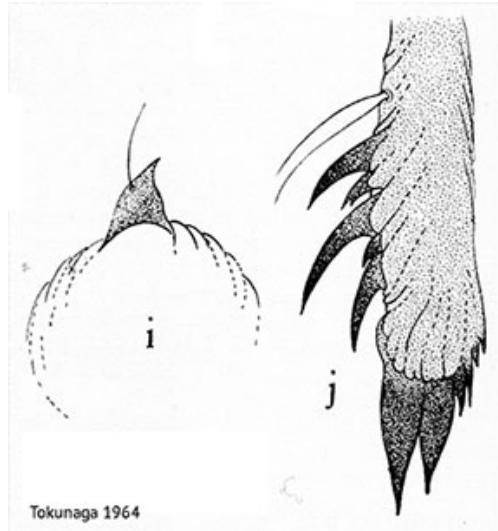
Wing length 3.04 mm, width 0.89 mm. LR about 1.81, PI F/T about 1.29. FT about 1.5 times as long as the diameter; palp proportions about 20 : 18 : 70.5 : 82.5 : 107 (P5/P4 about 1.30; P5/P3 about 1.52).

Scutal vittae entirely brown; scutellum with 12 setae along caudal margin and 7-10 smaller setae anteriorly (total 19-22).

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 IV 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.



Pupal cephalic tubercles and spur of *C. claggi* from Tokunaga 1964

Larva and Cytology: not known.

Found: MICRONESIA - Futami-ko; Camp Beach, Omura; Gen's beach, Minato-ko, Yatsue Region; all Chichi Jima. (Type localities)

JAPAN - Tokyo Metropolitan; Chicijima Is. and Hahajima Is., Bonin Isles, Tokyo; Shimanto River, Nakamura, Kochi Pref. (type locality of *C. shimantobeceus* (as '*simantobeceus*')) (all Yamamoto & Yamamoto 2018); and 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 fujiprimus* Sasa 1985**

Junior syn. of *Lipiniella moderata* Kalugina 1970 – Hirabayashi et al. 2007

Adult:

Male: Body length 6.84 (6.42-7.36) mm; wing length 3.43 (3.26-4.0) mm.; 27.7 (23-33) setae in squamal fringe.

Largely yellowish-green, scutum yellow, stripes yellowish brown, scutellum yellow, postnotum brown; abdominal tergites greenish-yellow except VIII and hypopygium which are brown. Wing unmarked r-m area dark; femur and tibia of all legs yellow, tarsi gradually darkening to dark brown.

Head: FT about 60 µm long and at least sometimes with a narrowed tip (Sasa calls it bottle shaped).

AR 3.57 (3.19-3.88); 27.4 (23-34) clypeal setae; palpal segments (2-5)(micron) 83 : 259 : 259 : 403; P5/P4 and P5/P3 - 1.56.

Thoracic setae: Acrostichal 2.2 (0-5) in Japan, absent in Korea; dorsocentral abt 18 (13-26); prealar 7.8 (6-10); scutellar roughly in two rows 31.6 (28-42).

LR1 1.45 (1.41-1.53) (1.30 in Korea); LR2 0.55 (0.54-0.57); LR3 0.60 (0.58-0.61); Ant Ta5/Ti 0.21 (0.20-0.22); BR2.2 (1.9-2.4).

TIX with about 9-10 setae, but not shown as in clear spots. Anal point conspicuously darker than rest of hypopygium, narrower at base. SVo closest to E(h)-type of Strenzke (1959); IVo reaching about to end of anal point or basal third of gonostylus, which is relatively narrow and hardly narrows at distal end (however Korean material is shown to have a moderately swollen gonostylus which narrows gently over posterior third).

Female: Body length 7.63 mm. Wing length 3.7-4.2 mm.

Coloration as in male. Kim (2012) notes that the antenna is pale orange, with segment lengths (μm) 93 (abt 0.3) : 61 (0.5) : 60 (0.5) : 62 (0.5) : 168. AR abt 0.26; A5/A1 about 1.81. FT bottle shaped. 45 Clypeal setae.

Thoracic setae: Acrostichals - 6; dorsocentral - 16; prealars - 8 or 10; scutellar - 28. LR1 1.43; LR2 0.55; LR3 0.59; BR1 1.8.

Cercus about 330 μm long and 300 μm deep; with curved outline and no basal bulge but Korean specimens shown with extended ventral border.

Pupa, Larva and Cytology: not known.

Some of the differences between the Japanese and Korean specimens suggest that these may be different, but closely related, species.

Found: JAPAN – shore of Lake Shoji, Mt. Fuji area (Type locality)

KOREA - Gyeonggi-do, Yoju-gun, Gumsa-myeon.

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.

Chironomus fujisecundus Sasa 1985

Adult:

Male:

Wing length 2.54 (2.60-2.76) mm; squamal fringe with 17 (14-20) setae. AR 3.23 (3.04 -3.40).

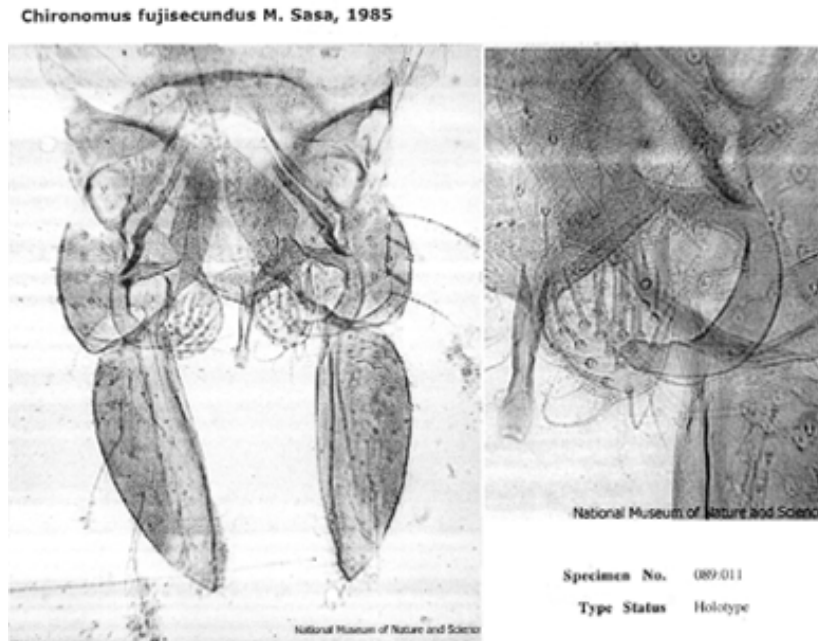
Coloration largely yellow or greenish yellow and partly brown; scutum yellow, stripes yellowish brown, scutellum yellow, postnotum brown; abdominal tergites entirely greenish yellow, hypopygium brown.

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 as in figure below; The figure shows some indication of setae in individual pale areas on tergite IX. Anal point long and narrow, slightly expanded at

the tip. SVo closest to E(i) type of Strenzke (1959); 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.

The details of the hypopygium suggest this may not be *Chironomus* (s.s.).

Female:

Wing length 2.86 mm. Coloration as male

Frontal tubercles 8 μ m long, 5 μ m wide; 25 clypeal setae.

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

LR1 1.35; LR2 0.54; LR3 0.61.

Pupa, Larva and Cytology: not known.

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

***C. daitoabeus* Sasa & Suzuki 2001**

Synonym of *Chironomus crassiforceps* - Todashi Kobayashi (personal information).
See under that species.

Found: JAPAN Type locality – Hyotan-ike, Minamidaito Island (abt.25°N, 131°E).

***C. daitobeceus* Sasa & Suzuki 2001**

Adult:

Male:

Body length 4.92 mm; Wing length 2.24 mm, WW/WL 0.30; AR 2.50; VR 1.10.
20 clypeal setae.

Palps short; 20 setae on clypeus. FT (2b) elongate, conical, 18 μm long x 15 μm wide at base.

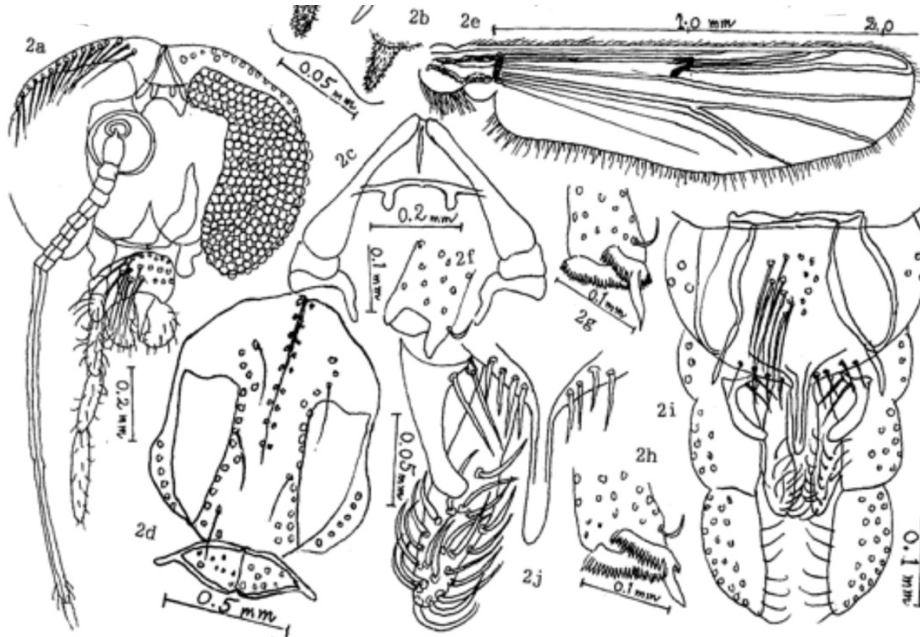
Antepnotum united and without setae. Thoracic stripes and postnotum brown, other scutal portions, scutellum and legs yellow; abdominal tergites brown, sternites yellow. Thoracic setae - Acrostichal 17; Dorsolateral 19, 19; Prealar 6, 6; Scutellar 18.

Ant.LR 1.39; mid.LR 0.66; hind. LR 0.75.

Abdominal tergites brown, sternites yellow. 14 setae on TIX. SVo an E-type of Strenzke (1959); IVo long and finger-like with simple setae.

Anal point long, narrow and nearly parallel-sided.

Gonostylus rather stout, widest at about the middle, with 7 setae along inner margin.



From Sasa & Suzuki 2001

Noted that resembles *C. kagaensis* and *C. fujiprimus* in some respects (Note that neither of these species is now considered to be in *Chironomus*).

Found: JAPAN Type locality –Hyotan-Ike, Minamidaito Island (abt.25°N, 131°E), Okinawa

***C. daitodecus* Sasa & Suzuki 2001**

Synonym of *C. javanus* (Yamamoto & Yamamoto 2018)
(Figure 3i clearly indicates that it is *C. vitellinus*) – see above.

Found: JAPAN Type locality –The Creek, Minamidaito Island (abt.25°N, 131°E), Okinawa

***C. daitodecus* Sasa & Suzuki 2001**

(Name also spelled “daitodeceus” in figures – more in line with other names)

Described on the basis of a single male.

Length 6.84 mm, wing length 2.64 mm. AR 2.37; VR 1.07; LR1 1.75; LR2 0.68; LR3 0.82; BR 2.3 (i.e. no beard).

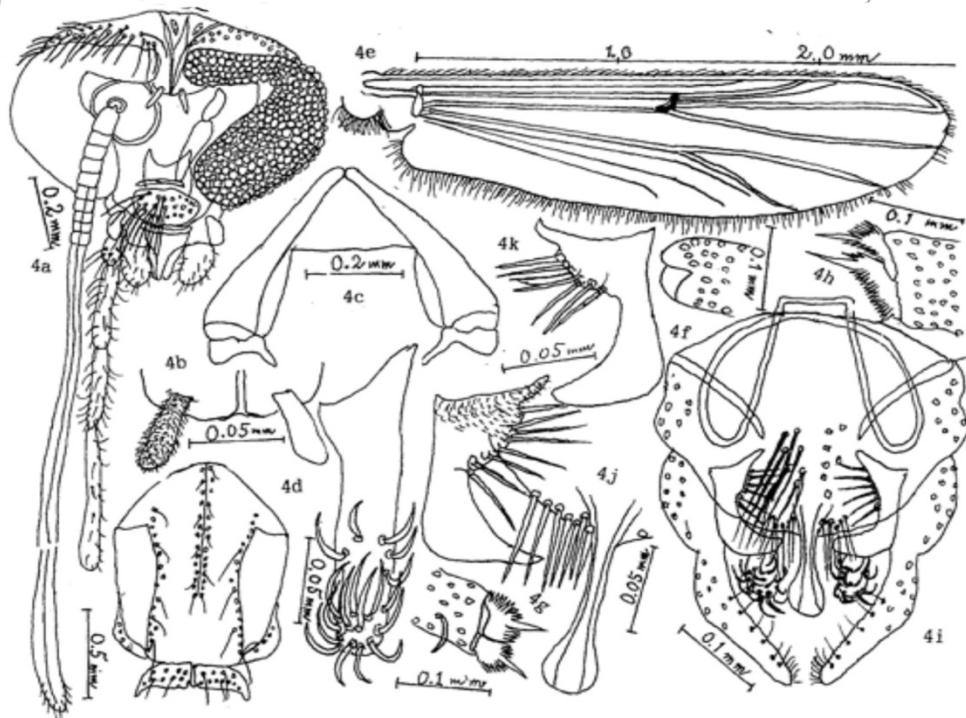
Frontal tubercles very large (fig. 4b), 46 μm long; Palps (fig. 4a) long; 30 clypeal setae.

Scutum yellow, stripes and postnotum brownish-yellow; legs largely yellow, abdominal tergites largely brownish yellow with posterior of segments I-V slightly paler.

Thoracic setae: 22 acrostichal; 20-22 dorsolateral; 4 prealar; 24 scutellar.

Abdominal tergites with large numbers of setae.

14 setae on TIX, shown in 2 slightly separated rows (fig. 4i); SVo closest to S-type of Strenzke (1959) but Fig. 4j shows a very sharp point; IVo about as long as the anal point, with simple setae; anal point constricted in middle and with lateral ridges; gonostylus only moderately swollen and narrows gently over posterior third.



C. daitodeceus adult male from Sasa & Suzuki 2001

Noted as being similar to *C. samoensis* which suggests it could be a member of the *C. flaviplumus*-group.

Found: JAPAN **Type locality:** –The Creek, Minamidaito Island (abt.25°N, 131°E), Okinawa

***C. daitoefeus* Sasa & Suzuki 2001**

Synonym of *C. circumdatus* or *C. yoshimatsui* - (Yamamoto & Yamamoto 2018)

Described on the basis of a single male.

Wing length 2.60 mm. AR 3.25; VR 1.03; LR1 1.62; LR2 0.67; LR3 0.81; BR 2.4 (i.e no beard).

Frontal tubercles very large, 40 μm long, 16 μm wide at base, i.e. 2.5 times longer than wide; Palps long; 28 clypeal setae;

Scutum yellow, stripes and postnotum largely dark brown but midline paler; legs largely yellow, abdominal tergites largely brownish yellow with posterior of segments I-V slightly paler.

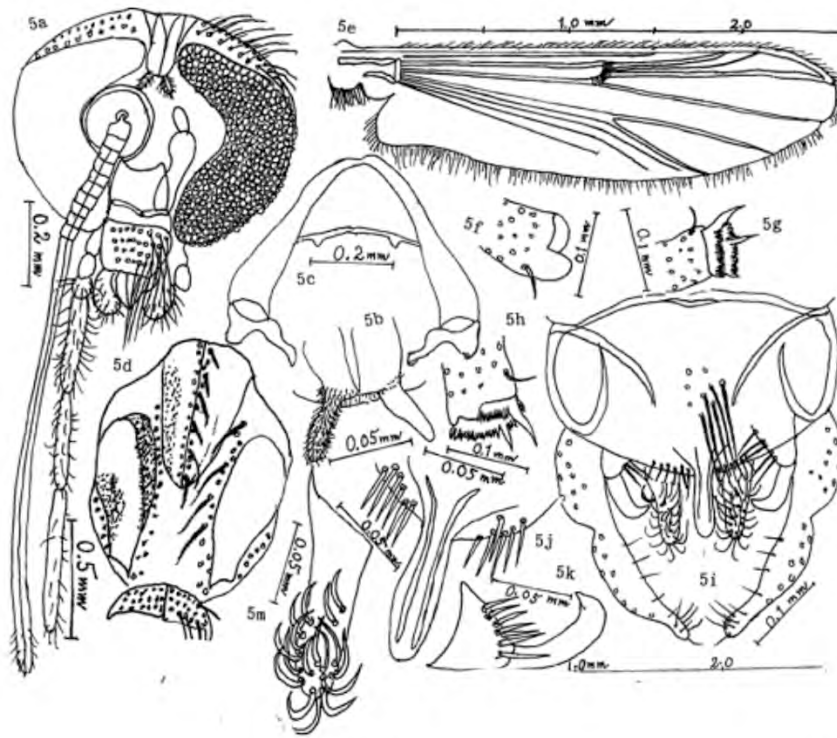
Thoracic setae 17 acrostichal; 21 dorsolateral, 6 prealar, 36 scutellar.

Wing membrane bare

9 setae in a central group on TIX;

SVo closest to E(h)-type of Strenzke (1958); IVo slightly longer than the anal point, with 16 simple setae; anal point slightly narrower at base; gonostylus only moderately swollen and narrows over posterior third with 5 preapical setae.

Noted as similar to *C. kiensis*, but wing noted as having the membrane bare.



C. daitoefeus adult male from Sasa & Suzuki 2001

Found: JAPAN. Type locality — Ouke, Minamidaito Island (abt.25°N, 131°E), Okinawa

Chironomus flavitibia Johannsen 1932

Type of genus *SYNTENDIPES* (Lenz 1937B)
as genus *CHIRONOMUS* (Sublette and Sublette 1973)

47. *Chironomus flavitibia* n. sp.

Male. Pale yellow species (perhaps greenish in life); shaft of flagellum except the basal segment, brown; legs pale, first and second tarsal segments of fore legs brown, third to fifth, white; tips of first and second segments and the whole of segments three to five of middle and hind tarsi pale brownish. Head with frontal tubercles; eyes narrowly separated; fourth palpal segment nearly as long as second and third combined; twelfth antennal segment slightly less than three times as long as segments 2–11 combined. Dististyles slender, tapering from the middle, with a few small, inwardly directed bristles at tip; inferior appendages more or less clavate with the usual curved bristles; superior appendages stout, bare, curved; spur of the ninth tergite projecting as far caudad as the inferior appendages (fig. 26). Proportions of segments of the fore leg are: 44 : 39 : 58 : 30 : 26 : 21 : 12. Middle and hind tibiae each with two spurs, combs as usual; empodium long; pulvilli large. Wings hyaline; costa not produced, ending about as far before the wing tip as the media does behind it; cubitus forks under the crossvein, the latter pale. Halteres pale. Squama with fringe of hairs. Length 5 mm.

Reared from a larva taken in a ditch at Buitenzorg, West Java, Sept. 26.

Original description by Johannsen

Adult:

Male: Length 5 mm.

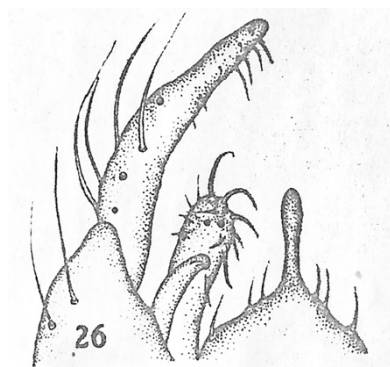
Pale yellow species (perhaps greenish in life). Legs pale, 1st & 2nd tarsal segments of fore legs brown, 3rd-5th white; middle and hind legs with tips of 1st & 2nd tarsi and whole of other tarsi pale brownish. Head with FT present; fourth palpal segment almost as long as second and third combined; AR almost 3.

Wings hyaline, squama fringed, costa not produced, ending about as far before the wing tip as the media does behind it. Cubitus forks under crossvein, the latter pale. Haltere pale.

Leg proportions and ratios (foreleg only)

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	BR
PI	44(?)	39	58	30	26	21	12	1.5	1.13	-

Gonostyle slender, tapering from the middle, shown with 4 setae at tip. IVo, shown with simple setae, almost to tip of anal point, which is narrow and slightly expanded at the tip. SVo closest to S(f) type of Strenzke (1959).



From Johannsen 1932

Found: INDONESIA. Type locality – Buitenzorg, Bogor, Indonesia (type in ZSM Munich)
Reared from a larva, but larva not described.

***Chironomus inaabeus* Sasa, Kitami & Suzuki 2001**

Syn. *C. nipodorsalis* (Yamamoto & Yamamoto 2018)
see under that species.

Found: JAPAN Type locality – Lake Inawashiro, Fukushima Prefecture, Honshu. [Holotype:
male, 401(2):008 (NSMT-I-Dip 5369)].

***Chironomus inabeceus* Sasa, Kitami & Suzuki 2001**

Not *Chironomus*. Synonym of *Glyptotendipes biwasecundus* (Yamamoto &
Yamamoto 2018)

Found: JAPAN Type locality – Lake Inawashiro, Fukushima Prefecture, Honshu [Holotype:
male, 401(2):090 (NSMT-I-Dip 5377)].

***Daitoyusurika daitofegea* Sasa & Suzuki 2001**

Synonym of *Chironomus crassiforceps* (Kobayashi & Endo 2008)
see also under that species.
Holotype: Male No. 412:17

Described as new genus on basis that the gonocoxite had 3 appendages, the dorsal one
finger-like and without setae, the median appendage small, half circular, clothed in
microtrichia and with 3 short setae, and the ventral one very long and bearing
numerous short setae along the entire length of inner margin, and anal point apically
expanded.

No long setae in mid portion of TIX.

Noted specimen No. 412.83 was unusually small.

Found: JAPAN Type locality: - Ouke & Minamidaito Island (abt.25°N, 131°E), Okinawa
Hyotan-ike, Minamidaito Island, Minamidaito Island, Okinawa.

***Chironomus incertus* Kieffer 1924**

Originally described in genus *Camptochironomus*.

Secondary homonym of *C. incertus* Walker 1856, [so no change required](#).

Could it be a synonym of *C. nudipes* Kieffer 1919?

There is also *Chironomus incertus* Becher 1886, but this is a possible synonym of
Smittia extrema (Holmgren) or a nomen dubium in *Chironomus*.

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 and 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.

Not illustrated.

Found: INDONESIA Type locality – Buitenzorg, Java.

The description is not illustrated, and it does not seem to have been collected since.

***Chironomus indiaensis* Martin 2011**

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

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

Adult:

Male: Wing length 2.53-2.58 mm, wing width 0.73-0.76, VR 1.02; 3 Scf on stem vein, numerous setae on squamal fringe. AR 2.99.

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

Head: FT present, abt 180 µm; abt 23-25 clypeal setae

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

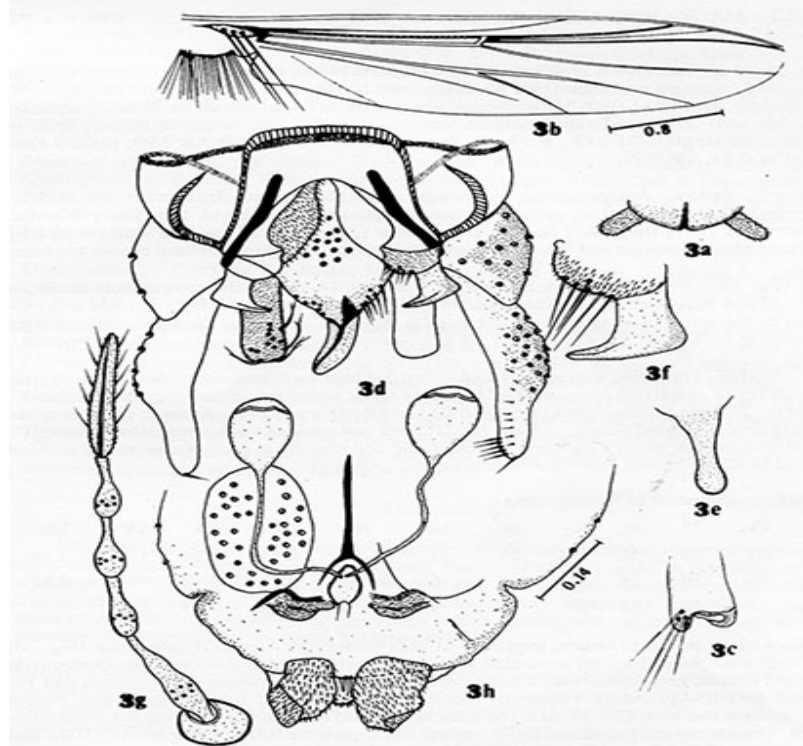
Thorax: Setae - Acrostichal 14; dorsocentral 11-12; prealar 6; scutellar in two or three rows, ant. row 9-10 small setae, post. rows 10-12 long setae (total 19-22).

Leg proportions (arbitrary units):

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	BR
PI	42	39	55	30	26	23	11	1.41	1.08	2.44
PII	45	38	24	13	8	6	4	0.63	1.18	
PIII	49	50	35	20	15	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 reaching about to end of anal point. Gonostylus markedly swollen and narrowing sharply over distal third.



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

Differs from *C. samoensis* where the FT are longer (33-38 micron); the LR is greater (1.82-1.96); and the fore Ta5 is relatively longer (0.35-0.40 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. Necks of segments 2-4 about half of segment length; A5/A1 1.15.

Cercus shown as having an almost square antero-dorsal corner with a short dorsal edge, going into a more rounded posterior margin and a rounded ventral margin, len/wth about equal.

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. Cephalic 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 340 µm 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: INDIA. **Type locality:**– Berhampur, Farakka, Burdwan, West Bengal.

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

***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: 112 : 96 : 128 : 169 : 192; P5/P4 1.14; P5/P3 1.5.

Clypeus with 6-8 setae.

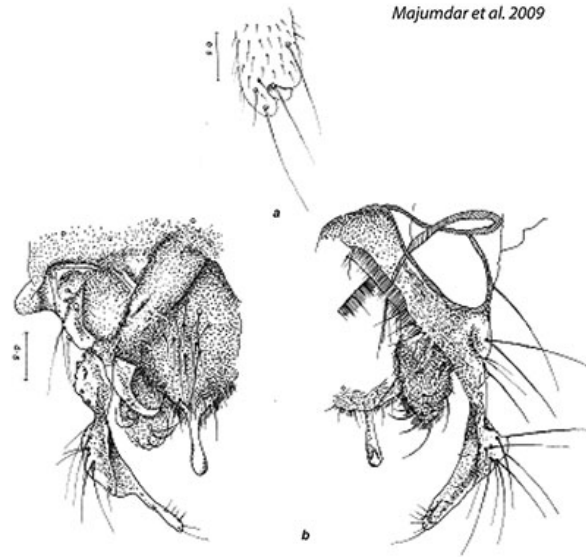
Thorax yellow. Setae: acrostichal 10-12; dorsocentral 12-14 uniserial; prealar 4-6, scutellar 18-20 biserial. Postnotum pale.

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):

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



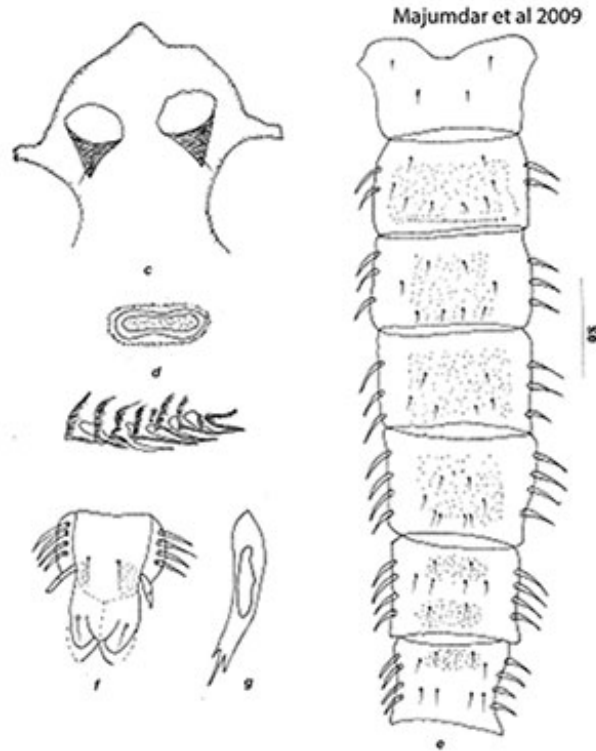
Abdomen greenish with dark median spots on tergites II-V, tergite IX triangular with about 10 median setae.

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 (listed as unknown, although mating and egg laying was observed).

Pupa: Length 7.2 mm. Cephalothorax with conical cephalic tubercles bearing a subapical seta 40 μ m 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 VII 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 on long base with 3 spines, the medial one elongated. Anal lobe with 80-100 taeniae.

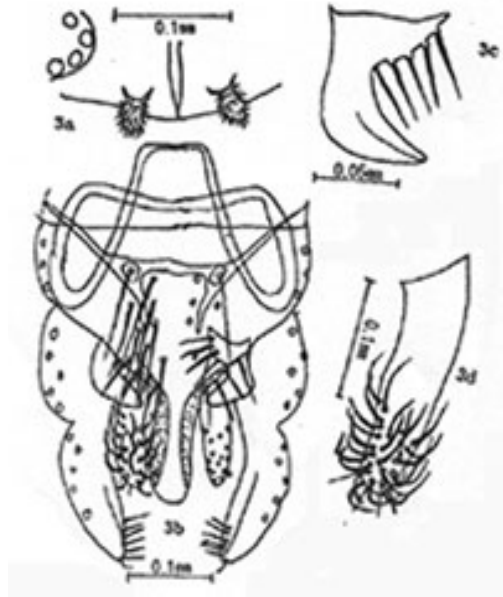


Fourth instar larva: Small (5.2 mm) plumosus- type.

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. MTR about 0.39



Frontal tubercle and male hypopygium of *C. mongolcedeus* (Sasa & Suzuki 1997)

Female: not known.

Pupa, Larva and Cytology: not known.

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

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

This name is spelled two different ways in the publication:

mongoldeeus – at beginning of description (p. 154)

mongoldccus – in Fig. 4 (p. 153)

These are obviously typographical errors, probably due to the small-size font used (a magnifying glass had to be used to clarify how the names had actually been spelled)

The spelling used here is clearly the intended spelling - consistent with the naming of the other *Chironomus* species in the publication.

Adults

Males

Body length 8.52 (7.28-11.12) mm; wing length 3.86 (3.38-4.81), both highly variable; WL/WW 028 (0.27-0.29) mm; R-M area dark; AR 4.35 (3.98-4.75); VR 1.05 (1.03-1.07) or 0.95 (0.93-0.97). Ground color of scutum and scutellum yellow, stripes brown and postnotum dark brown; legs almost uniformly yellowish-brown. Abdominal tergites II-VIII each with a large central brown oval area with yellow zones along the lateral and posterior margins (Fig. 4b).

FT widest at about middle and spindle-shaped, 22 x 12 μm. ER of eyes 0.09-0.29. AR 4.08 (3.48-5.00).

Wings bare, membrane slightly bluish, crossvein darkly pigmented, VR 1.03 (1.01-1.034).

Thoracic setae: 22.5 (17-28) acrostichal; 34.6 (26-51) dorsocentral; 7.1 (6-8) prealar; 33.3 (18-46) scutellar, all highly variable.

SVo of the E-type of Strenzke (1959); anal point stout, widest at base; IVo long, straight, widest at base and tapering towards rounded apex; gonostylus moderately swollen and narrowing markedly over posterior third.
 Leg ratios: fLR 1.44 (1.32-1.49), mLR 0.60 (0.56-0.62), hLR 0.74 (0.70-0.77). BR highly variable 3.1 (1.9-5.0) (i.e. only some specimens have a tarsal beard).
 TIX illustrated with 9 setae, apparently in a single pale spot. SVo long, darkly pigmented, closest to E(g) of Strenzke (1959), IVo reaching about to end of the stout anal point which is widest at the base; Gonostylus moderately swollen and abruptly constricted over distal third, 6 setae at tip.



Frontal tubercles, abdomen & hypopygium of *C. mongoldecus* (Sasa & Suzuki 1997)

Female: Not known.

Pupa, Larva and Cytology: Not known

Found: MONGOLIA - Type locality: Karakorum. Holotype No. 308:52.

Specimens quite variable for most measurements but can be differentiated from other species in the peculiar coloration of abdominal tergites and the particular shape of the parts of the hypopygium.

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

Adults

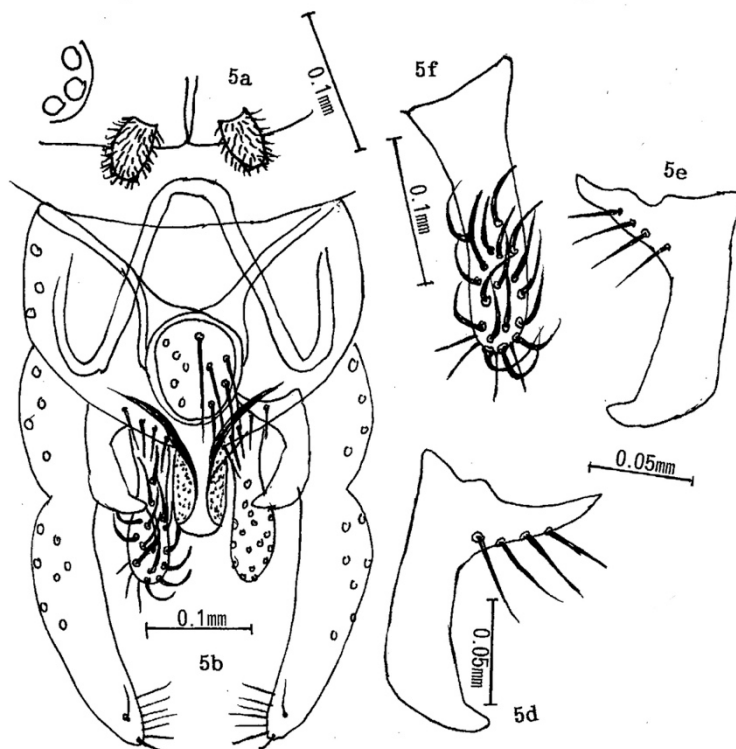
Males

Body length 7.52 (7.32-7.64) mm; wing length 3.37 (3.35-3.40), wing length/width 0.27-0.29 mm. cross vein darkly pigmented, squamal fringe 26, VR 1.01 (0.99-1.03). Ground color of scutum yellow, vittae largely dark brown, margins black; scutellum yellow; postnotum black. Femora largely yellow with distal portion brown; tibiae brown over basal 1/3 and distal portion but yellow in middle; tarsi I yellow for basal half, then brown; other tarsal segments brown. Abdominal tergites largely brown, II-VIII with a yellow band along caudal margin.

Head: FT prominent (below). AR 3.73 (3.61-3.94). Clypeal setae 32.5 (20-40).

Thoracic setae: Acrostichal 14-18; Dorsocentral 22-34; Prealar 6-9; Scutellar 25-34.

LR1 1.37-1.48; LR2 0.53-0.55; LR3 0.70-0.71. BR1 1.4-2.1 (i.e. no tarsal beard); BR2 1.8-5.3; BR3 1.8-4.0.



Antennae and male terminalia of *C. mongolefeus* (Sasa & Suzuki 1997)

About 10 setae in an obvious area on TIX. SVo closest to the D-type (f) of Strenzke (1959); IVo widest at base and narrowed about a third up from the base before widening again; reaching beyond the end of the anal point to about 1/3 along the gonostylus; setae shown as simple. Anal point very stout and sickle shaped in lateral view. Gonostylus referred to as slender but is illustrated as moderately swollen, and narrowing evenly to the tip; 7+1 setae at tip.

Female: Not known.

Pupa, Larva and Cytology: Not known

Somewhat related in the shape of the anal point to *C. anthracinus* Zetterstedt and some Japanese species, but differs in the shape of the SVo and gonostylus.

Found: MONGOLIA - Type locality: Karakorum. (Holotype No. 308:58)

***Chironomus mongolfegeus* Sasa & Suzuki 1997**

Adults

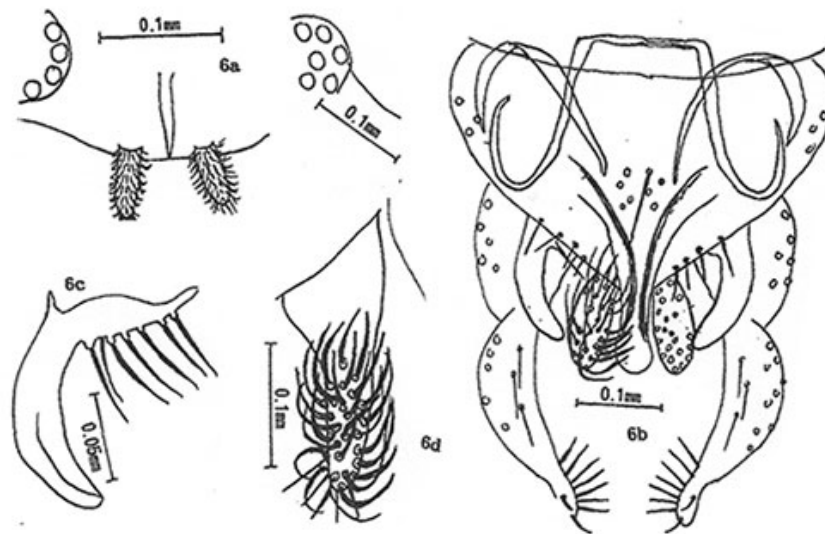
Males:

Wing length 3.35-3.40 mm; width 0.27-0.29 mm. Cross vein darkly pigmented, squamal fringe 26 setae.

Ground color of scutum yellow, vittae largely dark brown, margins black; scutellum yellow; postnotum black. Femora largely yellow with distal portion brown; tibiae brown over basal 1/3 and distal portion but yellow in middle; tarsi I yellow for basal half, then brown; other tarsal segments brown. Abdominal tergites largely brown, II-VIII with a yellow band along caudal margin.

Head: FT prominent (below). AR 3.61-3.94. Clypeal setae 20-40.

Thoracic setae: Acrostichal 14-18; Dorsocentral 22-34; Prealar 6-9; Scutellar 25-34. LR1 1.37-1.48; LR2 0.53-0.55; LR3 0.70-0.71. BR1 1.4-2.1; BR2 1.8-5.3; BR3 1.8-4.0.



Frontal tubercles and hypopygium of *C. mongolfegeus* (Sasa & Suzuki 1997)

TIX shown with 8 medial setae. Anal point stout, widest at base and slightly constricted in the middle; SVo closest to E-type of Strenzke (1959); IVo with recurved setae (shown as simple) over distal half, reaching just to end of anal point; gonostylus moderately swollen and narrowing markedly at tip; with 7+1 setae at end.

Female: Not known.

Pupa, Larva and Cytology: not known.

Somewhat related to *C. salinarius* and *C. mongolgeheus* (De Geer) (i.e. *C. plumosus*), but differs in details of the hypopygium.

Found: MONGOLIA - Type locality: Karakorum.

***Chironomus mongolgeheus* Sasa & Suzuki 1997**

Adults

Males

Body color largely brown. Ground color of scutum yellow, vittae and postnotum brown; scutellum yellow. Femora and tibiae uniformly yellow but yellow in middle; tarsi I - III largely yellow with an apical dark ring; IV yellow on basal half and brown distal half; V brown. Abdominal tergites almost uniformly brownish yellow.

Head: FT prominent (below)(68x28 μm); palps relatively short. AR 4.74 (4.45-5.41).

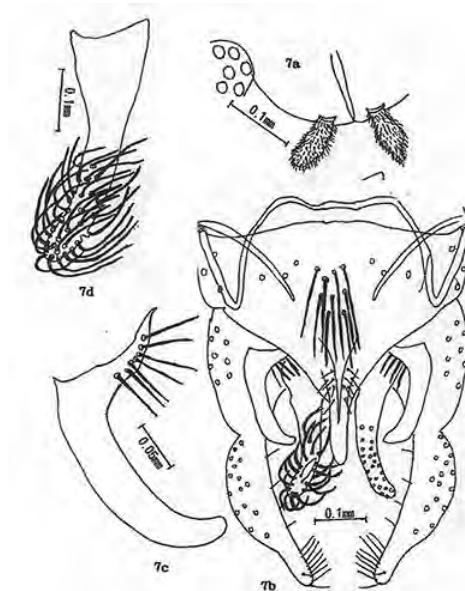
VR 1.08 (1.05-1.11) or 0.92 (0.89-0.95). Clypeal setae 41.8 (36-50).

Thoracic setae: Acrostichal 20.7 (18-24); dorsolateral 40.3 (36-42); prealar 6.8 (5-8); scutellar 41.2 (36-44). 14-28 setae in squamal fringe.

Body length 10.35 (9.96-11.12) mm; wing length 4.87 (4.80-5.02) mm.; AR 4.74 (4.45-5.41);

Anterior legs with beard, BR 5.8 (4.3-7.3);

fLR 1.32 (1.26-1.37) (relatively low); mLR 0.58 (0.57-0.59); hLR 0.70 (0.68-0.71).



Antenna and terminalia of *C. mongolgeheus* (Sasa & Suzuki 1997)

TIX with about 9 medial setae.

Anal point long and narrow, slightly constricted in the middle and darkened; SVo of the E-type of Strenzke (1959); IVo reaching about to middle of the gonostylus, setae apparently simple; gonostylus only moderately broad, and narrowing markedly over posterior quarter, 8+1 setae at tip.

Female: Not known.

Pupa, Larva and Cytology: not known.

Somewhat similar to *C. fujiprimus* Sasa (now considered to be *Lipiniella*), and *C. annularius* (De Geer)(i.e. *C. plumosus*) but differs in details of the hypopygium and lack of tarsal beard.

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

***Chironomus mongolheius* Sasa & Suzuki 1997**

Adults

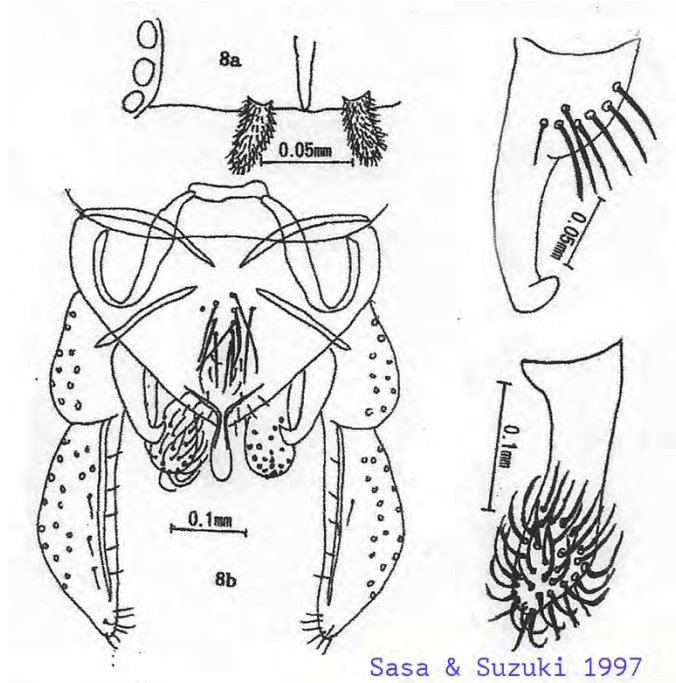
Males

Body length 8.32 (6.28-9.86) mm; wing length 3.63 (2.88-4.22) mm, WW/WL 0.27 (0.26-0.28), R-M area dark; AR 4.35 (3.98-4.75); VR 1.05 (1.03-1.07) or 0.95 (0.93-0.97).

FT prominent, 38 x 11 (3.45 μ m longer than wide). Eyes bare, ER 0.23 (0.13-0.29); palp relatively short.

Ground color of scutum and scutellum yellow, vittae brown-dark brown, postnotum dark brown, leg segments almost uniformly brownish-yellow, with TaV darker, and without dark rings. Abdominal tergites almost uniformly brown, but Tergites VII and VIII with pale area along caudal margin.

fLR 1.37 (1.25-1.46); mLR 0.54 (0.49-0.57); hLR 0.65 (0.62-0.68). BR 5.3 (3.3-7.8) i.e. tarsal beard present.



TIX shown with about 17 setae. SVo of the E-type of Strenzke (1959). IVo about to end of anal point. Anal point relatively short, narrow and constricted at base; gonostylus swollen, smoothly rounded and reducing evenly over post third..

Female: Not known.

Pupa, Larva and Cytology: not known.

Noted as somewhat similar to *C. plumosus* (Linnaeus) but not as large and gonostylus much more swollen.

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

***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, FT 50 x 21 µm; palpal proportions (segs 2-5; micron) 110 : 310 : 350 : 540; P5/P4 1.54, P5/P3 1.74.

Leg lengths and proportions:

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	BR
PI	2050	1850	2830	1390	1020	930	460	1.53	1.11	2.1
PII	2220	2240	1170	950	490	320	240	0.52	0.99	
PIII	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 of IVo 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: FT 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; P5/P4 1.54, P5/P3 1.74.

Leg lengths (micron)and proportions:

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	Ta4/Ti
PI	1630	1510	2440	1270	970	890	400	1.61	1.08	0.59

PII	1810	1730	1000	590	420	250	170	0.58	1.05	
PIII	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).

Fourth instar larva: The larva is called a plumosus-type, but Sasa's illustration suggests it could be a melanotus-type. The TLt 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 (RUSSIAN) - Sakhalin Island, Sikuka, Karahuto, (Type locality);

JAPAN: Tsuchiura, nr. Lake Kaiwaguchi & Shinano River, 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 fujitertius* Sasa 1985**

Placed as synonym of *C. nipponensis* (misidentification) (see below).

Valid name for the "Lowland form" of *C. nipponensis* e.g. Hashimoto 1977, Sasa 1985, Yamamoto 1988 and 2010; Yamamoto *et al.* 2019.

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

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

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

Male

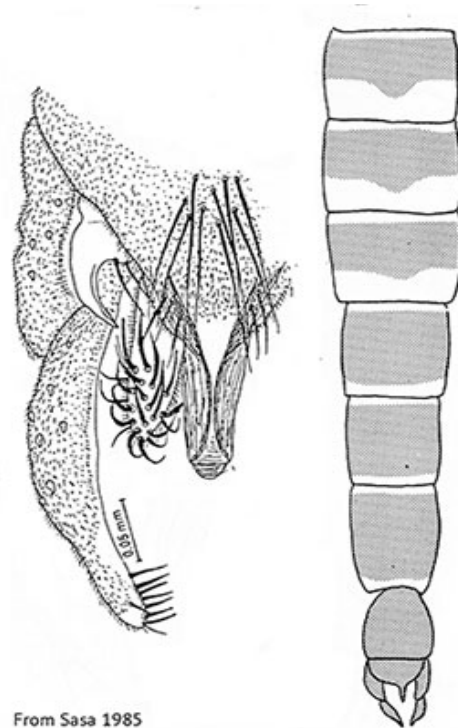
Wing length 2.25-4.84 mm; VR abt 1-1.09; 32-40 setae in squamal fringe.; AR 3.31 (3.19-3.51); VR abt 1; LR 1.79 (1.67-1.81).

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; FT abt 26 µm long and 11 µm wide. 22-56 clypeal setae.

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

Legs: LR1 1.43-1.81; BR 2.9 (2.6-3.4); LR2 0.58-0.62; LR3 0.70-0.80



Ninth tergite with about 9 long central setae, shown as 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 moderately swollen, narrowing relatively sharply over posterior third; about 7+1 setae at tip.

Female: not described

Pupa, Larva and Cytology: not described

Found: JAPAN - Type locality –Japan: Lake Kawaguchi (35.59°N, 136.79°E) and Lake Motosu (35.77°N, 138.88°E) Yamanashi Prefecture; Kechi Dam (Holotype *C. tsusimaabeus*) & Nita Dam (Paratypes *C. tsusimaabeus*), 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 acutus* Das, Majumdar and Hazra 2016**

Junior homonym of *C. acutus* Goetghebuer 1928 - New name required.

Adult:

Male:

Total length 4.52-4.70 mm. Wing length 2.08-2.50 mm, width 0.64-0.76 mm, VR 1.12-1.14 (0.96-0.98).

Head light brown, palps brown; antepnotum light brown, postnotum dark brown, legs and abdomen pale yellow; Vertex with 20-22 setae (IV 6-8, OV 6-9, Po 7-8). FT 82-90 long and 34-40 wide (i.e about 2.4 times longer than wide). Clypeus 170-180 x 136-140 μm , with 18-20 setae. AR 2.95-3.02. Palpal segments (μm) 68-85; 34-51; 187-204; 170-187; 255-272; P5/P4 abt 1.45-1.5; P5/P3 abt 1.33-1.36.

Thoracic setae: 10-12 acrostichal; 12-14 dorsocentrals; 6-8 prealars; 16-18 biserial scutellars.

Wing: light yellow with brown veins. 2 Scf on brachiolum, squama with 16-18 setae. VR 1.12-1.14.

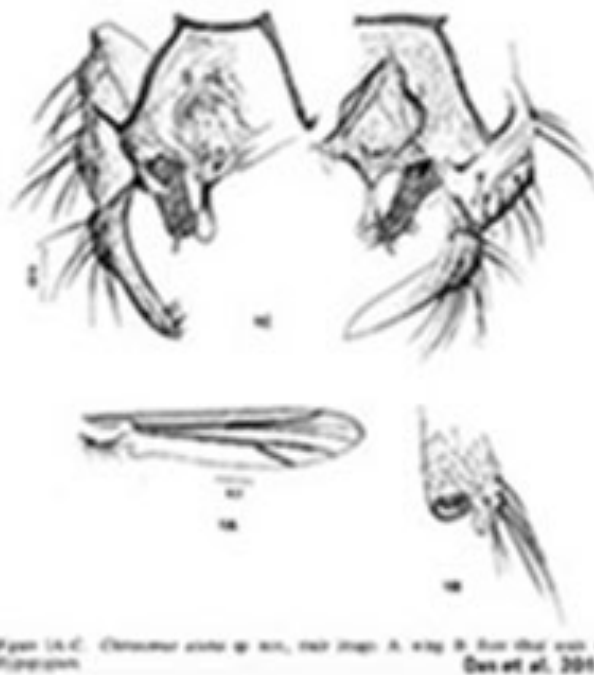
Legs pale yellow.

Table 1. Lengths (μm) and proportions of leg segments.

	Fe	Ti	ta ₁	ta ₂	ta ₃	ta ₄	ta ₅	LR	BV	SV	BR
Fore	1120-1160	960-1000	1560-1640	840-920	760-800	640-680	320-360	1.59-1.62	1.39-1.42	2.45-2.48	2.62-2.65
Mid	1080-1120	960-1000	640-720	320-360	200-280	160-220	120-160	0.64-0.67	3.31-3.35	6.38-6.41	4.20-4.23
Hind	1000-1040	1200-1260	880-920	480-520	320-360	240-320	120-160	0.69-0.73	2.61-2.66	4.53-4.58	2.63-2.67

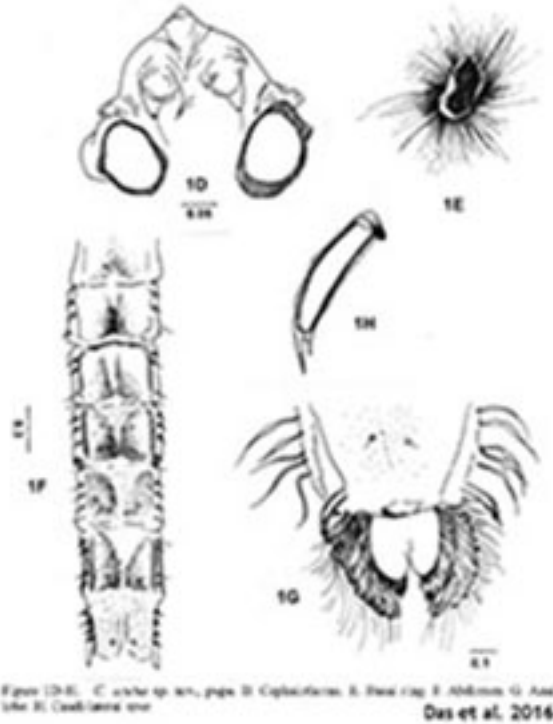
Foretarsi without beard.

Abdomen pale yellow, TII-IV with faint spots, TIX with 15-17 setae, some possibly in pale areas. Anal point blunt and bulb-like (shown narrow at base); SVo D(e) type of Strenzke (1959). IVo reaching about to end of the anal point and 1/3 length of the gonostylus, with 10-12 incurved setae near apex; gonostylus only moderately swollen and narrowing markedly from about midpoint..

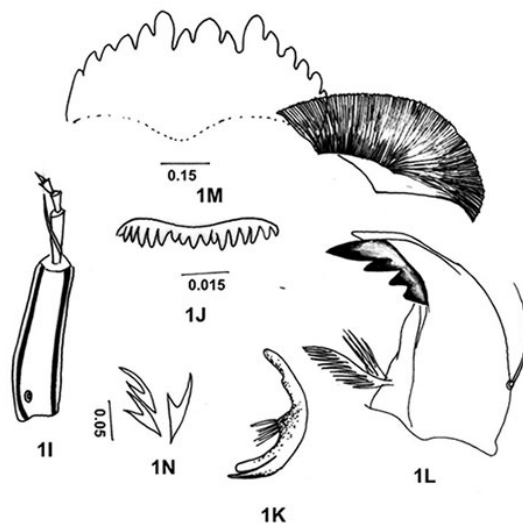


Female not described.

Pupa: Length 5.56-6.92 mm.; wing sheath 1.36-1.44 mm long. Yellowish, exuviae grey. Frontal apotome triangular with subapical frontal setae 30-38 μ m long. Cephalic tubercles cone-shaped 86-92 μ m long and 64-69 μ m wide. Basal ring of thoracic horn bean shaped. Abdomen yellowish brown, tergites II-VI with median shagreen, VII with a single semicircular patch of basomedian shagreen, VIII with little shagreen. Hook row comprising 52-56 hooklets. Segment II with caudolateral PSB (69-72 x 52-56 μ m), with a PSA (77-82 x 65-69 μ m). Caudolateral spur with two spines. 160-166 taeniae in multiple rows on anal lobe.



Fourth instar larva: Deep red in color. Length



Found: INDIA - Type locality – Itanagar (27.03°N, 93.63°E), Arunchal Pradesh, 440 m.

***Chironomus alternus* Das, Majumdar and Hazra 2016**

Adult:

Male:

Total length 4.6-5.0 mm. Wing length 2.48-2.64, width 0.62-0.68 mm. Head and legs brownish yellow, thorax yellowish, postnotum dark, abdomen yellow. AR 2.22-2.64.

Thoracic setae: 14-16 acrostichals; 12-14 dorsocentrals; 12-14 prealars, 10-12 scutellars.

Wing membrane brown with dark veins; 1 Scf on brachiolium, squama with 16-18 setae. VR 1.06-1.08.

Leg lengths and proportions (micron):

Table 2. Lengths (µm) and proportions of leg segments.

	Fe	Ti	ta ₁	ta ₂	ta ₃	ta ₄	ta ₅	LR	BV	SV	BR
Fore	880- 920	880- 940	1280- 1320	680- 720	560- 600	480- 520	200- 240	1.40- 1.45	1.53- 1.58	2.58- 2.59	1.78- 1.81
Mid	1000- 1140	840- 880	480- 540	280- 320	160- 200	120- 160	100- 120	0.57- 0.61	3.20- 3.52	6.31- 6.57	2.14- 2.23
Hind	1160- 1200	1040- 1080	720- 760	360- 380	280- 300	120- 160	120- 140	0.69- 0.70	3.10- 3.17	6.0- 6.11	2.20- 2.46

Lacks a beard

Abdomen yellow, tergites II-V with dark median spots (as in the ‘flaviplumus-group’). Tergite IX with about 7 medial setae, apparently not in any pale area.

Anal point described as straight but shown with a narrow base. IVo with branched setae, reaching beyond end of anal point and to about the middle of the gonostylus, which is hardly narrowed over distal third.

Female not described.

Pupa: Length 5.96-6.08 mm. Yellowish brown in color.

Frontal apotome triangular; cephalic tubercles 20-21 µm long and 30-31 µm wide at base.

Thorax rugose, basal ring oval, HR about 1.6. Wing sheath 1.24-1.25 mm long.

Abdomen yellowish brown. Tergite I bare, tergites II-VI with median shagreen, VII-VIII with faint shagreen; segment I with baso-lateral and II with a caudo-laterals PSB; IV with PSA (58-60 x 68-69) µm. Lateral muscle marks obvious.

Hook row of segment II with 40-42 hooks, claimed to be separated into two equal halves although not obvious in figure. Caudolateral spur 180-182 µm long with 4 spines, all pointing to one side. Anal lobe 290-291 µm with 128-132 taeniae in multiple rows. ALR 1.88-1.9.

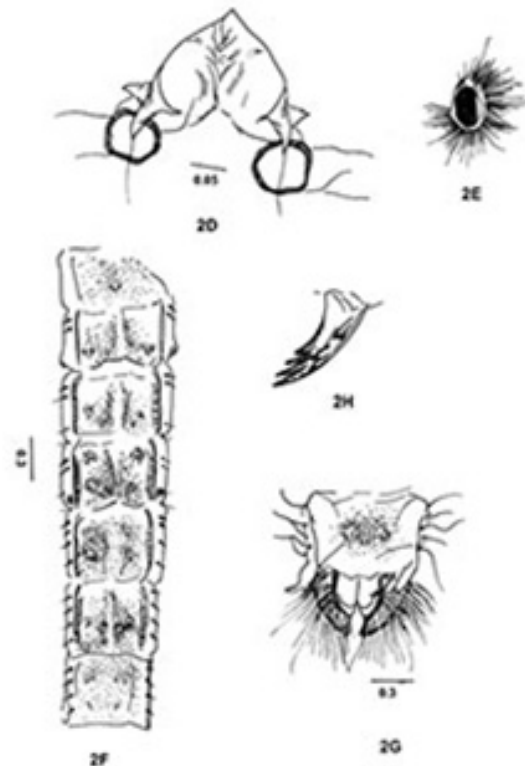


Figure 20-21. *C. alternus* sp. nov., pupa. D: Cephalothorax, E: Basal ring, F: Antenna, G: Ant. lobe, H: Caudal cone. Das et al. 2016

Fourth instar larva: Length 6.88-9.52 mm. Deep red in color.

No information on larval type and no mention of lateral projections. Ventral tubules 1.24-1.44 μm in length.

The mentum 180-186 μm wide; described as having gradually decreasing teeth (although appears to be type II) and the central tooth type III.

Ventromentum about the same width as the mentum, but the inner margin appears unusual (actual inner margin not shown?) margin serrated, IPD 112-121 μm .

Maxillary palpus well developed with lacinial setae. PE with 14-16 teeth.

Antenna with basal segment 86 μm long, RO about 1/3 from base. Ratio of antennal segments: 86-90 ; 21.5-25.8 : 8.6 : 4.3 : 4.3 ; AR 2.10-2.22.

Premandible with five teeth and a minute setose globular structure at their base.

Mandible 156-160 μm long and 49-52 μm wide. The drawing of the mandible possibly with a pale dorsal (apical?) tooth and 4 distinct dark inner teeth (Ty. IIIC?); no mention of presence of furrows or the number of taeniae in the PecM.

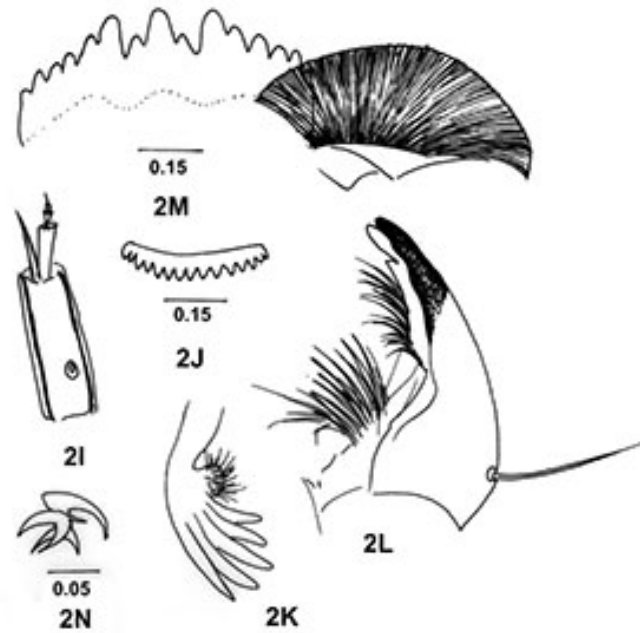


Figure 2I-N. *C. alternus* sp. nov., larva. I. Antenna. J. Pecten epipharyngis. K. Premandible. L. Mandible. M. Mentum. N. Claw. **Das et al. 2016**

Found: INDIA - Type locality - Namdapha (27.29°N, 96.23°E. 720 m a.s.l.), Arunchal Pradesh.

Noted as showing relationship to the group of species *C. circumdatus*, *C. ramosus*, *C. striatipennis* and *C. incertipennis* but this is in regards to certain specific characters including the presence of dark median spots on tergites II-V and an anal point narrowed at the base. For these reasons it is tentatively included with the species of the ‘flaviplumus group’. The five branched premandible of the larva does not seem to indicate a relationship to *C. javanus*.

***Chironomus clavipennis* Das, Majumdar and Hazra 2016**

Adult:

Male:

Total length 4.52-5.12 mm. Wing length 2.28-2.48 mm, width 0.64-0.78 mm., VR 1.04-1.10.

Head yellowish brown, palp dark brown, antenna brown; thorax yellow; postnotum dark; wing membrane pale brown with veins darker. Abdomen pale yellow.

Vertex with 22-26 setae (IV 4-6, OV 12-14, Po 6-8). FT 73-83 µm long and 34-44 µm wide (i.e. abt twice as long as wide). Clypeus 136-141 x 119-134 µm, with 22-24 setae. AR 2.79-2.83. Palpal segments (µm) 34-59.5; 51-59.5; 187-204; 68-85; 102-119; P5-P4 abt 1.4-1.5; P5/P3 abt 0.57-0.58.

Thoracic setae: 8-10 acrostichal; 10-12 dorsocentrals; 6-8 prealars; 14-16 scutellars. 2 Scf on brachiolum, squama with 14-15 setae.

Table 3. Lengths (µm) and proportions of leg segments.

	Fe	Ti	ta ₁	ta ₂	ta ₃	ta ₄	ta ₅	LR	BV	SV	BR
Fore	1080-1120	960-1000	1480-1540	760-800	640-680	560-600	240-280	1.55-1.59	1.59-1.63	2.68-2.66	1.76-1.80

Mid	1200-	1160-	840-	440-	320-	200-	120-	0.72-	2.90-	5.36-	2.20-
	1240	1200	880	480	360	240	160	0.75	2.93	5.31	2.22
Hind	1160-	1240-	1000-	560-	320-	160-	120-	0.81-	2.89-	4.25-	2.60-
	1200	1800	1620	800	360	180	160	0.85	2.91	4.29	2.62

Lacks a beard

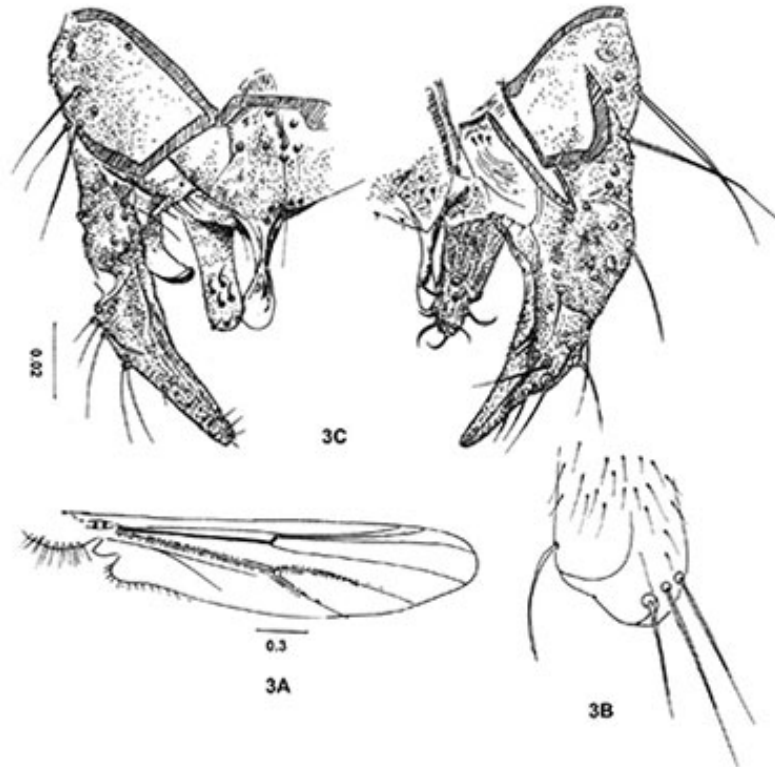


Figure 3A-C. *Chironomus clavipennis* sp. nov., male imago. A. Wing. B. Fore tibial scale. C. Hypopygium. **Das et al. 2016**

About 10 setae in individual pale spots on TIX. SVo shoe-like (S(a)-type of Strenzke 1959); IVo reaching about to end of anal point with 11-12 apparently simple setae; gonostylus moderately swollen and narrowing relatively gently over posterior third; anal point narrow in middle region and expanded at the distal end.

Pupa:

Length 5.88-6.28 mm. Wing sheath 1.36-1.38 mm in length.

Yellowish brown, exuviae grey.

Frontal apotome (3D) triangular with 21-26 long subapical frontal setae. CT 51-56 µm long and 19-24 µm wide at base. Thorax rugose. Respiratory base constricted and with HR about 2.2.

Abdomen (3F) yellowish brown, tergite I bare, II-VI with median shagreen, VII-VIII with 2 small circular patches of basolateral shagreen. Caudolateral PSB (69-73 x 52-56) on segment II; PSA (77-81 x 60-64) on segment IV. Hook row separated with 40-46 hooklets.

Caudolateral spur (3H) with 10-12 tooth-like projections, median one sharply pointed. Anal fringe of 136-142 taeniae in multiple rows.

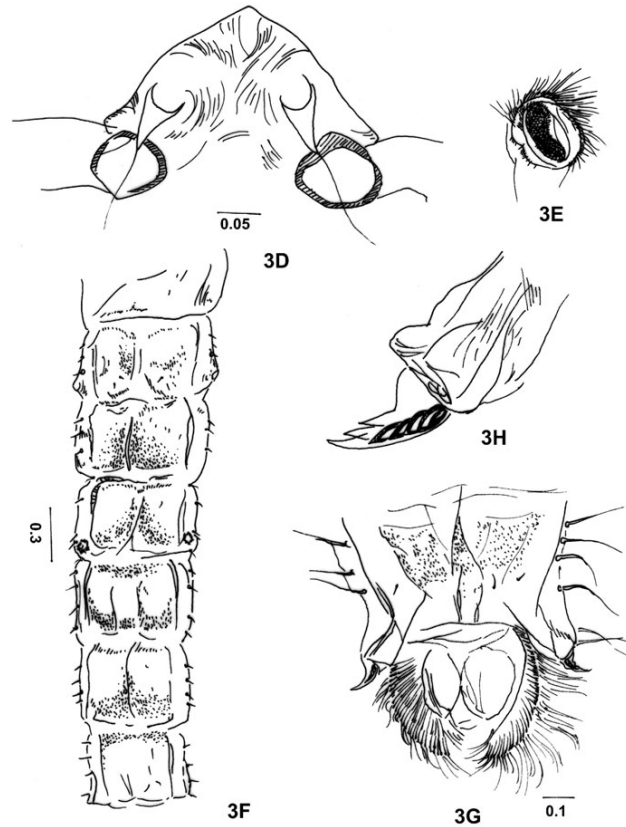


Figure 3D-H. *C. clavipenis* sp. nov., pupa. D. Cephalothorax. E. Basal ring. F. Abdomen. G. Anal lobe. H. Caudolateral spur.

Das *et al.* 2016

Fourth instar larva: Length 7.60-8.20 mm. Larval type and head coloration not given. Ventral tubules 1.12-1.16 mm but no information on relative lengths. Anal tubules 1.08-1.12 mm long.

Antenna (Fig. 3I): segment lengths 107.5-111.8 : 12.9-17.2 : 8.6-12.9 ; 8.6-12.9 : 4.3- 6.46, AR 3.12-3.15; DRO shown about 20% up from base of segment 1, which is 2.7 times longer than wide.

PE (Fig. 3J) with 14-16 teeth. Mentum (Fig. 3M) 129-137 μ m wide, with 4th lateral reduced to about level of 5th lateral; appears to and set below level; 6th lateral arising below level of other teeth. Central trifold tooth essentially Ty.4 and set below level of lateral teeth. Premandible with dark apex and 5 teeth which arise at the distal end of the PreM. Ventromentum about 60-68 μ m wide, with serrated margin; ICD 121-129 μ m, VMR perhaps 0.31.

Mandible (Fig. 3L) 163-180 μ m long. Illustration would suggest it is Ty. IIIC. No information on number of taeniae in PecM or the number of furrows near the base (or even if there are such furrows).

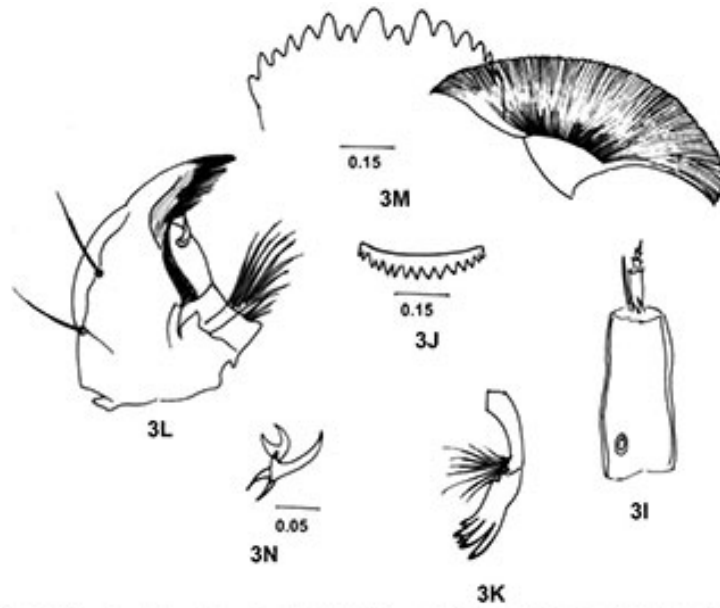


Figure 3I-N. *C. clavipennis* sp. nov., larva. I. Antenna. J. Pecten epipharyngis. K. Premandible. L. Mandible. M. Mentum. N. Claw. **Das et al. 2016**

Found: INDIA - Type locality – Ziro (27.63°N, 93.83°E 1688 m a.s.l.), Arunchal Pradesh.

Noted as close to *C. ramosus*, *C. striatipennis* in structure of the male hypopygium. Another species with 5 teeth on the premandible, but it and the adult unlike *C. javanus*, although the illustration of the larval mentum suggests similarity to that of *C. javanus* in the lowered center teeth.

***Chironomus confectus* Das, Majumdar and Hazra 2016**

Adult:

Male:

Total length 5.52-6.32 mm. Wing length 2.48-2.76, breadth 0.71-0.78.

Head yellowish-brown, palps yellow; thorax yellowish-brown, except antepnotum dark brown. Wings brown with dark veins; abdomen brown with faint median spots on TIII-IV. Vertex with 30-32 setae; FT 64-77 μm long and 38-50 μm wide.

Clypeus with 22-24 setae, clypeal ratio 1.22-1.34. Palp ratios 153-170: 42.5-51 : 170-187 : 153-170 : 255-272; P5/P4 1.60-1.67; P5/P3 1.45-1.5. Antenna brown, AR 2.8-2.9. Thoracic setae: 10-12 acrostichal; 10-12 dorsocentrals; 6-8 prealars; 16-18 biserial scutellar.

Wing with 2 setae on brachiolum, squama with 14-15 setae, VR 0.83-0.84.

Leg lengths (microns) and proportions as follows:

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	BV	SV	BR
PI	1120-1200	960-1000	1520-1560	720-760	640-700	560-600	280-320	1.56-1.58	1.58-1.62	2.82-2.87	3.50-3.52
PII	1200-1240	1000-1040	600-640	280-300	200-220	160-180	120-140	0.60-0.62	3.61-3.66	7.81-7.85	2.14-2.17
PIII	1280-1320	1240-1320	840-880	400-440	280-320	200-220	200-220	0.68-0.66	3.31-3.35	6.23-6.29	2.63-2.65

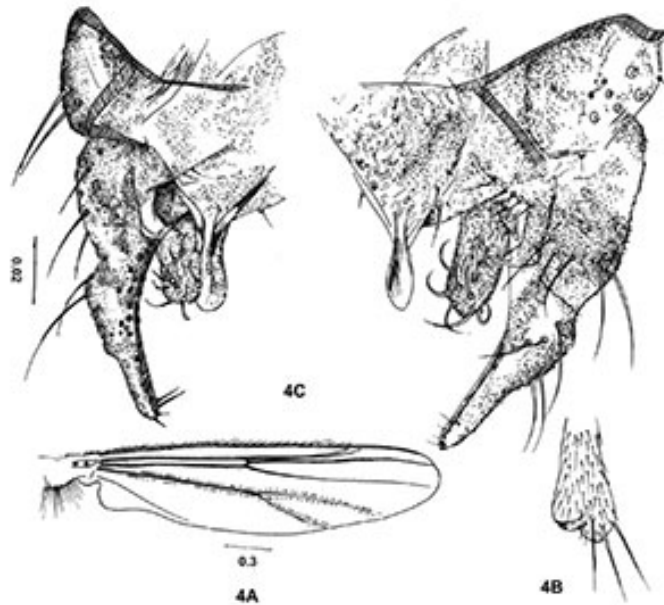


Figure 4A-C. *Chironomus confectus* sp. nov., male imago. A. Wing. B. Fore tibial scale. C. Hypopygium. Das et al. 2016

TIX with 10-12 setae apparently in individual spots (Fig. 4c). Anal point narrow at base. Gonostyle relatively swollen basally and narrowing markedly over distal half. Superior Volsella closest to D(d) type of Strenzke (1959); Inferior volsella reaching about to end of anal point or basal third of the gonostyle (Fig. 4c).

Pupa: (Males) Length 5.72-6.68 mm, wing sheath 1.15-1.17 mm long. Yellowish brown, exuviae grey. Cephalic tubercles (Fig. 4D) 86-92 μm long and 43-53 μm wide at base; antennal sheath 1.04-1.08 mm long. Thorax rugose. Respiratory base not measured, but illustrated (4E, below) not constricted and with HR about 1.3.

Abdomen yellowish brown, shagreen pattern shown in figure 4F. Hook row of 44-48 hooklets, separated in mid-line. Pedes spurii B on segment II (65-70 x 43-48 μm) and segment III, Pedes spurii A on segment IV (73-78 x 65-70 μm).

Caudolateral spur of segment VIII (4H, below) 138 μm long with 5 sharp spines, median one strongest. 104-108 taeniae on anal lobe.

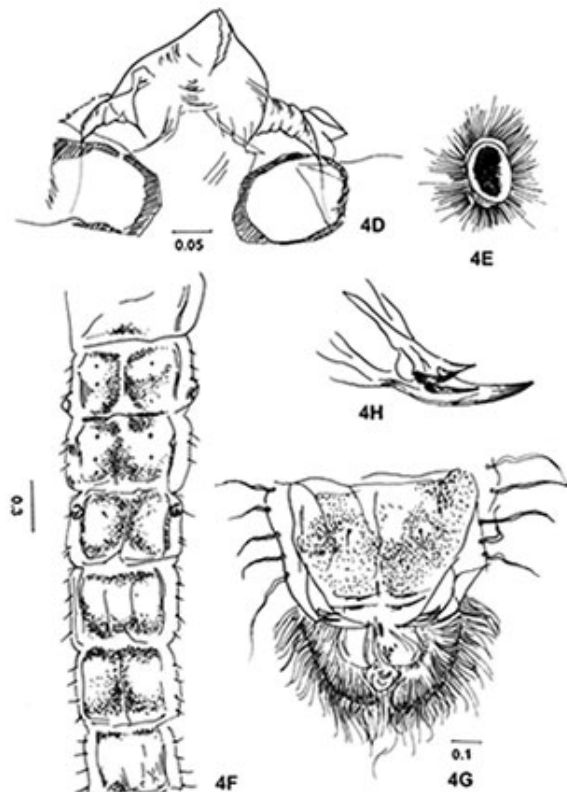


Figure 4D-H. *C. confectus* sp. nov., pupa. D. Cephalothorax. E. Basal ring. F. Abdomen. G. Anal lobe. H. Caudolateral spur. Das et al. 2016

Fourth instar larva: Length 7.72-8.60 mm. No details of head coloration or shape of ventral tubulles given.

Antenna (Fig. 4I) with basal segment about 3.3 times longer than wide, RO about a third up from the base of the segment. Length of segments (micron): 77.4-81.7 ; 17.2-21.5 ; 8.6-12.9 ; 10.75-12.9 ; 4.3-6.45, AR 1.9-2.1.

Mentum (Fig. 4M) with 15 teeth, of type I, center trifid tooth lower than lateral teeth, possibly type IIA. Ventromentum with serrated margin and slightly wider than the mentum, number of striae not recorded.

Premandible (Fig. 4k) dark brown with teeth narrow and coming to relatively sharp point (Ty. A).

Pecten epipharyngis (Fig. 4J) with 12-16 teeth (Ty. A).

Mandible (Fig. 4L) 190-200 μ m long with pale apical tooth, dorsal and inner teeth dark, Pecten mandibularis with about 13 taeniae, no mention of basal furrows.

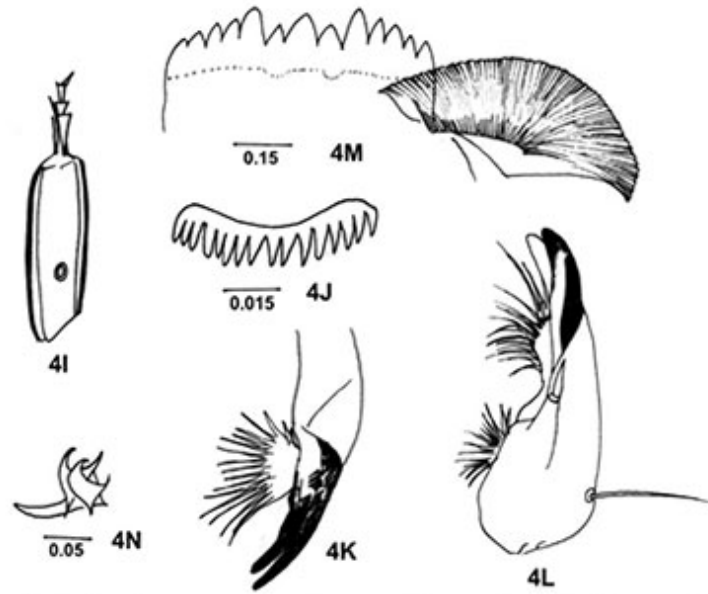


Figure 4I-N. *C. confectus* sp. nov., larva. I. Antenna. J. Pecten epipharyngis. K. Premandible. L. Mandible. M. Mentum. N. Claw.
Das et al. 2016

Found: INDIA - Type locality – Bomdila (27.42°N, 92.06°E 2217 m a.s.l.), Arunchal Pradesh.

The authors note various components with similarity to a variety of species, but the apparently S-type SVo of Strenzke (1959) is rare in India and suggests a connection to the *C. flaviplumus*-group. However others characters raise a query as to whether this species belongs in *Chironomus* s.s. or in one of its close relatives.

***Chironomus culterus* Das, Majumdar and Hazra 2016**

Adult:

Male

Total length 4.92-5.4 mm; Wing length 2.4-2.71 mm, width 0.48-0.68 mm.

Head brownish-black, palps yellowish brown; thorax yellow. Wing light yellow; abdomen pale yellow to pale brown. Vertex with 17-23 setae; FT 22-36 µm long and 16-21 µm wide.

Clypeus with 10-12 setae, clypeal ratio 1.21-1.33. Palp ratios 34-51; 204-221; 238-272; 136-153; 187-204; P5/P4 1.33-1.38, P5/P3 0.75-0.79. Antenna brown, AR 3.32-3.72.

Thoracic setae: 10-12 acrostichals; 12-14 dorsocentrals; 4-6 prealars; 15-18 scutellars. Scutellum brown.

Wing: Brachiolum with 1 long seta, squama with 12-14 setae; VR 1.08-1.10.

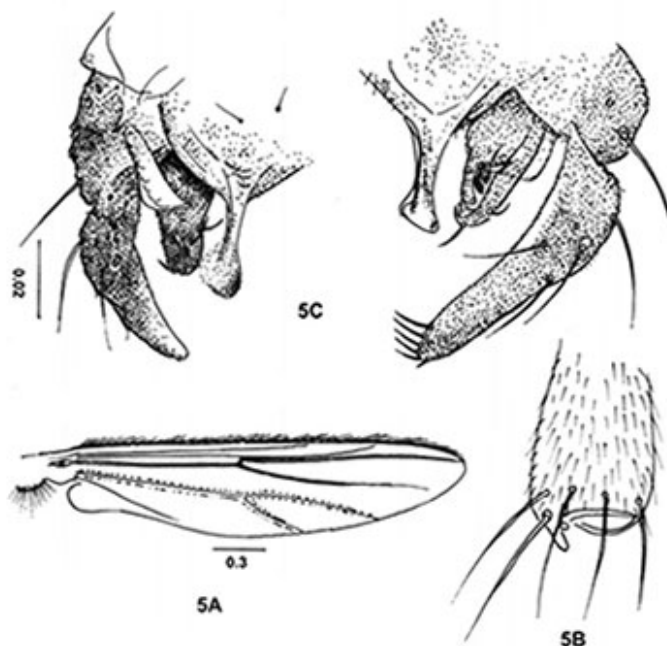


Figure 5A-C. *Chironomus cultorus* sp. nov., male imago. A. Wing. B. Fore tibial scale. C. Hypopygium. Das et al. 2016

Table 5. Lengths (μm) and proportions of leg segments.

	Fe	Ti	ta ₁	ta ₂	ta ₃	ta ₄	ta ₅	LR	BV	SV	BR
Fore	1720- 1800	1440- 1520	2120- 2200	1120- 1160	920- 960	880- 960	400- 480	1.44- 1.46	1.53- 1.57	2.76- 2.80	2.81- 2.85
Mid	1480- 1560	1280- 1360	720- 800	480- 520	320- 360	200- 240	160- 200	0.56- 0.58	2.94- 3.00	5.69- 5.75	3.80- 3.87
Hind	1800- 1880	1720- 1800	1560- 1620	720- 800	480- 520	320- 360	200- 240	0.92- 0.95	2.91- 2.93	4.82- 4.85	7.59- 7.71

About 7 setae on TIX, apparently not in a pale area. Anal point with an expanded end. IVo shorter than the anal point and about to the basal third of the gonostylus, which is relatively swollen and narrows slowly over distal third.

Female not known.

Pupa: Total length 6.48-7.72 mm. Yellowish brown, exuviae grey.

Frontal apotome rugulose with subequal frontal setae, CT funnel shaped (Fig. 5D) 84-87 μm long and 50-52 μm wide at base. Antennal sheath 583-587 μm long (not clarified as to whether this is for male pupae). 2 pairs precorneals. Wing sheath 1.51-1.77 mm in length.

Abdomen yellowish brown, tergite II-VI with median shagreen, VII with subbasal and subcaudal transverse band of shagreen, VIII with 2 patches of median shagreen; segment II with caudolateral PSB (55-59 x 56-62); IV with a caudolateral PSA (62-69 x 50-59).

Hook row separated (unusual and not apparent in figure) with 56-60 hooklets.

Caudolateral spur with a single spine, but may have a small basal one (Fig. 5M). 134-142 taeniae in anal fringe (Fig. 5G).

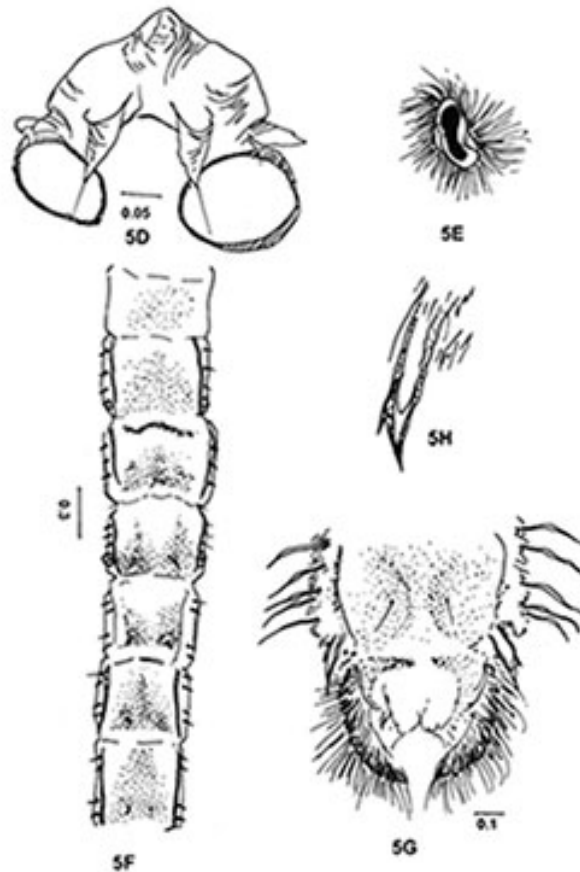


Figure 5D-H. *C. cultrata* sp. nov., pupa. D. Cephalothorax. E. Basal ring; F. Abdomen. G. Anal tube. H. Caudal fork. Das et al. 2016

Fourth instar larva: (n=6):

Head. Antenna (Figure 5I) 5 segmented, length ratio of flagellomeres I–V: 94.6–98.9: 12.9–17.2: 8.6–10.17: 4.3–6.45: 4.3–6.45, basal segment larger than flagellum, AR 2.73–2.86; blade 34–46 long and nearly equal to flagellum; accessory blade 16–28 long, ring organ (Figure 5I) 3.5–4.5 in diameter at the basal one-fifth of flagellomere I; length of lauterborn organ nearly equal to length of basal antennal segment, ratio of lauterborn organ and antennal segments 0.72–0.84.

Labrum: S I 20–32 long with finely serrated outer margin, S II 52–64 long with pointed tip, S III and S IV indistinct, S IVA and S IVB prominent 10–11 and 6–7 long respectively, labral lamellae 135–149 long with depressed median part; pecten epipharyngis (Figure 5J) with single row of 14–16 teeth, pecten hypopharyngis pentadactylus, dark and paired structure on each side of mentum. Premandible (Figure 5K) 57–71 long dark with 5 teeth, pecten premandibularis robust. Mandible (Figure 5L) 178–191 long and 63–76 wide with 1 pale dorsal, 1 dark apical and 3 dark inner teeth, seta subdentalis 37–51 long, seta interna plumose with 3 basal stalks, pecten mandibularis filiform, sensilla minusculum 2. Maxillary palpus well developed with lacinial chaeta. Mentum (Figure 5M) 142–157 wide with crenate median and 6 pairs of gradually decreasing lateral teeth, two smaller outer teeth fused at the base of central one; ventromental plate 58–72 wide, margin serrated and separated by a distance of 118–134 greater than median mentum tooth. Body. Anterior and posterior parapods with sharp, curved and pointed apex claws (Figure 5N). Anal tubules 0.960–1.44 long, ventral tubules slender (does this mean they are halophilus-type?) and 1.84–2.44 long; procercus with 6–8 anal setae in each.

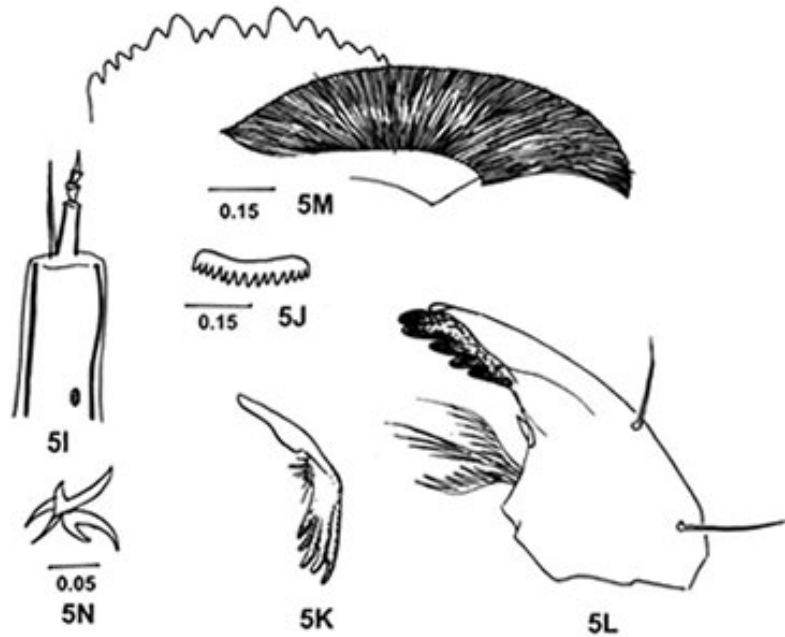


Figure 5I-N. *C. culterus* sp. nov., larva. I. Antenna. J. Pecten epipharyngis. K. Premandible. L. Mandible. M. Mentum. N. Claw. **Das et al. 2016**

Found: INDIA - Type locality – Kalimpong (27.04°N, 88.28°E 1247 m a.s.l.), West Bengal.

Another species in which the larva has a five-toothed premandible; perhaps some relationship to *C. clavipenis*.

***Chironomus fortibracchius* Das, Majumdar and Hazra 2016**

The name derives from the strong claws of the legs.

Adult

Male (n=5):

Total length 4.3–5.8 mm. Wing length 2.38–2.86 mm, wing width 0.52–0.63 mm, ratio of wing length and length of anterior femur 2.20–2.55. Head and antenna dark brown in colour. Maxillary palpus yellowish. Thorax yellowish brown in colour except antepnotum and scutellum brown. Wing light yellow in colour. Leg pale yellow in colour. Abdomen yellowish brown.

Head: Eyes bare with 34-42 extension; Vertex with 18-22 setae. Frontal tubercles distinct 52-59 x 30-37 µm. Clypeus 170-181 µm long and 102-112 µm wide, with 24-26 long setae. Length ratio of palp segments I-V: 51-68 : 34-51 : 170-187 : 136-153 : 153-170 ; P5/P4 1.11-1.25; P5/P3 0.9 - 1.0. AR 3.16-3.18.

Thoracic setae: 8-10 acrostichals in 2 rows ; 10-12 biserial dorsocentrals; 4-6 prealars; 14-16 scutellars.

Wing: Brachiolum with 2 Scf; 16-17 setae in squamal fringe; RM dark distal to FCu; VR 0.90-0.95.

Legs: Lengths (µm) and proportions:

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	SV	BR
PI	1080-1120	920-960	1680-1720	800-840	720-760	680-720	360-400	1.79-1.81	1.19	2.48-2.50	1.78-1.80

PII	960-1000	1000-1040	640-680	360-380	240-300	120-160	120-140	0.62-0.64	-	5.37-5.40	3.71-3.74
PIII	1160-1200	1240-1280	1000-1020	560-580	400-440	160-200	200-220	0.53-0.56	-	4.25-4.27	2.68-2.70

Abdomen: yellowish brown. Tergites II-IV with median dark spots. Anal point constricted along midline ending in a bulbous tip; SVo closest to S type(b) of Strenzke 1959; IVo, with setae shown as simple, reaching almost to the end of the anal point and 1/3 along the gonostylus.. Gonostylus moderately swollen and reducing gently over posterior third with about 5 setae at tip.

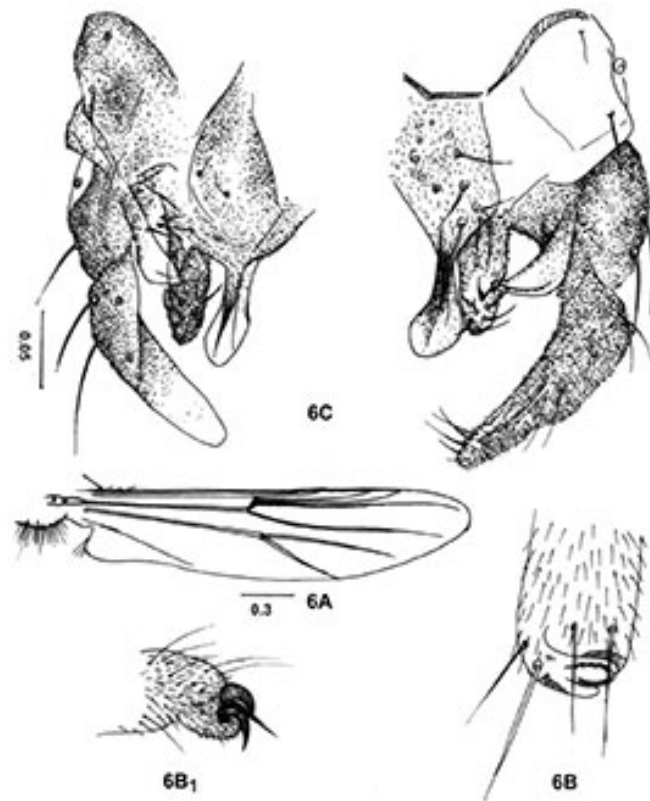


Figure 6A-C. *Chironomus fortibracolus* sp. nov., male imago. A. Wing. B. Fore tibial scale. B₁. Claws of leg. C. Hypopygium.

Das et al. 2016

Pupa: Total length 6.68–7.92 mm. Yellowish brown, exuviae grey.

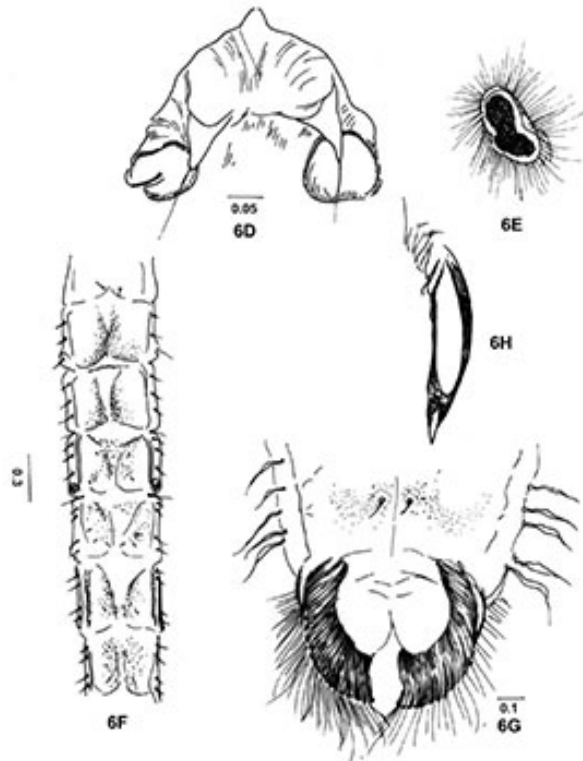


Figure 6D-H. *C. fortibraccolius* sp. nov., pupa. D. Cephalo-thorax. E. Basal ring. F. Abdomen. G. Anal lobe. H. Caudolateral spine. Das et al. 2016

Fourth instar larva:

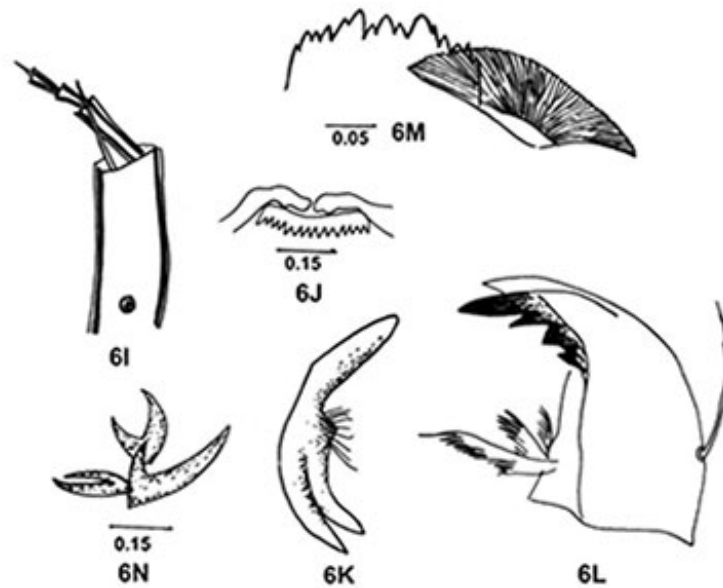


Figure 6I-N. *C. fortibraccolius* sp. nov., larva. I. Antenna. J. Pecten epipharyngis. K. Pre-mandible. L. Mandible. M. Mentum. N. Claw. Das et al. 2016

Found: INDIA - Type locality – Kalimpong (27.04°N, 88.28°E 1247 m a.s.l.), West Bengal.

***Chironomus melanophorus* Kieffer 1911**

Described on basis of female:

Nomen dubium according to Sublette & Sublette 1973.

Adult:

Female:

Antenna reddish, except for 5th segment which is black; thorax dull yellow with three black or brown bands, the median gradually thinning, metanotum brownish black, halteres whitish, legs dull yellow – abdomen brown black

Antenna with 6 segments (i.e. counting pedicel); Pronotum bilobed.

Wings hyaline

Legs pubescent, with long hairs; metatarsus a quarter longer than the tibia (i.e. LR 1.25), 4th tarsal segment hardly shorter than the 3rd.

Length 4 mm.

Found: INDIA - Type locality –Calcutta (now Kolkata)

***Chironomus palpalis* Johannsen 1932**

Sublette and Sublette (1973) listed this as a species of *Chironomus*.

Adult:

Johannsen's 1937 description of adults:

Male:

38. *Chironomus palpalis* n. sp.

Male. Yellowish species, perhaps greenish in life; mesonotum with three ferruginous vittae; tergites each with a broad, transverse pale brown fascia, the last two segments more or less wholly pale brown; hypopygium yellowish; legs bicolored. Eyes separated on the front by a distance nearly equal to a fifth the width of the head; frontal tubercles lacking; twelfth antennal segment over 3.5 times as long as segments 2—11 combined; palpi broken off. Pronotal collar slightly though distinctly emarginate. Spur of ninth tergite produced beyond the tips of the inferior appendage, the latter rounded and enlarged at the ends with recurved hairs; superior appendages short and stout, curved, bare, scarcely attaining the end of the basistyle; dististyles with about four short stiff hairs on inner mesal margin near apex (fig. 22). Legs yellow; basal fourth of fore tibia and extreme apices of all of them, brown; apices of tarsi and tips of the first three or four tarsal segments of the middle and hind feet, dark. Empodium nearly as long as the claws; pulvilli large and broad; both combs of each tibia of middle and hind legs, bearing a short spur, fore tarsi broken off. Wing hyaline; crossvein not dark, posterior branch of the radius ends about as far in front of the wing tip as the media does behind it; cubitus forks distad of the crossvein. Squama with fringe. Halteres pale. Length 3.5 mm. Reared from a larva collected in the water of a hollow bamboo stump, in the forest of Tjurup, South Sumatra, June 7.

A teneral male specimen reared from a larva taken in Lake Ranau, at a depth of 45 meters. South Sumatra, January 26. In this specimen the fore basitarsus is 1.7 times as long as the tibia and the fore tarsi are not bearded.

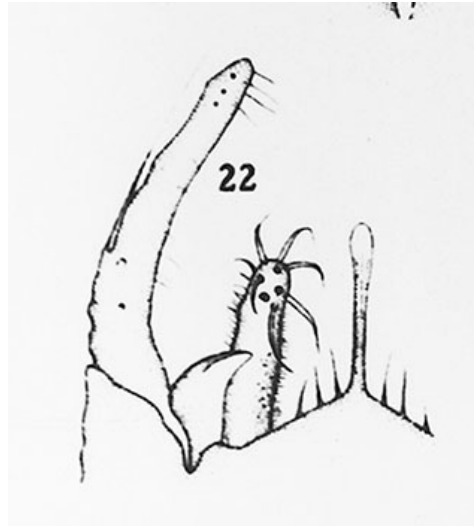
A female specimen from the same source has a six-segmented antenna with intermediate segments flask-shaped, with necks as long as the bulbous part. In it the crossvein is slightly darkened.

Original description of *C. palpalis* from Johannsen 1937

Yellowish or perhaps greenish species; thoracic vittae ferruginous; frontal tubercles lacking; AR over 3.5; palps missing.

Abdominal segments with transverse brown fascia, final two segments almost wholly pale brown, hypopygium yellowish.

Genitalia briefly described as: SVo short and stout (illustrated as S-type of Strenzke 1959), barely reaching the base of the long, relatively narrow gonostyle which narrows gently over posterior 2/3, with 4 stiff setae near tip. Anal point (as spur of ninth segment) produced beyond the end of the IVo, which is rounded and enlarged at the end with simple recurved hairs.

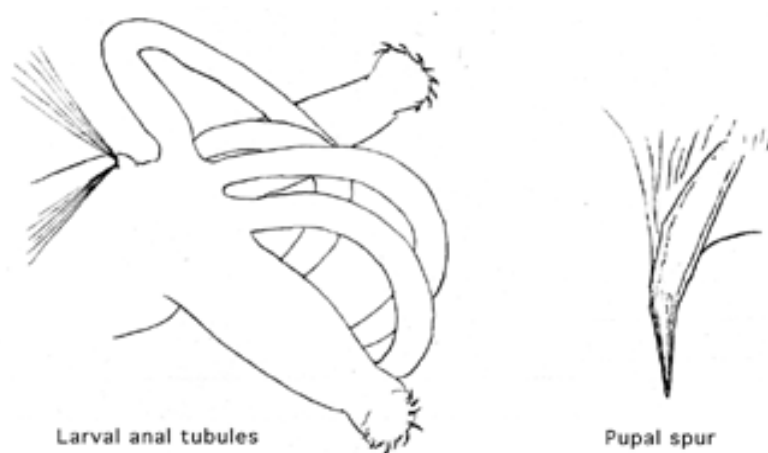


Male hypopygium from Johannsen 1937

Female:

Only briefly mentioned in original description as having a six segmented antenna with intermediate segments flask-shaped, with necks as long as the bulbous part. Crossvein of wing slightly darkened.

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



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

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).

Cytology: Not known

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

Larva collected from water in a hollow bamboo stump, and a male and female reared from larvae collected at 45 m in Lake Ranua.

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

***Chironomus quadratus* Johannsen 1932**

Adult male and female described by Johannsen.

Male. Length 6.5 mm. Head yellow, basal antennal segment ferruginous. FT present. 4th palpal segment a half longer than 3rd (probably indicates that P5/P4 is 1.5). AR 3.0. Thorax yellow, vittae ferruginous, postnotum brown; halteres yellow; abdomen yellowish, the intermediate segments with a median, transverse brown spot, becoming larger on posterior segments; behind this transverse spot is a pair of very small transverse, somewhat indistinct spots, more or less oblique on the posterior segments. IVo, with simple recurved setae, reaching just beyond the end of the anal point, which reaches nearly to the midpoint of the gonostylus; SVo bare, incurved, barely passing beyond the tip of gonocoxite IX; closest to S-type (b) of Strenzke (1959). Gonostyle moderately swollen and narrowing relatively gently over posterior third, 6 setae shown at tip.

Wings hyaline, crossvein not darkened, cubitus forks under the crossvein
 Legs yellow, apical fifth of fore tibia brownish; fore tarsi not bearded; segments of foreleg in ratios of: 37 : 31 : 50 : 28 : 24 : 19 : 10 . LR about 1.6; F/T 0.84.



Male hypopygium of *C. quadratus* (from Johannsen 1932)

Female. Length 6 mm. Resembles male in colouring but the mesonotal vittae are more brownish and the fasciae of the abdominal tergites almost reach the sides. Caudal lobes yellowish. Collar of the intermediate segments (presumably of the antennae) and the whole of the sixth segment (i.e. including the pedicel) subfuscous; A5/A4 1.5. Segments of foreleg in ratios of: 37 : 30 : 48 : 26 : 23 : 20 : 9 . LR about 1.6; F/T 0.81.

Pupa: Length 9 mm. Moderately slender and light brown. Edges distinctly brown. Caudolateral spur mostly with only one spine, at most with a small accessory spine.

Larva: A plumosus type, 14-15 mm long. Anal tubules thin, as long as the proleg.

Cytology: Not known.

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

Found: INDONESIA- Type locality: Lake Warna (2000 m a.s.l.), Middle Java

***Chironomus simantobeceus* Sasa, Suzuki and Sakai 1998**

Syn. *C. claggi* – Yamamoto & Yamamoto 2018

Adult:

Male: Length 7.12 mm. Wing length 3.04 mm, width 0.88 mm.

AR 3.11. FT prominent, 48 µm long, 12 µm wide.

Clypeal setae 26.

Thoracic setae: 17 dorsocentral, 21 acrostichals; 7 prealars, 34 scutellars.

Illustration of the SVo by Yamamoto & Yamamoto (2018) does not easily fit the types characterized by Strenzke (1959), closest to an S-type but with a folded tip.

No information on whether the setae of the IVo are simple or forked (those of *C. claggi* are trifid)

Found: JAPAN - Type locality – Shimanto River, Shikoku Island,

***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 (in brackets following the Japanese data)

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 anteprenotum yellow, mesonotum ochreas, 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.

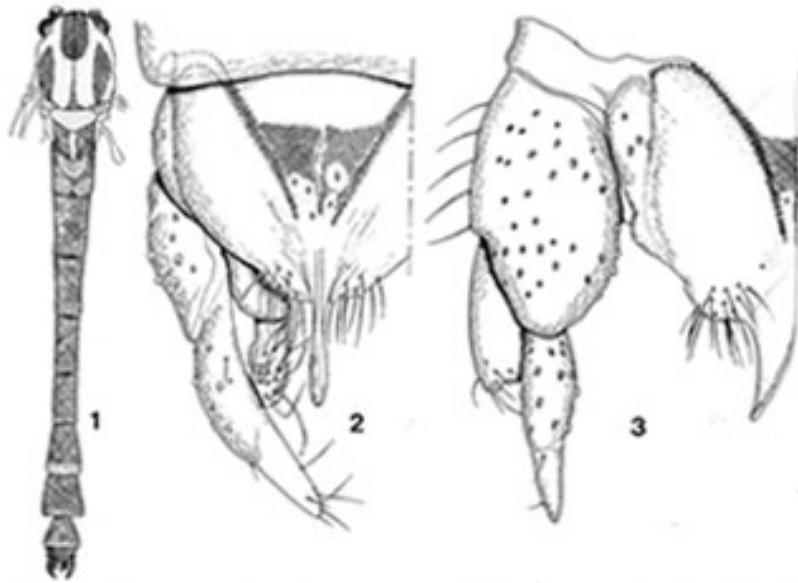
Head: FT small. Palpal proportions (micron) 65 : 80 : 180 : 240 : 370; F5/F4 1.54; F5/F3 2.06. Clypeus with 33-34 setae, prementum with 1 seta.

Thoracic setae - 0-1 (1) lateral anteprenotal; acrostichal - 18-23 (8-23); dorsocentral - 32 (25-53); prealars 5-6 (5-9); supraalar - 1 (0-2); scutellar - 33-34 (29-55) irregularly triserial.

Leg lengths and proportions (micron):

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	Ta5/Ti
PI	1350	1240	1890	980	780	680	310	1.49-1.56	1.09	0.25
PII	1400	1350	850	500	350	250	150	0.65	1.04	
PIII	1600	1750	1250	750	550	350	200	0.71	0.91	

BR (Europe) 2.58 (1.83-4.00)



Figs. 1-3 *Chironomus sollicitus* HIRVENOJA. — 1, Body color pattern, in dorsal view; 2, hypopygium in dorsal view; 3, ditto, 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 or midpoint of gonostylus, with about 20 recurved setae on apical half, some of which are forked near the tip. Gonostylus only moderately swollen and narrows relatively gently over posterior third

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); dorsocentrals – 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	Ta4/Ti
PI	1.19	1.0	1.57	0.75	0.62	0.57	0.24	1.48-1.68	1.19	0.57

BR 1.64 (1.43-2.17)

Pupa & Larva: No information.

Found: JAPAN- Koshunai, Bibai, Hokkaido; Noboribetsu Hot Spr. (42.29°N, 141.08°E), Hokkaido (BOLD & GenBank),

Type locality – FINLAND - Riihimäki (60.83°N, 24.83°E), FINLAND

Other record: - NORWAY - Rondane national park (61.9814°N, 9.8048°E), Dovre, Oppland (BOLD).

Has similarities to *C. trinigrivittatus* but differs in the shape of the anal point and the SVo.

***Chironomus trinigrivittatus* Tokunaga 1940**

Possible synonymy: *Chironomus riparius* (Sasa, see below)

Probably described purely on basis of adult male.

Original description not seen.

Hashimoto (1982) redescribed the species based on specimens from Oze, Japan:

Adult:

Male:

Body length 6.5 mm. Head with FT rather small. Antenna with 12 segments (i.e. including the pedicel).

Palps 4-segmented (i.e. segment 1 not identified) relative lengths: 8 : 22 : 28 : 28; P5/P4 1.0 (unusual) & P5/P3 1.27.

Thoracic vittae blackish brown, scutellum & postnotum brown.

Wings hyaline and bare, fCu just at or slightly distad of base of r-m; squama fringed.

Legs yellow to pale brown, apex of each segment more or less dark in colour; anterior tarsi not distinctly bearded. LR 1.4-1.5.; pulvilli well developed.

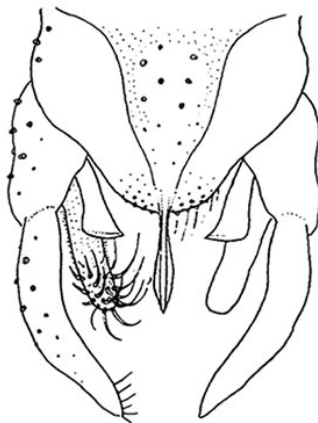
Abdomen brown, caudal margin of each tergite pale yellow.

TIX shown with about 12 setae, possibly in individual clear areas.

Hypopygium with anal point long and broadened distally. SVo broad apically and sharply pointed at inner apex (closest to D(9) type of Strenzke (1969)).

Ivo slightly upcurved and broadened apically in lateral view, shown with simple setae.

Gonostylus reaching about to end of anal point, moderately swollen and reducing gently over posterior third.



Male hypopygium of *C. trinigrivittatus* (from Hashimoto 1982)

Female: Only noted that the antenna is 6 segmented (i.e. including the pedicel).

Hashimoto classes the species as closest to *C. samoensis* – but if he is referring to the Japanese *C. samoensis* this would mean *C. flaviplumus* – and it is quite similar in the characters of the hypopygium to *C. flaviplumus* Ty. B. Also noted as similar to *C. riparius*, but the abdomen of that species is banded.

Sasa has queried whether the differences from *C. riparius* are just intraspecific variation arising from the different habitats from which the specimens have been collected – *C. trinigrivitattus* from higher altitudes, while *C. riparius* is from lowland areas.

Also claimed to have similarities to *C. sollicitus* but differs in the shape of the anal point and the shape of the SVo and gonostylus.

Found: JAPAN - Type locality – Sikuka, Sakhalin, Japan (Russian)

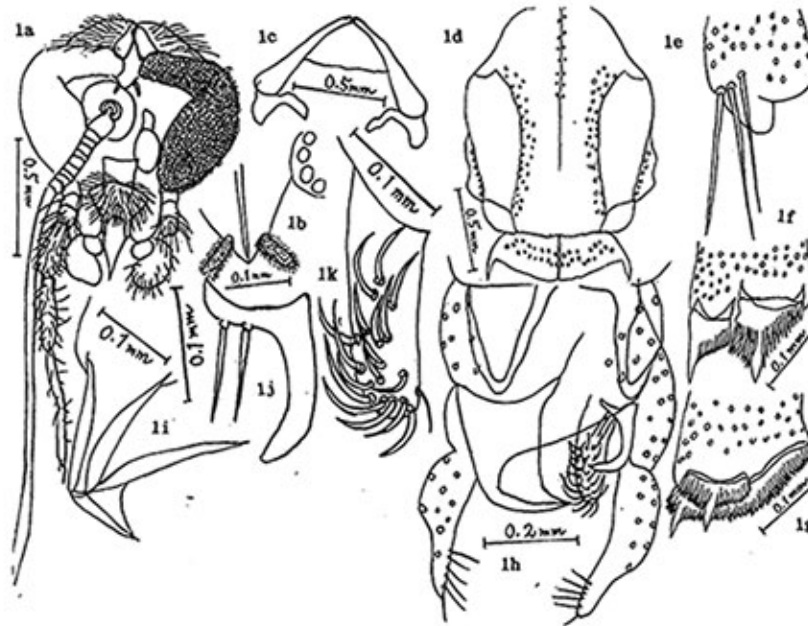
JAPAN proper – Ozegahara Moor, Oze, central Japan. (specimens in Dept. Biology, Faculty of Education, Shizuoka University).

***Chironomus tusimaabeus* Sasa & Suzuki 1999**

Adult:

Known only from adult male

Male:



C. tusimaabeus from Sasa & Suzuki (1999)

Body length 8.98-9.41 mm; wing length 4.48 (4.16-4.84) mm, width 1.21 (1.12-1.31) mm., VR 1.07 (1.04-1.09) (or 0.91-0.96?).

Body uniformly black or dark brown, abdominal tergites slightly paler along caudal margin. Setae on scutellum and abdomen arising from pale pits.

Head: Antenna with 11 flagellar segments, AR 3.96 (3.80-4.11). FT prominent 54 μ m long and about 3.5 times longer than wide. Palp 5 segmented, segment I with a seta, other segments with numerous setae; clypeal setae 45 (34-56).

Thoracic setae: 20.7 (16-26) acrostichal; 34.8 (34-36) dorsocentral; 7.3 (7-8) prealar; 39 (37-41) scutellar in two rows.

LR1 1.48 (1.43-1.54); LR2 0.59 (0.58-0.62); LR3 0.74 (0.70-0.80); BR 3.8 (3.2-4.4), i.e. short beard.

No indication of setae on TIX. Hypopygium with anal point extremely and unusually wide and sickle-shaped in lateral view; SVo possibly E-type (h) of Strenzke (1959); IVo reaching about to tip of anal point and a third along the gonostylus, with 18 simple recurved setae. Gonostylus moderately swollen and sharply constricted over distal third and with 6 setae at distal end.

Female. pupa, larva and cytology unknown.

Found: JAPAN - Type locality – Kechi Dam, Mitsushima, and Nita Dam, Kamiagata, both Tsushima Island, Nagasaki Prefecture, Kyushu,. [Holotype: male, 355:018 (NSMT-I-Dip 5166); paratypes: males, No. 355:95, 374:57].

***Chironomus uttarpradeshensis* Singh & Kulshrestha 1976**

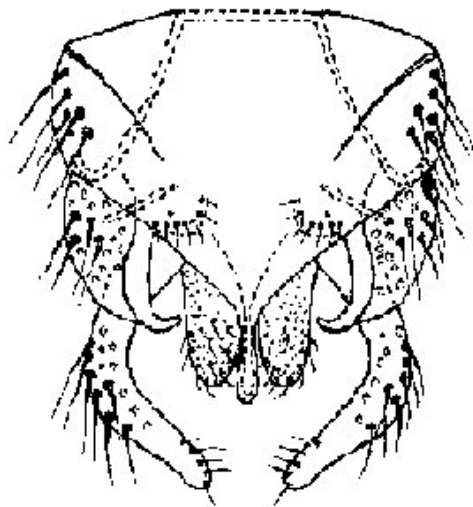
Redescribed by Maheshwari, 1989, who notes that the original description actually described the female of *C. bharati* by mistake.

Adult:

Male: Body length 5.29 (5.19-5.40) mm. Yellowish brown, tibial apex black, abdominal terga II-V with black marking. Hypopygium light-brown. Wing length 2.80 mm; VR 1.09. Head – AR 2.6; FT 41.5 µm; palp proportions 14 : 13 : 33 : 20 : 40 ; P5/P4 2.0, P5/P3 1.21.

Leg lengths (microns) and proportions:

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	Ta5/Ti
PI	1080	960	1590	840	600	450	240	1.63	1.13	0.25
PII	1240	1140	670	380	270	190	140	0.63	1.09	
PIII	1380	1440	1030	600	480	290	170	0.72	0.96	



Male hypopygium of *C. uttarpradeshensis* (Maheshwari, 1989)

Anal point rounded, 97 µm long and reaching beyond the IVo. Gonostylus curved and only moderately swollen, narrowing gently over about posterior third, with four setae at tip. SVo sickle shaped, closest to E(h) of Strenzke 1959. IVo with 13-17 recurved setae (although shown as directed posteriorly). No setae shown on TIX.

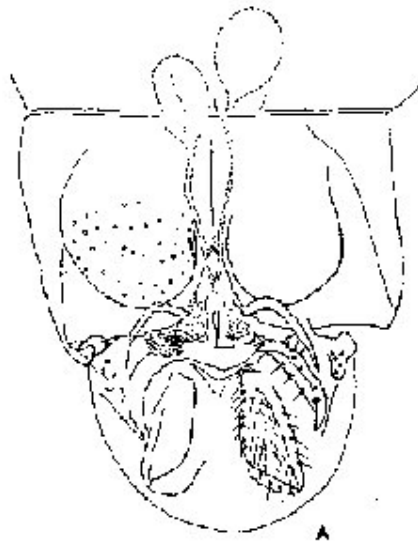
Female: Colour similar to male but marking on abdominal tergites less conspicuous.

Head: FT smaller than in male. Antennal proportions 22 : 7 : 7 : 8 : 14, AR 0.32, A5/A1 0.64.

Wing length 3.72 mm, slightly wider than in male; VR 1.10.

Legs as in males, lengths (micron) and proportions:

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	Ta4/Ti
PI	1320	1260	2040	990	840	660	280	1.60	1.67	0.52
PII	1440	1500	840	460	360	200	170	0.56	0.96	
PIII	1680	1800	1320	720	500	310	190	0.73	0.93	



Female genitalia of *C. uttarpradeshensis* (Madeshwari, 1989)

Genitalia as in figure above. GCIX with 2-3 setae; segment X with 11-12 setae. Cerci shown as long and narrow, widest posteriorly; dorsal surface longer and coming to an acute angle at posterior end, which merges into the ventral surface.

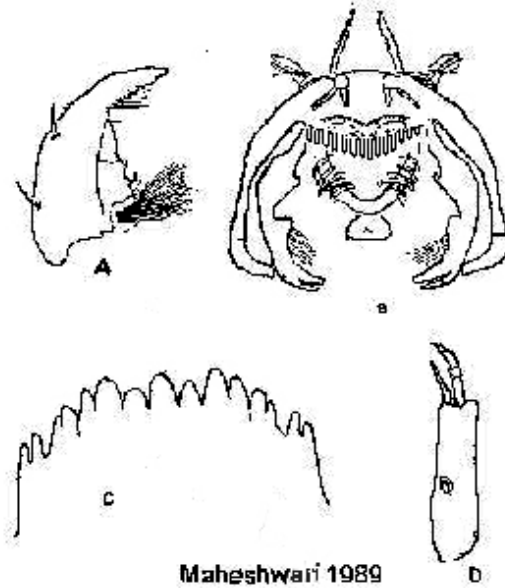
Pupa: Body length 5.00-5.40 mm; abdomen pale brown. Respiratory organ with four branches; anterior trunk larger than posterior trunk. TII (not TIII as stated) with a row of hooklets (not counted), spur of segment VIII with two pointed spines.

Fourth instar larva: length 9.00-9.84 mm; VT present, but no details; head capsule with a pair of dorsocentral stripes originating from the median strip; length 0.57 mm and width 0.46 mm. PE with single row of teeth, figure shows 11 teeth of type B.

Mentum shown as type I-II, but 4th lateral very closely attached to 5th laterals and separated from 6th laterals, central tooth appears to be type IIA.

RO in basal half of A1, 25 µm up from base; antennal blade reaching apex of A4; A3 smaller than A4, A5 smallest, AR 1.83.

Mandible triangular, appears 4th inner tooth about type I; no mention of presence of furrows or of the number of taeniae in the PecM. Premandible with 2 teeth, inner tooth shown about 4x wider, possibly Ty. B2.



Maheshwari 1989
Larval mouthparts of *C. uttarpradeshensis*: a. Mandible;
b. Labrum; c. Mentum; d. Antenna

Cytology: not known.

Found: INDIA - Type locality – Khanari Agricultural Farm, Agra, Uttar Pradesh.

Larvae in mud and coarse sand at bottom of water tanks and other lentic waterbodies.

***Chironomus viridiventris* Kieffer 1911F**

Described on the basis of the adult male and female.
Classified as uncertain Chironomini by Sublette and Sublette 1943

Found: BURMA - Type locality – Mandalay.

***Chironomus brevistylus* Guha et al. 1985**

Adult:

Male:

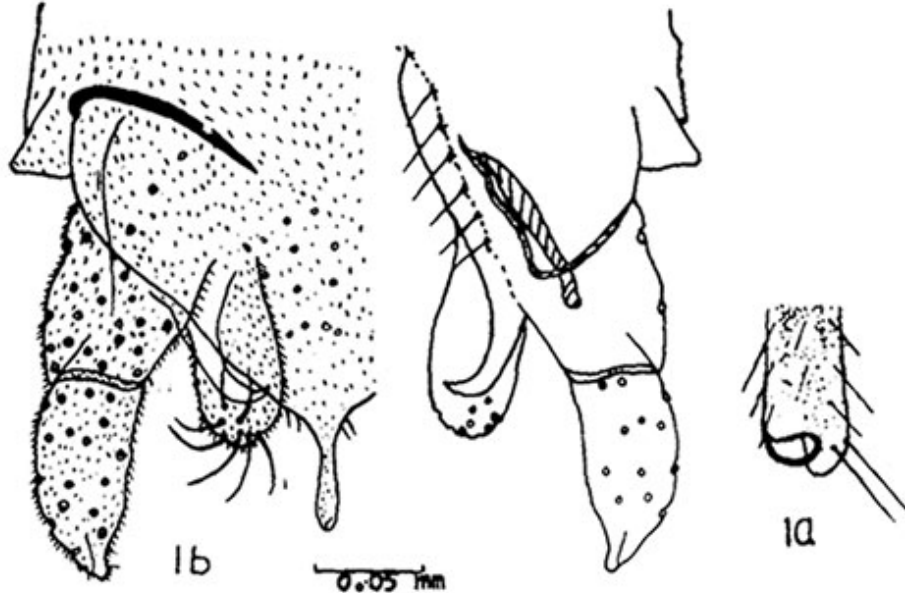
Body length 4.73 mm, wing length 2.1 mm, wing width 0.57 mm. Antenna missing. Head yellow; vertex with 11 setae. 20 clypeal setae, clypeal ratio 1.2. Maxillary palp brown, ratio of segments: 10 : 11 : 40 ; 50 ; 64; P5/P4 1.11; P5/P3 1.60. Frontal tubercles well developed. CA 0.68, CP 1.15.

Thorax yellow, antepnotum collar-like without v-shaped emargination; postnotum yellow and bare.

Setae: 2 acrostichals; 9 dorsocentrals, 4 prealars, 10 scutellar.

Wing: 2 Scf on brachiolum, 13 setae in squamal fringe. Dark spot on fCu. CR 0.97; VR 1.05.

Femur and tibia of all legs yellow, tarsomeres of fore and hind legs missing from type, TI-III of midleg with apical brown band, rest brown, LR1 2.1; LR2, 0.68; LR3 0.64. Ta4 of anterior legs noted as unusually long (from paratypes). Abdomen yellow and terga uniformly setaceous. Anal point slender, narrower at base with apex blunt. Gonocoxite with 16-18 setae; gonostylus short and stout, coming to a narrow point and with 18 setae. SVo closest to E-type of Strenzke (1959); IVo short and wide, extending barely past the base of the anal point and the gonostylus, shown with simple setae. HR 1.3; HV 4.27.



From Guha et al. 1985

Female: Body length 4.07 mm, wing length 2.07 mm, width 0.66 mm. Femur and tibia brown, TI-III with brown apical band, rest of all legs brown. Antenna pale, Seg. V longest and brown, ratio of flagellomeres I-V: 9 : 7 : 7 : 8 : 12. AR 0.26; A5/A1 1.33. Genitalia: Notum 0.15 mm. Coxosternapodeme incurved. Gonapophysis VIII divided into a broad posteriorly directed dorsomesal lobe, hooked ventral lobe and needle-like apodeme lobe. Gonocoxite IX with 4 setae on each side. Postgenital plate protruded and pointed at apex. Seminal capsules oval, measuring 0.06 mm by 0.039 mm, ducts bent and open separately.

Notes some similarity to *C. javanus* in coloration, and to *C. vitellinus* in the characters of the hypopygium.

Found: INDIA - Type locality – Holotype male: (no. 129, B.U. Ent.).

Allotype 9, data as holotype, paratypes 2 males, 2 females, collected same locality.

***Chironomus yangtzensis* Hongtsu**

Known from adult male (single specimen?)

Only type locality available:

Found: China - Type locality – Chenjia Lake, Jiangxi

***Chironomus inermifrons* (Kieffer 1916)**

Currently a nomen dubium but could be a valid species if adult males were identified.

Smaller than the European '*C. inermifrons*' sensu Goetghebuer 1921

Male: Not known.

Female: Reddish brown. Frontal lobes (i.e. FT) absent. Antennae with 6 segments, the last slightly darkened; second segment weakly narrowed in the middle; short collar; 3-5 flask-shaped; long collar, more than twice as long as wide; vertex with 6-8 very long hairs; sensory organs scarcely larger than the hairs of the vertices; 6th segment scarcely more pointed than the preceding ones, cylindrical, gradually tapering to a point in the distal third, twice as long as the 5th; long distal sole (?) and fairly long and numerous sensory organs. Mesonotum whitish, with three shortened, shiny black bands. Metanotum dark brown. Halteres white.

Wings hyaline; cross vein no darker than the other veins; bifurcation of the postical vein markedly distal to the cross vein.

Legs whitish, last tarsal segments darkened, anterior metatarsus almost half longer than the tibia (i.e. LR about 1.5), the latter scarcely shorter than the femur, tarsal segments 2-4 gradually and very slightly shortened, pulvili broad. Abdomen a light brownish, compressed and slightly arched.

Length 3 mm.

Found: FORMOSA. Type locality – Tainan (abt 23.0°N, 120.0°E), (Taiwan).

Anping, Formosa

Specimens destroyed in fire

***Chironomus formosae* Kieffer 1912B (as *Tendipes*)**

A species of *Chironomus* – Sublette & Sublette 1973B, 402

The original description is rather poor (and I have not been able to obtain a copy), but Sublette and Sublette reviewed the specimens and considered that this was a species of *Chironomus*.

Found: FORMOSA. Type locality – Taiwan

***Chironomus formosicola* Kieffer 1912B (as *Tendipes*)**

Original description poor but not seen.

Uncertain Chironomini - Sublette & Sublette 1973B, 412.

Found: FORMOSA. Type locality – Taiwan

***Chironomus enteromorphae* Tokunaga 1936**

A species of *Dicrotendipes* – Yamamoto (unpublished)

Male, female, pupa and larva all described, as well as a variety *pacifica*
Original descriptions not seen but make it clear that it is not a species of *Chironomus*,
but rather a species of *Dicrotendipes* (Yamamoto, unpublished).
Variety *pacificus* is from rock tide pools. Differs slightly in the structure of the
hypopygium, wing venation, LR and palp proportions.

Found: JAPAN Type locality – Seto, Wakayama Prefecture, (pools with green alga
Enteromorpha intestinalis); var. *pacifica* from rock tide pools.

Specimens in the Entomological laboratory of Kyoto Imperial University.

***Chironomus kagaensis* Sasa 1994**

Junior synonym of *Glyptotendipes* (*Glyptotendipes*) *tokunagai* Sasa & Kawai 1979
(Yamamoto & Yamamoto 2018, p.521)

Male

Body entirely dark brown, frontal tubercles minute, fore tarsi not bearded.
Abdominal tergites II-VI each with a median scar-like appearance.

Found: JAPAN Type locality – Ishikawa Pref., Yamashiro Spa, holotype ♂ of *Chironomus*
kagaensis, 11. vii. 1991, M. Sasa [specimen No. 227:55 (NSMT-I-Dip-4858)];
paratypes 5♂♂, as previous except specimens No. (227:56-60).

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

Redescribed from Japan by Yamamoto 1987 as *Chaetolabis macani* and type of the
genus *Chaetolabis* Townes.

The elevation of *Chaetolabis* to generic status has not been generally accepted.

It is also uncertain if the Japanese material is conspecific with the European material
in the absence of cytological or DNA data, due to the lack of a beard in the Japanese
specimens.

Chironomus macani Freeman 1948

Einfeldia macani Thienemann 1954

Einfeldia macani Pinder 1978

Chironomus macani Lindeberg & Wiederholm 1979

Chironomus macani Wiederholm 1979

Adults

Male:

Length 7.0-8.5 mm. Head brown, antennal pedicel dark brown, flagellum brown.
Head: AR 4.44 (4.12-4.67). FT 15-32.5 µm x 7.7-10.0 µm, 2-3.3 times longer than
wide. Palpal segments (micron) 75 : 98 : 325 : 340 ; 475; P5/P4 1.40; P5/P3 1.46.

Thorax with antepnotum yellowish green; mesonotum pale green to yellowish-green; scutellum green, postnotum dark brown, scutum with distinct dark brown vittae, median one with a pale brownish yellow median line, scutellum green, postnotum dark brown.

Legs predominantly pale brownish yellow, darkened on tarsi and tip of femur and tibia of foreleg.

Wings hyaline, slightly tinged with grey; length 4.3-4.7 mm; width 1.1-1.3 mm; VR 0.95 (0.94-0.95); 26-35 setae on squamal fringe.

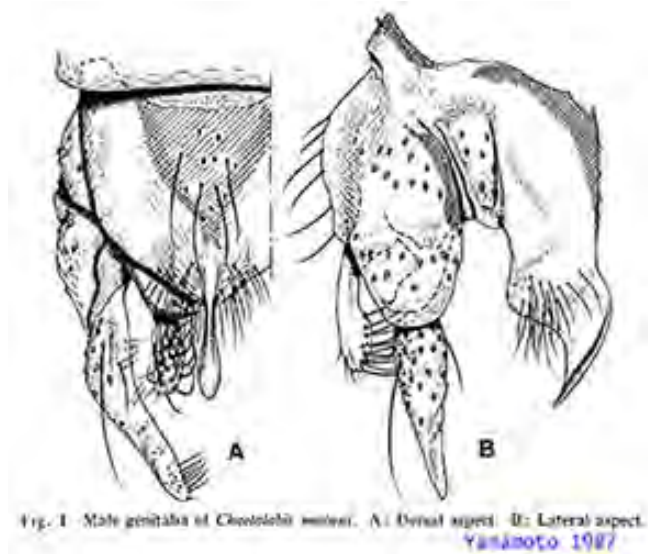
Thoracic setae: 16 acrostichals; 32-38 dorsocentral; 1 supra alar; 7-10 prealars; 41-51 scutellars.

Leg lengths (micron) and proportions:

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	Ta5/Ti
PI	2060	1770	2450	1300	1030	920	430	1.36-1.41	1.16	0.24
PII	2160	1960	1230	730	540	350	240	0.62-0.64	1.10	
PIII	2310	2400	1710	1020	730	440	260	0.71-0.72	0.96	

Males lack tarsal beard of European specimens.

Abdomen pale (greenish) with a relatively broad brown band about the middle of segments II-V, then covering most of the following segments.



TIX with 12-19 setae, some in individual spots, others with 2-3 setae in a single spot. Anal point long and slender, expanded in distal half; SVo long and slender, perhaps S (C)-type of Strenzke (1959). IVo reaching to end of anal point with apical 1/3 produced dorsally and with 26-28 long setae. Gonostylus long and slender, narrowing from about mid-point and with 6-9 short apical setae.

Female:

Length 6.5-7.5 mm. Coloration about as in male. Antennal pedicel orange yellow to brown; antenna orange yellow with last flagellomere dark brown.

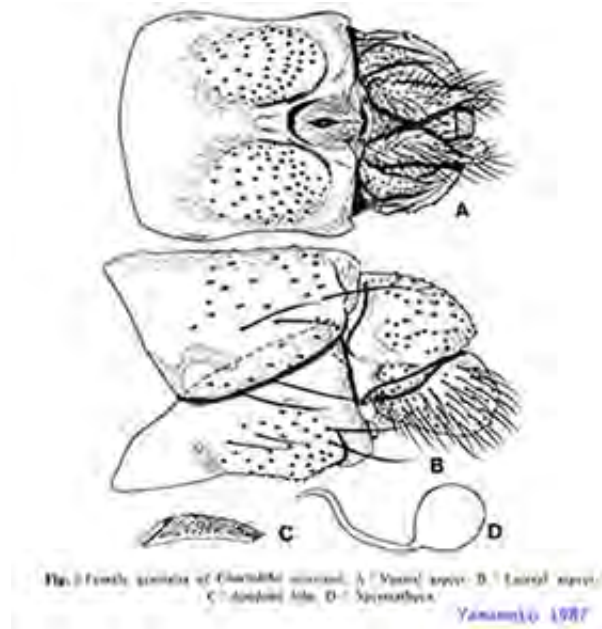
Wing length 4.2-5.1 mm; width 1.3-1.5 mm. VR 0.89-0.91.

Antennal proportions (µm): 232 : 158 : 168 : 140 : 288. AR 0.41. A5/A1 1.09-1.24.

Thoracic setae: 20-30 acrostichals; 38-54 dorsocentrals (including humerals); supra alar 1; prealars 8-10; scutellars 51-88.

Leg lengths (micron) and proportions:

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	Ta4/Ti
PI	2140	1820	2600	1280	410	970	460	1.36-1.46	1.18	0.53
PII	2230	2030	1200	670	480	330	240	0.58-0.60	1.10	
PIII	2730	2440	2160	960	690	410	280	0.69-0.72	1.12	



TX, with 17-20 setae, shown as only slightly down-turned at the ends. Cercus comparatively large, margin rounded, dorsal surface shorter than ventral margin which has a slight basal bulge.

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

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

Syn. of *Chironomus yoshimatsui* Martin & Sublette 1972 – Yamamoto & Yamamoto 2018

Adult

Male:

Body entirely dark brown, frontal tubercles minute, fore tarsi not bearded. Yamamoto & Yamamoto (2018) state that the diagnostic features of *C. echizensis* are fully consistent with those of *C. yoshimatsui*.

Found: JAPAN. – Yamashiro Spa, Ishikawa Pref. (Type locality) Type specimen No. 227:061 (NSMT-I-Dip-4859).

Subgenus *Lobochironomus*

This name was validated in 1985. However, Martin Spies has clarified that this name is synonymous with *Trichotendipes* Guha *et al.*, which was also validated in 1985. It is not clear which has precedence.

***Chironomus (Lobochironomus) arcuta* (Majumdar & Mazumdar 2008)**

Originally described as a species in *Einfeldia*, but Martin Spies (pers. comm.) says it better fits as *Lobochironomus*. Described on the basis of the adult male, pupae and larvae. However, the described larva is not a *Chironomus* species and would be considered as contaminants if some paratype specimens had not been reared from egg masses (another explanation could be that they may be erroneously included in place of the true larvae). The holotype male, however, was collected separately about 10 months before those reared from egg masses and so has no direct association with the described larvae.

Adults

Males: from original description:

Body length 5.2 (4.8-5.8) mm. Wing length 2.37 (2.2-2.6) mm.

AR 2.8 (2.5-3.2). Anterior LR not given. mid 0.61, hind 0.63.

Thoracic setae: 20-25 acrostichals; 10-12 dorsocentrals, uniserial; scutellars 20 (18-20), irregular.

Wing without conspicuous markings, crossvein barely darkened.

Fore tibia a little dark at the base.

Anal tergite bands weak, anal point broadened at base; IVo reaching just beyond the end of the anal point and to base of the gonostylus which is swollen but reduces evenly over about the distal third. The IVo is stated to be ‘bow-shaped’ and is source of the specific name.

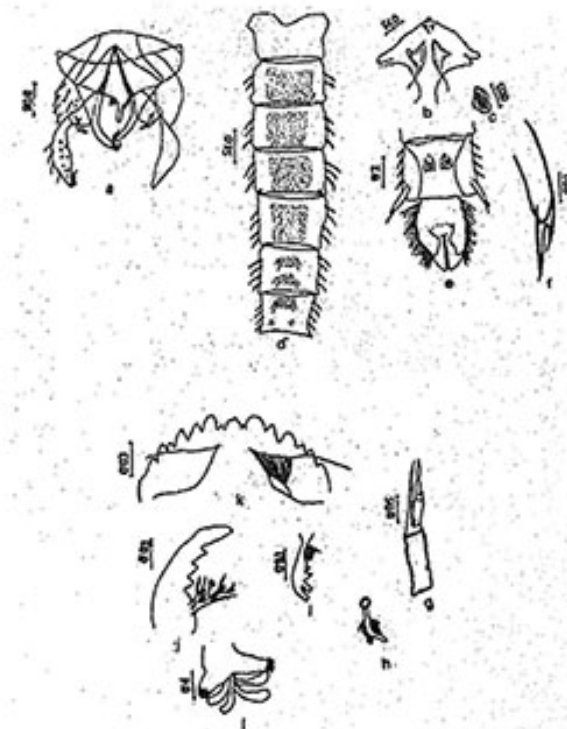


Fig. 1. Structural parts of *Einfeldia arcuta* sp.n. male hypopygium (a), pupa (b-f) and larva (g-l).

from Majumdar & Mazumdar (2008)

Pupa: Typical *Chironomus*. Body length 8.3 (7.6-9.2) mm; segments VI-VII and anal spur brown. Frontal apotome without frontal warts; cephalic tubercles broad and blunt. Abdomen (Fig. 1,d): Tergite I bare, II-V with dense middle shagreen, tergite VI also with similar interrupted shagreen, tergite VII with a patch of basal and indistinct distal shagreen, tergite VIII (Fig. 1,e) with a pair of lateral patches of shagreen with 2 setae, hook row of seg. II with 45-50 hooklets. Anal spurs each with 1 long and 1 short sharp teeth. Anal lobe with 50-60 setae on each side.

Fourth instar larva: Clearly not *Chironomus*, perhaps wrong dataset chosen ?

Body length and coloration of the head capsule are not given. One pair of ventral tubules; anal tubules noted as more or less spatulate.

Mentum 176 (162-192) μm wide, apparently with 4th laterals reduced (Ty. 2), central tooth apparently trifold. Ventromental plates 256 (240-272) μm wide, dorsal margin smooth, separated medially by their width – however the inner margin is shown to slope forward (Fig. 1k), while in *Chironomus* it is turned down.

Platelets of PE in two rows.

Ratio of antennal segments (%): 60 : 24 : 16 : 20 : 12, AR 0.83 (although given as 1.2);

A1/A2 2.5; A4/A3 1.25; A5/A3 0.75; blade extends beyond segment IV.

Premandible 28 μm long with 1 apical and 3 inner teeth, but narrow, unlike those of *C. javanus* or *Kiefferulus* spp.

Mandible 264 (240-288) μm long, illustrated as quite narrow (Fig. 1j), with 1 apical and 3 indistinct inner teeth. This is also unusual for a *Chironomus* larva.

The mandible, ventromental plates and premandible show similarity to some *Harnischia* species.

Found: INDIA – Darjeeling, West Bengal (Type locality); Ziro, Arunchal (2 paratype males).

It seems highly likely that at least the figure of the larva is from a different, non-*Chironomus*, species.

***Chironomus (Lobochironomus) insulus* (Guha et al. 1985)**

Originally *Trichotendipes insulus* and type species of that genus. It is not certain whether *Lobochironomus* or *Trichotendipes* has precedence as both were validated in 1985.

Adults

Males: from original description

Body length 3.36 mm, wing length 1.66 mm., width 0.48 mm. AR 2.43.

Head brown. Vertex 14 (inner verticals 3, outer verticals 11 and postocular 3) setae. 11 clypeal setae, clypeal ratio 0.91. Maxillary palp brown, segment ratios 10 : 9 : 35 : 41 : 56, P5/P4 1.37, P5/P3 1.60.

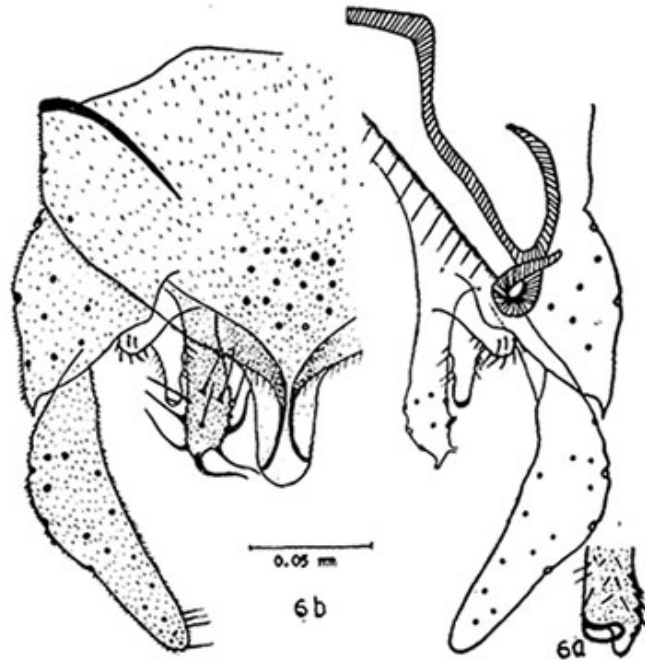
Thorax: Acrostichals 8, dorsocentrals 7, prealar 4, scutellar 14; postscutellum light brown and bare.

Wing: 2 Scf on brachiolium, 10 setae on squamal fringe; r-m distinct and proximal to f-cu, VR 1.08. Haltere yellow.

Legs yellow. Fore LR 1.56, Mid LR 0.75, Hind LR 0.83.

Abdomen pale, and terga uniformly setaceous. TIX with 16-17 setae - not shown in a pale patch, but with individual spots.

Anal point stout rounded with a dorsal crest; SVo perhaps D-type of Strenzke (1959), or horn-like as *C. ocellatus*, reaching about 2/3 along the IVo which is shown with simple setae and reaching about to tip of the anal point. Gonocoxite narrowed distally bearing a sharp point; gonostylus moderately swollen and narrows gently over distal third with 3+1 setae at tip.



Guha et al. 1985

Females – Not known.

Pupa & Larva – Not known.

Found: INDIA. **Type locality:** South Andaman, Wright Myo (6.23°N, 92.67°E).

***Chironomus (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, FT cylindrical and pubescent; antennae with scape dark brown, other segments pale grey. Palp proportions (segs. 2-5) 5 : 20 : 20 : 23, P5/P4 & P5/P3 1.15.

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 tarsi 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, with about 6+1 setae at tip. SVo horn-like with a large basal lobe covered with minute setae and 2 or 3 long marginal setae (D-type of Strenzke 1959, as C); IVo long, about halfway along gonostylus, and somewhat expanded apically with more than 20 curved but apparently simple, dorsal setae.

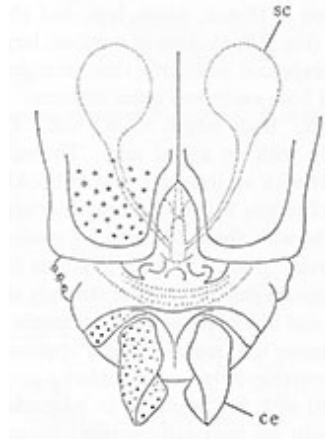


Hypopygium of *C. ocellatus* from Yamamoto *et al.* (2015)

Female: Body length 5.0-6.5 mm. FT 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; TX with about 10 setae; cercus large and nearly trapezoid in lateral view, ventral margin with a slight basal bulge; marginally dark brown, covered with numerous setae on both inner and outer surfaces.

TX, with 17-20 setae, shown as only slightly down-turned at the ends.



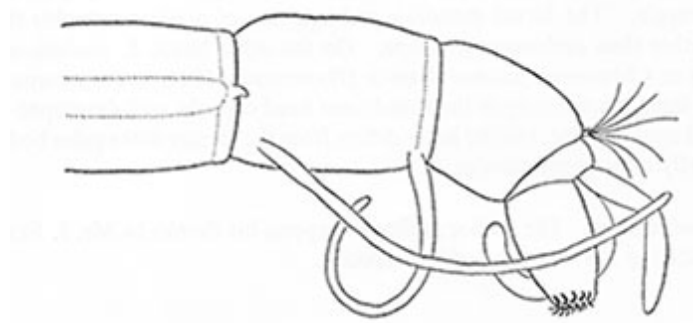
Female terminalia of *C. ocellatus* (Hashimoto 1985)

Pupa: (from Hashimoto 1985)

Body length 5.5-6.5 mm.

Cephalic 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 (Yamamoto *et al.* 2015 class it as ‘anthracinus-type’), 11-13 mm in length. Hashimoto’s drawing shows the lateral projections as quite short, while Yamamoto *et al.* (2015) show them relatively longer. VT long, anterior pair very long and dragging caudad in living specimens, much longer than the at least partially coiled posterior pair. AT long, longer than length of posterior prolegs, and probably with a median constriction.



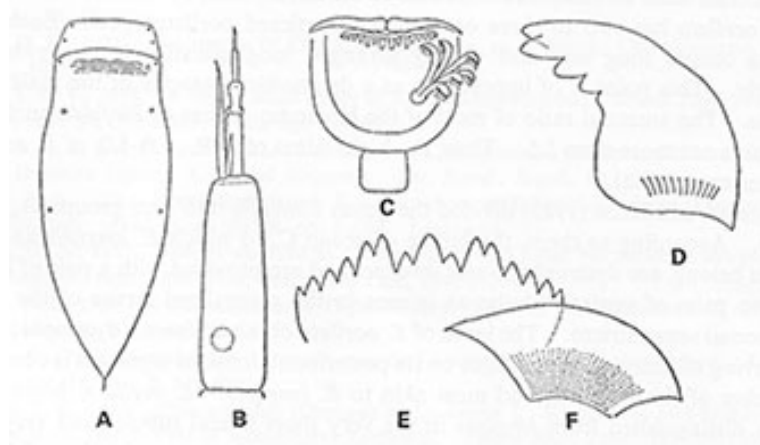
Posterior segments of *C. ocellatus* larva (Hashimoto 1985)

Head capsule pale brown, only the postoccipital margin strongly chitinised, thick and black, with TO narrow and small. Frontal apotome (A, below) 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 (B, below) with 5 segments in proportions: 23 : 7 : 3 : 3 : 2; A1 about 3 times longer than wide; AR about 1.53. Segment 1 with RO in proximal third, antennal blade long, extending beyond middle of segment IV.

Mentum (E, below) with 15 teeth, central tooth essentially type IB, fourth lateral reduced sometimes almost to level of fifth lateral (type I-II).

Ventromentum (F, below) about 3 times longer than deep and 1.08 times the width of the mentum, VMR shown as about 0.45.

PE (C, below) with about 16 teeth, but not noted whether there are smaller interstitial teeth. Mandible (D, below) claimed to have only 3 inner black teeth, although the figure suggests there may be a poorly separated and pale fourth inner tooth (i.e. type IA); about 12 furrows shown near the base; Pecten mandibularis not illustrated.



Larval mouthparts of *L. ocellatus* from Hashimoto 1985

Cytology: Not known, but if *Lobochironomus* it is likely to be in the thummi-cyto-complex.

The actual placement of this species is uncertain due to the loss of the types, combined with a diversity of views concerning the distinctive characters of this subgenus.

Found: JAPAN. **Type locality:** Komadorinoike, Senmaidake, Shizuoka Prefecture.

Types apparently discarded.

***Chironomus uncinus* Konar 2018**

This is not a species of *Chironomus* and it appears to be a species of *Kiefferulus* related to *K. inciderus* Chattopadhyay & Chaudhuri 1991; i.e. *K. uncinus* (Konar 2018)

Adult:

Male: Length 4.16-4.30 mm. Wing length 1.92-1.98 mm; 2-3 Scf on brachiolum; 9-11 in squamal fringe. VR 1.02-1.03. LR not given.

Color: Golden brown, pedicel light brown; maxillary palp light yellow. Legs brownish towards apices; hypopygium light brown.

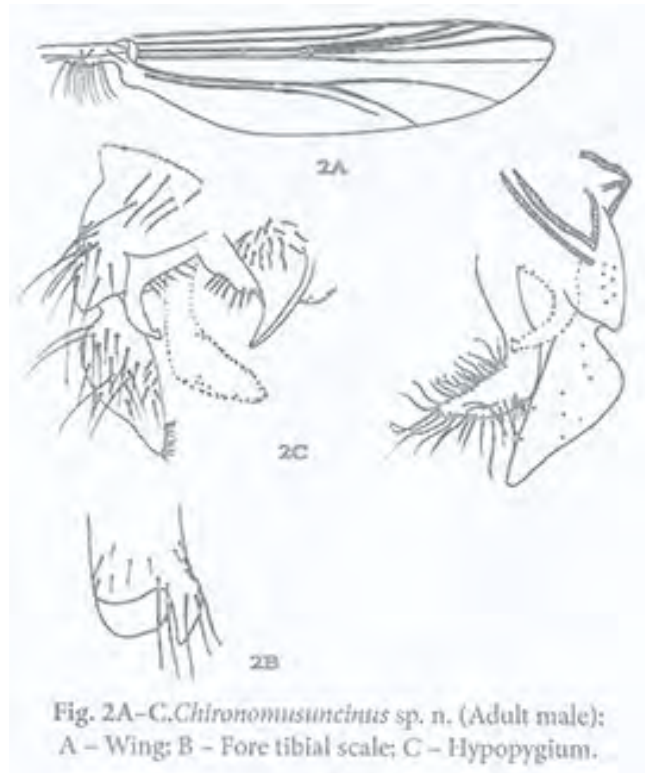
AR 2.28-2.97. Clypeus with 20-22 setae on each side (i.e. 40-44 setae in total?)

Palp segments (µm) 9-10 ; 9-10 ; 17-18 ; 25-26 ; 27-28; P5/P4 1.04-1.12; P5/P3 1.56-1.65.

Thoracic setae: 10-12 acrostichals; 7-9 dorsocentrals; 3-4 prealars; 4-5 scutellars.

Leg lengths (µm?) and proportions:

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	BR
PI	57-61	52-54	62-65	40-43	37-40	32-35	16-19	1.19-1.20	2.33-2.40
PII	54-57	52-55	25-27	20-23	15-18	10-13	9-11	0.48-0.49	1.25-1.32
PIII	61-64	64-68	38-40	25-29	23-25	15-19	9-13	0.58-0.59	3.66-3.70



Adult characters of *K. uncinus* (Konar 2018)

Anal point broad basally, pointed towards apex, with 6-8 basolateral setae. Anal tergite band V-shaped with 15-18 setae. Gonocoxite with 17-20 setae. Gonostylus stout, bulbous with 9-10 setae on inner apex. SVo perhaps closest to E-type of Strenzke (1959): IVo extending well beyond the anal point, with long apparently simple (not recurved) setae. HR 1.10-1.11; HV 1.92-1.95.

Female, pupa and larva: Unknown.

Found: – INDIA. **Type locality:** Kaligram, Burdwan, West Bengal.

***Einfeldia kanazawai* Yamamoto 1996**

Yamamoto *et al.* (2015) provided further information and transferred it to *Chironomus* and suggested 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: AR 2.81 (2.61-3.06).

Head, including antennal pedicel and mouthparts, dark brown. Antepnotum, postnotum and scutellum yellowish white (ground color), vittae brown, postnotum dark brown. Legs yellowish white, tarsi somewhat infuscated, front tarsi broken. Wings hyaline, crossvein slightly darkened. Haltere yellowish white. Abdomen including genitalia uniformly dark brown.

Head: FT linear, 20 µm long, 10 µm wide. Palpal proportions (micron): 60 : 40 : 170 : 180 : 270:P5/P4 1.5. P5/P3 1.6. 15 clypeal setae, 27 setae on vertex.

Thorax with a prominent median tubercle; Setae – 16 acrostichal; 12 dorsolaterals; 5 prealars; 1 supraalar and 17 scutellar in two rows.

Leg lengths (µm) and proportions (means):

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T
PI	1313	798	1620	850	678	740	293	1.84-2.15	1.59-1.66
PII	1225	1010	725	368	263	168	115	0.70-0.79	1.20-1.22
PIII	1330	1230	990	497	367	230	133	0.80-0.84	1.01-1.08

TIX with about 14 setae in a single pale area, although setae may be in individual spots within that area.



Hypopygium of *E. kanazawai* from Yamamoto (1996)

Anal point broad, narrowing slightly at distal end. SVo closest to S-type of Strenzke (1959). IVo expanded at tip, with some bifid setae, not reaching the end of the anal point, but to about a third of gonostylus. Gonostylus moderately swollen and narrows markedly at about half to two thirds of its length, 1+5 setae at tip.

Female: Total length 3.4-5.6 mm. Wing length 2.6 (2.0-2.9) mm, width 0.7 (0.6-0.9) mm. Coloration as in male.

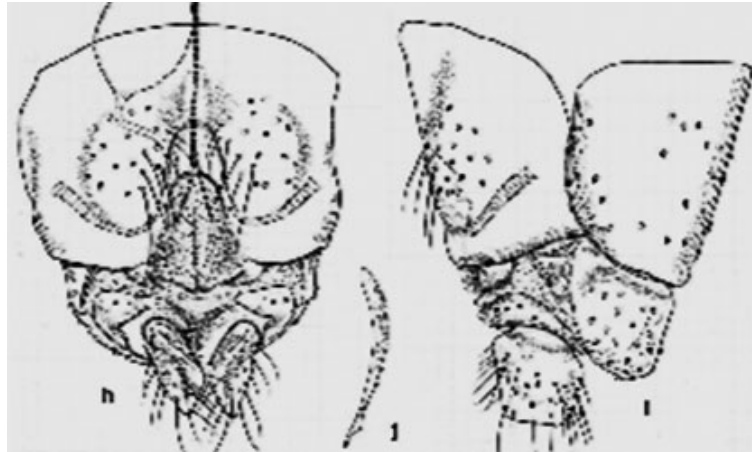
Head: Antenna (µm): 163 : 110 : 119 : 110 : 219, AR - 0.44, A5/A1 - 1.34.

Palps (µm) 50 : 60 : 176 : 213 : 310; P5/P4 - 1.46; P5/P3 – 1.76. Clypeus with 21-33 setae.

Thoracic setae: 10-19 acrostichals; 16-20 dorsocentrals partially biserial (no humerals shown); 3-8 prealars; 1 supraalar; 16-29 scutellars, partially triserial.

Leg lengths (µm) and proportions:

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	Ta4/Ti
PI	1507	930	1953	1000	807	1007	390	1.84-2.15	1.62	1.08
PII	1370	1180	807	393	267	180	130	0.67-0.71	1.16	
PIII	1500	1373	1090	535	395	255	160	0.76-0.82	1.09	



Female genitalia of *E. kanazawai* from Yamamoto *et al.* (2015)

Segment X about 2.3 times longer than its greatest width, with 4-10 setae. Gonostylus approximately rectangular with a slight bulge on dorsal margin and a larger one on the ventral margin, at the base.

Pupa, Fourth instar larva and Cytology: not known.

A characteristic of this species is the very long anterior Ta4 of both sexes.

Found: JAPAN. Type locality – Kampira, Iriomotejima Is., Ryukyus.

other localities – Honshu; Kyushu; Nago City, Kunen-mata; Kochi; Kunigami-son, Aha, Okinawa Island.

Holotype deposited in collection of the Osaka Museum of Natural History

***Einfeldia pagana* (Meigen 1838)**

Originally *Chironomus paganus*

Synonym: *Einfeldia synchrona* Oliver, 1971 (Oliver *et al.* 1990)

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.

Einfeldia pagana is claimed to be a Holarctic species. 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).

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 suggest that it is actually a specimen of *Benthalia* sp.3 See 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). Sasa and Suzuki (2001) provided a further description in English. Some information on the larvae is given by Yamamoto *et al.* (2015), but for the pupa, descriptions of European material must be used.

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: FT 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; P5/P4 1.33; P5/P3 0.96.

Anteprepronotum distinctly divided at middle by a conspicuous V-shaped notch, scutal tubercle indistinct, acrostichals normally developed.

Thoracic setae: acrostichals 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
PI	1530	1290	2000	1080	810	620	300	1.52-1.63	1.18	0.23
PII	1560	1460	890	550	420	300	210	0.58-0.63	1.07	
PIII	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 anteprepronotum 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. FT 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)

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	Ta4/Ti
PI	1590	1270	2020	1040	790	600	300	1.45-1.63	1.25	0.47
PII	1640	1460	860	520	390	280	210	0.57-0.62	1.12	
PIII	1650	1790	1150	700	540	340	320	0.62-0.66	0.92	

(These values are essentially as for males)

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 - sex of exuviae not stated but likely includes both males (smaller specimens with larger cephalic tubercles) and females (larger specimens with smaller cephalic tubercles):

Length of exuvia 7.5-9.0 mm. Cephalic tubercles large, conical, curved, 145-190 μm long and 120-155 μm wide (in males about 3 times longer than width at base; in females about as long as width at base).

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 on a short base that does not exceed the margin of the segment. Fringe of anal lobe with 63-86 taeniae.

Fourth instar larva: In 2006, Yamamoto published some brief notes on the larva:

One pair of ventral tubules, antepnotum distinctly divided at middle by a conspicuous V-shaped notch, scutal tubercle indistinct, acrostichals normally developed. In 2015, Yamamoto *et al.* further noted the large oblong fenestra in the frontoclypeal apodome, 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.

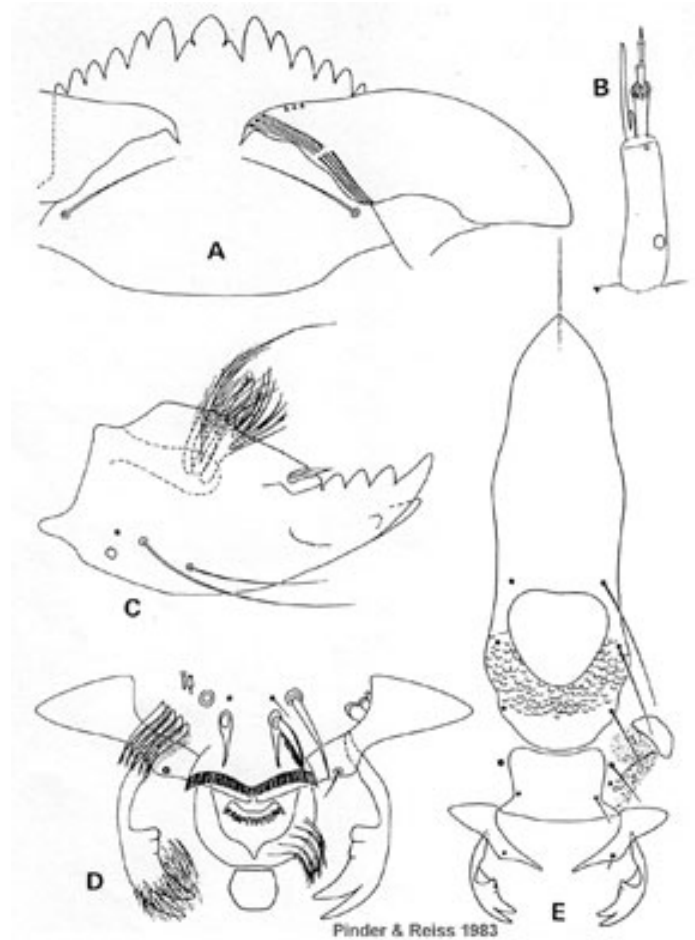
Mentum with pointed teeth apart from central tooth which may be worn in the available specimen, c2 teeth little more than notches (type I); 4th laterals in line with other lateral teeth (type I).

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 = 1.4, about 3.3x as long as wide; A3 relatively long, A4/A3 about 1.2.

Mandible (C, below) with pigmented and clearly separated third inner tooth (type IIIC). No furrows on outer surface near the base. MTR about 0.41.



Larval headparts of European *E. pagana*: A. Mentum, B. Antenna, C. mandible, D. 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 anteppronotum to have a distinct V-shaped notch, while the Holarctic keys indicate that the anteppronotum 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, Honshu; Ouke, Minamidaito Island (abt.25°N, 131°E), Okinawa and Okinawa Island; Kyushu; Lake Hibera, Fukushima; Yoshimi, Shimonoseki (abt 33.9°N, 130.95°E), Yamaguchi Pref.; Okinawa. 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).

Recorded from shallow eutrophic pools.

***Einfeldia pritiensis* Singh & Rawal 2016a**

Singh & Rawal 2016b published a barcode sequence supposedly for this species, but that sequence corresponds to a species in BOLD Bin: [BOLD:ACC5662](#) (see below)

Adult:

Male: (Holotype)

Length 4.5 mm. Wing length 3.4 mm. VR abt 0.91.

Head brown, thorax dark brown, abdomen pale brown.

Wings clear with dark veins.

Leg lengths and proportions (micron):

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	Ta5/Ti
PI	1600	1280	1700	900	800	640	300	1.33	1.25	0.23
PII	1600	1500	700	500	400	280	200	0.47	1.07	
PIII	1700	1700	1100	680	600	380?	200	0.65	1.00	

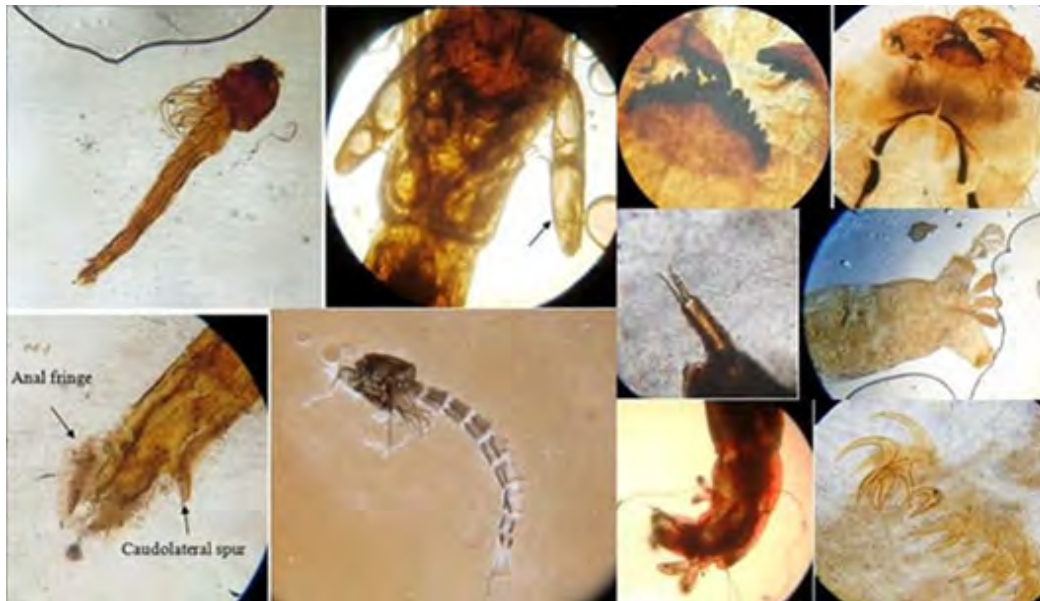
Abdomen tapered. Hypopygium not clear from photograph or drawing. No setae can be seen on tergite IX, anal point narrow, perhaps narrower at base; SVo not described but appears to be long and sickle-shaped, base not visible; IVo long and clubbed, extending about to the sharp narrowing of the gonostylus.



Adult male (left) and female (right) of *E. pritiensis* from Singh & Rawal 2016b.

Female - not described, but small photographs of the whole fly against a ruler (length appears about the same as for the male); the antenna; the seminal capsule (appears shaped like a wine glass); and the ventral posterior segments. The antennal proportions are approximately (units) 12 : 10 : 10.5 : 10 ; 17, AR abt. 0.4; A5/A1 abt 1.42.

Pupa: The pupa is illustrated by four small photographs, but the description is only that for a Chironomini pupa. It appears the thorax is dark brown and the abdomen yellow-brown. The exuvium is relatively dark. There is a well-developed spur on segment VIII, but it is not possible to accurately determine the number of spines, but it may be only one.



Pupa (left) and larva (right) of *E. pritiensis* from Singh & Rawal 2016b.

Fourth instar larva: In their Introduction, Singh & Rawal (2016a) note that they identified their species as an *Einfeldia* from the larval identification manual of Epler (2001), otherwise photographs of the mentum and mandibles; head, antenna, posterior part of larva, ventral tubules and setae on prolegs in Singh & Rawal (2016b). From these it can be determined that there is one pair of ventral tubules, anal gills short, about 2.5 times longer than wide.

Ventral head darkened on posterior half and width greater than the width of the mentum.

Given the identification from Epler, the frontoclypeus presumably has a foramen.

Mentum apparently with 13 teeth although unclear if there are notches on the central tooth, but these can be lost due to wear.

Antenna with 5 segments, blade reaching to end of segment 5; AR perhaps 1.5.

Mandible with three dark teeth and a pale but relatively well separated fourth inner tooth (Ty. I or IIB).

Cytology: No information.

Found: INDIA: Type locality - Udaisagar lake, Udaipur, Rajasthan

Molecular sequence:

Singh & Rawal (2016c) obtained a COI barcode sequence, which they note is very close to *Polypedilum*. In fact it has better than 95% homology to an unnamed *Polypedilum* species in both GenBank and BOLD. The most obvious explanation of this is that their sample contained both *Einfeldia* and *Polypedilum* specimens, and that a *Polypedilum* was accidentally chosen for the DNA extraction. This can be confirmed if there is a voucher available for examination.

This species is not necessarily a new species, as it may have been described from elsewhere. Unfortunately this description is not sufficient to distinguish it from other species, and the inappropriate *COI* sequence does not help.

***Einfeldia sasai* Yamamoto & Yamamoto, 2018**

as new name for *Einfeldia pagana* sensu 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.

FT very small, nearly circular, only 8 μ m in diameter. 12 clypeal setae.

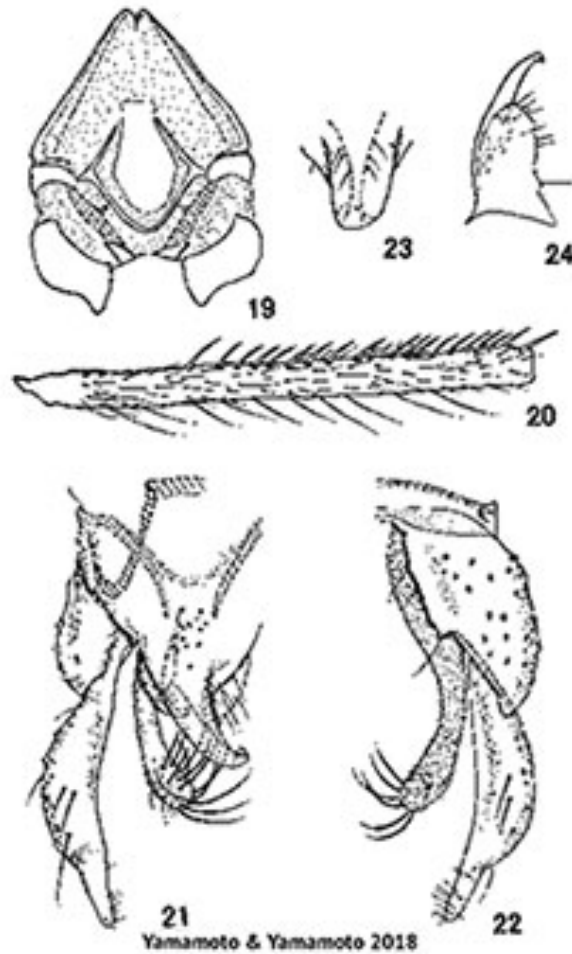
Anteprepronotum slightly separated (Fig. 19, below), without setae.

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.

TIX appears to have about 19 setae scattered around the midline.

Hypopygium as in Figs 21-22, below; anal point (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 (Fig. 24 below), chitinised distal portion arising from outer side of the base, closest to E(h) of Strenzke (1959). IVo (Figs 21 & 22, below) long, finger-like, slightly expanded distally, shown with 28 recurved simple setae on it; illustrations do not show its length in relation to the anal point but extends to about 2/3 along the gonostylus. Gonostylus moderately swollen, reducing markedly over distal quarter.



Einfeldia sasai from Yamamoto and Yamamoto 2018

Female, Pupa and Larva not described.

Found: - JAPAN. – Ouike, Minamidaito (abt.25°N, 131°E), Okinawa Prefecture, Ryukyus (Type locality)

Recorded from shallow eutrophic pools.

Originally identified as *E. pagana* but Yamamoto and Yamamoto (2018) noted this as a misidentification and re-described it as a new species. It can be separated from *E. pagana* by the distributional pattern of the temporal setae on vertex, mid-Ta1 bearing many pseudospurs, the lunate gonostylus with distal 1/4 constricted, the long slender IVo, shown with simple setae, and the sickle shaped SVo.

?*Einfeldia thailandicus* Hashimoto 1981

Yamamoto *et al.* 2015 class this as so-called *Einfeldia*, requiring more study. They report it from Japan and suggest it belongs in the “dissidens-group” – which they consider is actually in the genus *Benthalia*).

Adult:

Male: Body length 4.5-5.0 mm.

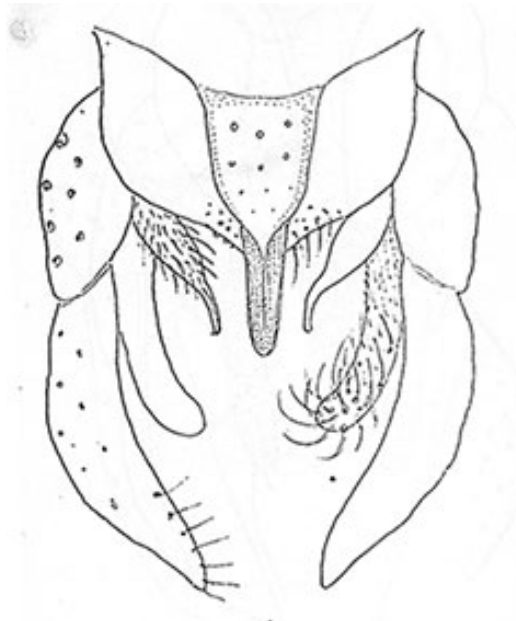
Head: FT vestigial; vertex setae relatively long. AR 2.5-3.5. Relative lengths of palps (segs 2-5) 2 : 7 : 7 : 12; P5/P4 & P5/P3 - 1.71;

Pronotum narrow but not divided. Thoracic vittae pale brownish yellow; median vitta with median longitudinal line slender and black with caudal minute black spots, scutellum white, postnotum brownish on sides.

Fore tarsi broken so LR unknown. Leg segments yellow, tarsal segments 4 and 5 of mid & hind legs somewhat darker.

Wings hyaline, fCu at base of r-m; squama fringed.

Abdomen pale in colour, caudal margin of TI-VI each with darker band with mesal portion broader; tergites VII and VIII with no band. Anal point black, broad but narrowing gently towards the distal end; dististyles moderately broad, narrowing gently to the end; SVo swollen and pubescent at base, bare and forming a hook on distal portion; IVo long and relatively narrow, bending upwards, with recurved apical setae, shown as simple.



Hashimoto's illustration of the male hypopygium

Female, Pupa, Larva and Cytology not described.

Found: THAILAND (Holotype Ban Bangkanark, Chachoengsao Prov.); Ban Chau Sieo, Amphoe San Pa Tong, Chiang Mai Province. Japan (Yamamoto *et al.* 2015)

?*Einfeldia nojiriprima* Sasa

Yamamoto *et al.* 2015 class this as so-called *Einfeldia*, requiring more study – but it may be a species in *Glyptotendipes* (*Heyotendipes*) (Cranston *et al.* 2016). If truly *Einfeldia*, Yamamoto *et al.* (2015) place it in the “pagana-group” of Yamamoto (2006).

Found: JAPAN. Lake Nojiri area, Nagano.

***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, 12th 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:

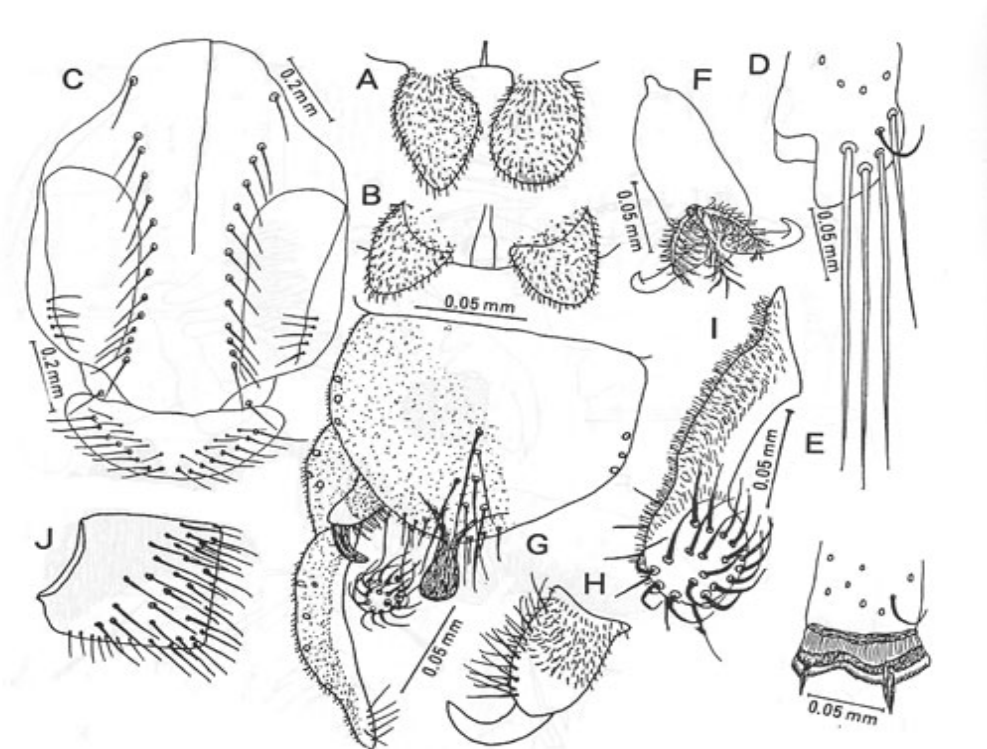
Male: Ground color of dark brown or nearly black, vittae shining black, scutellum dark brown, postnotum black; wings unmarked; femora, tibia and tarsi I of all legs yellow, tarsi II-V brown; abdominal tergites uniformly dark brown or nearly black. Wing length 2.40 (2.23-2.53) mm., 15.8 (13-19) setae in squamal fringe. AR 2.64 (2.60-2.68); Frontal tubercles (fig. A) prominent 48 μ m long and 18 μ m wide.

Thoracic setae: Anteprenotals absent; acrostichals – none; dorsocentrals 15.3 (12-18); prealars 5 (4-7); scutellar 15 (13-19) in two rows – shown with 11 in anterior row and 16 in posterior row (which does not).

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).

Group of abt. 7 longer setae near rear of TIX, forming a narrow triangle with the apex anteriorly. Hypopygium as in figure, SVo (Fig. H) 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, shown as simple (Fig. E).



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 µm long, 32 µm in diameter.

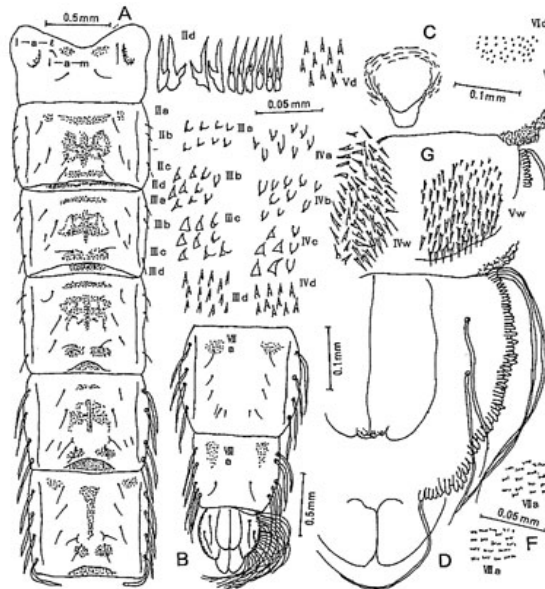
Thoracic setae: Anteprenotals absent; acrostichals – none; dorsocentrals 14-15; prealar – 5; scutellar 18 in two transverse rows.

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 62µm long and 60 µm wide.

Ventral margin narrows anteriorly.

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

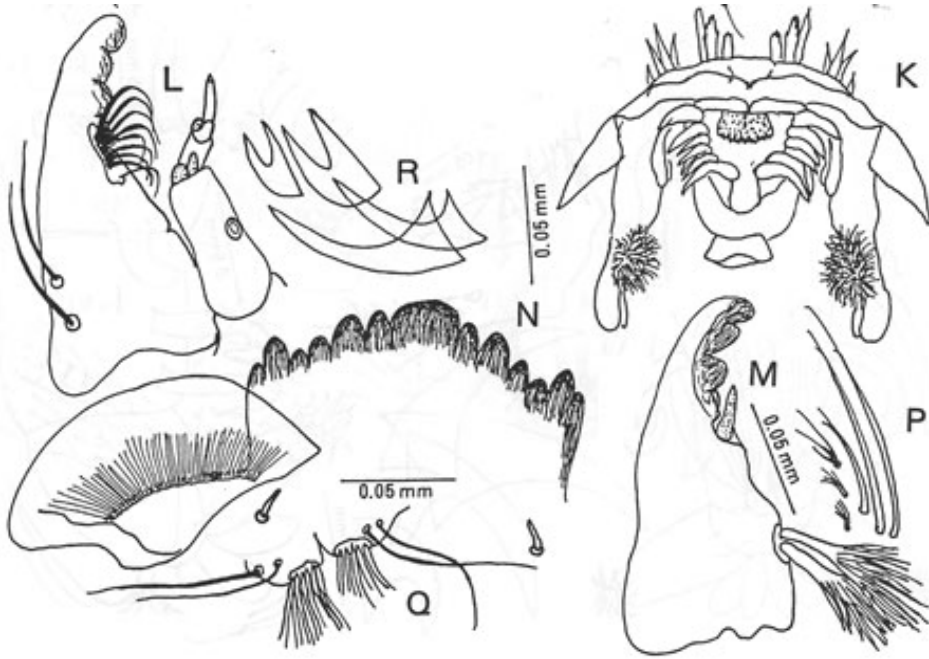
Fourth instar larva: Gross morphology not described, but likely it has only 1 pair of ventral tubules. No information on anal tubules, but base of preanal hair tuft low and flat with 2 long slender setae, while preanal hair tuft (Fig. O) comprises 7 on each side.

Mentum (Fig. N, below) 144 µm wide with 13 teeth, c1 highest and widest, 4th laterals narrower and shorter than neighbours. Ventromentum (Fig. N, below) fan shaped, 138 µm wide and 70 µm deep; the figure shows about 55 striae.

Antenna 4 segmented (Fig. L below); 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.

Figure (K, below) shows numerous very small teeth in PET, and premanible with very short teeth (very worn?).

Mandible (Fig. M) 142 µm long, with about 9 taeniae in the Pec.M.



Larval mouth parts of *B. dissidens* from Sasa 1985.

DNA analyses:

MtCOI barcode sequence from the Lake Ikeda and other localities is available from GenBank through the <http://www.nies.go.jp/yusurika/en/index.html> Chironomid DNA Barcode Database (CDBD).

Found: - JAPAN. - Shore of Lake Ikeda (31.23°N, 130.57°E), Kagoshima Prefecture, and Shimobaru, Fukuokashiigashiku, Fukuoka 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 (36.05°N, 138.10°E)?; 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:

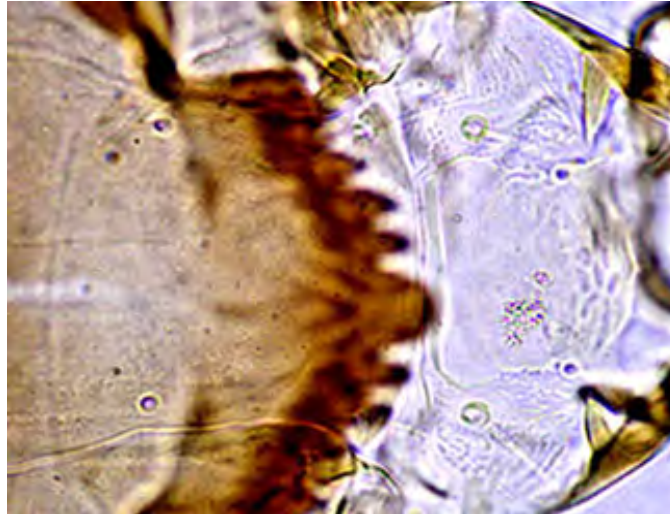
Males: Some details of the males can be determined from the photographs in the CDBD, since those specimens are placed in the same BOLD Bin. Color dark brownish black, legs yellowish, but darkening on tarsi; but some specimens have a yellowish base color of the thorax and more dull green on abdominal segments I-VII, but posterior end of segment VII, and segments VIII and IX almost black. Ant LR abt. 1.8; 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; dorsal RO just anterior to S5 setae.



Mentum 152 μm wide with 13 teeth, c1+2 tooth narrower than that described by Sasa (see sp.1), 4th laterals reduced (Type II-III).

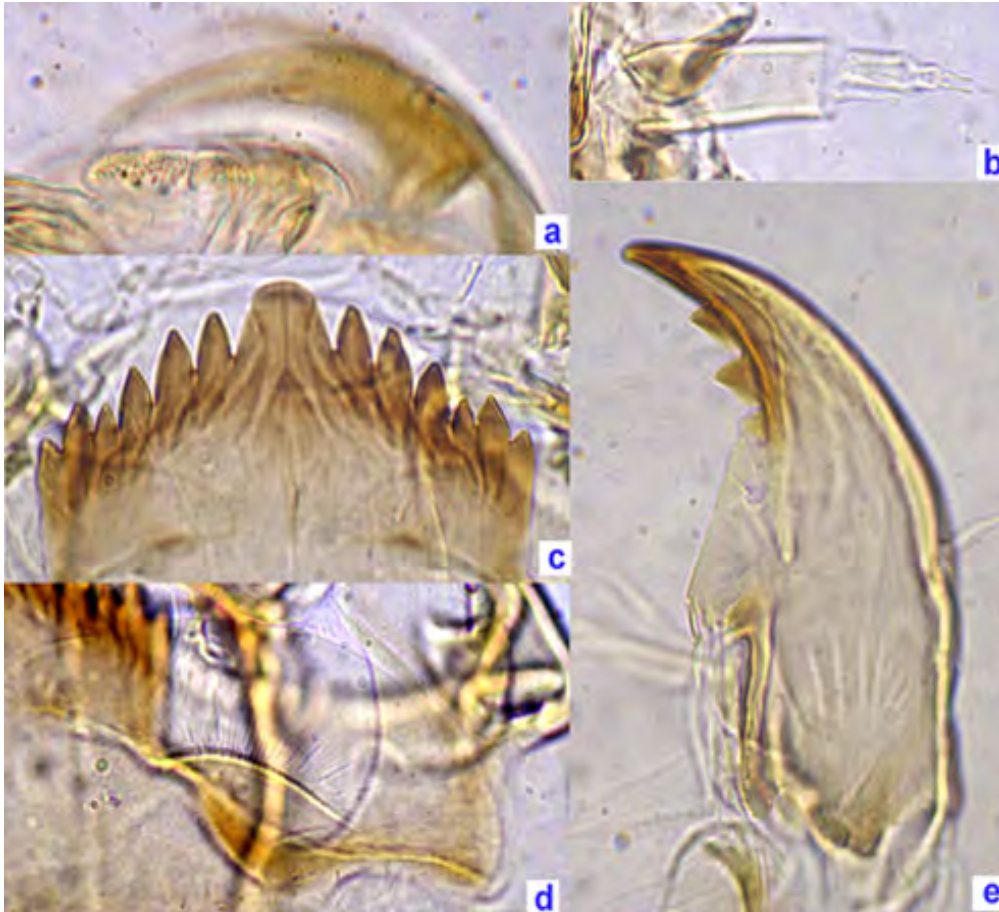
Ventromentum (Fig. d, below) 4 times longer than wide, 1.15 times the mentum width; with about 47 striae.

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.

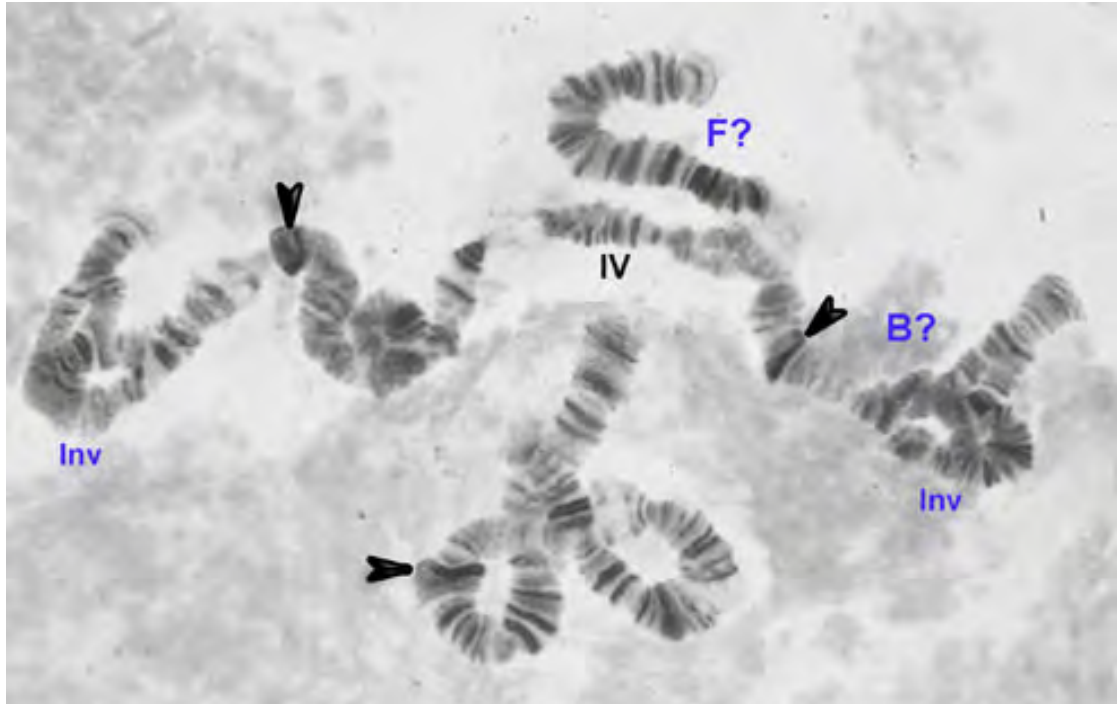
Antennal bases separated by 104 μm , wider than the distance between the S4 setae (91 μm , which is 0.88 of the Frontoclypeal width at that point).

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 μm , essentially Ty. IIB; 7 widely separated furrows, 12 taeniae in PMA; MTR - 0.4.



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 a thinner centromeric band. Arm F also probably contains 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 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 (36.05°N, 138.10°E)?; 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.

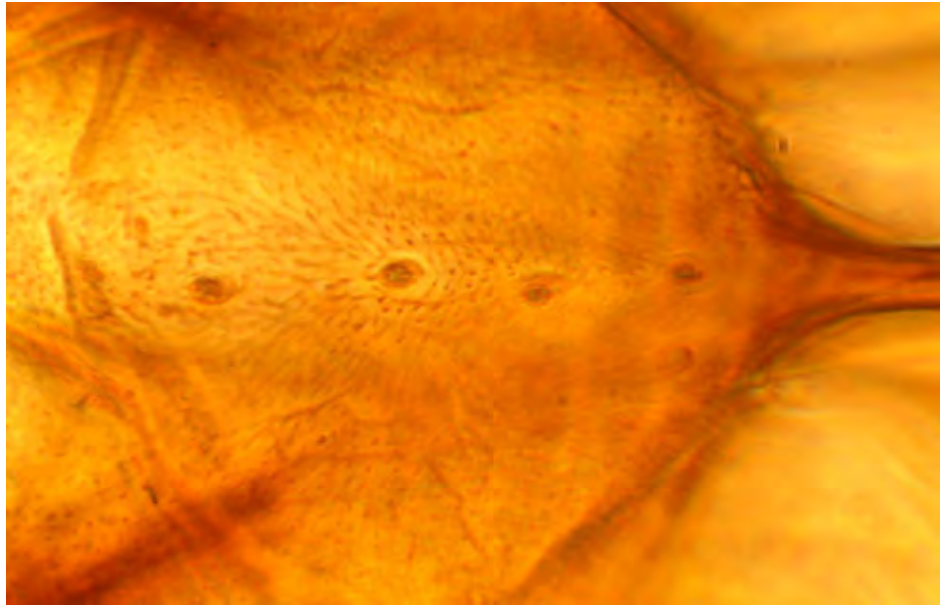
Head: Antennae missing on both specimens. Frontal tubercles 40 µm long and 20 µm wide at base. clypeus width about 0.97 the diameter of the antennal pedicel; The palpal proportions (micron) 44 : 37 : 134 : 158 : 700.

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
PI	940	763	-	-	-	-	-	-	1.24-1.28
PII	998	905	512	278	210	120	118	0.55-0.59	1.09-1.12
PIII	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.

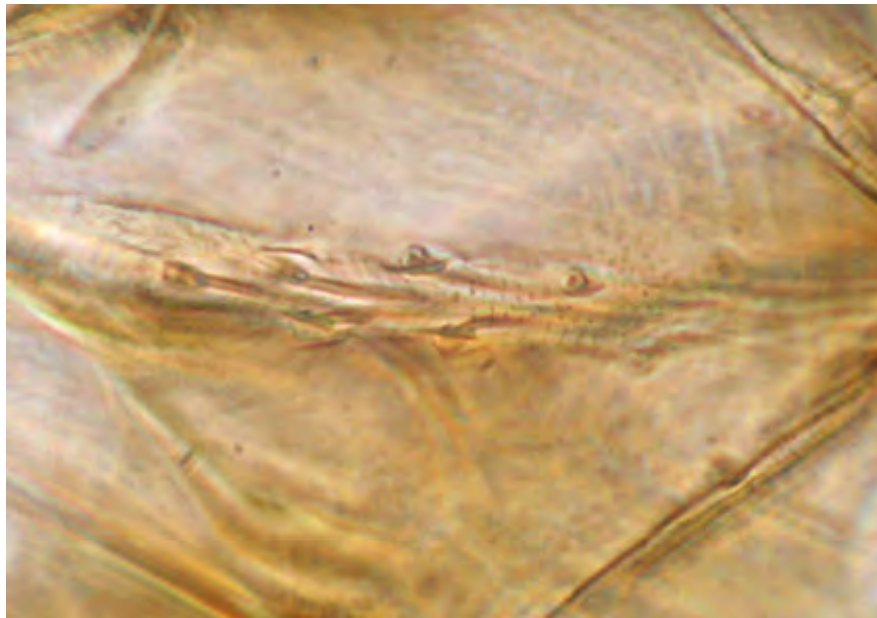
Head: Antennae missing; frontal tubercles almost globular 30 x 24 μm; clypeus width about 0.77 the diameter of the antennal pedicel, 18 clypeal setae; palpal proportions (μm) 43 : 43 : 164 : 177 : missing.

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
PI	860	900	-	-	-	-	-	-	0.96
PII	910	785	450	245	165	105	85	0.57	1.16
PIII	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.



Double row of setae on midline of TIX

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.

Genus *Kiefferulus*

Some species described as *Chironomus* are actually, or likely to be, *Kiefferulus* :

***C. barbatitarsis* Kieffer 1911F**: 154, on basis of adult male and female. Transferred to *Kiefferulus* by Chaudhuri & Ghosh 1986: 277

Found **Calcutta (Kolkata), India & Mandalay, Burma, Singapore.**

***C. biroi* Kieffer 1918B** – on basis of adult male and female.

Transferred to *C. (Nilodorum)* by Freeman 1961 and as synonym of *C. tainanus* by Hashimoto et al. 1981.

Type locality - **SRI LANKA**: **Colombo**, (Types in Hungarian Museum, so now lost); India, Thailand.

***C. calligaster* Kieffer 1911F** - on basis of adult male

Transferred to *Kiefferulus* by Chaudhuri & Guha 1987

Type locality – **INDIA**. **Port Canning, W.Bengal.** - Thailand

***T. glauciventris* Kieffer 1912B**

Transferred to *Kiefferulus* by Sasa & Kikuchi 1995, and as syn. *K. calligaster* by Cranston 2002

Type locality - **FORMOSA**

***C. lasiochirus* Kieffer 1911F** - on basis of adult male and female.

Transferred to *Kiefferulus* by Chaudhuri & Guha 1987

Type locality – **INDIA**. **Port Canning, W.Bengal,**

***T. longilobus* Kieffer 1916B** - on basis of adult male and female.

Transferred to *Kiefferulus* by Cranston, Webb & Martin 1990

Type locality – **FORMOSA**. **Takao.**

***C. Einfeldia* group *nodulosus* Hashimoto** (in, Hashimoto, Wongsiri, Wongsiri, Tirawat

Lewvanich & Yasumatsu) 1981 – on basis of adult male

Transferred to *Kiefferulus* by Hongtsu (pers. information)

Possible synonym: *Chironomus bifidus* Pal & Hazra 2017

Type locality – **THAILAND**. **Ban Bangkanark, Chachoengsao Province, CHINA.**

***C. sp. otsura* – Sasa & Hasagawa 1983**

Syn. *Kiefferulus calligaster* – Chaudhuri & Guha 1987.

Type locality – **JAPAN**. **Rykyu Islands.**

***C. psilochirus* – Kieffer 1911**

Transferred to *Kiefferulus* by Cranston, Webb & Martin 1990

***C. rostratus* – Kieffer 1911F** – on basis of adult male

Transferred to *Kiefferulus* by Cranston, Webb & Martin 1990

Type locality – **INDIA**. **Sylhet, Assam (Kamrup),**

***C. secures* Konar 2018** – *Kiefferulus* (see above)

Type locality – INDIA. Narajole, Mednipur, West Bengal

***C. semiflavis* - Kieffer 1911F** – as variety of *C. barbatitarsis*, on basis of adult male

Syn. *Kiefferulus barbatitarsis* – Chaudhuri & Guha 1987

Type locality – INDIA. Calcutta (Kolkata).

***C. stupidus* -Johannsen 1932** – on basis of reared adult male & female. Notes similarity to *Nilodorum* Kieffer.

Syn. *Kiefferulus barbatitarsis* – Cranston 2002

Type locality – INDIA. Calcutta (Kolkata); Botanical Garden, Buitenzorg, JAVA .
INDONESIA

Lenz 1937B (Type of species); Sublette & Sublette 1973B: 409 - as *Stictotendipes*. Alfred & George 1990: 183 - Cytology as *Nilodorum*.

***T. tainanus* Kieffer 1921** - on basis of adult male and female.

Type locality – TAIWAN. Tainan. JAPAN

Transferred to several genera: (*Phytochironomus* Kieffer 1921; *Glyptotendipes* Goetghebuer 1937-54 (13c); *Chironomus* Hashimoto 1977 & 1981; *Nilodorum* Ashe & Cranston 1991, Cranston & Martin 1989; and *Kiefferulus* Bugledich, Cranston & Martin 1999.

***C. (Kiefferulus) umbraticola* Yamamoto 1979** – on basis of adult male, pupa and larva.

Synonym: *C. toyamabiceus* Sasa 1996

Type locality – JAPAN. Mt. Wakasugiyama, Fukuoka Pref., Kyushu.

Yamamoto 1995: 577 – description of female genitalia.

***C. uncinus* Konar 2018** – description consistent with it being a species of *Kiefferulus*, with the shape of the gonostylus suggesting a relationship to *Kiefferulus inciderus* Chattopadhyay & Chaudhuri 1991? (see above for more detail)

Type locality – INDIA. Kaligram, Burdwan, West Bengal.

***C. vilis* - Kieffer 1911F** – as variety of *Chironomus calligaster*, on basis of male.

Syn. *Kiefferulus calligaster* Chaudhuri & Guha 1987: 28

Type locality – INDIA. Calcutta (Kolkata).

***C. (Lobochironomus) bifidus* Pal & Hazra 2017**

Pupal characters indicate that this is not *Chironomus*

Possibly junior synonym of *Kiefferulus nodulosus* (Hashimoto 1981)

Adults

Males (from original description)

Total length 4.38–5.69 mm; wing length 2.68–2.9 mm; total length/wing length 1.66–2.12; wing length/length of profemur 2.22–2.28.

Coloration. Thorax brown. Abdomen brown with few setae. Wing transparent.

Head. Eyes bare, with 65–73 µm long dorsomedian parallel sided extension.

Temporal setae 11–14 (IV 2–4, OV 2–3, Po 3–4). Frontal tubercles present. Clypeus with 11–16 setae on each side. Tentorium (?-this is a larval character) 100–166 µm long and 33–42 µm wide at sieve plate. AR 3.75–4.5; ultimate flagellomere 1056–1220 µm long; total antennal length 1300–1545 µm. Length ratio of palpomeres (I–

V) (μm): 81–130, 81–114, 81–114, 97–114, 49–81. CA 0.51–0.55, CP 1.61–2.04 (was P5 shrivelled in these specimens?).

Thorax. Acrostichals 10–12; anteprenotals 6–10. dorsocentrals 5–6 setae; prealars 4–7; scutellum 8–10 setae.

Wing (Fig. 1) transparent without any markings, anal lobe indistinct. 2 Scf on brachiolum, 15-17 setae on squamal fringe; VR 1.06-1.16.

Leg lengths and proportions:

	Fe	Ti	ta ₁	ta ₂	ta ₃	ta ₄	ta ₅	LR	BV	SV	BR
Fore	1220- 1462	927- 1056	1100- 1350	688- 815	625- 780	469- 586	244- 260	1.18- 1.27	1.58- 1.6	1.86- 1.95	1.71- 6.2
Mid	813- 1056	813- 976	488- 770	325- 374	277- 327	163- 165	130- 152	0.6- 0.78	2.36- 2.67	2.63- 3.33	2.5- 3.8
Hind	1302- 1381	975- 1041	688- 815	425- 571	344- 408	179- 246	130- 165	0.7- 0.78	2.3- 2.75	2.97- 3.3	1.75- 1.8

No information on the presence or absence of setae on TIX.

Hypopygium (Fig. 3) – anal point shown with base about as wide as the tip, but narrower in between. Anal tergite band T-shaped. Gonostylus with 18-20 inner subapical setae arranged in 2 parallel rows, few of which apically split. Anal point narrow at base and reaching just past the ‘beak’ of the SVo which is moderately projected posteriorly, swollen apically without any setae, microtrichios, beak-like apicomedian projection, 1.5-2 times as long as the average width of basal portion (unlike any of the Strenzke 1959 types) IVo long, parallel-sided (and shown as curved), with 10-12 forked setae, and reaching about halfway along the swollen gonostyle which reduces markedly over about the posterior third.

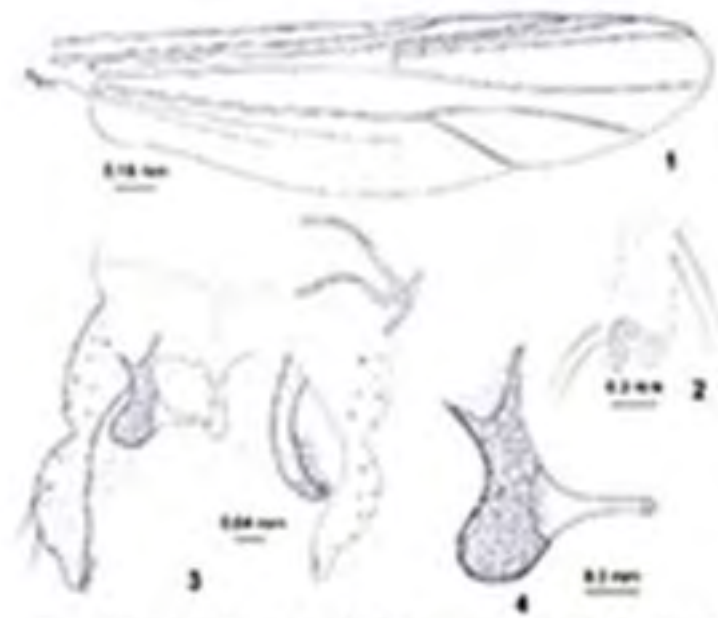
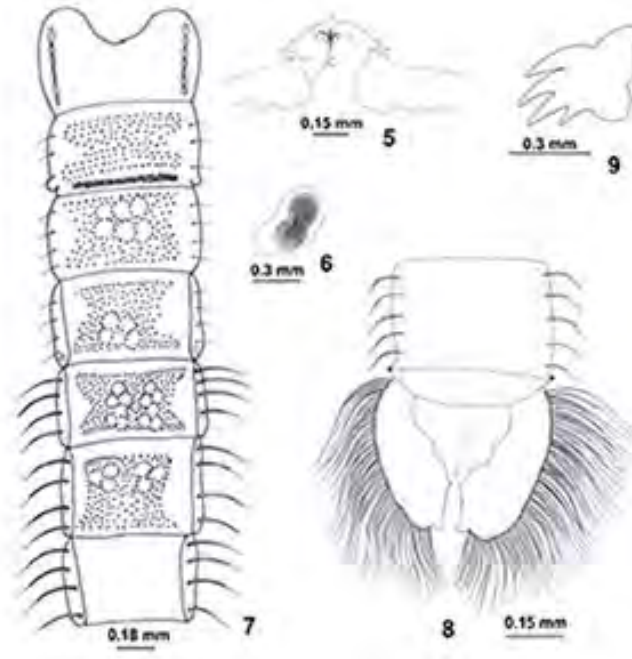


Fig. 1 - *Chironomus* sp. n. 1 - wing; 2 - anal lobe; 3 - gonostylus; 4 - anal point.

Female – not known.

Pupa: Total length of exuviae 6.8 mm, antennal sheath 1.78 mm. wing sheath 1.77 mm. Color light brown; dark brown margin at wing sheath, margin of tergites. Frontal apotome 405 μm long and 324 μm wide, without a frontal wart; CT not prominent, with an apical seta 8 μm long. Basal ring kidney shaped, 113 x 82 μm . Tergites I, VII and VIII bare, II-VI with uniform shagreen. Hook row of TIII with about 54-56 hooklets, occupying 0.75 of segment width. PSA and B present. Caudolateral comb of segment VIII with 3-4 stronger spines. Approximately 80 taeniae on anal lobe.



Larva: Damaged during preparation but apparently no recording of gross morphology before treatment for slide mounting.

Found: INDIA. Type locality: Malda, Gour, West Bengal (24.90°N, 88.11°E)

GenBank accession number AB704937, claimed as *C. sulfurosus*, is actually for a species of *Kiefferulus* (Pramual et al. 2016), although it was not one of those included in that study (*K. tainanus* and *K. calligaster*) The species is recorded from Thailand and Japan.

***Chironomus* (new subgenus) species DSC1**

This species is being described as *C. kangleipak*
It has sufficient unique characters in larvae, pupae and adults to merit description as a new subgenus.

In BOLD Bin: [BOLD:ADU7113](#)

Notable for an unusual larval type (yama-type) (Martin & Chingangbam 2016), a pupa with a clearly divided hook row and a strong pupal spur. May be a new subgenus showing indications of relationship to the genus *Yama*.

Adult:

Male:

AR about 2.30 (2.13-2.58); Wing length about 2.76 (2.45-2.99) mm, width about 0.69 (0.62-0.76) mm; about 12.7 (9-17) setae on squamal fringe; abt 2.75 (2-4) SCf on brachiolum. VR about 0.97 (0.96-1.0); LR about 1.54 (1.51-1.58).

Head: FT about 25.7 (15-38) μ m and 1.9 (1.4-3.2) times longer than wide. Palpal proportions (μ m): 51 : 45 : 185 : 185 : 278; P5/P4 1.54-1.55, P5/P3 1.43-1.54.

Clypeal width about 0.70 (0.56-0.71) the diameter of the antennal pedicel, about 16.4 (12-22) clypeal setae.

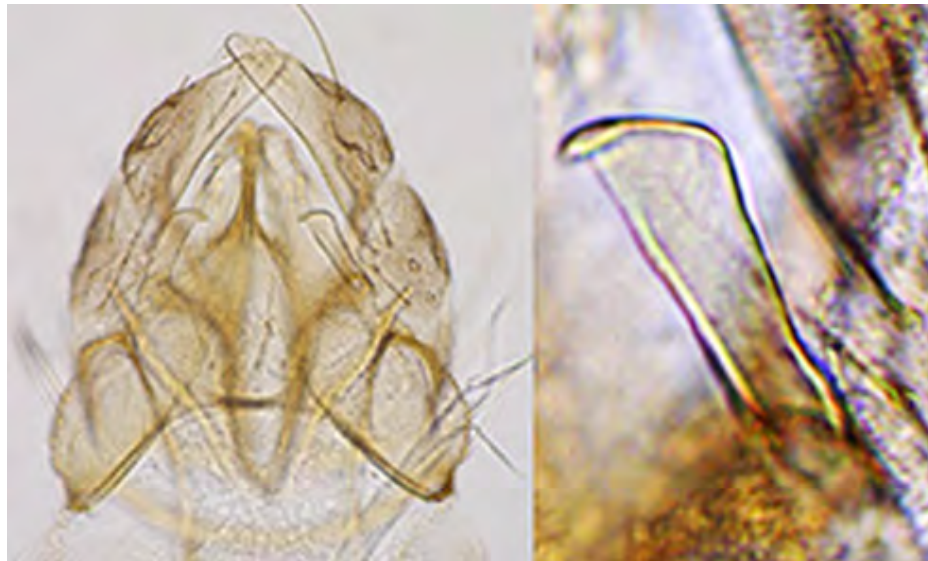
Thoracic setae: about 13 (10-15) acrostichal; 10.4 (9-15) dorsocentral; 4.3 (4-5) prealar; 1.3 (1-2) supra-alar; 0-2 in anterior row, 10.6 (9-13) in posterior row (total 11.4 (9-14)) on scutellum.

Leg lengths and proportions (μ m):

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	Ta5/Ti
PI	1203	1020	1466	742	620	536	280	1.24-1.58	1.10-1.34	0.29-0.30
PII	1214	1050	637	316	225	148	111	0.52-0.70	1.07-1.17	
PIII	1322	1216	827	412	295	182	137	0.67-0.78	0.96-1.09	

BR – 1.6 (1.36-1.80) i.e. no beard

Abdomen with a band across the middle of the anterior tergites, which expands posteriorly on segments V-VIII; about 6.2 (4-7) setae in several pale areas on tergite IX.



Male hypopygium (left) and SVo (right) of *C. kangleipak*

SVo variable (mounting variants?) mostly E type of Strenzke (1959); IVo, with simple setae, reaching to end of anal point which is darkened and narrow at the base. GS somewhat swollen proximally and tapering over posterior third to quarter.

Female:

Wing length 3.2 (2.35-3.85) mm, width 0.62-0.81 mm; about 10.7 (8-15) setae on squamal fringe, abt 2-3 SCf on brachiolum. VR 0.89-0.93.

Head: FT small, about 20 (15-25) μ m and 1.1-1.3 times longer than wide. Antennal proportions (micron) 181 : 110 : 126 : 122 : 206; necks of segs 2-4 comprising 0.35,

0.275 and 0.4 of the segment length, respectively; AR 0.38 (0.37-0.39); A5/A1 1.14 (1.05-1.18).

Palpal proportions (µm) 59 : 66 : 170 : 185 : 300; P5/P4 1.4-1.62, P5/P3 1.45-1.75.

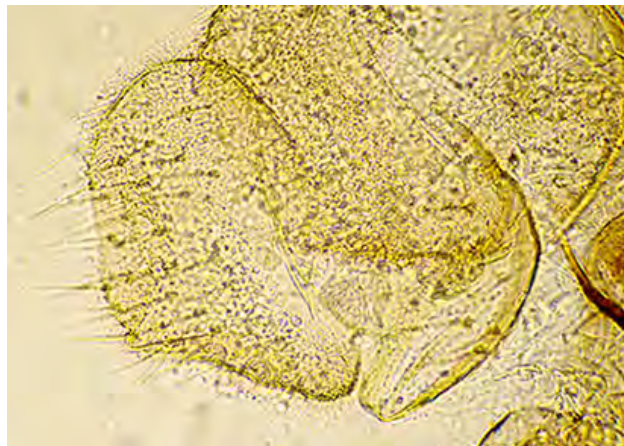
Clypeal width about 1.3-1.6 times that of the antennal pedicel, about 26 (24-29) clypeal setae.

Thoracic setae: about 13 (10-20) acrostichal; 2-5 humeral (roughly linear or in small group), 11 (10-12) dorsocentral, (14.3, 12-17 dorsocentral+ humeral); 4-5 prealar; 1 supra-alar; 2 in anterior row, at least 9 in posterior row (total 11-13) on scutellum.

Leg lengths and proportions (µm):

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	Ta4/Ti
PI	1225	1070	1805	890	775	685	330	1.51-1.55	1.13-1.15	0.61
PII	1270	1175	635	310	215	140	120	0.53-0.56	1.06-1.11	
PIII	1365	1370	1005	510	380	230	160	0.60-0.69	0.99-1.06	

Abt 19 setae on abdominal GpVIII; abt 8-11 on Segment X, which is wider at its widest point, (len/gr.wdth. 1.7-2.1) sometimes almost a “half-moon”, than in other species of *Chironomus*. Cercus essentially rectangular although dorsal margin may be curved, longer in the dorso-ventral dimension, with a broad ventral bump.



Pupa: Length abt 8.4 mm (7-10 mm); inner margin of wing case (1.3-1.6 mm), about 17.5% of exuvial length. Length of antennal sheath of female about 835 mm. Cephalic tubules about 155-180 µm long and 130-135 µm wide at base, seta at least 40 µm long.



Respiratory base about 130-140 μm long and 60-80 μm 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 μm , the total extent of the hook row being 180-202 μm hooks, 100-278 μm gap and a further 180-202 μm 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 μm), about 0.17 of the segment length (70-73 μm).

Armature of segments covering most of segment but with a clear spot at mid line of posterior region, larger on the anterior segments.

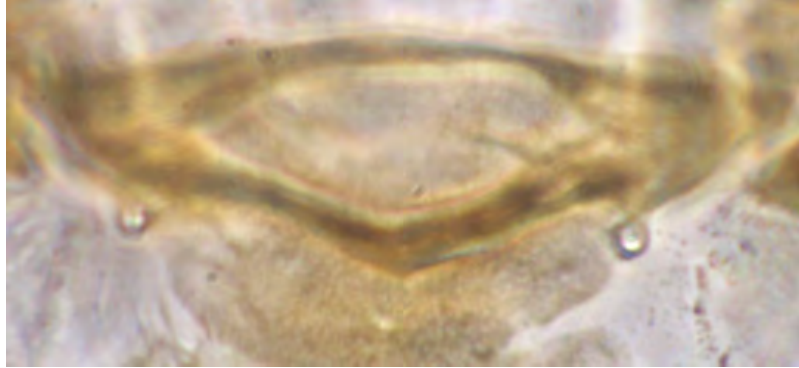
Posterolateral spur of eighth segment strong and curved with about 5 short spines and sometimes a further 2 very small 'teeth'.

About 69-78 taeniae on each side of the swim fin, mostly in a single row.

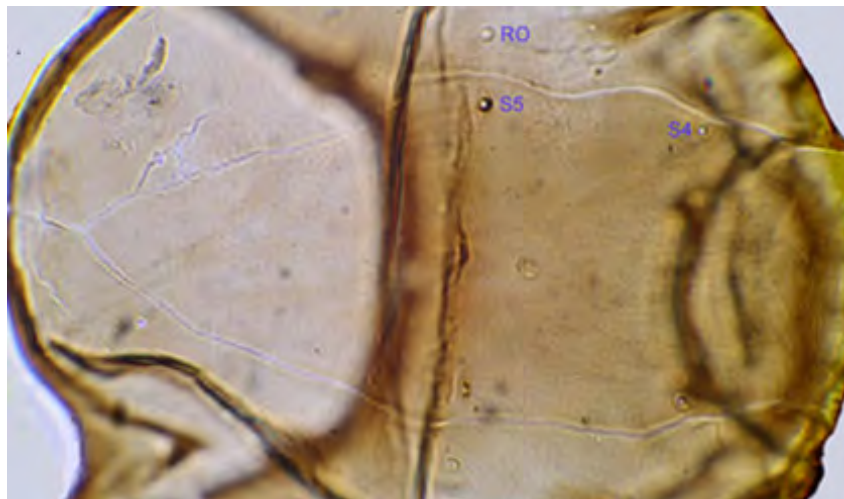
Fourth instar larva: A small 8.4 (7-10) mm yama-type, i.e. no ventral or lateral tubules, anal tubules conical, in a "star"-arrangement, dorsal pair longer and wider than the ventral pair. Posterior prolegs about 4 times longer than width at base, terminal hooks either about 139 μm or 63 μm long.



Gula and frontoclypeus slightly dark to dark: gula over posterior 2/3; sometimes slight darkening outside the frontoclypeus. This may be a difference between the two localities. SAL wider at mid-point with a curved ventral border, about 2.5 times longer than width at widest point.



VHL about 233-238 μm , with mentum width about 0.63-0.70 of VHL (149-153 μm). Distance between the S4 setae about the same, or slightly larger (141.83 μm :138.83 μm) than that between the antennal bases; S5 setae level with RO of dorsal head.



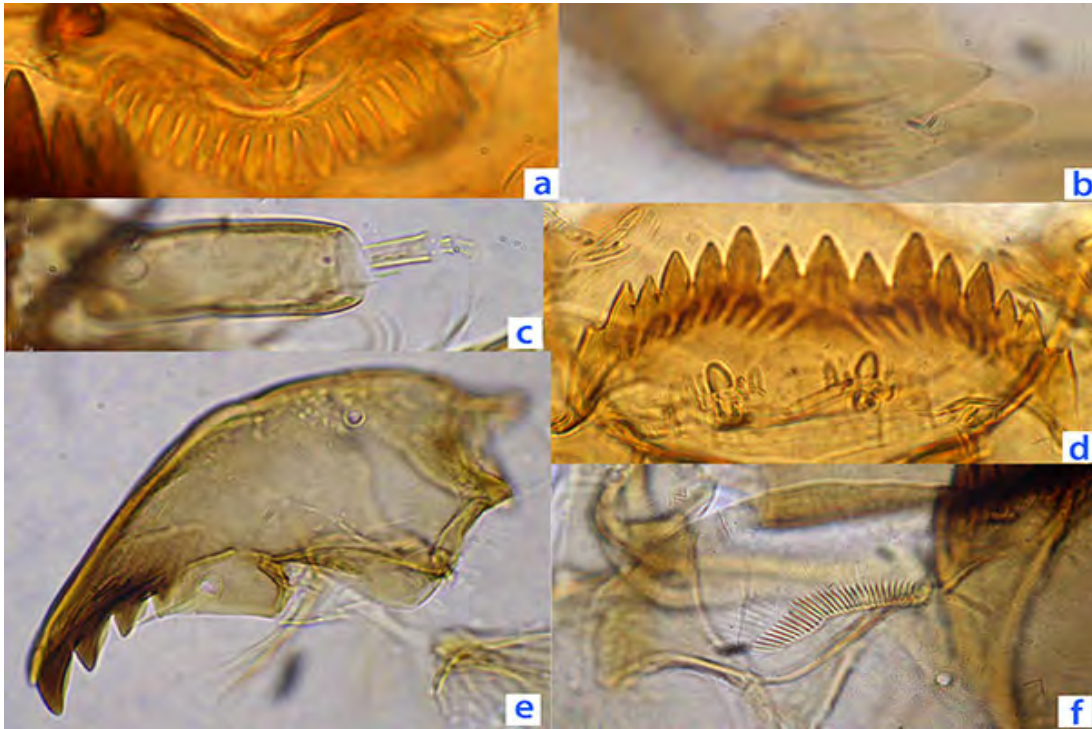
Mentum (d, below) with 4th laterals reduced almost to level of 5th laterals (type II), central trifold tooth of type IV, 4th laterals at least partly reduced to level of 5th laterals (type I-II); 6th laterals reaching only to base of 5th laterals.

VM plates (f, below) about 3.4-3.8 times longer than deep; separated by about 40% of width of mentum, with about 37-39 striae; VMR about 0.21-0.26, but increasing to about 0.39 near internal end.

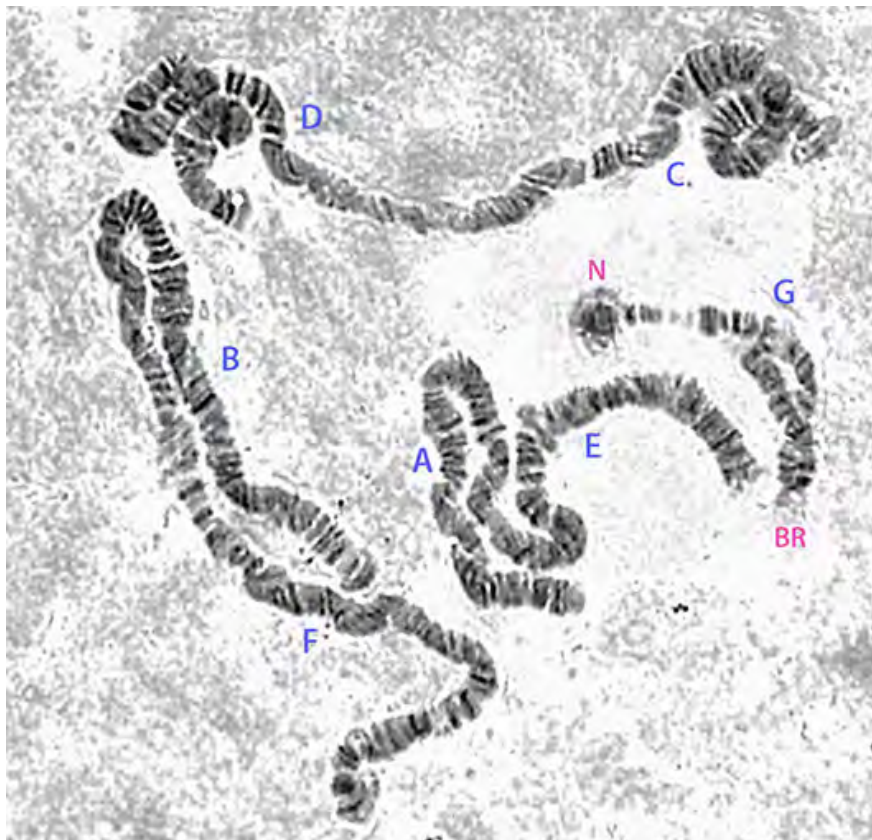
PE (a, below) with about 11-17 relatively broad teeth. Premandibles (b, below) of type E with inner and outer teeth about the same width.

Antennae (c, below) 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 (μm) 103 : 21 : 5 : 6 : 5.

Mandible (e, below) with 3rd 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; MTR about 0.31 (0.16-0.42).



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.



Found in flowing, heavily polluted man-made sewage drains; water quite dark. The strong pupal spur may serve to hold the pupa in place against the water flow.

This species shows similarities to the genus *Chironomus* in most life stages; including male and female genitalia, larval head characters and chromosomes with the pseudothummi chromosome arm combination. On the other hand it also shows similarities to *Yama tahitiensis*, notably the larval type, the divided hook row and the weak shagreen pattern of the pupa. The *COI* sequences differ by about 12.8% so, using the figure of 0.75% change per million year (Martin *et al.* 2002), the lines diverged perhaps 17 million years ago.

Molecular:

Mt*COI*: Sequence is available from both Devchand and Manipur. It matches a sequence in the BOLD database for which the information is private.

Found: INDIA - Manipur: Central Agricultural University Campus (24.8111°N, 93.8894°E) and Devchand (24.8095°N, 93.8924°E), Iroisemba, Imphal.

References

- Alfred, J. R. B. and Michael, R. G. (1990) Cytotaxonomy of three species of the family Chironomidae. *Rec. zool. Surv. India* **86**: 183-186.
- Al-Shami, S.A. Rawi, C.S., Ahmad, A.H. and Nor, S.A. (2012) Redescription of *Chironomus javanus* and *Chironomus kiiensis* (Diptera: Chironomidae); Larvae and adults collected from a rice field in Pulau Pinang, Malaysia. *Trop. Life Sci. Res.* **23**: 77-86.
- Amora, G., Hamada, N., Fusari, and Andrade-Souza, V. (2015) An Asiatic chironomid in Brazil: morphology, DNA barcode and bionomics. *ZooKeys* **514**: 129-144.
- Andersen, F.S. (1949) On the subgenus *Chironomus*. Studies on the systematics and biology of Chironomidae III. *Vidensk. Meddel. Dansk Naturhist. Foren.* **III**: 1-66.
- Bouchard, R.W., Jr., Hayford, B.L. and Ferrington, L.C., Jr. (2022) *Chironomus gelhausi*, a new species of surface mating *Chironomus* Meigen, 1803. *Zootaxa* 5116(1): 123-135 <https://doi.org/10.11646/zootaxa.5116.1.6>
- Bugledich, E.-M.A., Cranston, P.S. and Martin, J. (1999) Chironomidae, In: "Diptera: Nematocera" (Ed. E.-M.A. Bugledich) Zoological Catalogue of Australia Vol. 30.1. CSIRO Publishing, Melbourne, pp. 112-158.
- Chattopadhyay, S. and Chaudhuri, P. K. (1991) *Kiefferulus inciderus* sp. nov. from West Bengal, India (Diptera: Chironomidae). *Hexapoda* **3**(1&2): 24-26.
- Chattopadhyay, S. Mazumdar, A. and Chaudhuri, P.K. (1991) Life stages and biology of *Chironomus samoensis* Edwards (Diptera: Chironomidae). *Proc. Natl. Acad. Sci, India* **61**: 291-301.

- Chaudhuri, P.K. and Das, S.K. (1996) *Chironomus incertipenis* Chaudhuri, a new name for *Chironomus niger* Chaudhuri, Das & Sublette (preoccupied) (Diptera: Chironomidae). *Oriental Insects* **30**: 154.
- Chaudhuri, P.K., Das, S.K. and Sublette, J.E. (1992) Indian species of the genus *Chironomus* Meigen (Diptera; Chironomidae). *Zool. Jb. Syst.* **119**: 1-51.
- Chaudhuri, P.K. and Guha, D.K. (1987) A conspectus of the chironomid midges (Diptera: Chironomidae) of India and Bhutan, *Entomologica Scandinavica Suppl.* **29**.
- Chavan, R.J., Gaikwad, A.M., Shinde, L.V., and Sonune, B.V. (2013) Studies on taxonomy of genus *Chironomus* (Meigen 1803) (Insecta; Chironomidae) from Balaghat Ranges in Beed District of Maharashtra. *The Ecoscan* **IV**: 117-121.
- Cranston, P.S. (2001) <a href=<http://apes.skullisland.info/sites/default/files/webfiles/members/pete/start.pdf> Electronic Guide to Chironomidae of Australia.
- Cranston, P.S. (ed.) (1995) Chironomids: from Genes to Ecosystems. CSIRO Publications, Melbourne, 482pp.
- Cranston, P.S. (2007) The Chironomidae larvae associated with the tsunami-impacted waterbodies of the coastal plain of southwestern Thailand. *Raffles Bull. Zool.* **55** 231-244.
- Cranston, P.S., Martin, J., Mulder, M., and Spies, M. (2016) Clarification of *Einfeldia* Kieffer, 1922 (Diptera: Chironomidae) with *E. australiensis* (Freeman, 1961), comb. n. based on immature stages. *Zootaxa* **4158**: 491-506.
<http://www.mapress.com/j/zt/>
- Das, N., Majumdar, U., Mazumdar, A., and Hazra, N. (2016) Life stages of eight new species of *Chironomus* Meigen (Diptera: Chironomidae) of the Eastern Himalaya of India. *Oriental Insects* **49**: 99-149.
- De, A. and Gupta, J.P. (1994) Karyological characterization of *Chironomus niger* (Diptera: Chironomidae). *Cytobios* **80**: 55-62.
- Deepak, R., Himani, V., and Gyata, P. (2021) Identification and confirmation of *Chironomus circumdatus* Kieffer, 1916 (Diptera: Chironomidae) using DNA barcoding. *International Journal Zoological Investigations* **7(1)**: 301-307.
<https://doi.org/10.33745/ijzi.2021.v07i01.025>
- Dejoux, C. (1968) Contribution à l'étude des premiers états des Chironomides du Tchad (Première note). *Hydrobiologia* **31**: 449-464.
- Edwards, F. W. (1928) Nematocera. *Insects of Samoa* Part **VI**. Fasc. 2: 23-68.
- Elbetieha, A. and K. Kalthoff (1988) Anterior determinants in embryos of *Chironomus samoensis*: Characterization by rescue bioassay. *Development* **104**: 61-75.

- Epler, J.H. (2001) Identification manual for the larval Chironomidae (Diptera) of North and South Carolina. J.H.Epler, 8 PDF volumes.
- Epler, J.H., Ekrem, T. and Cranston, P.S. (2013) 2. The larvae of the Holarctic Chironomidae – Morphological terminology and key to subfamilies. *In: Andersen, T., Cranston, P. S. and Epler, J. H. (Sci. eds): The larvae of Chironomidae (Diptera) of the Holarctic region — Keys and diagnoses. Insect Systematics & Evolution, Suppl. 66:13–24.* Lund, Sweden 30 Apr. 2013. ISSN 2001-4945.
- Fittkau, E.-J. (1968) *Chironomus strenzkei* n. sp. (Chironomidae, Dipt.), ein neues Laboratoriumstier. *Z. Morph. Tiere* **63**: 239-250.
- Freeman, P. (1958) A study of the Chironomidae (Diptera) of Africa south of Sahara. IV. *Bull. Br. Mus. nat. Hist. Ent.* **6**: 263-363.
- Freeman, P. (1961) The Chironomidae (Diptera) of Australia. *Aust. J. Zool.* **9**: 611-737.
- Goetghebuer, (1928) Diptères (Nematocères). Chironomidae. III. Chironomariae. *Faune France* **18**: 1-174.
- Golygina, V.V. and Kiknadze, I.I. (2018) The revision of chromosome III (EF) mapping in *Chironomus plumosus* group (Diptera, Chironomidae). *Comparative Cytogenetics* **12**: 201-222. (doi: 10.3897/CompCytogen.v12i2.23327)
- Golygina, V.V., Martin, J., Kiknadze, I.I., Siirin, M., Ivanchenko, O.V. and Makarchenko, E.A. (2003) *Chironomus suwai*, a new species of the *plumosus* group (Diptera, Chironomidae) from Japan. *Aquatic Insects* **25**: 177-189.
- Guha, D.K., Das, S.K., Chaudhuri, P.K., and Choudhuri, D.K. (1985) Chironomid midges of the Andean Islands (Diptera: Chironomidae). *Proc. Nat. Acad. Sci. India* **55B**: 22-38.
- Gupta, J.P. and Kumar, A. (1991) Chromosomal characterization of *Chironomus striatipennis* Kieffer (Diptera: Chironomidae). *Zool. Sci.* **8**: 959-965.
- Guryev, V., Makarevitch, I., Blinov, A. and Martin, J. (2001) Phylogeny of the Genus *Chironomus* (Diptera) inferred from DNA sequences of mitochondrial *Cytochrome b* and *Cytochrome oxidase I*. *Molec. Phylogen. Evol.* **19**: 9-21.
- Hasagawa, H. and Sasa, M. (1987) Taxonomical notes on the chironomid midges of the tribe Chironomini collected from the Ryukyu Islands, Japan, with description of their immature stages. *Jpn. J. Sanit. Zool.* **38**: 273-295.
- Hashimoto, H. (1977) The Chironomus of Japan (In Japanese) *Iden* **31(4)**: 78-84.
- Hashimoto, H. (1977) details not known.
- Hashimoto, H. (1982) Four species of Chironomidae (Diptera) obtained from Ozegahara Moor. *Ozegahara: Scientific Research Highmoor in Central Japan* 367-370.

- Hashimoto, H. (1984) Notes on *Chironomus javanus* Kieffer from Japan. *Proc. Jap. Soc. Syst. Zool.* **29**: 24-29.
- Hashimoto, H. (1985) A new species of *Einfeldia* (Diptera, Chironomidae) from Japan. *Kontyu* **53**: 360-365.
- Hashimoto, H., Wongsiri, T., Wongsiri, N., Tirawat, C., Lewvanich, A., and Yasumatsu, K. (1981) Chironominae from rice fields of Thailand with descriptions of 7 new species. *Tax. Br. Ent. & Zool. Div., Dept. Agr. Bangkok, Tech. Bull.* **007**: 1-47.
- Heiser, M. and Schmitt, T. (2013) Tracking the boundary between the Palaearctic and the Oriental region: new insights from dragonflies and damselflies (Odonata). *J. Biogeog.* (DOI: 10.1111/jbi.12133)
- Hirabayashi, K., Kimura, G., Fukunaga, Y., and Fukunaga, Y. (2007a) Distribution pattern of chironomid midges (Diptera: Chironomidae) in the upper and middle reaches of the Shinano River in Central Japan. In: T. Andersen (ed.) "Contributions to the Systematics and Ecology of Aquatic Diptera - A Tribute to Ole A. Sæther." The Caddis Press, pp. 129-136.
- Hirabayashi, K., Nakazato, R. and Higo, M. (2007b) The identity of Japanese *Lipiniella* Shilova species. In: T. Andersen (ed.) "Contributions to the Systematics and Ecology of Aquatic Diptera - A Tribute to Ole A. Sæther." The Caddis Press, pp. 155-164.
- Hirvenoja, M. (1962) Materialien zur Kenntnis der Gattung *Chironomus* (Dipt.). *Ann. Ent. Fenn.* **28**: 63-67.
- Hirvenoja, M. and Michailova, P. (1998) The karyotype and morphology of *Chironomus brevidentatus* sp. n. (Dipt. Chironomidae). A species with a 'salinarius type' larva from northern Finland. *Ent. Fenn.* **9**: 225-236.
- Jablonska-Barna, I., Kownacki, A., Langton, P., and Michailova, P. (2012) The external morphology of *Chironomus* (s.str.) *acerbiphilus* Tokunaga, 1939 a senior synonym of *C. crassimanus* Strenzke (Diptera, Chironomidae) from Poland. *Annales Zoologici* (Warszawa) **62**: 633-638. (doi: 10.3161/000345412X659696)
- Jablonska-Barna, I., Michailova, P., Kownacki, A. and Langton, P. (2010) The karyotype of *Chironomus acerbiphilus* Tokunaga, 1939 (Diptera: Chironomidae) from Poland. *Zootaxa* **2359**: 65-67.
- Johannsen, O.A. (1905) Aquatic nematoceros midges. In: Needham, I.G., Morton, K.I., Johannsen, O.A. (eds) 'May flies and midges of New York'. Bulletin New York State Museum. **86**: 76-327.
- Johannsen, O.A. (1932B) Chironominae of the Malayan subregion of the Dutch East Indies. *Arch. Hydroiol. Suppl.* **11**: 503-552.
- Karunakaran, L. (1966) Parasitism of *Chironomus costatus* Joh. (Diptera, Nematocera) by a mermithid. *Nematologia* **12**: 172-174.

- Karunakaran, L. (1969) Studies on the bionomics and taxonomy of Singapore Chironomidae. Ph.D. Thesis, Department of Zoology, University of Singapore, 404 pp.
- Keyl, H.-G. (1962) Chromosomenevolution bei *Chironomus* II. Chromosomenumbauten und phylogenetische Beziehungen der Arten. *Chromosoma* **13**: 464-514.
- Keyl, H.-G. and Keyl, I. (1959) Die cytologische Diagnostik der Chironomiden. I. Bestimmungstabelle für die Gattung *Chironomus* auf Grund der Speicheldrüsenchromosomen. *Arch. f. Hydrobiol.* **56**: 43-57.
- Kieffer, J.J. (1910) Etude sur les Chironomides des Indes Orientales, avec description de quelques nouvelles espèces d’Egypte. *Mem. Indian Mus.* **2**: 181-242.
- Kieffer, J.J. (1911) Descriptions de nouveaux Chironomides de l’Indian Museum de Calcutta. *Rec. Indian Mus.* **6**: 113-177.
- Kieffer, J.J. (1912) Tendipididae (Dipt.) In: Formosa-Ausbeute. *Supplta. ent.* **1**: 27-43.
- Kieffer, J.J. (1916) Tendipedides (Chironomides) de Formose conserves au Museum National Hongrois de Budapest et determines par J.J. Kieffer. *Annales hist.-nat. Mus. natn. hung.* **14**: 81-121.
- Kieffer J.J. (1921) Chironomides des Phillipines et de Formosa. *Phillipines J. Sci.* **18**: 557-593.
- Kieffer, J.J. (1923) Chironomariae de l’Afrique de sud. *Annls Soc. scient. Brux.* **42**: 382-388.
- Kieffer, J.J. (1924) Chironomides non piqueurs de Java. *Annls. Soc. scient. Brux.* **44**: 262-270.
- Kiknadze, I.I., Golygina, V.V., Broshkov, A.D., Gunderina, L.I., and Istomina, A.G. (2008) Mystery of *Chironomus dorsalis* Meigen karyotype (Diptera: Chironomidae). *Comp. Cytogenet.* **2**: 21-35.
- Kiknadze, I.I., Istomina, A.G., Golygina, V. and Gunderina, L. (2016) Karyotypes of Palearctic and Holarctic species of the genus *Chironomus*. Novosibirsk Academic Publishing House “GEO”, Novosibirsk, 490 pp. (unedited).
- Kiknadze, I.I., Istomina, A.G., Makarchenko, E.A., Katokhin, A.V. and Golygina, V.V. (2003) Karyotype and chromosomal polymorphism in the midge *Chironomus yoshimatsui* (Diptera, Chironomidae). *Ent. Rev.* **83**: 887-893.
- Kiknadze, I.I., Siirin, M.T., Kerkis, I.E. and Aimanova, K.T. (1993) Unusual cytochrome complex in the chironomids. (In Russian) *Tsitologiya* **35**: 46-52.
- Kiknadze, I.I., Wang, X., Istomina, A.G. and Gunderina, L.I. (2005) A new *Chironomus* species of the plumosus-sibling group (Diptera, Chironomidae) from China. *Aquatic Insects* **27**: 199-211.

- Kobayashi, T., Nakazato, R. and Higo, M. (2007) The identity of Japanese *Lipeniella* Shilova species (Diptera: Chironomidae). In: T. Andersen (ed) Contributions to the Systematics and Ecology of Aquatic Diptera – A tribute to Ole A. Sæther, The Caddis Press pp.
- Konar, S. 2018. Two new species of the genus *Chironomus* Meigen (Diptera: Chironomidae) from India. *Indian Science Cruiser* **32**: 10-15. (DOI: 10.24906/isc/2018/v32/i2/173570)
- Kondo, N.I., Ueno, R., Ohbayashi, K. Golygina, V.V. and Takamura, K. (2016) DNA barcoding supports reclassification of Japanese *Chironomus* species (Diptera: Chironomidae). *Entomological Science* **19**: 337-350.
- Kuhn, K.L, Percy, M., Laurel, M. & Kalthoff, K. (1987) Instability of the anteroposterior axis in spontaneous double abdomen (sda), a genetic variant of *Chironomus samoensis* (Diptera, Chironomidae). *Development* **101**: 591-603.
- Kumar, A. and Gupta, J.P. (1990) Cytogenetic studies of *Chironomus circumdatus* from India (Diptera: Chironomidae) *Genetica* **82**: 157-163.
- Karunakaran, L. (1969) Studies on the bionomics and taxonomy of Singapore Chironomidae. Ph.D. Thesis National University of Singapore, 404pp.
- Kobayashi, T. and Endo, K. (2008) Synonymic notes on some species of Chironomidae (Diptera) described by Dr.M.Sasa. *Zootaxa* 1712: 49-64.
- Kobayashi, T., Nakazato, R., and Higo, M. (2007) The identity of Japanese *Lipiniella* Shilova species (Diptera: Chironomidae).
- Konar, S. (2018) Two new species of the genus *Chironomus* Meigen (Diptera: Chironomidae) from India. *Crossref* DOI: 10.24906/isc/2018/v32/i2/173570.
- Kuvangkadilok, C. (1985) Cytogenetic studies of *Chironomus plumisetigerus* (Diptera: Chironomidae) in Thailand. *J. Sci. Soc. Thailand* **11**: 37-45.
- Lacerda, A. C. F., Gusmao, G. A., Hamada, N. (2014) Tests of chronic and acute toxicity of crude oil on larvae of *Chironomus kiiensis* Tokunaga (Diptera: Chironomidae). *Brazilian Journal of Biology* **74** (3 Suppl): S70-S77.
- Langton, P. H. and Visser, H. (2003) Chironomidae exuviae. A key to pupal exuviae of the West Palaearctic Region. World Biodiv. Datab. CD-ROM Ser.; ETI, Amsterdam.
- Laviad-Shirit, S., Sela, R., Thorat, L., Sharaby, Y., Izhdal, I., Nath, B. B., and Halpern, M. (2020) Identification of chironomid species as natural reservoirs of toxogenic *Vibrio cholerae* strains with pandemic potential. *PLOS Negl. Trop. Dis.* **14** (12): e0008959 (<https://doi.org/10.1371/journal.pntd.0008959>)
- Lenz, F. (1937) Chironomariae aus Niederlänisch-Indien. Larven und Puppen. *Arch. f. Hydrobiol. Suppl.* **15**: 1-29.

- Maheshwari, G. (1989) Redescription of two species of *Chironomus* Meigen from India (Diptera; Chironomidae) with a note on ecological separation. *Acta Biol. Debr. Oecol. Hung.* **2**: 253-264.
- Majumdar, U. and Mazumdar, A. 2008. Post-embryonic development of *Einfeldia arcata* sp. n. (Diptera: Chironomidae) of Eastern Himalayas of India with a note on its biology. *Geobios* **35**: 281-285.
- Majumdar, U, Mazumdar, A., and Chaudhuri, P.K. 2009. Life stages and a short account of biology of *Chironomus mayri*, a new species of the genus *Chironomus* Meigen (Diptera: Chironomidae) from India. *Int. J. Dipterol. Res.* **20**: 145-156.
- Martin, J. (2011) *Chironomus samoensis* is a complex of species. *Chironomus Newsl.* **24**: 11-17.
- Martin, J. (1917) *Chironomus strenzkei* Fittkau, 1968 is a junior synonym of *C. striatipennis* Kieffer, 1910. *CHIRONOMUS Journal of Chironomid Research* **30**: 19-25.
(<http://dx.doi.org/10.5324/cjcr.v0i30.2190>)
- Martin, J. (2022) The *Chironomus* species studied by Letha Karunakaran in Singapore, with a review of the status of selected South-east Asian *Chironomus*. *Chironomus Newsl.* **35**: 44-49.
- Martin, J and Chingangbam, D.S. (2016) An additional larval type in the genus *Chironomus* – the yama-type. *CHIRONOMUS Journal of Chironomid Research* **29**: 38.
(<http://dx.doi.org/10.5324/cjcr.v0i29.2175>)
- Martin, J., and Epler, J.H. (2024) Clarification of the status of *Chironomus javanus* Kieffer, 1924 and *C. vitellinus* Freeman, 1961. *CHIRONOMUS Journal of Chironomid Research* **38**: 14-20.
- Martin, J., Guryev, V., Blinov, A., and Edward, D.H.D. (2002) A molecular assessment of variation and dispersal between Australian populations of the genus *Archaeochlus* Brundin (Diptera: Chironomidae). *Invertebrate Systematics* **16**: 599-603.
(10.1071/IT01040)
- Martin, J., and Saxena, S. (2009) Synonymy of *Chironomus plumatisetigerus* Tokunaga, 1964, with *Chironomus circumdatus* Kieffer, 1916. *Chironomus Newsl.* **22**: 14.
- Martin, J., and Sublette, J.E. (1972) A review of the genus *Chironomus* (Diptera: Chironomidae). III. *Chironomus yoshimatsui*, a new species from Japan. *Stud. Nat. Sci. (Portales, N.M.)* **1(3)**: 1-59.
- McLachlan, A.J. (1969) Notes on some larval and pupal chironomids (Diptera) from Lake Kariba, Rhodesia. *J. Nat. Hist.* **3**: 262-264.
- Meigen, J.W. (1804) Klassifikation und Beschreibung der europäischen zweiflügligen Insekten. (Diptera Linn.). Erster Band. K. Reichard, Braunschweig; Abt. I pp. i-xxviii, 1-152, pls 1-8; Abt. II pp. i-vi, 153-314, pls 9-15.

- Meigen, J.W. (1838) Systematische Beschreibung der bekannten europäischen zweiflügeligen Insekten. Siebenter Theil oder Supplementband. Schulzische Buchhandlung, Hamm; XII + 434 + [1] p., pls 67-74. [publd 21.ix.1838].
- Michailova, P., Krastanov, B., Hankeln, T., Schmidt, E and Kraemer, C. (2009) *In situ* localization of the evolutionary conserved Cpy/Cty gene in the subfamily Chironominae (Chironomidae, Diptera): establishment of chromosomal homologies. *J. Zool. Syst. Evol. Res.* doi: 10.1111/j.1439-0469.2008.00494.x
- Morisch, U. and Wülker, W. (1987) Formation of the cerci, abdominal segment X and postgenital plate in the genital imaginal discs of female larvae and pupae in *Chironomus*. In Sæther, O.A. (ed) A conspectus of contemporary studies in Chironomidae (Diptera). Contributions to the International Symposium on Chironomidae, Bergen, Norway. *Ent. scand. Suppl.* **29**: 91-96.
- Nath, B.B. and Godbole, N.N. (1997) Chromosomal characterization of a tropical midge. *Cytobios* **91**: 25-31.
- Nath, B.B. and Lakhotia, S.C. (1989) Heat-shock response in a tropical *Chironomus*: Seasonal variation in response and the effect of developmental stage and tissue type on heat shock protein synthesis. *Genome* **32**: 676-686. (doi: 10.1139/g89-498)
- Pal, G. and Hazra, N. (2017) Description of *Chironomus bifidus* sp. n. and first record of *Ch. crassiforceps* (Kieffer, 1916) from India (Diptera: Chironomidae: Chironominae). *Far Eastern Entomologist* **338**: 10-15. (<https://dx.doi.org/10.25221/fee.338.2>).
- Peck, M.R., Klessa, D.A. and Baird, D.J. (2002) A tropical sediment toxicity test using the Dipteran *Chironomus crassiforceps* to test metal bioavailability with sediment pH change in tropical acid-sulfate sediments. *Environmental Toxicology & Chemistry* **21**: 720-728.
- Pinder, L.C.V., and Reiss, F. (1983) 10. The larvae of Chironominae (Diptera: Chironomidae) of the Holarctic region – Keys and diagnoses. *Entomologica scandinavica. Supplement* **19**: 293-435.
- Pramual, P., Gomontean, B., Buasay, V., Srikhamwiang, N., Suebkar, P., Niamlek, C., Donsinphoem, Y. and Chalath-Chieo, K. (2008) Population cytogenetics of *Chironomus circumdatus* Kieffer, 1921 (Diptera, Chironomidae) from Thailand. *Genetica*, **135**: 51-57.
- Pramual, P., Simwisat, K. and Martin, J. (2016) Identification and reassessment of the specific status of some tropical freshwater midges (Diptera: Chironomidae) using DNA barcode data. *Zootaxa* **4707**: 39-60. (<http://doi.org/10.11646/zootaxa.4072.1.2>)
- Proulx, I., Martin, J. Carew, M. and Hare, L. (2013) Using various lines of evidence to identify *Chironomus* species in eastern Canadian lakes. *Zootaxa* **3741**: 401-458. (<http://dx.doi.org/10.11646/zootaxa.3741.4.1>)
- Rathore, H.S. (1979) Studies on the influence of various factors on puffing in Dipteran giant chromosomes. *Ph.D. Thesis, Vikram Univ. Ujjain, India.*

- Rathore, H.S. and Swarup, H. (1980) Studies on the effect of neomycin on puffing in *Chironomus*. *Acta histochemica* **67**: 86-94.
- Rathore, H.S. and Swarup, H. (1982) Toxicity of lead nitrate to *Chironomus* sp. larvae: a cytogenetic investigation. *Pakistan Journal of Zoology*
- Rathore, H.S. and Swarup, H. (1982) Cytogenetic investigations on *Chironomus* larvae treated with cadmium chloride. *International Journal of Environmental Studies* **19**: 209-214. (<https://doi.org/10.1080/00207238208709992>)
- Ree, H.L. (1985) Eight new and four newly recorded species of Chironomidae (Insecta: Diptera) from Korea. *Animal Systematics, Evolution and Diversity* **28**: 241-260. (<http://dx.doi.org/10.5635/ASED.2012.28.4.241>)
- Ree, H.L. and Kim, H.S. (1981) Studies on the Chironomidae (Diptera) in Korea 1. Taxonomical study on adults of Chironomidae. *Proceedings of the College of Natural Sciences (SNU)* **6**: 123-226.
- Rodrigues, G.G., Langton, P.H. and Scharf, B.W. (2009) The pupal exuviae of *Chironomus crassimanus* Strenzke (Diptera: Chironomidae), an acid resistant species from Germany. *Zootaxa* **2026**: 47-52.
- Sæther, O.A. (1980) Glossary of chironomid morphology terminology (Diptera: Chironomidae). *Ent. scand. Suppl.* **14**: 1-51.
- Sæther, O.A. (2012) The *Chironomus* group (Diptera: Chironomidae) in Lake Winnipeg, Canada. *Zootaxa* **3275**: 1-19.
- Sarkar, P., Bhaduri, S., Ghosh, C. and Midya, T. (2011) The species of *Chironomus* as biosensor in detecting environmental pollution: A study on *Chironomus striatipennis* Kieffer (Diptera: Chironomidae),” *The Ecoscan: Special Issue*, vol. 1, pp. 363-368.
- Sarkar, P., Bhattacharjee, N., and Midya, T. (2018) The non-biting midge species, *Chironomus striatipennis* Kieffer (diptera: Chironomidae) as a potent bio-indicator in water quality assessment. *International Journal of Engineering, Science and Mathematics* **7** Sp.Iss. 4(3): 129-138. (<http://www.ijmra.us>)
- Sasa, M. (1978) A comparative study of adults and immature stages of nine Japanese species of the genus *Chironomus* (Diptera, Chironomidae). *Res. Rep. NIES No.* **3**: 1-63.
- Sasa, M. (1979) Taxonomic accounts on the so-called *Chironomus dorsalis* complex of Japan. *Japanese Journal of Sanitary Zoology* **30**: 187-192 (In Japanese).
- Sasa, M. (1985a) Studies on chironomid midges of some lakes in Japan. Part I. A report on the chironomids collected in winter from the Sapporo area, Hokkaido (Diptera, Chironomidae) *Res. Rept. NIES* **83**: 1-22.

- Sasa, M. (1985c) Studies on chironomid midges of some lakes in Japan. Part II. Studies on the chironomids collected from lakes in southern Kyushu (Diptera, Chironomidae). *Res. Rept. NIES* **83**: 25-199.
- Sasa, M. (1985b) Studies on chironomid midges of some lakes in Japan. Part III. Studies on the chironomids collected from lakes in the Mount Fuji area (Diptera, Chironomidae). *Res. Rept. NIES* **83**: 101-151.
- Sasa, M. (1993) Studies on the chironomid midges (yusurika) collected in Toyama and other areas of Japan. *Res, Rep. Toyama Pref. envir. Pollut. Res. Cent.* **1993**: 1-127.
- Sasa, M. (1994) Studies on Chironomidae collected from Toyama Prefecture and other places. Part 1. Additional information on Chironomidae of Japan. *Res, Rep. Toyama Pref. envir. Pollut. Res. Cent.* **1994**: 28-67.
- Sasa M. and Hasegawa, H. (1983) Chironomid midges of the tribe Chironomini collected from sewage ditches, autrophicated ponds and some clean streams in the Ryukyu Islands, southern Japan (Diptera, Chironomidae). *Japan. J. sanit. Zool.* **34**: 305-341.
- Sasa, M. and Kawai, K. (1987) Studies on the chironomid midges of Lake Biwa (Diptera: Chironomidae). *Lake Biwa Stud. Monogr.* No. **3**: 1-120.
- Sasa, M. and Suzuki, H. (1995) The chironomid species collected on the Tokara Islands, Kagoshima (Diptera). *Japan. J. sanit. Zool.* **46**: 255-288.
- Sasa, M. and Suzuki, H. (1997) Studies on the Chironomidae (Diptera, Insecta) collected in Mongolia. *Jpn. J. Trop. Med. Hyg.* **25**: 149-189.
- Sasa, M. and Suzuki, H. (1999) Studies on the chironomid midges of Tsushima and Iki, western Japan. Part 1. Species of Chironomini collected on Tsushima. *Tropical Medicine* **41**: 1-53.
- Sasa, M. and Suzuki, H. (2000) Studies on the Chironomid species collected on Ishigak and Iriomote Islands, Southwestern Japan. *Tropical Medicine* **42**: 1-37.
- Sasa, M. and Suzuki, H. (2001) Studies on the species of Family Chironomidae (Diptera) collected on Minamidaito Island, Okinawa, South Japan. Part 1. *Tropical Medicine* **43** (3/4): 61-92.
- Sasa, M., Suzuki, H., and Sakai, T. (1998) Studies on the chironomid midges collected on the shore of Shimanto River in April, 1998. Part 1. Description of species of the subfamily Chironominae. *Tropical Medicine* **40**: 47-89.
- Saxena, S. (1995) Basic patterns in the chromosomal evolution of the genus *Chironomus*; polytene chromosomes of three Indian species *C. plumatisetigerus*, *C. calipterus* and *Chironomus* species, pp. 39-48. In P.S. Cranston (ed.) *Chironomids: from Genes to Ecosystems*. CSIRO Publications, Melbourne, 482pp.
- Sela, R., Laviad-Shirit, S., Thorat, L., Nath, B.B., and Halpem, M. (2021) *Chironomus ramosus* larval microbiome composition provides evidence for the presence of

- detoxifying enzymes. *Microorganisms* **9**: 1571
(<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8398091/>)
- Sharma, O.P., Gupta, S.C., and Gandotra, A. (1990) The polytene chromosomes of an unidentified species of *Chironomus* from Jammu (Diptera: Chironomidae). *Chromosome Dynamics* **1**: 139-143.
- Sharma, O.P., Gupta, S.C., and Gandotra, A.K (1995) Polytene chromosome map of *Chironomus* species II. *Chromosome Information Service* No. **59**: 5-6.
- Sharma, O.P., Tripathi, N.K., and Khanna, P. (2004) Karyotypic analysis of *Chironomus plumosus* form B (Diptera, Chironomidae) from Jammu region (India). *Persp. Cytol. Genet.* **11** (suppl. I) 595-608.
- Singh, P. and Rawal, D. (2016a) *Einfeldia pritiensis*, a new species of Chironomidae (Diptera) from Udaipur region (Rajasthan, India). *J. Ent. Zool. Stud.* **4**: 319-320.
- Singh, P. and Rawal, D. (2016b) Morphology of *Einfeldia* (Diptera: Chironomidae) found in Udaipur region. *Int. J. Zool. Stud.* **1**: 23-25.
- Singh, P. and Rawal, D. (2016c) Molecular phylogeny of *Einfeldia* (Diptera: Chironomidae) inferred from sequencing of mitochondrial cytochrome oxidase subunit 1 (COX1) gene. *Int. J. Ent. Res.* **1**: 11-15.
- Singh, S., and Kulshrestha, A.K. (1976) *Chironomus bharti* n.sp. and *C. uttarpradeshensis* n.sp. from India (Diptera: Chironomidae). *Ent. scand.* **7**: 155-158.
- Song, C., Martin, J., Wang, S., and Qi, X. (2022) Redescription of *Chironomus novosibiricus* Kiknadze, Siirin & Kerkis, 1993 (Diptera, Chironomidae) and a new record for Asia from Northern China. *Ann. Zool. Fennici.* **59**: 11-15.
- Spies, M. and Sæther, O.A. (2004) Notes and recommendations on taxonomy and nomenclature of Chironomidae (Diptera). *Zootaxa* **752**: 1-90.
- Strenzke, K. (1959) Revision der Gattung *Chironomus* MEIG. I. Die Imagines von 15 norddeutschen Arten und Unterarten. *Arch. Hydrobiol.* **56**: 1-42.
- Sublette, J.E. and Mulla, M.S. (2000) *Chironomus strenzkei* Fittkau - a new Pan-American distribution, with a review of recent similar additions to the Nearctic midges. *Spixiana* **23**: 145-149.
- Sublette, J.E. and Sublette, M.S. (1973) Family Chironomidae, in Delfinado, M.D. and Hardy, D.E., (eds.) *A catalog of the Diptera of the Oriental region, Volume I, Suborder Nematocera*, University Press of Hawaii, Honolulu, pp. 389-422.
- Tokunaga, M. (1936) Chironomidae of Japan (Diptera), VII New species and a new variety of the genus *Chironomus* Meigen. *Philipp. J. Sci.* **60**: 71-85 + 4plates.
- Tokunaga, M. (1938) Chironomidae from Japan (Diptera). X. New or little-known midges, with descriptions of the metamorphoses of several species. *Philipp. J. Sci.* **65**: 313-383.

- Tokunaga, M. (1939) Chironomidae from Japan (Diptera). XI. New or little-known midges, with special reference to the metamorphosis of torrential species. *Philipp. J. Sci.* **69**: 297-345.
- Tokunaga, M. (1940) Chironomidae from Japan XII. New or little-known Ceratopogonidae and Chironomidae. *Philipp. J. Sci.* **72**: 255-311.
- Tokunaga, M. (1964) Chironomidae of Micronesia. *Insects of Micronesia* **12**: 485-628.
- Townes, H.K. (1945) The Nearctic species of Tendipedini [Diptera, Tendipedidae (= Chironomidae)] *Amer. Midl. Nat.* **34**: 1-206.
- Tripathi, N.K., Sharma, O.P. and Khanna, P. (2002) Chromosomal characterization of *Chironomus plumosus* form A from Jammu region. *J. Cytol. Genet.* **3** (NS): 137-147.
- Vallenduuk, H. J. and Langton, P. (2010) Description of imago, pupal exuviae and larva of *Chironomus ul-iginosus* and a provisional key to the larvae of the *Chironomus luridus* agg. (Diptera: Chironomidae). – *Lauterbornia* **70**: 73-89.
- Vallenduuk, H. J. and Moller Pillot, H.K.M. (1997) Key to the larvae of *Chironomus* in Western Europe. *RIZA Rapport* **97.053**: 1-13 + appendices.
- Webb, C.J. and Scholl, A. (1985) Identification of larvae of European species of *Chironomus* Meigen (Diptera: Chironomidae) by morphological characters. *Syst. Entomol.* **10**: 353-372.
- Webb, C.J., Scholl, A. and Ryser, H.M. (1985). Comparative morphology of the larval ventromental plates of European species of *Chironomus* Meigen (Diptera; Chironomidae). *Syst. Ent.* **10**: 373-385.
- Wülker, W., Devai, Gy. and Devai, I. (1989) Computer assisted studies of chromosome evolution in the genus *Chironomus* (Dipt.) comparative and integrative analysis of chromosome arms A, E and F. *Acta Biol. Debr. Oecol. Hung.* **2**: 373-387.
- Wülker, W., Kiknadze, I.I. and Istomina, A.G. (2011) Karyotypes of *Chironomus* species from Africa. *Comp. Cytogen.* **5**: 23-46.
(<http://dx.doi.org/10.3897/compeytogen.v5i1.975>)
- Yamamoto, M. (1985) A new species of *Einfeldia* Diptera, Chironomidae) from Japan. *Kontyu* **53**: 360-365.
- Yamamoto, M. (1986) Studies of the Japanese *Chironomus* inhabiting high acidic water (Diptera, Chironomidae). I. *Kontyu* **54**: 324-332.
- Yamamoto, M. (1990) Study of the Japanese *Chironomus* inhabiting high acidic water (Diptera, Chironomidae) II. *Jpn. J. Ent.* **58**: 167-181.
- Yamamoto, M. (1995) Redescription of *Einfeldia pagana* (Meigen, 1838) (Diptera, Chironomidae) from Japan. *Jpn. J. syst. Ent.* **1** (2): 235-238.

- Yamamoto, M. (1996) A new species of the genus *Einfeldia* from Japan (Diptera, Chironomidae). *Jpn. J. Ent.* **64**: 241–244.
- Yamamoto, M. (1997) Redescription of *Chironomus sollicitus* Hirvenoja from Japan (Diptera, Chironomidae). *Jpn. J. Ent.* **65**: 205-208.
- Yamamoto, M. (2002) *Austrochironomus*, a subgenus of *Chironomus* Meigen (Diptera: Chironomidae). Abstracts 5th Internl. Congr. Dipterology, Brisbane, 2002: 144.
- Yamamoto, M. (2006) Some taxonomic characters of the so-called *Einfeldia* (Diptera, Chironomidae). *Yusurika* **31**, 37.
- Yamamoto, M. (2010) Chironominae. In: Zusetsu, Nihon, No (eds). *Japanese Association for Chironomidae Studies Yusurika* (Japanese Chironomids with Illustrations) (In Japanese), pp. 158-259. Bun-ichi Sogo Shuppan, Tokyo.
- Yamamoto, N., Suzuki, M. and Yamamoto, M. (2019) Taxonomic notes on several Japanese chironomids (Diptera) described by Dr. M. Sasa(dec.) and his coauthors. *Japan. J. Syst. Ent.* **25**: 63-72.
- Yamamoto, M., Yamamoto, N., and Kimura, M. (2015) Taxonomic notes on Chironomidae (Diptera) from Okinawa Island, Japan, with the description of three new species. *European Journal of Environmental Sciences* 5: 101-115.
(<https://doi.org/10.14712/23361964.2015.83>)
- Yamamoto, N. and Yamamoto, M. (2018) Taxonomic information on some Japanese Chironomidae (Diptera) described by Dr. M. Sasa. *Zootaxa* 4514: 516-528.
(<http://dx.doi.org/10.11646/zootaxa.4514.4.5>)