

NORTH AMERICAN SPECIES OF THE GENUS *CHIRONOMUS*

as recognized by larval cytology and morphology

(includes *CHAETOLABIS*, *LOBOCHIRONOMUS* and *EINFELDIA* (sens. lat.) and species included in *Tendipes* by Townes (1945) but now placed in other genera)

by

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Analysis of the karyotype of the polytene chromosomes in the fourth instar larvae has indicated the presence of a much larger *Chironomus* fauna than indicated in the revision of Townes (1945) or the Nearctic catalog of Oliver & Dillon (1990). Some of these species have been described subsequently, but many remain undescribed.

As well, since more information is becoming available, Greenland has been included as it is essentially part of the continent of North America.

This list gives some information on the morphology, karyotype, barcode and distribution of about 113 species that have been recognized, but it should be noted that even this list is not exhaustive as available material includes a number of specimens that do not easily fit this expanded list.

In many cases the assigned names result from unpublished studies with the late Jim Sublette, and without the assistance of Jim, and of Wolfgang Wülker, this list would not have reached even the present degree of development.

In the locality listings a couple of species are listed as “Hudson Bay Territory” in the absence of better information on the site of collection. Hudson Bay Territory (also known as Prince Rupert’s Land) existed from the 17th to 19th centuries and included the northern parts of Quebec and Ontario, all of Manitoba, and parts of Saskatchewan, Alberta, Nunavut Territory, Minnesota and North Dakota.



Map of Prince Rupert’s Land (from Wikipedia)

The initial samples of many of the provisional species were collected during my tenure of a Canadian National Research Council Post-Doctoral Fellowship at the then Entomological Research Institute, Ottawa, Canada in 1966-67. Consequently, most of the adults or rearings of these species are in the collection of the Canadian National Insect Collection at the Biosystematics Research Institute. Subsequent material was supported by research funds from my friend and colleague James E. Sublette, some on a New Mexico Energy Institute Grant. The rearings from this material are mostly in the Sublette Collection in the Museum of the University of Minnesota. Further funding came from The University of Melbourne, during periods of study leave, and from a grant to Professor Stephen M. Case at the University of Mississippi. Numerous other people have assisted with material and advice, notably Professor Dr. Wolfgang F. Wülker, Dr. Malcolm G. Butler, Professor Iya. I. Kiknadze and her group at Novosibirsk, Professor Peter S. Cranston and Dr. Martin Spies. I express my thanks to all those who have so generously assisted with the work and ideas included in the compilation.

The broad diagnosis of *Chironomus* used here reflects the fact that at the time this study was begun, the nature of *Einfeldia* was quite unclear, and that there was a broad overlap of characters with those of *Chironomus*. While many aspects have been clarified, it is still not agreed that *Benthalia*, as used here, should be recognized as distinct from *Chironomus*. The subgenus *Camptochironomus* is not recognized here, in line with the decision of Townes (1945, p.116). The subgenus was defined only by the enlarged genitalia of the male, but that is a common response to the adoption of mating on the substrate, and cytological and morphological studies indicate that this has occurred independently in unrelated species.

All species listed as *Tendipes* (*Tendipes*) by Townes (1945) are noted, including a species of *Kiefferulus* and two species of *Goeldichironomus* (note there are other species of *Goeldichironomus* or *Kiefferulus* in the U.S.A., but they were not included in the subgenus *Tendipes* by Townes, or have not been included in *Chironomus* (s.s.) at any stage).

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

Abbreviations:

ASA - distance between antennal bases

AT – Anal tubules

BOLD - Barcoding of Life Database (http://www.boldsystems.org/views/login_interim.php)

BR - Balbiani Ring

BV - length of (fe + ti + ta1) / length ta2-5

COI - Cytochrome oxidase subunit I

FC - Frontoclypeal Apotome

GC – Gonocoxite IX

GP – Gonopophysis VIII

GS - Gonostylus

HR – ratio of length to width of pupal respiratory base

IPD - distance between the Ventromental Plates

IVo – Inferior volsella

MD – male determining (gene)

Mt - Mitochondrial

MW - width of Mentum

N – Nucleolus (i.e. the sac produced by an active NOR)

NOR – Nucleolar Organizing Region (i.e. the chromosomal locus capable of producing a nucleolus)

PE - Pecten Epipharyngis

PLT – Posterolateral tubules

PMa – Pecten Mandibularis

PreM - Premandible

PsA – Pedes spurii A

PsB – Pedes spurii B

S4A - distance between S4 setae

SCf - Sensilla campaniformia

SCh – Sensilla Chaetica

SSV - length of (fe + ti) / length of ta1

SVo - Superior Volsella

VHL - Ventral Head Length

VM – Ventromental plates

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

VR – Venarum ratio. There are 2 variants of this measure, one used mainly in the United Kingdom, the other in Europe, North America. Hence the version used is length from arculus to posterior fork/ length from arculus to cross vein.

VT - Ventral tubules.

‡ - presence at locality not confirmed.

In the adult descriptions reference is made to the types of SVo 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).

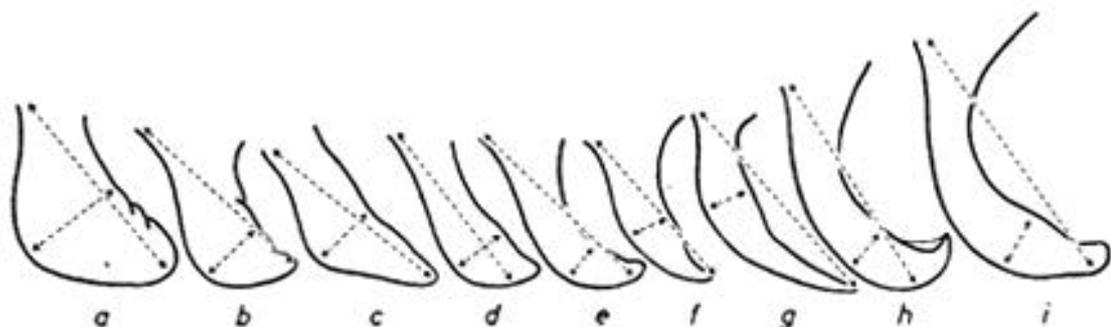


Abb. 4. Grundformen der Claspette des *Chironomus*-Hypopygs (♂). a—c S-Typ (a *halophilus*, b *thummi thummi*, c *luridus*), d—f D-Typ (d, e *dorsalis*, f *striatus*), g—i E-Typ (g *cingulatus*, h *salinarius*, i *annularius*).

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), which recognizes 9 categories. The categories are:

salinarius - lacking posterolateral (PLT) and ventral tubules (VT)

Lacking PLT:

halophilus - anterior VT very short or absent, posterior VT short, less than the width of the segment.

bathophilus – moderate to long, essentially straight VT, greater than the width of the segment.

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

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

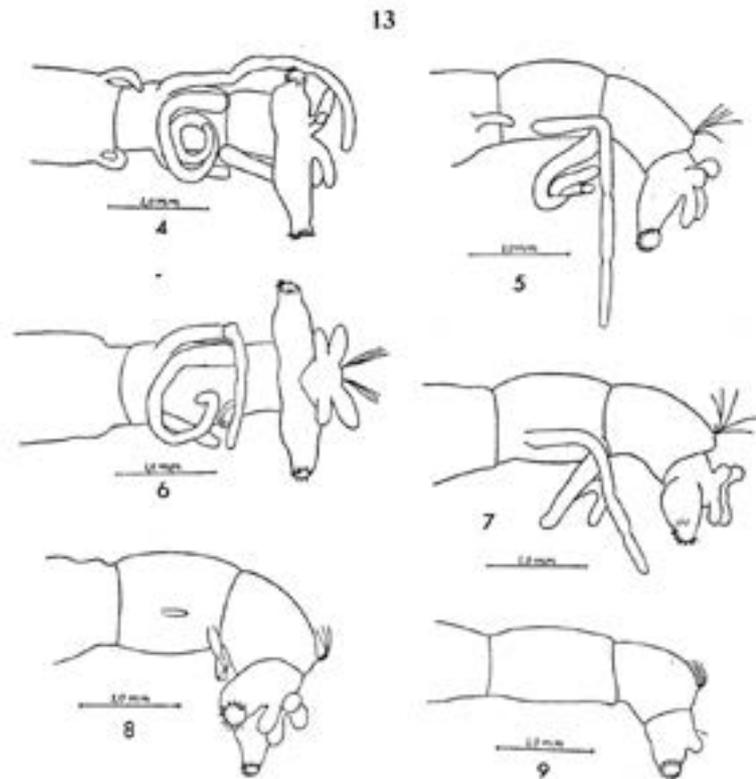
Possessing PLT:

reductus – lacking ventral tubules.

semireductus – short straight or slightly curved VT, less than the width of the segment.

melanotus – moderate to long, essentially straight VT.

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



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.

from Andersen 1949

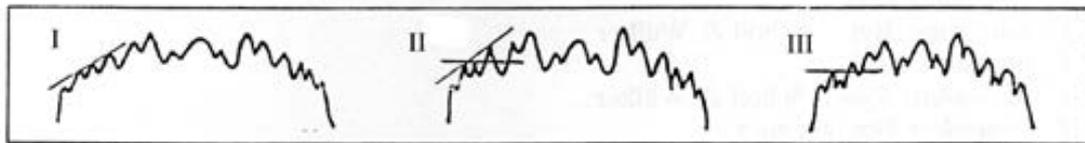
Reference is also made to the mentum and mandible types devised by Webb & Scholl (1985), Vallenduuk & Moller Pillot (1997) and Proulx *et al.* (2013). These earlier classifications were made for relatively small numbers of species, but with the much larger number of species in the North American fauna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

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

Central tooth type: 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)

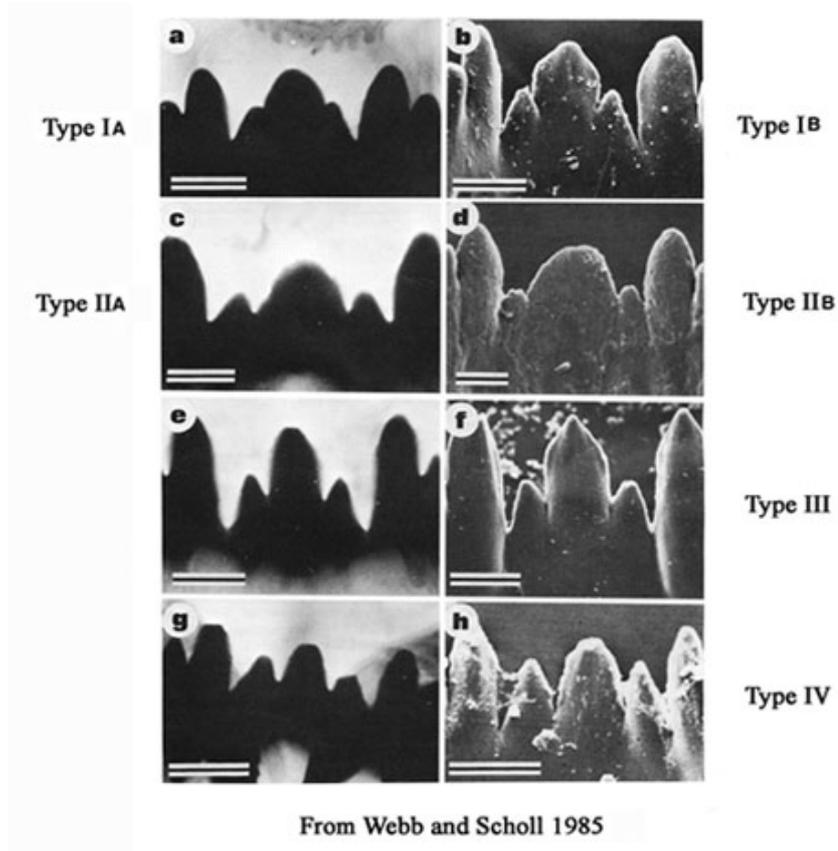
Type IB – c2 teeth slightly more separated (figure b)

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. Tooth coloration may be more independent of the degree of separation than recognized in Europe or by Proulx *et al.* 2013. As a result, it seems better to consider the two characters separately.

Separation:

Type I – tooth fused

Type II – tooth partially free

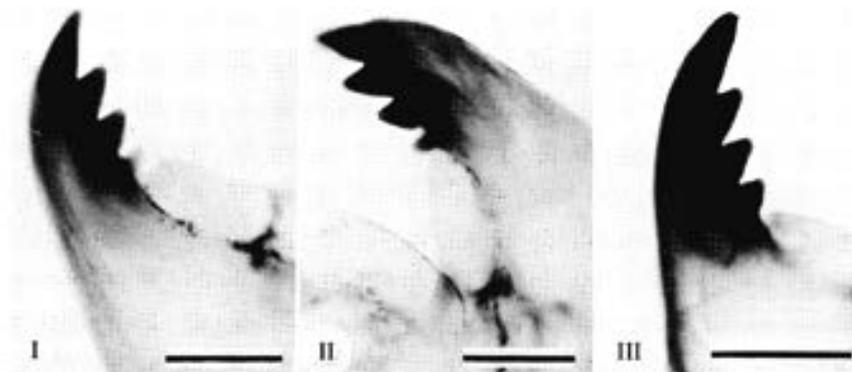
Type III – tooth completely separated

Color:

Type A - tooth pale

Type B - some degree of pigmentation

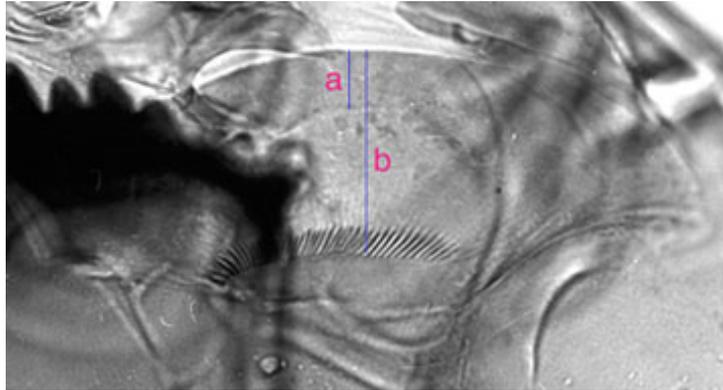
Type C – as dark as other inner teeth



From Webb and Scholl 1985.

This figure would show IA, IIB, and IIIC respectively

Ventromentum



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

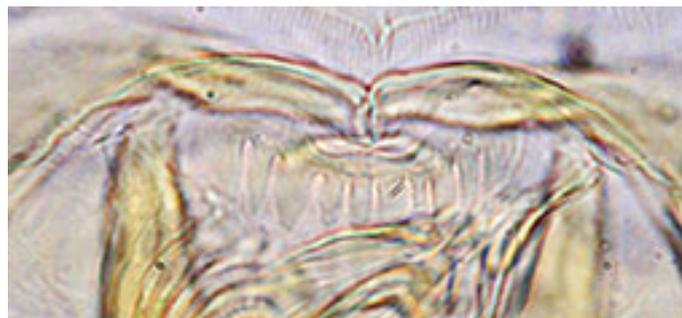
Pecten epipharyngis

Proulx *et al.* (2013) recognized 4 types of PE in North American species. These are useful if the teeth are not worn down, as they often are in older larvae.

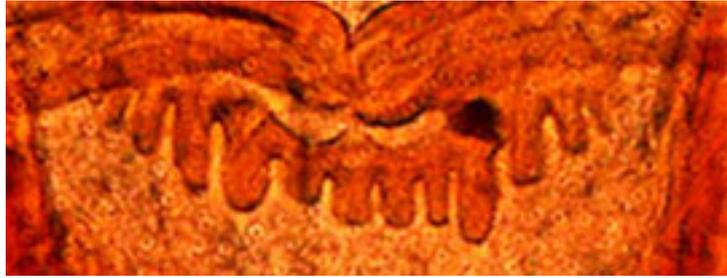
Type A - fine sharp rather uniform teeth.



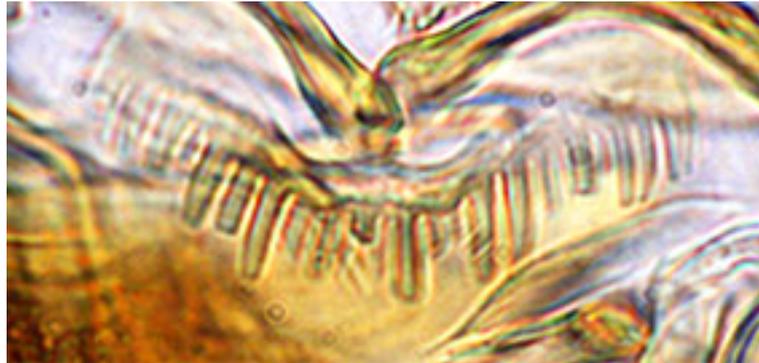
Type B - teeth broader but still sharp. Sometimes with one or two fine smaller teeth interspersed.



Type C - rounded and rather uniform, may also have sharp teeth. 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 from the anterior end near the antennal bases, and where the S4 setae are in relation to the broadening of the clypeus. Where the anterior narrowing continues almost to the S4 setae the distance between antennal bases will be greater; if the narrowing is only near the antennal bases and the width remains approximately the same until near the S4 setae the distances will be about equal; while if narrowing is quite short and then begins to widen up to the maximum width, the distance between the S4 setae will be greater.

Note that this only an approximate measure of these relationships as other features such as the relative width of the FC at its widest point will also affect the relationship.



Frontoclypeus with approximately equal distance between antennal bases and S4 setae (*C. species b*)

It should be noted that many of the larval characters referred to in the following descriptions can be quite variable. General size and ventral, lateral and anal tubules can be affected by environmental conditions, as well as by genetic variability. Appearance of mouth parts is also affected by wear, for example a worn type III central trifold tooth can appear to be type II. Genetic variation can also apply to these characters. Consequently, identification may need to be based on agreement of the majority of characters, particularly those that are least variable. This is why identification of larvae on the basis of morphological characters is so difficult.

Species a. *C. bifurcatus* Wülker *et al.* 2009

A member of the *C. decorus*-group

Also *C. species B1* = *C. decorus*-gr sp.1 of Butler *et al.* 1995.

In BOLD Bin: [BOLD:AAG5453](#) (Gp. 1)

Adult:

The adults and other life stages were described by Wülker *et al.* (2009). However, these descriptions are probably a mixture of specimens of *C. bifurcatus* and *C. 'proulxi'*, so need to be revised.

Male:

The adult male is a typical member of the *C. decorus*-group. Rather similar to those of *C. matorus* Johannsen in coloration and in the darkened SVo of the male genitalia but the SVo is shorter and darker than that of *C. decorus*.

Coloration: Head and thorax light to dark brown, postnotum blackish, scutellum paler, median and lateral vittae weakly separated by lighter color; abdomen strongly vittate, with the basal dark bands occupying half or more of each tergum, except on tergum VI where the dark marking is more saddle-shaped, as *C. decorus*; legs pale yellowish brown.

Head. AR 4.14 (3.33–4.21); temporal setae 32 (29–32); clypeus about 0.84 width of antennal pedicel; clypeal setae 32 (27–40); frontal tubercle length 42–86 µm; length of palpomeres II-V (µm): 62: 226: 273: 383.

Thoracic setae – Acrostichals abt. 16; dorsocentral 27, mostly in 2 rows; prealar 6; supraalar 1; scutellar 30, with 15 in posterior row, rest scattered anteriorly.

Wing length 2.87-3.95 mm; width 0.92-1.00 mm; VR 0.98.

Legs: LRI 1.58; LRII 0.62 ; LRIII 0.77; BR 3.0.

Leg proportions (micron)

	Fe	Ti	Ta1	Ta2	Ta3
PI	1190	1190	-	-	-
PII	1385	1150	730	385	230
PIII	1385	1190	1150	615	405
400	Ta4	Ta5	LR	F/T	BR
PI	-	-	1.51-1.68	1.0	2.31-3.57
PII	190	150	0.61-0.64	1.20	-
PIII	365	-	0.71-0.79	1.16	-

Some measurements of a confirmed specimen can be provided from a male (see below) from a photograph in the BOLD database:



C. bifurcatus male from Arizona

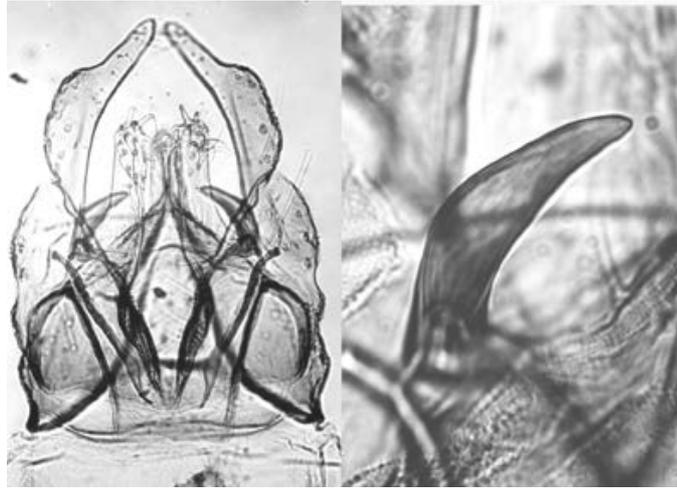
Basal dark band at anterior of abdominal tergites, broader at mid-line and becoming more extensive until segs. VI-IX are almost completely dark.

Wing length 3.8 for certain–4.1 mm, width 0.9-1.0 mm, VR abt 1.03.

Approximate leg proportions (micron):

	Fe	Ti	Ta1	Ta2	Ta3
PI	1430	1440	1950	1095	715
PII	1520	1475	855	525	380
PIII	1845	1865	1335	760	570
	Ta4	Ta5	LR	F/T	Ta5/Ti
PI	500	380	1.33-1.39	abt 1.0	abt 0.27
PII	260	215	abt 0.58	abt 1.03	abt 0.15
PIII	335	190	abt 0.72	0.98-0.99	abt 0.10

As well there is information on the hypopygium from an adult from the same egg mass as the Holotype:



Male terminalia of *C. bifurcatus*

A typical *C. decorus*-type hypopygium, with superior volsella similar to that of *C. maurus*.

Tergite IX with 12 (8-16) setae. SVo dark, of D-type of Strenzke (1959). GS narrows sharply over posterior third.

Female: - some data from photographs on BOLD



BIOUG03114-A06+1373481716

Coloration basically similar to male; abdomen with dark band on basal half of segment. Legs pale with some darkening at knees and on apical part of tibia, particularly on fore legs. Wing length about 2.25 – 4.7 mm; width about 1.14, VR abt 1.05. Leg proportions (approx.)(micron):

	Fe	Ti	Ta1	Ta2	Ta3
PI	1455	1310	-	-	-
PII	1500	1630	-	-	-
PIII	1635	1765	1290	710	400
	Ta4	Ta5	LR	F/T	Ta4/Ti
PI	-	-	-	1.10	-
PII	-	-	-	0.92	-

PIII	-	-	0.73	0.93-0.97	-
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Pupa is typical of most of the species in the *C. decorus*-group, in lacking the secondary tubercle on the cephalic tubercles found in *C. decorus* itself.

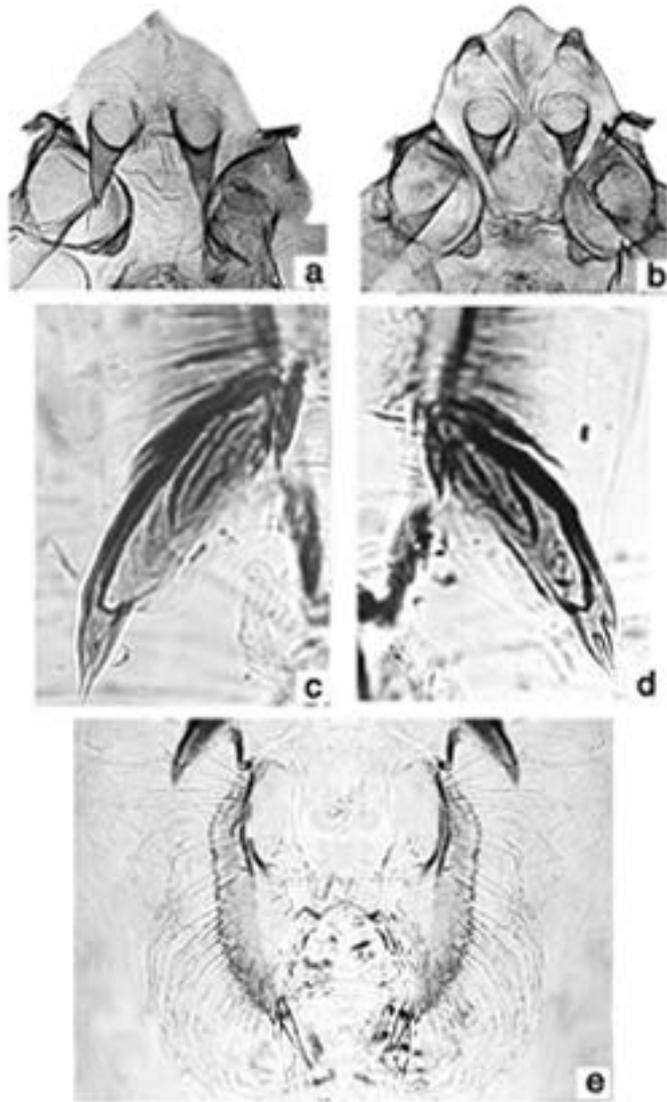
Length 6.45–8.08, mean 7.56 mm (11). Cephalothorax mostly dark; frontal tubercles black, remainder of frontal apotome pale; abdomen pale with faint lateral vertical stripes on either of TI; TII–TIV with heavy lateral dark, vertical stripes; TVI, TVII with much weaker lateral stripe, reaching only about halfway to the posterior margin of each tergum; lateral margin of V–VIII darker, heaviest on TVIII, which grades into the dark posterolateral spur; lateral margins of swim fin darkened.

Cephalothoracic tubercles weak; prealar tubercle elongate, not strongly produced.

Abdominal shagreen moderately developed occupying slightly more than the apical half of TII; TIII–TVI with a quadrate shagreen patch which is slightly expanded laterally on TIII–TV and less so on TVI; TVII with a weak patch on each side near the base; TVIII with heavier shagreen than VII.

TII with 78–118 posterior hooks. Caudolateral spur normally with about 2 - 3 apical spines but varying from 1 to 6. It differs from *C. matorus* in the usually higher number of spines.

Swim fin with 71–93 taeniform setae.



a, c-e - Pupal characters of *C. bifurcatus*. b. Frontal apotome of *C. decorus* (sp. 3a) showing the secondary tubercles not found in other species of the *C. decorus*-group. d. Spur from pupa from same egg mass as the Holotype

Fourth instar larva small to moderate size, length 12.2 (10–15) (33) (fem. 11.4–13.8); male 11.4 mm; essentially of the bathophilus-type but sometimes a melanotus-type with some development of PLT in Canadian specimens (0–160 μ m) The presence and absence of PLT can be seen even in offspring from a single egg mass (see below re Type egg mass), suggesting it is genetic in origin. Anterior VT usually slightly longer (ant. 0.87–1.56 mm, post. 0.87–2.04 mm), those of mid-west larvae are of fluviatilis- type (this may be a characteristic of larvae from deeper waters). AT with a medial constriction, 355–480 μ m long, and 2.5–4.0 times longer than wide. Gula (below) dark on posterior third to half, FC pale.



Gula region of *C. bifurcatus* – from a larva from the type egg mass

Mentum (Fig. d, below) with pointed teeth, c2 teeth sometimes only partly separated from the relatively tall c1 tooth (type III), 4th laterals reduced at least halfway to the level of 5th laterals (type I-II).

VM (Fig. e, below) with about 30 - 49 striae, IPD a third or more (0.32-0.43) of the mentum width, VMR about 0.27-0.29. PE (Fig. a, below) with about 12 (11-14) generally sharp, even teeth (type B). Premandible (Fig. b, below) with inner tooth about 2-3 times the width of the outer, which may be slightly longer or slightly shorter (possibly due to wear).

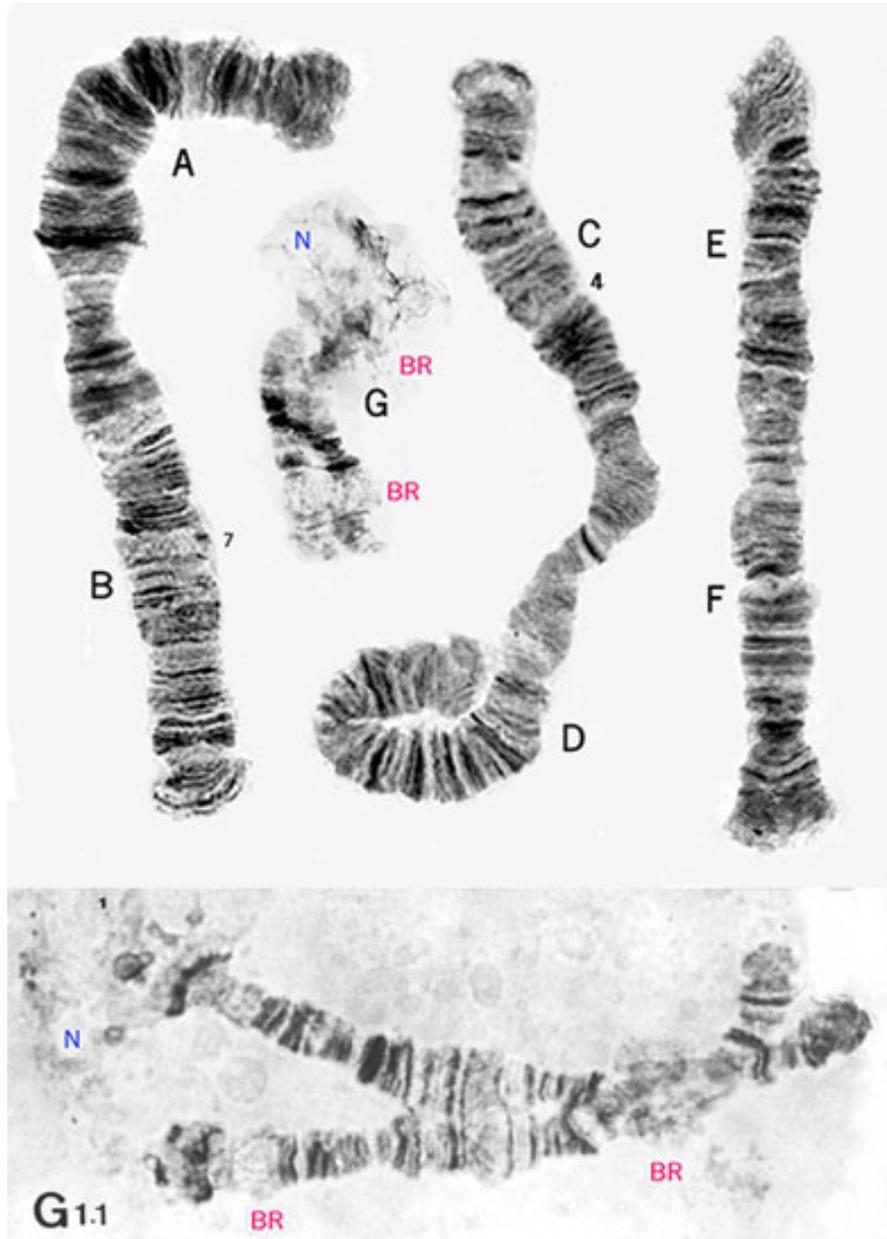
Antenna (Fig. c, below) relatively short, about 30-40% of VHL; basal segment about 2.8–4.8 times as long as wide; RO a third to almost half way up (0.32-0.47) segment 1; segment proportions (microns) 123 : 27 : 7 : 12 : 6; AR 1.8–3.1; A3 much shorter than A4 (A4/A3 abt. 1.5-2.2), and equal or slightly longer than A5.

Mandible (Fig. f, below) with the third inner tooth partially separated and pale or slightly darkened (type IIA-B), about 18 (15–20) furrows on outer surface near base; PMA with 11 (10-12) taeniae.



Mouthparts of *C. bifurcatus* larvae from the type egg mass.

Cytology: 4 polytene chromosomes with thummi arm combination AB, CD, EF, G. Arm G at least partly unpaired, with a terminal nucleolus and BR. The nucleolar end is always unpaired, giving the forked appearance referred to in the proposed name. The whole arm may be unpaired, which may be due to the presence of inversion polymorphism. No other nucleoli. Bulb with distal dark bands usually developed near center of arm B. Polymorphic in A, B, C, D, E, F and G (at least band polymorphism, but also an inversion). At least three new heterozygous inversions have been identified since the published map of Wülker *et al.* (2009).



- bif A1: 1a-e, 14-15, 7b-4c, 13a-f, 8d-9, 2d-3, 17h-a, 3f-i, 12-10, 2c-1f, 8c-7c, 4ab, 16a-d, 18-19
- bif A2: 1a-e, 14-15, 7b-4c, 13a-f, 8d-9, 2d-3, 16d-a, 4ba, 7c-8c, 1f-2c, 10-12, 3i-f, 17-19
- bif A3: 1a-e, 14a-g, 3-2d, 9-8d, 13f-a, 4c-7b, 15d-a, 14ih, 17h-a 3f-i, 12-10, 2c-1f, 8c-7c, 4ab, 16a-d, 18-19
- bif A4: 1a-e, 14a-g, 3-2d, 9-8d, 13f-a, 4c-7b, 15d-a, 14ih, , 4ba, 7c-8c, 1f-2c, 10-12, 3i-f, 17a-h, 16a-d, 18-19
- bif B1: Large puff (group 7) near the middle of the arm.
- bif B2: Puff in more distal position
- bif C1: 1 - 6b, 12b - 15, 8 - 11c, 12a - 11d, 6gh, 17a - 16, 7d-a, 6f-c, 17b - 22 as C1 of *blaylocki*
- bif C2: 1 - 4h, 15 - 12c, 6b-4i, 8 - 11c, 12a - 11d, 6gh, 17a - 16, 7d-a, 6f-c, 17b - 22
- bif D1: 1 - 3e, 18d - 13d, 7e - 10, 4a-c, 13c - 11, 3gf 18e-g, 7d - 5, 19 - 24
- bif D2: 1 - 3e, 10 - 7e, 13d - 18d, 4a-c, 13c - 11, 3gf 18e-g, 7d - 5, 19 - 24
- bifD3: approx 1 - 3e, 10 - 9, 16 - 13d, 7e - 8, 17 - 18d, 4a-c, 13c - 11, 3gf 18e-g, 7d - 5, 19 - 24
- bif E1: 1 - 3e, 5 - 10b, 4 - 3f, 10c - 13 i.e. as *aberratus*, sp. 2b

- bif E2: 1 – 3a, 10e-c, 3f - 4, 10b – 5, 3e-b, 11 - 13
 bif F1: 1, 9 - 7, 14-17, 11e - 13, 11d - 10, 2 - 6, 18 - 23 (WW)
 bif F2: approx 1, 9 - 7, 19 - 18, 6 - 2, 10 - 11d, 13 - 11e, 17 - 14, 20 – 23
 bif F3: approx 1, 9 - 7, 14 – 17, 11e, 5 - 2, 10 – 11d, 13 – 12, 6, 18 - 23
 bif G1: terminal nucleolus and usually a large median BR (in type 2) and a smaller almost terminal one.
 bif G2: a small inversion around the median BR (may be type 2).

Found: **Alberta** - Astotin Lake, Elk Island Natl. Pk. (53.685°N, 112.89°W) (BOLD database)
Ontario - Lac Deschêne (45.37°N, 75.85°W) (**Type locality**), Ottawa, Carleton Co: Georgian Bay Islands N.P. (44.7418°N, 79.8501°N)(BOLD); Catholic Central H.S. (42.9869°N, 81.239°W) and Oakridge Secondary School (42.978°N, 81.312°W), both London (BOLD).
Nova Scotia - Point Pleasant Park, Halifax (44.623°N, 63.569°W) (from GenBank).
Quebec - L. Adéline (48.20°N, 79.17°W); L. D’Alembert (48.38°N, 79.02°W), L. Arnoux (48.25°N, 79.33°W), L. St. Joseph (2007) (46.8°N, 71.63°W), L. Duprat (48.33°N, 79.12°W) and L. Opasateca (48.17°N, 79.33°W) (Proulx *et al.*).
Arizona - at 2033 meters Kaibab National Forest (35.939°N, 112.121°W) (BOLD)
Massachusetts - Lake Pleasant (43.56°N, 72.51°W), nr. Montague, Franklin Co.
Minnesota - Turtle Lake, Becker Co. (M.G. Butler).

Localities not clearly identified as *C. bifurcatus* or *C. ‘proulxi’*:

- Manitoba** - Lake Winnipeg (Sæther 2012)
New Brunswick - Kouchibouguac Natl. Pk. (48.858°N, 64.975°W).
Ontario - Algonquin Provincial Park, Nipissing Co. (abt. 45.58°N, 78.70°W); Bear Creek, Carlsbad Springs, Carleton Co. (45.37°N, 75.47°W); Copanspin Farm, Dunrobin (45.75°N, 75.87°W), and 0.5 ml Dunrobin; Arboretum, Ottawa (45.40°N, 75.87°W), South March (45.40°N, 75.87°W), all Carleton Co.
Quebec - Brewery Creek, Hull (45.43°N, 75.73°W), Gatineau.
Kansas - Lone Star Lake (38.83°N, 95.38°W), Douglas Co.
Michigan - Lake Michigan, Epoufette (46.05°N, 85.17°W).
Minnesota -; Anderson Lake, Clearwater Co.; Bad Axe Lake, Hubbard Co. (M.G. Butler).

Creeks, pools, the shallows to the profundal of lakes. In some locations it co-occurs with *C. decorus* (species 3a). At least where this occurs, the larvae of the two species can be separated by the greater region of gula darkening and the longer AT of *C. decorus* (3A).

All stages (except female) and the salivary gland chromosomes described by Wuelker *et al.* (2009) (but see note above). Some information on arm F given in Fig. 3 of Martin (1979) and a photograph of the chromosomes in Butler *et al.* (1995) as *C. decorus*-gr. species 1.

DNA analysis: Sequence for the mitochondrial *COI* and the nuclear *gb2β* genes are available. The data of Proulx *et al.* (2013) suggested that the species may comprise two closely related components. Additional data, mostly from GenBank, confirms there are distinct base differences between the groups at 10 bases (see Table below).

Locality	# specimens	base no.									
		1	2	3	3	3	4	4	5	5	6
		9	7	3	4	8	7	9	1	6	2
		7	1	6	2	1	7	8	6	4	1

Group 1		
Halifax NS	1	C C T T A T C C A ?
L. D'Allembert QC	1	C C T T A T C C A A
L. Adéline QC	2	C C T T A T C C A A
L. Arnoux QC	1	C C T T A T C C A A
L. Duprat QC	4	C C T T A T C C A A
L. Opasatica QC	3	C C T T A T C C A A
L. St Joseph QC(07)	1	C C T T A T A C A A
GeoBayIsNP ON	1	C C T T A T A C A A
Algonquin Pk ON	1	C C T T A T C C A A
Ottawa ON	1	C C T T A T C C A A
London CCHS ON	1	C C T T A T A C A ?
London OSS ON	1	C C T T A ? ? ? ? ?
Sudbury ON	2	C C T T A T C C A A
ElkIsNP AL	1	C C T T A T C C A A
Pleasant L. MA	1	C C T T A T C C A A
Kaibab Nat.For. AZ	1	T T A T A T A C A C
Group 2		
Pr.Ed.Is NP. PEI	1	T A A C T A T T A ?
L.St Joseph QC(06)	3	T G A C T A T T T C
L.Kinojévis, QC	1	T G A C T A T T T C
McFarlane L. ON	3	T G A C T A T T T T
Tilton L. ON	1	T G A C T A T T T T
Kawatha ON	1	T G A C T A T T T C
Kawatha ON	2	T G T C T A T T T T
Brockville ON	1	T G A C T A T T T ?
Kitchener ON	1	T A A C T A T T A ?
London BSPS ON	1	T T A C T A T T A ?
London ABLSS ON	1	T A A C T A T T ? ?
Meaford CS ON	1	T A A C T A T T A ?
Peterborough ON	1	T A A C T A T T A C
Puslinch Twn ON	1	T A G C T ? ? ? ? ?
Rouge NUP ON	1	T A A C T A T T ? ?
Whitby ON	1	T A A C T A T T ? ?
Madison WI	2	T A A C T A T T A C
Pr.Alf. NP SK	1	T A A C T A T T A C
Grasslands NP SK	1	T A A C T A T T A ?
Gulf Is NP BC	2	T C A C T T T T A ?
Kamloops NAM BC	2	T G A C T A T T T ?
Kelowna CS BC	1	T G A C T A T T T ?
Riffle Ck OR	1	T G A C T A T T T C

Bases that differ between the two groups of *C. bifurcatus* in the *COI* tree
 ? - base unknown in short sequences from BOLD database

DeSalle *et al.* (2005) suggested that for closely related species, such specific base differences are a better indicator of specific status than distance measures. Martin (2011) noted some examples amongst the Australian species and the distinction between *C. frommeri* (sp. 2d) and the other members of the *C. staegeri*-group is a further example.

Initially the split of *COI* sequence of specimens identified as *C. bifurcatus* was recognized in the BOLD database by placing them in separate bins, although BOLD has subsequently amalgamated the two Bins, probably as a result of confusion from shorter Barcodes accepted in the database. As seen in the Table above (where sequences shorter than 500bp were not included), some of these sequences can be missing up to four of the critical bases.

There is no indication of the two types in the *gb2β* sequences as there is a very low level of polymorphism overall.

As well there is some suggestion of alternative banding sequences on some chromosome arms (particularly arms B and F) of those relatively few specimens for which both cytology and DNA sequence is available. Those of group 1 correspond to those of the type egg mass (see Table below).

Specimen \ Arm	A	B	C	D	E	F	G(med BR)
Group 1			some C2				
Pleasant L. MA 21	A2	B1	C1	D2	E1	F1	abs
Algon Pk ON 21f	A3	B1.2	C1	D1	E1	F1	pres
L.Dupret QC 10	A1	B1		D1	E1	F1	abs
L.Arnoux QC 11	A1.2	B1	C1	D1.2	E1	F1	abs
L.D'AlembertQC 12	A1	B1	C1	D1	E1	F1	abs
Group 2							
Madison WI em#8	A3	B2	C1	D2.3	E2	F2	pres
Madison WI em#7	A3	B2	C1	D2	E2	F2	pres
McFarlane L.ON 7	A1	B2	C1	-	E1*	F2	pres
Tilton L.ON 8	-	B2	-	-	E1?	F2	pres
Type material							
Type egg mass	A1&3	B1	C1	D1	E1	F1	abs

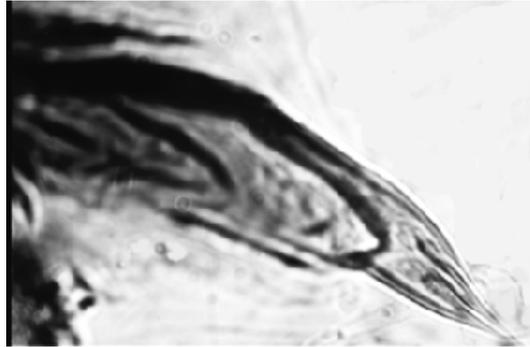
* it is just possible that this is E1.2

Sequences of *Chironomus bifurcatus* specimens used in *COI* analysis

In case this is supported, the following information is given based on material from the same egg mass as the Holotype:

Adult: No additional data other than the hypopygium shown above.

Pupa: Caudolateral spur of known pupa has only 3 spines, as shown below.



Fourth instar larva: Length 10.2 – 13.8 mm, PLT sometimes absent, but up to 186 μm in length in others. Posterior ventral tubules longer in half the available larvae, but equal or anterior tubules longer in others. AT up to 3 times (2.5-2.8) longer than wide.

Gula darkened on posterior half, frontoclypeus pale.

Mentum of type II (4th laterals reduced almost to level of 5th laterals), central tooth of type III, with c2 teeth relatively separated.

About 30-43 striae on ventromental plates, which are separated by a third or more (0.32-0.43) of the mentum width.

Antenna relatively short; AR about 2.14 (1.8 – 3.1); A1 about 2.8 – 4.8 times longer than wide; RO almost half way up segment 1 (0.32-0.45); segment proportions (microns) 119 : 25 : 7 : 12 : 6.

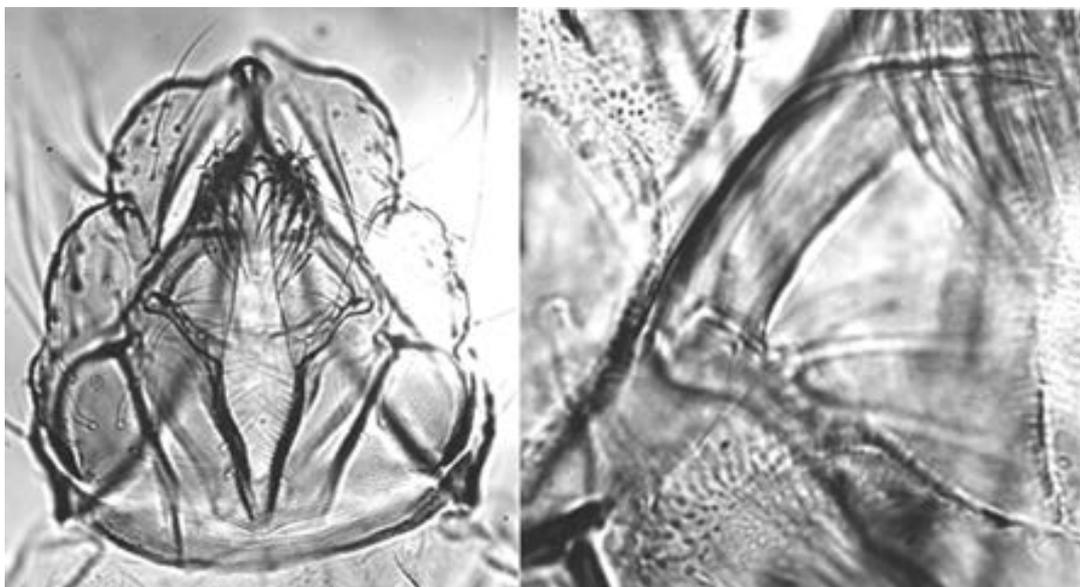
Third inner tooth of mandible hardly separated and with little color (type IA), about 15-19 furrows.

This egg mass has the sequences bifA1 and A2, bifB1, bifC1, bifD2, bifE1, bifF1, bifG1 with no median BR.

Species b. *C. decorus* group

Adult:

Male: The adult male is a typical member of the *C. decorus*-group. The GS is relatively short and stout compared to those of *C. bifurcatus* or *C. blaylocki*, narrowing sharply over distal quarter. The SVo shows similarities to that of *C. blaylocki* i.e. S-type, closest to Strenzke's figure c.



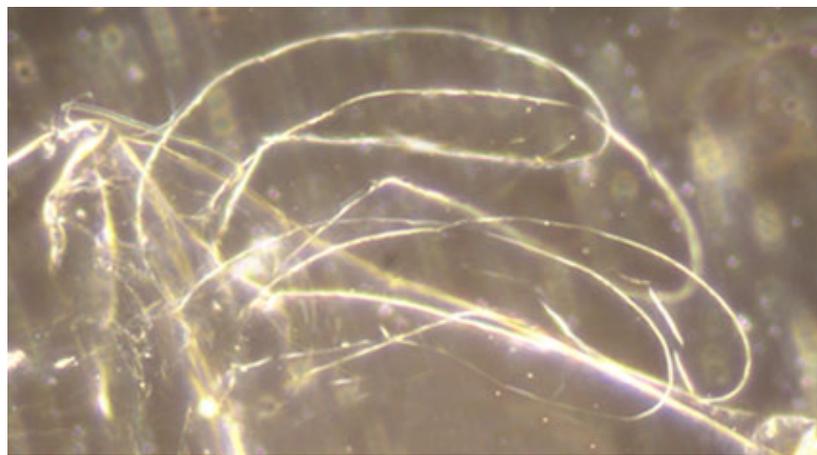
Male terminalia of *C. species b*

Note relatively short GS, and the SVo similar to that of *C. blaylocki*.

Pupa: Caudolateral spurs (below) with about 5 spines along the outer edge.



Fourth instar larva of the plumosus-type with long VT, posterior pair normally longer (anterior 1.6 - 2.3; posterior 1.9 - 2.8). PLT about 170 - 360 μm . Length, female 14.4 - 17.2 mm; male 12.0 - 15.3 mm. AT relatively long, about 4.4 times longer than wide; with a median constriction, length about 550 - 700 micron, ventral pair may be narrower.



Gular region darkened on post half, FC normally darkened, occasionally pale.

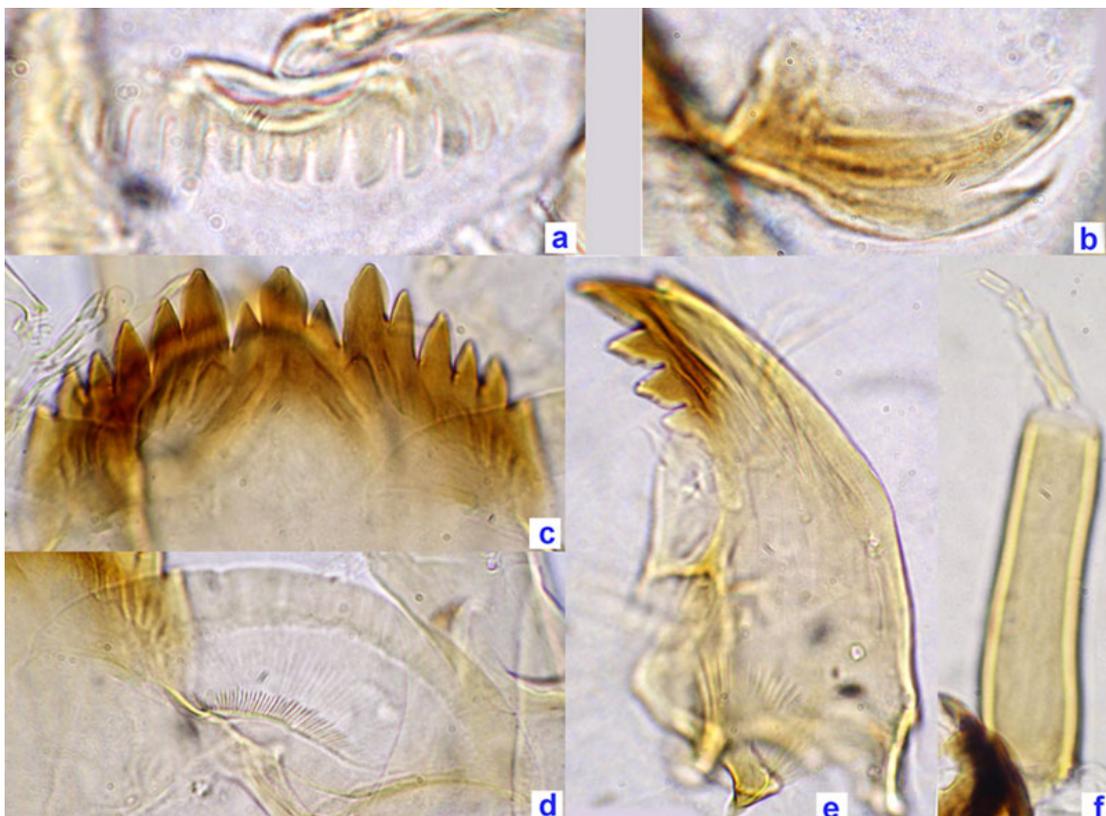


Mentum (see c, below) width about half the ventral head length; with somewhat rounded teeth, c2 teeth of center trifold tooth well separated (type or IIA if worn); fourth laterals not reduced (type I). Ventromental plates (see d, below) separated by about one third of the mentum width, with about 44-47 striae. PE (see a, below) with about 14 relatively broad teeth (type B). Premandible (see b, below) with outer tooth probably longer, but often broken or worn to about equal length, inner tooth about twice the width of the outer.

Antenna (see f, below) with basal segment about 3.6 times as long as wide; AR about 2.27-2.40; RO just less than halfway up A1; A3 just shorter than A4, and just longer than A5; VMR about 3.2, increasing towards midline.

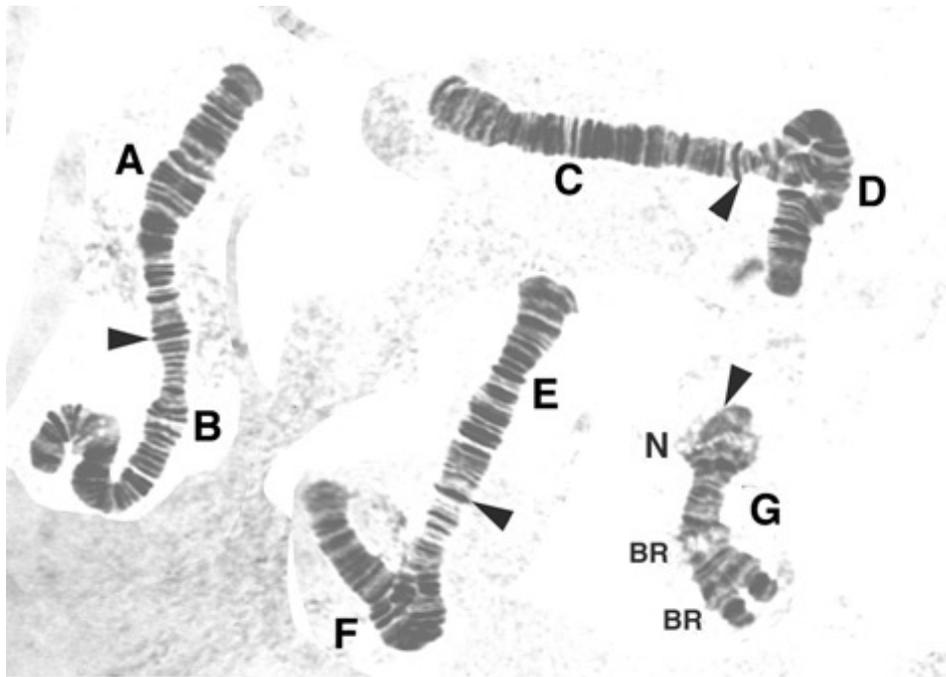
Distance between the antennal bases sometimes shorter, and sometimes about equal to width between S4 setae. (see above)

Mandible (see e, below) about 240-250 μ m long, with 3rd inner tooth relatively darkened, but not well separated (type IIB-C), with about 14 furrows on the outer surface at the base.



Cytology: 4 polytene chromosomes with thummi arm combination AB, CD, EF, G.
 Arm G normally paired with subterminal nucleolus and BR about one third from other end. No other nucleoli. Bulb with proximal dark bands near end of arm B. Polymorphic in A, B, D, E & F.

- Arm A1: 1a-e, 4d-a, 13-15, 3e-2d, 9-8, 5-7, 16d-a 1F-2c, 10-12, 3i-f, 17-19 (Wülker)
- Arm A2: 1a-e, 4d, 10a-e, 2c-1f, 16d-a, 7-5, 8-9, 2d-3a, 15-13, 4a-c. 11-12, 3i-f, 17-19
- Arm B1: Puff with proximal dark bands (groups 7 and 8) near distal end of arm.
- Arm B2: Puff with distal dark bands (groups 8 and 7) about 1/3 from end of arm, as B of *blaylocki*
- Arm C1: possibly as C2 of *blaylocki*
- Arm D1:
- Arm D2: Simple inversion of proximal half of arm.
- Arm E1: 1 - 3e, 8 - 5, 9 - 10b, 4 - 3f, 10c - 13 i.e. as *maturus*, *blaylocki* & *stigmaterus*.
- Arm E2: 1 - 3e, 6 - 8, 5, 9 - 10b, 4 - 3f, 10c - 13
- Arm F1: 1a-f, 9 - 2, 10 - 23 i.e. as *blaylocki*
- Arm F2: 1, 9 - 2, 10, 17 - 11, 18 - 23 (Wülker)



Found: Ontario - Dunrobin, Carleton Co.; Bear Creek, Carlsbad Springs, Carleton Co. (45.37°N, 75.47°W).
 Wisconsin - Arboretum, Madison, Dane Co. (43.03°N, 89.42°W).

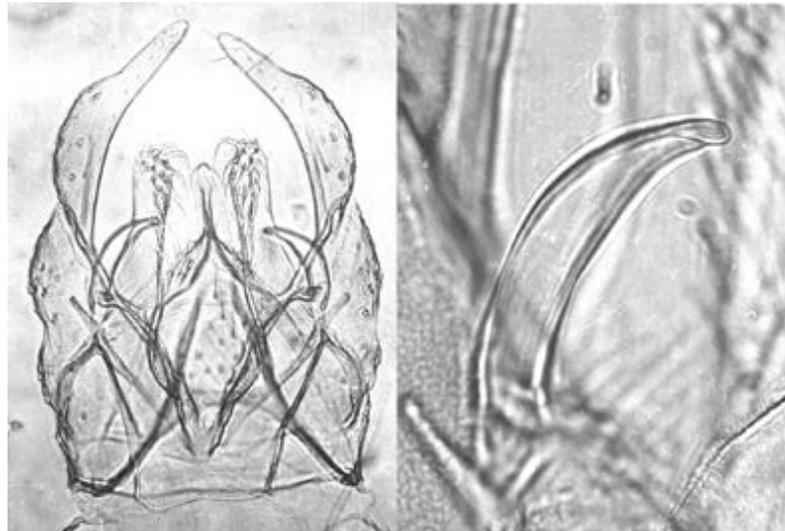
Shallow pools, including in creeks.

This species is very close to *C. blaylocki*, possibly a subspecies. A brief description of the larva and a photograph of the polytene chromosomes are given in Wülker *et al.* (2009).

Species c. *C. decorus* group

Adult:

Male: The adult male is a typical member of the *C. decorus*-group.



Male terminalia of *C. species c.*
A typical *C. decorus*-type hypopygium

About 13 setae in center of segment IX, SVo of E-type closest to Strenzke's figure g, i.e. longer than most *decorus*-group species. Hypopygium narrows relatively sharply over distal third.

Pupa: The pupa is typical of most of the species in the *C. decorus*-group, in lacking the secondary tubercle on the cephalic tubercles found in *C. decorus* itself. The caudolateral spur on segment VIII has about 4 spines.



Fourth instar larva of the semireductus-type with moderately long tubules (abt 1.2 times segment width), on average of equal length (anterior 0.7-1.84 mm; posterior 0.6-1.84 mm). Larval length, females 9.0-14.1; males 9.5-12.3 mm). PLT relatively short, 31-250 micron). AT about 3-5.5 times longer than wide, dorsal pair usually slightly longer and with a constriction about a third from the base. Gular region darkened over most of central region, FC pale. ASA generally slightly less than S4A.

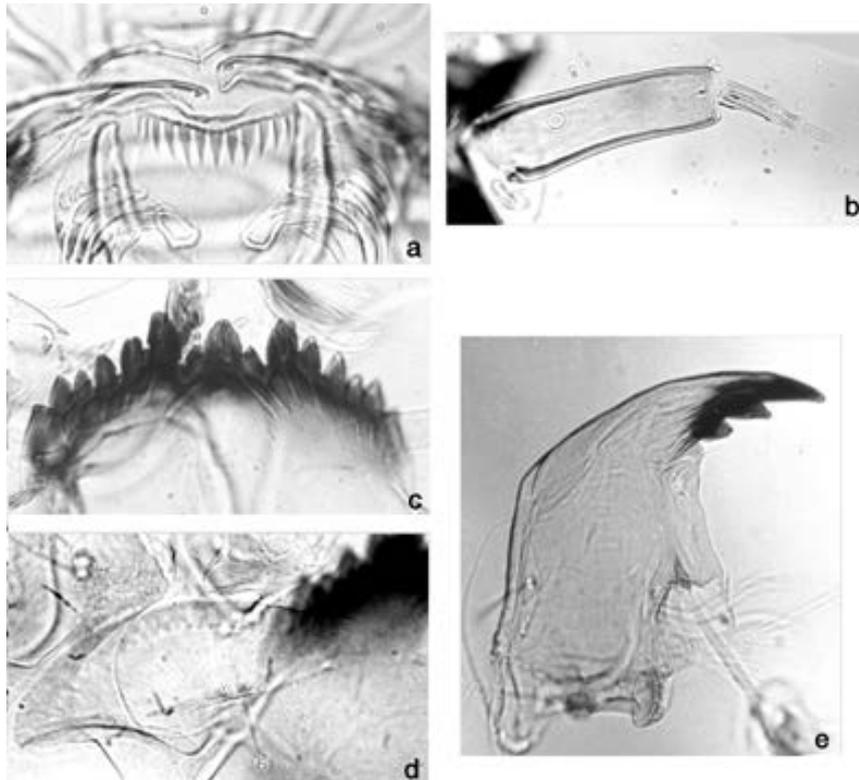
Mentum (c, below) with pointed teeth, c2 teeth only partly separated from the square sided c1 tooth (type III or sometimes IB); 4th laterals reduced part way or about to level of 5th laterals (type I-II).

VM separated by about 0.38 of mentum width, with about 31-40 striae, IPD abt. 0.38; VMR about 0.23-0.29. PE (a, below) with about 11-15 sharp pointed teeth (type A).

Premandible with teeth about equally long, outer tooth about 2.5-3 times wider than inner tooth. Distance between the antennal bases sometimes greater, but more usually less, than that between the S4 setae.

Antenna (b, below) with basal segment 0.3-0.4 of VHL; AR abt. 1.65-2.1; basal segment about 3.0-3.6 times as long as wide; A4/A3 about 1.4-2.5; relative lengths antennal segments (micron) 119 : 27 : 7 : 12 : 7.

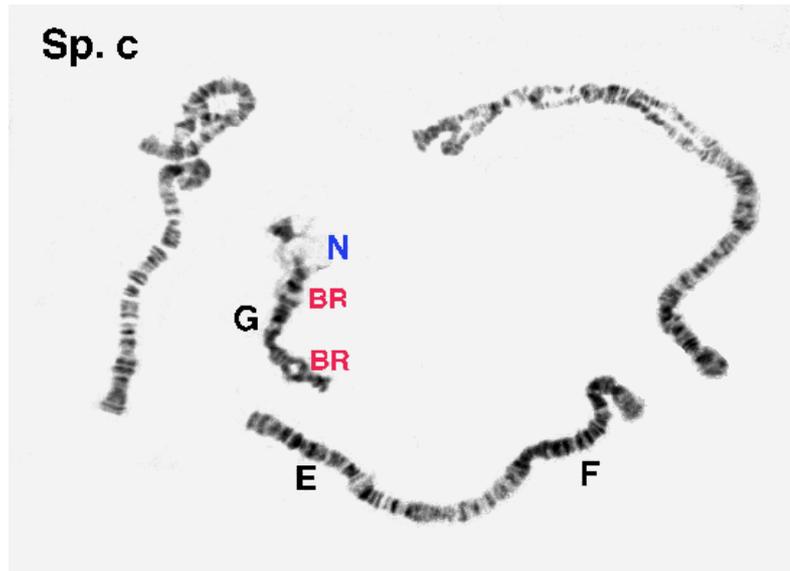
Mandible (d, below) with the third inner tooth slightly colored and not separated (type IA or B) and about 14-17 furrows on outer surface near base; PMa with about 11 taeniae.



Cytology: 4 polytene chromosomes with thummi arm combination AB, CD, EF, G, these arm combinations difficult to identify.

Arm G normally paired with the nucleolus clearly subterminal, BR present but often difficult to see. No other nucleoli? Band groups 22-24 of arm B in normal position close to the centromere. Quite polymorphic, including in arms A and F, and sometimes with complex inversions.

The inv4-11b in arm E suggests a connection to *C. quinnitukqut*.



Arm E1: 1 - 3a, 5 - 10b, 11b - 10c, 3f - 4, 11c - 13

Farm pools and pools in rivers.

Found: Ontario - Dunrobin (45.45°N, 76.00°W), Carlingwood, Ottawa (45.37°N, 76.00°W); Rideau River, and Black Rapids (45.32°N, 75.82°W), all Carleton Co.; Vittoria, Norfolk Co.

Vermont - White River, Sharon (43.80°N, 72.45°W), Windsor Co.

Species d. *C. maturus* Johannsen, 1908
(i.e. *C. decorus* group)

In BOLD Bin: [BOLD:AAB4657](https://www.boldsystems.org/#AAB4657)

Adult:



Male (from Sublette & Sublette 1974)

Wing length about 3.64 mm; width about 0.83 mm; VR 1.06.

Foretarsus bearded, BR about 3-5.

AR about 3. Frontal tubercles present, about 25 μm long. Clypeus with at least 14 setae. < Thoracic setae - scutellum with an anterior row of about 12 long setae, and a main row of about 6 scattered setae.

Legs with tibiae infusate yellow, middle and hind tarsi becoming darkened apically; foretarsus bearded. Leg proportions:

	Fe	Ti	Ta1	Ta2	Ta3
PI	75	76	100	55	41
PII	85	78	48	28	20
PIII	98	102	75	45	32
	Ta4	Ta5	LR	F/T	BR
PI	16	-	1.32-1.66	0.99	3.0-5.0
PII	14	9	0.56-0.65	1.09	
PIII	20	10	0.70-0.79	0.96	

Abdomen with a dark band across the base of each segment, similar to *C. bifurcatus*, while the superior volsella is darker and heavier than in *C. bifurcatus* or *C. decorus*.

Pupa: Length about 6.30 - 8.88 mm General color dark with lateral abdominal markings blackish. Usually with about 1 or 2 spines on the caudolateral spurs of segment VIII, but some have 3 on one side. Swim fin with about 64 - 96 broad taeniae.

Fourth instar larva of the plumosus-type, with long VT, posterior pair usually longer (ant. 0.9-3.4 mm, post. 0.9-3.7 mm). Length about 12.5 - 14.8 mm (female), 12.3-13.3 mm (male). AT about 3-4 times as long as wide. Gular region slightly darkened, FC darkened.

Mentum with rather rounded teeth, c1 tooth long and narrow with c2 teeth well separated (type III), 4th laterals barely reduced (type I).

PE usually with fairly uniform teeth, occasionally with an interspersed smaller tooth, about 10 - 19 teeth.

Antenna with basal segment relatively long, about 3.5 times longer than wide; AR about 1.7-2.0; segment lengths (micron) 134 : 39 : 14 : 16 : 6.; i.e. A3 much longer than A5, and only slightly shorter than A4.

Mandible with third internal tooth well developed but not darkened (type IIA).

Cytology: 4 polytene chromosomes with maturus arm combination AF, BE, CD, G.

Arm G often partly unpaired, with a subterminal nucleolus and 2 BRs whose position varies depending on the sequence. Nucleolus also in arm F.

Polymorphic in all arms except E.

mat A1: 1-2c, 10-12, 3-2d, 9-4, 15-13, 16-19

mat A2: 1a-e, 2d-3, 12-10, 2c-1f, 9-4, 15-13, 16-19

mat A3: 1a-e, 2d-3, 12-10, 16, 13-15, 4-9, 1f-2c, 17-19

mat B1: Bulb with distal dark bands nearer the end of the arm than in *whitseli*.

mat C1: 1a-i, 10-11c, 2-6b, 9f-a, 6hg, 11d-15, 8a-g, 17-16a, 7d-6c, 17b-22

mat D1: 1a-i, 15e-11, 3-2, 16-18f, 7d-4, 10-7e, 18g-24

mat E1: 1-3e, 8-5, 9-10b, 4-3f, 10c-13 i.e. as *stigmaterus*.

mat F1: 1-2, 15e-3, 15f-23

mat F2: 1, 13b-15e, 2, 13a-3, 15f-23

mat G1: Large BR near center of arm with darker bands towards the nucleolus

- mat G2: A large inversion from just distal of nucleolus, to just proximal of subterminal BR
 mat G3: A small inversion at the distal end of the arm, which takes small BR terminal (not proven)
 mat G4: Derived from G2 by a similar small inversion to that hypothesized for G3

Found: **Manitoba** - Southern Indian Lake (Rosenberg *et al.* 1984)
Ontario - Copanspin Farm (45.75°N, 75.87°W), Central Experimental Farm Ottawa (45.38°N, 75.70°W), Hogs Back (45.37°N, 75.70°W), Torbolton (45.47°N, 76.05°W), all Carleton Co.; Mile 14.3, Highway 60 (45.58°N, 75.70°W), Algonquin Provincial Park, Nipissing Co.
Quebec - Lake Bédard (47.27°N, 71.12°W).
Yukon - Kluane National Park and Reserve (60.714°N, 137.432°W).
Alaska - Potter Marsh (61.054°N, 149.792°W), Anchorage Co.
California, - Berkeley, Hayward, Oakland and Strawberry Canyon, Berkeley Hills, Alameda Co.; El Cerrito, West Pittsburg, Trout Farm, Concord, Wildcat Creek, nr. El Cerroti, Jewell Lake, Tilden Park and Antioch, Contra Costa Co.; State line, Eldorado Co.; Mad River Beach, Humboldt Co.; Lakeport and Clear Lake Park, Lake Co.; Susanville, Lassen Co.; Rio Hondo, Montebello, and Pasedena, Los Angeles Co.; Lily Lake, Marin Co.; 15 ml nw. Canby, Modoc Co.; 3 ml sw. & 1 ml. sw. Napa, Napa Co.; Huntington Beach (33.640°N, 117.971°W), Orange Co.; Lake Almanor & Lake Davis, Plumas Co.; Bergh Ranch, Coachella Valley, Arlington, Good Samaritan Retirement Home, Corona, 448 Orange St., and UCR Experimental Ponds, Riverside, Palm Springs, Hidden Lake, 3 ml. n. Arlington & Priester Ranch, Norco, Riverside Co.; Ontario & Spring Valley Lake nr Hesperia, Apple Valley, San Bernardino Co.; San Luis Obispo & Black Lake Canyon, San Luis Obispo Co.; Redwood City, Laurel Creek, marshland pond Millbrae, 19th & Bayshore & 16th Ave., Hayward Park, San Mateo, & Atherton, San Mateo Co.; Stanford Uni., Palo Alto & Mountain View, Santa Clara Co.; Hat Creek, Fall River Mills, Shasta Co.; Vallejo, Dixon, & Rio Vista, Solano Co.; Cotati, Sonoma Co.
Indiana, - Ridinger Lake, Kosciusko Co.
Louisiana, - Fish Hatchery and Chaplain's Lake, Natchitoches, Natchitoches Ph.
New York, - Ithaca, Tompkins Co. (**Type locality**)
New Mexico, - Bonito Dam (33.45°N, 105.72°W), Lincoln Co.
South Dakota - 3 ml. w. Yankton, and Yankton (42.93°N, 97.33°W), Yankton Co.
Wisconsin: Trout Lake Limnological Station (41.02°N, 89.67°W), Vilas Co.

Shallow pools, often temporary and often polluted.

Morphology of larva, pupa and adult described by Sublette (1974). Cytology described by Wülker and Martin (1974) with arm C1 and D1 in Kiknadze *et al.* (2004).

Barcode: COI sequence in GeneBank, Accession no. DQ648204; and in BOLD database.

Species e. *C. melanescens* Keyl, 1962

Keyl attributes the species to Strenzke, but Strenzke did not publish any description.
Chironomus melanescens Keyl, 1961 – nomen nudum with no description.

This species is BOLD BIN: [BOLDAAI4303](#)

Adult:**Male:**

comparison to characters of Palearctic specimens (in brackets) where these are available from Wülker *et al.* (1981).

Wing length 3.74 mm (3.42-4.66), wing width 0.99 mm; AR 3.7 (3.20-4.58); LR 1.52 (1.42-1.58); FeI/Ti 1.05 (1.00-1.11); BR 2.0-2.2 (1.5-3.0).

Additional data from Nearctic male:

Length/width of frontal tubercles 22 x 10 µm; palpal proportions (micron)

50:53:230:255:355. 43 clypeal setae.

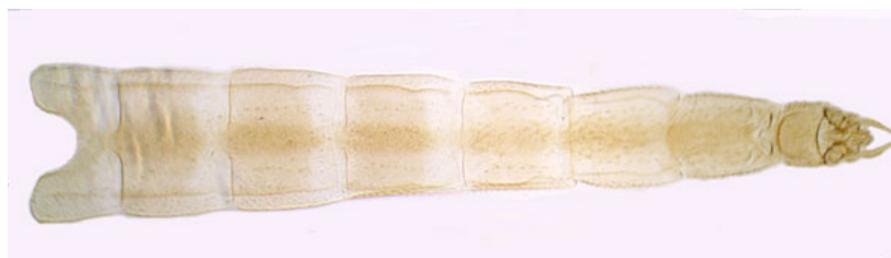
Thoracic setae: at least 13 acrostichals; 21-43 dorsolaterals; 5-6 prealars; 1-2 supra-alar; scutellars in approximately three rows, posterior row with 19 setae, other two rows less clear and with 25 setae between them.

Three SCf on branchiolum of wing, 26 setae in squamal fringe.

Leg proportions (micron):

	Fe	Ti	Ta1	Ta2	Ta3
PI	1400	1330	2025	995	835
PII	1455	1405	880	500	365
PIII	1710	1745	1335	735	580
	Ta4	Ta5	LR	F/T	BR
PI	755	380	1.52	1.05	2.0-2.2
PII	255	175	0.63	1.04	-
PIII	335	195	0.76	0.76	-

Abdominal tergites (below) with brown bands across the anterior part but extending further along the tergite in the more posterior segments. Nine (4-16) setae in center of tergite IX.



Hypopygium (below) as that of European specimens of *C. melanescens* in being similar to *C. riparius* Meigen, 1804, with an SVo of the S-type of Strenzke (1959). Setae of IVo simple. GS tapers relatively gradually from about two thirds along its length.



Female – no information available.

Pupa typical of the genus, lightish brown in color. Length about 8.3 mm, posterior margin of wing case 3.5 mm. Cephalic tubercles abt 55 μm in length, slightly longer than their basal diameter. Basal ring of abt 56 x 48 μm , prealar tubercle weakly developed, about 50 μm in length. About 51 recurved hooks on posterior margin of segment II, hook row approximately half of width of the segment. Light shagreen pattern particularly near the centerline towards the rear of the segments, small muscle marks on segments I-III; obvious pedes spurii B on segment III and large pedes spurii A on segment IV; posterolateral spurs of segment VIII with 1 - 2 spines. Hair fringe with about 75 filamentous setae on each side of the anal lobe.



Fourth instar larva a medium sized (length, female abt 13.0-16.5 mm, male 10.3 mm) bathophilus-type with VT of equal length (ant. 0.8-2.75 mm; post. 0.8-2.73 mm), anal tubules (g, below) long, about 6 times longer than wide. Gular region pale to slightly dark on posterior third, FC pale to slightly darkened.

Mentum (c, below) with pointed teeth; 4th laterals hardly reduced (type I); c1 tooth long and narrow with c2 teeth well separated (type III).

VM (d, below) with about 37-43 not very obvious striae; VMR about 0.35-0.41 of distance to base of striae. PE (a, below) with about 13-16 sharp teeth (type b), although Clarence Creek specimens had deformed irregular PEs.

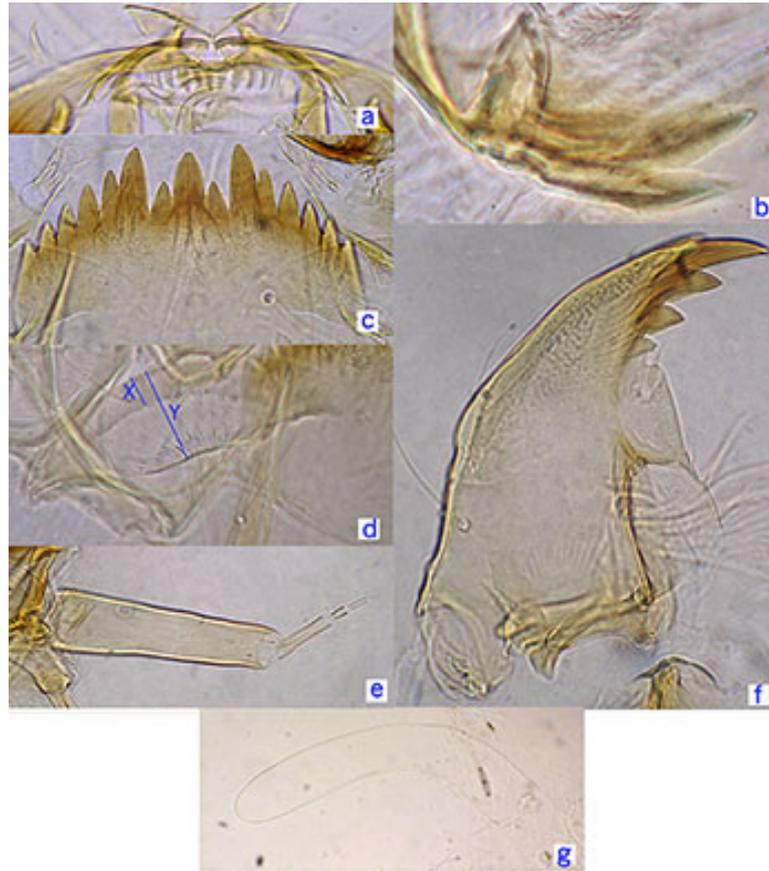
Premandible (b, below) with teeth about equally long, unless outer more worn, inner tooth about 1.6-2.3 times the width of outer tooth.

Antenna (e, below) with relatively long, narrow basal segment, about 4 (3.9-4.4) times as long as wide; ring organ between a quarter and half way from base of A1 (0.24-0.32); AR about 1.88-2.3; A1/A2 3.9-4.2 (abt 3.8-4.8); ratio of segments (in microns) about 183 ; 43 : 13 : 15 : 9.

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

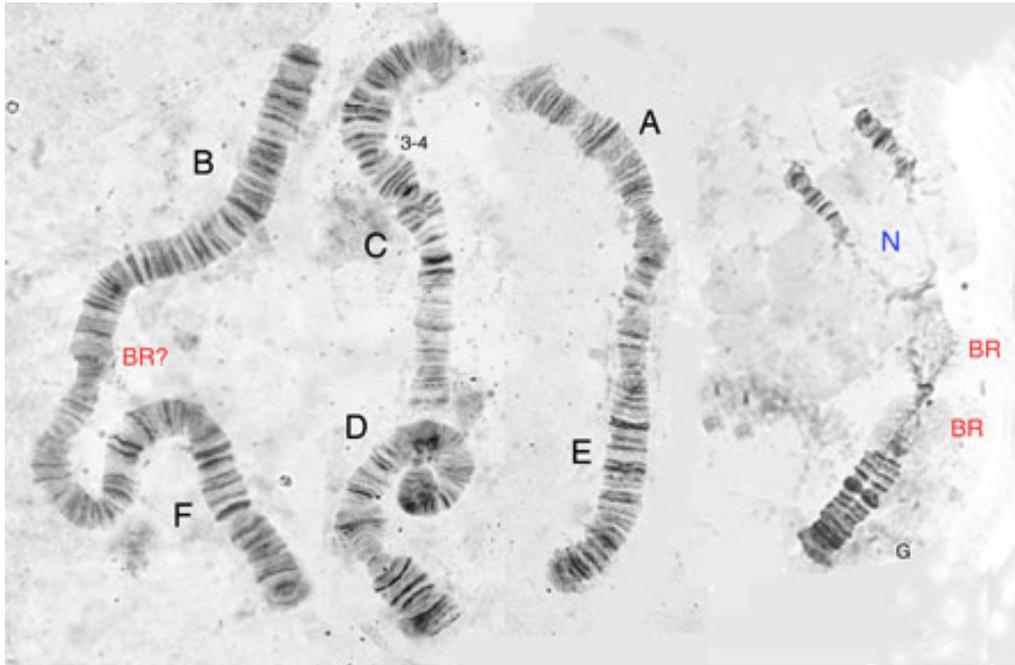
Mandible (f, below) with 3rd inner tooth only slightly darkened and partly to nearly completely separated (type II-IIIB), and with about 11-14 furrows on the outer surface at the base.

Ventral tubules of Wisconsin specimens were much longer than those from Ontario.



Cytology: 4 polytene chromosomes with pseudothummi arm combination AE, BF, CD, G. Arm G generally paired unless heterozygous, with a subterminal nucleolus and 2 BRs which vary in position depending on the sequence. No nucleoli in other arms. Polymorphic at least in arms A, C, and G - these inversions also occur in European populations. Arm B of North American specimens is inverted compared to the Palearctic sequence.

- mlsA1: 1 - 2c, 10 - 12, 3i - 2d, 9 - 4, 13 - 19 i.e. as *holomelas*
 mlsA2: 1 - 2c, 10 - 12, 3i - 2d, 16 - 13, 4 - 9, 17 - 19
 mlsB1: Typical puff (BR) approximately medial (Palearctic)
 mlsB2: Typical puff (group 7) near centromere (Nearctic)
 mlsC1: 1-2f, 11c-10, 16-17a, 7d-a, 13-11d, 2g-6, 14-15, 8-9, 17b-22. (Palearctic)
 mlsC2: 1-2f, 11c-10, 16-17a, 9-8, 15-14, 6-2g, 11d-13, 7a-d, 17b-22 (Palearctic)
 mlsD1: 1a-e, 9-7, 13c-10, 1f-6, 13d-16, 19e-23, 19h-17, 24. (NB. bands 19fg not listed)
 mlsE1: 1a-d, 3f - 11, 1e - 3e, 12 - 13
 mlsF1: 1 - 4b, 15f - 4c, 15g - 23
 mlsG1: subterminal nucleolus with two nearby BRs.
 mlsG2: simple inversion near distal end of arm.
 mlsG3: simple inversion of medial section of arm.



Molecular Data: Sequence for mitochondrial *COI* and *CytB* of Palearctic material is available in GenBank (accession numbers AF192204, AF192173), *COI* of four NA specimens is available in GenBank (accession numbers KT608863, 608904, 609554 & 611186), and two others not yet lodged in GenBank or BOLD.

Found: **Ontario** - Clarence Creek (45.50°N, 75.22°W), Carleton Co.; Dunrobin (45.45°N, 76.00°W), Carleton Co.; Blair Rd Public School, Cambridge (43.3718°N, 80.327°W) (BOLD BIOUG13119-C10); rare Charitable Research Reserve (43.3705°N, 80.3641°W), Cambridge. (Telfer *et al.* 2015); Howick Central Public School, Gorrie (43.884°N, 81.053°W) (BOLD BIOUG13107-G1); Saunders Secondary School, London (42.947°N, 81.289°W) (BOLD BIOUG13007-E01); Notre Dame Catholic School, Orillia (44.61°N, 79.461°W) (BOLD BIOUG13120-A02); Thousand Islands Natl. Park (44.453°N, 75.865°W) (BOLD BIOUG20486-E04); Toronto Zoo, Rouge Natl. Urban Park (43.822°N, 79.19°W), Toronto (BOLD BIOUG20014-G11).
Prince Edward Island - Cavendish Grove, Prince Edward Island Natl. Park (46.493°N, 63.394°W) (BOLD BIOUG20330-B12)
Wisconsin - Arboretum, Madison (43.03°N, 89.42°W), Dane Co.; Trout Lake Limnol. Stn. (41.02°N, 89.67°W), Vilas Co.
 Germany: Clausthal (Zellerfeld) (**locality of type**) and Duemmer Lake;
 Switzerland and Russia.

Temporary pools, especially snow melt pools.

Adults and larvae partly described by Wülker *et al.* (1981), who also described the cytology, and Kiknadze *et al.* (1991) illustrated the larva and redescribed the cytology (with minor errors in arm E); Kiknadze and Broshkov (2009) redescribe the cytology from the Palearctic. Martin (2015) described morphology, karyotype and barcodes of North American material.

Species f. *C. riparius* group

In BOLD Bin: [BOLD:AAM6280](https://www.boldsystems.org/index.php/AAM6280)

Adult:

Some data on the adults can be obtained from photographs in the BOLD database.

Male - Antennae are not available, fore tarsi are not available, so AR, LR and BR are not known.



Thorax yellow, with vittae, etc., brown.

Wing length about 3.35 mm.

Femur and tibia yellowish, but with dark knees.

Leg proportions (approximate) (micron):

	Fe	Ti	Ta1	Ta2	Ta3
PI	1300	1050	-	-	-
PII	1370	1275	-	-	-
PIII	1660	1535	-	-	-
	Ta4	Ta5	LR	F/T	BR
PI	-	-	-	1.24	-
PII	-	-	-	1.07	-
PIII	-	-	-	1.00	-

Abdominal tergites dark brown, with just a narrow distal stripe on segments III-VII.

Female - Antennae are not available, fore tarsi are not available, so AR and LR are not known. Darker than the male, thorax yellowish brown, vittae dark brown.

Wing length about 4.7 mm.

Legs with anterior half yellow, then darkening, and tibiae and tarsi brown.

Leg proportions (approximate) (micron)

	Fe	Ti	Ta1	Ta2	Ta3
PI	2050	1610	-	-	-
PII	2050	1750	-	-	-
PIII	2160	2160	-	-	-
	Ta4	Ta5	LR	F/T	BR

PI	-	-	-	1.28	-
PII	-	-	-	1.17	-
PIII	-	-	-	1.00	-

Abdomen dark brown.

Pupa: Not known.

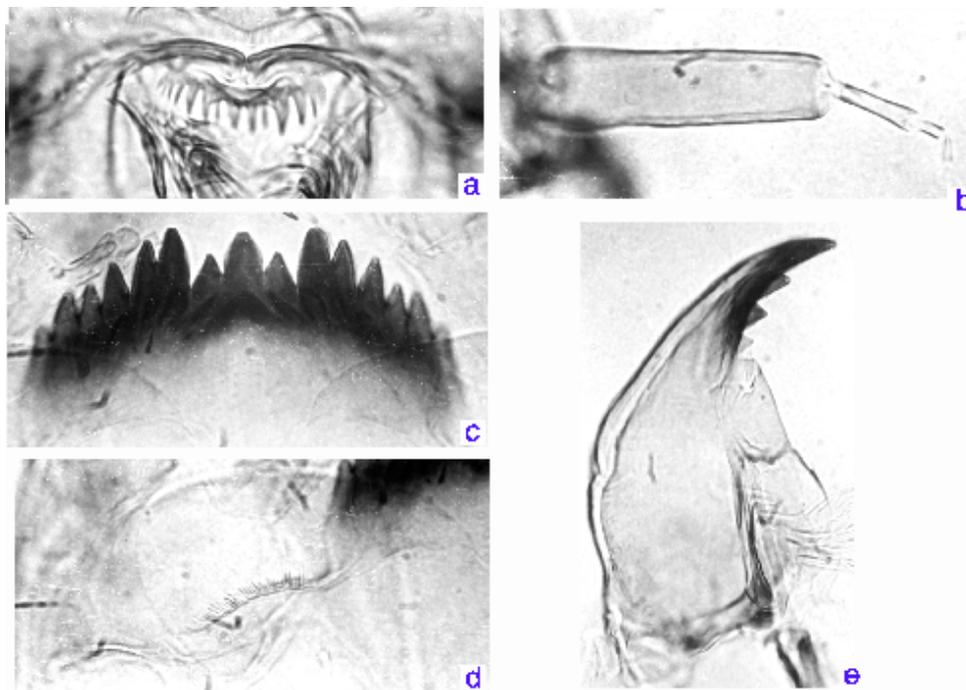
Fourth instar larva of the plumosus-type, length about 16 mm; VT quite long. Gula slightly darkened, FC pale or slightly darkened.

Mentum (c, below) with teeth pointed, c1 tooth with square sides, c2 teeth well separated (type IV); 4th laterals slightly reduced (type I-II).

VM (d, below) about 3.6 times longer than deep, with about 39-40 striae, VMR about 0.33-0.41.

PE (a, below) with about 14 sharp but irregular teeth (type C variant).

Antenna (b, below) with basal segment about 4 times longer than wide; AR about 2. Mandible (e, below) with third inner tooth pale but separated (type II-IIIa). AT quite long.



Cytology: 4 polytene chromosomes with thummi arm combination AB, CD, EF, G.

Arm G mostly paired, although ends may be unpaired, with a median BR and relatively heterochromatic centromere. Nucleoli in arms A and D. BR in arm E. Polymorphism in arm G.

Arm A1: nucleolus near bands 4-6 making arm hard to identify.

Arm B1: Bulb, with proximal dark bands (groups 7 & 8), almost terminal.

Arm C1: Groups 3-4 proximal of center of the arm.

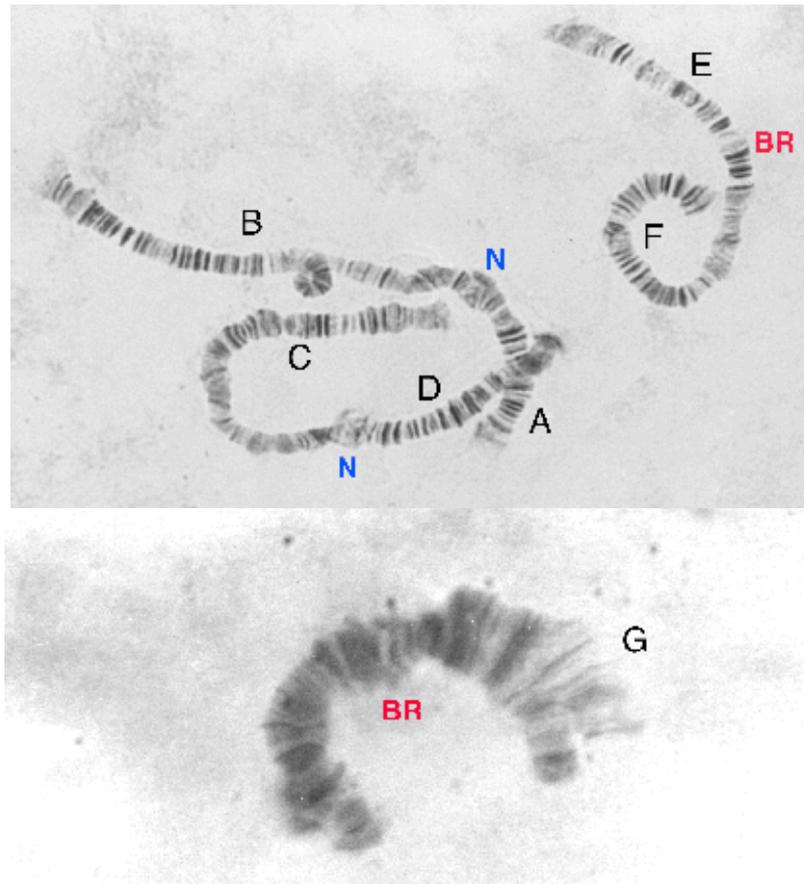
Arm D1: Nucleolus median in arm.

Arm E1: 1 - 3e, 5 - 10b, 4 - 3f, 10c - 13 i.e. as *aberratus*, bifE1, etc.

Arm F1: 1a-d, ? - ?, 7 - 9, 2 - 1e, 16 - 17, 11 - 14?, 6 - 4? 19?, 23 - 20

Arm G1: Approximately median BR

Arm G2: Inversion of most of the length of the arm (see figure below).



DNA analysis:

mtCOI – there are numerous sequences in the BOLD database, which are unidentified but belong in BOLD BIN AAM6280.

- Found:** Alberta - Jasper National Park (from BOLD)
British Columbia - Mount Revelstoke National Park (from BOLD)
New Brunswick - Grand Bay-Westerfield (from BOLD); Kouchibouguac Natl. Pk.; Gros Morne National Park (from BOLD).
Newfoundland & Labrador - Gros Morne National Park; Terra Nova N.P., Newman Sound (48.543°N, 53.978°W)(from BOLD)
Nova Scotia - Cape Breton Highland Natl. Pk. (from BOLD); Kejimikujik Natl. Pk. (from BOLD).
Ontario - Clarence Creek, Russell Co. (45.50°N, 75.22°W), Barron Creek, nr. Squirrel Rapids (45.87°N, 77.90°W), Algonquin Provincial Park.
Prince Edward Island - Prince Edward Island Natl. Pk. (from BOLD)
Quebec - King Mt. (45.43°N, 75.73°W), Gatineaus; La Mauricie National Park; Mingan Archipelago National Park Reserve (from BOLD)
Saskatchewan - Prince Albert National Park.

Snow melt pools and other small pools.

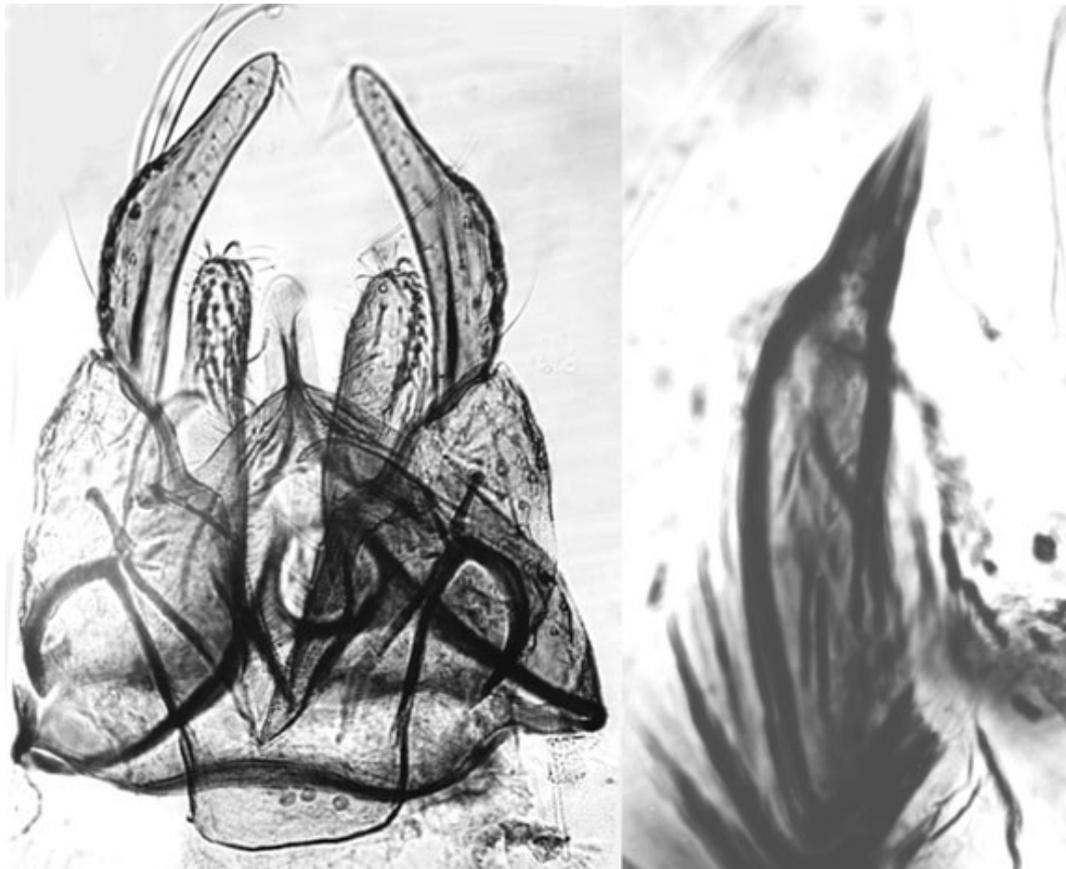
Species g. *C. species* ‘algonquian’

In BOLD Bin: [BOLD:ACQ1765](https://www.boldsystems.org/index.php/Taxonomy/bold_bin/ACQ1765)

Adult: Some adults may be in the Sublette collection in the Museum of the University of Minnesota.

Male: : Only a photograph of the male hypopygium is available.

Anal point relatively broad. About 12 setae in a large pale circle on tergite IX. SVo of D-type(e) of Strenzke (1959), IVo extends to just beyond the tip of the anal point, gonostylus narrowing relatively gently over posterior third.



Male terminalia (left) and pupal spur (right) of *C. species algonquian*

Pupa: caudolateral spur of segment VIII with about 3 spines (see figure above).

Fourth instar larva of the semi-reductus type, of medium size (fem. 12.9-14.0 mm; male 12.2-13 mm), lateral projections 170- 250 μ m). Posterior pair of VT longer (ant. 0.78–1.15 mm; post. 1.1–3.25 mm), anal gills very long, 4-6 times longer than wide. Gular region dark and FC also darkened.

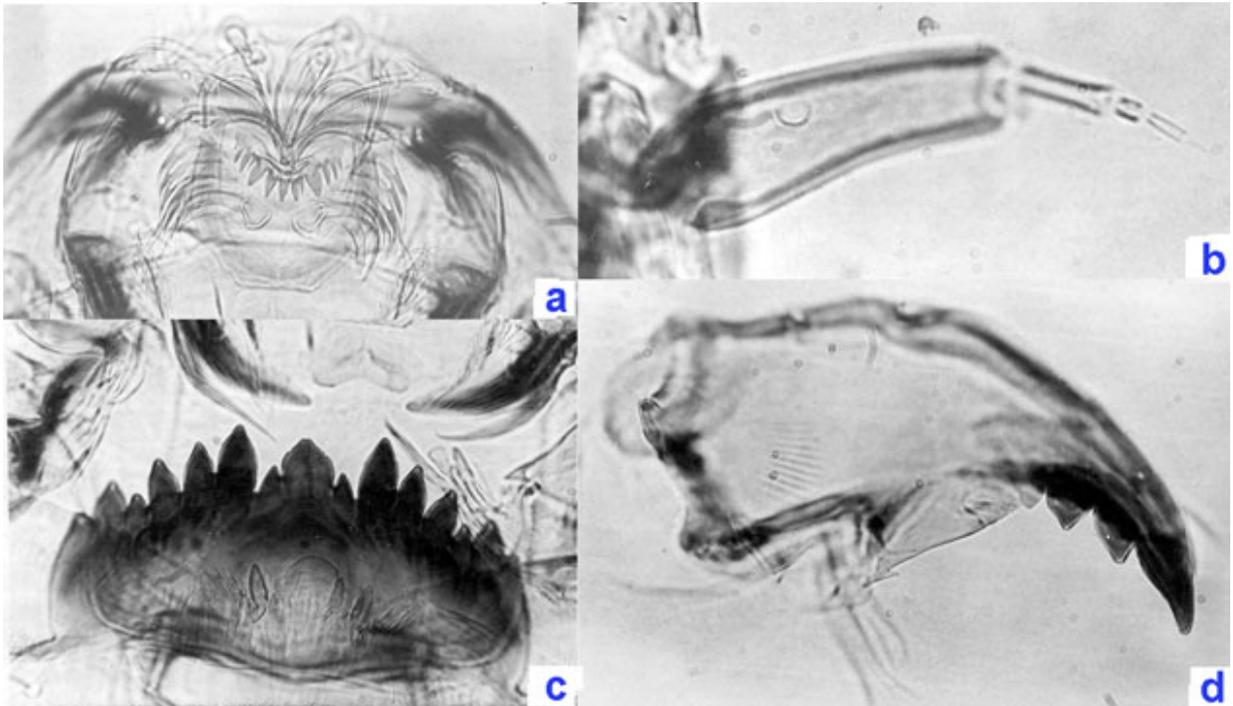
Mentum (Fig. c, below) with pointed teeth, c1 tooth broad, c2 teeth moderately separated but tend to continue edge line of c1 tooth (type IB); 4th laterals markedly reduced (type III).

Ventromentum –VMR 0.33-0.36. PE (Fig. a, below) with about 14-15 sharp, variable teeth (a sharp variant of type D).

PreM (Fig. c, below) with teeth about equal in length, inner tooth about 3 times wider than the outer.

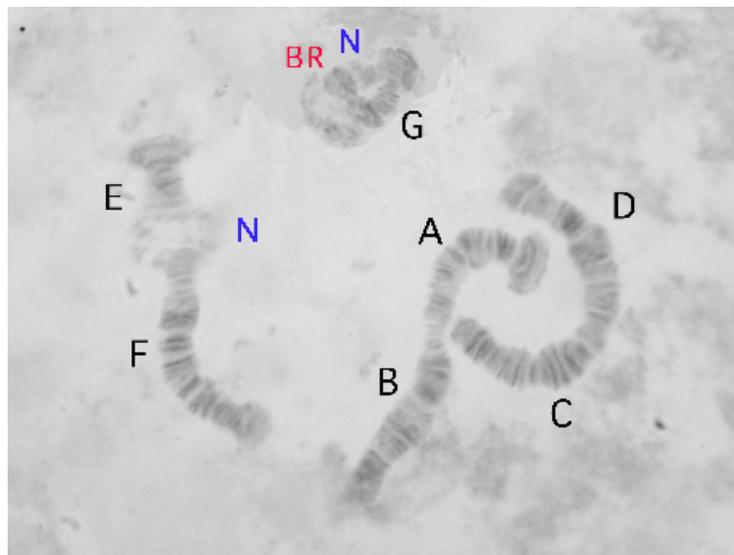
Antenna (Fig. b, below) with RO about half –way up from base of A1, which is about 3.4 times longer than wide; AR about 2.3; antennal proportions about 51 : 11 : 3 : 5 : 3.

Mandible ((Fig. d, below) with 3rd inner tooth only partly separated and colored (type IIB), about 13 furrows on outer surface near the base.



Cytology: 4 relatively short polytene chromosomes with the thummi arm combination AB, CD, EF, G. Centromeres not noticeably heterochromatic.

Arm G relatively short, normally paired at ends, with a small median nucleolus that may be polymorphic and a BR near one end. Main nucleolus (N) in arm E. No inversion polymorphism in specimens seen.



- “alg”A1: 1a - 2c, 10 - 12, 3i - 2d, 9 - 4, 13 - 19 i.e. as *holomelas*
- “alg”E1: 1-3e, 5-10b, 4-3f, 10c-13 i.e. as *aberratus* Nucleolus at 3f.
- “alg”F1:

Found: Ontario - Bat Lake (45.577°N, 78.523°W), Algonquin Provincial Park, Nipissing Co.; Frontenac Provincial Park, Sydenham (44.5178°N, 76.5394°W) (BOLD).

Amongst deep organic litter in highly eutrophic lake.

The manuscript name is one of the versions of the spelling for the Provincial Park in which it was found

Species h. Similar to *C. decumbens* but may be new species

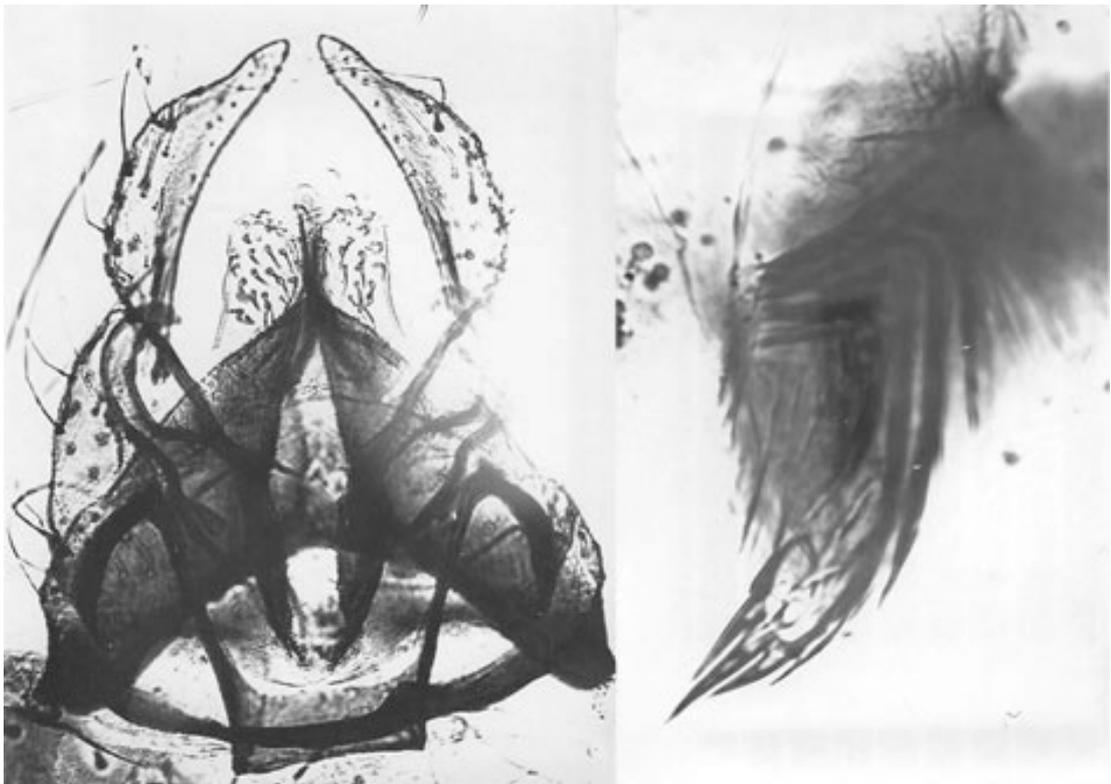
In Bold Bin: [BOLD:AAP3010](#)

(Mined from GenBank KF278349 – see below)

Adult: There are at least 4 adult males in the collection of J. E. Sublette, in the Museum of the University of Minnesota or in the collection of the Canadian National Insect Collection in Ottawa.

Male: Only a photograph of the male hypopygium is available.

Anal point slim. A small number of setae in pale circles on tergite IX. SVo of E-type (j) of Strenzke (1959), Ivo to about the tip of the anal point, gonostylus narrowing relatively sharply over posterior quarter.



Male hypopygium of adult male (left) and spur of pupal segment VIII (right)

Female – not known.

Pupa: Caudolateral spur of segment VIII with about 4 spines, but with other fine spines on base to the spine, particularly on the inner side (see figure above).

Fourth instar larva of the plumosus-type, medium to large size (fem. 14.2–17.5 mm; male 13.2–16.7 mm), lateral projections from 130–280 μm . Anterior pair of VT usually longer (ant. 0.72–1.60 mm; post. 0.72–1.30). AT long (1.06–1.52 mm), about 3.8–6.4 times longer than wide, ventral possibly longer; apparently longer in deeper water. Gular region usually darkened on posterior third to half with slight wing-like extensions but may be pale; and FC pale or occasionally slightly darkened.

Mentum (Fig. b, below) with pointed teeth; c1 tooth broad, possibly with a flanged edge, c2 teeth moderately separated but tend to continue edge line of c1 tooth (type IB); 1st laterals sloping outwards, 4th laterals reduced almost to level of 5th laterals (type II).

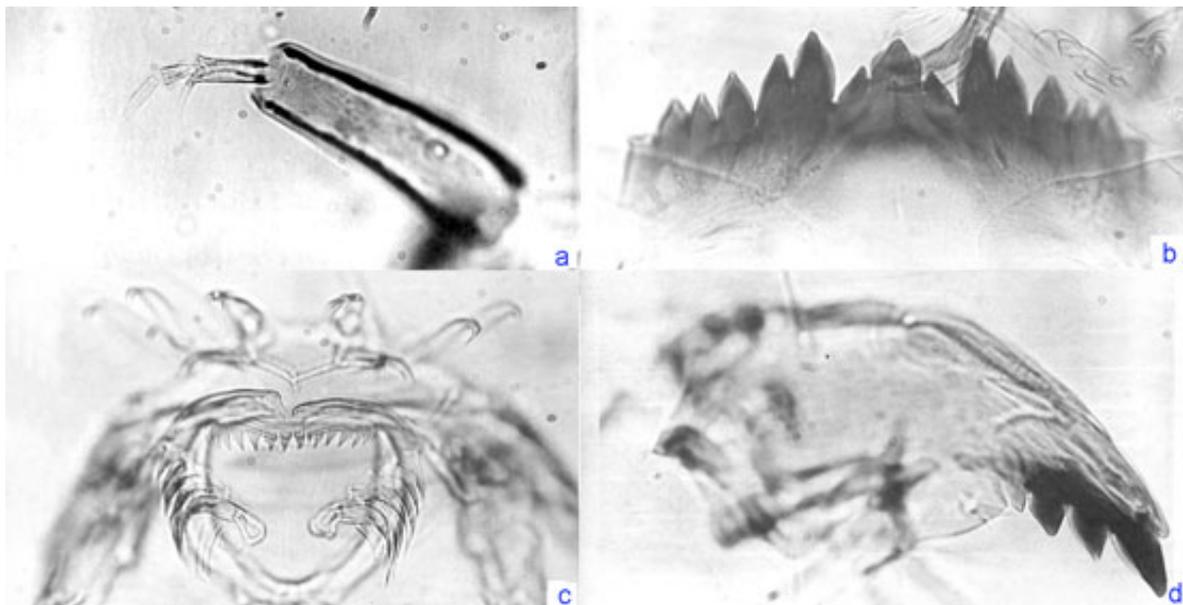
VM about 3.5 times longer than deep, with about 44–49 striae reaching almost to anterior margin; VMR 0.25. PE with about 13–14 sharp, broad teeth (type B).

PreM (Fig. b, below) with teeth about equal in length, inner tooth about 2.5–3 times wider than outer tooth.

Distance between antennal bases about the same as that between the S4 setae, which are separated by about 77–81% of FC width at that point.

Antenna long 3.5–4 times longer than wide, RO about 2/5 to 1/2 up from base of A1; AR about 2.04–2.09; A2 about 0.25 the length of A1; segment lengths (μm) 145 : 37 : 10 : 15 : 8.

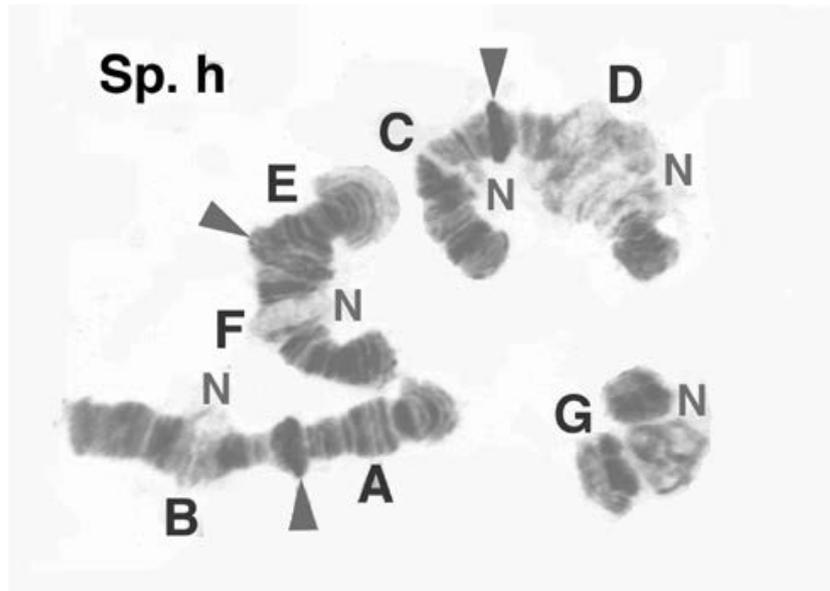
Mandible with 3rd inner tooth distinct but only partially colored (type II – IIIA/B); about 19–21 furrows on outer surface near the base; 12–14 taeniae in PMA.



Cytology: 4 relatively short polytene chromosomes with markedly heterochromatic centromeres; thummi arm combination AB, CD, EF, G.

Arm G very short, bands indistinct and normally only paired at the almost terminal nucleolus.

Nucleoli also in arms B, C, D (2 or multiple nucleoli) and F. No polymorphism in known specimens.



- Arm A1: 1 - 2c, 10 - 11? 9, 2d - 3, 12, 8 - 4, 13 - 19 (Wülker)
- Arm B1: 1-?, 20 - 18, ?, 9(?) - 13, ? - 8b, 17 - 14, 23 - 28 i.e. derived from *heteropilicornis*
- Arm C1: Nucleolus about one third from centromere.
- Arm D1: Nucleoli near middle of the arm
- Arm E1: 1 - 3e, 5 - 10b, 4 - 3f, 10c - 13 i.e. as *aberratus*
- Arm F1: 1a-f, 9 - 1g, 11 - 23? nucleolus about group 15.
- Arm G1: Virtually terminal nucleolus.

Found: North West Territories - Cache Lake, Tuktoyaktuk National Park (from BOLD)
 Ontario - Bat Lake (45.577°N, 78.523°W), Algonquin Park.

Amongst deep organic litter in a highly eutrophic lake.

DNA sequence:

mtCOI- in GenBank, accession no. KF278349 (see Proulx *et al.* 2013)

Species i. *C. atrella* (Townes, 1945) *Tendipes (Tendipes) atrella* – Townes, 1945
C. nr. anthracinus – Butler *et al.* (1995)

This species is in BOLD Bin: [BOLD:AAG5507](https://www.boldsystems.org/index.php/Taxonomy_browse.asp?BINID=AAG5507)

Adult:

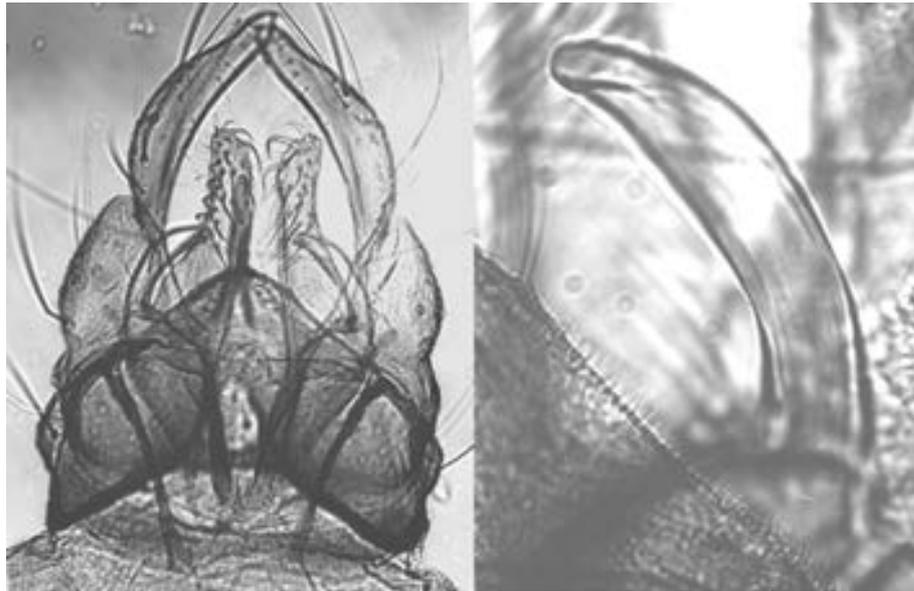
Male (based on Townes (1945):

Wing length 4.1 mm, AR 3.9, anterior LR 1.35, body slender.

Blackish brown; wing vein r-m slightly darker, legs brown, foretarsis with long sparse beard.

Frontal tubercles of small, clypeus of medium size.

Genitalia similar to that of *C. decorus* but anal point narrower and SVo shorter and stouter.



Male terminalia of *C. atrella*

Genitalia similar to that of *C. decorus* but anal point narrower and SVo shorter and stouter; about 5 setae in a pale patch on IXth tergite, style narrows relatively sharply over distal third.

Female: not described, but some characters from a photograph in BOLD database: Antennae, thorax and postnotum blackish, scutellum yellowish, abdominal segments dark brown with a light posterior band which becomes larger from segment III; legs yellowish with darkened knees, and slight darkening at distal ends of the segments; wings pale, with slightly darkened crossvein.



Pupa: Caudolateral spur of segment VIII with about one or two major spines but may be two more smaller lateral spines.



Pupal spur of *C. atrella*

Fourth instar larva a small to medium plumosus type (len. female abt 9.4-16.5 mm; male 10.4-11.5 mm), VT moderately long with posterior pair generally longer (ant. 0.8-2.9 mm; post. 0.90-3.45 mm). Posterolateral tubules well developed, 200-400 μm . Anal tubules relatively long, often partially bilobed, dorsal and ventral pair approximately the same size, length about 633-660 μm , and 3.7 to 4.2 times longer than wide.

Gular region slightly darkened on posterior third or occasionally half, FC pale.

Mentum (Fig. c, below) with rounded teeth, c1 tooth rather narrow, c2 teeth moderately separated (type IB or III, but often worn); 4th laterals reduced part way or completely to level of 5th laterals (type I-II).

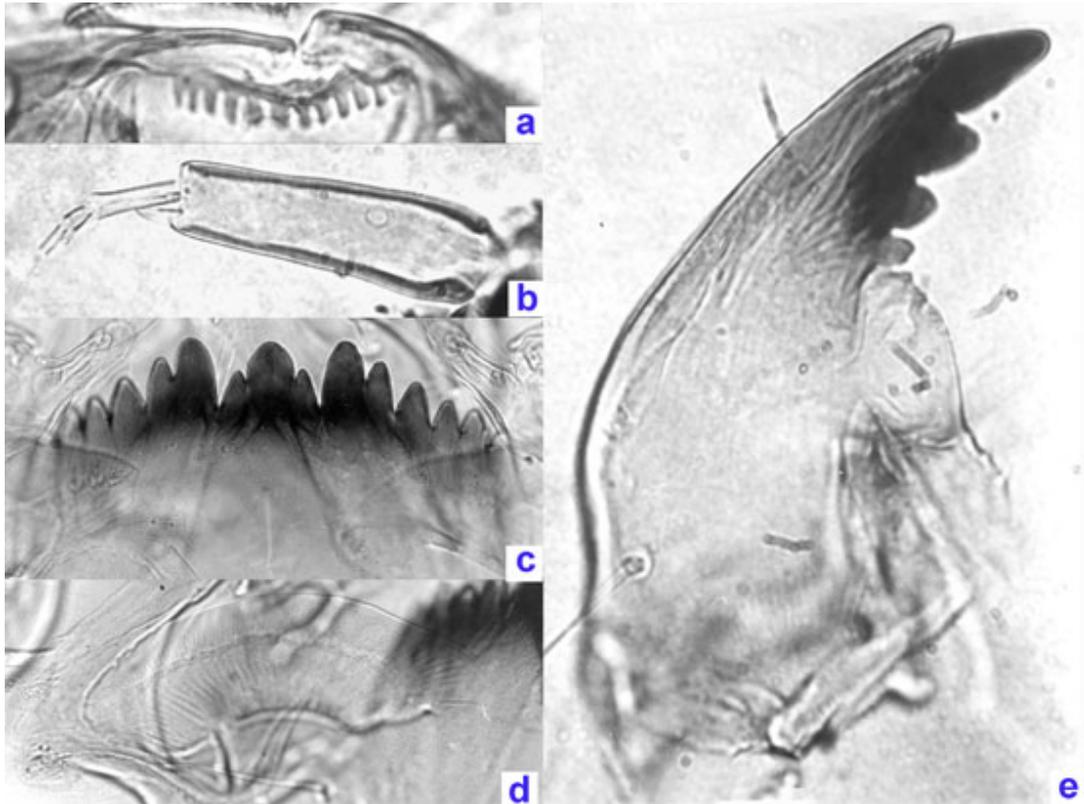
Ventromental plates (Fig. d, below) separated by about 29-33% of mentum width, with about 39-51 striae; VMR about 0.33-0.35. PE (Fig. a, below) with about 11-14 teeth (type B).

Premandible with inner tooth 3-4 times wider than outer tooth.

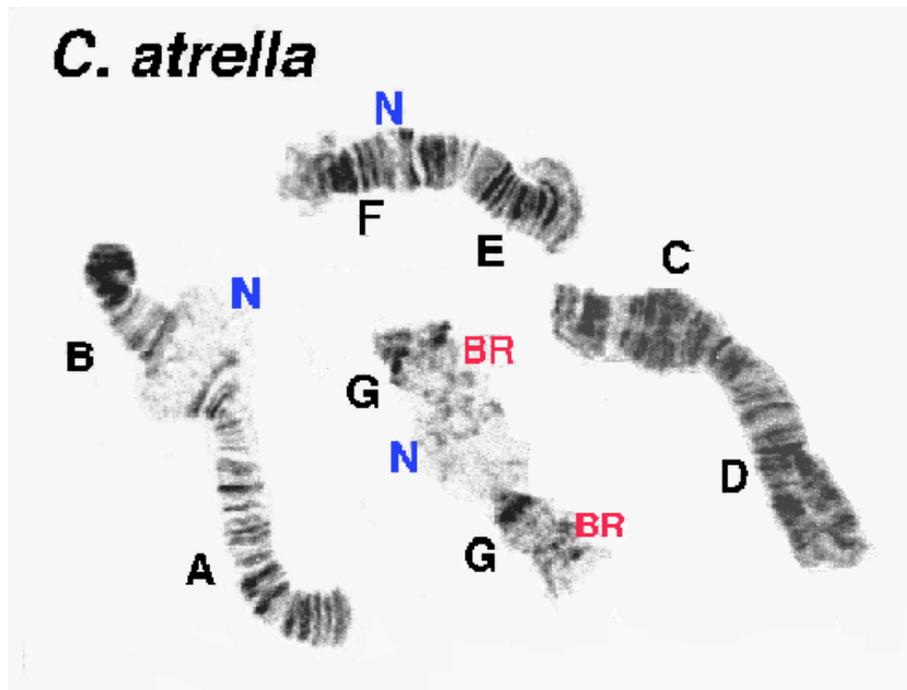
Antenna (Fig. b, below) with basal segment about 3.5-4.7 times longer than wide, RO about 2/5-1/2 up from the base; AR about 2.1-3.2; segment lengths (micron): 144 : 34 : 11 : 13 : 7. The relative lengths of the segments varies considerably in larvae from different areas, a New Mexico larva having a much longer antenna, while a Californian rearing had a shorter antenna, the differences not being obviously related to overall larval size.

Distance between the antennal bases generally less than that between the S4 setae, which are separated by 80-90% of the width of the frontoclypeus.

Mandible (Fig. e, below) with 3rd inner tooth only partly separated and colored (type IIB) and about 14-19 furrows on outer surface at base; 10-13 taeniae in PMA.



Cytology: 4 polytene relatively short chromosomes with thummi arm combination, AB, CD, EF, G. Arm G very short and paired only at the terminal nucleolus. Large nucleolus in arm B and a smaller one in arm F at about group 11. Arm C unpaired in some specimens. Polymorphism in arms A, B, C, D, and F.



atrA1: 1a-e, 2d - 3i, 12c - 10a, 2c - 1f, 9e - 4a, 13a - 19
 atrA2: 1a-e, 8a - 9e, 1f - 2c, 10a - 12c, 3i - 2d, 7d - 4a, 13a - 19

atrB1:	Puff (group 7) generally not developed, but is near distal end of arm, nucleolus about middle of arm.	
atrC1:	1 - 3, 8 - 11c, 4a-i, 6b - 5, 15 - 11d, 6gh, 17a - 16, 7d-a, 6f-c, 17b - 22	
atrC2:	1 - 3, 8 - 9d, <u>4c-a, 11c - 9e</u> , 4d-i, 6b - 5, 15 - 11d, 6gh, 17a - 16, 7d-a, 6f-c, 17b - 22	
atrC3:	1 - 3, 8 - 11c, 4a-i, 6b - 5, <u>12 - 15e</u> , 11h-d, 6gh, 17a - 16, 7d-a, 6f-c, 17b - 22	
atrD1:	1 - 3, 11 - 18d, 7 - 4, 10 - 8, 18e - 24	i.e. as in <i>longistylus</i>
atrD2:	1 - 3 11 <u>16c - 12</u> 16d - 18d 7d - 4 10 - 7e 18e - 24	
atrD3:	1 - 3e, <u>5d - 4, 10, 7d - 5e, 11 - 15d, 18d - 15e, 3fg</u> , 9 - 7e, 18e - 24	
atrE1:	1a - 3e, 10b - 3f, 10c - 13	i.e. as in <i>aprilinus</i>
atrE2:	1 - 3e, 10b - 9, <u>7 - 8</u> , 6 - 3f, 10c - 13	
atrF1:	1a-f, 9 - 3c, 14 - 10, 1g - 3b, 15 - 23	i.e. inv 3g-14 from ' <i>blaylocki</i> ' & sp. b.
atrF2:	1a-f, 9 - 3c, 14h-a, 16 - 15, 3b - 1g, 10 - 13, 17 - 23	
atrF3:	1a-f 9 - 5d 13 - 14 3c - 5c 12 - 10 1g - 3b 15 - 23	
atrF4:	approx: 1a-f 14h-a <u>3c - 9 16 - 15</u> 3b - 1g 10 - 13 17 - 23	i.e. from F2

Found: **Alberta** - Nordegg (Paratype - Townes 1945)
British Columbia - Sorenson Lake (abt 51.97°N, 122.52°W), Springhouse area (Cannings and Scudder 1978).
Manitoba - Aweme, Caroll (Paratypes - Townes 1945); 6.7 ml s. Erickson (50.48°N, 99.90°W); Lake Winnipeg (Sæther 2012)
Ontario - 'Copanspin Farm' Dunrobin (45.42°N, 75.87°W); 0.5 ml e. Dunrobin (45.25°N, 75.86°W); South March nr Mud Lake (44.88°N, 78.27°W); Hogs Back (45.37°N, 75.70°W), Ottawa (all Carleton, Co.).
Prince Edward Island - Brackley Beach (abt 46.24°N, 63.13°W), Canadian National Park (Paratype - Townes 1945)
Saskatchewan - Floral (Driver 1971)
California - Tahoe City (Paratype - Townes 1945) Lake Davis, Plumas Co.; Spring Valley, San Diego Co.
Colorado - Denver; FortCollins (Paratypes - Townes 1945).
Indiana - Crooked Lake, Noble Co.
Massachusetts - Oak Bluffs (Paratype - Townes 1945).
Minnesota - Luverne; Nine Mile Creek, Anoka Co. (Paratypes - Townes 1945); Lake Christina (46.08°N, 95.75°W), Douglas Co.; Anderson II WPA wetland, Audubon (46.86°N, 95.98°W), Becker Co.
Nevada - Reno (**Type locality**)
New Mexico - Eagle Nest Lake (36.55°N, 105.25°W), Colfax Co.
North Dakota - Fuller Lake; Larimore Dam, Grand Forks Co.; McVillem Dam, Nelson Co.; Warsing Dam, Eddy Co.
South Dakota - Brookings, Erwin (Paratypes - Townes 1945).
Wisconsin - Reader Farm (45.07°N, 89.42°W), Madison, Dane Co.

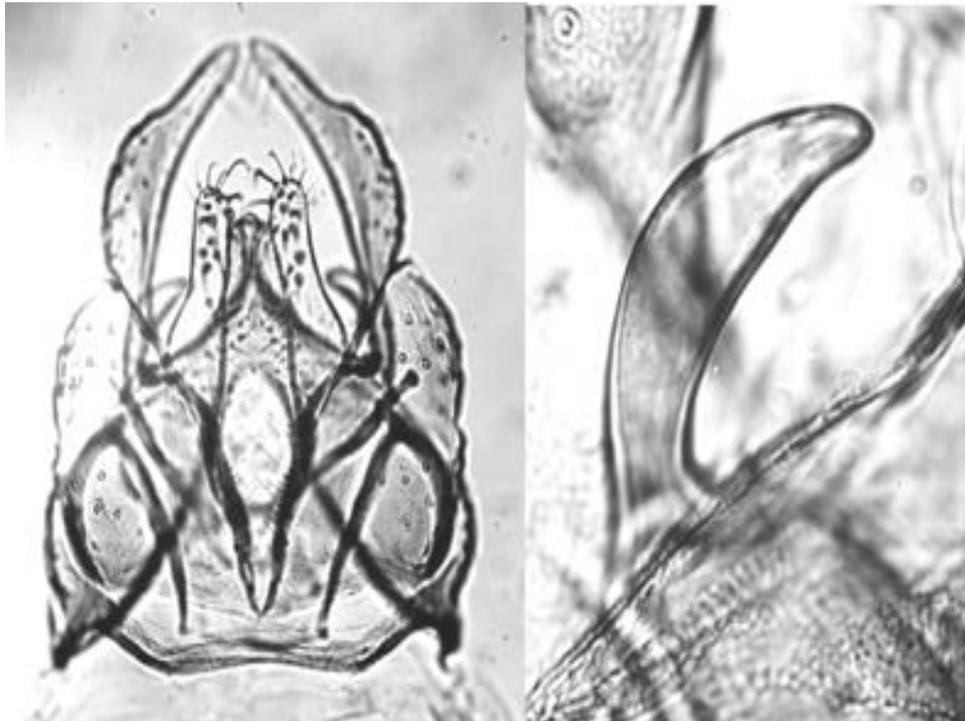
Prairie sloughs, pools, and lakes.

Species Ea of Butler, and then *C. nr. anthracinus* of Butler *et al.* (1995). The cytology was described in detail by Martin *et al.* (2006).

Species j. *C. decorus* group

Adult male:

Specimens in the J. E. Sublette collection in the Museum of the University of Minnesota.



Male terminalia of *C. sp. j.*

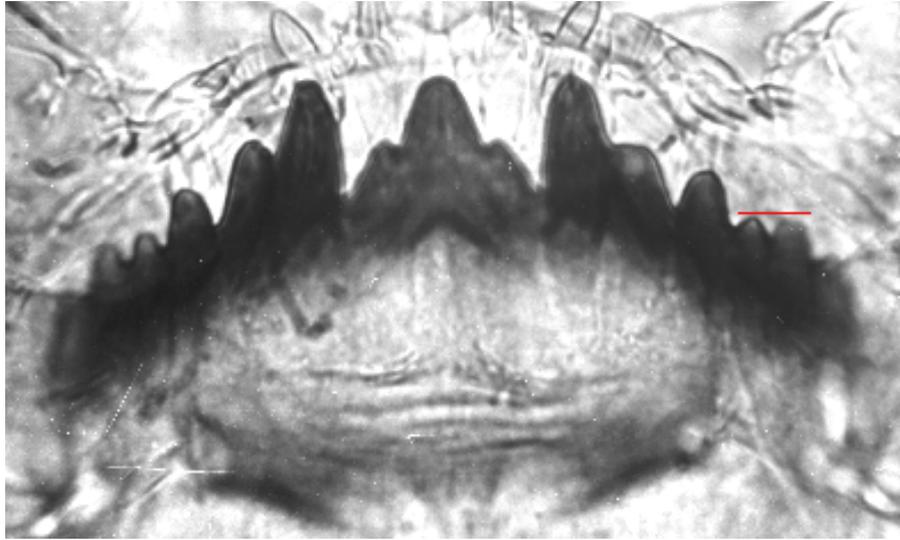
About 9 setae in a central pale patch on TIX. A typical *C. decorus*-type hypopygium, with SVo similar to that of *C. bifurcatus* and *C. maturus*. IVo extending beyond the expanded end of the anal point.

Pupa: postero-lateral spur on segment VIII with about 4 spines.



Fourth instar larva a medium size (fem. 12.9-14.1; male 12.1-13.6) thummi-type, with anterior VT longer (ant. 1.3-2.0; post. 1.2-1.91). AT about 3 times longer than wide, with a slight constriction in the middle, ventral pair thinner than the dorsal pair (hence with higher length to width ratio). Dark posterior half of gular and FC pale or with darkened edges.

Mentum with rounded teeth; 4th laterals reduced almost to height of 5th laterals (type II); c1 tooth high and fairly narrow, c2 teeth moderately separated (type III, but may appear to be type I or II due to wear).



Ventromental plates separated by about 0.3 of mentum width, with about 39-48 striae. Pecten epipharyngis with about 9-13 relatively broad teeth.

Premandible with teeth about equal in length, inner tooth about 1.7-2.8 times the width of the outer tooth.

Antenna with A1 about 2.5-3 times longer than wide, RO about 0.33-0.4 up from base; AR about 2.5-3.1; A4 about 25% longer than A3, which is longer than A5; proportions (μm) 118 : 31 : 10 : 12 : 7.

Mandible with 3rd inner tooth slightly colored and partly separated (type IIB); about 14 - 15 furrows on the outer surface at the base.

Cytology: 4 polytene chromosomes with thummi arm combination AB, CD, EF, G.

Arm G largely unpaired, although may be paired in middle. Nucleolus subterminal, BR subterminal at the other end. No nucleolus on other arms but large distal bulb (gp. 7) in arm B.

Polymorphism at least in arms A and B.

Arm A1:

Arm A2: Simple inversion near the centromere.

Arm B1: Group 7 distal.

Arm B2: Simple inversion of about 1/3 of arm just distal to middle of arm.

Arm C1:

Arm D1:

Arm E1: possibly 1-3e, 9-10b, 4-3f, 10c-11a, 5-8, 11b-13

Arm F1:

Arm G1: Subterminal nucleolus.

Found: New Brunswick - Kouchibouguac National Park (46.858°N, 64.975°W)

Ontario - Algonquin Provincial Park (45.58°N, 75.70°N), Nipissing Co.; Bear Creek, Carlsbad Springs (45.37°N, 75.47°W), Carleton Co.

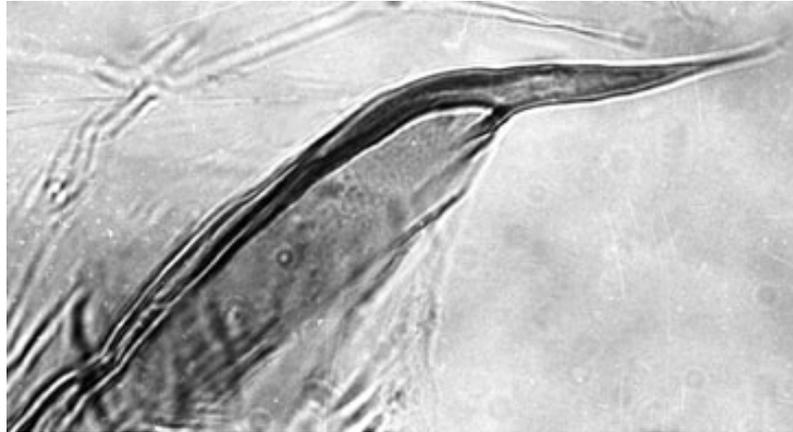
Quebec - Notch Road, Gatineaus (45.92°N, 75.60°W)

Slow moving creeks and pools.

Species k.

Adult not known for certain

Pupa: Caudolateral spur of segment VIII with a single long spine.



Fourth instar larva a small to medium plumosus-type (Fem. abt 11.4 mm (1)). VT moderately long. AT at least twice as long as wide. Gular region slightly darkened, FC pale to slightly dark.

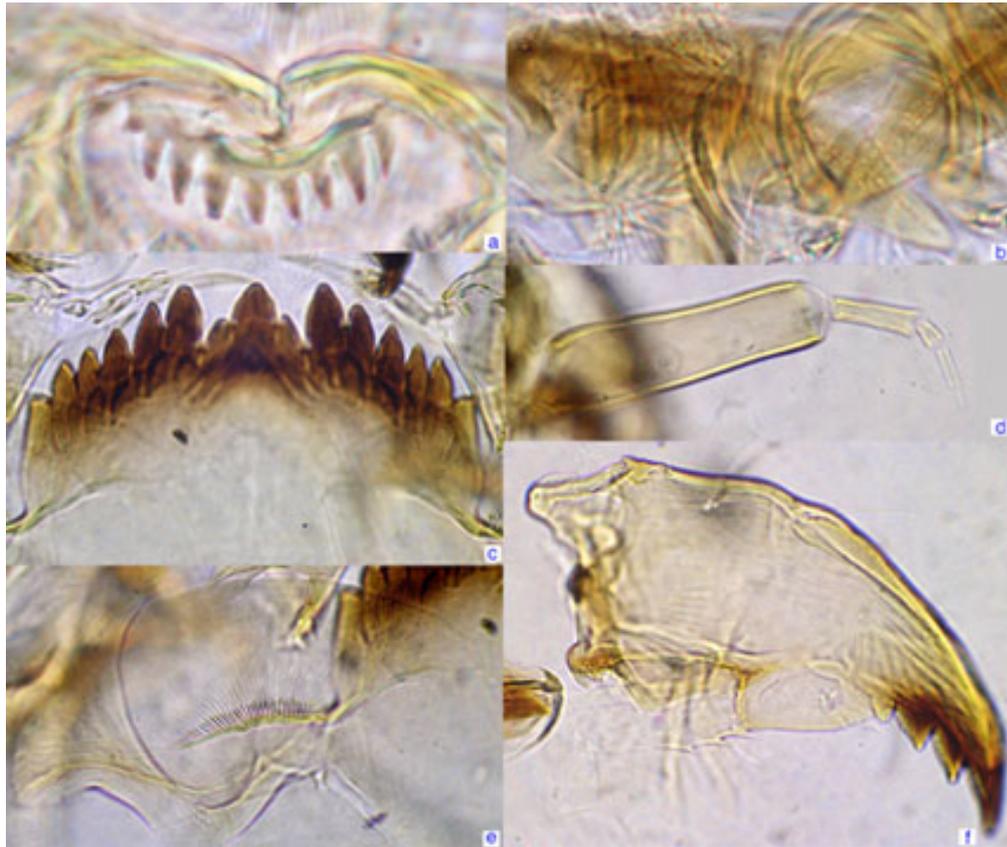
Mentum (c, below) with pointed teeth; c1 tooth high and almost parallel sided, c2 teeth moderately developed (type III), 4th laterals hardly reduced (type I).

Ventromentum (e, below) with about 39-43 striae reaching about half way to margin. PE (a, below) with about 9-10 moderately long and fairly broad teeth (type C, sharp variant).

PreM (b, below) with relatively broad, about equal length teeth, inner tooth about 1.9-2.3 times wider than outer tooth.

Antenna (d, below) with basal segment about 3.7-3.8 times longer than wide; RO about 40% up from base of segment; AR abt 1.69-1.75; segment proportions (microns): 140 : 38 : 11 : 18 : 8.

Mandible (f, below) with 3rd inner tooth only partly separated and pale (type 2A), about 15-16 furrows on outer surface near the base, PMa with about 13-15 taeniae.



Cytology: 4 polytene chromosomes with thummi arm combination AB, CD, EF, G. Centromeres only slightly heterochromatic.

Arm G generally unpaired, with a large terminal nucleolus and at least one BR near the other end; rather similar to arm G of *plumosus*. No nucleolus in any other arm. Arm E generally unpaired or may be a rearrangement. Polymorphism in B(?).

Arm A1: Olive (groups 4-6) about middle of arm.

Arm B1: Slight distal puff (group 7?).

Arm B2: Inversion in proximal half of arm.

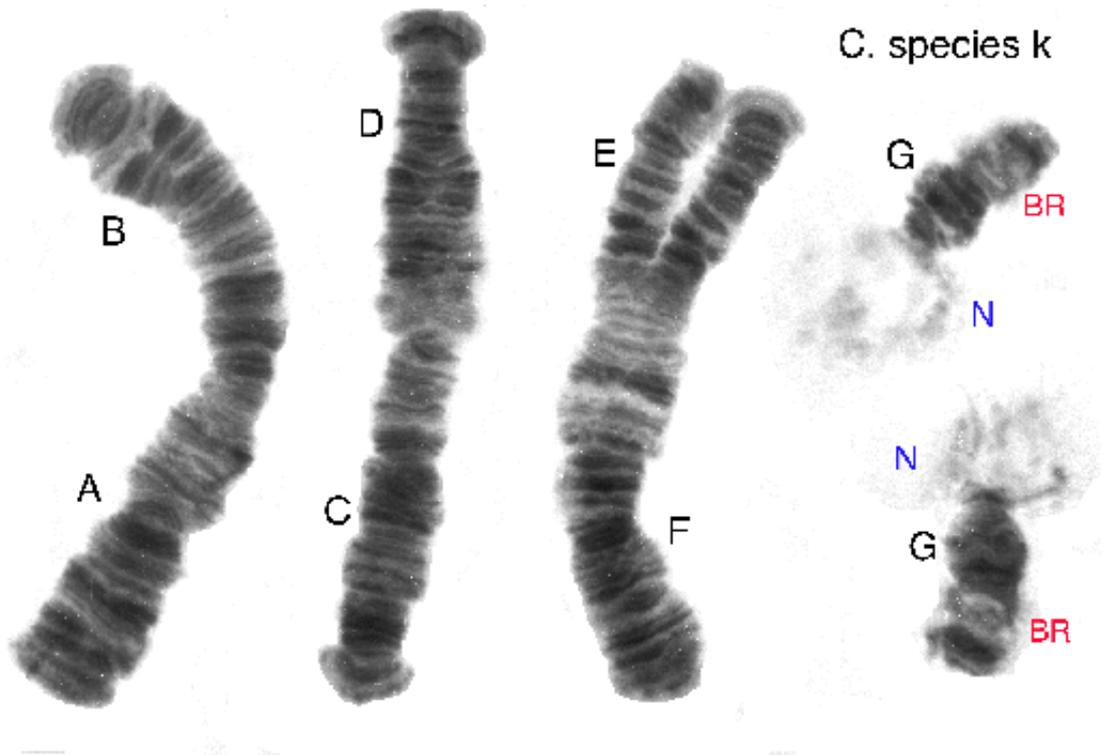
Arm C1: typical groups 3-4 about 1/3 from centromere.

Arm D1:

Arm E: Lack of pairing may be a small inversion near distal end.

Arm F1:

Arm G1: Large terminal nucleolus, 1 or 2 BR near other end.



Found: Ontario - Costello Creek, Algonquin Provincial Park (45.58°N, 78.32°W)
 New Hampshire - Lancaster, Coos Co (44.49°N, 71.57°W).

Creeks and pools.

Species I. *C. blaylocki* Wülker *et al.*, 2009

A member of the *C. decorus*-group, described as *C. tentans* by Blaylock, Auerbach and Nelson (1964).

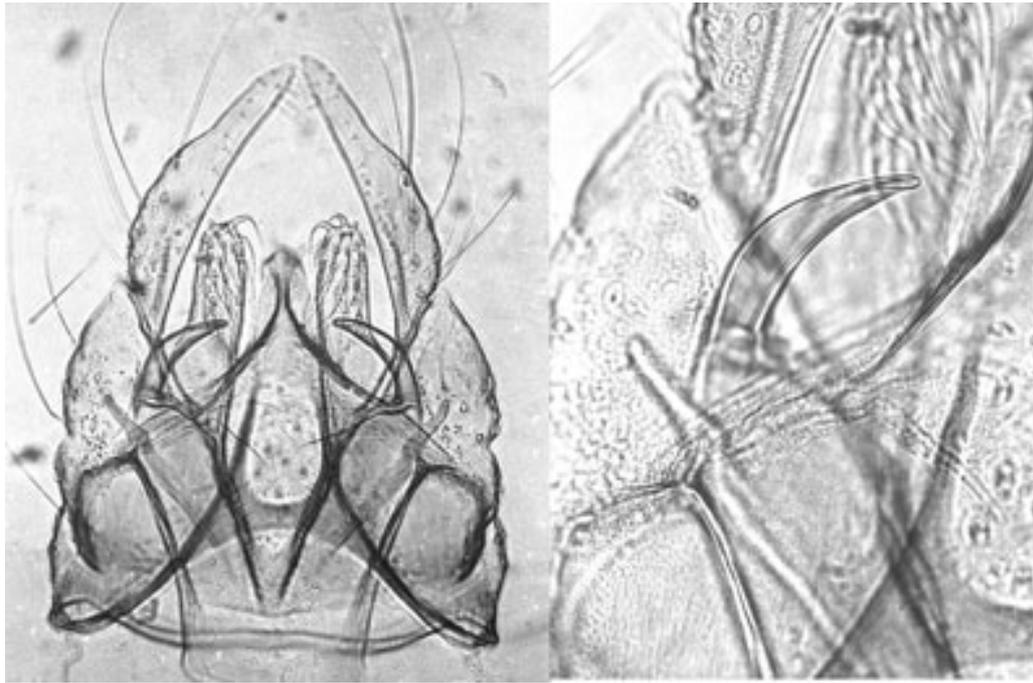
Adult: Presumptive male described by Wülker *et al.* 2009.

Male: Head, thorax and abdomen with extensive dark markings, legs infuscate.

Wing length about 2.87 mm, VR 0.98, 22 setae in squamal fringe; AR 3.86; LR 1.73.

Head with frontal tubercles about 32 µm long, 28 clypeal setae, palp segments (2-5)(micron): 47 : 203 : 265 : 351.

Thoracic setae: Acrostichal abt 16; dorsocentral 27; prealar 6; supraalar 1, scutellar 15 strewn on anterior face, 15 in posterior row.



10 setae on TIX; SVo of D-type of Strenzke (1959); gonostylus narrowing relatively gently over posterior third.

Female and pupa: not described.

Fourth instar larva a medium sized plumosus-type (length about 12.2 - 14 mm female, 12 mm male). VT long, posterior pair usually longer (3-3.8 mm, cf. 2.4-2.8 mm). PLT well developed, about 300-420 micron. AT with a medial constriction. Dark gular region over posterior third and pale or slightly darkened FC.



Mentum with rounded teeth, 4th laterals not reduced (type I); c1 tooth moderately broad with well developed c2 teeth (type III).

VM with about 36-40 striae, and about 4 times longer than deep, VMR about 2.76. PE with about 13 to 16 teeth, the most lateral ones being somewhat narrower (type B).

Premandible with two teeth as typical for the genus, outer tooth shorter (may be due to wear), inner tooth about 2.5 times wider.

Antenna with relatively long basal segment, almost 4 times longer than wide; RO about 1/3 to 1/2 way up from base of segment; AR about 2.36; segment proportions (microns) 163 : 38 : 10 : 13 : 8 ; A1/VHL about 0.46; A2/A1 about 0.23.

Mandible with 3 spines on the inner margin; about 15-16 furrows on outer surface near the base; 3rd inner tooth clearly separated but only moderately darkened (type II-IIIB); PecM with about 13 taeniae.

Cytology: 4 polytene chromosomes with thummi arm combination AB, CD, EF, G.

Arm G generally paired with a subterminal nucleolus and nearby BR. No nucleoli in the long chromosomes. Bulb about middle of arm B with distal dark bands. Polymorphic in all arms in areas subject to radioactive effluent (Blaylock *et al.* 1964), but no endemic inversions recorded for arms A, E and G.

blaA1: 1a-e, 8 - 9, 2d - 3e, 15 - 14, 2c - 1f, 16a-d, 7 - 4, 13a-f, 10 - 12, 3i-f, 17 - 19

blaB1: Puff (group 7) with distal dark bands about the middle of the arm. Possibly as B2 of Sp. b

blaB2:	Formed by overlapping inversions from B1, such that the puff is near the distal end of the arm, with the dark bands proximal to it.
blaC1:	1 - 6b, 12b - 15, 8 - 11c, 12a - 11d, 6gh, 17a - 16, 7d-a, 6f-c, 17b - 22 as <i>C. bifurcatus</i> .
blaC2:	1 - 2e, <u>12b, 6b - 2f</u> , 12c - 15, 8 - 11c, 12a - 11d, 6gh, 17a - 16, 7d-a, 6f-c, 17b - 22
bla D1:	1 - 3, 11 - 12, 18 - 19, 13 - 17, 4 - 7, 10 - 8, 20 - 24
bla D2:	1 - 3, <u>19g - 18, 12 - 11</u> , 19h, 13 - 17, 4 - 7, 10 - 8, 20 - 24
bla E1:	1 - 3e, 8 - 5, 9 - 10b, 4 - 3f, 10c - 13 i.e. as <i>maturus</i> & <i>stigmaterus</i> .
bla F1:	1, 9 - 2, 10 - 23
bla F2:	1, 9 - 5d, <u>16 - 10, 2 - 5c</u> , 17 - 23

Found: Tennessee - White Oak Creek (**Type locality**) (36.03°N, 84.27°W), and McCoy Branch, Clinch River, nr. Oak Ridge, Knox Co; Ten Mile Creek (35.90°N, 84.07°W), Knox Co.

Pools in creeks.

Fourth instar larva, presumptive adult and the salivary gland chromosomes described by Wuelker *et al.* (2009). Chromosomes mapped, as *C. tentans*, by Blaylock *et al.* (1964). The identity of this species as a member of the *C. decorus* group was noted by Wülker *et al.* (1968). The sequences of arms E and F were given in Wülker *et al.* (1989) and of arms C1 and D1 in Kiknadze *et al.* (2004). This species is very close to *C. sp. b*, and they may be subspecies of the same species.

Species m. *C. pilicornis* (Fabricius 1787)
as *Tipula pilicornis*

Proposed synonyms by Kiknadze *et al.* (2016): *C. conformis*, Malloch (1923)(new name *C. sanctipauli* Sublette 1966, see species 5g); *C. dolens*, Walker (1856); *C. moerens*, Walker (1848); *C. niveipennis*, Fabricius (1805); *C. obscurus*, Zettersted (1838); *C. polaris*, Kirby (1824) (usually considered a *nomen nudum*); *C. ridis* Zettersted (1838); *C. tristis* Weidemann Meigen, (1818); *C. sp. Ya1*, Kiknadze *et al.* (1996).

While possibly all correct, it is also possible that one of these names is the valid name for some of the species incorrectly called *C. pilicornis* - e.g. Sp. 5e (see below).

Adult:

North American adults of *C. pilicornis* were described by Townes (1945).

Male:

AR 6.5. Frontal tubercles rather small, clypeus large.

Wing length 5.5 mm. "Body stout, legs somewhat inflated". Body coal black, legs pale by comparison.

LR 0.95-1.0. Fore tibia with a long dense beard. Legs brown.

Anal Point narrow (unusual among dark species). In Townes figure the style only narrows, sharply, in the distal 1/5.

Townes (1945) claimed that *C. pilicornis* was unique in the genus in having an LR of about 1. This has since proven to be incorrect, with at least 4 species having a similar LR (*C. pilicornis*, *C. heteropilicornis*, *C. sanctipauli*, *C. species 5e*).

The unfortunate consequence has been that any adult male from the Nearctic with an LR of about 1 has been automatically called *C. pilicornis*. (see also below)

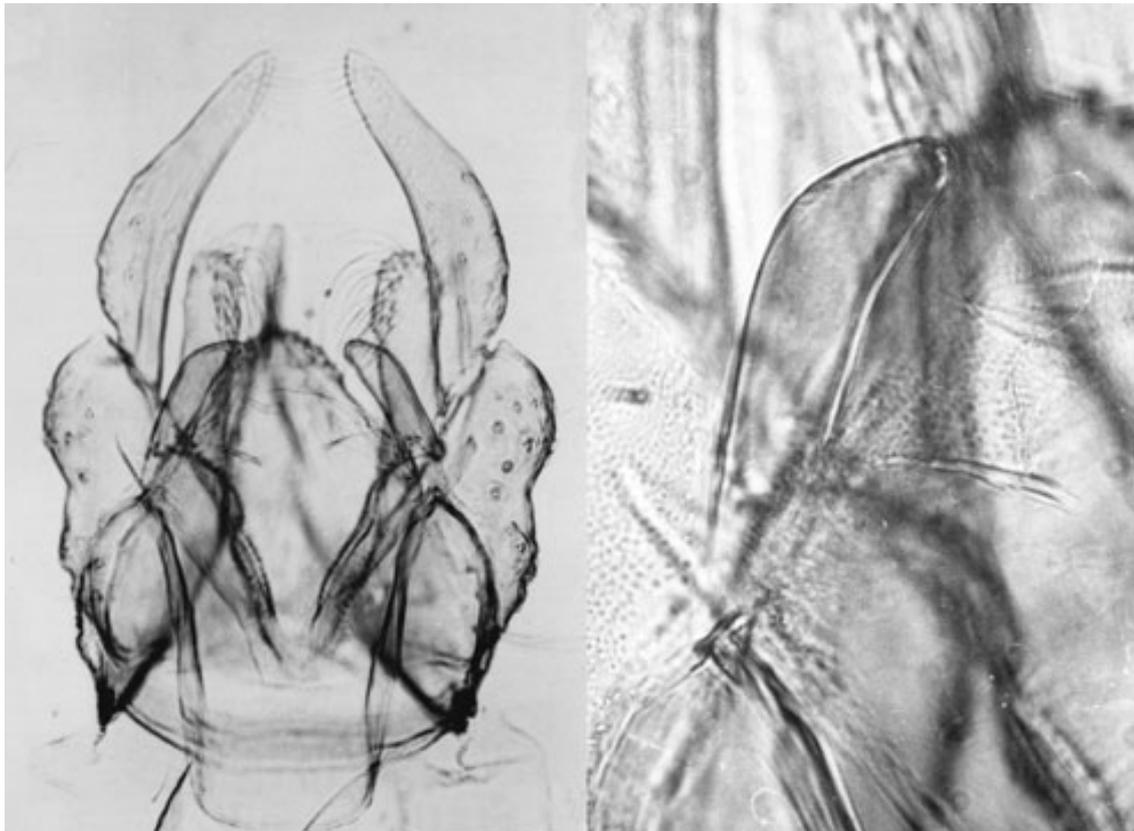
Since it is uncertain that Townes had the correct species, or even just material of a single species, the description of the cytologically characterized Palearctic material from Wülker (1996) is given as well:

AR 4.67-5.87.

Wing length 3.80-4.45 mm. Body black, including setae of thorax and abdomen; only a rectangular or quadratic field at posterior of abdomen. segment VII is light; halteres brownish.

Thoracic setae: acrostichal – 0-12; dorsolateral – 37-64; prealar – 8-24; scutellar - 45-70. LR 0.97-1.11; BR 4.0-8.0.

About 0-8 setae in group on tergite IX. SVo curved, relatively short (reaching about halfway up length of IVo, closest to Strenzke’s type E(i). Anal point narrowed at base (shared with *C. heteropilicornis*). Style narrows abruptly over about the distal 1/3 – 1/4.



Terminalia of male from Calgary, Alberta

Female: Not described but inferred to be as Palearctic material. Described in Russian by Rodova (1974):

Length 8 mm. Wing length 6 mm. Dull black with dark-brown halteres. Frontal tubercles with thick pubescence vary in size. Antennae dark-brown, first segment black; proportions (units) 25 : 15 : 16 : 13 : 31; AR about 0.42, A5/A1 about 1.24. Palps brown, third segment slightly longer than fourth.

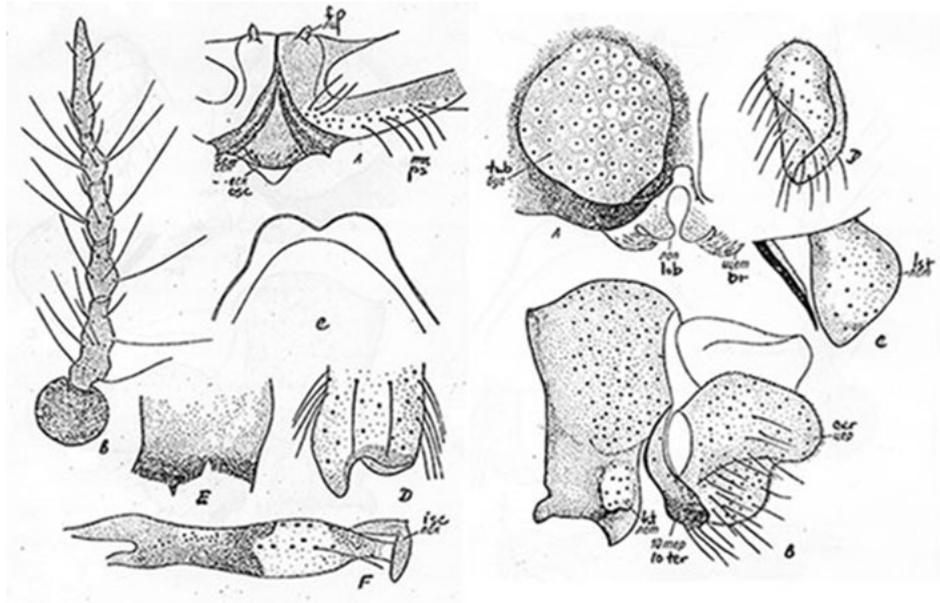
Pronotum, mesonotum, scutellum and thoracic vittae black.

Thoracic setae – Acrostichals- nil; Dorsocentrals 60-115; Prealar – 20; Supraalar 2; Scutellar – approx. 100. About 9 Scf on stem vein.

Legs black brown. LR and other leg proportions (micron) given by Wülker (1996):

	Fe	Ti	Ta1	Ta2	Ta3
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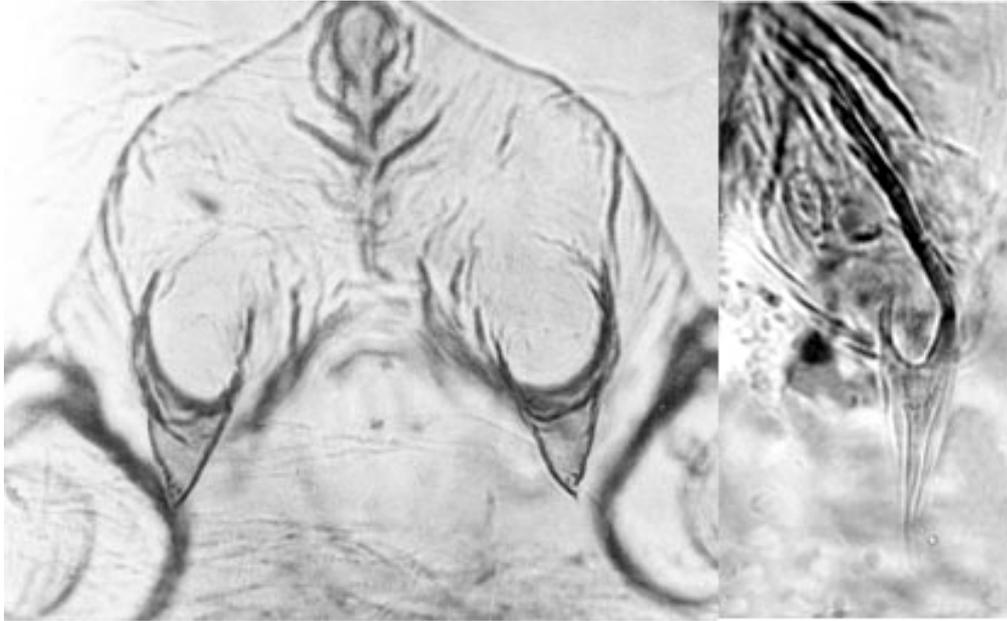
PI	1432	1506	1630	888	543
PII	1531	1630	914	543	370
PIII	1852	2099	1481	790	617
	Ta4	Ta5	LR	F/T	Ta4/Ti
PI	420	272	1.06	0.95	0.27
PII	272	247	0.56	0.93	0.17
PIII	321	247	0.71	0.88	0.15



Characters of female head and abdomen from Rodova (1974)

Abdomen black-brown, with light colored setae. Tergites and sternites light-brown along posterior edge; 8th sternite black, with 2 large lighter colored tubercles (GcIX), unevenly covered with setae. Two spermathecae located at the boundary of segments VII and VIII.

Pupa: At least one adult male was reared from an egg mass from Calgary, Alberta (in Sublette collection) and photographs exist of the cephalic tubercles and spur of the pupal exuvia. The spur has 4 closely applied fine sharp spines.



Fourth instar larva: a medium sized plumosus-type although none of the available specimens were able to be measured. PLT about 260 μm , VT quite long, anterior pair longer (2.5 mm. cf. posterior 2.3 mm). AT about 506-555 μm long and 2.8-2.9 times longer than wide.

Dark posterior 1/3-1/2 gula (just under region of mentum) and FC slightly dark-dark.

Mentum (c, below) with pointed teeth, c1 tooth quite broad and parallel sided, c2 teeth well separated and pointed (usually type III but sometimes closer to IB); 4th laterals reduced nearly to level of 5th laterals (type II).

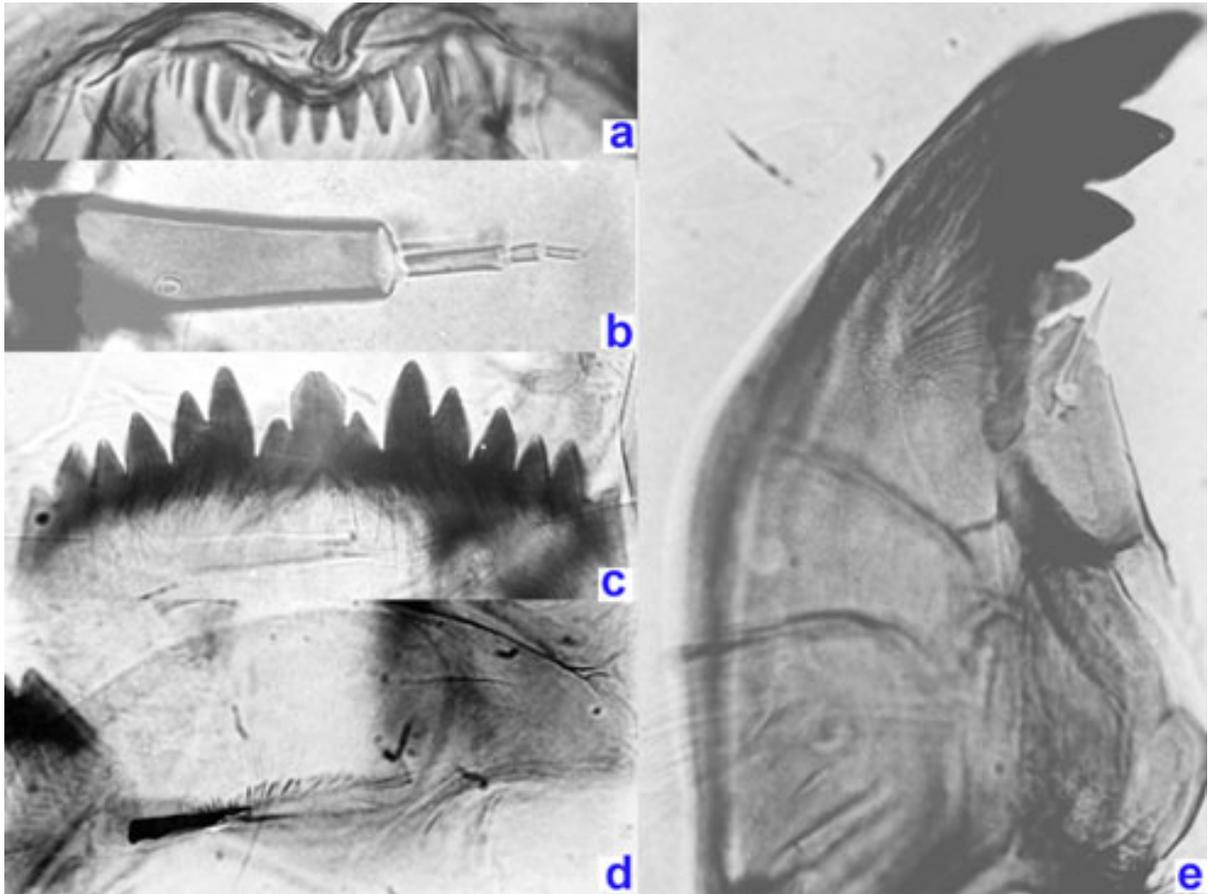
VM plates (d, below) about 3.6-5.5 times longer than deep and separated by about 0.26-0.39 of mentum width; about 52 (37-63) striae which reach about halfway to the anterior margin; VMR about 0.36 (0.32-0.41) but increasing to about 0.4-0.42 towards the medial margin for those with lower values.

PE (a, below) with about 14 (12-18) relatively broad teeth (type B), sometimes with smaller teeth at outer edges. Premandible with inner tooth about 2-4 times the width of the outer tooth; inner tooth longer if not worn.

Antenna (b, below) with A1 about 3.3 (2.87-3.97) times longer than wide, RO about a third to a half up from base of segment; AR about 2.20 (1.97-2.46), ave. length of segments (μm) 165 : 35 : 12 : 15 : 8.

Distance between antennal bases usually less than that between the S4 setae, but sometimes may be slightly larger.

Mandible (e, below) with third inner tooth partly to completely separated, and moderately darkened (type II-III B); about 20 (14-24) furrows on outer surface near the base; PMa with about 14 (11-18) taeniae.

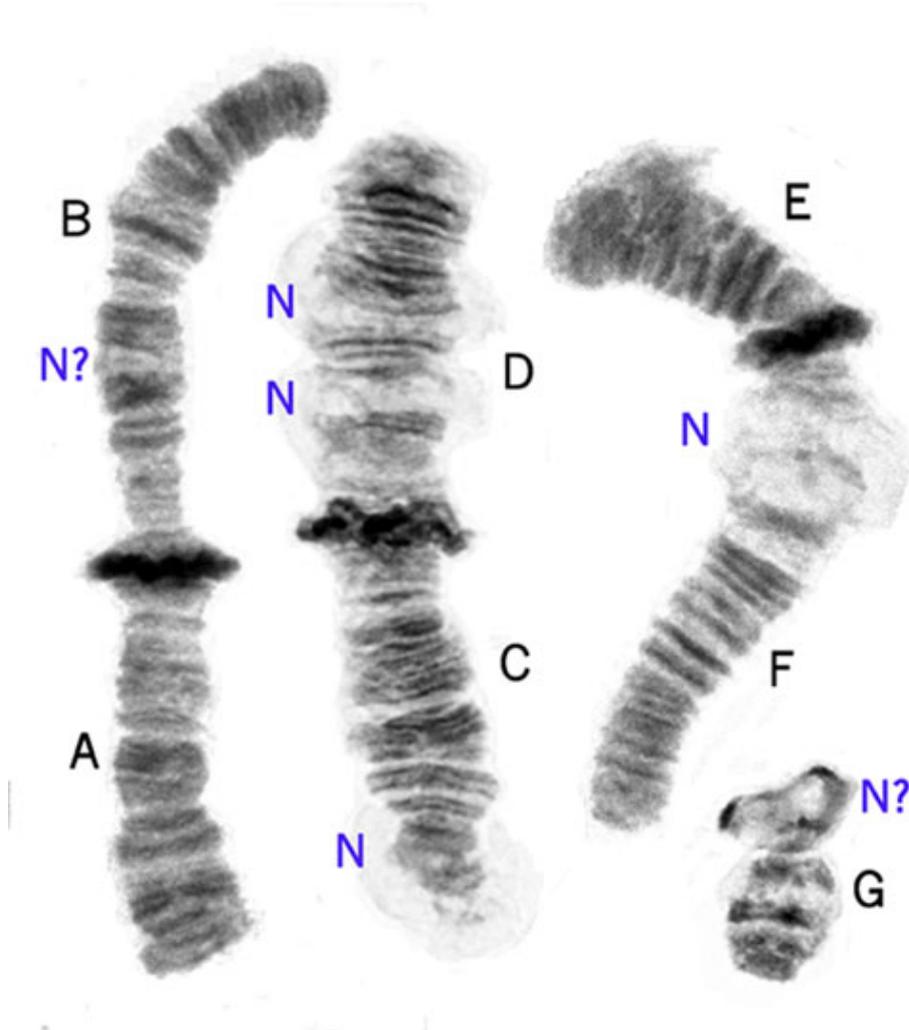


Wülker (1996) described the larva of Scandinavian specimens as a plumosus-type, about 15 mm in length. Head with diffusely dark clypeus, hind part of gular with a dark oval spot. Lateral tubuli on abdominal segment VII less than 1/5 of the length of the segment.

Cytology: 4 relatively short polytene chromosomes with distinct heterochromatic centromeres.

Arm combination is thummi-cytoplex, AB, CD, EF, G.

Arm G closely paired with a constriction near the heterochromatic end, and a dark group of bands near the middle of the arm. No distinct N in G, but N probably sub-terminal as in Palearctic material, probably 2 BRs towards the other end of the chromosome. Nucleoli developed in all three larger chromosomes, in arm B (although may not be obvious), 2 proximal in F, 2 in D and a terminal nucleolus is sometimes present in C (see below). In the Palearctic, polymorphism has been reported in arms A, B, and D as well as B chromosomes in some populations (Kiknadze *et al.* 1996b, 2016). In North America, so far, polymorphism has only been reported in arm D in the region of the nucleoli. Kiknadze *et al.* (2016) give a different interpretation of the arm D sequences, with their D2 being closest to the NA sequence.



- pilA1: 1 - 3, 12 - 4, 13 - 19 i.e. as *pseudothummi*
 pilB1: 1-2d, 3-2e, 20-18, 21-22, 6-8a, 5-4, 8b-13, 17-14, 23-28
 pilC1: 1-6b, 11c-8, 15-11d, 6gh, 17a-16, 7d-a, 6f-c, 17b-22 i.e. as *aberratus*, *tenuistylus*
 pilD1: 1 - 3, 11 - 18d, 7 - 4, 10 -8, 18e - 24 i.e. as *longistylus*, *tardus*, *cucini*
 pilD2 (Pal): 1 - 3, 11 - 16, 9 - 4, 10a-e, 17 - 24 (Kiknadze *et al.*, 2016)
 pilE1: 1a-3e, 10b-3f, 10c-13g i.e. as in *aprilinus*, *atrella*, *athalassicus*
 pilF1: could be 1 - 6, 12 - 7, 13 - 23 i.e. as Palearctic *pilicornis*
 pilG2 (Nearctic): Inversion of distal half compared to Palearctic pilG1.

Found:

- Alberta** - Rosebud (51.30°N, 112.95°W); Huntington, Calgary (51.08°N, 114.08°W);
 ⚡ Waterton Lakes (adult – Townes 1945).
Manitoba - 7 ml S of Erickson (50.48°N, 99.90°W); ⚡ Southern Indian Lake (57.17°N, 98.50°W) (Rosenberg *et al.* 1984).
Northwest Territories- ⚡ Trough Pond, Horton River area (M.G. Butler)
Ontario - 4 ml e Sudbury, Sudbury Co. (46.52°N, 80.90°W).
Saskatchewan - ⚡ Oxbow, Saskatoon (Townes 1945).
Alaska - ⚡ Point Barrow (71.39°N, 156.48°W); ⚡ St Paul Island, Bering Sea (57.18°N, 170.27°W) (*Chironomus sanctipauli*, see species 5g); (both Townes 1945)
South Dakota - ⚡ Emanuel Cr., 2 ml W of Springfield (Sublette, pers. comm.).
 (some of these localities may refer to related species)

Greenland - Nedre Midommer Sø.

Also found in the Palearctic, **Type locality:** Kiel, Germany.

Prairie sloughs and pools.

The chromosomes have been described for Palearctic material from Europe by Wülker (1996) and from Siberia by Kiknadze *et al.* (1996) (as *C. species* Ya1) and Kiknadze *et al.* (2002, 2004, 2016). The chromosomes of North American specimens are essentially identical in sequence to Palearctic *C. pilicornis* in 5 of the 7 arms. As noted above, present data suggests there may be several species amongst the material considered to be *C. pilicornis* but for which there is no cytological confirmation.

There does not seem to be any Barcode sequence from Europe to help confirm identity (the specimens identified as *C. pilicornis* may be misidentified *C. heteropilicornis* (see below) or the two species may have essentially the same sequence. It is possible that *C. pilicornis* (at least the species recognized cytologically) may not have an Arctic distribution.

There is no evidence that the very similar *C. heteropilicornis* occurs in the Nearctic as there is no Nearctic data in the BOLD database allotted to the same Bin ([BOLD:ACX5781](#)) as the Palearctic specimens.

Molecular data:

MtCOI: There is BARCODE sequence in the BOLD database that is attributed to North American *C. pilicornis*, however this is almost certainly a misidentification, as the larva shown is a salinarius-type rather than a plumosus-type. The sequence matches species 5e (see below). There is no available sequence from cytologically identified North American specimens of *C. pilicornis*.

Species n. *C. stigmaterus* Say 1823

Tendipes (Tendipes) stigmaterus – Townes 1945

This is BOLD Bin No. [BOLD:AAW3998](#)

Adult:

Male:

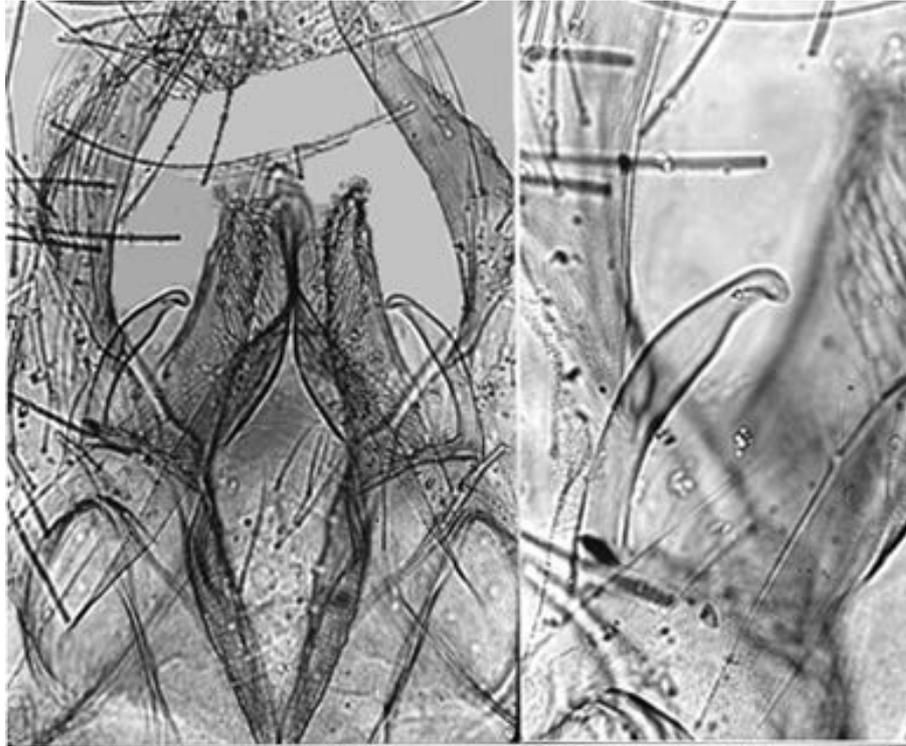
Wing length 4.06 (3.20-5.02) mm. VR 1.00-1.01.

AR – 4.0-5.17; LR1 - 1.33–1.49; LR2 - 0.55-0.63; LR3 - 0.68-0.75.

Pale greyish brown; lighter portions of thorax with a greenish tint; abdomen brown, darker towards the apex and paler near the incisures.

Legs with apex of the tibiae and basal tarsal segments brown; fore tarsi with long heavy beard, LR 5-7.

Frontal tubercles large, about 1.7 times longer than width at base, clypeus small, about width of antennal pedicel with 22-38 setae; palp proportions (units) 10 : 8 : 16 : 24 : 40. Central portion of pronotum strongly produced, no mesonotal tubercle. Thoracic setae - acrostichal in 2 staggered rows; dorsolaterals - about 13 in 1-3 rows; prealars - about 4; scutellar with posterior row of about 18 setae, anteriorly with about 12 smaller setae in a random pattern.



SVo long and slender, E-type, between h and i, of Strenzke (1959); IVo with forked setae

Female.

No detailed description available – basically described as similar to male except for sexual differences. From the figures in Sublette and Sublette (1974), the following characters can be adduced:

Antennal proportions (units); 15 : 10 : 10 : 9 : 22. AR abt 0.5, A5/A1 abt 1.5. Clypeal width about 1.2 times width of antennal pedicel; about 27 clypeal setae.

GcIX ovoid with about 6 setae. GpVIII with about 9 setae.

Pupa: Mean total exuvial length 9.67 mm (male 8.21-11.01; female 7.99-12.30). Thorax finely papillose; recurved hooks simple, sometimes with a slight barb near the center of the row; 80-116 in females, 60-91 in males. Distinctive rugose stripes on abdominal segments. Posterolateral spurs with 5 (3-8) spines. Anal fringe with a sexual difference in number of flattened setae: 103 (88-117) in males, 117 (94-139) in females.



Fourth instar larva a medium to large plumosus-type. Length: female 14.5-16.8 mm, male 12.7-15.3 mm). VT long with posterior pair longer (Anterior: fem. 2.6-4.1 mm, male 2.0-3.6 mm; fem. 3.6-5.5 mm, male 2.1-4.1 mm). PLT 330-730 μ m.

Darkened gular and FC (which may be darker in center) (Sublette and Sublette 1974 state that only the gula is darkened). Mentum of type I, with somewhat rounded teeth, which in trifold center tooth causes c1 tooth to narrow at base (type 1B or III).

Ventromentum with about 47-53 striae, VMR 0.31-0.38; IPD about 0.32-0.38 of mentum width. PE with 13-16 sharp teeth (type A or B). Premandible with outer tooth slightly longer than inner tooth, which is about 1.7-3 times the width of the outer tooth.

Antenna with A1 about 3 (Calif) - 3.91-3.94 (Texas) longer than wide; RO about 0.3-0.4 up from base; AR - 2.35 (Calif) - 2.74 (Texas); A2/A1 abt 0.18 (Texas)-0.22 (Calif); segment lengths (micron) 170 : 31 : 9 : 15 : 8.

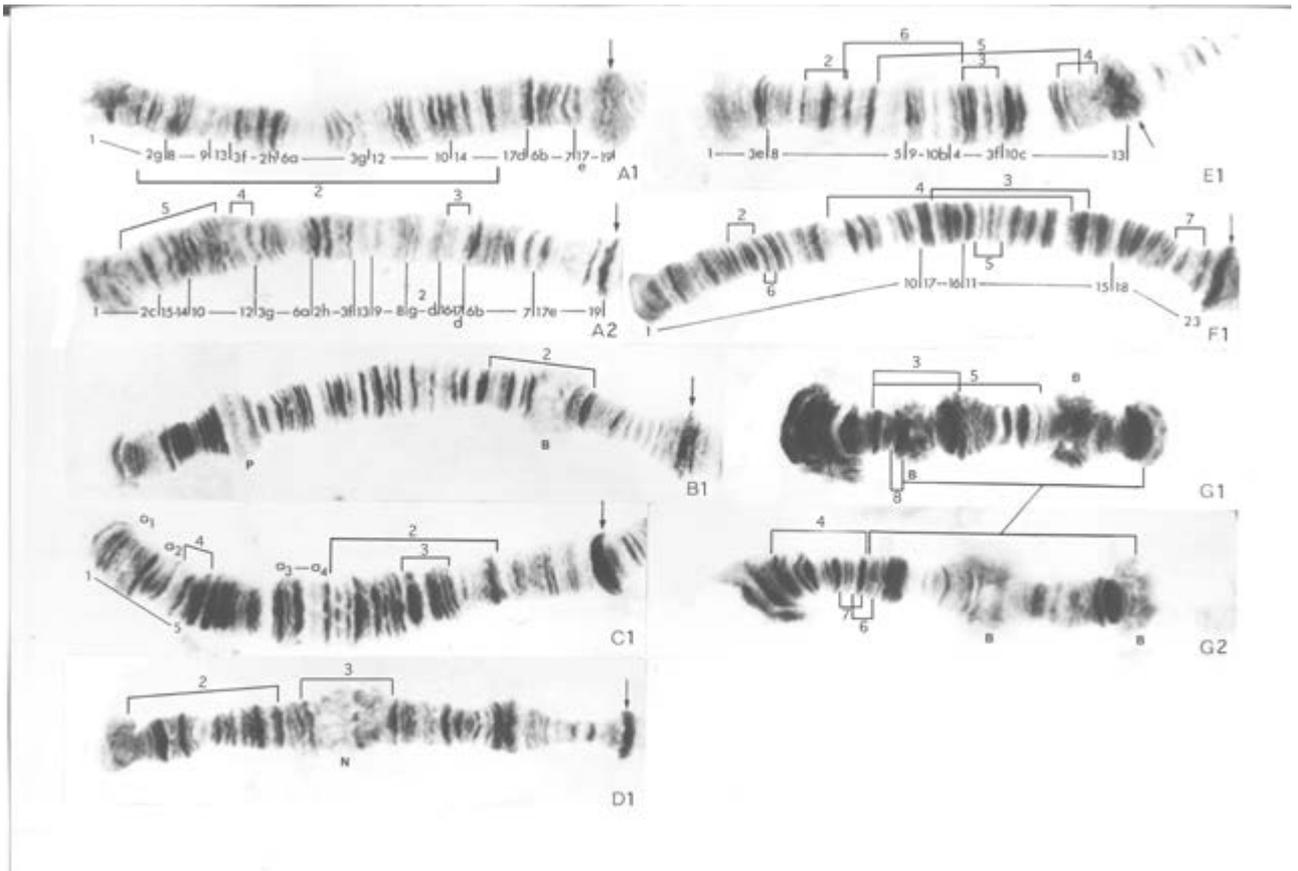
Mandible with 3rd inner tooth well developed and partially to fully dark (type IIIB-C); about 14-15 furrows on outer surface near the base; 11-12 taeniae in the PMA.

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

Arm G closely paired except where heterozygous. Californian populations have 2 interstitial BRs in arm G but some of the alternative sequences present in other areas appear to have only one BR, because the other is inverted to a terminal position where it is difficult to see. Nucleolus is about the middle of arm D. Inversions are known in all arms, with some populations quite polymorphic (Hilburn 1979). Only a single specimen from Florida was available for the populations in eastern North America.

- stiA1: 1a-2g, 8-9, 13a-f, 3f-2h, 6a-3g, 12c-10, 14-17d, 6b-7, 17e-19
(all localities, highest Texas)
- stiA2: 1a-2c, 15-14, 10-12, 3g-6a, 2h-3f, 13f-a, 9-8, 2g-d, 16-17d, 6b-7, 17e-19
(all localities, highest California)
- stiA3: approx 1a-2c, 15-14, 10-12, 3g-6a, 2h-3f, 13f-a, 9-8, 2g-d, del 16, 17a-d, 6b-7, 17e-19
(New Mexico)
- stiA4: approx 1a-2c, 15-14, 10-11, 3i-g, 12c-a, 4-6a, 2h-3f, 13f-a, 9-8, 2g-d, 16-17d, 6b-7,
17e-19
(Texas)
- stiA5: approx 1a-f, 11e-10, 14-15, 2c-1g, 12a-c, 3g-6a, 2h-3f, 13f-a, 9-8, 2g-d, 16-17d, 6b-7,
17e-19
(California)

- stiB1: Puff with distal dark bands (groups 7 & 8) near end of arm, BR near characteristic 4 bands (24-26) (in all localities)
- stiB2: Inversion of region around BR, about groups 21-23 (California)
- stiC: Four sequences are known, only C1 and C2 common (all localities)
- stiC2: Inversion of proximal third of arm. (New Mexico, Texas)
- stiC3: small proximal inversion within region of C2 (California)
- stiC4: small distal inversion (California)
- stiD: Three sequences known, but only D1 common (all localities)
- stiD2: Inversion of about distal third of arm (Texas)
- stiD3: small inversion of region of nucleolus (California)
- stiE1: 1-3e, 8-5, 9-10b, 4-3f, 10c-13 i.e. as *maturus* (differs from *aberratus* by In8-5) (all localities)
- stiE2: approx 1-3e, 8-7h, 6e-7g, 6f-5, 9-10b, 4-3f, 10c-13 (Texas)
- stiE3: approx 1-3e, 8-5, 9-10b, 4hg, 4a-f, 3f, 10c-13 (New Mexico)
- stiE4: approx 1-3e, 8-5, 9-10b, 4-3f, 10c-12b, 13f-12c, 13g (Texas)
- stiE5: approx 1-3e, 8-5c, 13a-10c, 3f-4, 10b-9, 5ab, 13b-g (Texas)
- stiE6: approx 1-3e, 8-6f, 4a-h, 10b-9, 5-6e, 3f, 10c-13 (Texas)
- stiF1: 1-10, 17-16, 11-15, 18-23 i.e. derived from *aberratus* by In11-5
- stiF2: 1-4, 6a-5, 6b-10, 17-16, 11-15, 18-23 heterozygous in all males
- stiF3: 1-4, ?-?, 6b-10, 17, 14h-11, 16d-a, 15a-i, 18-23 (could be 1-10 or 1-4, 6a-5, 6b-10) (California)
- stiF4: approx 1-8b, 14d-11, 16-17, 10-8c, 14e-15, 18-23 (New Mexico)
- Note: limits of stiF4 shown in Hilburn are those of stiF3 of Martin and Wülker, but he does not show limits for F3.
- stiF5: approx 1-10, 17-16, 11a-c, 11i-d, 15, 18-23 (Texas)
- stiF6: approx 1-5, 7a-6a, 6b-10, 17-16, 11a-15, 18-23 (New Mexico)
- stiF7: approx 1-10, 17-16, 11a-15i, 18-20g, 22d-20h, 22e-23 (California)
- stiG1: Two BRs, one near each end of arm (throughout, but highest California)
- stiG2: Inversion of about two thirds of the arm; takes one BR to terminal position (New Mexico and Texas)
- stiG3: Inversion of the region around proximal BR of G1 (New Mexico and Texas)
- stiG4: Inversion of slightly more proximal region than in G3, but in G2 (New Mexico and Texas)
- stiG5: Inversion of about half the arm from G1 (Texas)
- stiG6: Small inversion sharing distal break of G4 and within the region of the G4 inversion
- stiG7: Duplication of small proximal region of G2 (New Mexico)
- stiG8: Small inversion of G1, proximal to, and sharing proximal breakpoint of, G2 (Texas)



Found: Numerous populations in:

Arizona - Tucson (32.32°N, 110.82°W), Pima Co.; Douglas (Townes, 1945)

California - Hayward, Alameda Co.; Napa, and 1 mile s. Napa, Napa Co.; Riverside, Riverside Co.; Dolwig Lake, Vallejo, Solano Co.; Davis, Vacaville, Cutler, Oildale, Ontario, Cerritos, Palm Springs, Blythe (all Hilburn 1979)

Florida - Lake Miccosukee (Alberta Lake), Leon Co.; Biscayne Bay and Ft. Lauderdale, Miami-Dade Co.; Charlotte Harbor, Charlotte Co.; Jacksonville, Duval Co.; Lake Worth and West Palm Beach, Palm Beach Co. (all Townes, 1945)

Louisiana - Many, Sabine Co.

Nebraska - Oak Creek at Lincoln (Townes 1945)

New Mexico -- Portales (33.42°N, 103.33°W), and 4 ml s. Portales, Roosevelt Co.; Santa Rosa, Guadalupe Co.; Roswell & Torrence Co. (Townes 1945); Lordsburg, 74. km w Quincey, Alamogordo (all Hilburn 1979)

New York - Worlds fair Grounds, Flushing (Townes 1945)

Ohio - Summit Co. (Townes 1945)

Pennsylvania - Type specimen

South Dakota - (from P.L. Hudson?)

Texas - Brackenridge Exptl Station, Austin, Travis Co.; Galveston & San Antonio (Townes 1945); Broncho, Fredericksburg, Van Horn, Davis Mountains, Marathon, Lubbock, Petersburg, Bronte, Junction, Nacogdoches (all Hilburn 1979)

Mexico - Tlahualilo (Townes 1945)

Type locality – United States – one Say specimen from Pennsylvania.

Often in sewage oxidation ponds, windmill tanks, etc.

Morphological description by Sublette and Sublette (1974). Note that pupa has distinctive rugose stripes on abdominal tergites. Morrow, Bath and Anderson (1968) described the egg mass as arcuate, with more than 900 eggs, and 50% of egg masses with an enlarged capitulum. Cytology described by Martin and Wülker (1974). The work of Hilburn (1979, 1980) suggests the Texas and New Mexico populations are a distinct species from those in other parts of North America. This is supported by the *COI* results in the BOLD database, which are split into two subgroups. Little morphological data on this possibility is available, since Sublette & Sublette (1974) do not identify the source of illustrated material and only a few larvae are available for study. These latter suggest there may be differences in some characters, e.g. antennal characters. Obviously more material from other regions are needed to determine whether the two groups are really distinct species or simply extremes of geographical clines.

Species o. *C. cucini* Webb

In BOLD Bin: [BOLD:ACQ0844](#)

Adult: Based on Webb 1969.

Webb notes that the adult is closest to *C. staegeri*

Male:

Color mostly brown, thoracic vittae and postnotum blackish brown, abdomen dark brown with apical quarter of segments I-VIII pale yellow.

Head: AR 3.7; frontal tubercles long (60 µm); relative lengths palpal segments 2-4: 6 : 20 : 19 : 21. Clypeus 1.3 times antennal pedicel diameter.

Thoracic setae – Acrostichals absent; dorsolaterals extending the length of the vittae; 7-9 postalar (prealar?); scutellar with numerous setae arranged in 5 transverse rows.

Wing length 4.1-5.2 mm; squama fringed.

Legs dark, tarsal beard short; proportions:

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	Ta5/Ti
PI	32	31	42	24	17	13	6	1.35	1.03	0.19
PII	36	33	23	14	10	7	5	0.89	1.09	
PIII	42	42	31	19	14	9	5	0.73	1.00	

Setae of tergite IX not specified; anal point broad with rounded end; SVo as *C. staegeri* – i.e. closest to E(i) type of Strenzke (1959); IVo broad, extending beyond anal point; gonostylus narrowing over distal third.

Female:

Coloration largely as male, only with just the posterior margin of each tergite yellow.

Head: Frontal tubercles large (60 µm); clypeal width twice the antennal pedicel diameter; palp proportions (segs. 2-5): 6 : 21 : 23 : 33.

Wing length 5.4-6.3 mm.

Leg proportions:

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	Ta4/Ti
PI	34	32	42	22	16	11	6	1.31	1.06	0.34
PII	38	34	22	13	9	6	4	0.64	1.12	

PIII	44	43	31	19	13	8	5	0.72	1.02	
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Pupa: Length 10.2-11.8 mm. Cephalic tubercles slightly longer than wide, len. about 50 μm , apical setae as long as tubercle. Posterolateral spur of segment VIII with about 4 (2-7) spines. Anal fin with over 50 taeniae.

Fourth instar larva a large (length 18.0-19.4 mm) salinarius or halophilus-type, i.e. posterior VT sometimes present. Gula darkened posteriorly, FC pale or slightly darkened with small dark stripe in posterior part and a lobed dark spot in anterior part.



(Picture courtesy of M.G. Butler)

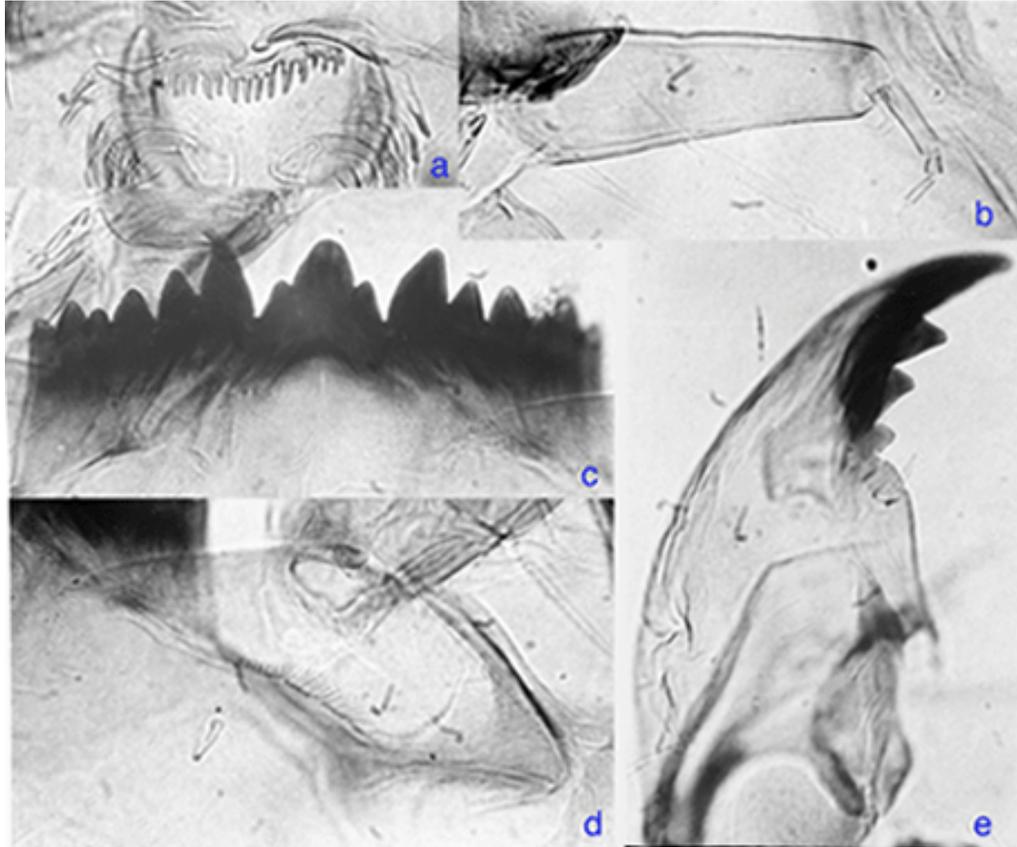
In this larva there is some development of the posterior VT.

Mentum (Fig. c, below) with relatively shallow curve, teeth pointed; center tooth moderately broad, c2 teeth moderately separated (type III); first laterals slope away from center; fourth laterals definitely reduced (type III).

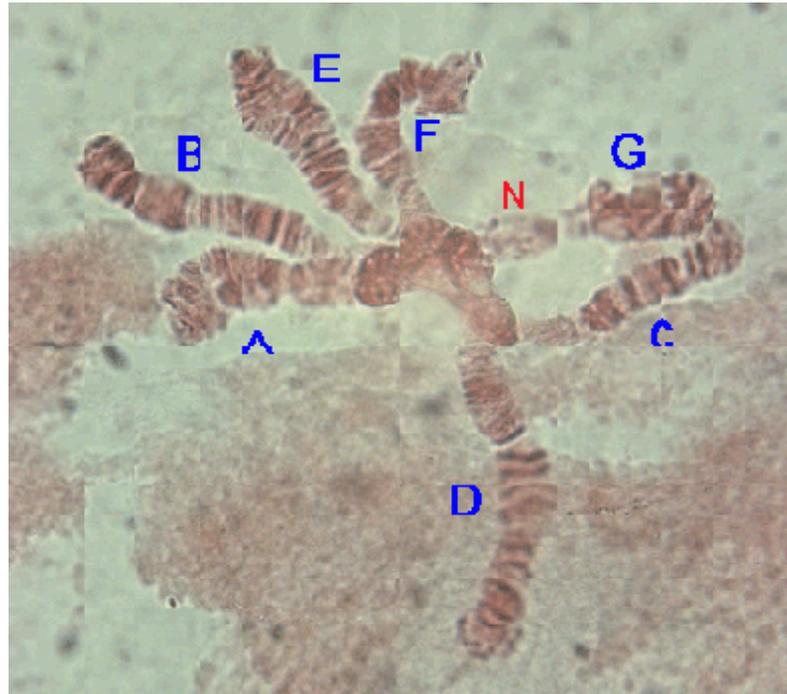
VM (Fig. d, below) about 3.7 times longer than deep. PE with 12-19 pointed irregular teeth (Fig. a, below) (type B or pointed C).

Antennal segment 1 relatively long: 3.20 (2.67-4.10) times longer than wide, RO about 0.36 up from base; AR about 2.0-2.35; A2/A1 about 0.23-0.24; ratio of segments (μm) 143 : 34 : 7 : 14 : 8 (Fig. b, below).

Mandible with third inner tooth pale, but separated to varying degrees (type II-III A-B) (Fig. e, below)



- Cytology:** 4 polytene chromosomes with the thummi arm combination AB, CD, EF, G. Centromeres very heterochromatic, forming a chromocenter with all chromosomes attached. Arm G with nucleolus, bounded by dark bands, near centromere, then a constriction followed by two BRs which may be more obvious in Californian populations. No nucleolus in long chromosomes, but a BR may be developed distal of middle of arm B, particularly in some Californian specimens. No inversion polymorphism has been observed.
- cuc A1: 1 - 2c, 10 - 12, 3 - 2d, 9 - 4, 13 - 19 i.e. as *holomelas*, *tardus*, etc.
- cuc B1: Commonly a BR towards distal part of arm. Differs from majB1 by a long central inversion.
- cuc C1: 1 - 6b, 15c-e, 8 - 11c, 15b - 11d, 6gh, 17a - 16, 7d-a, 6f-c, 17b - 22 i.e. as *islandicus*, sp. 3b.
- cuc D1: 1 - 3, 11 - 18d, 7 - 4, 10 - 8, 18e - 24 i.e. as *longistylus*, *tardus*, *pilicornis*, etc.
- cuc E1: 1 - 3e, 5 - 10b, 4 - 3f, 10 - 13 i.e. as *cingulatus*, *tardus* and sp. 3b.
- cuc F1: 1 - 10, 17 - 11, 18 - 23 i.e. as *tenuistylus*, *magnus* & *tardus*.
- cuc G1: Virtually terminal nucleolus and two central BRs.



Note the well developed chromocenter

- Found:** **British Columbia** - Osoyoos (Townes 1945, as *C. atritibia*)
Ontario - Clearwater Lake (Proulx *et al.* 2013): Clarke Lake, Algonquin Provincial Park; Kearney Lake, Algonquin Provincial Park; Costello Lake (45.56°N, 78.32°W), Algonquin Provincial Park (**Type locality**); Lake Nipissing(?)
Quebec - Lake Bousquet, Lake Opasatica, Lake St. Joseph, Lake Vaudray (Proulx *et al.* 2013).
California - Lake Davis, Plumas Co.; Castle Lake, Siskayou Co.
Indiana - Crooked Lake,
Minnesota - Long Lake
New York - Kanisko Reservoir, Westchester County (Townes 1945, as *C. atritibia*)

Thick mud in depth 5 m or more in lakes.

Morphology described by Webb (1969), who notes that the adult is most closely related to *C. staegeri*, but also needs to be compared with *C. atritibia*. Can be differentiated from *C. staegeri* most easily by the chromosome number (4 polytenes cf. three) and also in the larvae by the larval type (salinarius or halophilus c.f. plumosus-type in *C. staegeri*; in the adult by the larger size (7-7.6 mm cf. 3.86-6.3 mm); and the smaller pale apical band of the abdominal segments; in the pupa by the shagreen patterns and the generally smaller number of spines on the spur. Karyotype figured by Martin (1979) and described by Wülker & Butler (1983). This may be *Chironomus* species B of Hilsenhoff and Narf (1968).

Species p. *C. plumosus* (Linn.)

Doubtful synonym: *C. vancouveri* Michailova and Fischer 1986a (Butler *et al.* 1999) (but see Species 5m)

It might also be noted that Spies (2011) re-examined the available types and found them to be a species of the former subgenus *Camptochironomus*.

In BOLD Bin: [BOLD:ADM7020](#)
as is *Chironomus entis*.

Adult essentially similar to *C. entis*. Shobanov claims differences exist in Palearctic specimens, but these have not been confirmed in the Nearctic.

Townes (1945) description probably includes *C. entis*, but is likely correct in gross details, given the two species are so similar. No description of the adults or pupae of the Nearctic specimens appears to have been published subsequent to the identification of *C. entis*, so the data for Palearctic specimens from Shobanov (2005) will be used.

Male:

Wing length abt 5.9 mm (Townes (1945); Body length generally smaller than *C. entis*, but ranges overlap; AR 5.12 (4.79-5.48).

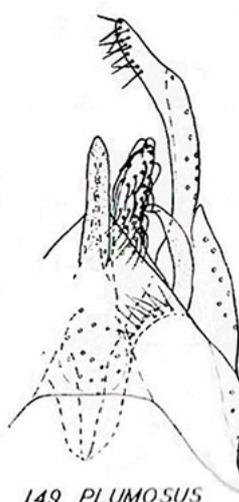
Clypeal setae 33-49. Palp segs (3-5) μm : 289 : 299 : 426.

Thoracic setae: Dorsolateral 51.2 (41-65); Scutellar 57.9 (47-69).

Selected leg measures (mm) and ratios:

	Fe	Ti	Ta1	LR	F/T	Ta4/Ti
Fore	1.73-2.02	1.83-2.07	2.12-2.61	1.16-1.26	0.91-0.94	0.4-0.46
Mid	1.83-2.29	1.93-2.32	1.10-1.29	0.56	0.95-0.99	
Hind	2.29-2.71	2.34-2.76	1.56-1.85	0.67	0.98	

About 13-14 setae on TIX, mostly in individual clear spots; SVo possibly closest to E(i); gonostylus narrows gently over posterior third to half. A comparison with Shobanov's figures suggests that the illustration of the hypopygium in Townes (1945) (below) is that of *C. plumosus*.



Female:

There seems to exist only the Townes (1945) statement: "Similar to male except for the usual sexual differences"

Pupa:

Fourth instar larva are relatively variable in different areas, possibly due to different ecological conditions. Large (13.7-29.9 mm: fem. 27.2-29.9; male 20.3-25.4) semireductus- to plumosus-type; anterior VT often with a flexure in basal half (Butler, unpubl.), and often longer than posterior pair (ant. 0.4-2.07 mm; post. 0.4-1.29 mm), but in New Mexico specimens the VT are longer and the posterior pair are nearly equal or may be longer. PLT variable, from 90-550 μm in length. Anal tubules quite long (759-911 μm) and about 2.2-3.0 times longer than wide (ventral pair often narrower than dorsal pair).

Gular region dark to very dark, covering most of the region, but often with a slightly scalloped anterior margin (up and around the outer edges of the mentum), FC pale.



(Picture courtesy of M.G. Butler)

In this larva the ventral tubules are relatively long, showing the inflection of the anterior pair and tendency for posterior pair to coil.

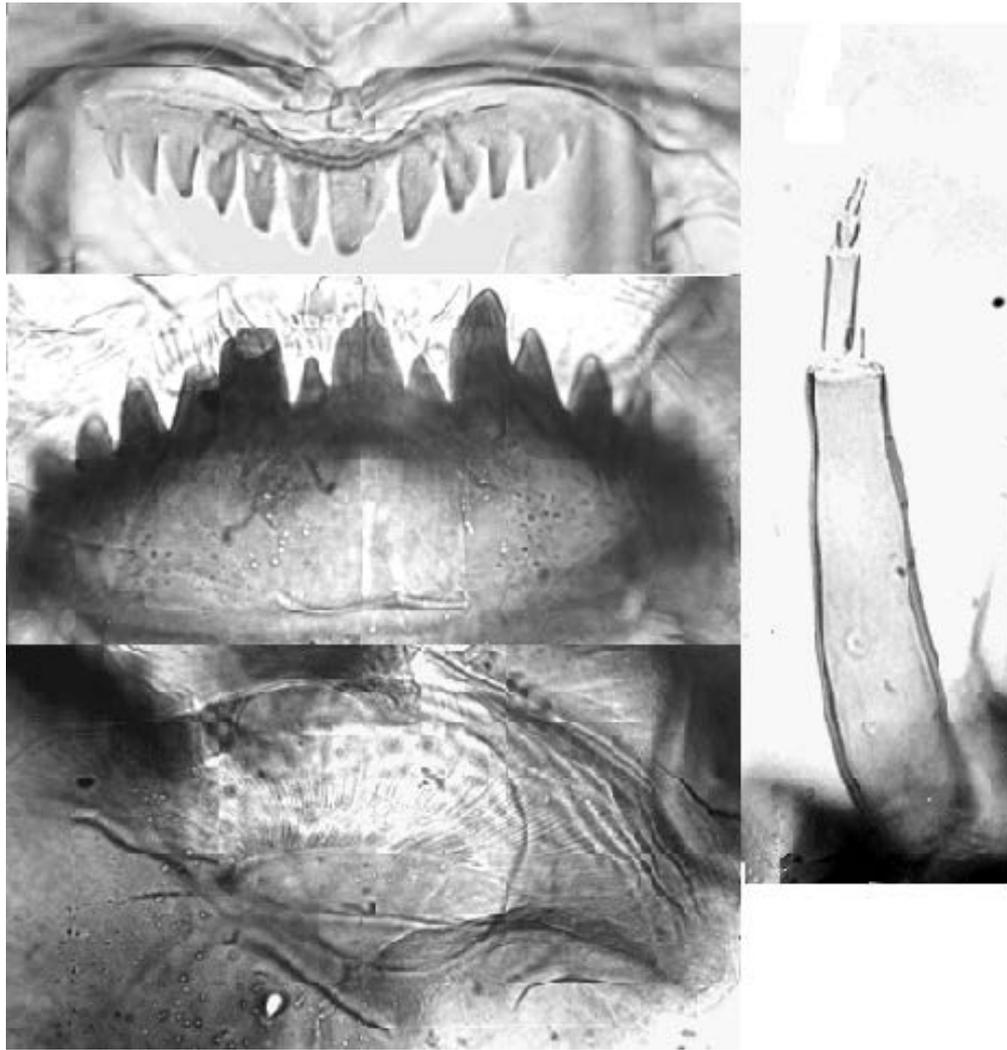
Mentum with pointed teeth and fourth laterals hardly reduced (Type I); c1 tooth relatively narrow, c2 teeth well separated (Type III, or IIA if worn).

VM with a slightly jagged edge, particularly near the center, due to the presence of protruding outer hooks (Shobanov (1989b) notes that these hooks have the shape of an isosceles triangle), striae reaching to margin, VMR difficult to measure because of the striae in the anterior region, 0.23-0.37; separated by about 1/3 of mentum width. PE with about 12-20 broad, normally sharp, teeth (type B).

Antenna with relatively long narrow basal segment, about 3.7 (3.1-4.2) times as long as wide (lower figures, e.g. 2.62, may be obtained where the mandibles have not been dissected off, probably due to increased squashing of the antennae), RO near middle of the segment (0.32-0.54); AR 2.08-3.47; relative lengths of segments (μm) 167 : 38 : 11 : 15 : 9, but segment 3 may be only as long as segment 5.

Distance between the antennal bases about the same as that between the S4 setae, but can vary in either direction. S4 setae about 238-278 μm apart, about 0.73-0.84 of FC width.

Mandible with third inner tooth well developed and darkened (type IIIC), with about 28-34 furrows near base and 11-14 taeniae in the PMA.



Cytology: 4 relatively short polytene chromosomes with the thummi arm combination AB, CD, EF, G. Banding pattern often unclear.

Arm G usually unpaired, with a large virtually terminal nucleolus - often with a constriction just before the nucleolus; at least one BR near the other end. No nucleoli in other chromosomes but a BR often developed in arm B, mostly near the 4 characteristic bands near the centromere, but sometimes towards the end of the arm due to polymorphism. Arm A generally with sequence n'pluA9, but often with h'pluA2, possibly latitude or depth dependent. Polymorphism in arms A, B, D, and E including pericentric inversion E4/F4.

- h'pluA2: 1 - 2c, 10 - 12a, 13ba, 4a-c, 2g-d, 9 - 4d, 2h - 3, 12c-b, 13c - 14f, 15a - 14g, 15b - 19
n'pluA9: 1 - 2a, 17 - 13c, 12bc, 3 - 2h, 4d - 9, 2d-g, 4c-a, 13ab, 12a - 10, 2cb, 18 - 19
n'pluA10: 1a-e, 3e-a, 2k-h, 4d-9, 2d-g, 4c-a, 13ab, 12a-10a, 2c-a, 1k-f, 3f-i, 12cb. 13c-14f, 15a-14g, 15b-19
n'pluA11: 1-2a, 17-15b, 14g-15a, 14f-13c, 12bc, 3-2h, 4d-9, 2d-g, 4cb, 19d-18, 2bc, 10-12a, 13ba, 4a, 19ef from n'pluA9
h'pluB1: 1 - 4c, 20c - 23a, 20b - 19, 15 - 17, 6d - 4d, 6e - 8b, 19a - 18, 8c-13, u, 23b - 28
BR proximal, near the 4 characteristic bands; puff in group 7 not developed.
h'pluB2: approx. 1 - 4c, 20c - 23a, 20ba, 13 - 8c, 18 - 19a, 8b - 6e, 4d - 6, 17 - 15, 19a-i, 23b - 28
BR distal due to large inversion of B1 (heterozygous only in Nearctic)
n'pluB4: BR proximal, inversion of region 5-10 (heterozygous only)
n'pluB5: BR about middle of arm due to complex inversion (heterozygous only)

h'pluC2: 1-2c, 6c-7, 16-17a, 6hg, 11d-12, 4-6b, 11c-8, 15-13, 3-2d, 17b-22
 h'pluD2: 1-3, 10b-e, 4-7, 18a-d, 8-10a, 13a-11, 13b-17, 18e-24
 n'pluD6: 1-3, 10b-e, 4-7, 18g-e, 17-13b, 11-13a, 10a-8, 18d-a, 19-24
 n'pluD7: 1-3, 10b-e, 4-7, 15d-13b, 11-13a, 10a-8, 18d-a, 15e-17, 18e-24
 n'pluD8: 1-3, 10b-e, 4-7, 18ab, 11-13a, 10a-8, 18dc, 13b-17, 18e-24
 n'pluD9: 1-3, 10b-e, 4-7, 18ab, 9-8, 18dc, 10a, 13a-11, 13b-17, 18e-24
 n'pluD10: 1a-d, 2f-1e, 2gh, 3a-g, 10b-e, 4-7, 18a-d, 8a-10a, 13a-11a, 13b-17, 18e-24
 n'pluD11: 1-3, 10b-e, 4ab, 18ba, 7-4c, 18cd, 8-10a, 13a-11, 13b-17, 18e-24
 h'pluE1: 1-3a, 4c-10b, 3e-b, 4b-3f, 10c-13
 h'pluE2: 1-3e, 10b-3f, 10c-13
 n'pluE3: 1-3e, 10b-5c, 4e-5b, 4d-3f, 10c-13
 n'pluE4: 1-3c, 4c-10b, 3ed, 4b-3f, 10c-13 [F20d-23] (Kiknadze *et al.* 2016)
 h'pluF1: 1a-d, 6-1e, 7-10b, 18ed, 17-11, 18a-c, 10dc, 19-23
 n'pluF4: 1a-d, 6-1e, 7-10b, 18ed, 17-11, 18a-c, 10dc, 19a-20c -/- arm E
 h'pluG1: as Palearctic specimens

Found: Numerous lakes in Canada and U.S.A.: **Alberta** - Amisk Lake (54.50°N, 112.65°W) (Kiknadze *et al.* 2016) and South Baptiste Lake (54.72°N, 113.57°W) both Athabasca Co. **British Columbia** - Near Opposite Crescent, Bechers Prairie, Cariboo and Chilcotin Parklands (about 52.13°N, 122.14°W) (Cannings). **Manitoba** - Delta Marsh Beach (50.20°N, 98.20°W), Portage la Prairie (Kiknadze *et al.* 2016); Lake Winnipeg (about 52.10°N, 97.25°W) (from figures of Sæther 2012) **Ontario** - Arboretum (45.38°N, 75.70°W), Ottawa; Bay of Quinte, Belleville (44.15°N, 77.25°W) (O. Johannsen); Millhaven Bay (44.20°N, 76.75°W) (P. Rueffel); White Lake, 3 Mile Bay (D.R. Oliver); Kelly Lake (46.45°N, 81.07°W), Sudbury (Proulx *et al.* 2013). **Quebec** - Lake Saint Augustin (46.75°N, 71.40°W), Quebec City; Lake D'Alembert (48.38°N, 79.03°W), Lake Duprat (48.33°N, 79.12°W), Lake Fortune (48.18°N, 79.32°W), Lake Kinojévis (48.13°N, 78.90°W), Lake Marlon (48.27°N, 79.07°W), Lake Osisko (48.27°N, 79.00°W), Lake Pelletier (48.22°N, 79.05°W), and Lake Rouyn (48.17°N, 78.95°W), all Rouyn-Noranda (Proulx *et al.* 2013). **Saskatchewan** - Lake Waskesiu (53.92°N, 106.08°W), Prince Albert National Park. **Alabama** - Farm pond, Auburn (32.58°N, 85.48°W), Lee Co. **California** - Clear Lake; Lake Merced (37.72°N, 122.495°W), San Francisco. **Colorado** - Crawford Lake (38.40°N, 107.35°W), Delta Co.; Kettering Reservoir (39.57°N, 105.02°W) (1641m), Broomfield Co. and Littleton Littleton Co. (39.629°N, 105.01°W) (1631 m), Jefferson Co. (Kiknadze *et al.* 2016); Miramonte Lake (37.58°N, 108.20°W), San Miguel Co.; Vega Reservoir (39.13°N, 107.47°W), Mesa Co. **Georgia** - Lagos Pond (33.97°N, 83.33°W), Athens, Clarke Co.. **Indiana** - Crooked Lake (41.68°N, 85.05°W), Angola, Stueben Co.; Crooked Lake (41.44°N, 85.80°W), and Sylvan Lake (41.50°N, 85.35°W), both Noble Co.; Manitou Lake (41.06°N, 86.19°W), Fulton Co.; Shafer Lake (40.83°N, 86.80°W), White Co. **Kentucky** - Lake, Campbell Co. **Massachusetts** - East Longmeadow Pond (42.07°N, 72.51°W) (Kiknadze *et al.* 2016). **Michigan** - Saginaw Bay (43.45°N, 83.67°W), Lake Huron, Bay Co. **Minnesota** - Anderson Lake (47.29°N, 95.25°W) (Kiknadze *et al.* 2016); Lake Itasca (47.23°N, 95.21°W), Clearwater Co. (R. Hellenthal); Lake Christina (46.08°N, 95.75°W), Douglas Co.; Spearhead Lake (47.37°N, 94.96°W), Hubbard Co. (Kiknadze *et al.* 2016). **New Mexico** - Eagle Nest Lake (36.55°N, 105.25°W), Colfax Co.; Upper Abbot Lake (36.25°N, 104.33°W), and Lower Abbot Lake (36.25°N, 104.33°W), both Harding Co.

North Dakota - Blacktail Dam (48.26°N, 103.44°W), Williams Co.; Brewers Lake (47.15°N, 97.46°W), Cass Co; Dead Colt Creek Dam (36.26°N, 97.41°W), and McVile Dam (47.77°N, 98.18°W), both Ransom Co. (Kiknadze *et al.* 2016); Fordville Dam (48.18°N, 97.77°W), and Larimore Dam (47.93°N, 97.60°W), both Grand Forks Co. (Kiknadze *et al.* 2016); Fullers Lake (47.19°N, 97.46°W), and South Golden Lake (47.31°N, 97.50°W), both Steele Co. (Kiknadze *et al.* 2016); Red Willow Lake (47.88°N, 98.40°W), Griggs Co.; Silver Lake (46.02°N; 97.57°W), Sargent Co.; Warsing Dam (47.83°N, 99.12°W), Eddy Co.; White Earth Dam (48.45°N, 102.74°W), Mountrail Co.; Williams Lake (47.06°N, 99.40°W), Kidder Co. and Wilson Dam (47.06°N, 99.40°W), Dickey Co. (Kiknadze *et al.* 2016);

Ohio - (Bolton 2012)

Oklahoma - University of Oklahoma Biological Station (33.89°N, 96.83°W), Willis, Marshall Co.

South Dakota - Lake Kampeska (44.93°W, 97.21°W), Codington Co.; Burke Lake (43.11°N, 90.17°W), Gregory Co. (Kiknadze *et al.*).

Wisconsin - Allequaush Lake (46.04°N, 89.62°W), Vilas Co. (Kiknadze *et al.* 2016); East Horsehead Lake (45.70°N, 89.62°W), Onieda Co. (W.L.Hilsenhoff); Grand Portage Lake (46.10°N, 90.80°W), Iron Co. (W.L.Hilsenhoff); Green Lake (43.72°N, 89.00°W), and Little Green Lake (43.44°N, 80.59°W), both Green Lake Co.; Lake Kengonsa (42.977°N, 89.205°W), Mendota Lake (43.08°N, 89.39°W), Lake Wingra (43.05°N, 89.42°W), and Murphy's Creek (43.05°N, 89.42°W), Madison, all Dane Co.; Lake Koshkonong (42.83°N, 89.00°W), Rock Co., Lake Onalaska (43.87°N, 91.31°W), La Crosse Co. (J. Kawatski); Pepin Lake (44.50°N, 92.30°W), Pepin Co.; Pine Lake (45.68°N, 89.40°W), Oneida Co.; Pleasant Lake (42.79°N, 88.55°W), Walworth Co. (W.L.Hilsenhoff); Yellow Lake (45.55°N, 92.24°W), Burnett Co. (J.E. Sublette).

Many localities from Butler *et al.* (1998b).

Lakes up to considerable depths (up to 23 m).

One North American population has been described as *C. vancouveri* by Michailova and Fischer (1986), but most have considered it a synonym of *C. plumosus* (Butler *et al.* 1998b, Kiknadze *et al.* 2016). Other workers (e.g. Hilsenhoff and Narf 1968) have suggested the existence of more than one species on ecological grounds. The broad range of some measurements, along with the tendency for extreme specimens for one measurement to be near one or other extreme for other measurements, but not related to north/south distribution, would also be consistent with presence of two forms.

Cytological studies indicate the presence of *C. entis* (see Species 3o), separated in part by differences in polymorphism and location of BRs. The two species are often found in the same lake. The form with 2 generations per year in general has better quality chromosomes. The cytology of North American *C. plumosus* has been described by Butler *et al.* (1999, 2000) and arm A revised by Golygina and Kiknadze (2008).

Kiknadze *et al.* (1991) describe the outer hooks on the anterior margin of the VM as being shorter and blunter than those of *C. entis* in Palearctic populations, but does not seem to apply in North America - besides being very difficult to see. Although the VT are generally longer than those of *C. entis*, and where the two species occurred together at Lake Itasca, MN, they could be accurately separated on this character, there is considerable overlap and it can only be reliably used if over 1 mm in length. Shobanov (1989b) notes that the basal antennal segment of *C. plumosus* (abt 167 µm) is shorter than that of *C. entis* (abt 210 µm).

Molecular: *C. plumosus* and *C. entis* cannot be separated on the basis of the DNA “barcode” sequence of *COI*, but can be separated by the sequence of the globin gene *gb2β* (Guryev and Blinov 2002).

Species q. *C. anthracinus* Zetterstedt

In BOLD Bin: [BOLD:ACB1083](https://www.boldsystems.org/#ACB1083)

Adult:

Male (based on Townes (1945):

Wing length 5.6 mm, AR 6.0, anterior LR 1.15, body stout.

Blackish with brown body hairs; legs blackish brown with long sparse tarsal beard.

Frontal tubercles of medium size, clypeus very large.

Mesoscutum with a weak median tubercle.



Male hypopygium of *Chironomus anthracinus* (from Townes 1945)

The anal point and appendages unusually short and broad. SVo does not exactly fit any of Strenzke's types, although it is essentially an E-type.

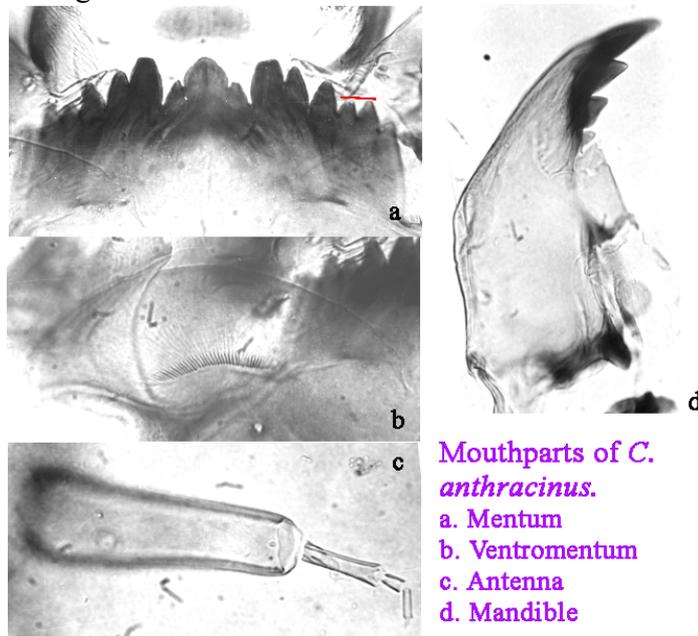
Female:

Similar to the male except for the usual sexual differences.

Fourth instar larva a medium to large thummi-type larva (12.4-20.2 mm) with anterior pair of VT normally longer (Ant. 1.08-1.9 mm; Post. 0.73-2.44 mm). Ventral head length about 410 μ m (female), 385 μ m (male). Gular region dark over at least the posterior two thirds and commonly right up to the base of the mentum, higher at outer edges and narrowing anteriorly; FC pale but with slightly dark lines along the edges.



.Mentum (a, below) with a broad c1 tooth, c2 teeth sometimes clearly on shoulders of c1, but in other specimens may be almost distinct teeth (type IB- IIA). Fourth lateral teeth reduced to height of 5th laterals (type II). VM (b, below) with about 38-42 striae reaching 2/3 of way to anterior margin, and reaching closer towards the lateral edge. Mentum width about 250 micron (female), 235 micron (male); ventromental plates separated by about 40% of mentum width, with about 37-45 striae. ASA greater than distance between the S4 setae. PE with about 12-17 mostly fairly broad sharp teeth, but a few may be reduced. Antenna (c, below) with relatively long basal segment, about 3.6-4.1 times as long as broad; Ring organ about one third to a half up from the base; AR about 1.8-2.2; antennal segments about 195 : 43 : 11 : 15 : 8 micron. Mandible (d, below) of type II-IIIB; about 16-20 grooves on outer surface near base.



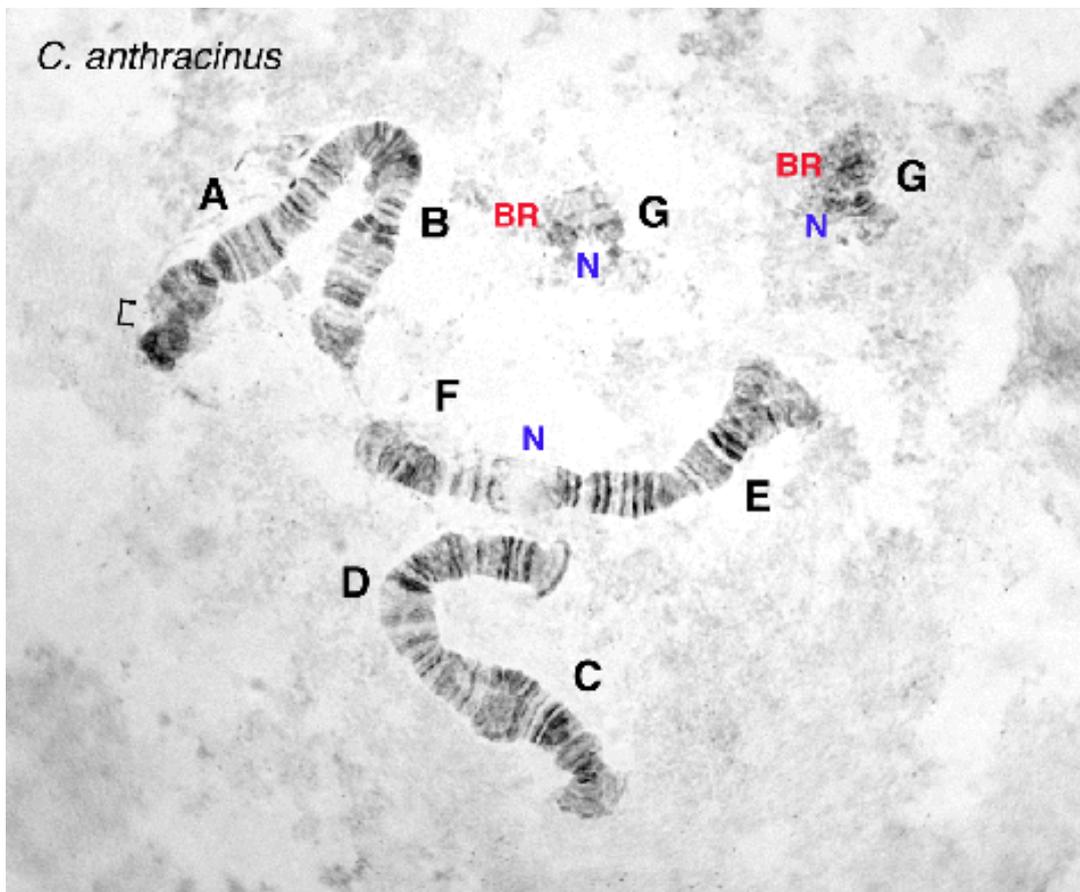
Mouthparts of *C. anthracinus*.
a. Mentum
b. Ventromentum
c. Antenna
d. Mandible

Two specimens from Friebauer Lake, Wisconsin differ in three respects - they possess PLT about 360 µm in length, the posterior VT are longer, and the FC is darkened. The significance of these differences is uncertain.

Cytology: 4 polytene relatively short chromosomes with the thummi arm combination AB, CD, EF, G.

Arm G unpaired and cloudlike with only one or two clear bands and a nucleolus. Arm F with a median nucleolus in group 9. Polymorphism in arms A and D. See also *C. rempelii* (sp. 2m), which may be a synonym. Some larvae have arm F with one or two heterochromatic knobs (F1k and F1kk), but whether such knobs are sex linked as in *C. rempelii* has not been determined, and hence there is uncertainty as to the synonymy.

- h'ant A1: 1-2c, 10-12a, 13ba, 4a-c, 2g-d, 9-4d, 2h-3, 12cb, 13c-19 i.e. as *plumosus* A2
 h'ant A2: 1-2c, 10-12a, 13ba, 3f-2h, 4d-9e, 2d-g, 4c-a, 3g-i, 12cb, 13c-19
 n'ant A3: 1 - 2c, 9a-e, 2d-g, 4c-a, 13ab, 12a - 10, 8a - 4d, 2h - 3i, 13c - 19 (heterozygote only)
 h'ant B1: not mapped
 h'ant C1: 1 - 6b, 11c - 8, 15 - 11d, 6gh, 17a - 16, 7d - 6c, 17b - 22
 h'ant D1: 1-3g, 14g-16, 8c-7g, 5d-7f, 18d-17, 8d-10a, 13a-11, 14f-13b, 10b-e, 4-5c, 18e-24
 h'ant D3: 1-3g, 14g-16, 8c-7g, 18a-d, 7f-5d, 17f-a, 8d-10a, 13a-11, 14f-13b, 10b-e, 4-5c, 18e-24
 h'ant E1: 1 - 3e, 5a - 10b, 4 - 3f, 10c - 13 i.e. as *cingulatus*
 h'ant F1: 1 - 8e, 9c - 23
 n'ant F3: 1 - 8e, 9c-e, 14h - 10, 15 - 23



- Found:** Alberta - ♂ Lake Amisk (Kiknadze *et al.* (2005).
 Manitoba - ♂ Baptist Lake (Kiknadze *et al.* (2005)
 Manitoba - ♂ Lake Winnipeg (Sæther 2012).
 Ontario - Bat Lake, Algonquin Provincial Park.
 California - Riverside, Riverside Co.
 Indiana - Crooked Lake.
 New Hampshire - Mirror Lake, Grafton Co.

Wisconsin - Pine Lake, Oneida Co.

Found in lakes.

Karyotype given by Kiknadze, Wuelker, Istomina and Andreeva (2005). Some of the sequences given may relate only to *C. rempelii*.

Molecular data suggests that two species are included amongst North American material, one of which corresponds to the Palearctic species (Proulx *et al.* 2013) The status of the second type (Sp. NAI) is currently unclear. It may correspond to *C. rempelii*, but unfortunately no material from larvae with the likely *C. rempelii* sequences have been available for molecular analysis. Larger specimens, with posterior VT longer, may be *C. nr. anthracinus* (Species 3c).

Species r. *C. 'tigris'* Butler and Kiknadze

Now a nomen nudum as the name was published by Martin *et al.* (2008) and Kiknadze *et al.* (2016).

C. sp. Am1 - Kiknadze *et al.* 1993.

C. species r - Butler *et al.* 1995.

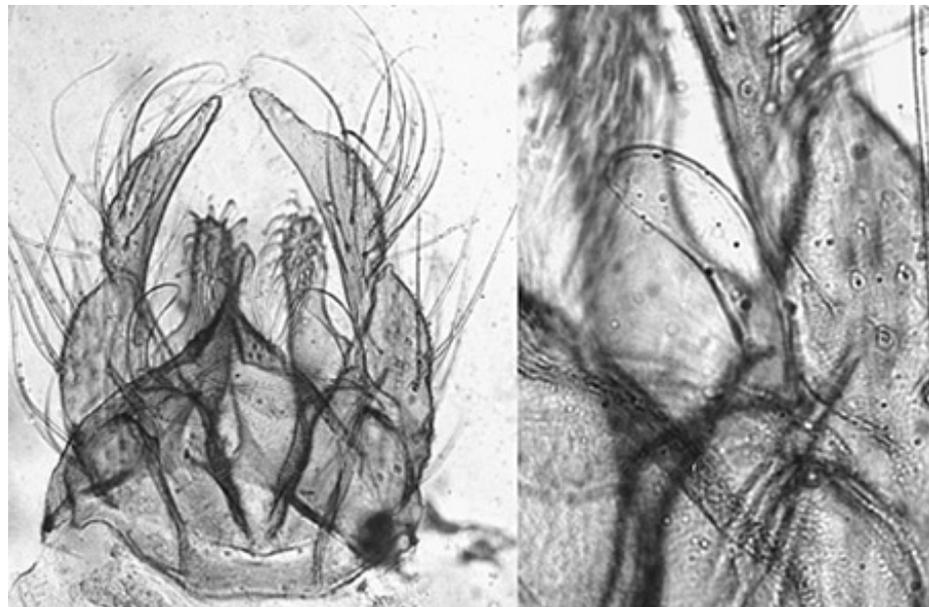
This species is a member of the staegeri group erected by Wülker *et al.* (1971).

In BOLD Bin No. [BOLD:AAP3004](#)

i.e. the same as *C. frommeri* and *C. staegeri*.

Adult:

Male: Derives its name from the yellowish base color and blackish stripes.



Male hypopygium (left) and superior volsella (right) of *C. 'tigris'*.

About 3 setae at center of 9th tergite, GS tapering over posterior third, and superior volsella closest to D(e)-type of Strenzke (1959).

Female: Wing length abt 5.57 mm, width abt 1.39-1.40 mm, VR abt 1.02-1.03, 3-4 SCf on brachiolum; abt 34 setae in the squamal fringe.

Antennal segments (µm): 218 ; 143 : 140 : 173 : 261. AR – 0.39; A5/A1 – 1.19.

Frontal tubercles moderately developed, about 2.2-2.3 times longer than wide (33-46 x 15-20 μm). Clypeal width about 2.5 times width of antennal base.

Palpal segments (μm) 100 : 66 : 264 : 282; 405.

Thoracic setae: Acrostichal – at least 11-19; Dorsolateral – 38-48; Prealar – 8-9; Supraalar – 1-2; Scutellars in 2 to 3 rows of 6-18 (5 & 13) and 11-18 setae.

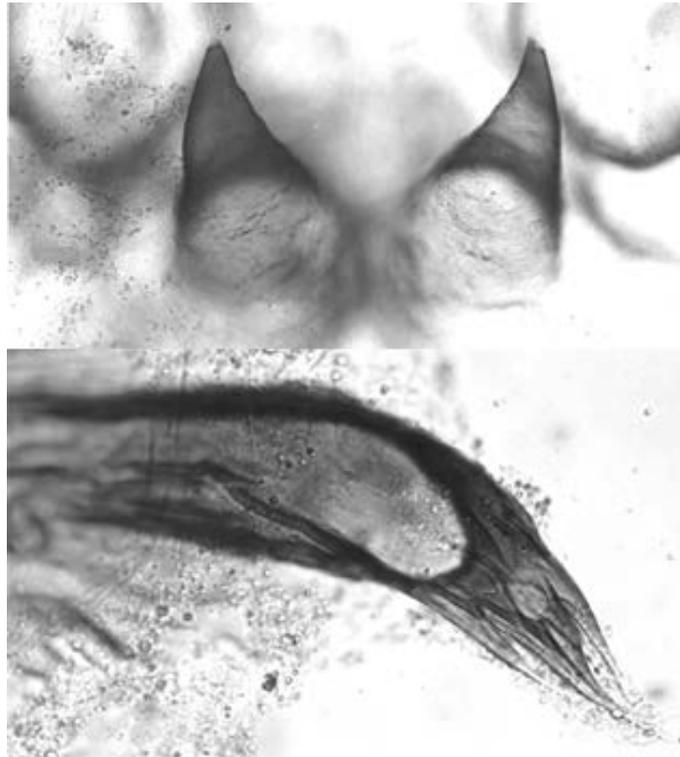
Leg proportions (μm):

	Fe	Ti	Ta1	Ta2	Ta3
PI	1880-1920	1760-1920	2760	1360	1020
PII	2000-2100	1980-2080	1180-1200	640-670	460-480
PIII	2280-2420	2440-2600	1720-1760	960	680
400	Ta4	Ta5	LR	F/T	Ta4/Ti
PI	880	400	1.56	1.00-1.07	0.50
PII	320	240	0.58-0.60	1.00-1.01	
PIII	400-420	260-280	0.68-0.70	0.93	



Setae on segment IX – abt 13-26; setae on segment X – abt 15-23.

Pupa: Caudolateral spur of segment VIII with about 5 or 6 spines.



Pupa of *C. 'tigris'*
Cephalic tubules (above), spur (below)

Fourth instar larva a large plumosus-type (length, female: 17.6-20.4 mm) with anterior VT longer (female: ant. 1.5-2.4 mm; post. 1.3 - 2.1 mm). PLT about 130-210 μm . Gular region completely dark, and FC usually darkened, and occasionally some darkening outside the FC.

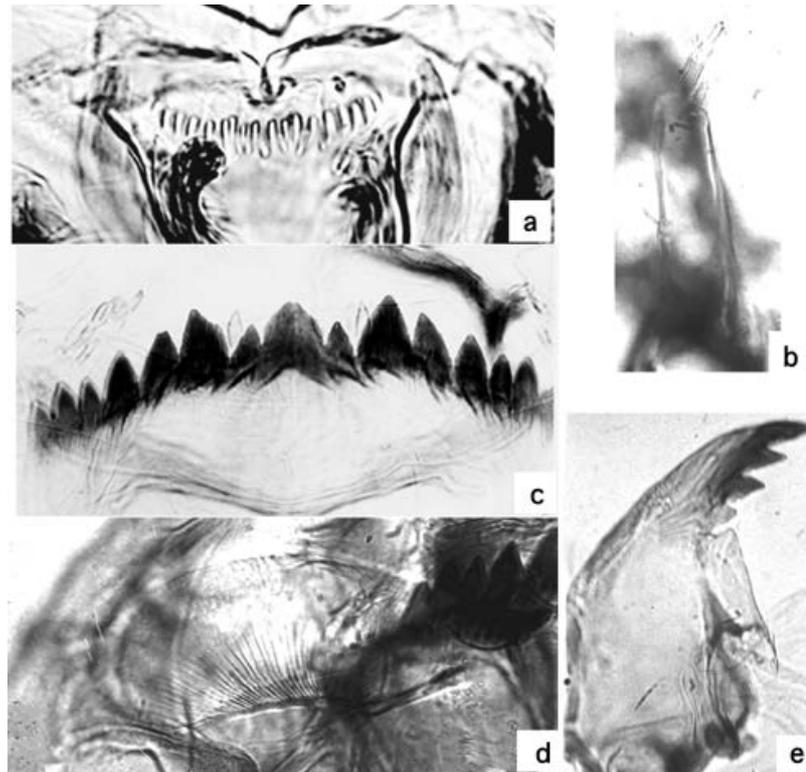
Mentum with a relatively shallow curve, teeth pointed, 4th laterals reduced often nearly to level of 5th laterals (type I-II); c1 tooth broad with short parallel sides, c2 teeth well developed (type IIA or III). PE with about 11-19 sharp pointed teeth.

VM (d, below) separated by about 0.3-0.36 of mentum width, with about 34 - 46 striae which extend essentially to outer margin; VMR abt 0.06–0.27 depending whether a faint outer ridge can be seen or whether only the edge where the striae end is visible; anterior margin relatively smooth. Premandible with teeth about equal in length, inner tooth at least 2.2-3.7 times wider than the outer tooth.

Antenna (b, below) with a polymorphic segment 1, sometime short and broad at the base, other times longer and almost cylindrical, hence the relative length to width of this segment (about 2.6–3.43 times as long as wide) and AR (about 1.93-2.46) are variable; RO abt 0.4-0.6 up from base; antennal segments (μm) 71-176 : 33 : 11: 16 : 7.

Distance between the antennal bases at least slightly greater than that between the S4 setae, which are about where the FC begins to widen.

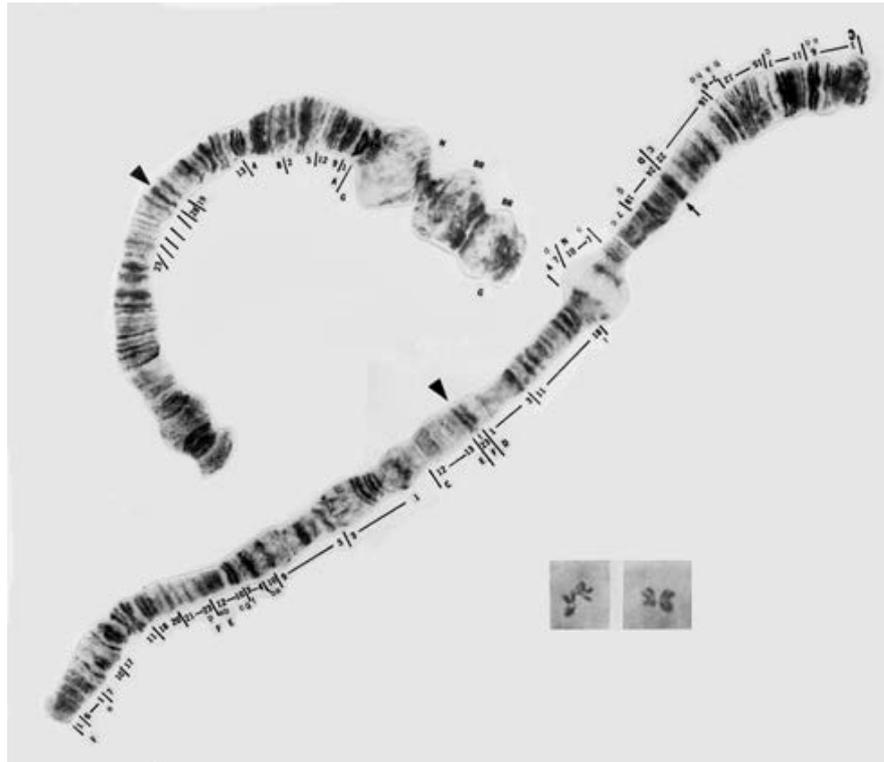
Mandible (e, below) with third inner tooth separated but still relatively pale (type II-III B), about 14-18 grooves on outer margin at the base, 10-13 taeniae in Pecten mandibularis.



Identification: The larva can be most easily separated from the other members of the staegeri group by the smooth anterior margin of the ventromentum and by the lower number of striae 34-46 *cf.* 60-80, and the shorter PLT. The FC is also generally darker. The relatively shallow curve and sharp teeth of the mentum will also help to distinguish it from many species.

Cytology: 2 polytene long chromosomes, banding pattern often unclear. Arm combination GAB, FEDC. Nucleoli in the region of arm G and arm D, i.e. one in each chromosome. BRs distal to nucleolus in arm G. Centromere of arm E, along with adjacent proximal bands, translocated to arm D, where it forms the centromere of chromosome FEDC. The centromere of the GAB chromosome is at the fusion of arms G and A (Kiknadze *et al.* (2016).

- 'tig'A1: (G) 1 - 2c, 10 - 12, 3 - 2d, 9-4, 13 - 19 (**B28**) as holA1 and staA1
'tig'B1: possibly 1 - 8a, 21 - 16?, 8b - 15, 22 - 25 - as longistylusB1 (Kiknadze)
'tig'C1: 1-6c, 11c - 8, 15 - 11d, 6gh, 17a -16, 7d-a, 6f-c, 17b - 22 (**D24g**) as abel and staC1
'tig'D1: (**E1a**) 18?, 19-17f, 23ba - 20, E13fg, 1 - 3, 11 - 17c, 8c - 10, 4 - 8b, 23c - 24
'tig'E1: (**D18**) 1 - 3e, 5 - 10b, 4 - 3f, 10c - 13e, (**F23f**) i.e. Transposition of 13fg to arm D
'tig'F1: 1a-f, 5c -1g, 5d - 10, 17 - 11, 18 - 23 (**E13e**) from pigF1
'tig'G1: similar to staG1, but attaches at nucleolar end (i.e. next to **A1a**) and with an extra BR. (Band numbers in bold indicate the bands to which the ends of an arm attaches if not a telomeric band)



(after Kiknadze *et al.* 1993)

Molecular data: There is mtCOI sequence in GenBank (KF278239-53), as well as specimens in BOLD, as *Chironomus* sp.

This molecular data suggests that *C. "tigris"* should be included in the staegeri-group, although it lacks the crenulated margin of the VM seen in the other members of the group.

Found: Ontario - Clarke Lake, Algonquin Provincial Park

Quebec - Lake St. Joseph

Minnesota - Lake Itasca, Clearwater Co., Spearhead Lake, Beltrami Co.; Turtle Lake, Becker Co. (46.78°N, 96.17°W)

Wisconsin - Friebauer Lake, Bayfield Co.

In thick mud at depths around 6 m in lakes.

Proulx *et al.* (2013) give some key features of the larval morphology, notes on the cytology and relationships of the mtCOI to that of other species. Cytology is also mentioned in Martin *et al.* (1974) and Martin (1979), described by Kiknadze *et al.* (1993) as *C. sp. Am1*, by Butler *et al.* (1995) as *C. sp. r*, and by Kiknadze *et al.* (2016) as *C. tigris* attributed to Butler & Kiknadze 2003 (which is only an abstract).

Species s. *C. staegeri* Lundbeck 1898

Synonym: *C. fasciventris* Malloch 1915

Note: Lindegaard (2015) notes that the larval type of *C. staegeri* from Greenland is different from that described here (see below). This raises the possibility that the current species is not *C. staegeri*, in which case it would become *C. fasciventris* Malloch 1915.

Lundbeck's original description provides little information that would enable identification of his species, other than that it is like *C. hyperboreus* but the beard of the foretarsus is not as long. Townes examined a male and a female of the type series and noted that both were very dark, and the superior volsella of the male was shorter than in North American specimens.

This species is a member of the *staegeri* group erected by Wülker *et al.* (1971).

In BOLD Bin No. [BOLD:AAP3004](#)
i.e. the same as *C. frommeri* and *C. "tigris"*

Adult redescribed by Townes (1945) and Sublette and Sublette (1971).



Male: Wing length 5.58 mm (3.86–6.30), width about 0.55 mm, VR about 0.87; AR 4.70 (3.64–5.83); LR 1.40 (1.30–1.54). Body moderately slender, fore tarsus with a short beard on its outer side, appressed and all in one plane. Ground color light pruinose brown with greenish tinge, with dark brown markings.

Head: frontal tubercles large 53 (30-75) μm long, clypeus rather large, 48 (26-74) clypeal setae. Palpal proportions (segs. 2-5) 4 ; 18 : 18 : 14 (*C. fasciventris* lectotype) Thoracic setae: acrostichals - not stated; dorsolaterals 31-48, in three rows anteriorly; prealar 5-12; scutellar 32-56 in a strewn pattern.

Wings: VR 1.01 (0.96–1.05); about 17 setae on squamal fringe.

Legs pale brown with apices of segments darker brown. BR 3.52 (2.5-4.7), mid LR 0.59 (0.55-0.70), hind LR 0.71 (0.67-0.76). 19 sensilla chaetica on pII and 13 sensilla chaetica on pIII

Abdominal tergites 1-6 with a submedian transverse dark band occupying 0.3 to 0.7 of the segment, tergite 7 and anal segment completely dark. About 9 setae in broken patches in center of tergite 9.

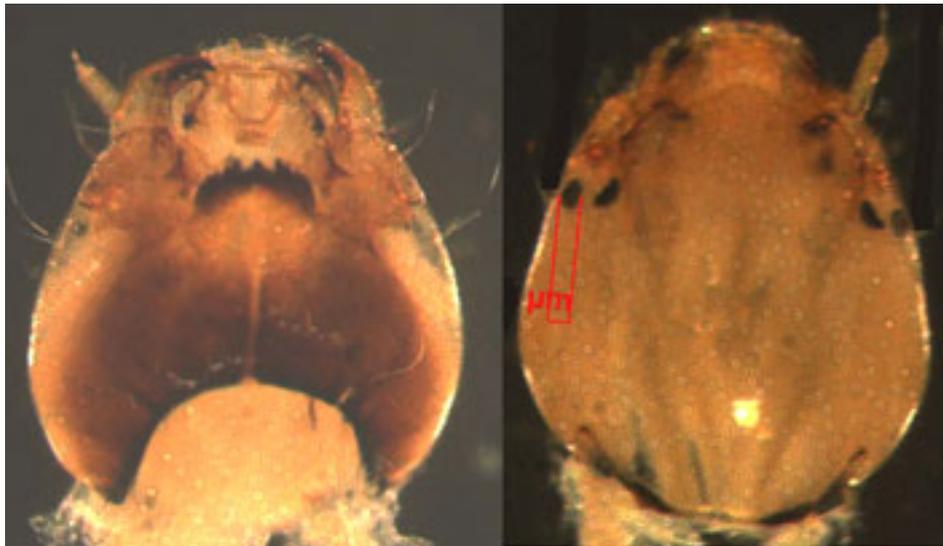
Hypopygium: SVo long and curved, ending bluntly, closest to E(i)-type of Strenzke (1959)

Female (measurements from lecto-allotype of *C. fasciventris*): Coloration generally as in male, but with posterior pollenose bands on abdominal segments. Wing length 4.88

mm. Antennal proportions 22 : 15 : 15 : 15 : 30. Frontal tubercles 82 μ m. Palpal proportions (segs. 2-5) 7 : 26 : 34 : 30 (somewhat shriveled). Mesoscutum with a slight tubercle. About 10 prealar setae. Leg ratios: ant 1.51, mid 0.52, hind 0.65.

Pupal exuviae: Cephalothorax blackish-brown, abdomen pale yellowish brown with darker markings. Frontal tubercles short and conical, subterminal seta about 70 μ m long. Length 9.13-13.0 mm (Female: about 9.5-13.0 mm, Male: about 9.3-13.0 mm). About 62-100 recurved spines at apex of tergite of segment II; caudolateral spur of segment VIII with 7-13 spines (female), 6 - 11 spines (male).

Fourth instar larva a large plumosus-type larva (fem. 13.5–25 mm; male 15.6-24.2 mm), anterior pair of VT usually shorter (Female: Ant. 3.12 mm (1.60-4.44), Post. 3.37 mm (1.60-4.52); Male: Ant. 2.51 mm (1.60-3.52), Post. 2.78 mm (1.48-3.68)). PLT about 0.23-0.55 μ m. Anal tubules relatively long (abt 810 μ m), at least 3x longer than wide, ventral pair may be shorter but narrower. VHL about 418 micron (375-425); width of head capsule greater than 0.85mm (Hilsenhoff & Narf 1968). Gular region dark to very dark on posterior 1/2-2/3 with center of margin slightly lower, FC pale or slightly darkened.



Gula and frontoclypeus of *C. staegeri* (photos courtesy I. Proulx)

Mentum (Fig. c, below) with sharp teeth, but which become rounded with wear; c1 tooth quite broad, c2 teeth well developed and very pointed (type III); fourth laterals slightly reduced (type I-II).

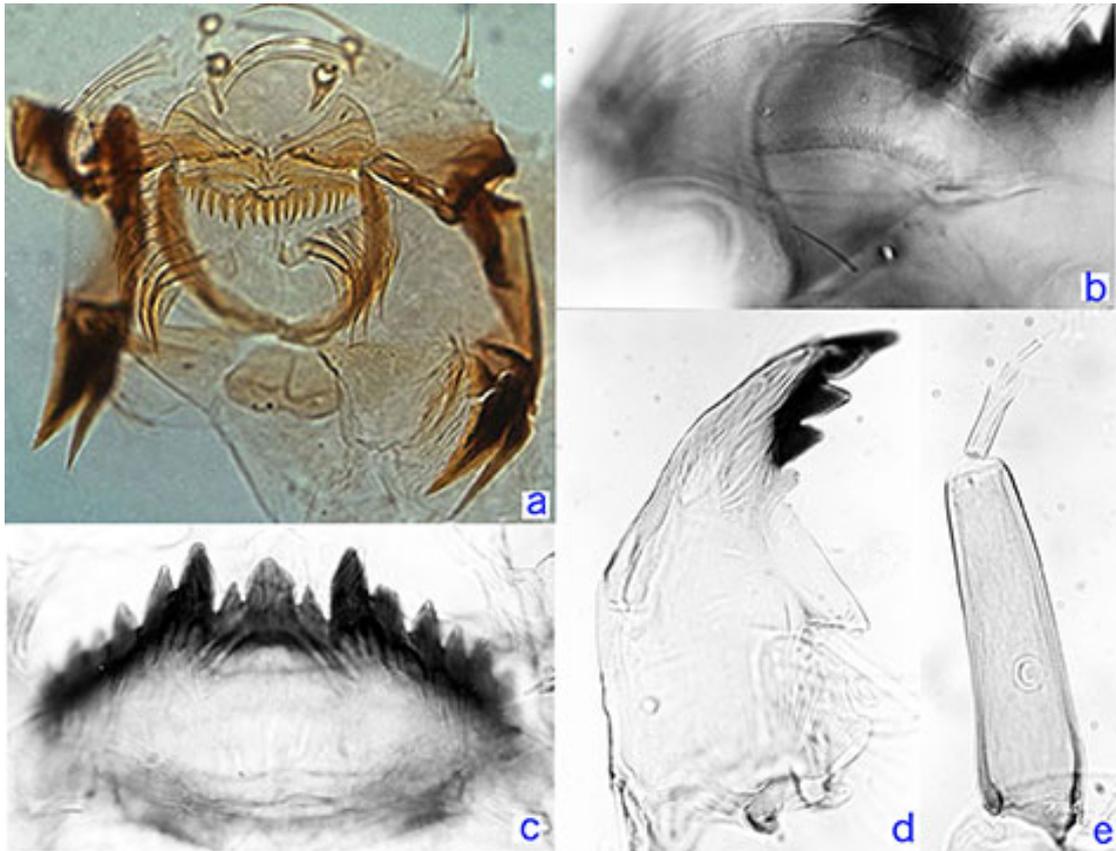
Central part of anterior margin of ventromental plates crenulate (Fig. b, below); VMR abt. 0.22-0.36, clearer than in *C. tigris*; about 88-99 striae which are clear to about 2/3 to margin, but extend almost to margin. PE (Fig. a, below) with 12-20 fine sharp teeth.

Premandible (Fig. a, below) with inner tooth 2.3 - 3.0 times the width of the outer, teeth about equal in length or outer slightly longer.

Antenna (Fig. e, below) with relatively long basal segment compared to total length of antenna, AR 2.1-2.4, and about 3.55 (3.5-3.75) times as long as wide; RO almost half way up from base of segment; ratio of segments (micron) 156 : 34 : 10 : 13 : 7.

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

Third inner tooth of mandible (Fig. d, below) lighter than other teeth (type IIIB), about 27-29 furrows near the base, about 13 taeniae in the PMA.

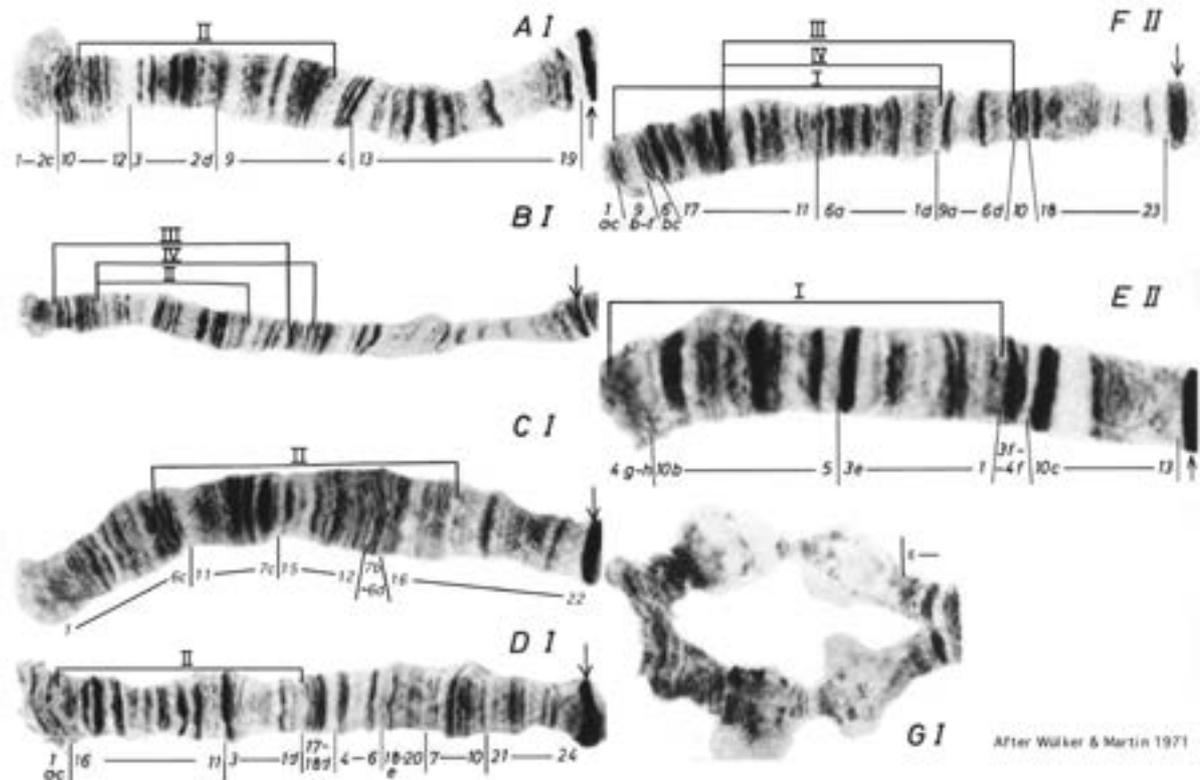
Mouthparts of *C. staegeri* (Photo 'a' courtesy of I. Proulx)

Identification: The larva of this species can be recognized by the combination of characters: large plumosus-type, dark gula but pale FC, greater than 80 striae on VM, which has a crenulated anterior margin. This does not separate it from *C. crassicaudatus* or *C. frommeri*.

Cytology: 3 polytene chromosomes with a modified thummi arm combination AB, CD, GEF. Arm G region generally unpaired with a large nucleolus broken into 2 parts by a few bands; bands distal to nucleolus often not clear but may contain a BR. Arm B with a nucleolus just distal to the 4 characteristic bands. Inversion polymorphism in all arms except G.

- staA1: 1 - 2c, 10 - 12, 3 - 2d, 9 - 4, 13 - 19 i.e. as *holomelas* AI
 staA2: 1 - 2c, 10, 5e - 9, 2d - 3, 12 - 11, 5d - 4, 13 - 19
 staB1: possibly 1 - 8a, 21 - 16?, 8b - 15, 22 - 25 1.e. as *longistylus* B1
 staB2: Puff with proximal dark bands (groups 7 - 8) near distal end of arm.
 staB3: Puff approximately as staB2.
 staB4: Puff with proximal dark bands (groups 7 - 8) about 1/3 from distal end of arm.
 staC1: 1 - 6c, 11 - 8, 15 - 11, 6gh, 17a - 16, 7d-a, 6f-c, 17b - 22 i.e. as *aberratus*,
pilicornis, *tenuistylus*, etc.
 staC2: 1 - 5, 16 - 17a, 6hg, 14d - 15, 8 - 11c, 6b - 5f, 7d-a, 6f-c, 17b - 22
 staD1: 1a-c, 16 - 11, 3 - 1d, 17 - 18d, 4 - 6d, 18e - 20, 7 - 10, 21 - 24 i.e. derived
 staD2: 1 - 3, 11 - 18d, 4 - 6d, 18e - 20, 7 - 10, 21 - 24
 staE1: 1 - 3e, 5 - 10b, 4 - 3f, 10c - 13 i.e. as *cingulatus*, *plumosus*, etc.
 staE2: 4g-h, 10b - 5, 3e - 1, 4f - 3f, 10c - 13
 staF1: 1 - 6a, 11 - 17, 6c-b, 9 - 6d, 10, 18 - 23 from *obtusidens* and *frommeri*
 staF2: 1a-c, 9b-f, 6b-c, 17 - 11, 6a - 1d, 9a - 6d, 10, 18 - 23

staF3: 1a-c, 9b-f, 6b-c, 17 - 14f, 6d - 9a, 1d - 6a, 11 - 14e, 10, 18 - 23 i.e. from staF2
 staF4: 1a-c, 9b-f, 6b-c, 17 - 14f, 1d - 6a, 11 - 14e, 9a - 6d, 10, 18 - 23 i.e. from staF2
 staG1: Nucleolus near attachment to arm E.



Molecular data: There are sequences for *COI* (GenBank accession numbers KF278254-KF278268, KF278356) and *ITS-2* (GenBank accession number HQ656599).

Found: **British Columbia**- Royal Oak & Victoria (Townes 1945).

Labrador- Hopedale (Townes 1945)

Manitoba- Southern Indian Lake (Rosenberg *et al.* 1984); Aweme (Townes 1945); 4 km off Grand Rapids, Lake Winnipeg (Sæther 2012).

Northwest Territories- Cameron Bay on Great Slave Lake (Townes 1945).

Ontario- Copanspin Farm, Dunrobin (45.75°N, 75.87°W); Central Experimental Farm and Hogs Back, Ottawa; and South March, nr Mud Lake (44.88°N, 78.27°W), – all Carleton Co.; Lake Potier, w. Sudbury (47.534°N, 82.065°W); Clarke Lake (45.533°N, 78.271°W) and Costello Lake (45.58°N, 78.33°W), Algonquin Provincial Park, Nipissing Co.; Smokey Falls on Mattagami River (Townes 1945).

Quebec- Lake D'Alembert (42.38°N, 79.02°W, Lake Duprat (48.33°N, 79.12°W), Lake Kinojévis (48.13°N, 78.90°W), Lake Opasatica (48.17°N, 79.33°W), all Rowyn-Noranda; Lake St. Joseph (46.88°N, 71.63°W), Quebec City (Proulx *et al.* 2015).

Saskatchewan - Oungre Memorial Park

Alabama - Auburn University pond.

California - Lake Davis, Plumas Co.; Prosser Reservoir, Nevada Co.

District of Columbia - Washington (Townes 1945)

Idaho - Moscow (Townes 1945)

Illinois - Dubois (**type locality** of *C. fasciventris*), 3.5 ml n.e. Mahomet, Champaign Co.; Burlington (Townes 1945)

Indiana - Crooked Lake, Noble Co.
 Iowa - Davenport & Mt. Pleasant (Townes 1945)
 Kansas - Lawrence, Douglas Co. (Townes 1945)
 Louisiana - Many, Sabine Pa.; Mound (Townes 1945)
 Massachusetts - Lake Pleasant, Franklin Co.; Amherst & Cambridge (Townes 1945)
 Michigan - Detroit (Townes 1945)
 Minnesota - Anderson Lake, Clearwater Co.; Bad Axe Lake, Hubbard Co.; Saint Paul (Townes 1945)
 Missouri - Atherton, Charleston & St. Louis (Townes 1945)
 New Hampshire - Berlin (Townes 1945)
 New Jersey - Riverton (Townes 1945)
 New Mexico: Eagle Nest Lake, Colfax Co.; Hondo Valley and beaver dam on Rio Bonito 3 ml e. Bonito Lake, Lincoln Co. (33.45°N, 105.67°W)
 New York - Barge canal, nr Knowlesville, Orleans Co.; McLean, Sea Cliff & Syracuse (Townes 1945)
 North Carolina - Raleigh (Townes 1945)
 North Dakota - McVile Dam, Nelson Co.
 Ohio - (Bolton 2012)
 Pennsylvania - Pottstown (Townes 1945)
 South Carolina - (Epler 2001)
 South Dakota - Yankton, Lake Francis Case & Gavins Point National Fish Hatchery, Yankton Co.; Ardmore (Townes 1945).
 Tennessee - White Oak Creek, Beaver Creek and Clinch River (Mile 20.8), Oak Ridge; 10-Mile Creek, Knox Co.
 Washington - Port Townsend & Seattle (Townes 1945)
 Wisconsin - Reeder Farm, Madison (43.08°N, 89.42°W), Dane Co.; Freibauer Lake, Bayfield Co.; East Horsehead Lake, Oneida Co.; Grand Portage Lake, Iron Co.
 (All of the above would be sites for *C. fasciventris*)
 Greenland - Egedesminde (now Aasiaat)(68.71°N, 52.87°W) (**Type specimens**) (Townes 1945)

Often in lakes to depth of 20 m, but also present in shallow permanent pools. Martin and Wülker (1971) suggest these may represent separate species. Miller (1941) noted that the life cycle took 2 years in the deep Costello Lake, Algonquin Provincial Park.

Morphology and cytology have been described by Wülker *et al.* (1971), with additional sequences for arms C and D by Kiknadze *et al.* (2004, 2010), the latter reference also having an updated photographic map. Some morphological characters show considerable variation, which may arise from the different habitats. The mtCOI sequences do not indicate the presence of more than one species, but sequence from a nuclear gene is needed to confirm this.

Species t. *C. dilutus* Shobanov *et al.* Synonym: *Chironomus pallidivittatus* Malloch 1915 (not sensu Beermann 1955 - see species 2l) This is actually the senior synonym, but confusion arises because of the widespread use of the name in the Beerman sense.

In BOLD Bin: ([BOLD:ADD4190](#)), now in Bin: [BOLD:ADM7020](#)

Adult: Shobanov *et al.* (1999) describe the adult of *C. dilutus* as paler than the Palearctic *C. tentans* (hence Malloch's description of it as 'pallidivittatus'), with a pale green thorax with orange grey

mesonotal bands; abdomen grey green, tergites uniformly colored or with a dark spot in the center. Legs green brown, with nearly 80 sensilla chaetica in ITa₁; LR₁ 2.04 (1.79-2.27), BR₁ 1.30-1.46. AR 3.36 (2.96-3.64).

Very similar to *C. pallidivittatus*, but males can be differentiated by characters of the hypopygium, viz. Dististyle and inferior appendage longer and more tapered, superior appendage longer, anal point broader, and indentation in tergite IX is more a U-shape.



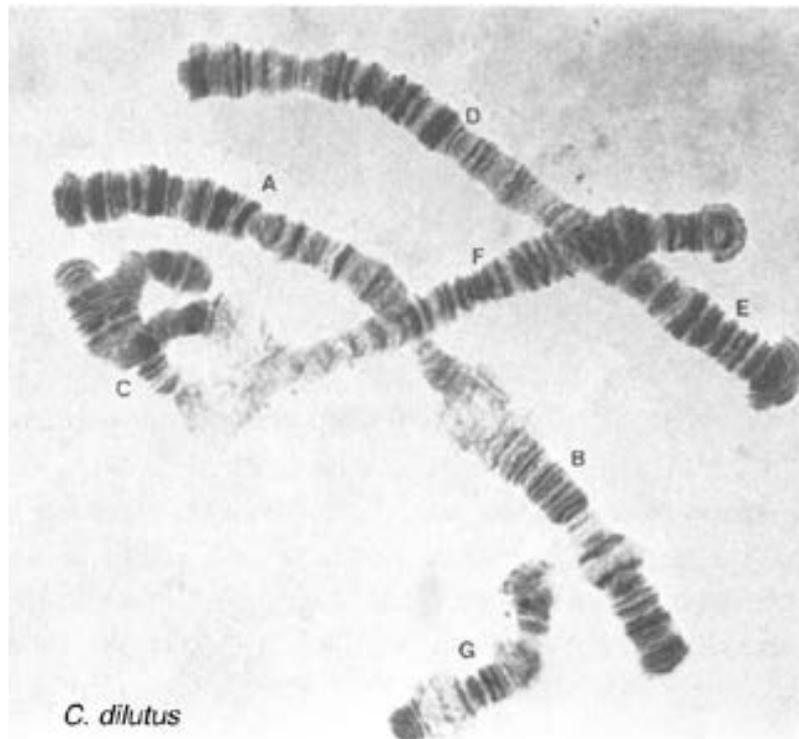
Pupa: Antennal sheath 1.89 (1.74-2.04), wing sheath 2.80 (2.53-3.16), abdomen length 9.51 (8.2-10.7), no. of hooklets on tergite 2, 92 (67-113); anal spur dark or black-brown with about 5-6 spines of varying length and width.

Fourth instar larva a large (fem. 24.3 mm; 20.8-28.9 (10); male 19.0 mm; 15.3-24.9 (11)) plumosus-type. PLT long, up to 1/3 of segment length (640 μm; 440-1070 (22)); VT longer than posterior parapods, posterior pair generally longer (ant. 2.16 mm; 1.39-3.84 (22); post. 2.23 mm; 1.39-3.94 (21)). AT well developed, about 2.5 times longer than wide. Gular region pale or slightly darkened, with FC darkened particularly in the center, posteriorly. Mentum with rounded teeth; c1 tooth broad with short parallel sides, c2 teeth quite well separated (Type II); 4th laterals only slightly reduced (type I). Ventromental plates separated by about 35% of the mentum width, each with about 52 - 66 striae. PE with about 10 - 18 broadly rounded or flat teeth (Hilsenhoff & Narf 1968, Shobanov *et al.* 1999). Basal segment of antenna about 3.7 times longer than wide; AR 2.1 (1.79 - 2.29). Mandible of type II, variation of 3rd inner tooth shown in Figs 4L and M of S of Shobanov *et al.* (1999), about 19-25 grooves on outer surface near the base. Note that female larvae can be larger than the 25 mm limit indicated by Shobanov *et al.* (1999).

Cytology: 4 polytene chromosomes with the camptochironomus arm combination AB, DE, CF, G. Arm G with 3 BRs but no nucleolus. Position of BRs variable due to the polymorphisms; arms B and C with a nucleolus near the centromere, nucleolus also in arm D with an extra band. Chromosome polymorphism in all arms, with 23 sequences known. The male sex determiner is on

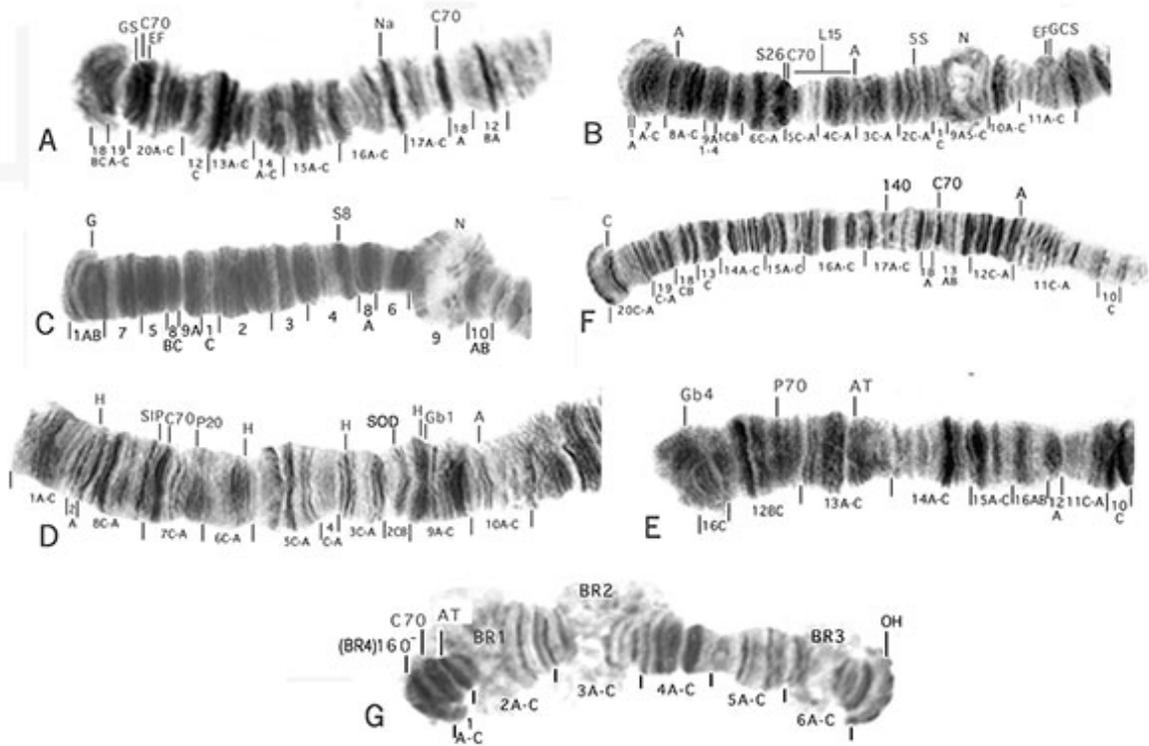
arm C near the centromere, but the female sex determiner reported by Thompson (1971) does not actually exist (Martin and Lee 1984).

- dilA1: 1a-b, 8c-7b, 3i-7a, 1g-c, 8de, 17-13, 1h-2c, 9c-8f, 10-9d, 11-12, 3h-2d, 17g-19
- dilA2:
- dilB1:
- dilB2:
- dilB3:
- dilC1: 1-2d, 4g-6b, 9-11c,3c-2e, 11d-14c, 19-16, 7d-a, 6h-c,8, 15-14d,4a-f, 20-22
- dilC2:
- dilD1: 1-2b, 15-14, 10, 4-7, 2c-3, 13, 22-18e, 8-9,17-18d, 12-11, 16e-a, 23-24 as
tenh'D1, except for nucleolus and extra band in 10B.
- dilD2: as temp'D2?, except for nucleolus and extra band in 10B
- dilD3:
- dilE1: 1 - 2b, 7h - 8, 9 - 10b, 3e - 2c, 7g - 3f, 10c - 13 as temp'E1
- dilE2: as temp'E2
- dilE3: 1 - 2b, 10a-c, 3f - 7g, 2c - 3e, 10b - 7h, 11 - 13
- dilF1: 1 - 2, 7 - 9, 16, 6 - 3, 15 - 10, 17 - 23 as temp'F3
- dilF2:
- dilF3: 1a-d, 9b-12, 3b-2, 13a-d, 1i-e, 3c-5c, 16-14d, 7-9a, 6-5d, 14c-a, 2a-e, 17-23
- dilF4:
- dilG1: BR1 and BR2 separated by about 1/3 of length, towards the centromeric end as
tenh'G1
- dilG2: Inversion of virtually the whole arm, so the close BRs are now at the distal end as
tenh'G2
- dilG3: Inversion including BR2, so that BR1 and BR2 are separated by over half the
chromosome length.
- dilG4: Reported by Acton (1962) as rare, but limits not defined.



Chromosome complement of a member of the Western race

(Modified from Martin (1979))



A more detailed map showing the position of some genes
(Modified from Martin *et al.* (2010))

- Found:** Numerous localities across the northern U.S. and Canada.-
- Alberta (WR)** - Elkwater; Edmonton; Lacombe.
 - British Columbia (WR)** - Chilcotin area; Williams Lake, Kamloops; Sawmill Lake, Sorenson, Westwick Lake (52.00°N; 122.17°W) (A.B. Acton).
 - Manitoba (WR)** - Churchill; Erickson; Winnipeg; St Alphonse.
 - Ontario (ER)** - Hogs Back, Ottawa; Cranberry Creek, Kars;
 - Saskatchewan (WR)** - Big Quill Lake; 6ml. n. & e. Colgate; Lake Waskesiu, Prince Albert Park; 6ml. s. & w. Stoughton; 5ml. w. Theodore.
 - Iowa** - Lake Okoboji & Jemmerson Slough, Dickinson Co.; Little Wall Lake, Hamilton Co.; Cerro Gordo Co.
 - Massachusetts (ER)** - Longmeadow.
 - Michigan (ER)** -
 - Minnesota (WR)** - Badger Lake, Erskine, Polk Co.(47.67°N, 96.00°W) Lake Christina (46.08°N, 95.75°W), Douglas Co.
 - New York (ER)** - Ithaca.
 - North Dakota(WR)** - Warsing Dam, Eddy Co.(47.83°N, 99.12°W); Braddock Dam, Emmons Co.; Fullers Slough; Hankinson.
 - South Dakota (WR)** - Lake Francis Case, Gregory Co. (43.27°N, 99.00°W); Gavins Point National Fish Hatchery, Yankton Co. (42.87°N, 97.47°W); Su-Falls.
 - Utah (WR)** - Logan.
 - Wisconsin (ER)** - Stevens Pond & U.W. Arboretum, Madison, Dane Co. (43.03°N, 89.42°W).

Wyoming (WR) - 6ml s Lander.

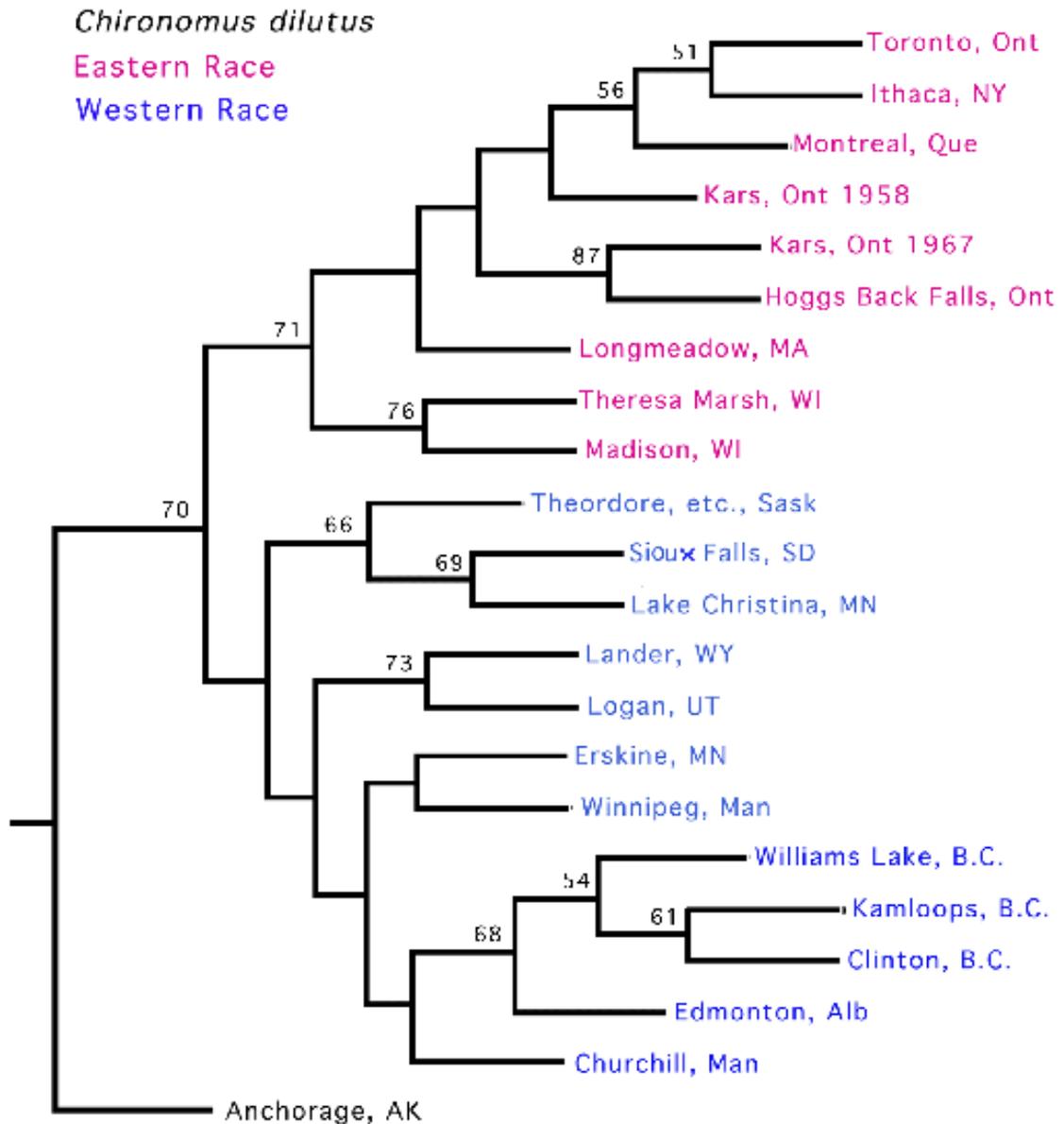
In prairie sloughs, shallow eutrophic lakes and ponds, sewage oxidation lagoons.

Fourth instar larva described by Johannsen (1937). Chromosomes have been shown in a number of papers, e.g. Thompson (1971), Firling and Kobilka (1979) Martin (1979); full karyotype, using Beermann maps, published by Kiknadze *et al.* (1996). Keyl (1962) gives the sequence of arm F on his scheme, including IR-2 = p'F3 = n'F1 (Kiknadze *et al.* 1996), other sequences from Kiknadze *et al.* (2004).

Martin *et al.* (2010) provided a physical map for the position of some genes on the polytene chromosomes.

Acton and Scudder (1971) consider North American populations to comprise three races - Alaskan, west Canadian, east Canadian. Alaskan is considered here to be still probably *C. tentans* (see Sp3y).

The other two races are distinct in the West and East respectively, but tend to merge in the central area where the biogeographic barriers currently exist, although Gunderina *et al.* (1996) showed that samples from Minnesota and Saskatchewan were distinct from the eastern populations. However, this could just reflect an east-west cline. Therefore, inversion frequency data from all available populations were incorporated in a UPGMA analysis (see below), which still supported two groupings, with a break somewhere around the western borders of Wisconsin in the U.S.A., and Ontario in Canada.



UPGMA tree showing the distribution of the two races of *C. dilutus*

Eastern Race: Larval length - female 24.5 mm (21.5 - 28.9)(4); male 20.0 mm (16.9 - 24.2)(3). Cytologically, this race is characterized by more frequent n'D2, h'E2, and n'F4, but lower frequencies of n'F3 and n'G3; with no n'G4 recorded.

Western Race: Larval length - female 22.5 mm (19.8 - 27.0)(13); male 19.1 mm (15.3 - 22.5)(14). Cytologically, this race is characterized by more frequent n'F3, n'G3 and rarely n'G4 (known only from British Columbia), while frequencies of n'D2 and h'E2 are lower; n'F4 has not been recorded in this form.

Formerly considered a synonym of *C. tentans* Fabricius, the North American material clearly differs genetically from the Palearctic species and was renamed by Shobanov *et al.* (1999).

C. dilutus and *C. pallidivittatus* cannot be separated on the basis of the DNA “barcode” sequence of *COI* and *CytB* (Guryev *et al.* 2001), but can be separated by the sequence of the globin gene *gb2β* (Martin *et al.* 2002).

Molecular sequences:

mt *COI* sequences in GenBank, Accession nos. AF110160 – AF110162.

mt *cytB* sequences in Genbank, Accession nos. AF109700 - AF109709.

gb2β sequences in Genbank, Accession nos. AF110173 - AF110174.

Species u. *C. species*

Near *C. hyperboreus*, *C. aberratus* or *C. sororius* and *C. sp. 2u*.

This species is in BOLD Bin: [BOLD:AAI4297](https://www.boldsystems.org/index.php/TaxaKey?id=AAI4297)

Adult:

Adults and rearings of this species are in the Sublette Collection, now in the Museum of the University of Minnesota, St Paul, MN.

Male: Some information can be noted from photographs in the BOLD database:

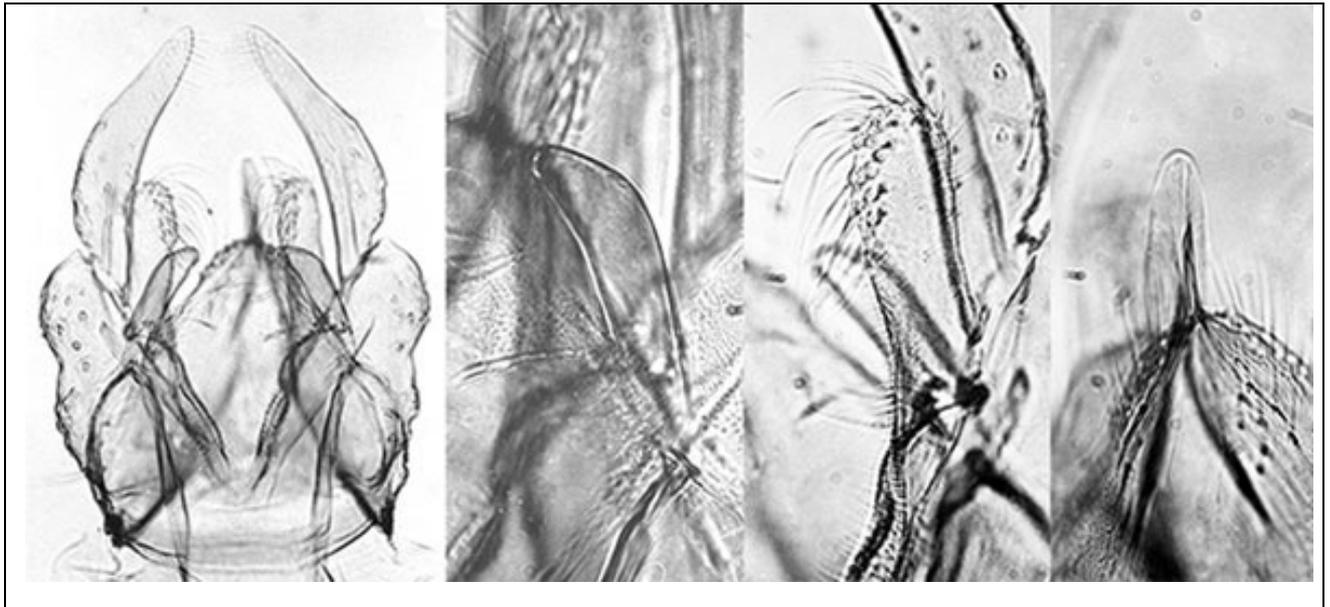


Wing length about 4.2-4.8 mm.

Thorax dark brown, vittae, scutellum, postnotum, legs, etc., blackish. Abdomen dark brown with a narrow pale band distal on segments VI and VII.

Approximate leg proportions (micron):

	Fe	Ti	Ta1	Ta2	Ta3
PI	1615	1530	-	-	-
PII	1580	1500	1000	630	475
PIII	1775	2000	1260	940	645
	Ta4	Ta5	LR	F/T	BR
PI	-	-	-	1.05	-
PII	315	210	0.63	1.03-1.05	
PIII	410	290	0.78	0.89	



SVo rather stout and blunt, most similar to D(d)-type of Strenzke 1959.

No, or only 1 or 2, median setae on tergite 9. GS narrowing relatively gently from about halfway.

Female:

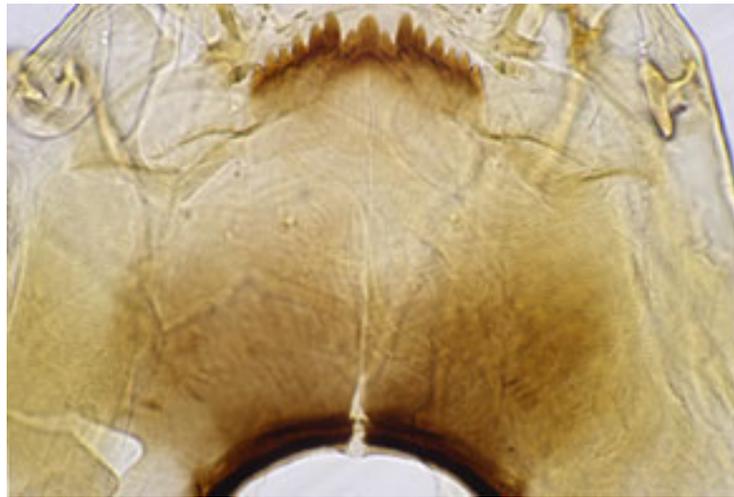
Wing length about 5 mm Generally dark color. Photos suggest femurs may be a lighter brown.

Pupa: Cephalic tubercles about 1.3 times longer than wide. Caudolateral spur of segment VIII with about 3(1-4) spines. Swim fin with about 62 taeniae in a double row on each side.



Fourth instar larva a medium size plumosus-type (female 12.7 - 15.9 mm); PLT about 305 (200-440) μm ; anterior VT 2.0 (1.10-2.48) mm, posterior 2.15 (1.30-2.56) mm, posterior pair generally longer in the Calgary sample, but some variability in Saskatchewan larvae. AT about 442 (405-500) μm (dors), 434 (359-600) μm (vent) and 2-3 times longer than wide, dorsal pair relatively longer (2.3-3.1 times) than the ventral pair (1.9-2.6 times).

Gular region (below) generally dark on posterior third to half, often more at outer edges, and in rare cases reduced to a “V” or just a very thin strip at posterior edge; slightly dark to dark FC often as a stripe.



Mentum (Fig. c, below) with relatively rounded teeth; c1 tooth with short sides sloping outwards, c2 teeth moderately separated (possibly type III, but usually appears type IB due to wear); 1st laterals sloping outwards; 4th laterals reduced (type I-II), sometimes only slightly in Calgary specimens, but generally almost to level of 5th laterals in Saskatchewan.

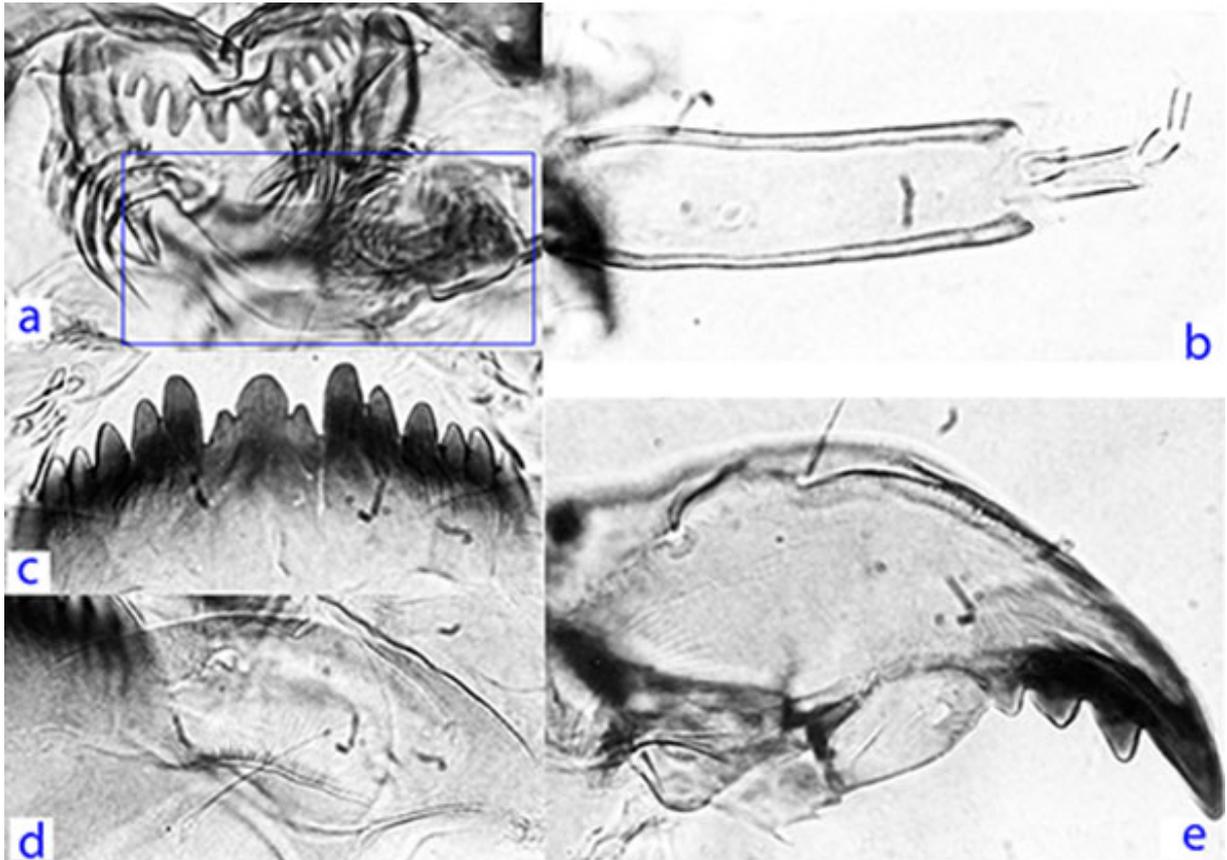
Ventromental plates (Fig. d, below) separated by about 0.3 to 0.4 of the width of the mentum, with about 46 (37-52) striae; VMR about 0.38 (0.33-0.43). PE (Fig. a, below) with about 12 (9-14) relatively broad teeth (type B).

Premandible (Fig. a - blue rectangle, below) with outer tooth shorter and narrower than the large inner tooth, which is 2–2.8 times wider.

Antenna (Fig. b, below) with basal segment abt 3.7 (3.5–4.0) times as long as wide, RO a third to half way up from base of segment; AR about 2.2 (1.8-2.8); antennal proportions 153 : 36 : 11 : 14 : 7.

Distance between the antennal bases generally less than that between the S4 setae, but occasionally much greater.

Mandible (Fig. e, below) generally with 3rd inner tooth partly to well developed and at least partly darkened (type IIB-IIIB/C), about 19 (14–22) furrows on outer surface near base, about 13 (9-16) taeniae in PMA.



Cytology: 4 polytene chromosomes with the thummi arm combination AB, CD, EF, G.
Centromeres moderately heterochromatic.

Arm G mostly unpaired, with a virtually terminal nucleolus and a BR (possibly 2 close BRs) near the other end. No nucleoli in the long chromosomes. Arm B with a BR near the 4 characteristic bands. A small distal inversion in arm D heterozygous in one specimen.

Arm A1: 1-2c, 10-12, 3, 8-9, 2k-d, 4-6c, 7-6d, 13-19

Arm B1: Puff (group 7) with distal dark bands near distal end of arm. Possibly by simple inversion from B2 of *C. atrella*; close to *aberratus*.

Arm C1: Groups 3-4 near distal end of arm (may be groups 1 – 9, from telomere). Possibly as *aberratus*.

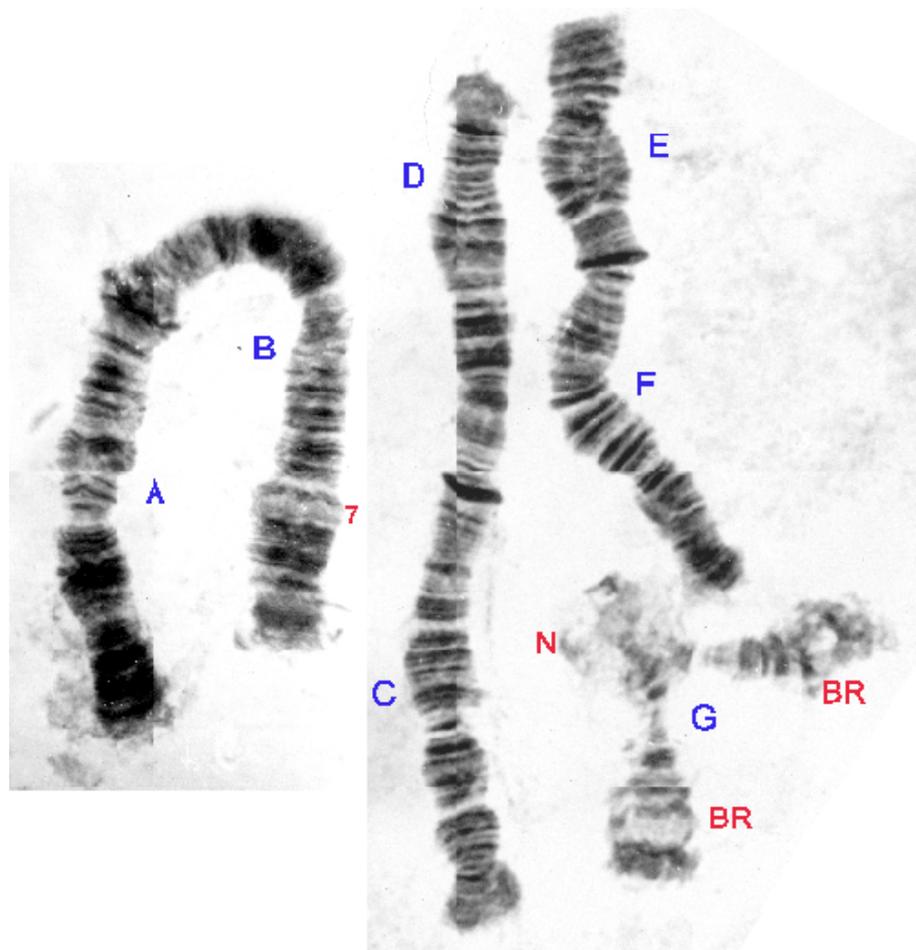
Arm D1: Groups 15 – 16 near middle of arm. Probably as *aberratus*, etc.

Arm D2: Small inversion in distal third.

Arm E1: 1 - 3e, 5 - 10b, 4 - 3f, 10c – 13 i.e. as *aberratus*, *cucini*, etc.

Arm F1: 1, 5 - 2, 6 - 10, 17 - 11, 18 – 23. i.e. inv2-5 from *aberratus*, *sororius*, etc.

Arm G1: Partly unpaired, virtually terminal nucleolus, large BR near other end.



Found: Alberta - Huntington Hills, Calgary (51.08°N, 114.08°W).

Manitoba - Churchill (58.771°N, 93.851°W); Grasslands Natl. Park (both BOLD); abt 8 Km nw Theodore (51.75°N, 102.95°W).

Saskatchewan - Yellow Grass; Wapusk Natl. Park (both BOLD); 5 ml. w. Theodore (51.75°N, 102.95°W).

Yukon Territory - Kluane Natl. Park; Lake Laberge (both BOLD)

A related species occurs at South Dakota - 3 ml. w Yankton, Yankton Co. (see below)

Prairie pool, about 60cm deep, with dark mud and much organic matter and slimy green covering.

Molecular sequences:

mtCOI: Sequence is available from the known localities, other than the South Dakota variant.

Although the adult is similar to *C. hyperboreus* amongst North American species, the larvae and cytology are different and the cytology and mtCOI sequence suggest a closer relationship to *C. sp. 2u* and Palearctic species such as *C. aberratus* Keyl 1961 and *C. sororius* Wülker 1973.

Species nr. Sp. u.

Known from a single larva collected by Patrick. L. Hudson (it is possible that there is another specimen in the collection of J.E. Sublette, in the Museum of the University of Minnesota).

Fourth instar larva: Larval type not known, as only the head capsule was mounted on the slide.

Ventral head length 316 μm ; c2 teeth of mentum partly separated, either type IIA or a worn IV; 4th laterals only slightly reduced (type I). Ventromental plates separated by about 49% of mentum width, with 44-45 striae. PE with 14 teeth.

Premandible with outer tooth slightly shorter than inner tooth, which is about 2-2.5 times wider.

Antenna with A1 segment about 2.9 times longer than wide, RO about halfway up from base; LR 2.30; antennal proportions (micron) 125 : 23 : 8 : 11 : 7.

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

Mandible with third inner tooth separated and darkened (type IIIC); 12 furrows on outer surface near base, 9-10 taeniae in PMA.

Species v.

Adult and **Pupa** – not known, unless some adults are in the Canadian National Insect Collection.

Fourth instar larva a large (abt. 13-13.5 mm) halophilus-type, although some specimens, e.g. at Isachsen, are salinarius-type. Dark posterior half of gular region and FC, rest of head also darker in the salinarius-type larvae. Anal tubules about 405-480 μm long and 2-2.5 times longer than wide in halophilus larvae, but slightly shorter and only 1.4-2 times longer than wide in the salinarius-type larvae.

Mentum (see d, below) with rounded teeth; c1 tooth with short outward sloping sides, c2 teeth well separated, probably worn type III, or type IIA; fourth laterals slightly reduced (type I-II).

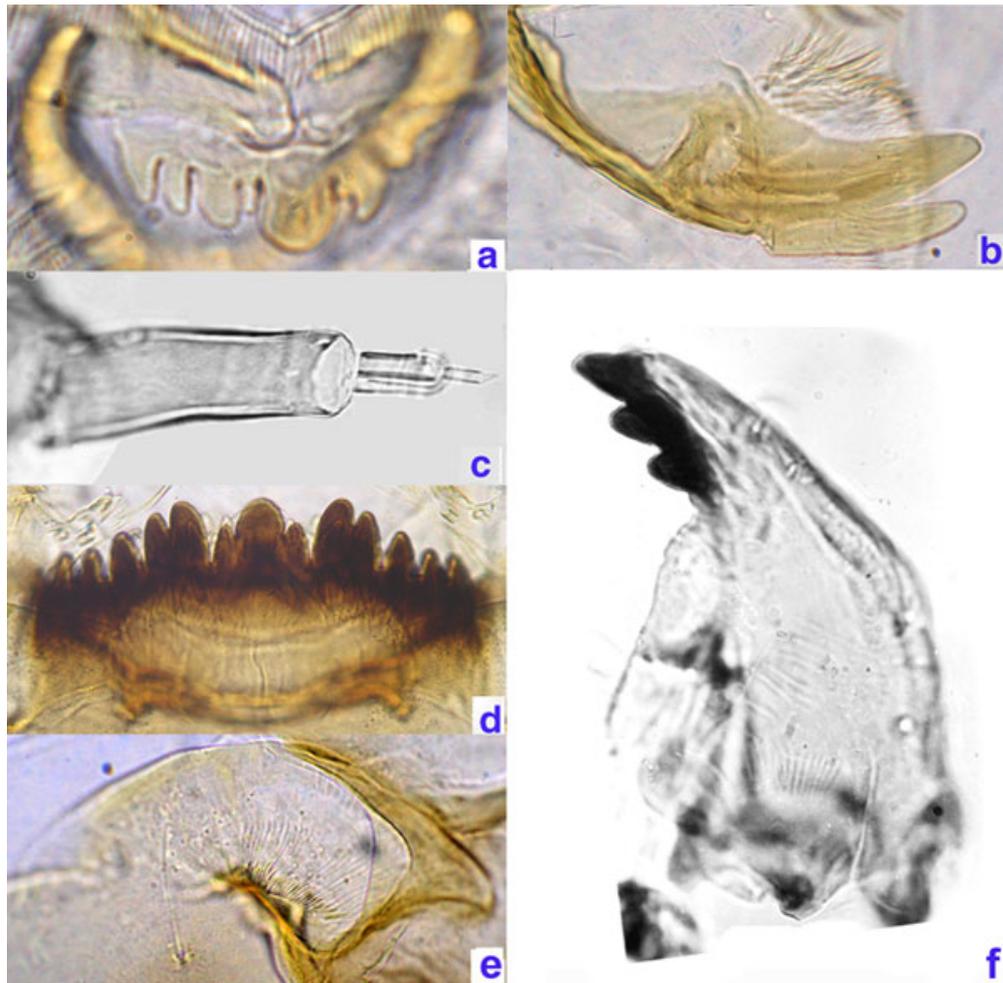
Ventromentum (see e, below) with about 45-53 striae, VMR about 0.28-0.33.

PE (see a, below) with about 10-11 irregular, often broad and rounded, teeth (type C). Premandible (see b, below) with outer tooth shorter (wear?) and about half the width of the inner tooth.

Antenna (see c, below) with relatively long basal segment (about 4.5 times longer than wide); RO about a third to almost halfway up from base of segment; AR about 2.40-2.46; segment proportions (micron) 182 : 37 : 14 : 16 : 9.

Distance between the antennal bases and that between the S4 setae about equal.

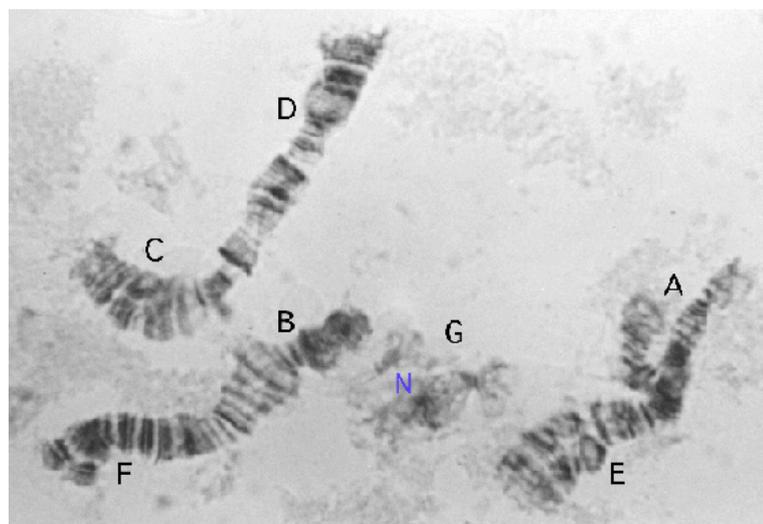
Mandible (see f, below) with 15-17 furrows on outer surface near base, 3rd inner tooth developed (type IIIC) (damaged in photo below); about 11-15 taeniae in PMA.



Mouthparts of *C. species v.*

Cytology: 4 polytene relatively short chromosomes, probably with the pseudothummi arm combination, AE, BF, CD, G, but Keyl pattern hard to recognize.

Arm G rather indistinct, usually unpaired, with a terminal nucleolus. Arm A sometimes unpaired. According to Wülker (pers. comm.), arm A has the *holomelas* banding sequence.



Arm A: 1 - 2c, 10 - 12, 3 - 2d, 9 - 4, 13 - 19 i.e. as *holomelas*

Found: Nunavut (formerly Northwest Territories) - Hazen Camp Pond, Ellesmere Island ((Pond 1 of Oliver & Corbet, 1966); Ellef Ringnes Island (78.8°N, 103.5°W).

Species w. *C. trabicola* Shobanov, Wuelker & Kiknadze, 2002

Adult:

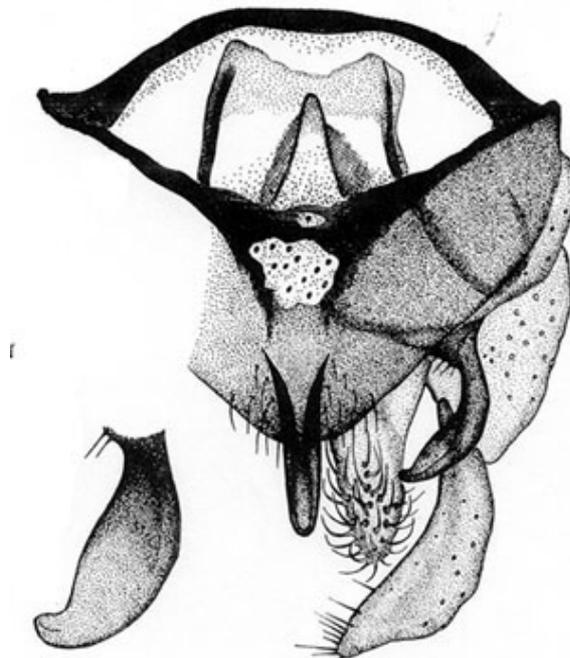
Based on Russian specimens from data of Shobanov *et al.* (2002).

Male: Dark species, thorax almost black, abdomen brown to dark brown, tergites uniformly colored. Sternite I with about 11 - 36 setae, sternite II with 2 - 6 lateral and about 70 medial setae. Ratio of 3rd-5th maxillary palpomeres (µm) 416 : 386 : 411. AR 5.8 - 7.3.

Anterior basitarsus with beard, BR ave 5.87. Anterior LR 1.03 - 1.08. Sensilla chaetica on LII 22 - 29. Legs unusual in that anterior femur is shorter than the anterior tibia.

Leg proportions (micron):

	Fe	Ti	Ta1	Ta2	Ta3
PI	1613	1818	1896	1221	685
PII	1982	1846	1115	735	513
PIII	2287	2448	1632	1052	780
	Ta4	Ta5	LR	F/T	BR
PI	449	291	1.03-1.08	0.88-0.93	5.25-6.78
PII	319	233	0.59-0.61	1.05-1.07	
PIII	411	266	0.66-0.71	0.93-0.98	

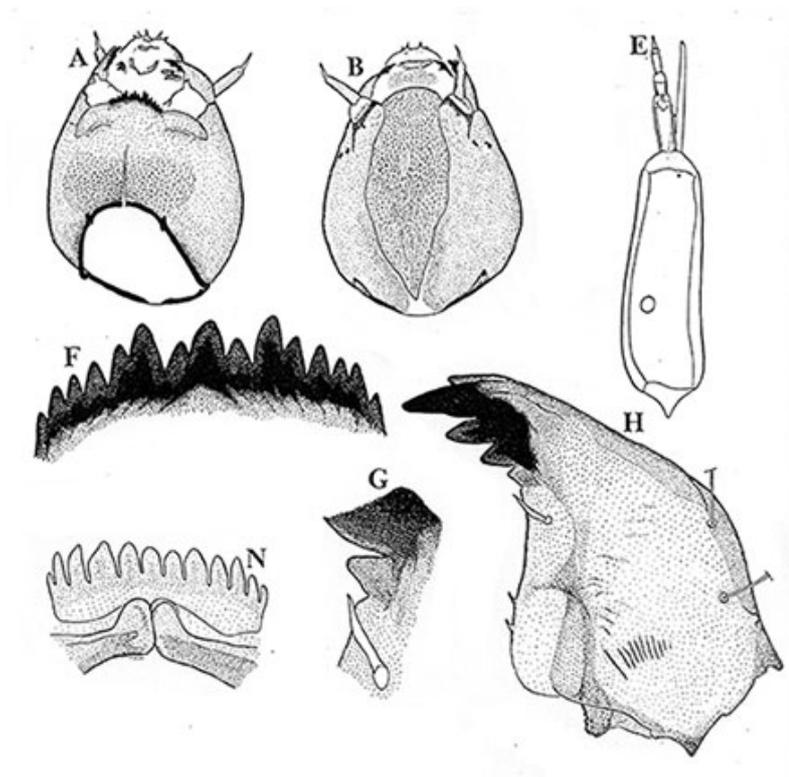


From Shobanov *et al.* 2002

Segment IX with about 12 setae in pale area in center of tergite. SVo of the E-type, with thickening on the inner side. IVo conical. GS broad, usually uniformly colored but sometimes with an obvious light area on external side; narrows sharply over posterior third. Anal point brown narrowing from base to top.

Pupa: Thorax dark brown, tergites of abdomen with grey spots, congruent with shagreen areas. Laterosternites dark brown. Abdomen length about 9.9 - 11.6 mm. Wing sheath length about 2.58 - 3.02 mm. Caudolateral spur of segment VIII almost black, usually with one spine, but sometimes with up to three, including a second tip.

Fourth instar larva a large salinarius-type, length up to 20 mm. Gular region, frontoclypeal and other dorsal areas of head darkened; in some specimens there may be a pale spot on the posterior half of the FC.



From Shobanov *et al.* (2002)

Mentum (c, below) of only specimen worn; c2 teeth well separated (type IIA or III), fourth laterals appear reduced, but in Russian specimens it appears only slightly reduced (Shobanov *et al.* 2002, below). PE (b, below) with 11-16 teeth, some broad and irregular (type C). Ventromental plates with 47 - 58 striae.

Antenna (a, below), AR 1.91-2.34, RO almost half way up A1; A1 about 3.2x longer than wide. Mandible (d, below) with 3rd inner tooth pale (type IIA), 12 - 15 furrows on outer surface near the base.

Nunavut (formerly Northwest Territories) - Skeleton Lake, Hazen, Ellesmere Island (Tarn 34 of Oliver & Corbet, 1966) (81.826°N; 71.483°W).

Alaska - west shore of Prudhoe Bay, EWD1, tundra pond east of West Doc pad.

Russia - Ice Sea coast: Lena Delta (Ust'Lena reserve, Danube Island, pool on polar station area, **Type locality**), Dikson, Archangelsk.

Cytology partially described by Wülker & Martin (2000). Full cytology and morphology described by Shobanov *et al.* (2002).

Species x. *C. hyperboreus* Staeger, 1845

Molecular sequence from Canada is under the name *C.* species TE13.

In BOLD Bin: [BOLD:AAC0596](#)

Adult

Male (from Townes 1945): Wing length 5.2 mm; fore LR 1.25 - 1.27; antennal ratio 5.0.

Body moderately stout.

Frontal tubercles rather small, clypeus small.

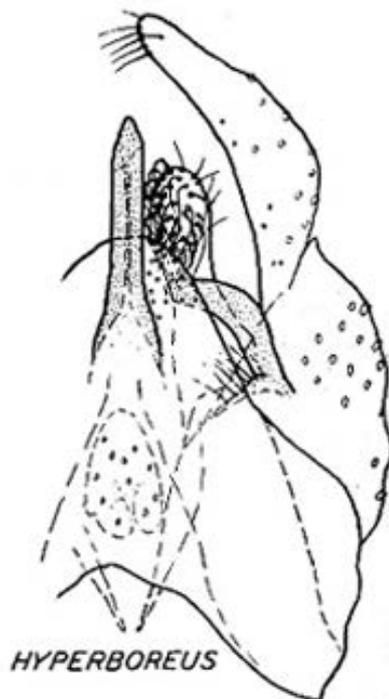
Middle portion of pronotum slightly broadened; mesoscutum without a tubercle

Fore tarsus with a long dense beard.

Blackish brown, legs brown to blackish, darker towards the apices.

Superior volsella rather unusual, not easily fitted into the Strenzke groups.

Townes notes that the specimen described has paler legs than the types.



From Townes 1945

Female:



From a photograph in the BOLD database (above), the following characters can be added:

Wing length about 3.1 mm.

Thorax, scutellum, etc., blackish, abdominal segments blackish at base, with a brownish band across the distal ¼ to 1/3; bases of anterior and midlegs brownish, rest of legs blackish.

	Fe	Ti	Ta1	Ta2	Ta3
PI	885	914	-	-	-
PII	940	-	-	-	-
PIII	1157	1343	1050	514	385
	Ta4	Ta5	LR	F/T	Ta5/Ti
PI	-	-	-	0.97	0.21
PII	-	-	-	-	
PIII	214	157	0.78	0.86	

Fourth instar larva a medium sized (male 12.2–14.5 mm) salinarius-type. AT relatively long (dorsal 375x140, ventral 401x185 µm), dorsal about 3 times longer than wide, the ventral pair about 2.2 times longer.

Gular region, FC and sometimes other parts of the head, darkened.



Mentum of all specimens badly worn, but side teeth are well separated (type IIA) and fourth laterals reduced (type II).

VMR about 0.24.

PE with 8 - 15 teeth, sometimes irregular and broad.

Premandible with teeth about equal, inner tooth about 1.2-1.5 times wider than outer tooth.

Antenna with basal segment about 3.6-3.7 times longer than wide, RO about 0.41-0.42 up from base; AR about 2.3; A2 about 0.25 of A1; segment proportions (micron) 147 : 39 : 11 : 15 : 9.

Distance between antennal bases about the same as the distance between the S4 setae.

Mandible with 3rd inner tooth partly developed (type IIB), and with about 14-15 grooves on the outer surface near the base.

Cytology: 4 short polytene chromosomes with the thummi arm combination AB, CD, EF, G, but Keyl pattern hard to recognize. Centromeres heavily heterochromatic, often forming a chromocenter.

Arm G short, often unpaired, with a nucleolus near the centromere and possibly a BR near the other end. Polymorphic in arm A. Polymorphism also occurs in arm F, but only F2 is present at Ellesmere.

Preliminary sequences according to Wülker:

Arm A1: 1-2c, 10-12, 3-2d, 9-4, 13-19 i.e. as *holomelas* I

A2: 1-2c 10-12 7-9 2d-3 6-4 13-19 (Greenland)

A3: 1-2c 3-2d 9-7 12-10 6-4 13-19 (Ellesmere)

Arm B: as *riihimakiensis*.

Arm C1: 1-2c, 3-2d, 9-7, 12-10, 6-4, 13-19 (Wülker) or
1-6b, 11c-8, 15-11d, 6gh, 17a, 16h-a, 7d-a, 6f-c, 17b-22 (Kiknadze)

Arm D1: 1-3, 11-18d, 7-4, 10-8, 18e-24 i.e. as *longistylus*, *tenuistylus*, etc.

Arm E1: 1 - 3e, 5 - 10b, 4 - 3f, 10c - 13 i.e. as *aberratus*, *bifE1*, etc.

Arm F1: 1 - 6, 12 - 7, 13 - 23 (Greenland)

Arm F2: 1 - 2, 14 - 13, 7 - 12, 6 - 3, 15 - 23

Found: **Alberta** - Corral Creek old road Banff National Park (51.407°N, 116.154°W), NE Jasper Lake, Jasper National Park (both as sp. TE13) (BOLD)

Manitoba - Launch Rd Bluffs, Churchill (58.765°N, 94.013°W) (as sp. TE13) (BOLD)

Nunavut (was Northwest Territories) - Hazen Camp Pond, Skeleton Lake and its inlet marsh, Hazen, Ellesmere Island (Pond 33 & Tarn 34 in Oliver & Corbet, 1966).

Quebec - Quarry Island, Mingan Archipelago National Park Reserve (50.2135°N, 63.7979°W) (BOLD)

Yukon Territory - Wolf Creek, Whitehorse (60.5954°N, 134.953°W) (as sp. TE13)(BOLD)

Greenland - Egedesminde (Townes 1945); Lake 517, Stoe Kvaneso, West Greenland (Type locality); Zackenberg Research Station, Northeast Greenland (GenBank & BOLD).

Arctic lakes and pools.

Chromosomes pictured and briefly described by Wülker & Butler (1983), redescribed by Wülker & Martin (2000).

Molecular sequences:

mtCOI: A number of sequences are available in GenBank or BOLD, under the names *C. hyperboreus* or *C. sp. TE13* (from Arctic Canada).

Species v. *C. riparius* Meigen, 1804
Syn: *C. thummi thummi* Meigen – Credland (1973a)
C. serus Malloch, 1915
C. cristatus Branch 1923
C. militaris Johannsen 1937

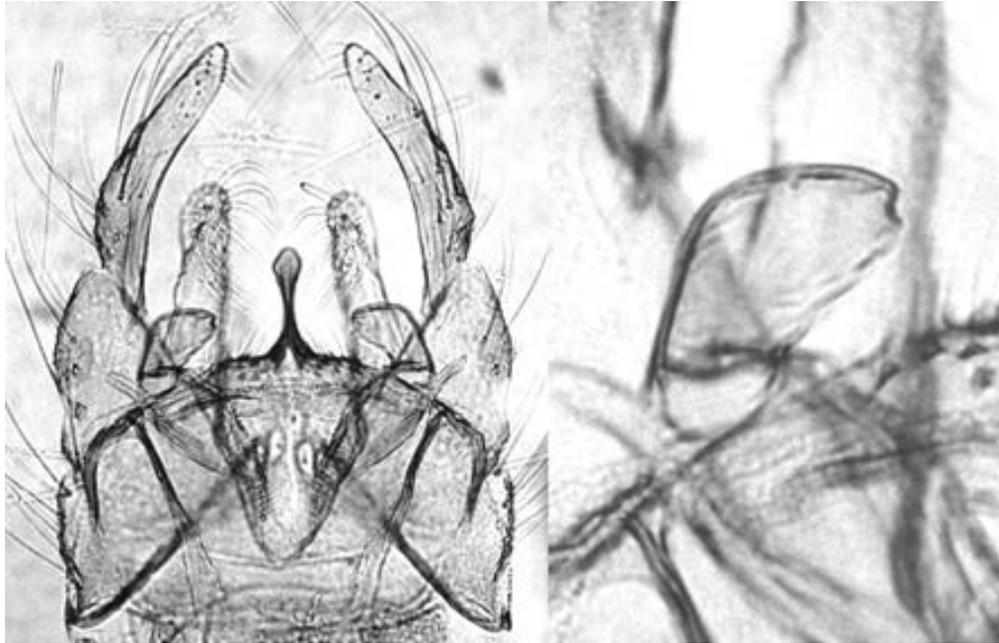
This species is in BOLD Bin: [BOLD:AAA7263](#)

Adult



Male: Wing length about 3.7 - 3.8 mm. AR 3.2 – 3.6. LR about 1.6. Frontal tubercles small, clypeus rather small.

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.

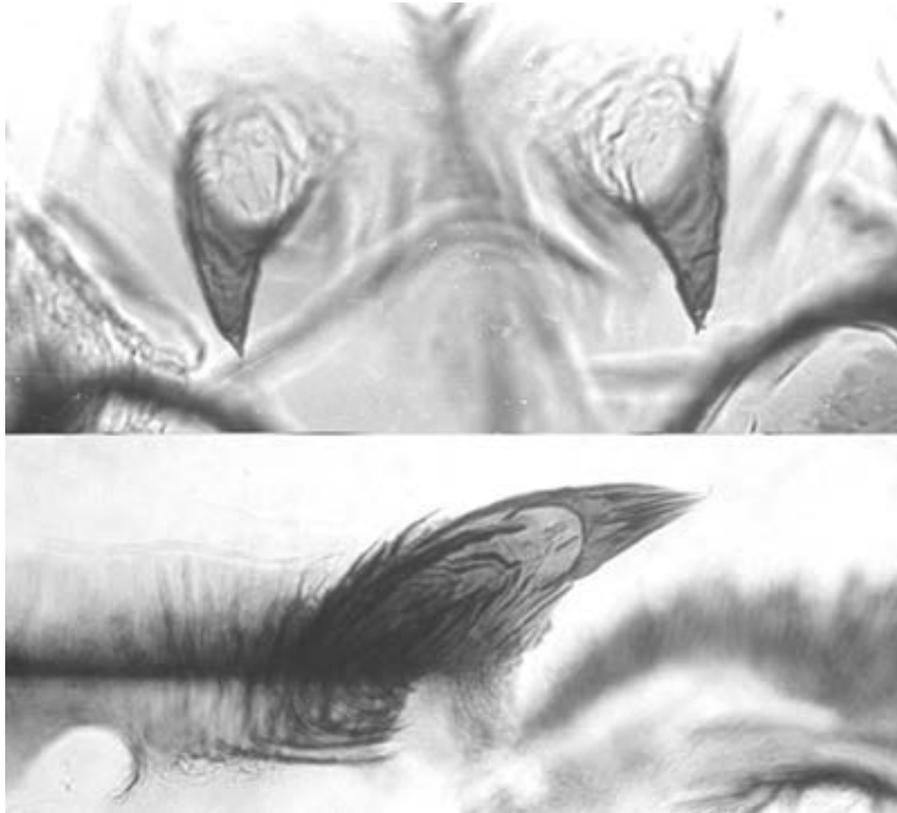


Terminalia of adult male

About 3 – 4 setae on 9th tergite. The superior volsella is Strenzke's S(b) type.

Female: According to Townes (1945), similar to male except for usual sexual differences.

Pupa:



Pupal cephalic tubules, and caudolateral spur of segment VIII

Spur with about 3 – 4 closely applied spines.

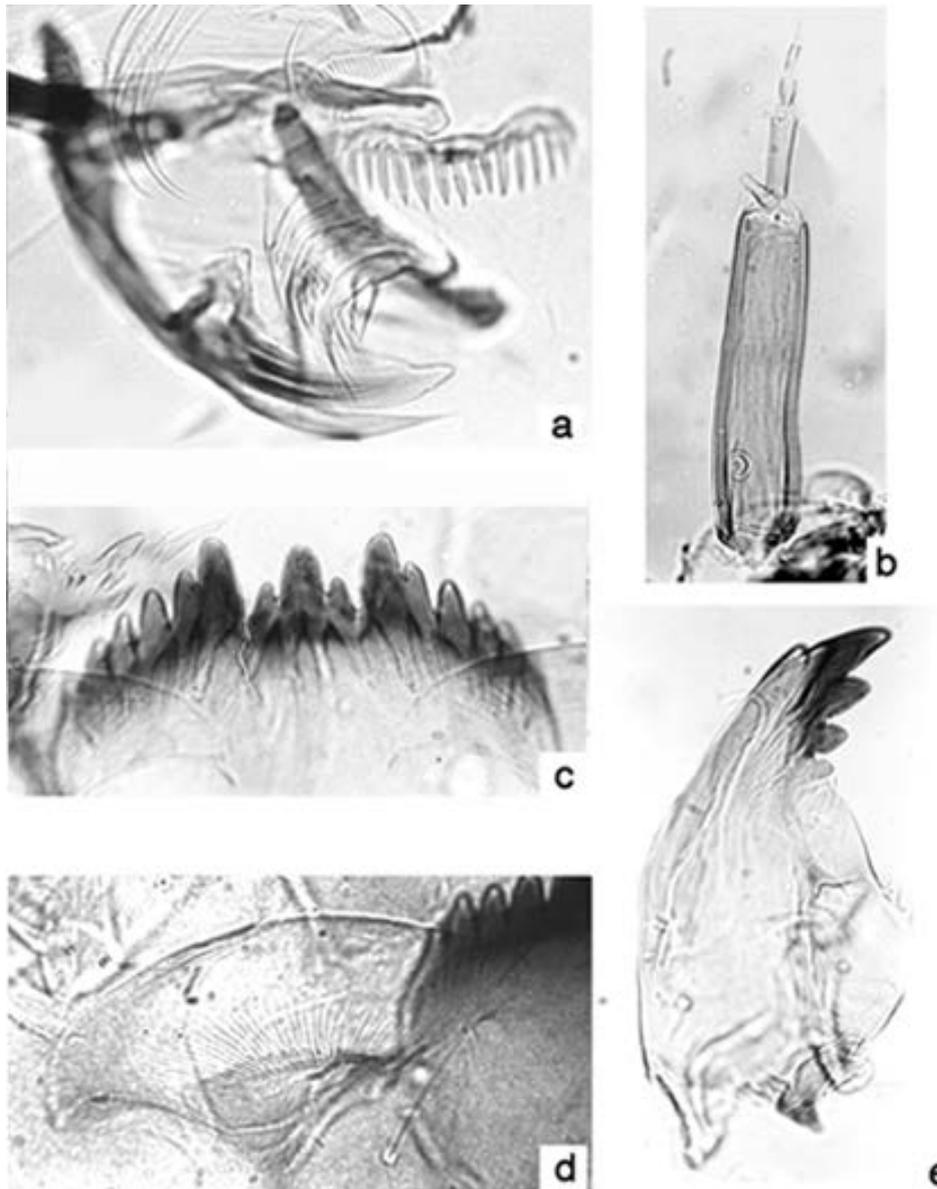
Fourth instar larva a medium sized thummi-type. Gular region dark, FC and other parts of the head capsule darkened.

Mentum (c, below) with pointed teeth and of type I; center tooth moderately broad with almost parallel sides, side teeth well separated, notches almost vertical (Type III); fourth lateral essentially in line with third and fifth laterals.

VM (d, below) with about 43 striae. PE (a, below) with about 14 irregular teeth.

Premandible (a, below) with teeth about equal in length, inner tooth about twice the width of the outer tooth.

Mandible (e, below) with third inner tooth pale and only partially separated (type II).



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 BRs near the center, the second followed by a constriction and a dark band. No nucleoli in long arms. Sequences as in the European synonym *C. thummi*. In European populations the MD is located on arm F in the vicinity of groups 1-2 (Hägele 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).

ripA1:	1 - 19
ripB1:	1 - 28
ripC1:	1 - 22
ripD1:	1 - 24
ripE1:	1 - 13
ripF1:	1 - 23

Found: Manitoba - Southern Indian Lake (Rosenberg *et al.* 1984); Lake Winnipeg (Sæther 2012).

Ontario - Amherstview; Etobicoke Creek nr. Brampton (43.68°N, 79.75°W) (Shrivastava & Loughton 1970); Stratford; Windsor.

Northwest Territories - Smoking Hills (Jernelov 1981)

Kansas - Douglas Co. (Townes 1945); Mill Creek, nr. Craig, Johnson Co.

Maryland - Baltimore, Baltimore Co.

Missouri - Columbia, Boone Co.

New York - Adams Center, Jefferson Co. (Branch 1923); Ithaca, Tomkins Co.

South Carolina - Liberty., Pickens Co.

South Dakota - 1 m W, 2 m N Yankton and 3 m W Yankton, Yankton Co.

Tennessee - Oak Ridge, Knox Co.

Wisconsin - Badfish Creek, Dane Co.

Wyoming - Hawk Springs, Goshen Co.

Greenland - (Lindegaard 2015) (but see species 5c)

Creeks and pools, particularly where polluted, and especially where polluted with milk waste.

Molecular sequences:

MtCOI: There are numerous sequences from 10 countries in the BOLD database.

Adult re-described by Townes (1945). Larvae described by Johannsen (1937) as *C. militaris*, and biology and all life stages (including some photographs) described as *C. cristatus* by Branch (1923).

Cytology given by a number of authors in North America (e.g. Poulson and Metz 1938, Blaylock 1971) and in Europe as *C. thummi* Kieffer (e.g. Keyl and Keyl 1959, Devai *et al.* 1989).

Credland (1973b) established a method for maintaining this species in the laboratory.

Species z. Possibly *C. decorus* group

Adult and Pupa not known.

Fourth instar larva small to medium melanotus-type (12.6 mm, fem; 12.1 mm, male), VT of moderate length (abt. 1.1-1.2 mm) and about equal length, PLT about 280-310 μm . AT quite long with a constriction in the middle, anterior slightly longer (abt 480 cf. 430 μm) and over 4 times longer than wide (4.0-4.3x).

Gular region usually pale to occasionally slightly darkened on posterior third, FC pale or slightly darkened.

Mentum (Fig. c, below) relatively pale with pointed teeth; c1 tooth long, narrow to wider and tapering, c2 teeth very well developed about 2/3 height of c1 tooth (type IV, or like IIA if worn), 4th laterals not or only slightly reduced (type I).

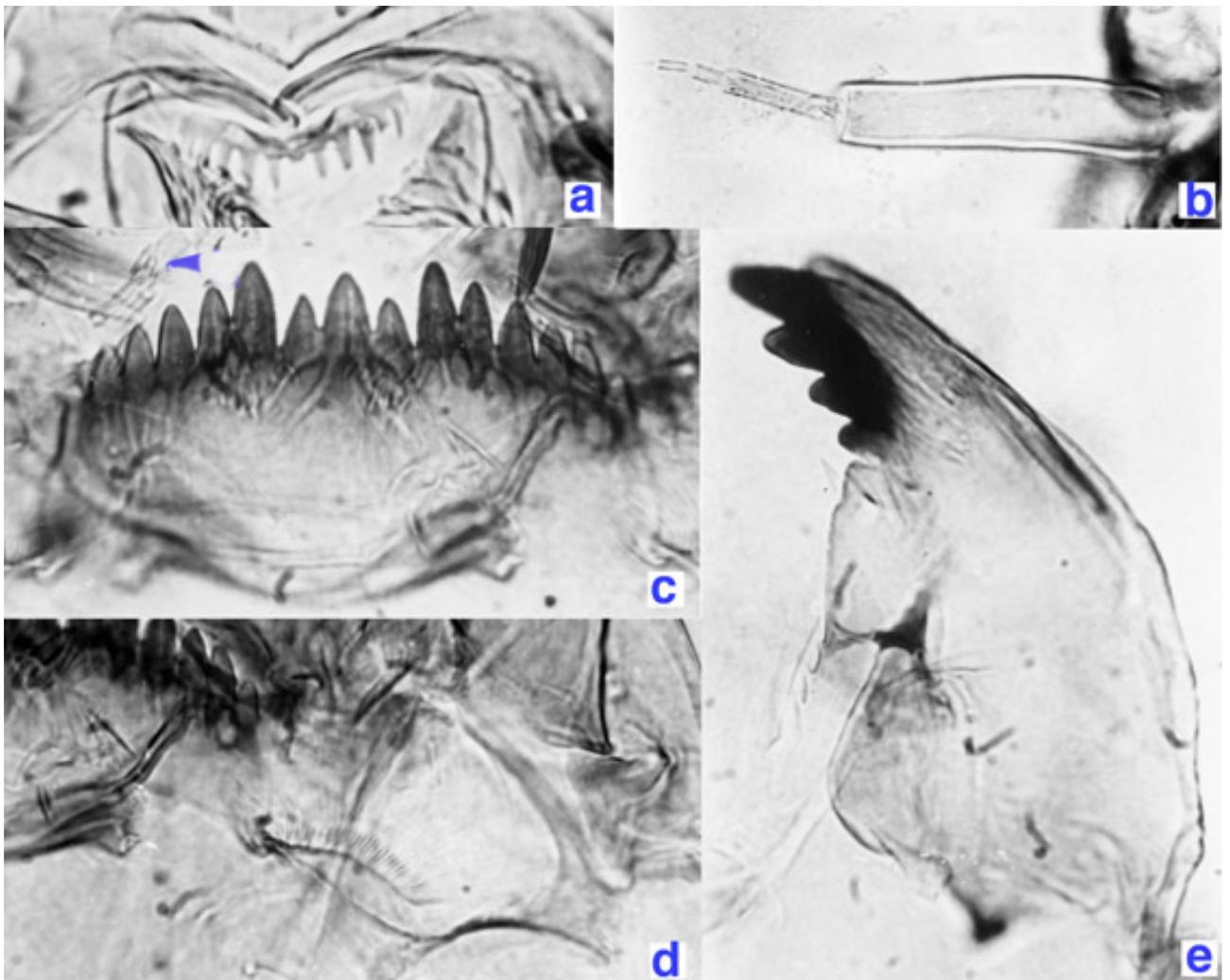
PE (Fig. a, below) with about 12-14 teeth, often irregular or short due to wear. Premandible (Fig. c, blue arrow) with outer tooth about equal length to inner tooth which is about 2-3 times as wide.

Ventromentum (Fig. d, below) with about 39-42 striae which reach just over half way to anterior margin, VMR about 0.24-0.3. Plates separated by about 0.29-0.31 of mentum width.

Antenna (Fig. b, below) with basal segment about 4.2-4.7 times longer than wide and about 3.5-3.9 times longer than A2 (i.e. A2 about 0.25-0.30 the length of A1); AR about 1.7-1.85; relative lengths of segments (micron): 154 : 41 : 11 : 13 : 8.

Width between antennal bases greater than that between the S4 setae (about a quarter to a third greater).

Mandible (Fig. e, below) with 3rd inner tooth moderately to well developed and darkened (IIB-C); about 13-17 grooves on outer surface near the base; 10-11 taeniae in the pecten mandibularis.



Mouthparts of *C. species z*

a. Pecten epipharyngis; b. Antenna; c. Mentum - note 4th lateral in line with 3rd and 5th laterals (type I), c2 teeth separate and high (type IV) and premandible (blue arrowhead); d. Ventromentum
e. Mandible - note for this specimen the 3rd inner tooth is well separated and colored (type IIIC).

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

Arm G at least partly paired, nucleolus about the center and generally 2 BRs in the paired section, one immediately adjacent to the nucleolus, other subterminal. No nucleoli in the long chromosomes. Polymorphic in arms B (complex inversion) and D.



- Arm A1: approx. 1 - 2c, 3 - 2d, 15 - 13, 9, 4 - 8, 10 - 19 i.e. Inv8-15 from *holomelas*.
 Arm B1: Puff (group 7) proximal in arm, with distal dark bands (group 8).
 ArmB2: Complex inversion begins in dark bands.
 Arm C1: typical constriction (groups 3 & 4) just distal of middle of the arm.
 Arm D1:
 ArmD2: Inversion of about 1/3 of arm, distal of the center.
 Arm E1: 1 - 3e, 10b - 3f, 10c - 13 i.e. as *aprilinus*, etc.
 Arm F1: A puff may sometimes be developed about a third from the centromere.
 Arm G1: Nucleous near center, 2BRs (as above).

Found: Ontario - Bear Creek, Carlsbad Springs, Carleton Co. (45.37, -75.47).

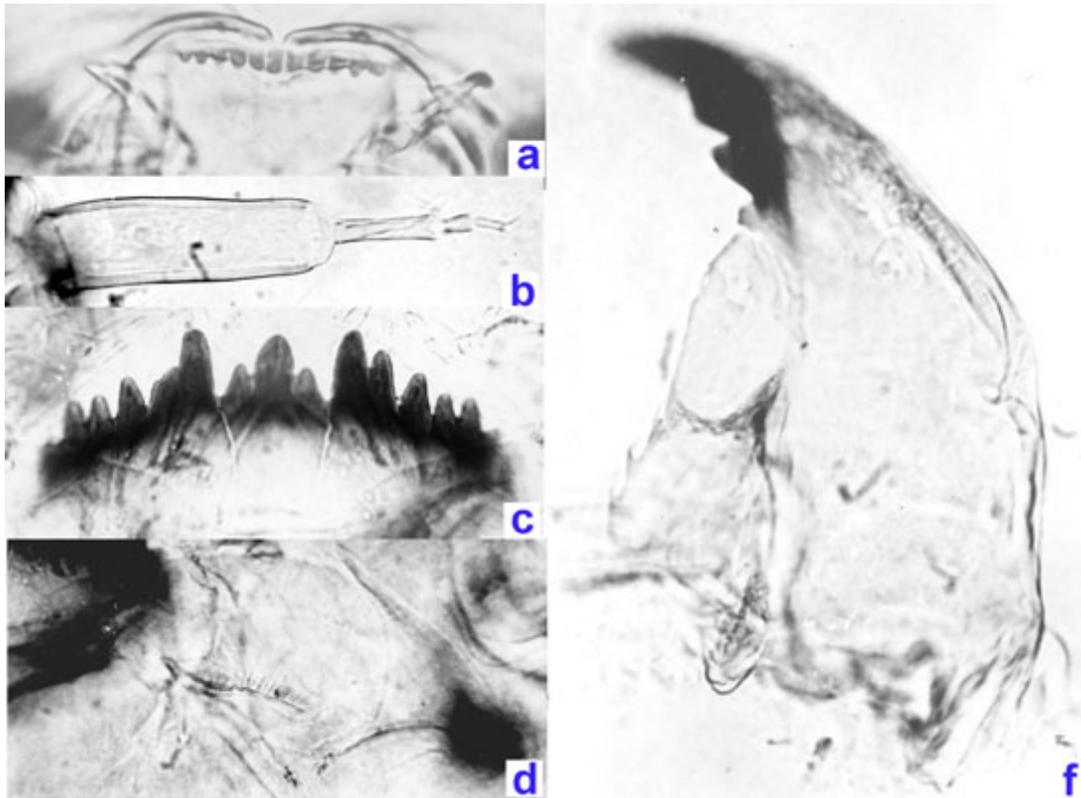
Pools in creek.

Species 2a. Possibly *C. decorus* group

Adult and Pupa not known.

Fourth instar larva a small to medium (abt. 11.5 mm) plumosus-type, VT of moderate length. AT relatively long, ventral pair longer (506 and 582 μm) 4 and 4.9 times longer than wide respectively. Gular region dark over posterior half, and a slightly darkened FC. Mentum with pointed teeth; c1 tooth fairly narrow with short almost parallel sides, c2 teeth fairly well separated (Type III). 4th laterals reduced about to level of 5th laterals (type II).

Ventromental plates separated by about 0.28 of the width of the mentum; with about 47 striae ; VMR about 0.33. PE with about 11-12 relatively broad teeth (type B). Premandible broken. Basal antennal segment about 3.6 times longer than wide, RO about 0.4 up from base of A1; AR abt 1.75; antennal proportions (μm) 125 : 39 : 12 : 13 : 8. Distance between the antennal bases about the same as the distance between the S4 setae, which are separated by about 88% of the width of the frontoclypeus. Mandible with 3rd inner tooth not completely separated and slightly darkened (type IIB); 13-15 furrows on outer surface at the base; about 13 taeniae in the PMa.



Cytology: 4 polytene chromosomes with the thummi arm combination AB, CD, EF, G. Arm G usually paired, nucleolus subterminal with a BR nearby and a further BR about one third from other end. Small nucleolus (probably usual bulb or BR of group 7) about center of arm B. Centromeres apparent but not heterochromatic. Polymorphic in A.

Arm A: Inversion covers over half the arm to within about 10 bands of the distal end.

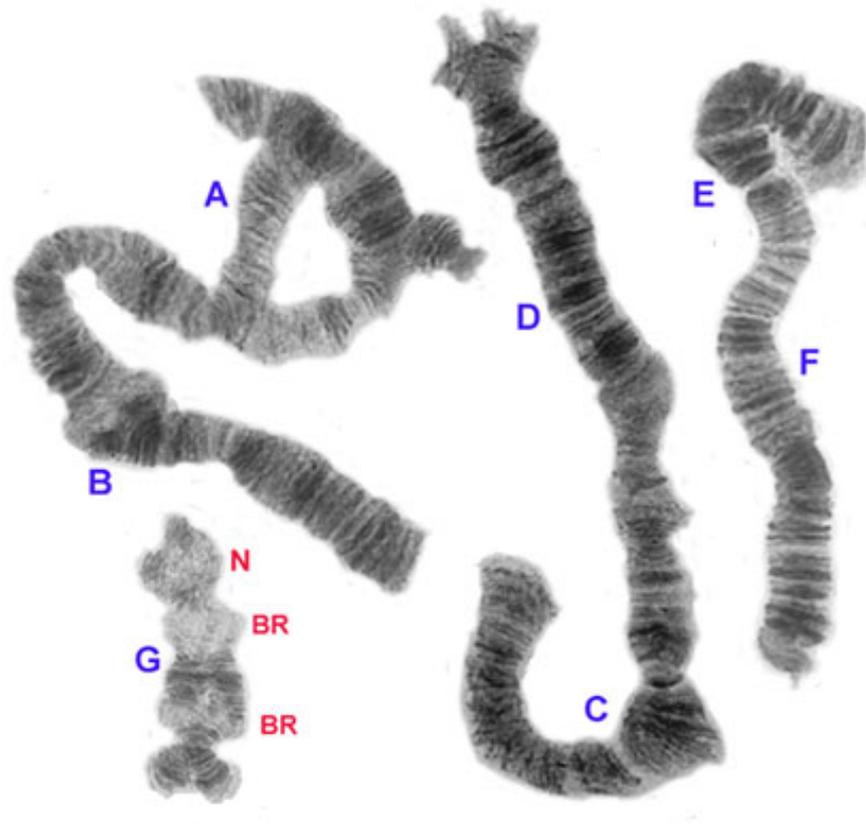
Arm B: Bulb with proximal dark bands (groups 7 & 8) near middle of the arm. Characteristic bands (21-28) near centromere.

Arm C:

Arm D:

Arm E:

Arm F: 1a-i, ???, 17 - 23.



Found: Ontario - Bear Creek, Carlsbad Springs, Carleton Co. (45.37°N, 75.47°W).

Pools in creek.

Species 2b. C. 'proulxi'

C. bifurcatus Type 2 (Proulx *et al.* 2013).

Was in BOLD Bin: [BOLD:AAW4003](#)
but BOLD operators decided to amalgamate it with the Bin containing *C. bifurcatus*,
[BOLD:AAG5453](#), although the distance graph shows two peaks

Adult:

Male

Description of a potential type male (UWI.5.2 em#8, reared male 3)

Coloration not clear as specimen had been in ethanol for 40 years. Abdomen appears to have a brown band over the anterior 2/3 of segments II-IV, heaviest in the midline, then most of segments V-VIII.

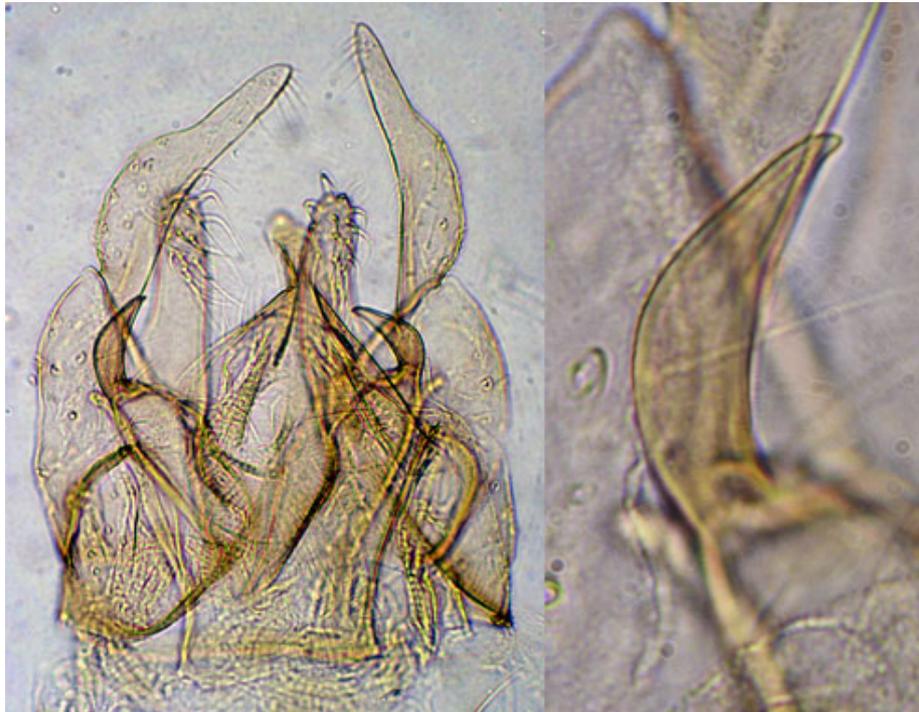
Wing length 3.36 mm, width 0.81 mm, VR 0.98; 4 SCf on brachiolum, about 34 setae on squamal fringe.

Head: AR 3.14; frontal tubercles well developed, but appearance variable: 35-45 µm long and about 2-3.5 times longer than wide; seta not visible. Palp proportions (micron) 95 : 50 : 190 : 230 : abt 300. Clypeus about 0,7 of the width of the antennal pedicel, with 32 setae.

Thoracic setae: Acrostichal 16; dorsolateral 21-25 beginning at anterior end of lateral vittae; prealar 6,7; Supra-alar 1,1; Scutellar 11 in 2 approximate anterior rows, 14, mostly larger, in posterior row.

Leg lengths and proportions (micron)

	Fe	Ti	Ta1	Ta2	Ta3
PI	1245	1200	1785	945	710
PII	1320	1265	735	420	310
PIII	1520	1550	1165	670	495
	Ta4	Ta5	LR	F/T	Ta5/Ti
PI	635	300	1.48	1.04	0.25
PII	210	150	0.58	1.05	0.12
PIII	285	190	0.75	0.98	0.12



7 setae in a single pale oval on tergite IX, SVo closest to E(g) of Strenzke (1959); IVo with simple setae. Gonostylus tapers sharply over posterior 1/3 – 3/8.

Some additional information can be provided from other males from the same egg mass, and from a male (see below) from a photograph in the BOLD database:

Coloration much as *C. bifurcatus*, but knees and anterior tarsi darkened.

Basal dark band at anterior of abdominal tergites, broader at mid-line and becoming more extensive until segs. VI-IX are almost completely dark.

Wing length 2.78-3.8 mm, width 0.68-0.9 mm, VR 0.98-1.03; 3-4 SCf on brachiolum, about 19-34 setae on squamal fringe.

Head: AR 3.14-3.5; cephalic tubercles 35-45 µm long and about 1.8-3.5 times longer than wide; seta not visible. Palp proportions (micron) 75 : 51 : 173 : 210 : abt 265. Clypeus about 0.5-0.7 of the width of the antennal pedicel, with 28-32 setae.

Thoracic setae: Acrostichal 10-16; dorsolateral 21-28 beginning at anterior end of lateral vittae; prealar 6-7; Supra-alar 1; Scutellar 11 in 2 approximate anterior rows, 14, mostly larger, in posterior row.

Approximate leg proportions (micron):

	Fe	Ti	Ta1	Ta2	Ta3
PI	1245	1205	1750	945	710
PII	1325	1265	750	445	320
PIII	1545	1590	1180	685	500
	Ta4	Ta5	LR	F/T	Ta5/Ti
PI	565	320	1.39-1.56	1.0-1.09	0.25-0.29
PII	220	165	0.58-0.62	1.03-1.07	0.12-0.15
PIII	335	195	0.72-0.76	0.93-0.99	0.10-0.13

BR 1.7-2.0

Female

Coloration essentially as in the male.

Wing length about 3.48-4.1 mm, width abt 1.02 mm; VR 1.08; abt 21 setae on squamal fringe; 3-4 SCf on brachiolum.

Antennal proportions (micron) 190 : 120 : 125 : 115 : 185; AR - 0.34; A5/A1 - 0.97.

Cephalic tubules about 28-32 μm long and about 1.4-1.6 times longer than wide. Clypeus about twice the width of the antennal pedicel, about 39 clypeal setae.

Palpal proportions (micron) 65 : 50 : 190 : 230 : 310.

Thoracic setae: Acrostichal 17; Dorsocentral 35; Prealar 6; Supraalar 1; Scutellar 15 scattered anteriorly, 14 in posterior row.

Approximate leg proportions (micron):

	Fe	Ti	Ta1	Ta2	Ta3
PI	1330	1185	1875	975	745
PII	1300	1270	765	455	305
PIII	1505	1595	1175	685	455
	Ta4	Ta5	LR	F/T	Ta4/Ti
PI	700	350	1.5-1.68	1.19	0.69
PII	225	165	0.60	0.98-1.07	0.15-0.2
PIII	290	200	0.73-0.75	0.94	0.19-0.2

BR about 1.82

3-4 setae on GpIX; 6-7 on GcVIII.

Pupa: Length of exuvia about 6.91-7.56 mm (fem. 7.56; male 6.91-7.15. Inner margin of wing case 1.38-1.57 mm. Cephalic tubules simple, those of male (111-137 μm and 1.8-2.1x longer than width at base) larger than those of female (76-83 μm and 1.2-1.4x longer than wide); seta at least 50 μm long.

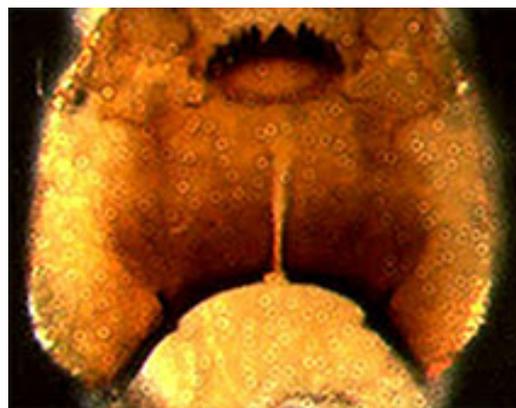
Shagreen of sharp points, strongest on posterior 2/3, but at posterior only of segment VI and not obvious on segment VII. 64-83 recurved hooks at rear of abdominal segment II, occupying about 55% of the width of the segment.

Clear PsB on segment II, and PsA on segment IV 95-185 μm long (i.e. about 0.20-0.25 of the segment length) and about 65 μm wide; that on segment V is perhaps 85% the size of that on segment IV.

Caudolateral spur with one or two spines. Swim fin with about 66-82 flattened taeniae, in 2 rows posteriorly, on each side.



Fourth instar larva a small to medium (about 11.5 (10.0-15.6 mm: fem. 10-13.3mm) melanotus-type (lateral projections only slightly developed, 0-160 μ m); VT with posterior pair usually longer (ant. 0.72-1.92; post 0.68-1.90 mm.). Anal tubules about 330-540 μ m (dorsal), 300-580 μ m (ventral), 2.5- 5 times longer than wide. Dark posterior half to two thirds of gular region, FC usually pale, but may have very slight darkening.



Gula region of *C. 'proulxi'* – courtesy of I. Proulx

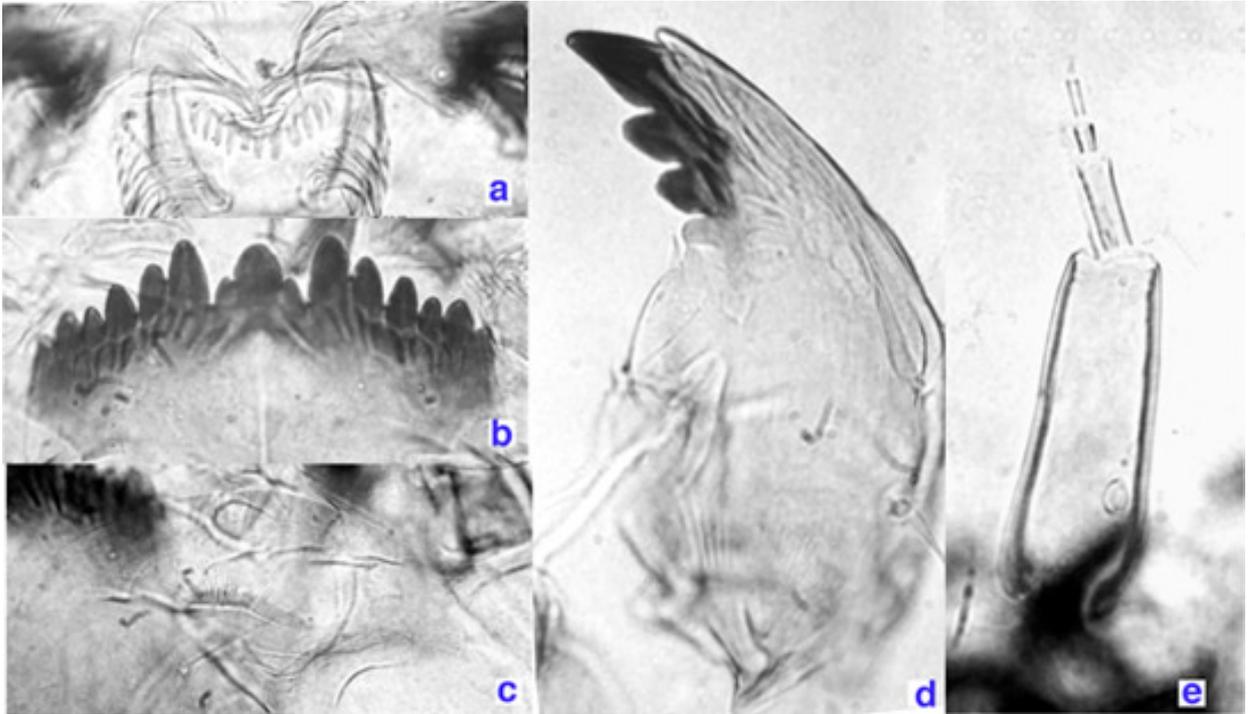
Mentum (Fig. b, below) with generally rounded teeth; c1 tooth fairly broad, c2 teeth only moderately developed, generally type III, but with wear may appear as type IB; fourth laterals usually reduced almost to level of 5th laterals.

VM (fig. c, below) with smooth anterior margin, VMR 0.26-0.45, about 44 (39-52) striae. PE (Fig. a, below) of type b with about 13 (10-14) teeth.

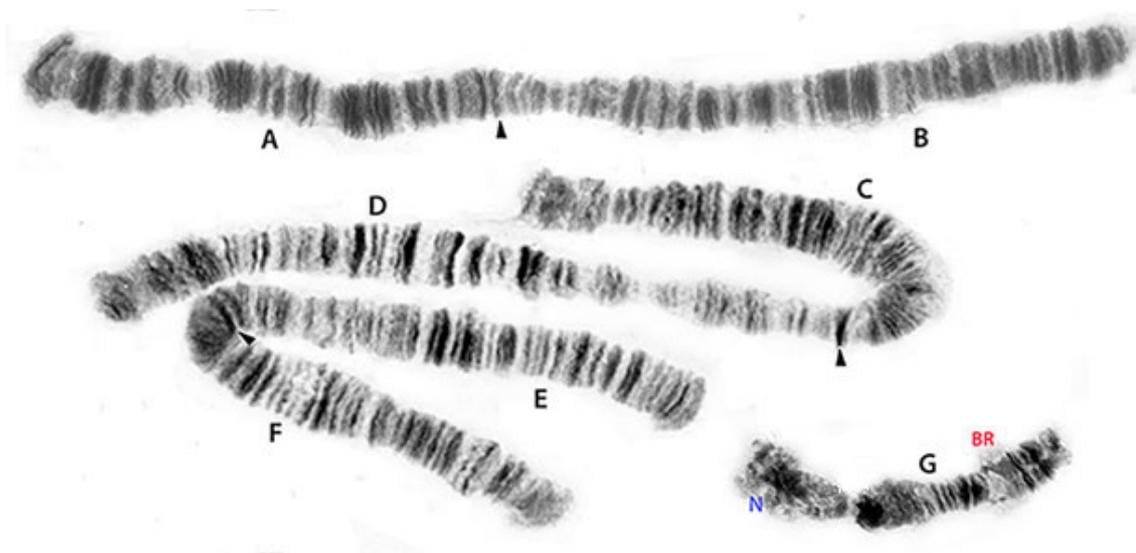
Premandible with teeth about equal or outer shorter (wear?), inner tooth about 2.3-3.1 time wider than inner tooth.

Antenna (Fig. e, below) relatively short, about a third to a half VHL; basal segment about 2.9–3.8 times as long as wide; RO a third to almost half way up (0.35-0.49) segment 1; segment proportions (microns) 126 : 29 : 8 : 12 : 5; AR 2–2.45; A3 shorter than A4 (A4/A3 abt. 1.3-1.8), but slightly longer than A5.

Mandible (Fig. d, below) with 3rd inner tooth only partially separated and pale (IA), but occasionally may be more separated or slightly darker (i.e. IB or IIA); about 17 (15-19) furrows on outer surface at the base; about 11 (9-13) taeniae in PMA.



Cytology: 4 polytene chromosomes with the thummi arm combination AB, CD, EF, G. Arm G partly paired and possibly submetacentric or with a block of heterochromatin about one third along the arm; nucleolus almost terminal on short arm, BR about one third from end of long arm and possibly another close to the nucleolus. No nucleolus on any other arm. Polymorphism in arms A, B, and F, and perhaps also G.



- prxA1 1a-e, 14a-g, 3-2d, 9-8d, 13f-a, 4c-7b, 15d-a, 14ih,17h-a 3f-i, 12-10, 2c-1f, 8c-7c, 4ab, 16a-d, 18-19 i.e. as bifA3
- prxA2: probably as bifA1
- prxB1: Puff (gp. 7) with proximal dark bands, about 1/3 from distal end. i.e. as bifB2
- prxB2: probably as bifB1
- prxC1: 1 - 6b, 12b - 15, 8 - 11c, 12a - 11d, 6gh, 17a - 16, 7d-a, 6f-c, 17b - 22 i.e. as bifC1
- prxD1: 1 - 3e, 10 - 7e, 13d - 18d, 4a-c, 13c - 11, 3gf 18e-g, 7d - 5, 19 - 24 i.e. as bifD2
- prxE1: 1 - 3e, 5 - 10b, 4 - 3f, 10c - 13 i.e. as *aberratus*, bifE1.
- prxF1: probably 1, 9 - 7, 14 - 17, 11e - 13, 11d - 10, 2 - 6, 18 - 23 i.e. as bifF1
- prxF2: small inversion a few bands distal of the characteristic bands.
- prxG1: heterochromatin block and/or a BR, about one third from end with nucleolus, and a BR about one third from other end.

Found: **British Columbia** - North Pender Island, Gulf Islands N.P. (48.781°N, 123.301°W)(BOLD); Kelowna C.S., Kelowna (49.863°N, 119.454°W)(BOLD).
New Brunswick - Kouchebougac National Park.
Ontario - abt 5 km NE Bobcayeon, Kawartha (44.57°N, 78.5°W) (BOLD); Brockville (44.589°N, 75.689°W)(BOLD); A.B.Lucas SS (43.033°N, 81.248°W) London (BOLD); 4 ml e. Sudbury (46.52°N, 80.90°W); McFarlane L. (46.42°N, 80.95°W) and Tilton L. (46.35°N, 81.07°W), Peterborough (44.271°N, 78.394°W)(BOLD); Sudbury area (Proulx *et al.*)
Prince Edward Island - Bubbling Springs Trail PEI Nat. Pk. (46.411°N, 63.093°W)(BOLD).
Quebec - L. St. Joseph (2006) (46.88°N, 71.63°W); L.Kinojévis (48.13°N, 78.90°W) (Proulx *et al.*).
Saskatchewan - Grasslands Nat. Pk. (49.001°N, 106.557°W); Prince Albert Nat. Pk., (53.85°N, 106.078°W)(both BOLD)
Oregon- Rolling Riffle Creek, e. Dexter, Lane Co. (43.90°N, 122.8°W).
Wisconsin - Greene Prairie, Arboretum (43.03°N, 89.42°W) and University Houses (43.07°N, 89.42°W), Madison, Dane Co.

Molecular sequences:

MtCOI: This species can be separated from the closely related *C. bifurcatus* at the molecular level on the basis of consistent differences at 10 base pairs:

base no.									
1	2	3	3	3	4	4	5	5	6
9	7	3	4	8	7	9	1	6	2
7	1	6	2	1	7	8	6	4	1
T A/G A C T A T T A/T C/T									

Note that 6 of these 10 sites are in the 3' part of the Barcode sequence and so will not be included in the short sequences in the BOLD database.

Lakes, pools and creeks.

While it is felt that this is a distinct species, it is difficult to give an accurate description or list of localities, since the only certain criterion at present is the *COI* Barcode, with some possible support from the cytology.

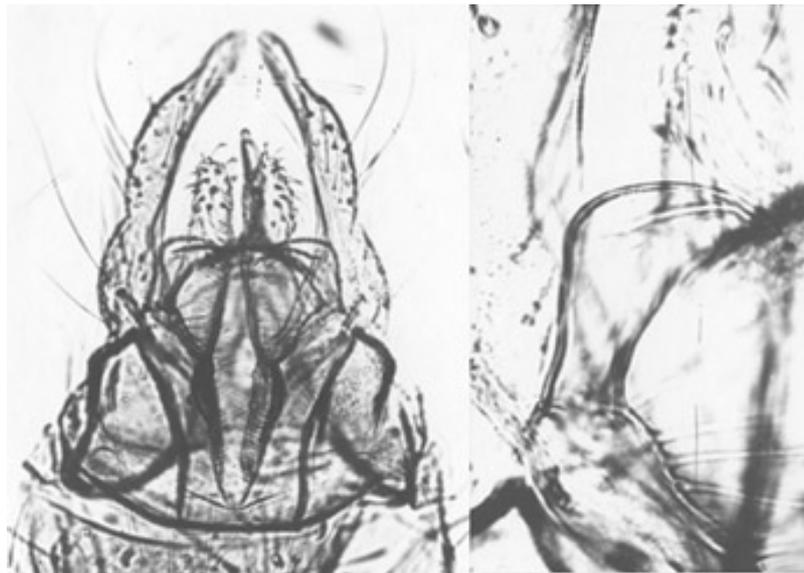
The potential type locality for this species is Madison, WI (UWI.5.2 and UWI.6.5) where reared egg mass specimens are available.

Species 2c. *C. species parariparius*

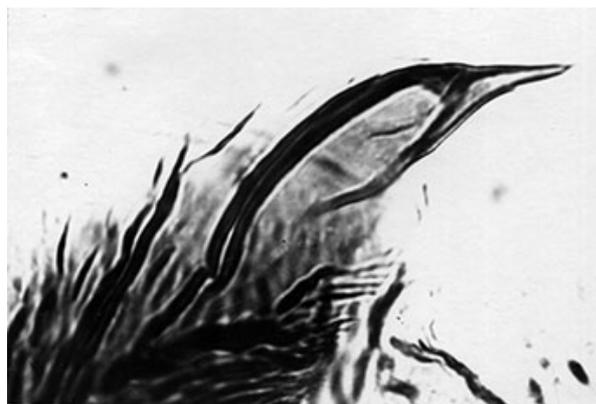
Adult:

Specimens, including rearings, in the collection of J.E. Sublette, now in the Zoological Museum of the University of Minnesota, St. Paul.

Male: Only available information is the photograph of the terminalia and superior volsella (below)



Pupa: Caudolateral spur of segment VIII with about one spine.

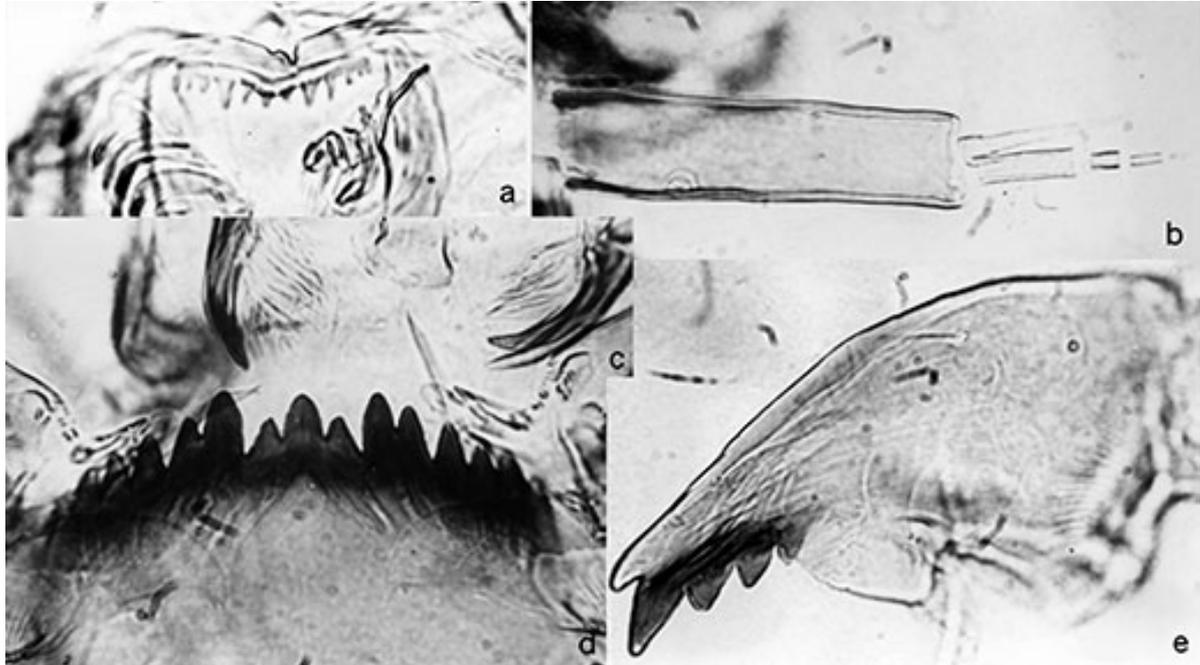


Fourth instar larva a small to medium thummi-type (Fem. 13.1-14.3 mm; Male abt 11 mm) with VT relatively short, about equal length or posterior pair longer (ant. 0.7-1.2 mm; post.0.8-1.3 mm). Gular region and FC pale or gula occasionally slightly darkened. Mentum (Fig. d, below) with generally sharp teeth; c1 tooth narrow, almost as long as first laterals, c2 teeth well formed and separated (type III); 4th laterals not reduced (type I). PE (Fig. a, below) with about 12 somewhat irregular sharp teeth. Teeth of premandible (Fig. c, below) about equal length.

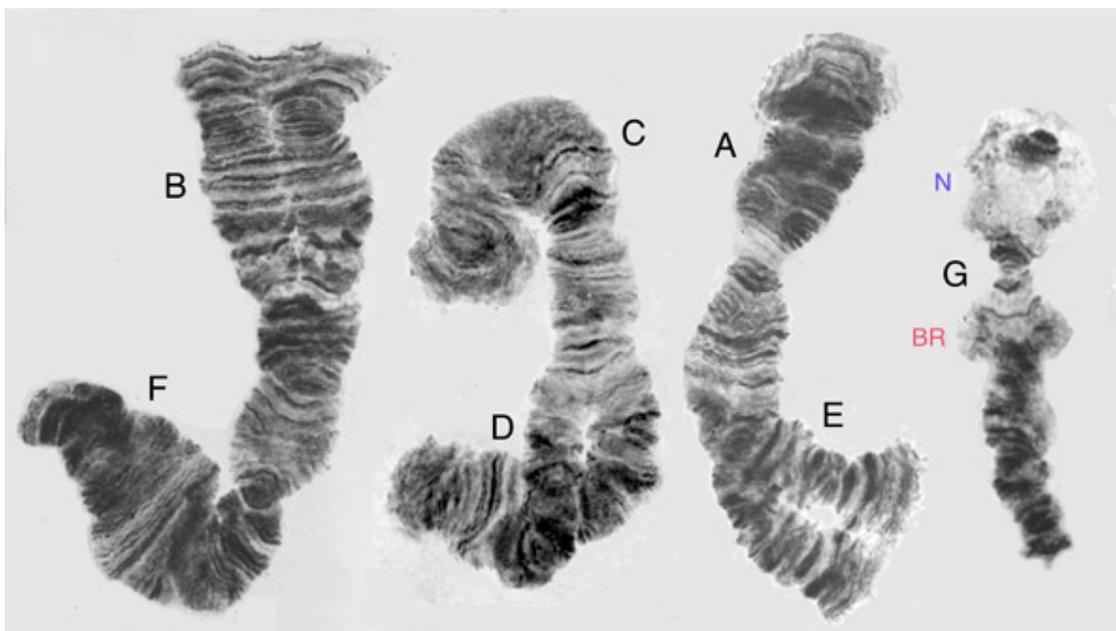
Antenna (Fig. b, below) with basal segment about 5 times longer than wide, RO about 0.4 up from base; AR about 2.

Distance between antennal bases greater than that between S4 setae.

Mandible (Fig. e, below) with 3rd inner tooth separated and darkened (type IIIB), about 14-16 grooves on outer surface near base.



Cytology: 4 polytene chromosomes with the pseudothummi arm combination AE, BF, CD, G. Chromosomes relatively short and often with sections unpaired. Arm G generally unpaired or paired at the subterminal nucleolus and nearly median BR; but occasionally fully paired as in figure. Centromere heterochromatic, arm often constricted between the nucleolus and BR. No nucleoli in the long chromosomes and centromeres not markedly heterochromatic. No polymorphism in specimens examined.



Found: Ontario - Glen Tay.

Snow melt pools.

Species 2d. *C. frommeri* Sublette & Sublette 1971

Syn. *Chironomus* species 2 - Morrow, Bath, and Anderson 1968

Chironomus species 2 - Bath and Anderson 1969

Initially attributed to Atchley and Martin 1971, but that use of the name did not constitute a valid description.

This species is a member of the *staegeri* group erected by Wülker *et al.* (1971).

In BOLD Bin: [BOLD:AAP3004](#)

However, this bin number is currently shared with *C. staegeri* and *C. "tigris"*.

Adult:

Male - Wing length 3.69 - 6.22 (5.41) mm; VR 1.00 - 1.05; AR 4.10 - 5.30 (4.66); LR 1.24. Ground color pale yellowish brown; thoracic markings dark brown, abdominal tergites with a dark central spot, particularly on segments 2 to 5.

Frontal tubercles about 44 - 82 μ m. Clypeus broad, clypeal setae - 48 - 76. Palpal proportions (segs 2 to 5) - 5 : 16 : 15 : 25.

Thoracic setae - Acrostichals in a staggered row; 28 - 76 dorsolaterals; 8 - 14 prealars; 48 - 78 scutellars.

Legs pale, some progressive darkening of tarsal segments. Fore tarsi with a sparse beard.

Leg proportions:

	Fe	Ti	Ta1	Ta2	Ta3
PI	38	39	50	27	17
PII	42	42	23	14	11
PIII	50	51	35	21	15
	Ta4	Ta5	LR	F/T	BR
PI	15	8	1.16-1.35	0.97	4
PII	7	5	0.54-0.65	1.00	
PIII	9	6	0.65-0.79	0.98	

About 9 setae near middle of 9th tergite. Superior volsella of Strenzke's E-type, closest to his figure i, but tending to a knob at the distal end.

Female – General coloration as male but with dark markings more extensive.

Wing length 6.08 mm; VR 1.05.

Antennal proportions 25 : 17 : 20 : 20 : 35. AR 0.43, A5/A1 – 1.4.

Length frontal tubercles 75 μ m. Clypeus broad, 2.2 times width of antennal pedicel. Palpal proportions (segs. 2-5): 5 : 16 : 15 : 22.

Thoracic setae: Acrostichal in one staggered row; dorsocentral – 70; prealar – abt 9; supra-alar 2; Scutellar – anteriorly abt. 60 in strewn pattern, posterior row about 40.

Leg proportions:

	Fe	Ti	Ta1	Ta2	Ta3
PI	40	40	49	25	16

PII	45	45	24	13	9
PIII	53	55	38	21	16
	Ta4	Ta5	LR	F/T	Ta5/Ti
PI	14	8	1.22	1.00	0.20
PII	6	6	0.53	1.00	0.13
PIII	9	6	0.69	0.96	0.11

Pupa: Length 9.19 - 14.0 mm (Female: about 12.9 - 14.0 mm, Male: about 9.2 - 13.3 mm).

Cephalothorax brown, abdomen pale yellowish with brown markings. Frontal tubercles short and conical, subterminal seta about 35 μ m long.

About 74 - 129 recurved spines at apex of tergite of segment II; caudolateral spur of segment VIII with 7 - 11 spines (female), 6 - 12 spines (male).

Swim fin with about 130 flattened taeniae.

Fourth instar larva a large plumosus-type (length: female - about 18.5 - 22.8 mm; male - about 17.3 - 20 mm); VHL about 290 micron (330 - 430). VT long, usually anterior pair longer (Female: Ant. 2.52 mm (2.20 - 3.00), Post. 2.15 mm (1.68 - 2.48); Male: Ant. 2.31 mm (1.84 - 2.64), Post. 1.98 mm (1.64 - 2.32)).

PLT about 300-400 μ m long. AT short and relatively cone shaped, less than 1.5 times longer than wide.

Dark to very dark posterior 2/3 gular region, slightly higher at edges, pale FC.



Mentum with pointed teeth; c1 tooth with parallel sides, c2 teeth well developed (type IIA); 4th laterals slightly reduced (type I-II).

VM plates separated by 0.32 - 0.37 of mentum width, with finely crenulated anterior margin; about 59 - 88 striae clearly visible about half way to margin, but actually extending almost to margin.

PE with about 11 - 19 teeth, larger near the center, diminishing in size laterally. Premandible with teeth about equal in length, inner tooth about 2.5 times wider than the outer tooth.

Antenna with basal segment 2.7 - 4.3 times longer than wide. At least in the Klamath Lake, Oregon population this character appears to be dimorphic, with some less than 3 times longer than wide (unless an artefact of slide mounting), others around 4 times longer than wide (4.0 - 4.3); AR

about 2.14 – 2.49; antennal proportions 148 : 38 : 8 : 12: 7; A3 shorter than A4, and usually slightly longer than A5.

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

Mandible, with small heel, with third tooth relatively distinct, but pale (type IIA), about 26 – 27 grooves on the outer surface at the base.

Identification: The larva of this species can be recognized by the combination of characters: large plumosus-type, dark gula and pale FC, about 60 - 90 striae on VM, which has a crenullated anterior margin. This does not separate it from *C. crassicaudatus* or *C. staegeri*.

Cytology: 4 polytene chromosomes with the thummi arm combination AB, CD, EF, G. Arm G closely paired with a virtually terminal nucleolus and a central BR; chromosome narrows from BR to nucleolus. Nucleolus also in arm B, just distal to the 4 characteristic bands. Inversion polymorphism in arms C, D and rarely in F.

fro A1: 1a-e, 7 - 5e, 3 - 2d, 9 - 8, 13 - 17d, 1f - 2c, 10 - 12?, 4 - 5d, 17e - 19 multiple inversion steps from homA1

fro B1: Puff with proximal dark bands (groups 7 and 8) at distal end of arm. Nucleolus about group 21.

fro C1: not clarified, typical group 3-4 about the middle of the arm.

fro C2: not clarified

fro D1: not clarified

fro D2: not clarified

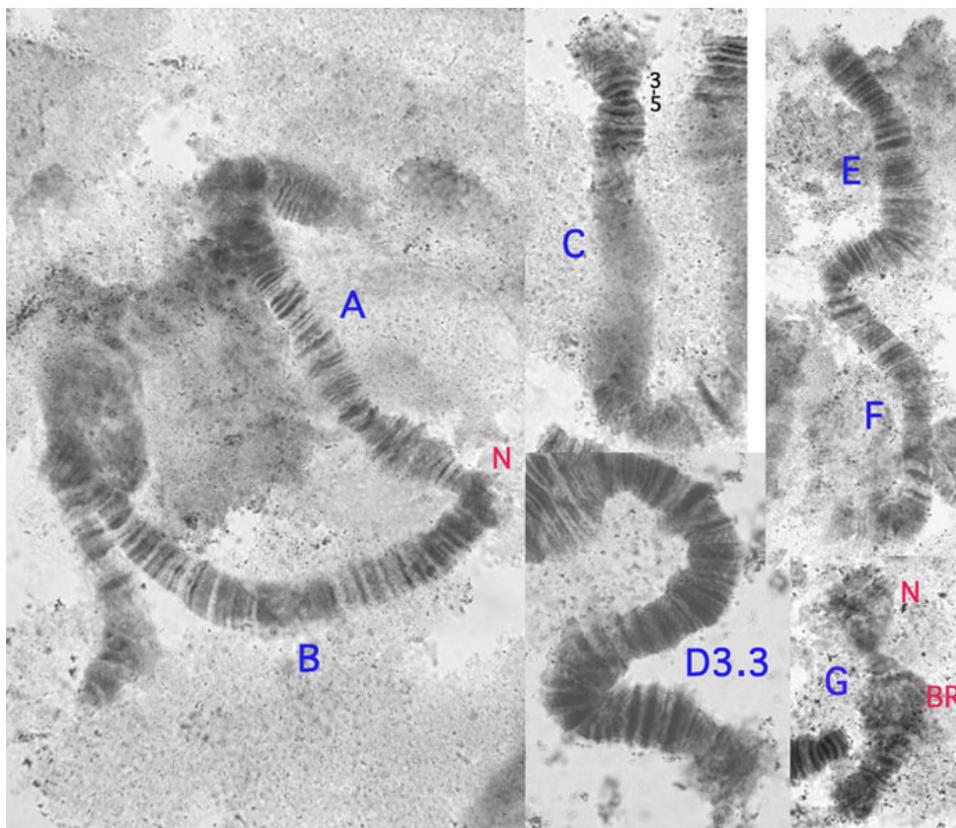
fro E1: 1 - 3a, 10b - 3f, 10c - 13

fro F1: 1 - 6a, 6d - 9, 6b-c, 17 - 10, 18 - 23

fro F2: 1 - 5, 17, 6c-b, 9 - 6d, 6a, 16 - 10, 18 - 23

froG1: virtually terminal nucleolus and median BR

i.e. as *aprilinus*, etc.
by transp. 6bc from *obtusidens*



Found: **Quebec** - near Trois-Rivières.
California - Antioch, Contra Costa Co.: 4 ml e. Olive, Los Angeles Co.; O’Neil Forebay and San Luis Reservoir, Merced Co.; Lake Crowley, Bishop, Mono Co., Greenfield, Monterey Co.; 1 ml s. Napa, Napa Co.; **Lake Elsinore, Riverside Co.** (type locality); Lake Merced, San Francisco Co.; San Mateo Co.; Lake Dalwigk, Vallejo, Solano Co.
Oregon - Upper Klamath Lake, 1 ml n. Williamson River (42.47°N, 121.57°W); Smith Loop Road, 7 ml. s. Corvallis (44.50°N, 123.25°W).

Lakes, oxbows and permanent ponds.

The morphology and cytology have been described by Wülker *et al.* (1971). Sublette & Sublette originally designated the species authors as Atchley and Martin, 1971, but Spies (2000) designated a lectotype and changed the author designation.

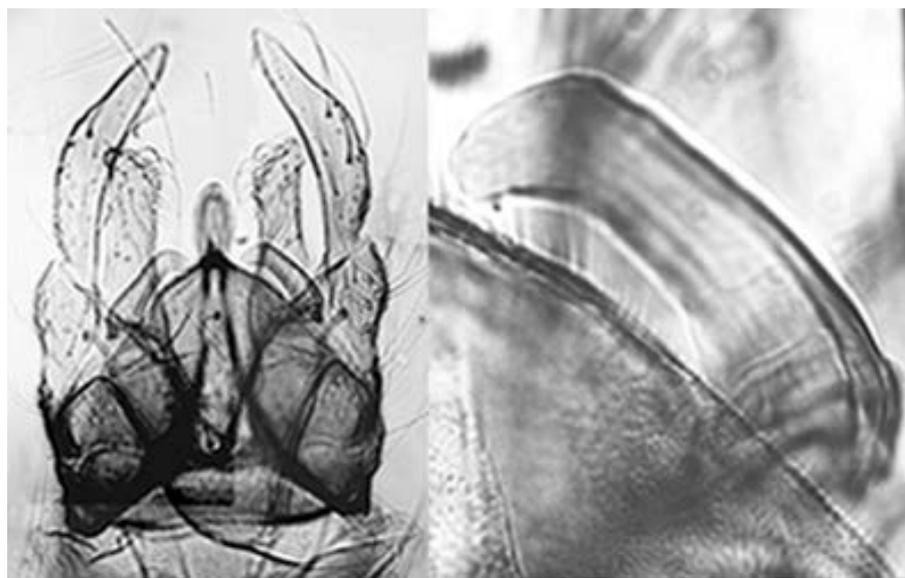
Molecular

Locality	# specimens	base no.
		1 4 5 5 5 6 6 9 5 6 7 8 0 4 7 5 1 3 8 9 5
C.frommeri	2	T G G T T T T
C.staegeri	7	C A T/G C C C C
C.‘tigris’	4	C A T C C C C

Species 2e. *C. (Lobochironomus) ?nr. austini*

Adult:

The adults and rearings of this species are in the collection of James E. Sublette, now in the Museum of the University of Minnesota, St. Paul, MN.



Male hypopygium (left) and superior volsella (right) of *C (Lobochironomus) ?nr. austini*

Pupa:

The caudolateral spurs on segment VIII have one major spine and one or two smaller ones flanking it.



Caudolateral spur of *C (Lobochironomus) ?nr. austini*

Fourth instar larva a small thummi-type (length, fem. 10.1-13.5 mm; male abt 9.5 mm); posterior pair of VT usually longer (ant 0.69-1.02 mm; post. 0.82-1.19 mm). AT about 4 times longer than wide, ventral pair thicker. Gula and FC pale.

Mentum (Fig. d, below) with somewhat rounded teeth; c1 tooth relatively narrow and rounded, c2 teeth well separated and quite tall (type IV), 4th laterals sometimes slightly reduced (type I-II).

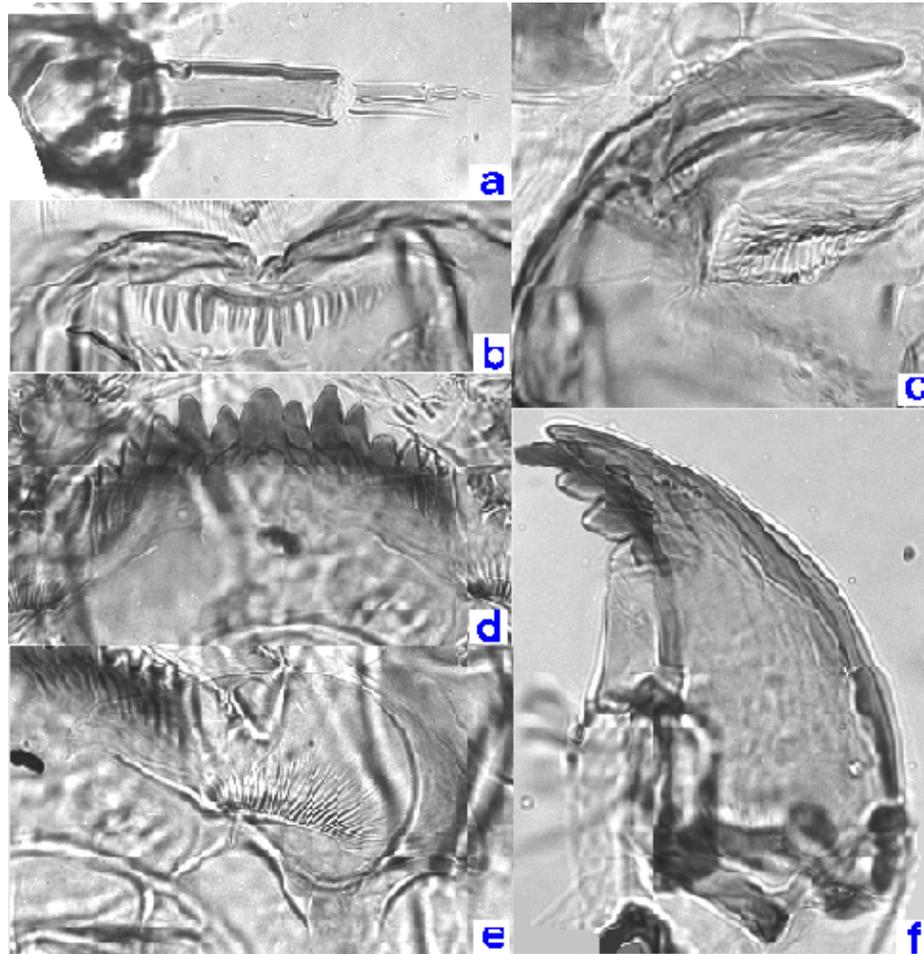
VM (Fig. e, below) with about 39-41 striae reaching about half way to margin. PE (Fig. b, below) with 20-23 teeth, including many small teeth.

Premandible (Fig. c, below) with both teeth equally long, inner tooth half to as wide again as the outer tooth.

Antenna (Fig. a, below) with basal segment over 4.0 times wider than long, RO about 40-50% of way up from base; AR about 1.85; 3rd segment longer than 4th or 5th segment; segment proportions (microns): 145 : 37 : 15 : 13 : 9.

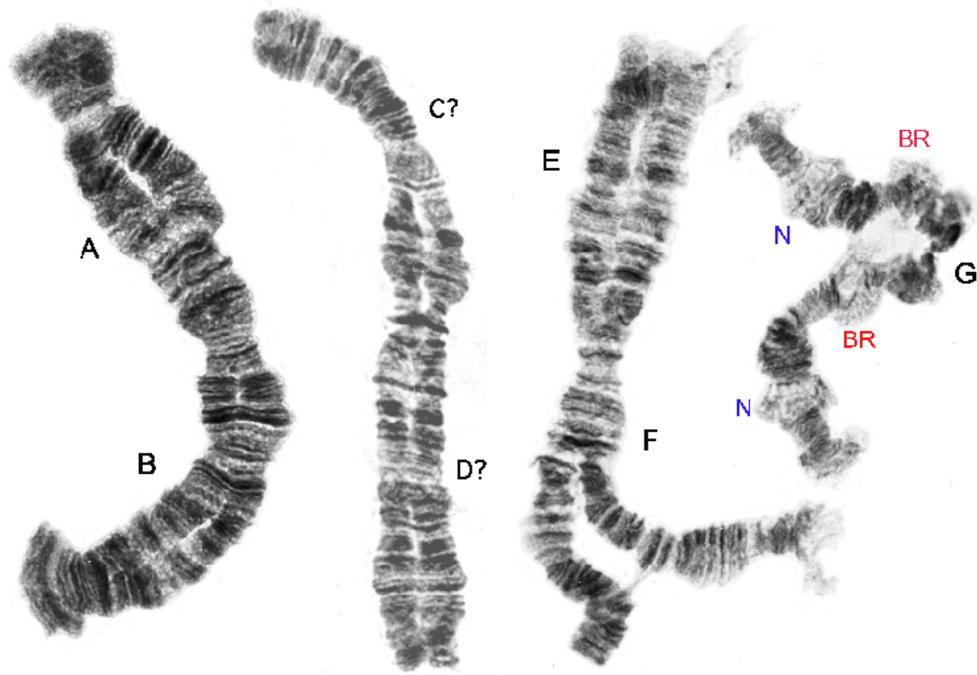
Distance between antennal bases greater than that between S4 setae.

Mandible (Fig. f, below) with third inner tooth poorly to moderately separated and with some coloration (type I-IIA-B); about 16-18 furrows on outer surface at base and 13 taeniae in PMA.



Larval mouthparts of *C. (Lobochironomus) ?nr. austini*

Cytology: 4 polytene chromosomes with the thummi arm combination AB, CD, EF, G. Keyl pattern difficult to distinguish because of lack of pairing in many areas.
 Arm G unpaired with a subterminal nucleolus and a BR near the other end. No nucleoli in the long chromosomes. Polymorphism in arms B and F.
 Arm A1:
 Arm B1: No obvious puff/BR.
 Arm B2: Small inversion in distal third of arm.
 Arm C1: Band groups 2-4 not readily obvious
 Arm D1:
 Arm E1:
 Arm F1:
 Arm F2: differs from F1 by simple inversion about one third from distal end
 Arm F3: differs from F1 by a complex inversion of distal third of arm



Polytene chromosome complement of *C. species 2e*.

Found: Ontario - 2 ml e. Morven (44.24°N, 76.84°W).

Pool with thick leaves and some algal growth.

The larval characters of this species correspond relatively well with Epler’s (2001) description of *C. (Lobo.) austini*, but the adult has a much more robust SVo.

Species 2f. *C. whitseli* Subl. & Subl., 1974

This species is in BOLD Bin: [BOLD:AAJ4143](https://www.boldsystems.org/#AAJ4143)

Adult

Male:

Wing length 2.62 - 3.77 mm; width about 0.89 mm; VR about 1.05.

AR 2.75 - 3.41; frontal tubercles present about 23 µm.

Clypeal setae - 18 - 38.

Palpal proportions (segs. 2 - 5): 5 : 30 : 32 : 43.

Thorax – Mesonotum with a low median tubercle. Acrostichals in a single staggered row; Dorsolaterals in a partial double row; Prealar – 5-7; Scutellar anteriorly with about 8 smaller setae in a strewn pattern, posterior transverse row of about 16 setae.

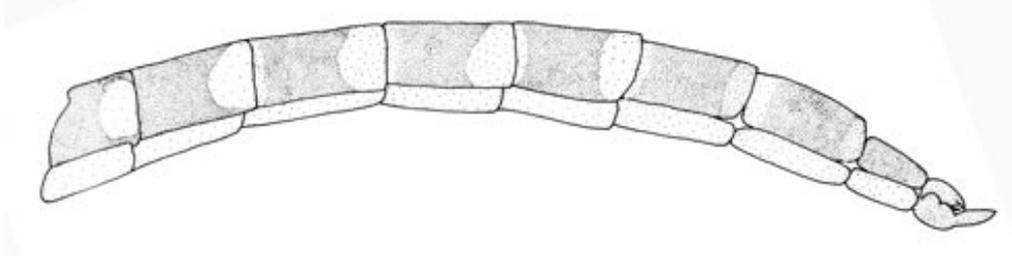
LRI 1.42 - 1.67; LR II 0.58 - 0.62; LIII 0.70 - 0.76.

Leg proportions:

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/Ti	Ta5/Ti
Fore	890	830	1190	650	480	390	170	1.42-1.67	1.07	0.20

Mid	950	870	550	320	250	180	100	0.58-0.62	1.09
Hind	1070	1130	820	400	350	210	120	0.70-0.76	0.95

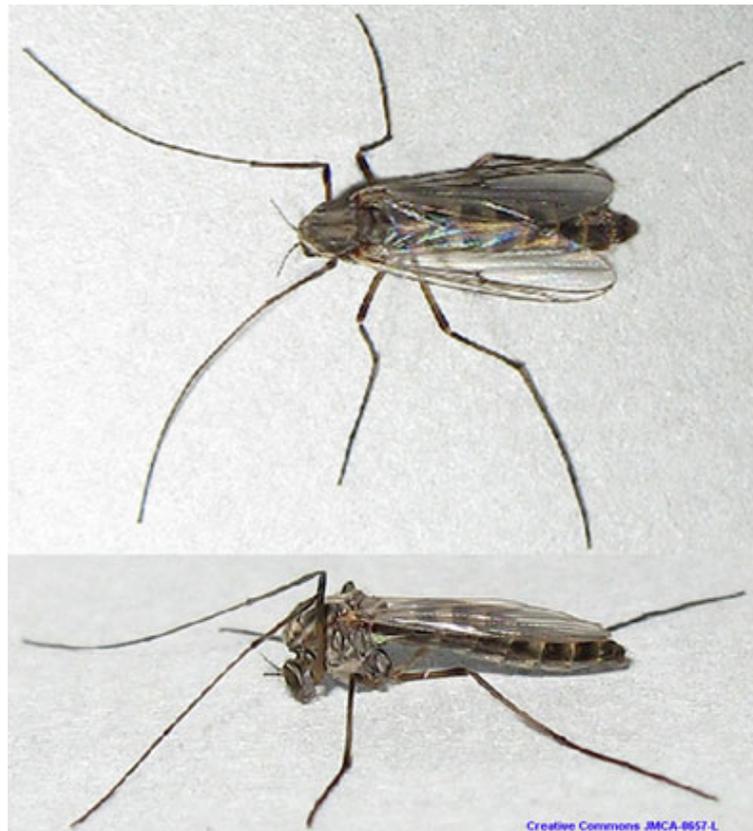
Abdominal segments with broad basal fasciae which extend all the way to the base of most terga.



From Sublette & Sublette 1974

Tergite IX with 4-11 setae. Setae of the IVo with small branches.

Female:



Wing length 3.77 mm; VR – 1.06. LR – 1.53-1.67.

Head – frontal tubercles about 410 µm.

Antennal proportions: 13 : 15 : 13 : 22. Palpal proportions (segs 2-5): 7 : 25 : 33 : 49.

Clypeus with 30 setae.

Thorax - Mesonotum with conspicuous median tubercle. Setae: Acrostichals in staggered row; Dorsocentrals – 33; Prealar – 6, Supra-alar - 1; Scutellar anteriorly with 14 smaller setae in random pattern, posterior transverse row of about 16 setae.

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/Ti	Ta4/Ti
Fore	900	780	1300	620	500	420	200	1.53-1.67	1.15	0.53
Mid	930	850	530	300	200	150	100	0.62	1.09	0.18
Hind	1000	1070	800	470	330	200	120	0.75	0.93	0.19

Pupa: Cephalothorax blackish; abdomen infuscate with marginal markings and swim fin blackish. Total length 6.13 - 8.44 mm (males). 65 - 74 recurved hooks on second tergum. Spurs highly variable with from 1- 6 spines, usually more than two. Swim fin with 57 - 85 flattened taeniae.

Fourth instar larva a small to medium (female 10.7 - 14.2 mm). thummi or plumosus-type (i.e. some with PLT up to about 50 µm long); posterior pair of VT usually longer. Gular region and FC pale.

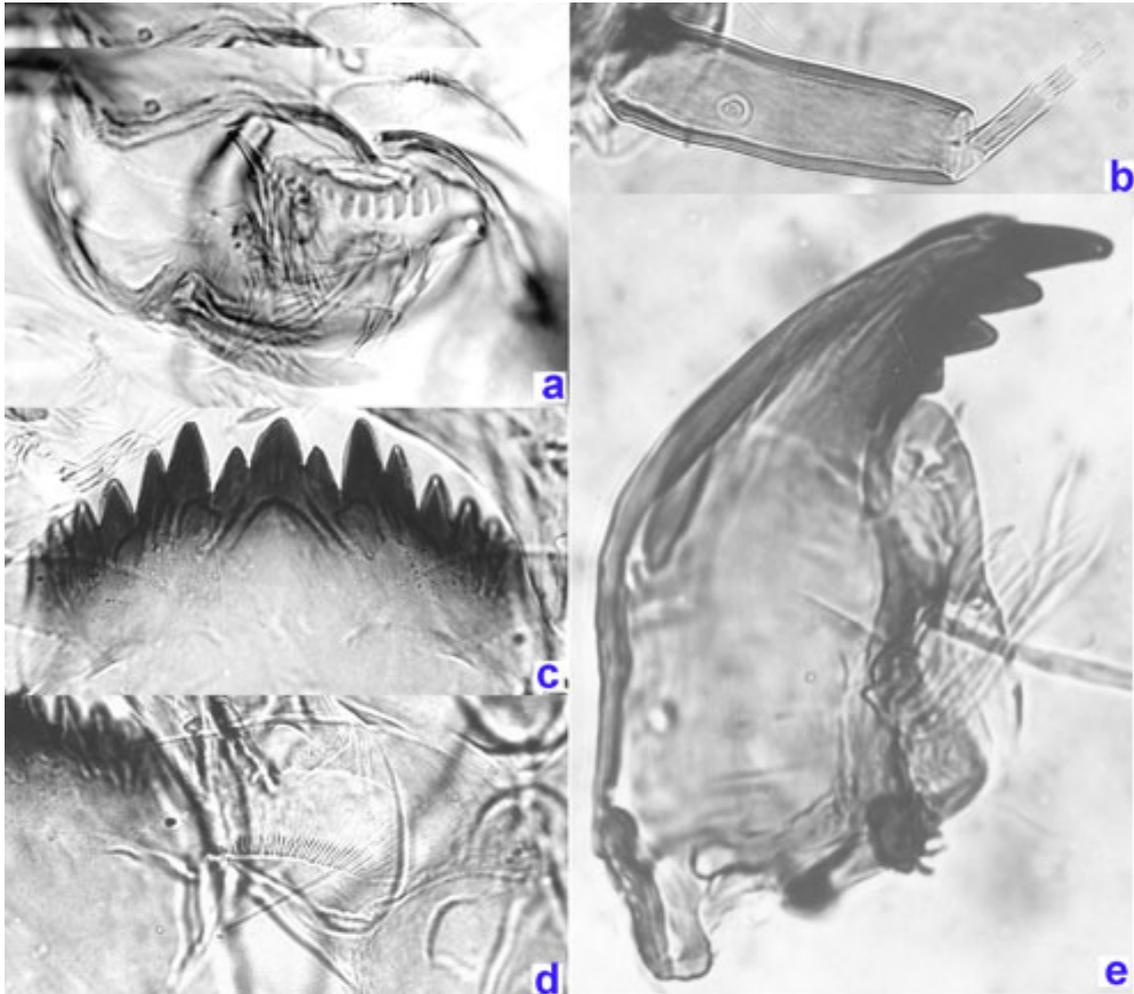
Mentum (Fig. c, below) with pointed teeth; c1 tooth tall and relatively narrow, c2 teeth well separated (type III) ; 4th laterals slightly reduced (type II).

VM (Fig. d, below) with smooth outer margin; about 37 striae, VMR about 0.29. PE (Fig. a, below) with 11-17 relatively broad, sharp teeth (type C).

Premandible with outer tooth slightly shorter

Antenna (Fig. b, below) with basal segment about 3.3 times longer than wide and about 3.3 times longer than segment 2; Ring organ about 1/3 to 1/2 way up from base; AR about 1.7.

Mandible (Fig. e, below) with 3rd inner tooth well developed and darkened (type IIIC).



Cytology: 4 polytene chromosomes with the matus arm combination AF, BE, CD, G. Arm G normally paired except in the area of the virtually terminal nucleolus; two BRs whose position varies due to inversion polymorphism. No nucleoli in the long chromosomes. Inversion polymorphism in arms B, C, D and G.

whiA1: 1a-e, 2d-3, 12-10, 2c-1f, 9-4, 15-13, 16-19 i.e. as *maturus* A2

whiB1: Puff with distal dark bands near the end of arm, but further from end than in *maturus*

whiC1: 1-6b, 11c-8, 15-11d, 17a-16, 7-6c, 17b-22 i.e. as *aberratus*, *picicornis*, *tenuistylus*, etc.

whiC2: 1-2b, 11bc, 6b-2c, 11a-8, 15-11d, 17a-16, 7-6c, 17b-22

whiD1: 1-3g, 11-18d, 7-4, 10-8, 18g-24

whiE1: 1 - 3e, 10b - 3f, 10c - 13

i.e. as *frommeri*, *aprilinus*, etc.

whiF1: 1 - 2, 15e - 12d, 8 - 3, 9 - 12c, 15f - 23

Found: British Columbia

California - horse trough, Santa Clara Co. (**Type locality**); Berkeley, Alameda Co.; 2 ml n. Lafayette, Kensington (37.906°N, 122.274°W), 1 ml s. Martinez and Wildcat Creek, El Cerrito, Contra Costa Co.; Pico Rivera, Los Angeles Co., 12 ml ne. El Portal, Mariposa Co.; 6274 Western, Arlington, Experimental Ponds UCR and 448 N. Orange St., both Riverside, all Riverside Co.; Truckee River nr. Tahoe City (39.172°N, 120.138°W), Placer Co.; 5 ml n. Vacaville (38.71°N, 121.98°W) Solano Co.

Pools and shallow flowing parts of creeks and rivers. The sample from near Vacaville was in sulphurous water.

Morphology described by Sublette and Sublette (1974), cytology by Wülker and Martin (1974), pattern of arm C1 in Wülker (1991) and of arm D1 in Kiknadze *et al.* (2004).

Species 2g. *C. "butleri"*

This species is named for Malcolm G. Butler who published a karyotype photograph

C. decorus group species 2 of Butler *et al.* 1995

In BOLD Bin: [BOLD:AAB7030](https://www.boldsystems.org/index.php/Taxonomy/req/show_record?id=AAB7030)

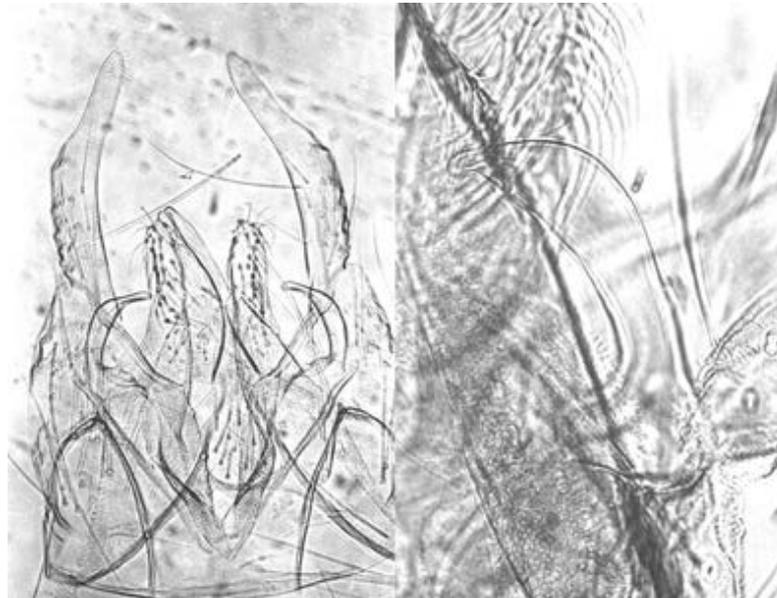
Adult:

Male (based on Mississippi specimen):

Wing length: 4.0 mm. Wing width: 0.96 mm. VR 1.0.

Antennal ratio: 3.01. Frontal tubercles developed, about 56-58 micron.

Setae: Clypeal - 28; Acrostichal - 29; Prealar - 7; Scutellar: anterior - 23; posterior - 18.



Male terminalia of *C. 'butleri'*
A typical *C. decorus*-type hypopygium.

Legs with darkening of the joints of the anterior tarsus and tibia.

Leg lengths (in microns) and proportions as below:

	Fe	Ti	Ta1	Ta2	Ta3
PI	1490	1450	2050	1065	800
PII	1585	1440	920	510	360
PIII	1661	1694	1199	653	510
	Ta4	Ta5	LR	F/T	BR
PI	680	325	1.39	1.03	3.0
PII	270	190	0.64	1.10	
PIII	300	188	0.77	1.01	

Note that for PI, Ta4 is shorter than Ta3 (about 85%).

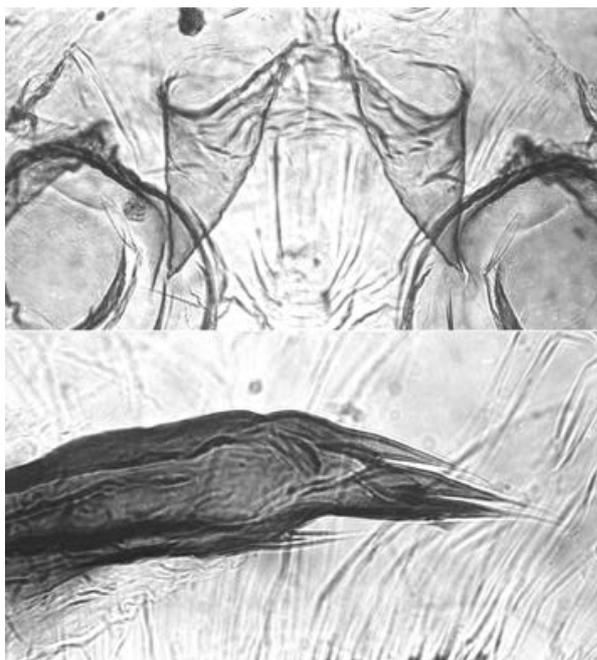
Abdomen: with saddle spots, about 10 setae on 9th tergite. SVo generally of the D-type, but some specimens tend to that of *C. cingulatus*, which Strenzke (1959) classes as an E-type. Setae on Svo forked.

Female (based on Mississippi specimen)

	Fe	Ti	Ta1	Ta2	Ta3
PI	1390	1290	-	-	-
PII	1620	1490	860	430	340
PIII	1730	1750	1280	740	580
	Ta4	Ta5	LR	F/T	BR
PI	-	365	-	1.08	1.5
PII	235	180	0.58	1.09	
PIII	320	210	0.73	0.99	

Pupa: Female abt. 9.5 mm, male about 9.75 mm. in length. Cephalic tubercles large, but no secondary tubercles.

Caudolateral spur of segment VIII with about 4 - 9 closely applied spines, some arising lower than the head of the spur.



Pupal cephalic tubercles (above) and spur (below) of *C. 'butleri'*
Note the simple tubercles without any secondary tubercles.

Fourth instar larva a medium sized bathophilus-type, but sometimes a melanotus-type with PLT to about 240 μm long) (length abt. 9.5 - 20 mm, female; 12.5 - 17.5 mm, male); VT may be of fluviatilis-type, with anterior pair usually slightly longer (ant. 0.80- 1.7 mm; post. 0.84 - 1.5 mm). AT about 340 – 600 μm long and about 3 times longer than wide, ventral pair may be thicker (about 2.5 times longer than wide).

Over 2/3 of gular region dark and extending higher at the edges than in the midline, and FC pale.



Frontoclypeus and gular region of *C. 'butler'*. Photos courtesy of I. Proulx

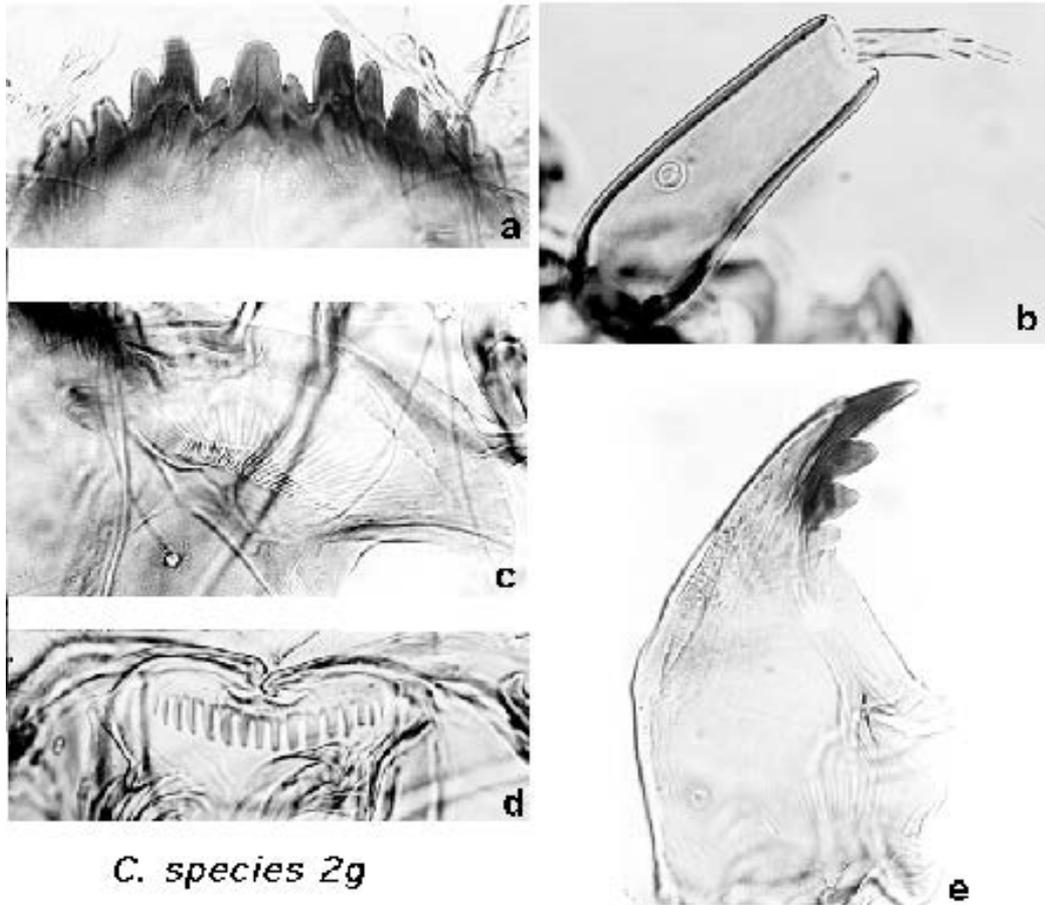
Mentum (a, below) with somewhat rounded teeth; c1 tooth tall and relatively broad, c2 teeth moderately well developed (type III, or IIB if worn) ; 4th lateral reduced to about level of 5th lateral (type II), although Hilsenhoff & Narf (1968) suggest the 5th laterals are raised, 6th laterals generally arising below the level of other teeth.

Ventromental plates (c, below) separated by about a third to a half of the mentum width, with about 32-41 striae. PE (d, below) with about 13-17 relatively blunt teeth (type C), lateral teeth smaller and narrower. Premandible with inner tooth long and tapering to a relatively fine tip, inner tooth 2.5 to 3.5 times wider.

Basal segment of antenna (b, below) about 2.9-3.5 times as long as wide, fourth segment almost twice the length of segment 3; AR 2.3 - 2.6; relative length of segments (micron): 143 : 29 : 8 : 11 : 7.

Distance between antennal bases greater than distance between S4 setae.

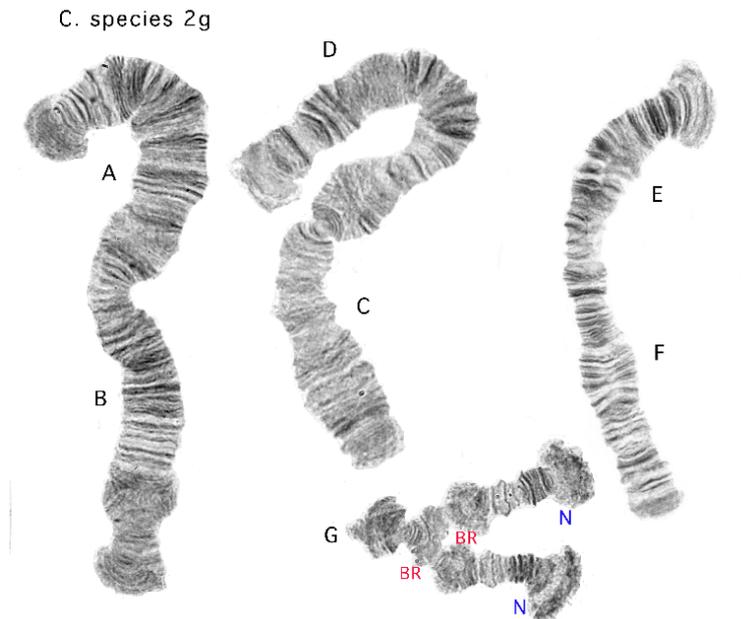
Mandible (e, below) of type IIA or B and with about 14-22 grooves on the outer surface near the base.



Cytology: 4 polytene chromosomes with the thummi arm combination AB, CD, EF, G; centromeres not heterochromatic.

Arm G usually paired only at the end away from the virtually terminal nucleolus; 2 BRs developed—one near the middle, the other near the other end of the arm. No nucleoli in the long chromosomes. Polymorphism in arms A, B, C, F and G - polymorphism may be higher in populations in the northeast.

butA1:	1a-e, 7c - 4c, 3i-f, 17a-h, 12 - 10, 2c - 1f, 15a - 16d, 3e-a, 14 - 13, 4ab, 2k-d, 9 - 7d, 18 - 19	(Kiknadze)
butA2:	Simple inversion.	
butB1:	Puff near distal end of arm, with dark bands proximal (groups 5 and 4).	
butB2:	Complex inversion Dark bands distal to puff (groups 4 and 5).	
butC1:	1a-e, 3c-2f, 4a-6b, 12b-14c, 12a-11d, 6gh, 17a-16, 7d-a, 6f-c, 17b-18, 15-14d, 1f-2e, 8-11c, 19-22	(Kiknadze)
butC2:	Inversion of about half the arm towards distal end.	
butD1:	1-3e, 17-18d, 14f-10d, 14g-16, 21-18e, 10c-a, 7d-3f, 9-7e, 22-24	(Kiknadze)
butE1:	1 - 3e, 10g-c, 3f - 4, 10b - 5a, 11 - 13	inv from bifE1
butF1:	1a-i, 9 - 2, 13c - 17, 10 - 11d, 13b - 11e, 18 - 23	inv from bifF1
butF2:	Inversion of about 1/3 of arm distal to center.	
butG1:	Virtually terminal N, central and distal BR	
butG2:		



Found: **Quebec** -St. Charles River (46.82°N, 71.22°W), Quebec City; Lake Adéline (48.20 °N, 79.17°W), Lake Dufault (48.28 °N, -9.00°W), Lake Duprat (48.33 °N, 79.12°W), Lake Fortune (48.18 °N, 79. 32°W), Lake Opatatica (48.17 °N, 79.33°W), all Rowyn-Noranda.
Saskatchewan - Lake Waskesiu (53.92 °N, 106.08°W), Prince Alfred National Park.
California - ♂ Lake Davis.
Indiana - ♂ Crooked Lake, Angola; Lake Oneotta, Marinette(?); Shafer Lake.
Kansas - Lone Star Lake (38.83 °N, 95.38°W), Natural History Reserve, University of Kansas (39.00°N, 95.42°W), both Douglas County.
Massachusetts - Connecticut R., Northfield (42.691 °N, 72.452°W), Franklin Co. and Northampton (42.322 °N, 72.638), Hampshire Co.
Michigan - Saginaw Bay (43.75 °N, 83.67°W), Lake Michigan.
Minnesota - Lake Christina (45.08°N, 95.75°W), Douglas Co.
Mississippi - Belzoni (33.17 °N, -90.67°W), Humphreys Co.; Jackson (32.50 °N, 90.33°W), Hinds Co.
New Mexico - Springer Lake, Colfax Co.; Frio Draw and Weber City cut-off, Curry Co.; Canadian River and Ute Lake, Quay Co.
North Dakota - Kota Ray Dam, Williams Co.; Lake Williams, Kidder Co.
Texas? - Quaker Street Plaza, Lubbock.
Vermont - White River (43.80 °N, 72.45°W), nr. Sharon, Windsor Co.
Wisconsin - Booth Lake; Friebauer Lake, Bayfield Co.; Lake Oneonta, Marinette Co.; Lake Pepin, Pepin Co.; Pine Lake, Oneida Co.; Booth Lake, Walworth Co.
 Also occurs in **Brazil**.

Found mostly in depths to over 10m in lakes.

This is the *C. attenuatus* of Hilsenhoff and Narf (1968) and *C. decorus*-group species 2 of Butler *et al.* (1995) who provide a karyotype photograph.

Species 2h. *C. (Chaetolabis) bitumineus* Langton & Vallenduuk, 2013
Chironomus (Chaetolabis) macani – misidentification by Wiederholm (1979)

Adult:

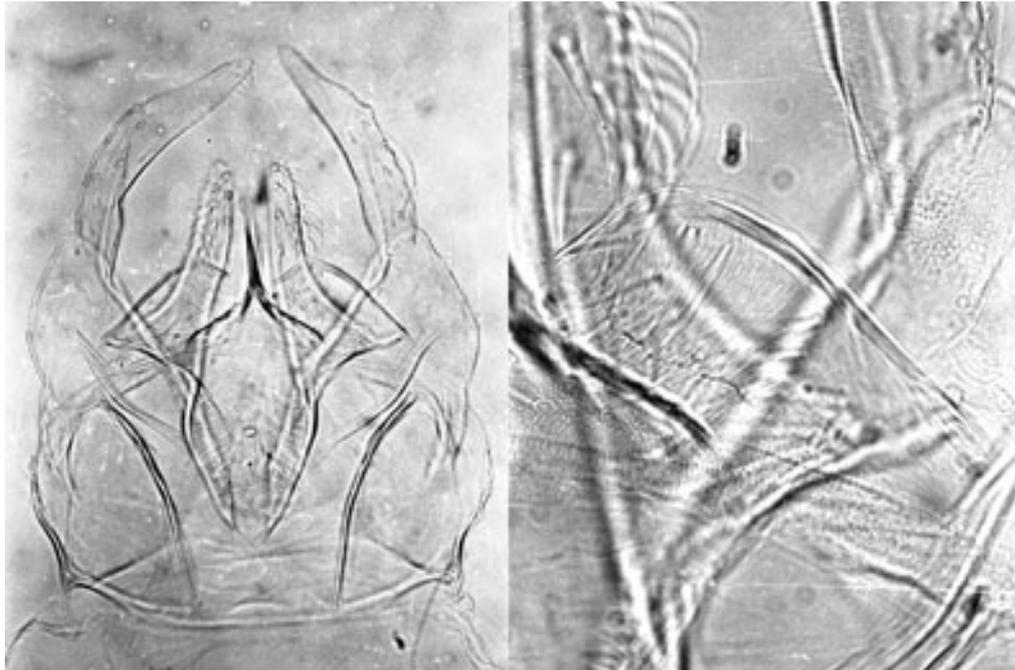
Adult male and female originally described by Wiederholm (1979) as *C. macani*. Several reared males from Ontario are either in the Sublette Collection at the University of Minnesota, or in the Canadian National Collection of Insects.

Based on the Wiederholm description, the following points can be made:

Male:

Dark species. AR 4.72 (4.61-4.86). Wing length 4.1 (3.9-4.3) mm. LR 1.38 (1.34-1.43); tarsi with a thin beard, easily broken off.

Frontal tubercles 11-14 μm long; Palp proportions (segs 2-5, μm) 86 : 315 : 291 : 350.



Male hypopygium (left) and superior volsella (right) of *Chaetolabis bitumineus*.

Anal point narrow, SVo broad with a strongly sclerotized hook, largely covered with microtrichia; setae of IVo appear to be simple. Tergite IX with 17 (14-20) setae in lighter fields. GS narrowing in the distal third.

Female:

Dark as male.

Wing length 4.6 (4.4-4.7) mm. LR 1.42 (1.39-1.47).

Antennal segment lengths (μm): 208 : 137 : 146 : 123 : 247. AR - 0.40; A5/A1 - 1.89.

Frontal tubercles about 23 (14-30) μm long.

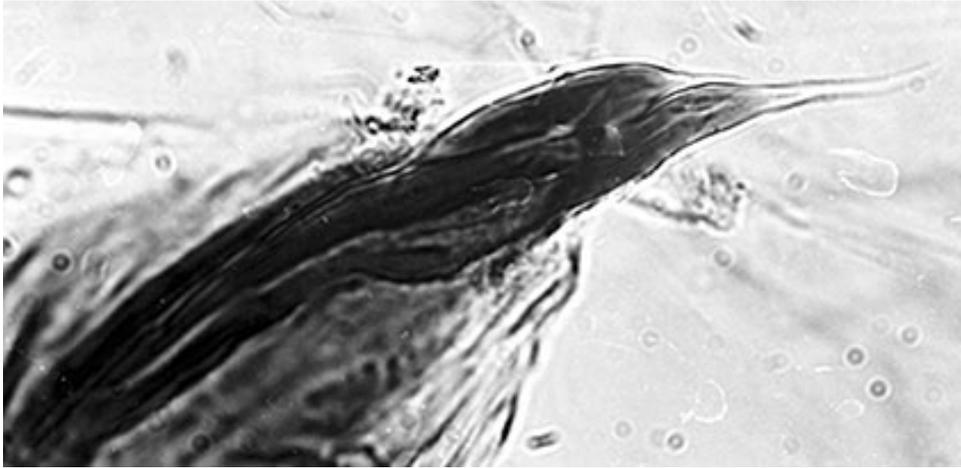
Palp proportions (segs 2-5, in μm): 86 : 290 : 294 : 382.

GpVIII with about 10 setae, GcIX with about 4 setae.

Pupa: (Largely based on European specimens) Length about 10.1-10.2 mm.

Conspicuous pedes spurii B on segment II; hook row with about 70 hooks.

Caudolateral spur of segment VIII with about 2 spines on North American specimen (below), but only one on European specimens.



Fourth instar larva a medium to large thummi-type (length about 17.8-18.0 mm). Anterior ventral tubules shorter than posterior pair (ant. 1.24 mm; post. 1.32 mm). AT long (abt. 530-710 μm) with a median constriction, about 3.5-5.5 times longer than wide; ventral pair possibly slightly longer and thicker.



Long anal tubules with constriction

Gular region dark on posterior half, FC slightly darkened.

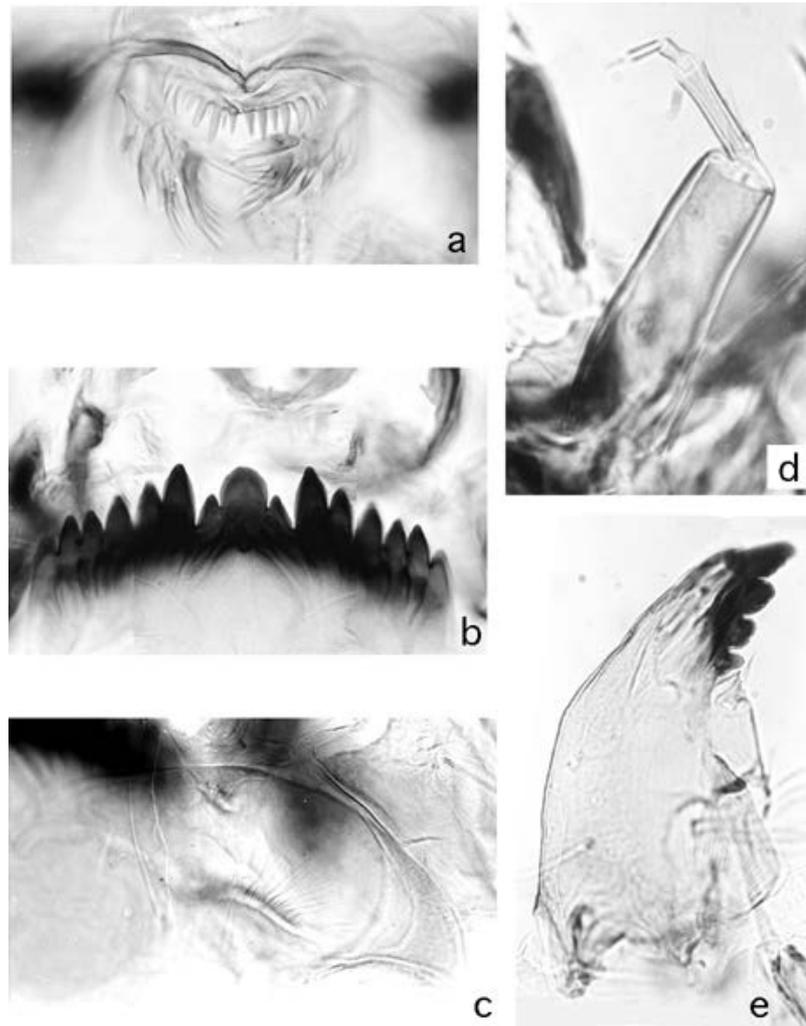
Mentum (b, below) as in *Chironomus*; central tooth relatively broad with short parallel sides (or possible diverge slightly), side teeth well developed (type III or II); 4th laterals slightly reduced (type I-II).

VM (c, below) with about 40 striae. PE (a, below) with about 16 irregular teeth.

Premandible with inner tooth about twice as wide as inner tooth, and slightly longer.

Antenna (d, below) with AR about 1.8; basal segment about 3.5x as long as wide.

Mandible (e, below) with third inner tooth relatively well separated and darkened (type IIC).



Cytology: 3 polytene chromosomes with some indications of Keyl pattern - appears to be modified thummi arm combination AB, CD, GEF.

Nucleolus subterminal in arm G, followed by two BRs. No nucleoli in other chromosomes.

Polymorphic in all three chromosomes.

bitA1: as in Palearctic specimens; olive not obvious.

bitA2: Inversion of central part of the arm.

as atrA2?

bitB1: Typical bands near the centromere still present but quite contracted in available material.

bitB2: Inversion of almost half the arm, beginning about 1/5 from centromere..

bitC1: as in Palearctic specimens but typical bands (groups 3-4) not as obvious and may be nearer the centromere.

as atrC2?

bitD1: Available specimens are heterozygous, but may be identical to the Palearctic sequence.

bitD2: Inversion of about 2/3 of the arm.

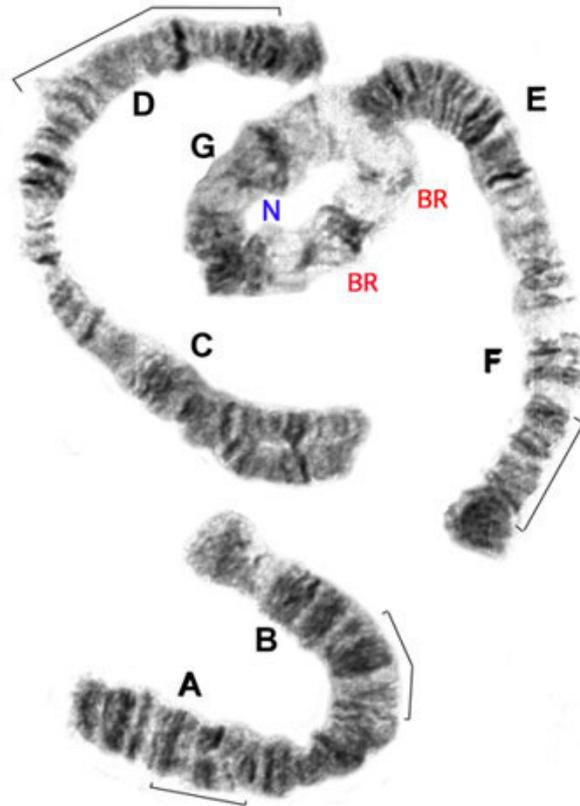
bitE1: as in Palearctic specimens, bands 10-13 obvious near the centromere.

bitF1: Available specimens heterozygous, but bands 20-23 obvious near the centromere, as in Palearctic specimens.

bitF2: Inversion of about the distal half of the arm.

as atrF2?

bitG1: Tandem fusion with arm E; subterminal nucleolus followed by two BRs.



N – nucleolus, BR - Balbiani ring, brackets – approximate limits of known inversions

Found: Ontario - Costello Creek, Algonquin Provincial Park (45.58°N; 78.32°W); Beaver swamp near Dunrobin (45.45°N; 76.00°W); Cranberry creek, abt. 1 km n. Kars, Carleton Co. (45.13°N; 75.63°W).

Quebec - Lake Marlon, Rouyn-Noranda (48.27°N, 79.07°W)(Proulx et al. 2013).
Also found in Palearctic: Venetjärvi, FINLAND (Type locality), SWEDEN.

Pools with grass on the bottom.

Morphology described by Wiederholm (1979) and Langton & Vallenduuk (2013). Cytology of European specimens described by Wülker (1987) (as *C. macani*), that of Nearctic specimens by Martin (2014).

The shared chromosome banding patterns and the extremely similar *COI* DNA sequence to that of *C. atroviridis* suggests that recent hybridization has occurred and may still be occurring.

Species 2i. *C. (Chaetolabis) atroviridis* Townes 1945

Tendipes (Chaetolabis) atroviridis – Townes 1945

Chironomus viridicollis – Johannsen 1905, Needham 1908, Branch 1937, all misdeterminations of *viridicollis* van der Wulp

Chironomus nr. *viridicollis* Townes 1937

Chironomus (Einfeldia) viridicollis – Johannsen 1937

It is possible some of these may refer to *C. (Chaetolabis) bitumineus*.

Adult: Based on description of Townes (1945).

Male

Wing length 5.0 mm. LR 1.55, fore tarsus without a beard. AR 4.0

Frontal tubercles small but rather long.

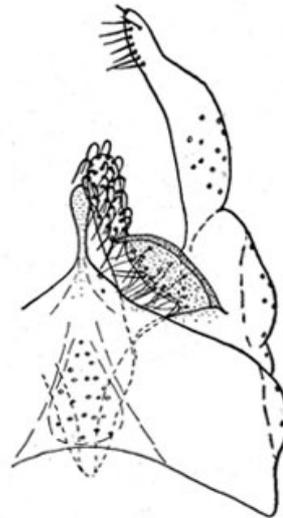
Head brown, clypeus and appendages dark brown.

Thorax ochraceous slightly tinged with green, vittae and posterior part of postnotum dark brown, median vitta divided by a pale line.

Abdomen blackish green, basal part more or less green.

Legs greenish, grading to brown on apical tarsal segments; dark brown at apices of femora, base and apices of tibiae (although some fore tibiae are entirely dark), apex of basitarsus and becoming more extensive on subsequent tarsi.

Hypopygium quite similar to that of *C. (Chaetolabis) bitumineus*.

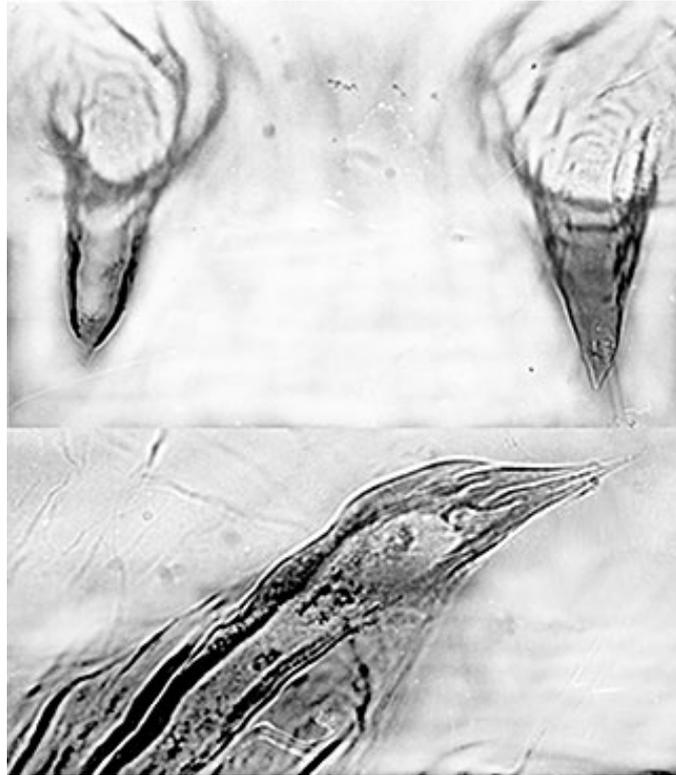


130. ATROVIRIDIS

Townes (1945) figure of hypopygium

Female: Townes (1945) only notes that it is similar to the male except for the usual sexual differences

Pupa: Has not been described. Two characters are known: The cephalic tubercles (below) are long, almost twice as long as wide, with a subapical seta. The caudolateral spur of segment 8 (below) has about 4 closely applied spines .

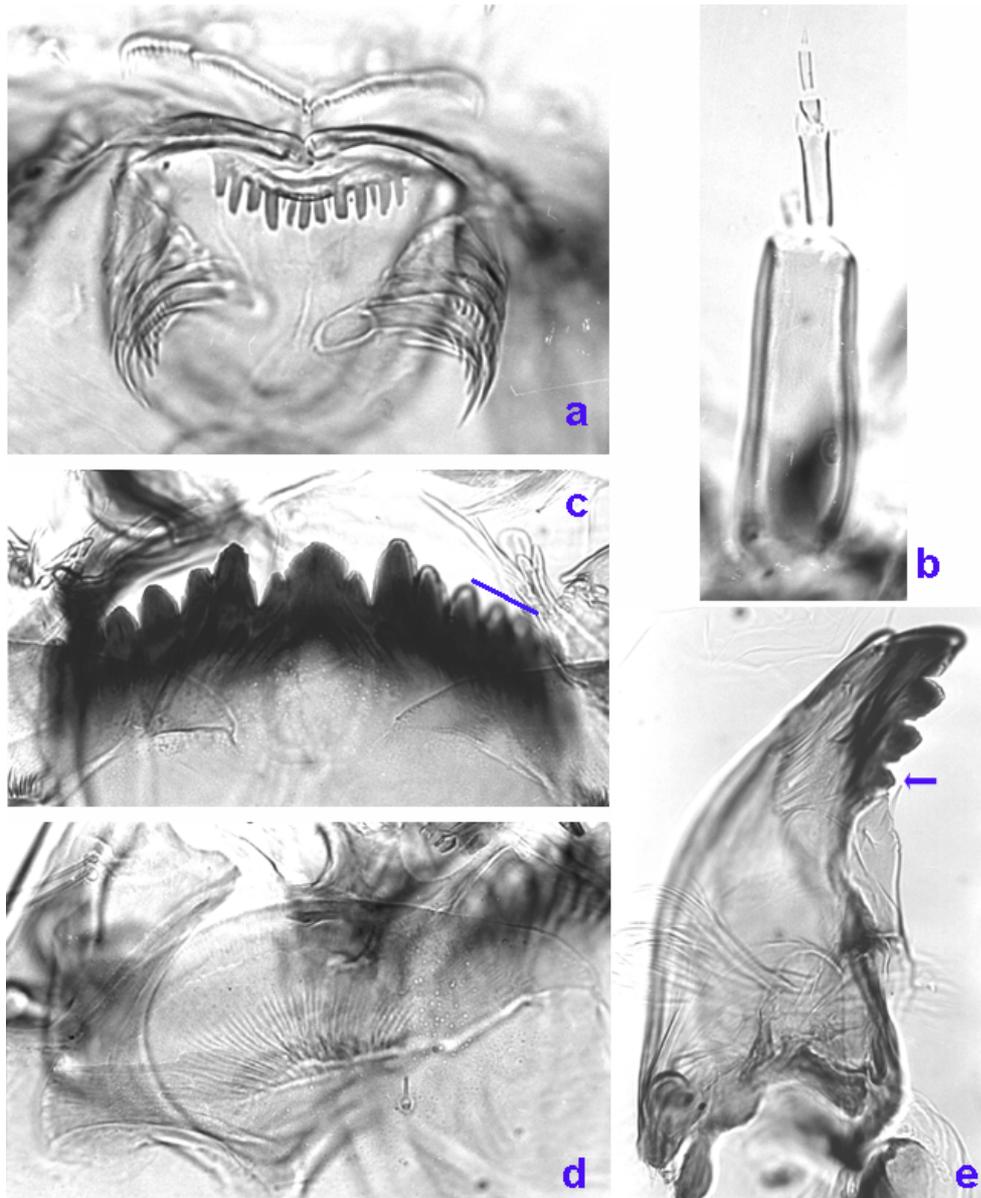


Fourth instar larva a medium to large bathophilus-type, length (male) 15.3 - 17.8 mm. VT about equal, ant. 0.80 - 1.04 mm, post. 0.80 - 0.95 mm long. Gula dark on posterior half, FC pale or slightly darkened. Mentum (c) as in *Chironomus*; 4th lateral barely reduced (type I); c1 tooth broad with short diverging sides, c2 teeth only moderately developed, notches about 45° (type IA, but sometimes c1 tends to type IIA).

Ventromental plates (d, below) separated by about 0.29 - 0.33 with about 50 - 54 striae. PE (a) with about 14 - 18 teeth, including 3 or 4 small teeth. Premandible with inner tooth about 2.3 - 3 times wider than outer tooth, teeth about equal in length or outer tooth slightly shorter.

Antenna (b, below) with basal segment about 3.3 - 3.5 times as long as wide, RO near middle of the segment; AR about 1.77 - 1.85; A2/A1 about 0.27; A3 shorter than A4, and sometimes longer than A5.

Mandible (e, below) with 3rd inner tooth (arrowed) pigmented and partly separated (type II-III), about 18 - 20 furrows on the outer surface near the base.



Cytology: 4 polytene chromosomes with indications of thummi chromosome arm combination, AB, CD, EF, G.

Arm G short, generally unpaired with a virtually terminal nucleolus then two BRs before a constricted chromosome end. No nucleoli in the long chromosomes.

Polymorphism in arms A, C, F, and possibly a small terminal inversion in arm E.

atrA1: Keyl pattern not clear, other than the proximal 16 - 19

atrA2: simple inversion of about the middle half of the arm as bitA2?

atrB1:

atrC1:

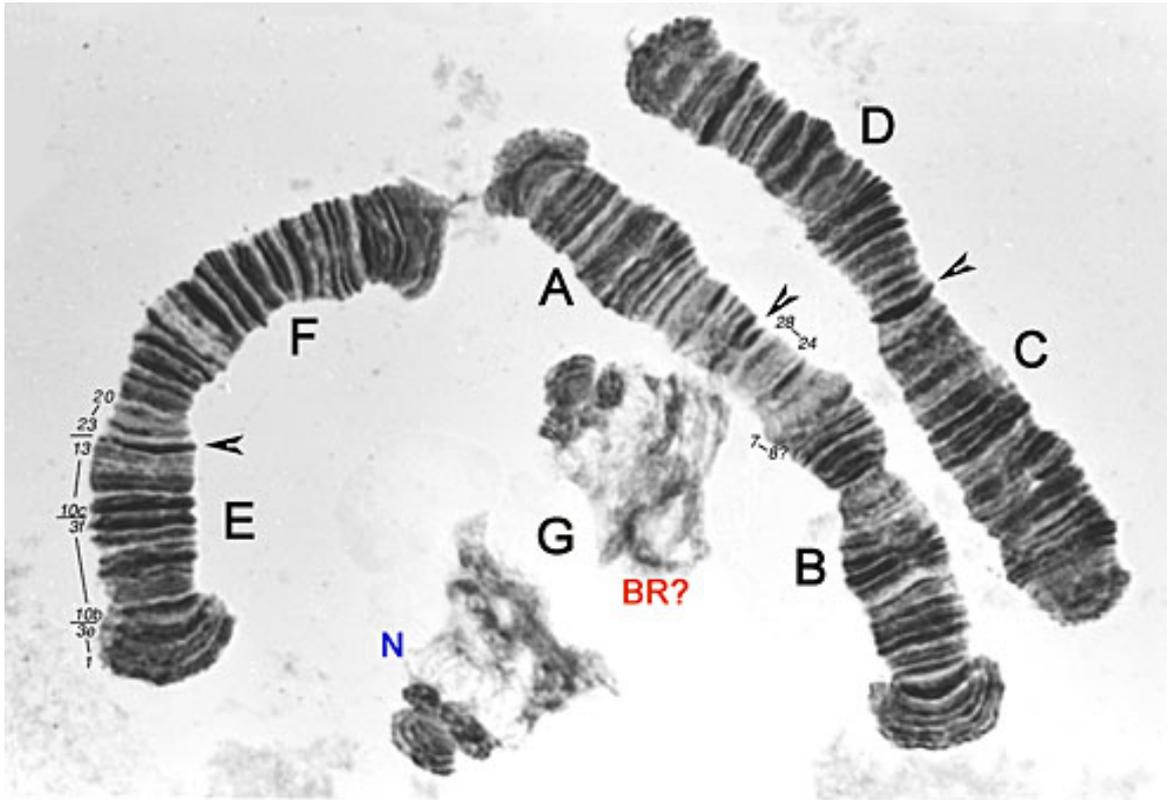
atrC2: inversion of about half of the arm beginning about 16 bands from the distal end of the arm - as bitC1?.

atrD1:

atrE1: possibly 1- 3e, 10b – 3f. 10c – 13 i.e. basic sequence as *luridus*, etc.

atrF1: only the proximal bands 20 – 23 can be readily recognized.

atrF2: simple inversion of about the middle half of the arm as bitF2?.



DNA analysis:

mtCOI: GenBank accession numbers KF278329.1 – 332.1, KF278342.1 & 360.1

gb7A: GenBank accession number KF278450.

The COI sequences are very similar to that of the known *C. bitumineus* sequence.

Found: British Columbia - Terrace (Townes 1945).

Manitoba - Southern Indian Lake (Rosenberg *et al.* 1984).

Ontario - White Lake, Three Mile Bay (48.70, -85.75); Orillia; Point Pelee (41.959, -82.518) (last 2, Townes 1945).

Quebec - Lac Marlon, Rouyn-Noranda (48.27, -79.07) (Proulx *et al.* 2013).

Saskatchewan - Oxbow (Townes 1945).

Connecticut - Stafford (Townes 1945).

District of Columbia - Washington (Townes 1945).

Idaho - Cataldo (Townes 1945).

Illinois - Urbana; (Townes 1945).

Iowa - Crystal Lake, Davenport; Dickinson Co. (Townes 1945).

Massachusetts - Amherst; Edgartown; Holliston; Wellesley (Townes 1945).

Michigan - East Lansing; Iosco Co.; Manistee Co.; Nottawa; Silver Lake, Oceana Co. (Townes 1945).

Minnesota - Cass Lake; Chisago Co.; Crystal Lake; Hennepin Co.; Mendota, Dakota Co. (Townes 1945).

New York - Amsterdam; Bemus Point (**Type locality**); Canandarago Lake; Ithaca; Mayville; Otsego Lake; Ringwood, Tompkins Co.; Round Island; Tuxedo. (Townes 1945)

Ohio - Summit Co. (Townes 1945).

Virginia - Dyke; Falls Church (Townes 1945).

Some of the Townes (1945) localities may refer to *C. bitumineus* (sp. 2h), although Townes notes that all samples came from lakes.

In lakes, possibly shallows with vegetation.

The adult male was described by Townes (1945). Notes on the larval morphology, cytology and DNA sequence were given by Proulx *et al.* (2013), and the species was confirmed as *C. atroviridis* and the sequences further defined by Martin (2014).

The shared chromosome banding patterns and the extremely similar *COI* DNA sequence to that of *C. bitumineus* (see below), suggests that recent hybridization has occurred and may still be occurring.

Species 2j. *C. crassicaudatus* Malloch 1915

This species is a member of the staegeri group erected by Wülker *et al.* (1971).

In BOLD Bin: [BOLD:AAP2996](#)

Adult Adult redescribed by Townes (1945), with some additional data by Sublette and Sublette (1971).

Male: Wing length - 4.87 (4.15 - 5.68) mm; AR - 4.52 (4.15 - 4.87); LR - 1.28.

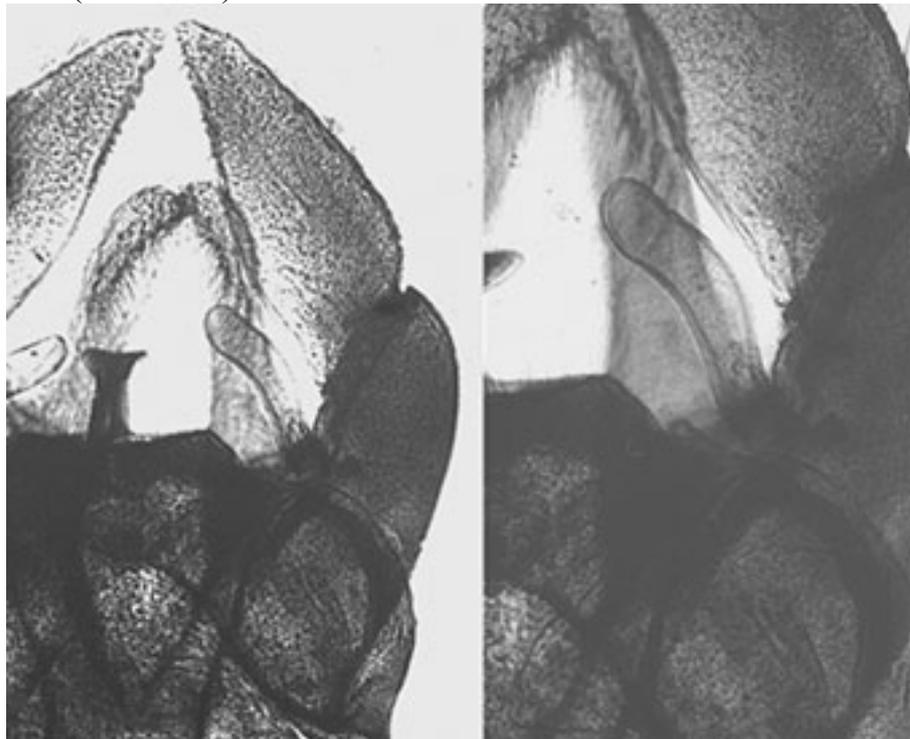
Large and very stout. Ground color light or pale brown, thoracic markings ochraceous brown

Head - frontal tubercles moderately large- 57 (35 - 82) μ m; Clypeus of moderate size, clypeal setae - 60 (44 - 76)

Thoracic setae - dorsolateral - 47 (29 - 59); prealar - 10 (8 - 13); scutellar 48 (36 - 62).

Wing length 4.35 - 5.68 mm. VR - 1.03 (1.00 - 1.05).

Legs - pale brown, apices of tibiae and of tarsal segments brown. Fore tarsus with short sparse beard, fore LR 1.28 (1.23 - 1.33); mid LR - 0.48 (0.42 - 0.53); hind LR 0.54 (0.50 - 0.57).



Male hypopygium of *C. crassicaudatus* (left) and superior volsella (right)

Abdominal tergites each with a central brown transverse band with indefinite edges, sixth and following segments mostly brown.

Genitalia large and heavy, with SVo essentially an E-type, closest to “i” of Strenzke (1959), but with a blunter, more rounded end.

Female: Townes notes as “similar to male except for the usual sexual differences”.

Pupa: Cephalothorax pale yellowish with brown markings, abdomen pale yellowish with brown markings. Frontal tubercles acutely tipped, subterminal seta about 70 µm long. Length 11.7 - 14.9 mm (Female: about 12.7 - 13.1 mm, Male: about 11.7 - 14.9mm). About 92 - 124 recurved spines at apex of tergite of segment II; caudolateral spur of segment VIII with 12 - 18 spines (female), 9 - 19 spines (male).

A pupa with over 12 spines on the spur is likely to be *C. crassicaudatus*.

Fourth instar larva a large plumosus-type, length 21.4 (17.3 -22.8) mm. PLT 370 (300-440) µm; LP – ant. 2.45 (1.84-3.00) mm; post. 2.06 (1.64-2.48) mm; AT 530 (480-640) µm. Very dark gular region, pale FC.

Mentum with pointed teeth, c1 tooth broad, c2 teeth well separated and sharp pointed (type III); fourth laterals slightly reduced (type I-II).

VM with finely crenullated anterior margin, median edges sharply downturned; striae reaching about 2/3 towards anterior margin, then replaced by numerous very fine striae to the margin.

PE with 13 - 20 irregular, conspicuous large and small teeth. Premandible with teeth about equal in length.

Antenna with basal segment about 3.2 times as long as wide (3.09 - 3.50); RO between one third and halfway up from base of the segment; antennal proportions 141 : 30 : 9 : 13 ; 6.

Mandible polymorphic for presence or absence third inner tooth, although more commonly present and pale (type IA).

Cytology: 3 polytene chromosomes with a modified thummi arm combination. AB, CD, GEF.

Arm G normally paired with a nucleolus near attachment to arm E, with nearby BR and sometimes an additional puff. Nucleolus in arm B near 4 characteristic bands,. Polymorphism in arms A, B, C and D; that in arm A appears closely linked to the MD in a Kansas population.

crcA1: 1 - 2c, 10 - 12, 3 - 2d, 9 - 5e, 17d - 13, 4 - 5d, 17e - 19

crcA2: 1a-e, 12 - 10d, 13 - 17d, 5e - 9, 2d - 3, 1f - 2c, 10a-c, 4 - 5d, 17e - 19

crcB1: Puff with distal dark bands (groups 8-7) about 1/3 from distal end.

crcB2: Puff with proximal dark bands (groups 7-8), still about 1/3 from distal end.

crcC1:

crcC2:

crcD1:

crcD2:

crcE1: 3e - 1, 3f - 10b, 12e - 10c, 12f - 13

crcF1: 1 - 6a, 6d - 9 6b-c, 17 - 11d, 19 - 18, 10 - 11c, 20 - 23

crcG1:

Molecular data. There is mtCOI sequence in GenBank (e.g. KR085208), as well as specimens in the BOLD database.

The molecular sequence, along with the modified male hypopygium, indicates that this species is less close to the other three species of the staegeri-group.

Found: **Manitoba** - Lake Winnipeg (Sæther 2012)
Ontario - Trenton, Ottawa & Point Pelee (41.959, -82.518) (Townes 1945)
Arkansas- Marianna, Lee Pa.
Florida - Cannon Lake, Polk Co., Lake Apopka, Orange Co. (Frouz *et al.* 2002), Miccosuccee Lake.
Georgia - 5 miles w Athens, & Lagos Pond, Athens, Clarke Co.; Lullwater Lake, DeKalb Co.
Illinois - Mahomet, Champaign Co.; Peoria, Peoria Co. (Type), Homer Park, Champaign Co. (Townes 1945)
Indiana - Shafer Lake.
Iowa - Davenport & Kossuth Co. (Townes 1945)
Kansas - Potters Lake, Lawrence, Douglas Co.; State Park, Leavenworth, Leavenworth Co. (Townes 1945)
Louisiana, - Natchitoches, Natchitoches Pa.
Maryland - Fenwick, Charles Co. (Townes 1945)
Michigan - Midland Co. (Townes 1945)
Minnesota - Hennepin Co. & Traverse Co. (Townes 1945)
Nebraska - no locality (Townes 1945)
New Jersey - Wildwood (Townes 1945)
Ohio - Maumee Bay, Toledo (GenBank [KP954640](#))
Oklahoma - Buncome Creek Bay, Lake Texoma, Marshall Co.; Oklahoma City (Townes 1945)
Pennsylvania - Philadelphia (Townes 1945)
South Dakota - Yankton, and Gavins Point National Fish Hatchery, Yankton Co.
Tennessee - Oak Ridge, Anderson Co.; Reelfoot Lake.
Texas - Brownsville & Lake Refugio at Twin Mott (Townes 1945)
Wisconsin - Lake Wingra, Dane Co.; East Horsehead Lake, Oneida Co.

Lakes and other lentic habitats, where it can be a pest (Frouz *et al.* 2002)

This species was placed in the subgenus *Camptochironomus* by Beyer (1941), but was not included in that subgenus by later workers. Morphology and cytology described by Wülker *et al.* (1971). Sublette and Sublette (1971) note that the only species that the adult male could be confused with is *C. tentans*, but this should also include *C. pallidivittatus* and *C. vockerothi*, the latter particularly since Rassmussen (1984) queried whether that species might be a hybrid between *C. tentans* and *C. crassicaudatus*.

The species can be bred in the laboratory (Hein and Schmulbach 1971; Frouz *et al.* 2002).

Species 2k. *Einfeldia pagana* (Meigen 1838)

Originally *Chironomus paganus* Meigen 1838

Syn: *Einfeldia synchrona* Oliver 1971 (Oliver *et al.* 1990)

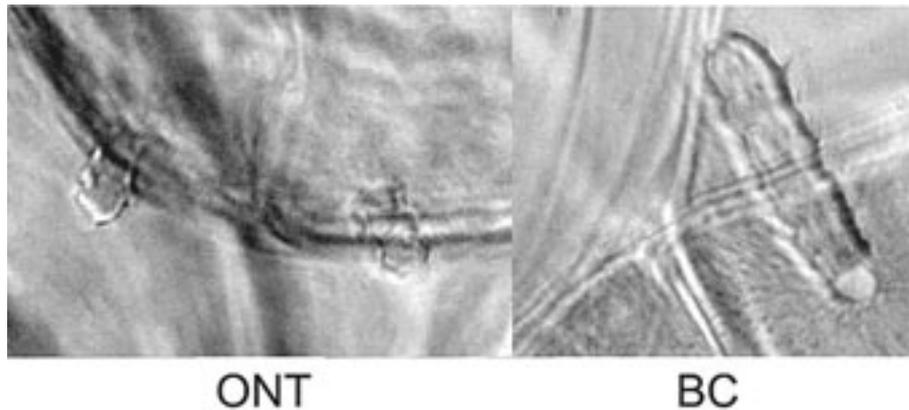
Adult of North American specimens described by Townes (1945) as *Tendipes (Einfeldia) paganus*, and by Oliver (1971) as *E. synchrona*.

Male: Wing length 2.4 - 3.8 mm, VR 1.02 - 1.09; LR 1.45; AR 2.67 - 3.06; frontal tubercles variable in size, fore tarsus with a rather short beard.

Light pea green, with thoracic markings, etc. ochraceous but occasionally brown or black; legs green, brown towards their apices.

The inflated style abruptly constricted near the apex and the broad anal point are distinctive.

Head: Frontal tubercles variable in size depending on locality, with those from British Columbia about 3 times the length of those from Ontario (Sublette, unpubl. data); with a seta approx. 4 times the length of the smaller tubercle. Clypeus with 18 - 30 setae. Palp segment lengths (2-5) (μm) 50-80 : 190-300 : 130-220 : 200-280.



Frontal tubercles of *E. pagana* from Ontario (left) and British Columbia (right)

Thoracic setae: Acrostichals 5 - 11; Dorsocentrals 12 - 28, uni- to biserial; Prealars 5 - 6; Supraalar 1; Scutellar 7 - 13, uniserial laterally to multiserial medially. Scutellum with a small central hump.

Legs with sparse beard, BR 3 - 5. Front LR 1.39 - 1.56; Mid LR 0.55 - 0.62; Hind L.R. 0.61 - 0.67. First tarsal segment of mid and hind legs with row of apically curved setae on anterior margin.

Female: As male, but the thoracic markings, etc., are never darker than pale brown.

Antennal flagellum 5-segmented. segment lengths (μm) 140-169 : 101-112 : 112-120 : 101-112 : 198-234.

Head: Clypeus with 6 - 24 setae. Palpal segments 2-5 (μm) 50-60 : 150-210 : 150-180 : 220-300.

Thoracic setae: Acrostichals 7 - 8; Dorsocentrals 16 - 21; Prealars 5 - 6; Scutellar 12 - 14. Wing length 2.6 - 3.0; VR 1.10 - 1.18.

Legs Front LR 1.66 - 1.79; Mid LR 0.50 - 0.54; Hind L.R. 0.57 - 0.62.

Genitalia: Cercus quadrate.

Pupa: Cephalic tubercle pointed with 1 fine terminal seta. Caudolateral spur comprising 0 - 2, but usually 1, spines.

Fourth instar larva not a *Chironomus* type but small (11.8 - 12.7 mm (2 male) with only one pair of VT (abt. 0.56 - 0.66mm) and no PLT. Anal tubules about 300 μm long and 2.5-3 times longer than wide (ventral pair may be thicker).

Gular and FC pale. Frontal sclerite with a large indistinct oval pit, with a large rugose area anterior to it.

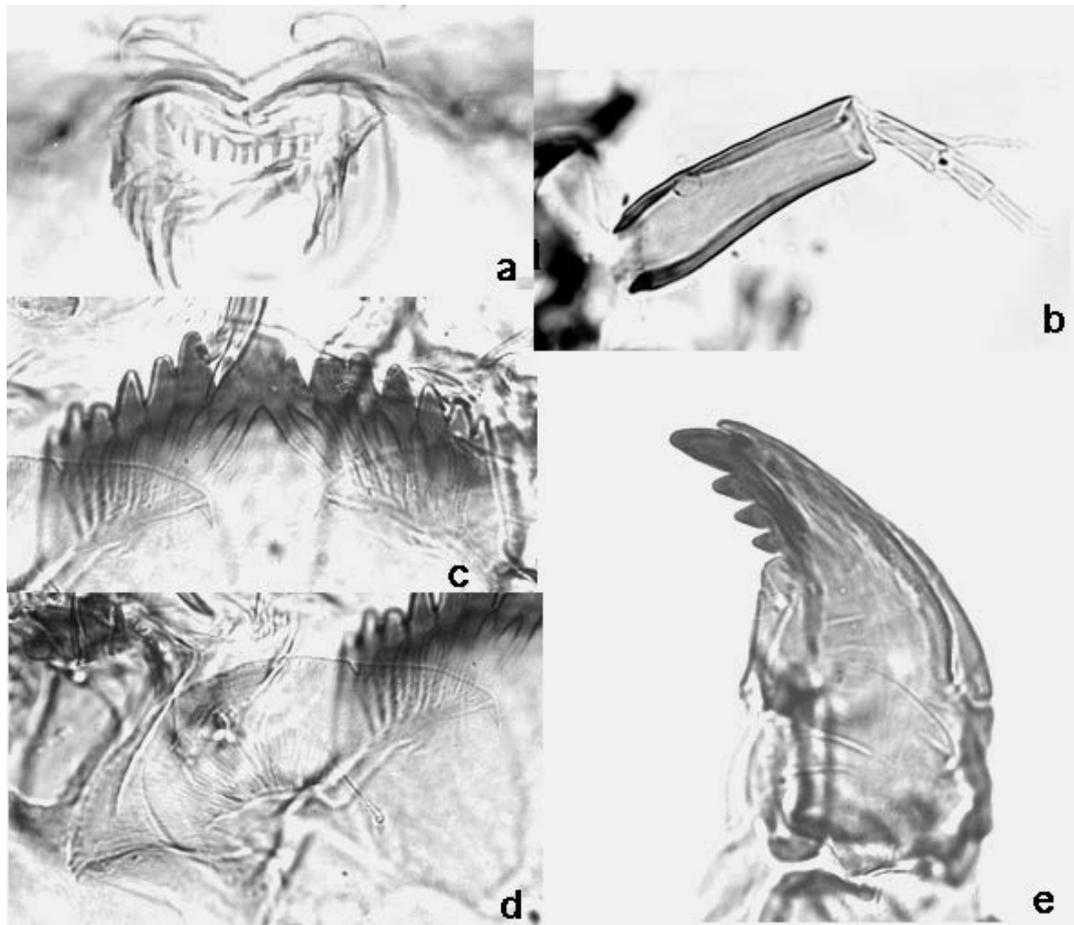
Mentum (c, below) with pointed teeth apart from central tooth which may be worn in the available specimen, c2 teeth little more than notches (type I); 4th laterals in line with other lateral teeth.

VM (d, below) with a sharply downturned inner edge and a wavy anterior margin. PE (a, below) with about 12 rather irregular teeth.

Premandible with two teeth of about equal length.

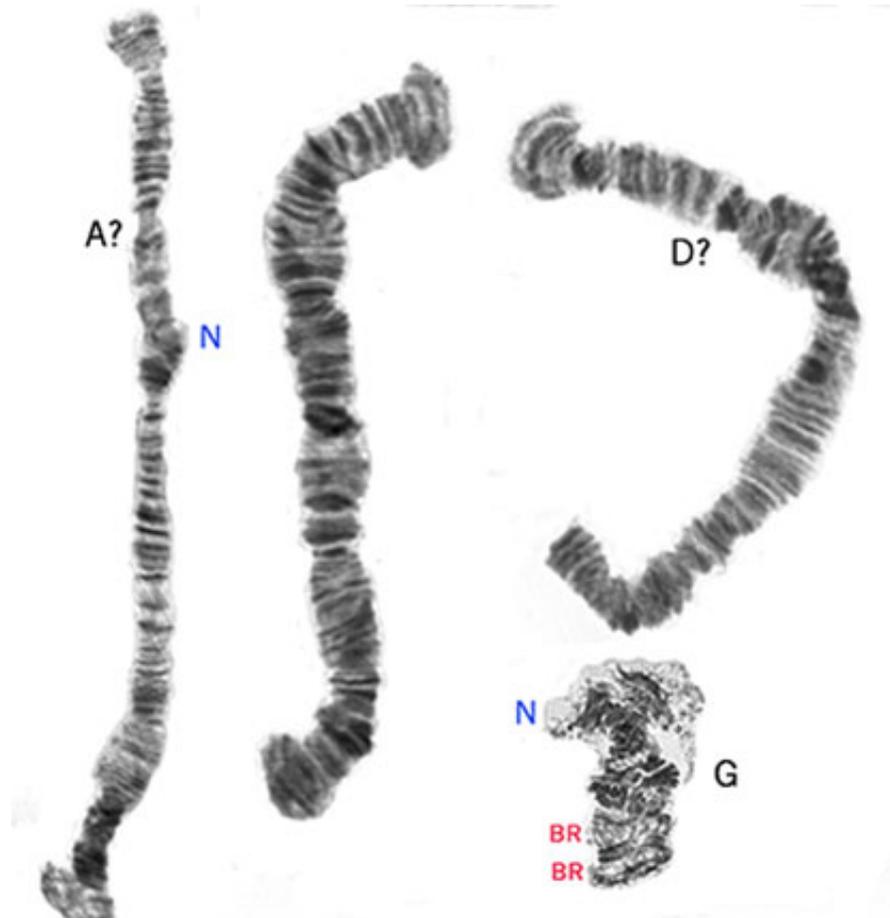
Antenna (b, below) with basal segment relatively short, $AR = 0.8$, about 3.3x as long as wide; A3 relatively long, $A4/A3$ about 0.8.

Mandible (e, below) with pigmented and clearly separated third inner tooth (type IIIC).



Cytology: 4 polytene chromosomes with little indication of Keyl pattern.

Chromosome 4 with a terminal nucleolus which pairs, otherwise unpaired. A smaller nucleolus is sometimes developed close to the centromere of one of the long chromosomes. However, a visible nucleolar envelope is only visible in some cells, sometimes very large and fused between the two nucleoli. Centromeres heterochromatic.



Note that arm G is normally only paired at the nucleolus.

- Found:** British Columbia - (Sublette (unpubl.).
 Manitoba - Lake Winnipeg (Sæther 2012).
 Ontario - White Lake, Three Mile Bay (48.70°N; 85.75°N); Ottawa (45.40, -85.75), and South March (**Type locality** *E. synchrona*) (44.88°N; 85.75°W), Carleton Co.
 Saskatchewan - Floral (Driver 1971).
 Idaho - Cataldo (Townes 1945).
 Michigan - Isabella Co. (Townes 1945).
 New York - Canadaroago Lake; Milford Center; Otsego Lake (Townes 1945).
 Ohio- – (Bolton 2012)
 South Dakota - Waubay (Townes 1945).
 Also found in the Palearctic (Belgium - region of Liège; **Type locality**).

Recorded from shallow eutrophic pools.

DNA analyses:

MtCOI barcode sequence is available from larvae from White Lake, Ontario. This sequence has 99% or better similarity to a large number of sequences in GenBank which are only identified as *Einfeldia* sp. or Chironomidae sp.

The difference in adult cephalic tubercles reported by Sublette (see above) could indicate the presence of different species under this name in the east and west of North America. The specimens of Curry (quoted in Oliver 1971) with a PE with scale like teeth is *Einfeldia* species A of

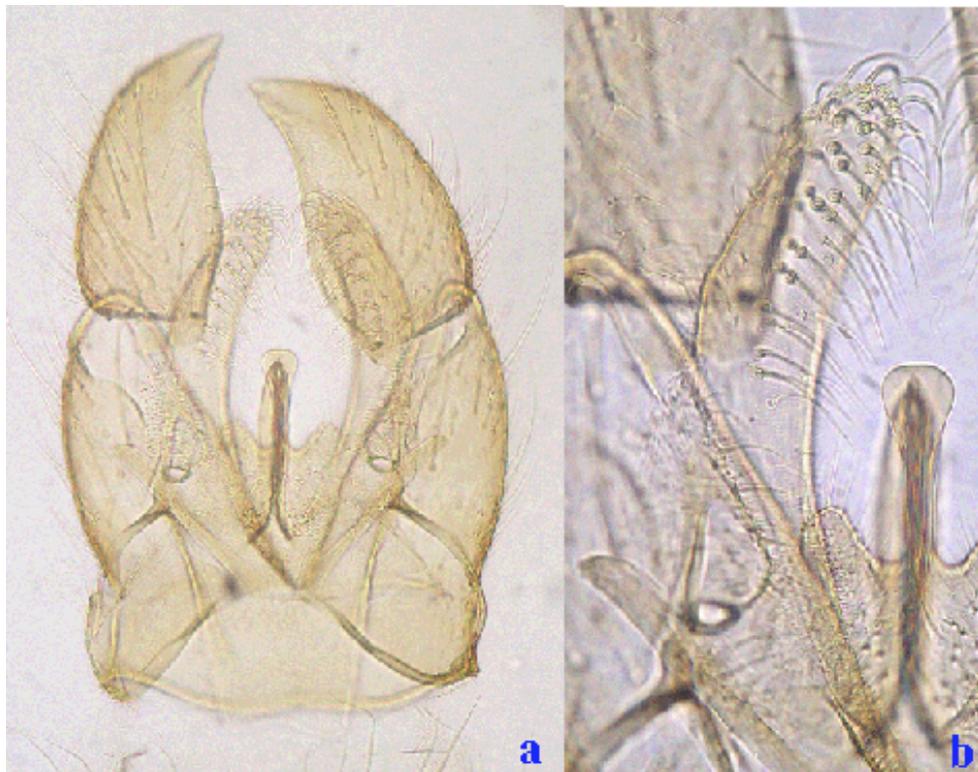
Epler (2001) (see species 5b). The adult and pupa of this species are presumably similar to *E. pagana*, as Epler notes that J. E. Sublette identified an adult and pupa of species A as *E. pagana*. Larval description recorded in Oliver (1971), as the synonym *E. synchrona*.

Species 21. *C. pallidivittatus* sensu Beermann (1955)

Placed in the subgenus *Camptochironomus*. Usually stated to be “sensu Edward 1929”, but Beermann did not confirm the identity of his material with that of Edwards, and until the identity is confirmed, this synonymy cannot be made with certainty.

Adult:

Male: similar to that of *C. dilutus* but paler and usually slightly smaller. Males can be differentiated from *C. dilutus* by characters of the hypopygium, viz. shorter and less tapered dististyle and SVo, the shorter SVo, narrower anal point, and the deep W-shaped indentation in tergite IX.



Female

Pupa: Length (male) about 16.5 mm; inner margin of wing case about 1.64 mm. Cephalic tubercles about 76 x 78 μm , seta at least 50 μm .

Basal ring about 177 x 89 μm , with core waisted in the middle.

Hook row of abdominal segment II with about 65 recurved hooks. Hook row about 0.4 mm wide, segment width 1.14 mm, so hook row occupies about 35% of segment width. Large Pedes spurii B on segment III, small one on segment II; large Pedes spurii A on segment IV, small ones on segment V and VI.

Postero-lateral spur of eighth segment relatively fine, with one or two spines.

About 81 taeniae on each side of the swim fin.

Fourth instar larva: a medium to large plumosus-type (fem. 18.0 - 19.7 mm; male 14.3 - 17.2 mm); PLT developed (340 - 680 μm); VT about equal length (ant.: fem 1.40 - 2.60; male 1.24 - 2.06 mm; post.: fem. 1.64 - 3.08; male 1.28 - 2.36 mm).

Gular region pale or darkened, FC darkened posteriorly.

Mentum of type IIA, with relatively pointed teeth; c1 tooth moderately broad with parallel sides, c2 teeth well developed and sharp pointed (type II).

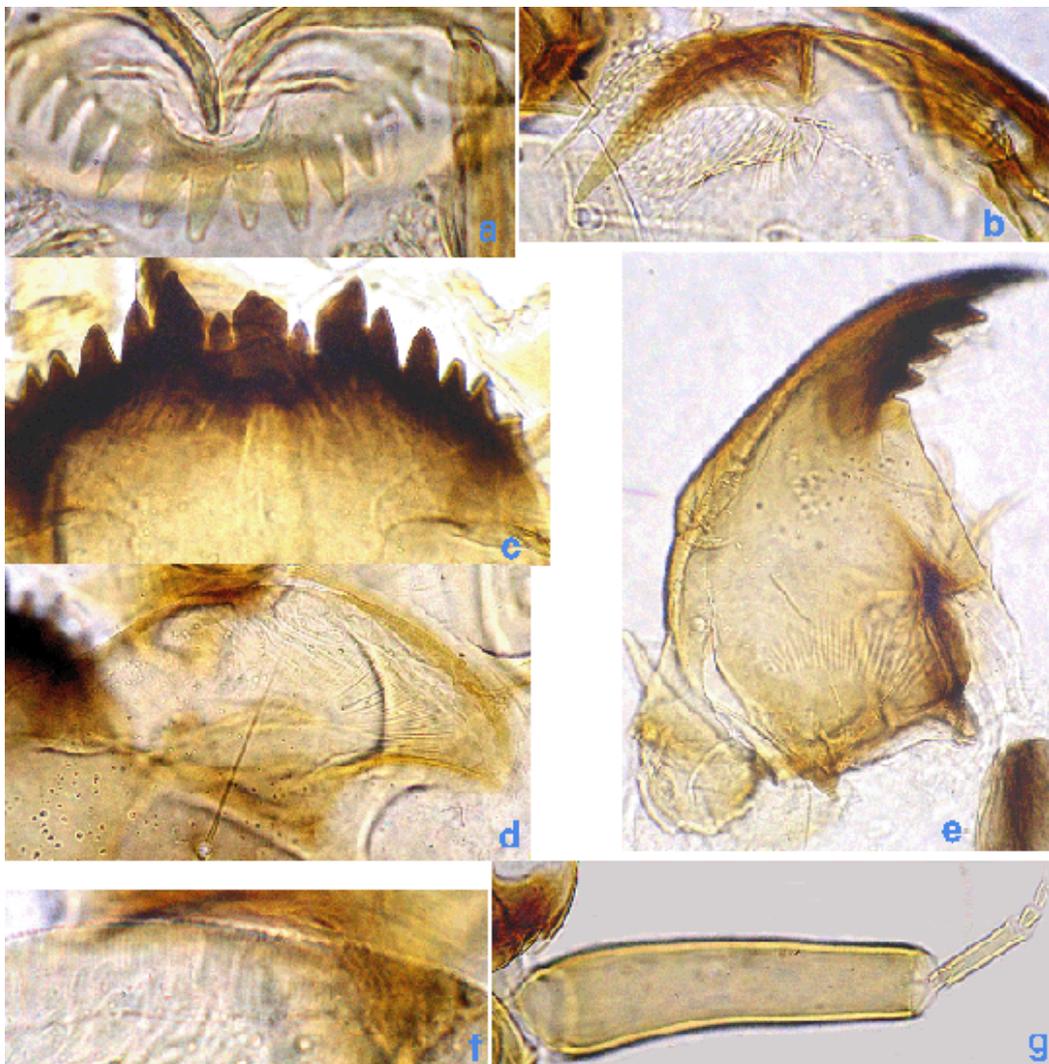
VM with deep clefts on inner edge of the marginal region; abt 52-55 striae reaching about $\frac{1}{2}$ way to anterior margin; VMR abt 0.32-0.35.

Premandible with teeth approximately equal in length unless outer worn, inner tooth about 1.75-2 times the width of the outer.

PE with about 13-14 even sharp teeth.

Antenna with RO about a third up from the base, A1 about 4 times longer than wide and abt 4.7 time longer than A2, AR abt 2.15, A3 about same length as A4 and longer than A5; segment proportions (μm): 167 : 35 : 13 : 13 : 8.

Mandible with third inner tooth generally dark and well separated (type IIB-IIIC), about 24-25 grooves on outer surface at base.



Cytology: 4 polytene chromosomes with the camptochironomus arm combination AB, DE, CF, G. Arm G closely paired with three BRs, 2 close together near one end with a constriction between most distal and the end, and the other towards the other end. Nucleolus in arm B, virtually at

centromere, but other smaller ones may be developed distal to this in sequence n'B9, known only as a heterozygote, and hence may be associated with the MD as in Palearctic populations.

pal h'A1: 1ab, 7d-7b, 3i, 2c-1h, 9c-8f, 10-9d, 11-12, 3h-2d, 8e-a, 1c-g, 7a-4, 13-19

pal n'B8:

pal n'B9:

pal h'C2: 1a-e, 15-14d, 4-6b, 8g-a, 2e-3c, 11c-9, 1f-2d, 11d-14c, 19-16, 7-6c, 20-22

pal h'D2: 1a-2b, 15-14, 22-18e, 8-9, 17-18d, 16a-e, 11-13, 3g-2c, 7-4, 10e-a, 23-24

pal n'D3:

pal h'E1: 1-2g, 4b-f, 12f-10c, 3f, 8g-10b, 3a-e, 8f-4c, 12g-13

pal h'F1: 1a-d, 9b-12, 3b-2f, 13-14c, 5d-6, 9a-7a, 14d-16, 5c-3c, 1e-2e, 17-23 i.e. as h'F1 of *tentans*

pal n'G4:

pal n'G5:

Found: **Manitoba** - Lake Winnipeg (Sæther 2012)

Saskatchewan - 5ml nw Theodore.

North Dakota - Cleveland

South Dakota - Vermillion, Clay Co.; Sioux Falls, Minnehaha Co.; Lake Francis Case, Yankton Co.

Generally at low frequency in prairie sloughs containing *C. dilutus*.

Hein and Schmulbach (1971) first described this species in North America, noting that it was not the same as *C. pallidivittatus* Johannsen. The cytology of North American populations in comparison to that of European populations was described by Kiknadze *et al.* (1998a).

Kiknadze *et al.* (1991) noted that larvae of the European populations of *C. pallidivittatus* could be distinguished from the related *C. tentans* by the smaller size as reflected in the head width and the length of antennal segment 1. It is not clear whether this could be applied to separating the North American specimens from those of *C. dilutus*, particularly in view of the occurrence of hybridization and the existence of different races of the latter species.

C. pallidivittatus and *C. dilutus* cannot be separated on the basis of the DNA "barcode" sequence of *COI*, but can be separated by the sequence of the globin gene *gb2β* (Martin *et al.* 2002).

Barcode: *COI* sequence in GenBank, Accession number AF110165.

Species 2m. *C. rempelii* Thienemann, 1941

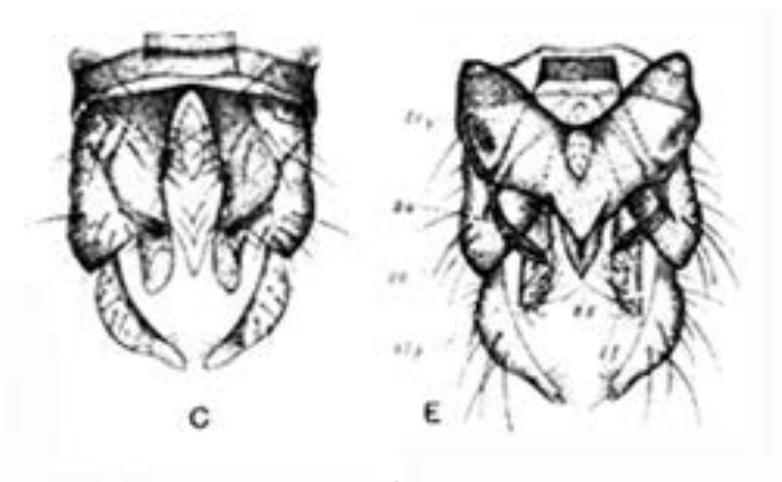
C. hyperboreus - Rempel, 1936, misdetermination of *C. hyperboreus* Staeger, 1845

Syn. *Tendipes anthracinus* - Townes, 1945

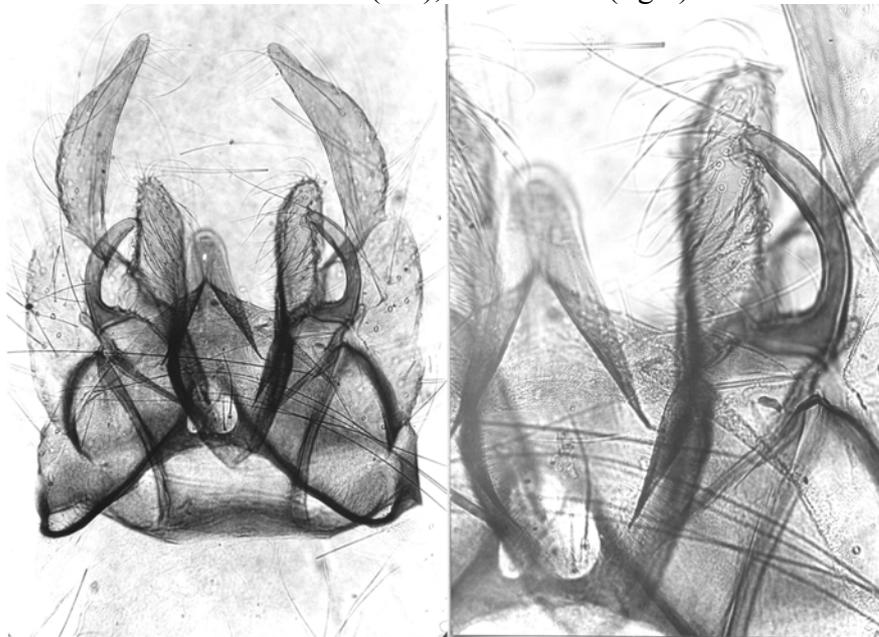
Possibly a synonym of *C. anthracinus* Zett., but may be a sibling species.

Adult:

Male: Length about 8 mm. Dark species, thorax black, scutal stripes barely visible, abdominal segments black with grey apical margins; legs black, anterior tarsi with beard. Frontal tubercles present. Relative proportions of palp segments 2 to 5 - 2 : 7 : 6 : 8.



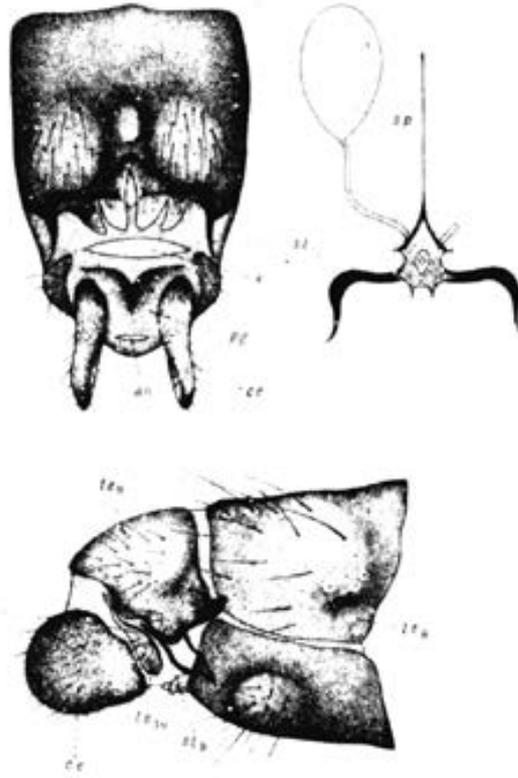
Male terminalia of *C. rempelii* (From Rempel 1936)
Ventral view (left), dorsal view (right)



Male hypopygium (left) and superior volsella (right) of *Chironomus rempelii* from Lake Waskesui, Saskatchewan.

Male genitalia figured by Rempel (1936); about 8 setae near middle of 9th tergite; style relatively short, narrowing over the posterior quarter; SVo closest to the E(i)-type of Strenzke (1959)

Female: Generally resembles male, but legs are paler - dark brown, with proximal half of anterior femur somewhat yellowish. Female genitalia figured by Rempel (see figure below)



Female adult of *C. rempelii* (From Rempel 1936)

Ventral view (upper left), tergite IX (upper right), lateral view (below)

Pupa: Mean length about 12 mm. Late pupa almost black. Frontal tubercles with a short seta. Lateral setae on Segments 2 to 4 have 3, 4 and 4 short lateral hairs respectively, while segments 5 to 7 have 4 lateral setae and segment 8 has 5. Shagreen pattern shown in figure below. Posterolateral spurs on segment VIII with about 8 rather long spines.

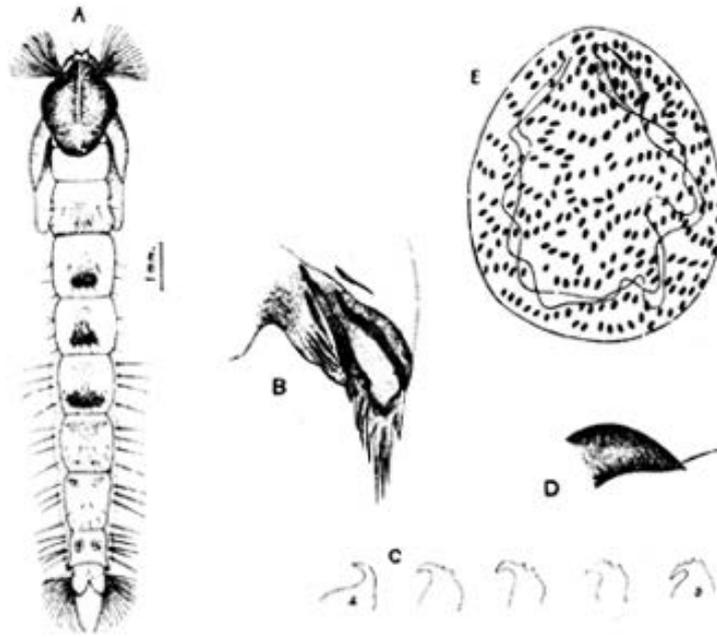


FIGURE 4. *C. hyperboreus*: A, pupa (from exuvium); B, lateral process of 8th segment; C, series of setulae, a lateral to b medial, distal margin of second abdominal segment; D, frontal tubercle; E, egg mass.

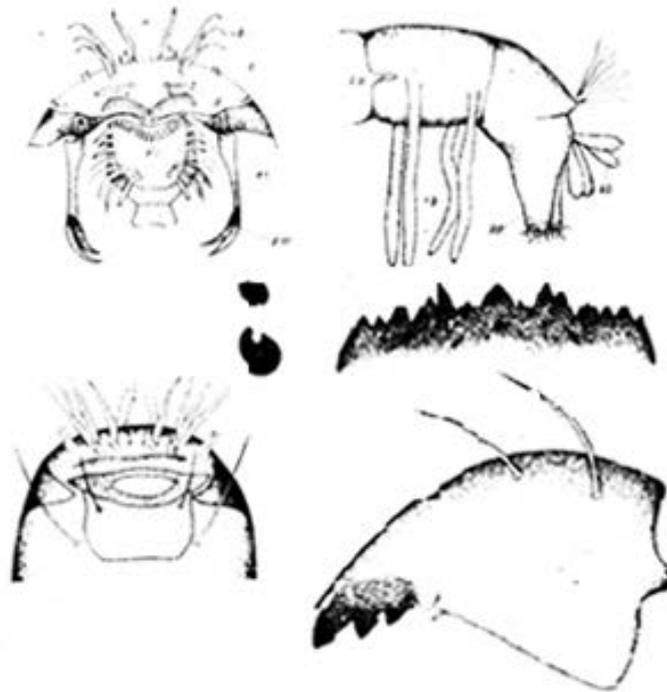
Egg mass and pupa of *C. rempelii* (From Rempel 1936)

Fourth instar larva a large melanotus type (see below), length 10.5 - 22.0 mm.; VT about equal length and longer than posterior prolegs.

Mentum width 220 μ m, with broad c1 tooth, c2 teeth relatively well separated (type I - II); 4th laterals reduced at least to level of the 5th laterals (type II), which in Rempel's material project beyond the level of 3rd to 6th laterals. PE with 16 - 18 blunt teeth.

Rempel's figure of the premandible suggests the teeth are about equal length and inner tooth is slightly wider. Mandible with 3rd inner tooth pale.

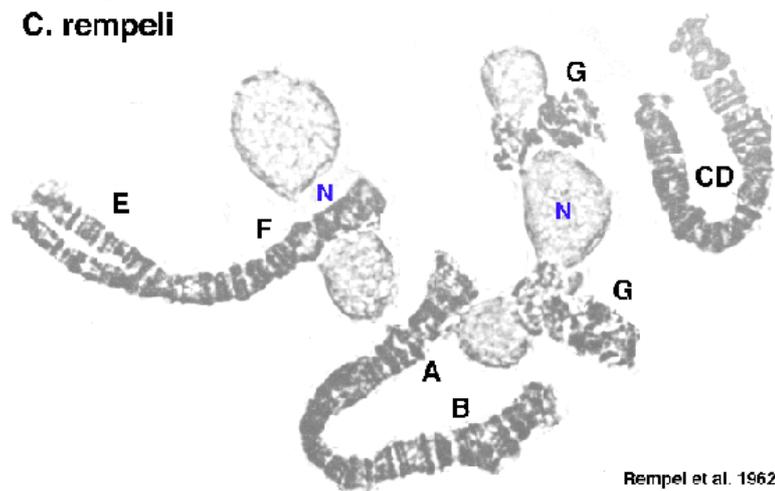
Antennal segments in ratio 40 : 10 : 3 : 5 : 1 ; RO towards middle of the basal segment.



Larval parts of *C. rempeli* from Rempel (1936)

Egg mass: Rempel (1936) figures the egg mass (see above) as globular with two transparent threads traversing it. Can be 650 eggs in the mass.

Cytology: 4 polytene chromosomes with the thummi arm combination AB, CD, EF, G. Arm G generally unpaired, sometimes cloudlike, sometimes with clear bands and heterochromatin cap in the area of the nucleolus. Nucleolus in arm F, which may be heterozygous in males for one (in region 3-4, F1k) or two (other in region 1, F1kk) heterochromatic bands. This polymorphism may be seen in all males (Waskesiu) or only in a small number (Lake Amisk and Baptist Lake). Most common sequence in each arm as in *C. anthracinus*. Polymorphism in arms A, B, C, D and F. Sequences are given the prefix ‘ant’ to relate them to the sequences as identified by Kiknadze *et al.*



antA1: 1-2c, 10-12a, 13ba, 4a-c, 2g-d, 9-4d, 2h-3, 12cb, 13c-19 i.e. as *plumosus* A2
 antA2: 1-2c, 10-12a, 13ba, 3f-2h, 4d-9e, 2d-g, 4c-a, 3g-i, 12cb, 13c-19 rare

antA3: 1-2c, 9a-e, 2d-g, 4c-a, 13ab, 12a-10, 8a-4d, 2h-3, 12cb, 13c-19 rare
antB1: not mapped.
antB2: Simple inversion near distal end. rare
antC1: 1-6b, 11c-8, 15-11d, 6gh, 17a-16, 7d-a, 6f-c, 17b-22
antC3: small inversion of region about 17a-6c rare
antD1: 1-3g, 14g-16, 8c-7g, 5d-7f, 18d-17, 8d-10a, 13a-11, 14f-13b, 10b-e, 4-5c, 18e-24
antD3: 1-3g, 14g-16, 8c-7g, 18a-d, 7f-5d, 17f-a, 8d-10a, 13a-11, 14f-13b, 10b-e, 4-5c, 18e-24 rare
antE1: 1-3e, 5-10b, 4-3f, 10-13 i.e. as *cingulatus*, *tardus* and sp. 3b.
antF1: 1 - 8e, 9c - 23 (with variants F1k and F1kk in males only)
antF3: 1 - 8e, 9c-e, 14 - 10, 15 - 23 rare

Found: **Alberta** - ♂ Lake Amisk (Kiknadze *et al.* (2005).
Manitoba - ♂ Baptist Lake (Kiknadze *et al.* (2005)
Saskatchewan - Lake Waskesiu, Prince Albert National Park (**Type locality**) (53.92°N, 106.08°W).
Wisconsin - ♂ Pleasant Lake, Walworth Co. (W. Hilsenhoff)

Occurs at depth of 10 m or greater. Life cycle in Lake Waskesiu is two years.



Lake Waskesiu, Prince Alfred National Park, Saskatchewan

Morphology of larva, pupa and adult above are based on the descriptions of Rempel (1936) (as *C. hyperboreus*). Townes 1945 considered the adult was *C. anthracinus* Zett., but Thienemann (1954) still regarded it as a separate species. The karyotype shows relationship to that of *C. anthracinus* such that Shobanov *et al.* (1996) and Kiknadze *et al.* (2005) have also considered it to be a synonym of *C. anthracinus*. This may well be correct, but there are some aspects that still suggest that it may be a separate subspecies or sibling species: The heterochromatin on arm F and the sequences A3, C3 and F3 have so far only been found in certain Canadian samples, and the location of the MD has not been determined in any typical *C. anthracinus* populations. The larva described by Rempel (see above) is shown as a bathophilus-type larvae, whereas the true *C. anthracinus* has a thummi-type larva.

Karyotype pictured by Rempel *et al.* (1962) and in more detail by Kiknadze *et al.* (2005).

Recent molecular results of Proulx *et al.* (2013) on Canadian lakes indicate that there is a close relative of *C. anthracinus*, which may be *C. rempelii*, although this cannot be proven in the absence of material from the type locality. This material also has a thummi-type larva (see sp. 4x *C. sp.* NAI), so may be further member of this anthracinus-group of species.

Species 2n. *C. quinnitukqut* Martin, Sublette & Caldwell

This species is in BOLD Bin: [BOLD:AAB7030](#)

Adult male identified by Townes as *C. atrella*, to which the species will key in his 1945 key.

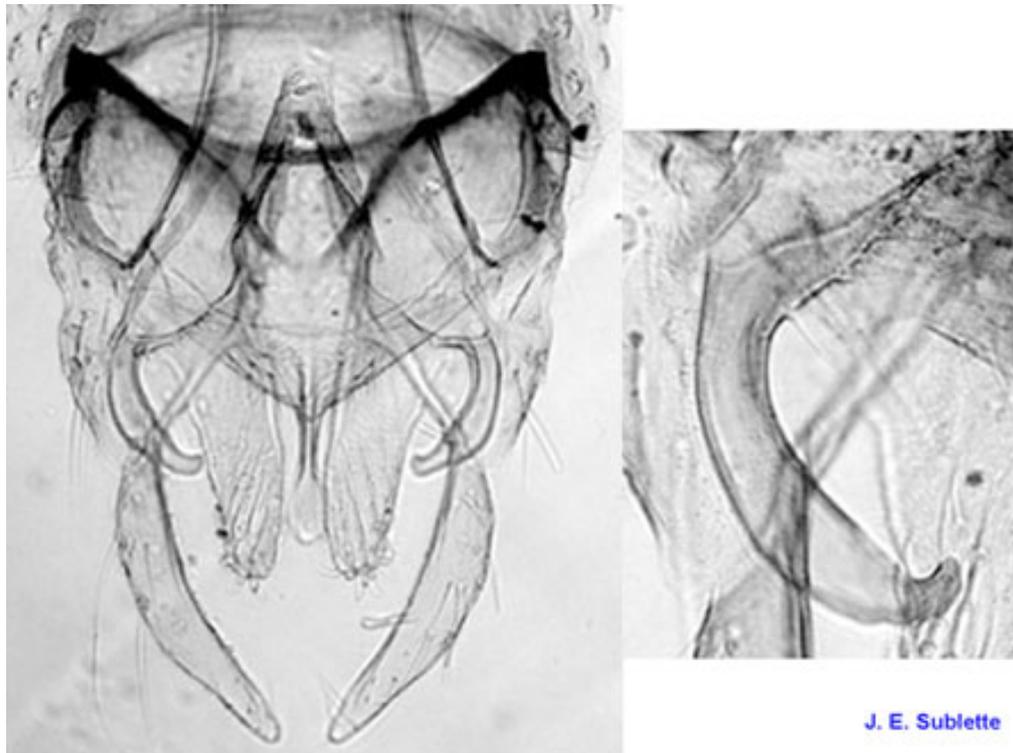
Male:

Wing length 3.70 (2.96-4.31) mm; 36 (21-43) setae on squamal fringe. LR 1.16 (1.14-1.22); BR 6.33 (5.71-7.16)

Head, thorax, including most of antepnotum and scutellum paler yellowish; thoracic vittae, postnotum, legs and abdomen largely blackish.

Head – AR 3.57 (3.41-4.70); frontal tubercles 30 (25-42) μ m; clypeal width about the same as width of antennal pedicel; clypeal setae 38 (24-56); palpal proportions (segs. 2-5) (μ m) 70 : 203 : 189 : 224.

Thoracic setae – Acrostichal present but not counted; Dorsolateral 29 (25-42) in a single to mostly triple row; prealar 7 (6-7); scutellar 26 (22-42) mostly in a single sl. staggered row laterally becoming double at medial apex.



6 (2-7) setae on tergite IX; SVo of the E-type of Strenzke (1959); gonostylus widest in basal third, narrowing gently over posterior half.

Female:

Wing length 3.61 mm; 38 setae on squamal fringe; VR 1.12. LR 1.24.

Color similar to male but paler abdominal incisures slightly more pronounced.

Antennal proportions: 150 : 85 : 85 : 105 : 270; AR 0.64. A5/A1 1.8.

Palpal proportions (segs. 2-5)(μm) 75 : 210 : 190 : 240; about 38 clypeal setae.

Thoracic setae: Acrostichal not counted; Dorsolaterals 41 extending anteriorly to near the antepnotum; Prealar 7; Scutellar 38.

Pupa: No pupae were present in our samples, but some pupal characters were visible from a late prepupa. The spur has about three spines, progressively along the outer edge, in the available specimen. About 115 setae, multilayered, on each side of anal fringe.



Fourth instar larva a small to medium sized bathophilus-type, length about 11.2 - 13.5 mm; VT 0.38 - 1.04 mm (ant.) and 0.28 - 0.96 mm (post.). AT relatively short, ventral pair usually slightly longer and narrower; however they can vary from about half as long as wide up to twice as long as wide.

Gular region slightly dark to dark, FC pale but sometimes with slightly dark lines alongside it.

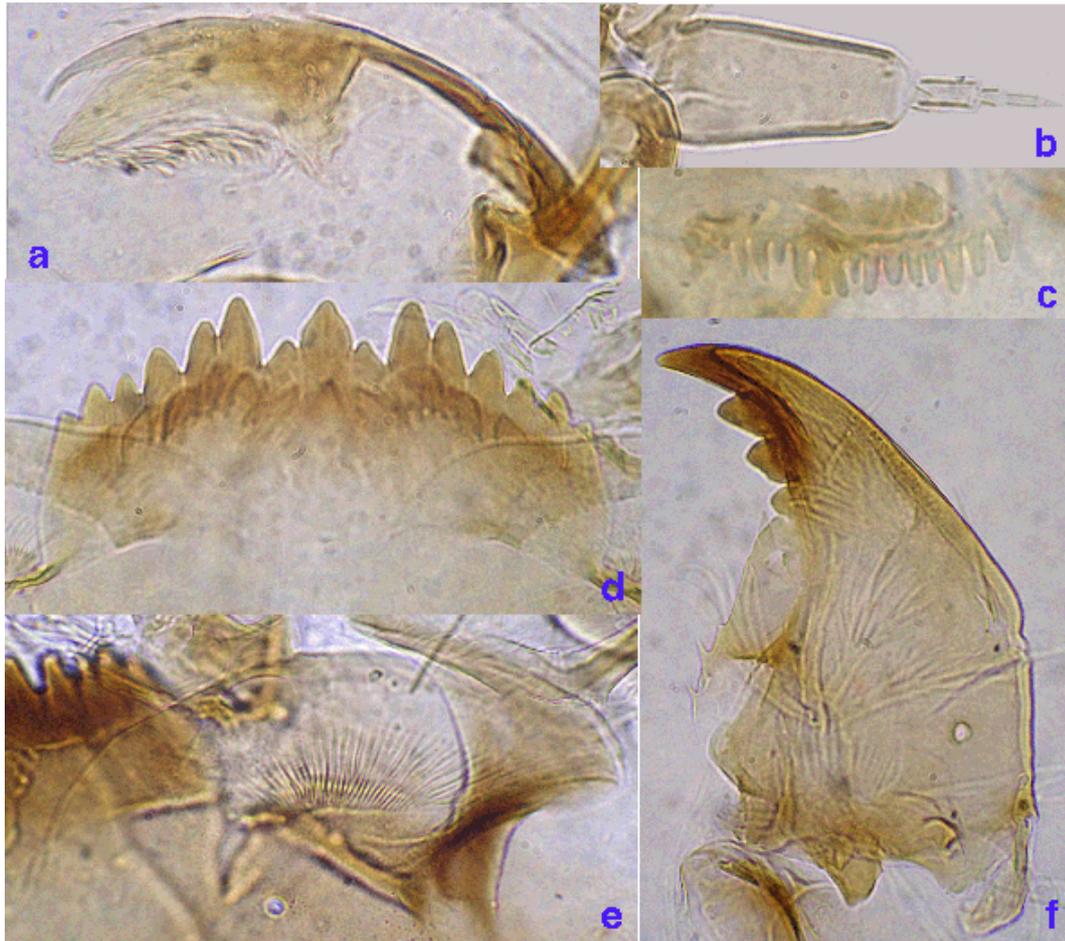
Mentum (d, below) with somewhat rounded teeth; c1 tooth broad and relatively tall, c2 teeth little more than notches (type I-III); fourth laterals slightly reduced to just above the fifth laterals (type I-II); sixth laterals often arising lower than other laterals.

Ventromental plates (e, below) with a smooth anterior margin and about 38 – 42 striae; VMR about 0.17. Premandible (a, below) with inner tooth 2 – 3 times wider than sharp but slightly shorter outer tooth. PE (c, below) with about 13 - 15 irregular teeth.

Antennal ratio 1.99 – 2.33 (2.13); basal segment about 2.3 – 3.2 (2.9) times longer than wide (b, below); antennal segments (10) (μm): 112-132 (123) : 22-27 (24) : 6-8 (7) : 12-15 (13) : 5-8 (7).

Distance between antennal bases sometimes larger, and sometimes smaller than that between the S4 setae - but not the same width.

Mandible (f, below) with third inner tooth relatively well developed and almost completely separated, but not as darkly colored as the other teeth (type II-IIIB), with about 12 – 16 grooves on the outer surface at the base.



Cytology: 4 polytene chromosomes with the thummi arm combination AB, CD, EF, G. Key pattern difficult to recognize particularly for chromosome AB, where the characteristic bands (groups 24 to 27) of arm B are away from the centromere and the “olive” (groups 6 and 7) of arm A is not obvious. In the CD chromosome, arm D is relatively shorter than arm C, as the result of a fixed asymmetrical pericentric inversion which moves band groups D24 to 21 into arm C, while only group C22 is added to arm D. Arm G may be fully paired, but is usually unpaired towards the sub-terminal nucleolus (see fig. below); a central BR and one near the other end. A nucleolus is sometimes developed about 1/3 from distal end of arm B. Polymorphic in arms A, C, D, E, F and G: polymorphism in C is small and terminal; apparently 3 sequences in arm D, one of which appears to be complex.

qutA1:

qutA2: Some distal homology to A1 of *C. decorus* (sp. 3a)

qutB1: Characteristic bands towards the middle of the arm; nucleolus, when present, at distal end of these bands.

qutC1: 1 - 2e, 12b, 6b - 2f, 12c, ?, ?, 21, (D)21 - 24

qutC2: 1 - 2e,

qutD1:

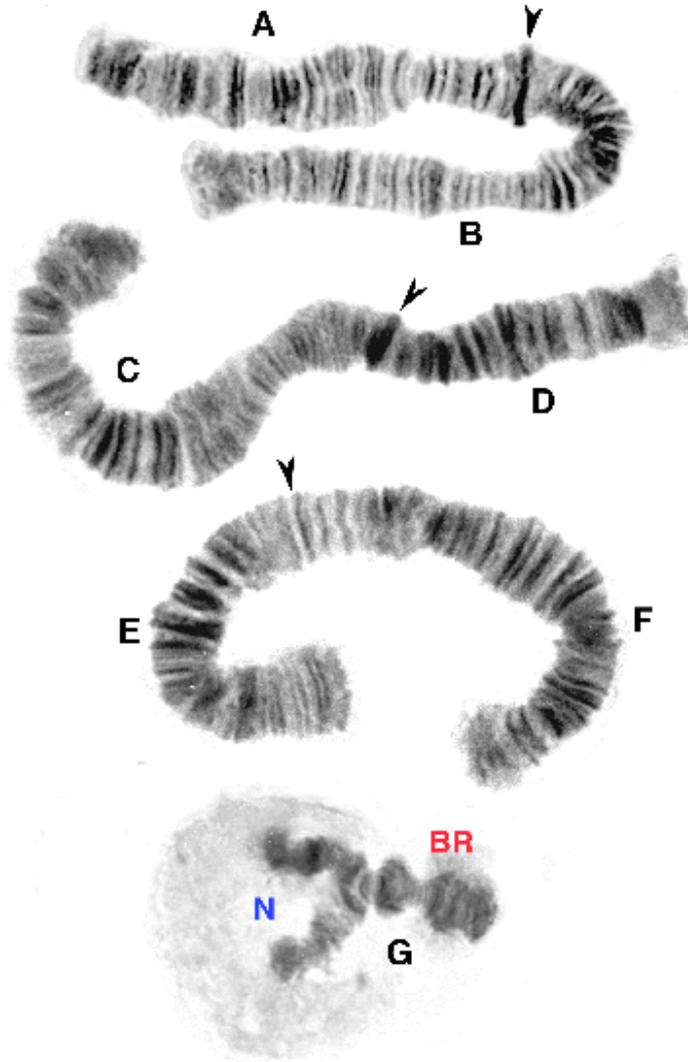
qutD2: differs by a simple inversion of distal half of the arm.

qutE1: possibly 1 - 3e, 10b - 5, 11b - 10c, 3f-4, 11c - 13 i.e. inv. 4-11b from *uliginosus*, etc.

qutE2: possibly 1 - 2c, 5 - 8, 3e - 2d, 11b - 10c, 3f-4, 11c - 13

qutF1:

qutF2:



Found: Connecticut - South Cove, Old Saybrook.

Massachusetts - East Harbor (Truro), Cape Cod National Seashore, Barnstable Co.

Tidal mud flats. Length of ventral and AT appears variable from sample to sample or locality to locality, perhaps dependent upon the salinity or other environmental factors at the time. At Truro it was found with an apparently related species *C. sp.* Cape Cod (sp. 4k).

DNA sequence: Sequence for the mtCOI gene has been obtained (GenBank access.no. HQ979113, HQ979133). This suggests that this species is closely related to *C. decorus*-group sp. 2 (Proulx *et al.* 2013), perhaps arising as a result of adaptation to estuarine waters.

This species was identified as *C. atrella* by Townes and Roback (Hitchcock & Anderson, 1968), but is cytologically quite distinct from other *C. atrella* populations. In general the cytology suggests it could be a member of the *C. decorus*-group, with similarities to *C. decorus* (Sp. 3a) and *C. sp.* Cape Cod.

The biology was described by Anderson & Hitchcock (1968). Described as *C. quinnitukqut* by Martin *et al.* (2010), including description of the polytene chromosomes.

Species 20. *C. anonymus* Williston

Tendipes (Tendipes) anonymus – Townes 1945 as syn. *C. decorus*.

Adult:

After Wülker *et al.* (1989):

Male: Head and thorax with dark brown markings, scutellum pale; all femurs with a narrow apical dark fascia, bases of all tibiae also dark, broadest on foretibia.

Abdominal tergites II-IV with saddle shaped marking, becoming a median spot on V-VI. Wing length 2.71 (2.53-3.06) mm. VR 1.04-1.07; 8-14 setae in squamal fringe; almost entirely pale, anterior wing vein slightly darker.

AR about 2.94 (2.84-3.01). Frontal tubercles small, length about 22 (16-30) μm . Palpal proportions (segs 2-5) (μm) 51 : 214 : 229 : 321. Clypeus about 0.75 times the width of the antennal pedicel, 24 (18-26) setae.

Thorax with a small but distinct median tubercle. Setae: acrostichal – 12-14 in double row; dorsolateral – 13-21; prealar – 5-6; scutellar – 14-34.

LRI about 1.77 (1.76- 1.82); LRII about 0.63 (0.61-0.64); LRIII 0.74 (0.72—0.76); BR 2.47-2.50.

Anal point downcurved; SVo curved dorsally, essentially D-type, perhaps closest to e of Strenzke (1959); Ivo with 20-27 setae, possibly with undivided tips. GS relatively narrow, reducing slightly from midpoint.

Female:

Antennal flagellomeres darkened; proportions (μm) 168 : 117 : 129 : 130 : 191 (Wülker *et al.* list only 4 segments); AR about 0.36; A5/A1 about 1-14-1.25. Frontal tubercles 41 μm . Palpal proportions (2-5) (μm): 61 : 280 : 286 : 474. Clypeus with about 44 setae.

Antepnotum slightly broader than in male, mesonotal tubercle conspicuous.

Thoracic setae: acrostichal - 14 in double row; dorsocentral – 45 in up to three rows; prealar 5, supra-alar – 1; scutellar – 31.

Wing length 3.64 mm, VR 1.11; squamal fringe of 19 setae.

LRI about 1.89; LRII about 0.56; LRIII about 0.70.

Pupa: Total length 5.64-6.22 mm (male); 6.44-6.66 (female). Integument infuscate with darker stripe extending to the postero-lateral spur, swim fin dark. Cephalothorax with coarse tubercles along both sides of the median raphe. Tergum II with 62-84 recurved hooks. Terga II-VI with coarse shagreen over most of the surface; tergum VII with finer shagreen in the basal half; tergum VIII with fine shagreen towards the lateral margin.

Caudolateral spur of segment VIII usually with only 1, but occasionally 2 or 3 weaker spines at the end. Swim fin 68-90 flattened marginal setae.

Fourth instar larva a small plumosus type; length about 8.0 - 12.0 mm (Bath and Anderson, 1969). AT 4 - 6 times longer than wide (abt. 520 x 140 micron).

Pale gular and FC.

Mentum with pointed teeth; c1 tooth moderately broad with parallel or slightly diverging sides, c2 teeth well developed and sharp pointed (i.e. type IA) ; 4th laterals at least slightly reduced (type I - II).

Ratio of antennal segments 25 : 5 : 1 : 2 : 1 (Bath and Anderson, 1969; AR about 2.1; basal segment about 4 times longer than wide; ring organ toward center of the segment. Mandible with third inner tooth dark (generally type IIIC).

Cytology: 4 polytene chromosomes with the pseudothummi arm combination AE, BF, CD, G. Arm G paired with a virtually terminal nucleolus at one end and two BRs, separated by dark bands near the other end. The more distal BR is almost terminal in Mississippi populations due to an inversion, apparently as in *C. columbiensis*. No nucleolus in the long chromosomes. Arm B with bulb about 1/3 from distal end. Inversion polymorphism occurs in arms D, F and G, although no heterozygotes have been found for the inversions in arms F and G. Two inversions occur in arm D, a short proximal one in California populations, and a distal one in Texas and Mississippi.

anyA1: 1a-e, 12-10, 4-9, 2d-3b, 2c-1f, 3c-i, 13-19

anyB1:

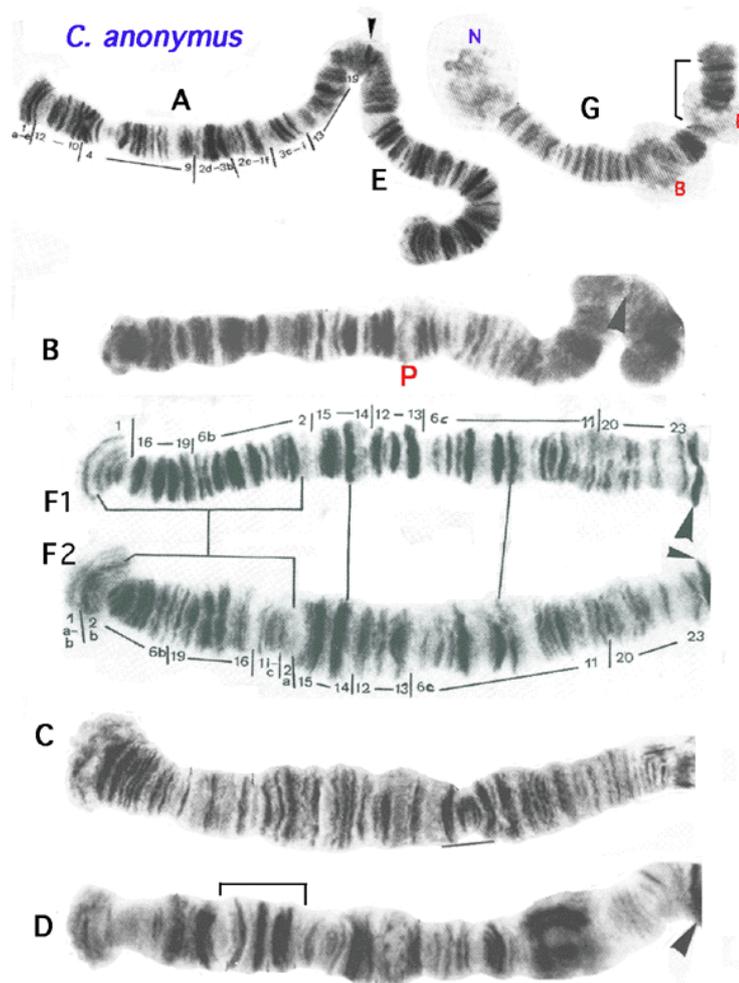
anyC1:

anyD1:

anyE1: 1a-2e, 9a-10b, 3e-a, 8i-3f, 10c-13

anyF1: 1a-i, 16a-19d, 6b-2a, 15i-14a, 12a-13d, 6c-11, 20-23 (Texas, Mississippi), as *columbiensis*.

anyF2: 1a-b, 2b-6b, 19d-16a, 1i-c, 2a, 15i-14a, 12a-13d, 6c-11, 20-23 (California)



Found: **California** - Stanford, Santa Clara Co.; Near Palo Alto, Riverside (incl. 'Midgeville', UCR Campus), 3.5 mls. Palm Desert, & Corona, Riverside Co.; Arlington.
Mississippi - Jackson, Hinds, Co.(30.50; -90.33)
Texas - Brackenridge Exptl. Stn., Austin, Travis Co.(30.27; -97.73; Fish hatchery Galveston, Galveston Co. Called *C. karensis* by Laufer *et al.* (1982)
 Also found on St. Vincent Island, West Indies.

Also known as Sp. 51 of Frommer. Egg mass described (as *C. sp.* 1 as arcuate, less than 900 eggs and no enlarged capitulum, by Morrow, Bath & Anderson (1968) and larva by Bath and Anderson (1969). Morphology and cytology described by Wülker, Sublette, Morath & Martin (1989), some details of arms A, E and F given by Wülker & Morath (1989). The sequence differences between western and eastern populations may indicate evolutionary divergence, but this is not certain until it is determined whether polymorphic populations occur between Texas and California. Biever (1965, 1971) successfully bred this species in the laboratory (under the name *C. sp.* 51).

Species 2p. *C. utahensis* Malloch, 1915

Tendipes (Tendipes) utahensis, Townes 1945: 127.

Adult redescribed by Townes (1945) and by Sublette in Wülker, Sublette and Martin (1991).

Male: Wing length 3.7 (3.1-4.6), LR 1.18, fore tarsi with a long dense beard. AR 4.26 (3.71-4.70).

Palpal proportions (segments 2-5)(micron): 55-70 : 211-250 : 195-242 : 179-350.

Frontal tubercles 40-50 µm long, up to twice as long as wide. Clypeus on average about 0.9 of width of antennal pedicel, but may be as wide if squashed in slide preparation.

Thorax yellowish-brown to dark brown, with vittae, postnotum blackish brown.

Thoracic setae – 15 (12-17) acrostichals; 36 (26-46) dorsocentrals in two to partially 3 rows; 7-13 prealars; 1-2 supra-alars; 40 (32-77) scutellars, with 2 rows heavy setae posteriorly and several strewn rows anteriorly.

Wing with 24 (20-41) setae in squamal fringe

Abdomen largely blackish-brown, terga II-VIII with a slightly paler brown, narrow apical fascia; genitalia dark. Tergite 9 with 6 (0-19) setae, usually in one paler patch, occasionally in two smaller patches, or lacking. Anal point short and moderately broad at the base, not strongly downcurved. SVo usually only slightly curved. GS abruptly tapered over distal third.

Legs with femora and tibiae yellowish brown; tarsi largely blackish; basal third of TA1 on PII and PIII, slightly paler. LR1 1.07-1.27; LR2 0.58 (0.55-0.62); LR3 0.70 (0.68-0.72). BR 6.32 (5.20-7.75).

Female: Color similar to male, but thorax more yellowish, with vittae more distinct. Wing length 3.89-4.53 mm; squama with 33-41 marginal setae.; LR 1.07-1.21.

Head – antennal proportions (µm): 179 : 133 : 133 : 125 : 211; AR = 0.12; A5/A1 about 1.18

palpal proportions (Segs 2-5)(in µm): 62 : 125 : 125 : 250.

Clypeal base 1.73 times the width of antennal pedicel.

Thorax with distinct mesonotal tubercle. Setae – Acrostichal abt 17-18; dorsocentral 45-48 in two to three rows at widest; prealar 17-18; scutellar 75-77.

Femora of all legs brownish, only apices blackish; anterior tibia and tarsi black; Mid and hind tibiae brownish, with only a narrow apical and basal darkening. Mid LR 0.51-0.54; Hind LR 0.66-0.67. 111-123 sensilla chaetica on mid leg, 114-120 on hind leg.

Pupa: Length 8.22-9.67 mm. Cephalothorax brownish-black, papillose; abdomen pale, very weakly dark longitudinal stripes laterally; posterolateral spur and swim fin margin dark. Cephalic tubercles relatively long and curved. Hooks of tergum II pale mean 90 (82-91); postero-lateral spur with 6 (4-8) spines; 94 (88-100) flattened taeniae on swim fin.

Fourth instar larva a medium sized bathophilus- or melanotus-type (i.e. some larvae have PLT up to 120 μm long), length 13-15.8mm (fem); 12.7-13.7 (male); VT about equal length, although anterior generally slightly longer (ant. 1.4-1.68; post. 1.2-1.64). PLT and VT lengths vary between populations: e.g. both are relatively longer at Klamath Falls than in California, and in California only 3 of 9 larvae had PLT up to 40 μm , while all larvae from Klamath Falls possessed PLT, varying from 40-200 (ave. 95) μm . AT a simple lobe, with some variability in length between populations; dorsal pair generally longer and varying from about 2-2.5 times longer than wide in South Dakota to 4-4.2 times longer than wide in Oregon.

Dark to very dark posterior 2/3 of gular region, pale FC or slightly darkened (in California); and antennal pedicels darkened.

Mentum with somewhat rounded teeth; c1 tooth relatively narrow with short parallel sides, c2 teeth well separated (type III but can appear as IIA if worn); 4th lateral reduced at least to the level of the 5th lateral (type II).

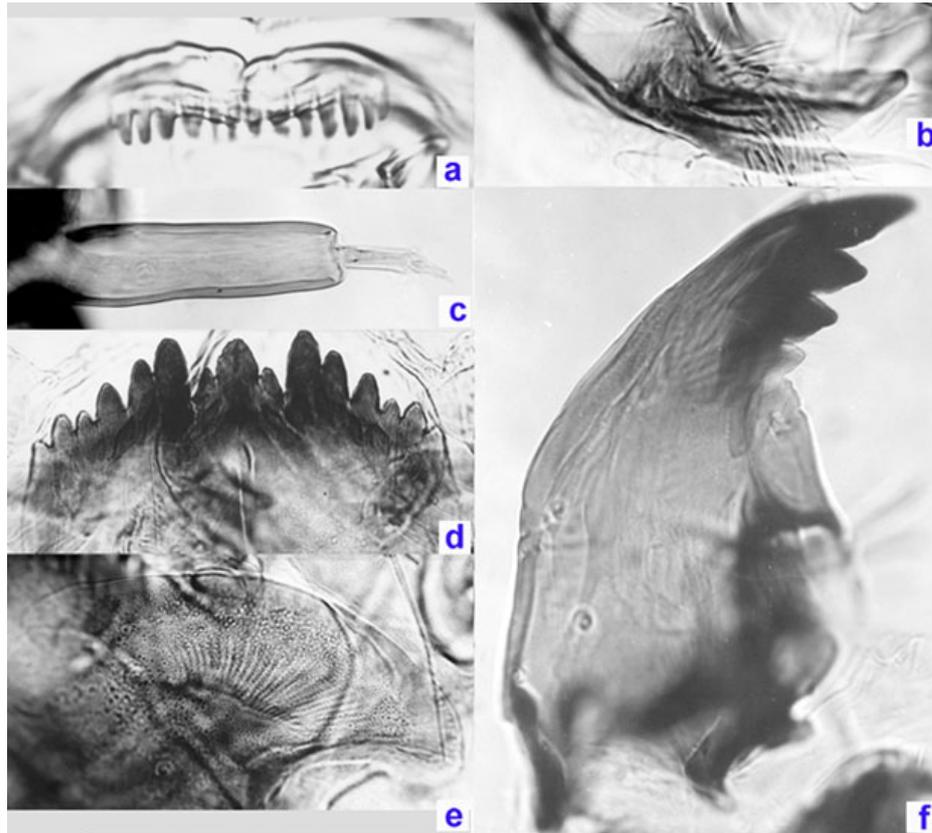
Ventromental plates separated by 0.38-0.45 of mentum width; with 31-40 striae reaching about 2/3 to the anterior margin; VMR about 0.27-0.33. PE with 11-13 relatively uniform broader teeth.

Premandible with narrow outer tooth slightly longer than the inner tooth, which is about 2.5-2.7 times wider.

Basal segment of antenna about 3.5-3.9 times longer than wide, RO between 1/3 and 1/2 way up from base of segment.; AR about 1.8-2.35; A2/A1 about 0.22-0.24; A3 generally of equal length; segment lengths (micron) 145 : 33 : 7 : 11 : 7.

Distance between the antennal bases and that between S4 setae generally similar, but can vary in either direction.

Mandible with 3rd inner tooth generally partly separated, but sometimes well separated (as fig. f below); and relatively pale (type II-IIIB); about 16-17 furrows on outer surface at the base; PMA with 10-14 taeniae.



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

Arm G closely paired, without a nucleolus, but with a BR towards one end, the position varying due to an inversion. The end near the BR is almost square due to a constriction, while the other end is fanned. Nucleolus in arm D. Polymorphic in arms A, D, E, F and G.

utaA1: 1a-e, 7 - 4, 13 - 15, 3e - 2d, 9 - 8, 3f-i, 12 - 10, 2c - 1f, 16 - 19

utaA2: approximately 1a-e, 7 - 4, 13 - 15, 3e-b, 9a-g, 2d - 3a, 8?-a, 3f-i, 12 - 10, 2c - 1f, 16 - 19.

utaB1: Puff with distal dark bands (groups 8-7) at distal end of arm, smaller BR in proximal third of arm.

utaC1: 1-6b, 12b-15, 18d-17b, 6c-f, 7a-d, 16-17a, 6hg, 11d-12a, 11c-8, 18e-22

utaC2: approximately 1, 14-12b, 6b-2, 15a-e, 18d-17b, 6c-f, 7a-d, 16-17a, 6hg, 11d-12a, 11c-8, 18e-22

utaC3: approximately 1-2e, 3-2f, 4-6b, 12b-15, 18d-17b, 6c-f, 7a-d, 16-17a, 6hg, 11d-12a, 11c-8, 18e- 22

utaD1: 1-3e, 17b-13d, 12-13c, 4c-a, 10-9, 17c-19b, 11a-c, 3gf, 8-5, 19c-24

utaD2: 1-3e, 17b-13d, 19b-17c, 9-10, 4a-c, 13c-12, 11a-c, 3gf, 8-5, 19c-24

utaD3: 1, 15-17b, 3e-2, 14-13d, 12-13c, 4c-a, 10-9, 17c-19b, 11a-c, 3gf, 8-5, 19c-24

utaE1: 1-3e, 5-7c, 12-10c, 3f-4, 10b-7d, 13a-g i.e. differs from *aberratus* by Inv 12-7d

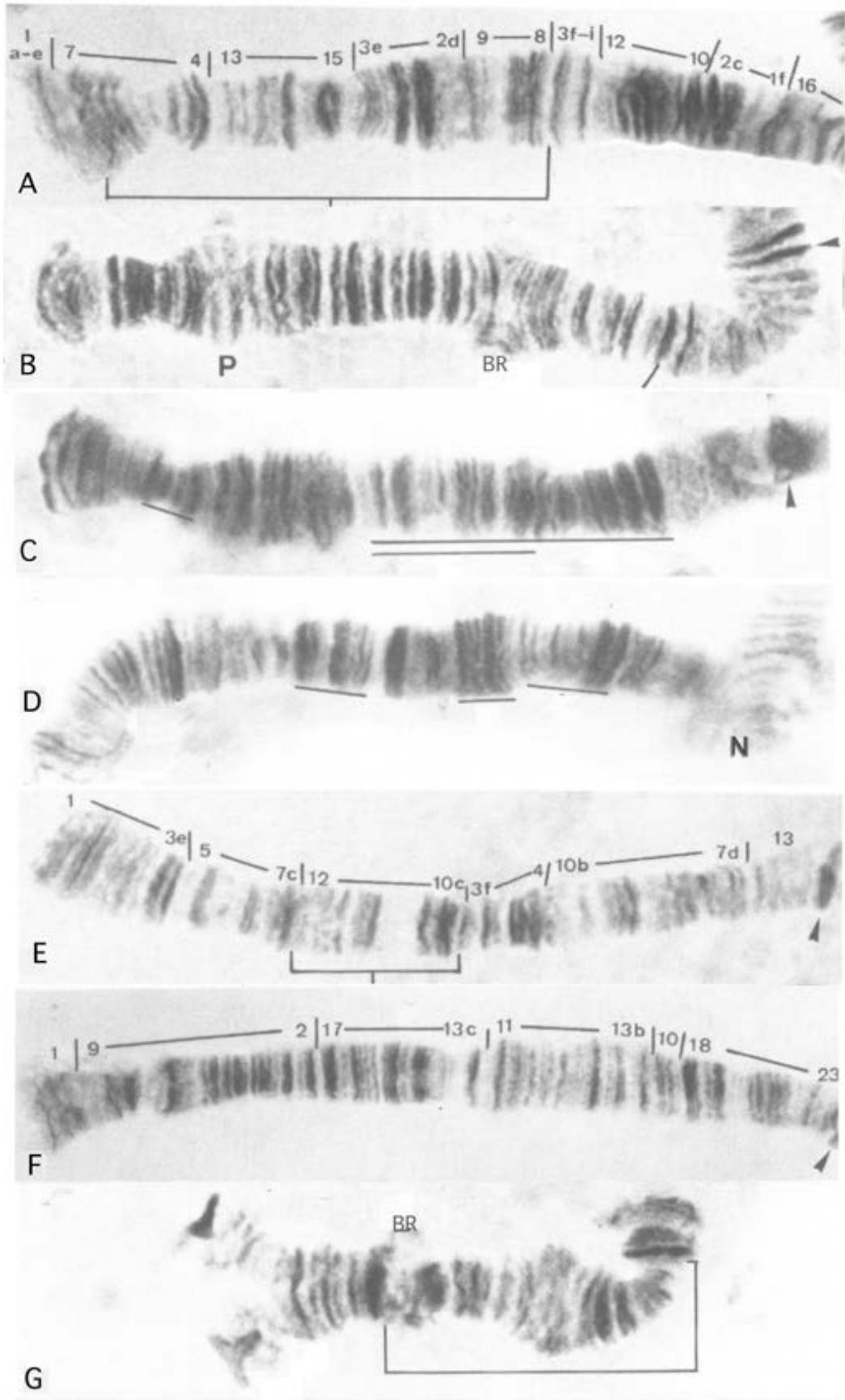
utaF1: 1a-i, 9-2, 17-13c, 11-13b, 10d-a, 18-23

utaF2: approximately 1a-i, 14-13c, 2-9, 15-17, 11-13b, 10d-a, 18-23.

utaF3: differs from F1 by two overlapping inversions.

utaG1: Obvious BR about one third from centromere.

utaG2: Inversion of about two thirds of the arm, taking the obvious BR to near the distal end.



C. utahensis
Modified from Wülker *et al.* (1991)

Shallows of lake or other pools, particularly where much algal growth.

Found: **Alberta** - Elk Island & Lesser Slave Lake (Townes 1945)
Arizona - Shultz Pass Tank and Lower Lake Mary, near Flagstaff; Williams (Townes 1945).
California - 1.7 ml Benton Hot Springs, Mono Co; nr Spring Valley Lake, Apple Valley, San Bernadino Co.; Alkali Lake in Antelope Valley, Kern Co. (Townes 1945)
Colorado - Fort Collins (Townes 1945)
Minnesota - Sand Lake (Townes 1945)
Montana - 2 ml s. Ronan, Lake Co.
Nevada - Reno & Wells (Townes 1945)
New Mexico - Mineral Springs, Taylor Springs, Colfax Co.; Eagle Nest Lake, Colfax Co.; Miami Lake, Colfax Co.; Upper Abbott Lake, Harding Co.
North Dakota - Dead Colt Creek Dam
Oregon - Upper Klamath Lake, 1 ml Williamson River, Klamath Co.
South Dakota - Wagner, Charles Mix Co.
Utah - Kaysville (Type), Bear River Bay, Great Salt Lake, Honeyville, Magna & Plain City (Townes 1945)

Morphology and cytology described by Wülker Sublette & Martin (1991), which corrects a minor error in the arm E sequence in Martin, Sublette, Sublette (1979). A photograph of the karyotype was also published in Schaller & English (1976) and Kiknadze *et al.* (2010). The cytology places *C. utahensis* as a member of the karyosystematically defined (but not the morphologically defined) ‘decorus-group’.

Species 2q. *C. magnus* White & Ramsey, 2015

New Name for *C. major* Wülker & Butler, 1983 (junior homonym)

Adult: Morphologically similar to *C. plumosus* (Epler 2001).

Male – Wing length greater than 7 mm, slightly longer than *C. plumosus*. BR <6.0.

Thorax dark brown; abdominal segments entirely light brown without dark bands or other markings.

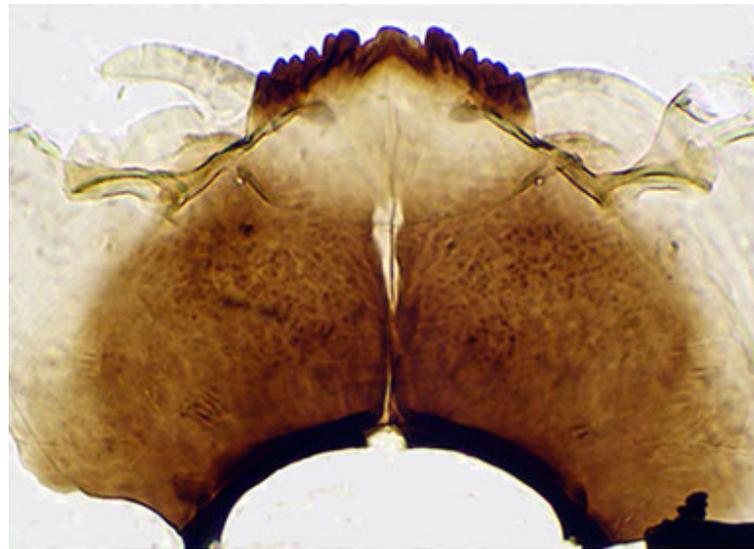
Hypopygium illustrated by White & Ramsey (2015). SVo about twice as long as in *C. plumosus*. Style swollen just beyond half way, then narrowing sharply.

Pupa: Not described.

Fourth instar larva of type series of halophilus type, but most other reports refer to salinarius type. Very large species, length from 30 mm to over 55 mm (Epler 2001). Where VT present the anterior pair are 1.04-1.11 mm long, generally shorter than the posterior pair which are 1.09-1.11 mm long. Details of AT are available only for the halophilus-type larvae, where they are about 567-784 µm long (means: dors. pair 625, ventral pair 641) and about 2.2-3.1 times longer than wide.



Gula (below) darkened on posterior half to three quarters and extending up to margin on either side of the mentum, FC pale. Clypeal aperture (Fig. b, below) about 2.18 times longer than wide.



Mentum (Fig. e, below) with 4th laterals reduced at least to level of 5th laterals (type II); central tooth relatively broad with c2 teeth relatively well separated (type IIA).

VM (Fig. f, below) about 3.65-3.75 times longer than deep, but only about 0.90-0.96 of the mentum width and separated by about 0.42 (0.38-0.49) of mentum width, about 48.5 (41-68) striae, VMR 0.31-0.40.

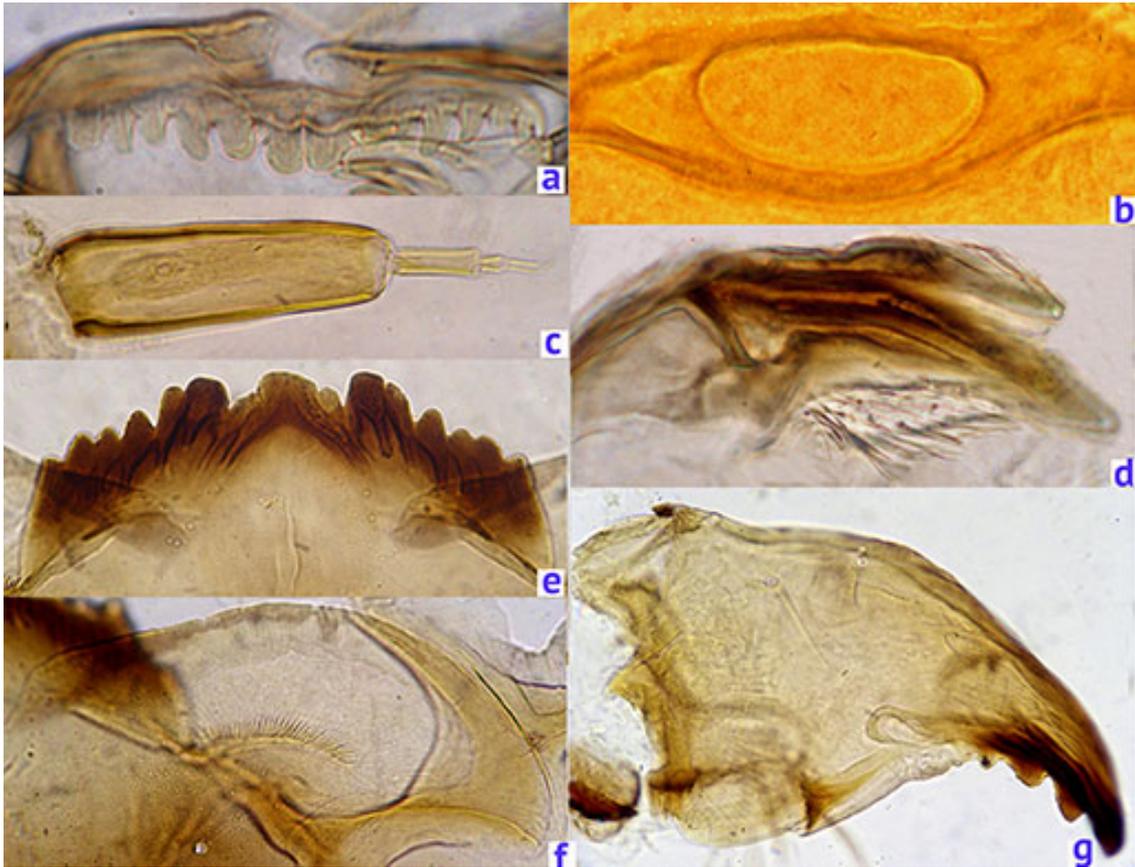
PE (Fig. a, below) with 12.7 (10-15) broad (type B), often somewhat irregular due to wear, teeth.

Premandible (Fig. d, below) with inner tooth about 2.0-2.8 times the width of the outer tooth, probably about equal in length, but outer badly worn in most of the available material.

Distance between antennal bases greater than that between the S4 setae, which are separated by about 0.75 of mentum width at that point.

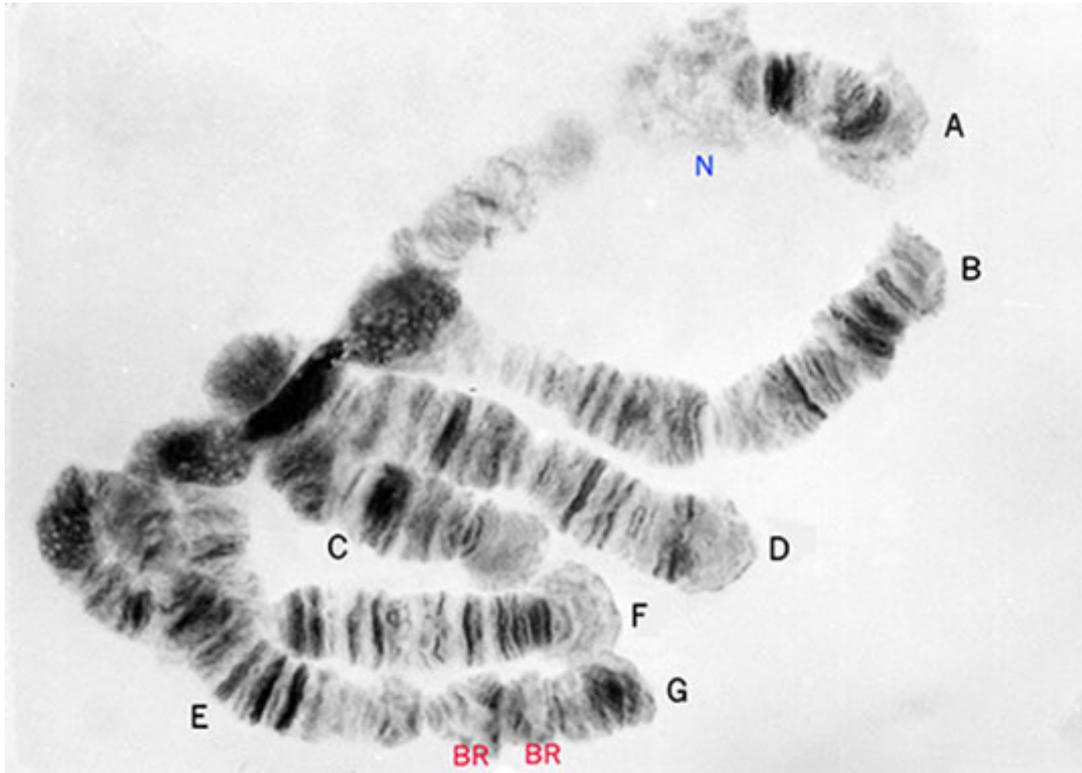
Antenna (Fig. c, below): Segment 1 relatively long, 2.36-3.78 times longer than wide, RO about 0.45 (0.38-0.47) up from base of segment; A_2/A_1 about 0.18-0.25; AR about 2.46 (2.22-3.01); ratio of segments (μm) 173 : 38 : 9 : 14 : 8.

Mandible (Fig. g, below) with third inner tooth often only partly separated and partially colored but may be completely separated and dark (type IIB-IIIIC; about 25 (21-31) furrows on outer surface near the base; 11.6 (10-13) taeniae in the PMA.



Cytology: 3 polytene chromosomes with a modified thummi arm combination AB, CD, GEF. Centromeres heterochromatic and may have a large vacuolated region and may form a chromocenter. No nucleolus in arm G, only nucleolus in arm A. Two BRs in arm G region. Arm B sometimes shows a bulb (group 7) with distal dark bands near distal end.

- mgsA1: 1-2c, 10-12, 3-2d, 9-4, 13-19 i.e. as in *holomelas*, *cucini* and *tardus*.
mgsB1: Puff and distal dark bands (groups 7-8) near distal end. Differs from *tardus*B1 by small inversion just distal of middle of arm.
mgsC1: Differs from *neocorax*C1 by small distal inversion.
mgsD1: Differs from *cuc*D1 by small distal inversion.
mgsE1: 13a-10c, 3f-4, 10b-5, 3e-1, 13b-g Long inv. from *cingulatus*
mgsF1: 1-10, 17-11, 18-23 i.e. as in *cucini*, *tardus* and *tenuistylus*.
mgsG1 Attached to distal end of arm E, with 2 BRs in middle of the arm.



Salivary gland chromosomes of *C. magnus* (modified from Wülker and Butler 1983.
B - Balbiani rings

Found: **Alabama** - locality not recorded.

Georgia - 5 ml w. Athens (33.97°N, 83.50°W), Clarke Co. (**Type locality**); Lake Sinclair, nr. Milledgeville, Putnam Co.; Lawrenceville, Gwinnett Co.; Lullwater Lake, nr. Atlanta, DeKalb Co.

Kentucky - Kentucky Lake, Livingston Co. (Balco et al. 2004).

Ohio - Buckey Lake, Perry Co. (Bolton 2012).

Oklahoma - Lake Texoma (abt. 33.80°N, 96.55°W), Buncombe Creek. Cove, Marshall Co.

Tennessee - Reelfoot Lake, Lake Co. (Epler 2001)

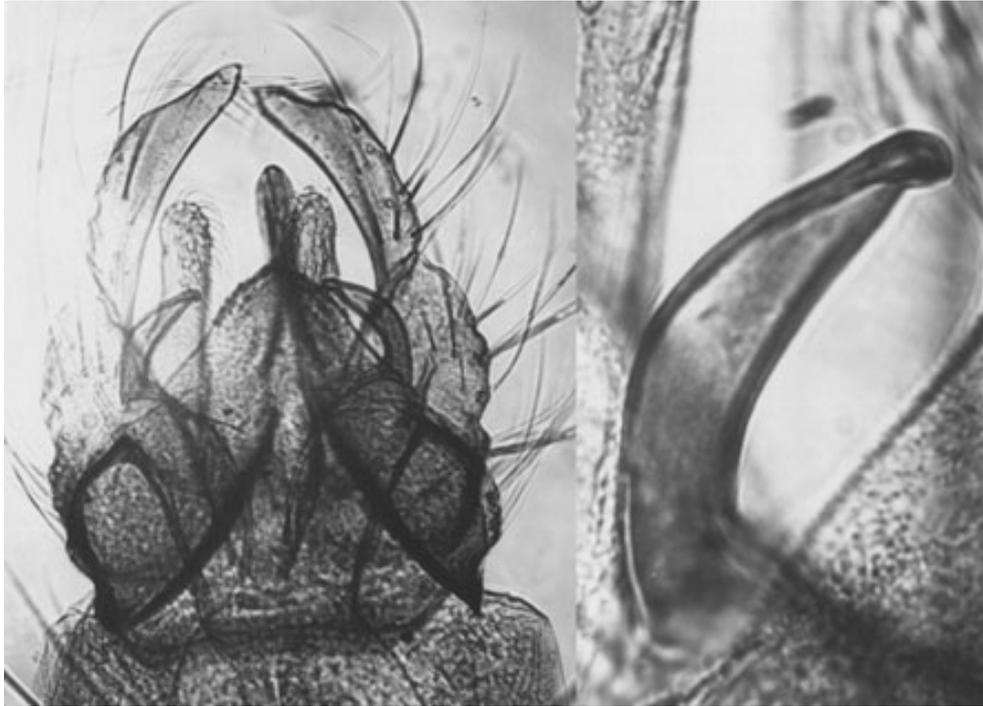
Lakes and ponds in southern U.S.A.

Described by Wülker and Butler (1983) as *Chironomus major* (although a junior homonym), some information on arm F given in Fig. 3 of Martin (1979).

Species 2r. *C. ?nr. atrella* Given manuscript name *C. grodhausi* by Sublette.

Adult: Adults may be in the collection of J. E. Sublette, now in the museum of the University of Minnesota.

Male:



Pupa: Only the caudolateral spur on segment VIII has been recorded, with from 1-3 spines at the end of the spur only.



Fourth instar larva a medium sized plumosus-type.

Gular region darkened over posterior half, FC probably darkened.

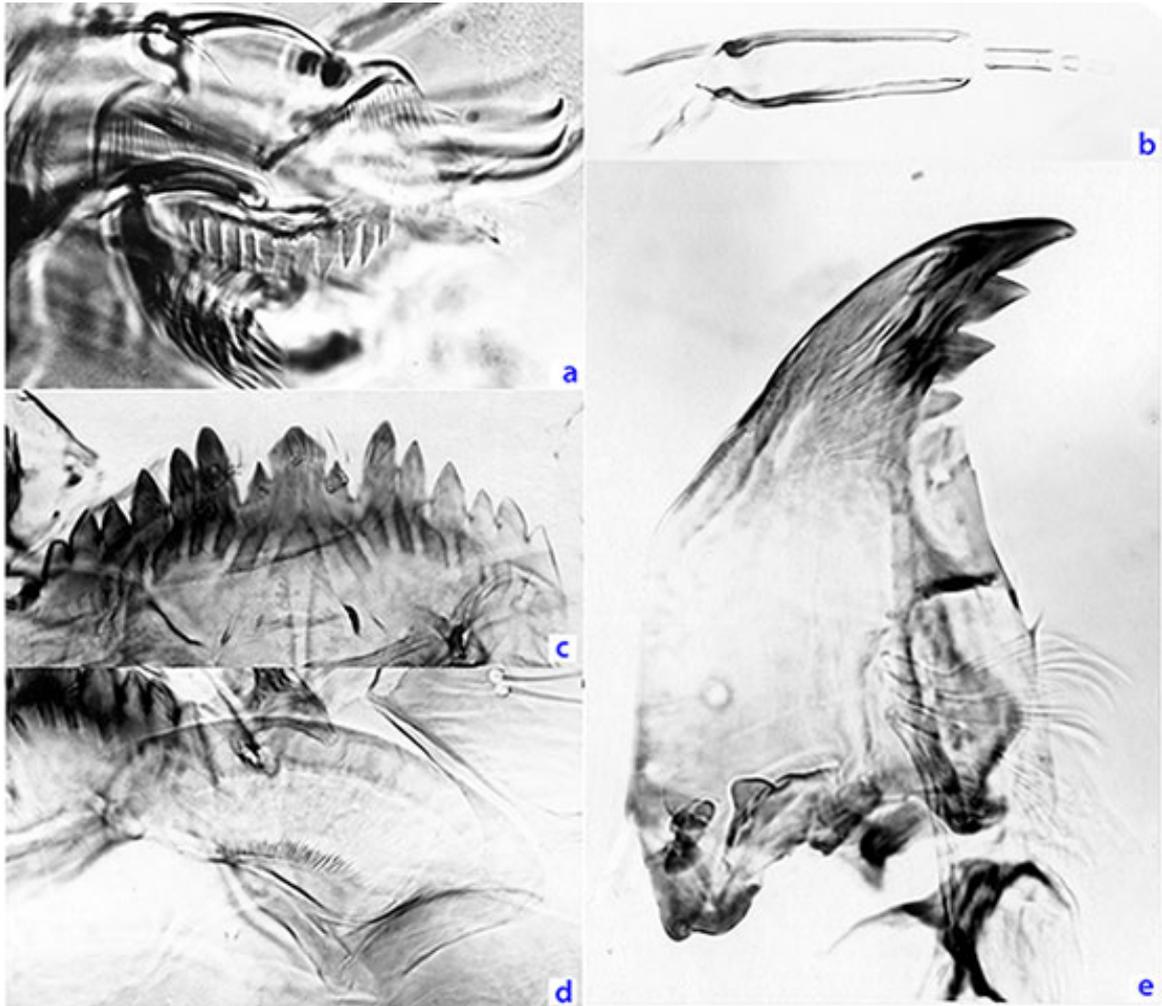
Mentum (Fig. c, below) with pointed teeth; c1 tooth relatively broad with diverging sides, c2 teeth, although well separated, virtually continue line of center tooth (type 1B or III). Fourth laterals not reduced (type I).

Ventromental plates (Fig. d, below) separated by about 0.36 of mentum width, with about 40-45 striae, VMR about 0.25-0.33. PE (Fig. a, below) with about 10-11 sharp but relatively broad teeth (type B).

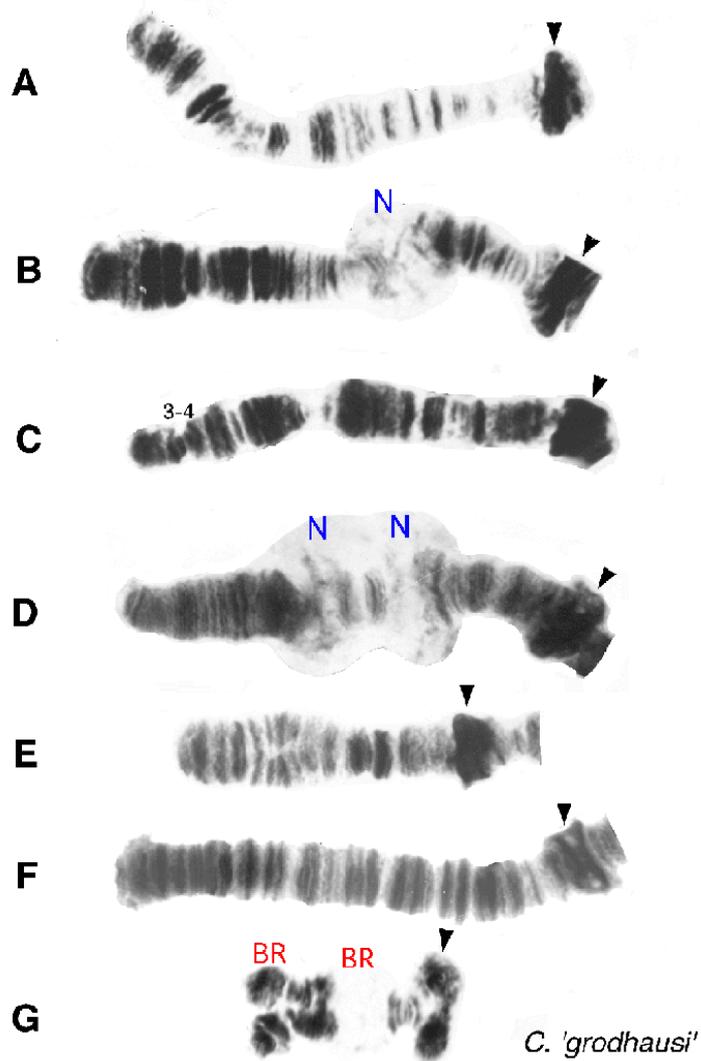
Premandible with outer tooth longer, inner tooth about three times broader than outer.

Antenna (Fig. b, below) with basal segment about 3.5-3.9 times longer than wide, RO nearly halfway up from base of segment; AR abt 2.1-2.33; relative lengths of segments (micron) 140 : 30 : 8 : 13 : 8.

Mandible (Fig. e, below) with third inner tooth well developed but only partly darkened (Type IIIB), about 16 furrows on outer surface near the base; 12-13 taeniae in PMA.



Cytology: 4 polytene chromosomes with the thummi arm combination AB, CD, EF, G. Centromeres heterochromatic, showing tendency to stick together to form a centromere. Large BR near center of closely paired arm G, with constriction between BR and centromere; another BR near distal end of the chromosome. Nucleolus in arm B, just distal to the 4 characteristic bands; 1 or 2 nucleoli near the center of arm D. No polymorphism in the small sample examined.



- Arm A1: 1a-e, 2d-3, 12-10, 14 – 13, 4 - 9, 1f- 2c, 15-19
- Arm B1: Nucleolus about 1/3 from centromere
- Arm C1: possibly 1 – 10, 15 – 11, 16 – 22 i.e. as sp. Apple Valley (sp. 3b)
- Arm D1: 1 or 2 nucleoli near middle of arm
- Arm E1: 1-3e, 5-10b, 4-3f, 10-13 i.e. as *cingulatus*, *tardus* and sp. 3b.
- Arm F1: 1 - 23 i.e. Standard, as *piger*

Found: California - Lake Davis, Plumas Co (abt 39.70°N, 120.50°W).

Some information on arm F given in Fig. 3 of Martin (1979). The cytology suggests a possible relationship to species Apple Valley (species 3b)

Species 2s. *Goeldichironomus carus* (Townes), 1945
Goeldichironomus carus - Contreras-Lichtenberg (1982).

Adult
 (from Townes 1945)

Male - Wing length 3.1 mm; fore LR 1.25; antennal ratio 3.8.

Body of medium build.

Frontal tubercles absent, clypeus very small.

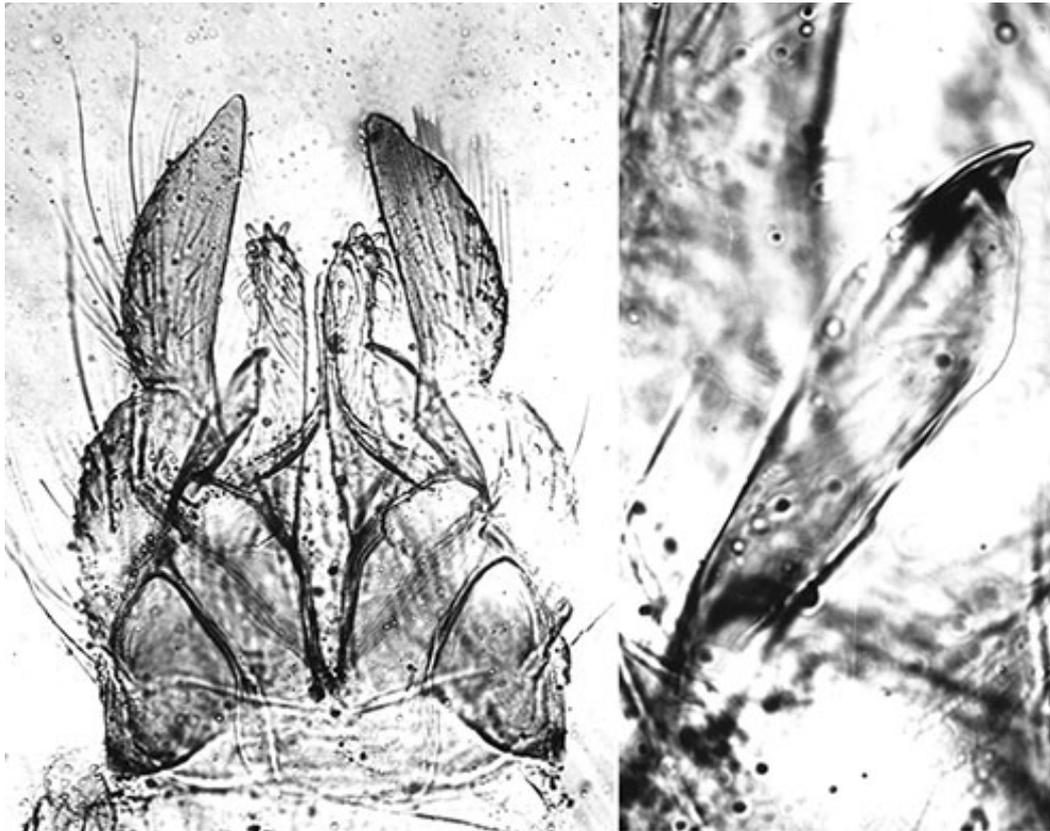
Pronotum slightly narrowed in the middle.

Fore tarsus with a short beard.

Ground color ochraceous more or less tinged with green or brown, apices of femora, tibiae, and tarsal segments light brown, apical tarsal segments brown.

Abdominal tergites 2-7 each with a more or less central rhomboidal brown patch.

Genitalia with narrow anal point and expanded superior volsella.



Male terminalia of *Goeldichironomus carus*

Note the expanded superior volsella.

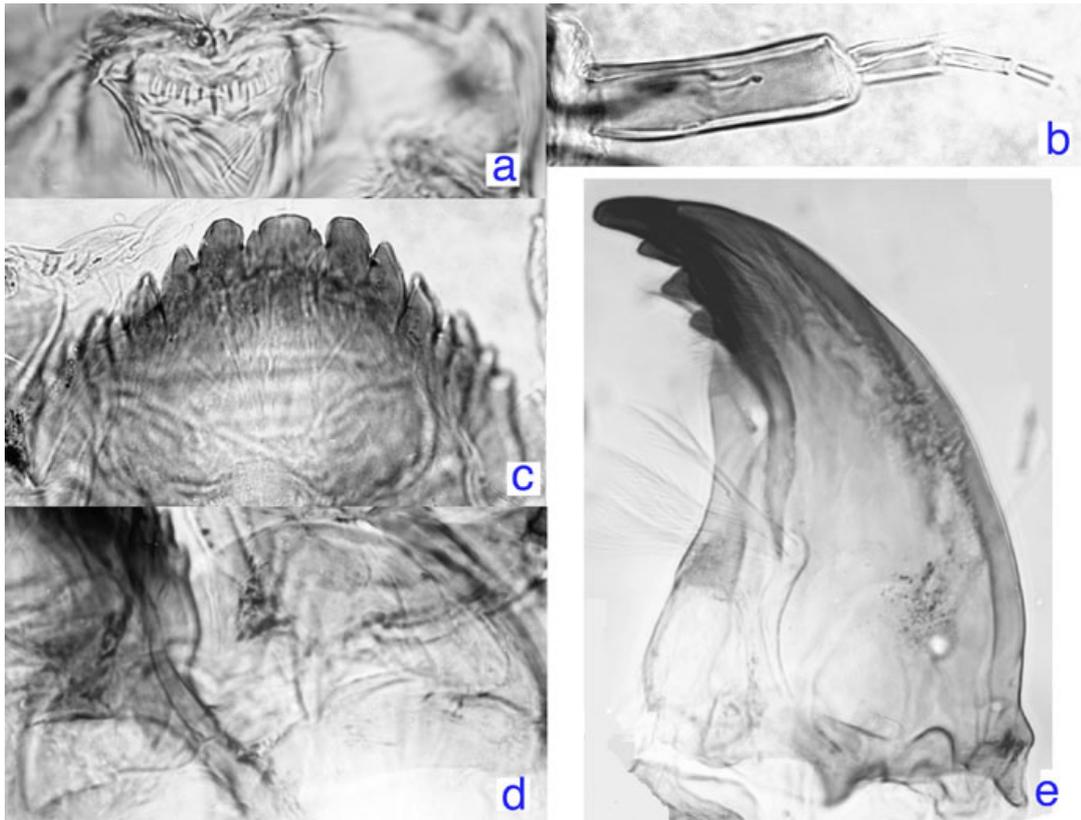
Female: Similar to male except for the usual sexual differences

Fourth instar larva a small bathophilus-type, but with a group of bristles at the rear margin of segment 10. Gula slightly darkened, FC as in *Glyptotendipes*, *Kiefferulus* and *Einfeldia* species. Mentum (Fig. c, below) not typically *Chironomus*, but as some other *Goeldichironomus* species; center tooth with only notches on the side, although sometimes these may be more obvious; 4th laterals reduced (typical for this species).

VM (Fig. d, below) with inner margin pointing ventrally. PE (Fig. a, below) with about 22 teeth of normal or reduced size.

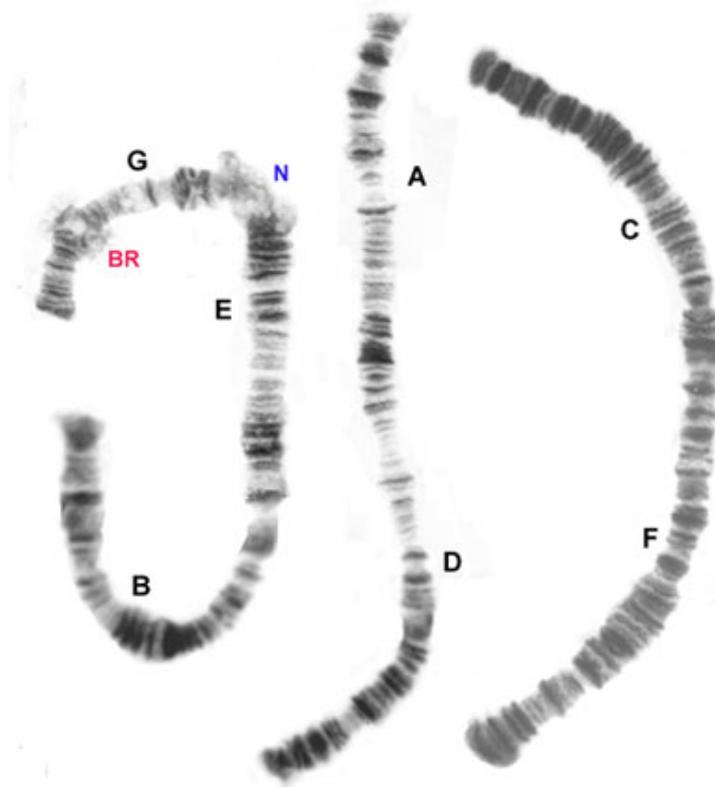
Antenna (Fig. b, below) with basal segment less than 4 times as long as wide, AR about 0.8; segment A3 relatively long, A4/A3 about 0.5.

Mandible (Fig. e, below) with 3rd inner tooth well developed and darkened, setae subdentalis with a fringed ventral margin.



The larva of this species is characterized as *Goeldichironomus* by the ventrally pointing inner margin of the ventromental plates and the serrate ventral surface of the seta subdentata, and as *G. carus* by the reduced 4th laterals of the mentum.

Cytology: 3 polytene chromosomes with the carus arm combination AD, BEG, CF. Keyl patterns not easily recognized. Nucleolus where arm G joins arm E; BR about $\frac{1}{3}$ from end of arm G.



Chromosome complement of *Goeldichironomus carus*.

Type locality: La Mucuy, Merida, VENEZUELA.

Found: Florida - Winter Haven, Polk Co.

Georgia (Caldwell et al. 1997)

North Carolina (Caldwell et al. 1997)

Texas - Brownsville, Cameron Co.; Cedar Lane, Matagorda Co.; Galveston, Galveston Co.; San Antonio, Bexar Co. (all Townes 1945)

Also Barro Colorado Island and Garun, Canal Zone; Baranquilla and Buenaventura, Columbia.

Townes notes that the adult is easily recognized by the mesoscutum, which has a brown band around the edge, just above which are three velvety-black subtriangular spots on each side, grading down in size from anterior to posterior.

Originally described as *Chironomus*, *G. carus* was transferred to *Goeldichironomus* by R.

Contreras-Lichtenberg (1982) following an examination of the immatures. A photograph of the arm E-G fusion is given in Martin *et al.* (1974).

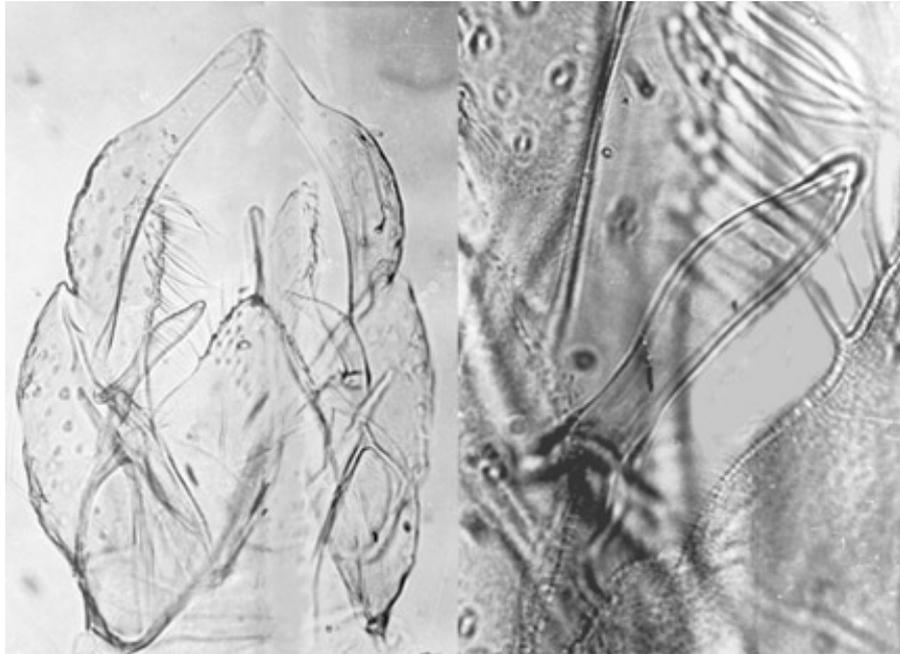
Species 2t. possibly *C. calligraphus* group

The identity of this species is quite uncertain. No larva is known that fits the few criteria listed by Wülker. It is possible that it is an early designation for the sample from Winter Haven, Florida, since the description and the few images available show a mixture of characters of *C. calligraphus* and *C. species WOC*, both of which were found together at this location (see Spies *et al.* (2002).

Adult

The adults of this species are in the Sublette Collection, now in the museum at the University of Minnesota, St. Paul, MN.

Male:



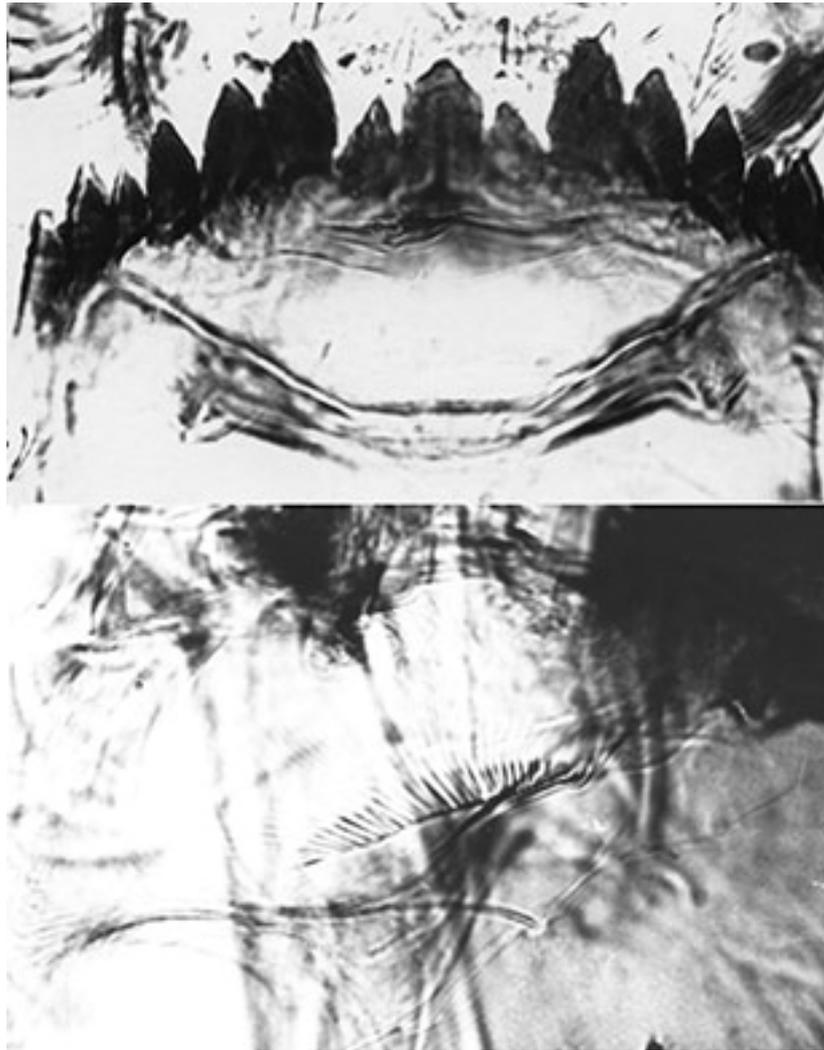
Male terminalia of *C. species 2t* (left), and superior volsella (right).

Possibly no setae near middle of tergite IX. Superior appendage most like Strenzke's S(f)-type. Anal point narrow.

This could be a male of *C. calligraphus*.

Fourth instar larva: gross morphology not known. Mentum (below) with pointed teeth; c1 tooth relatively broad with parallel sides, c2 teeth well developed and separated (type III), as that of *C. sp.* WOC.

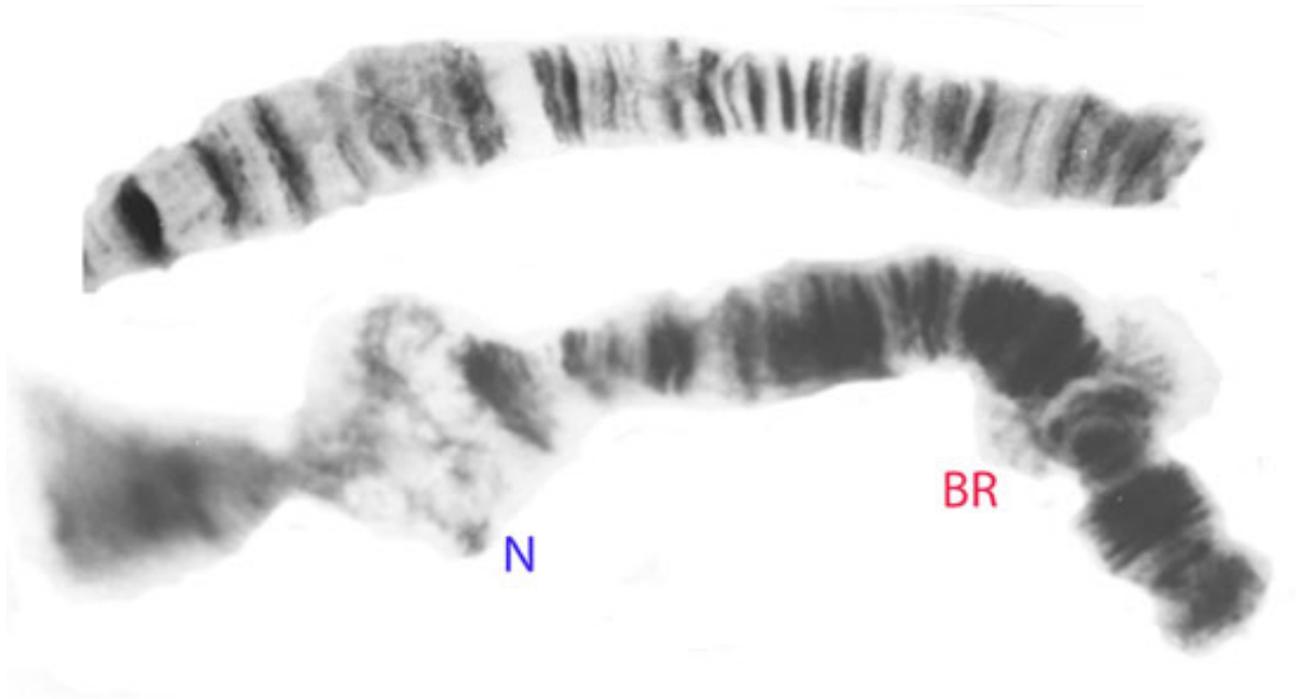
Ventromentum (below) with about 35 striae reaching about halfway to the margin.



Cytology: 4 polytene chromosomes with pseudothummi arm combination AE, BF, CD, G. Arm G (below) paired with nucleolus about a third from one end; two to three BRs, the position of which varies due to inversion polymorphism, very similar to that of *C. calligraphus*. The distal end of arm F (below), is also apparently identical in sequence to that of *C. calligraphus*. Centromeres of long chromosomes sometimes inflated like a nucleolus.

Arm F1: 1 - 6b, 19 - 18, 11f - 14, 17 - 15, 11e - 6c, 20 - 23 i.e. as *calligraphus* & sp.
WOC.

Arm G1: subterminal nucleolus, with an obvious Balbiani ring towards the other end.
Similar to that of *C. calligraphus*.



Distal end of arm F (above), and arm G (below) of *C.sp. 2t*
Both are consistent with *C. calligraphus*

Found: Florida - Winter Haven and Lake Cannon, Polk Co.

Corresponds to Species 15 of Wülker. He noted the existence of polymorphism in arm G, but did not indicate the nature or extent of this polymorphism in the Winter Haven material. It may reflect the difference between the G of *C. calligraphus* and *C. sp. WOC*.

Species 2u. *C. nr. tuxis*

This species is closely related to *C. species u.*

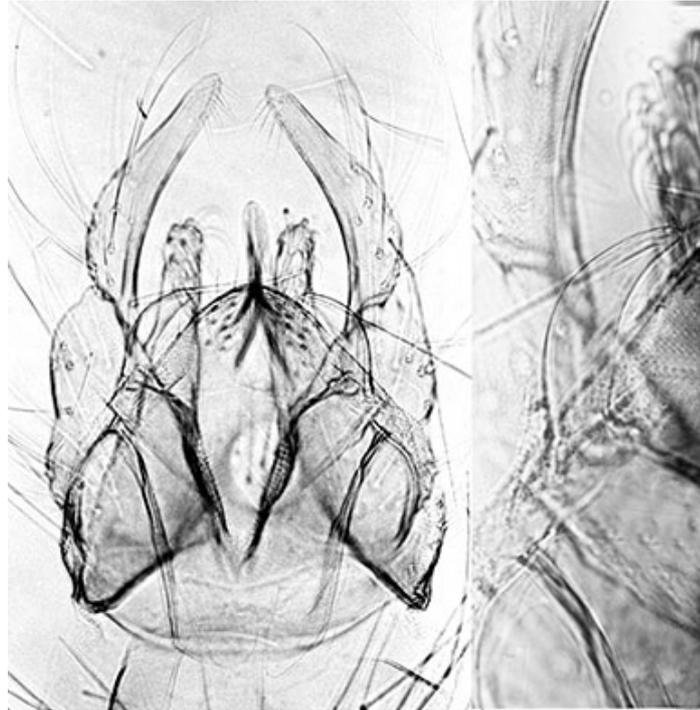
There is no BARCODE sequence matching that of this species currently in the BOLD database.

Adult:

The adults and pupal exuviae of this species are in the Sublette Collection, now in the museum at the University of Minnesota, St. Paul, MN.

Only the male terminalia can be given here.

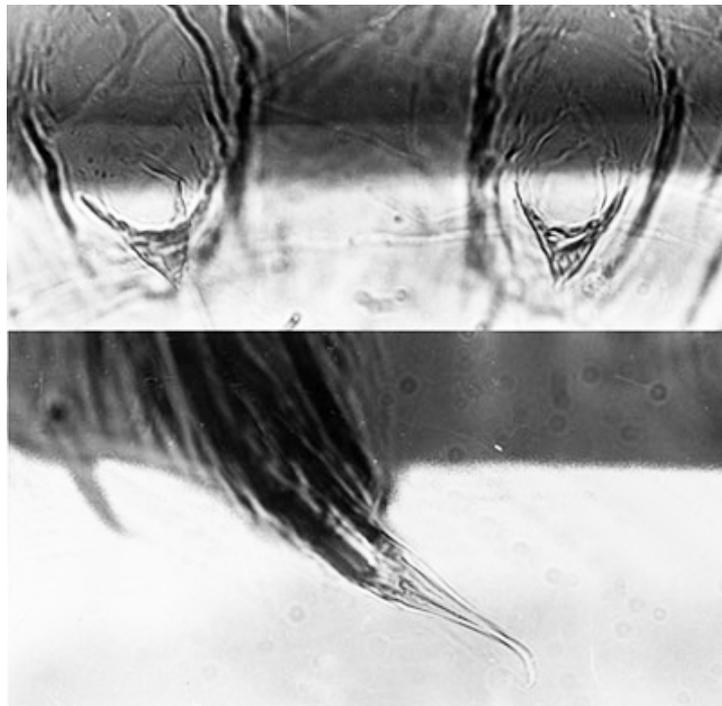
Male:



Male hypopygium (left) and SVo (right) of *C. sp. 2u*

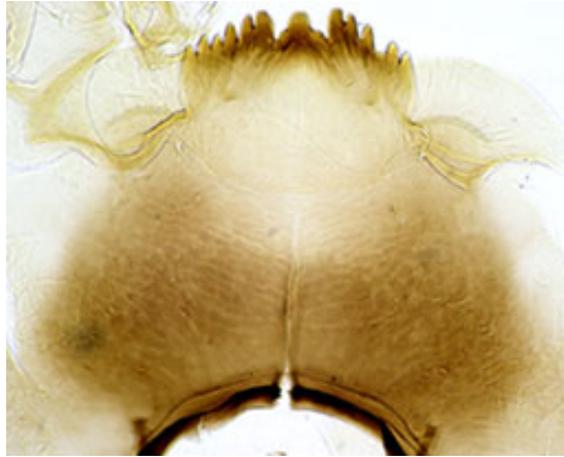
About 5 setae within a patch on 9th tergite. SVo closest to E(g)-type of Strenzke (1959). GS narrowing gently over posterior half.

Pupa: Cephalic tubercles of only specimen relatively small, postero-lateral spur with 1-2 long spines and possibly a shorter one arising lower down the spur.



Fourth instar larva a medium sized (length 10.5-12.5 mm) plumosus-type. PLT about 239 (200-275) μm ; anterior VT (1.31 mm) shorter on average than the posterior pair (1.33 mm). Anal

tubules a single lobe, ventral pair probably longer (300-500 μm , cf. 355-540 μm), and 2-3.5 times longer than wide. Gula (below) broadly darkened but less in mid line (as in *C. species u*); FC also darkened, sometimes as thick stripe (also as *C. species u*).



Mentum (c, below) with c1 tooth quite broad with short diverging sides (i.e. like a spear point) then rounded, c2 teeth quite well separated (type IB-III); 4th laterals generally reduced to about the level of the 5th laterals (type II-III).

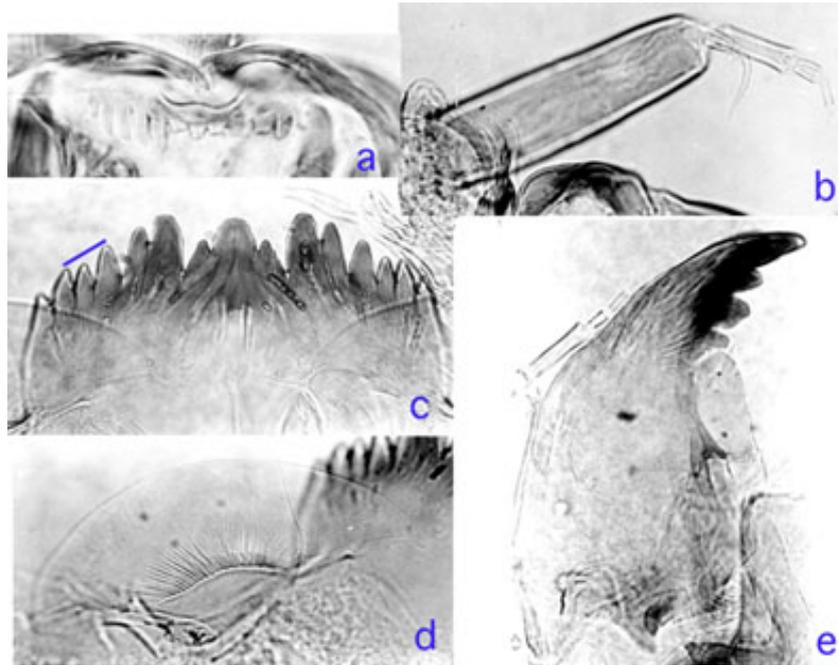
Ventromental plates (d, below) about 3.4-3.5 times longer than deep; with about 48 (41-59) striae; VMR about 0.36 (0.35-0.38); separated by about 0.35-0.38 of mentum width. PE (a, below) with about 13 (10-17) relatively broad teeth (i.e. type B).

Premandible with outer tooth probably about same length as the inner tooth depending upon wear; inner tooth about 2.5 (2.3-3.3) times wider.

Antenna (b, below) with basal segment about 3.2 (2.7-3.8) times as long as wide; AR about 2.08 (1.86-2.41); RO from one third to one half up from base of segment; antennal segments (micron): 145 : 37 : 12 : 14 : 8. Segment A1 sometimes quite wide, but this may be due to being squashed onto slide during mounting.

Distance between antennal bases less than that between S4 setae; distance between S4 setae about 89 (83-92)% of FC width.

Mandible (e, below) with 3rd inner tooth lightly colored and mostly partially separated (type I-IIB); about 21 (18-24) furrows on the outer surface near the base; and 12 (10-14) taeniae in PMA.

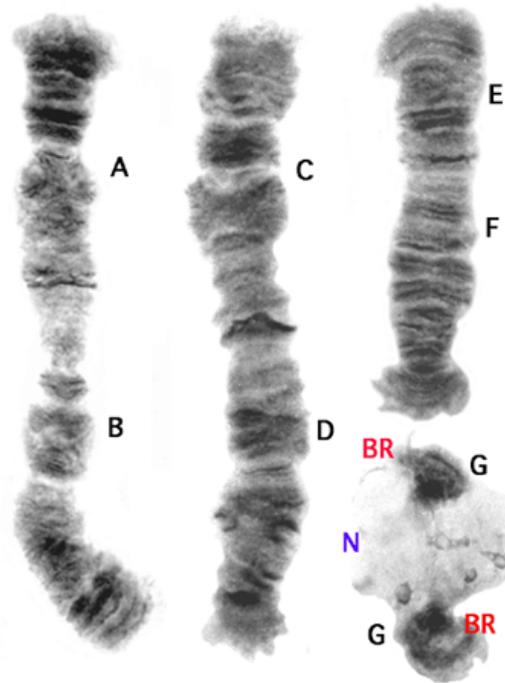


Mouth parts of the larva of *Chironomus* nr. *tuxis*

a. Pecten epipharyngis; b. Antenna; c. Mentum (showing reduction of 4th laterals); d. Ventromentum; e. Mandible.

Cytology: 4 relatively short polytene chromosomes with the thummi arm combination AB, CD, EF, G. Arm G short and generally paired only at the virtually terminal nucleolus; BR about 5 bands from the other end. No nucleoli in the longer chromosomes.

Bulb in arm B (groups 7 & 8) with distal dark bands near end of arm. Since the larvae are known only from a single egg mass, it is not possible to say whether inversion polymorphism occurs. The available chromosome preparations are not clear because they are quite contracted, but it is possible the sequences are the same as those of *C. species u*.



Chromosome complement of *C. nr. tuxis*.
 Note arm G does not always show this end to end pairing at the nucleolus
 N - Nucleolus; BR - Balbiani Ring.

Found in large pools with mud bottoms at depth of about 60 cm.

- Found: Alberta - Huntington Hills, Calgary (51.08°N, 114.08°W).
- Ontario - 4 ml e. Sudbury (44.88°N, 78.27°W).
- Manitoba - 6.7 ml s. Erickson (50.48°N, 99.90°W).

Molecular data:

MtCOI: Sequence has been obtained from larvae from Ontario and Manitoba but, as noted above, there is no matching sequence in BOLD or GenBank.

Species 2v. *C. athalassicus* Cannings, 1975

This species is in BOLD Bin: [BOLD:AAW3972](https://www.boldsystems.org/?bin_id=AAW3972)

Adult:

Male: Coloration variable from pale to dark.

AR 3.92 - 4.43 (4.14); wing length 4.3 - 4.7 mm (4.5 mm); VR 1.04 - 1.09 (1.05); LR 1.07.

Frontal tubercles about 40 micron long. Clypeus broad with 25-52 (42) setae. Palp segments 2-5 (micron) 84 : 300 : 265 : 320).

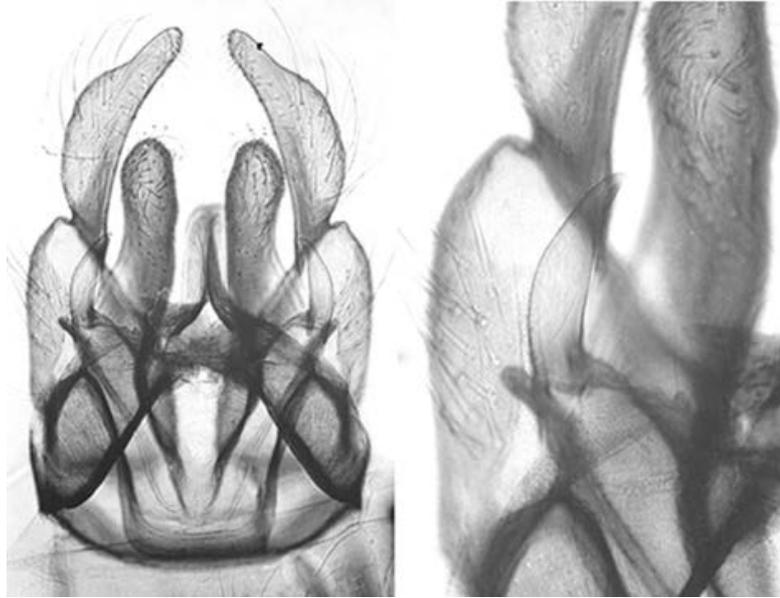
Thorax with median tubercle as a low bump. Setae: Acrostichals 0 - 5; Dorsocentrals multiserial 30 - 50 (39); Prealars 15 - 19 (16); Scutellars 42 - 70 (53).

Anterior tarsi without beard, but occasional long setae up to 6 times the tarsal diameter.

Leg segments (microns):

	Fe	Ti	Ta1	Ta2	Ta3
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PI	2180	1990	2130	1190	880
PII	2190	2120	1110	740	570
PIII	2480	2510	1550	980	740
	Ta4	Ta5	LR	F/T	BR
PI	690	350	1.07	1.10	6.0-rare
PII	420	270	0.52	1.03	
PIII	470	290	0.61	0.98	



Hypogygium (left) and superior volsella (right) of a paratype male of *C. athalassicus*.

Abdominal terga reddish brown with a thin dark basal band. The apical one third to one half of segments 7 and 8 pale. In higher salinities the colors become paler.

Anal point broad, inner edge of superior volsella only slightly curved, superior volsella of D(f)-type.

Female: Color as male, but generally paler.

Wing length 5.0 - 5.2 mm; VR 1.13 (1.10-1.14); ant. LR 1.1-1.15, mid LR 0.52 (0.50-0.54), hind LR 0.63 (0.60-0.68).

Antennal segments (micron) 200 : 150 ; 160 ; 150 ; 260. Frontal tubercles about 25 micron long. Clypeus broad. Palp segments 2-5 (micron) 80 : 225 ; 225 ; 345.

Thorax with median tubercle as a bump. Setae: Acrostichals absent; Dorsocentrals multiserial 46-74; Prealars 12-16; Scutellars multiserial 62, 56 (47-97).

Genital lamina quadrate.

Pupa

Total length 11.7mm (10.0-13.8). Frontal tubercles 240 μ m long, subterminal seta about one third of length of tubercle at about 75 μ m long. Posterior row of curved hooks on segment II comprising 75-90 hooks. Caudolateral spur of segment VIII with 6 - 9 spines; anal lobes with 115-125 irregularly biserial lateral setae.



Caudolateral spur of segment VIII from a paratype of *C. athalassicus*.

Fourth instar larva a medium to large (fem. 13.5-20.8; male 17.0 mm) melanotus or semireductus-type, possibly depending upon salinity of habitat. PLT relatively short (80-240 μm); VT short to moderate length, but apparently longer in lower salinity, where the posterior pair of tubules may have a slight coil at the end (saline - about 0.68-0.72 mm; fresh water about 1.12-1.56 mm, anterior generally longer). AT about 2-3 times longer than wide (len. 354-633 μm , width 127-228 μm) larger in saline conditions and ventral pair generally larger.

Gular region generally darkened in posterior 1/3 to 2/3, FC pale, but darker around antennae and mouthparts.



Photo courtesy of M.G. Butler

Mentum (c, below) with sharp teeth when not worn; c2 tooth relatively well separated (type III); 4th laterals reduced to about level of 5th laterals (type II).

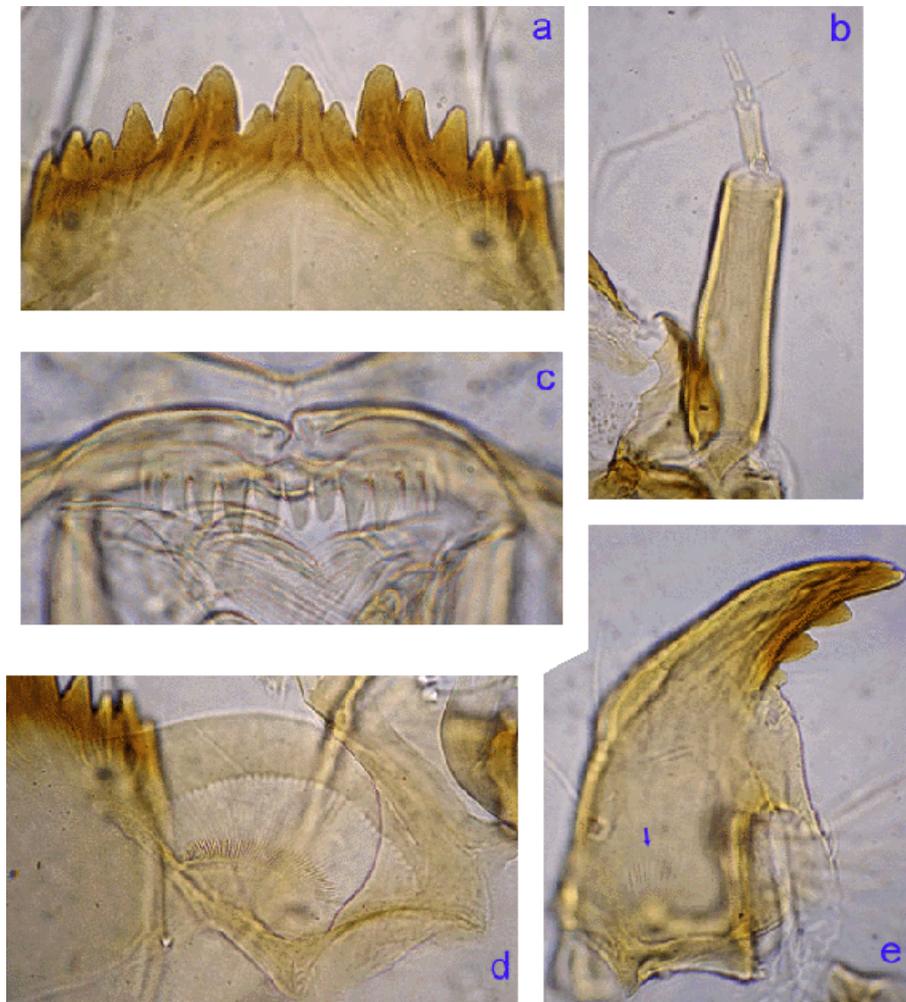
VM (Fig. d) about 3.1-3.4 time longer than deep; with about 45-47 striae), VMR about 0.32-0.41.

PE (a, below) with 10-17 broad sharp teeth.

Antenna (b, below) with AR about 2.7 (2.54-2.98); basal segment about 3.8 times as long as wide; antennal segment proportions (μm) 179 : 33 : 10 : 16 : 7 (Cannings gives segment 5 as same length as segment 3); ring organ just below middle of basal segment.

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

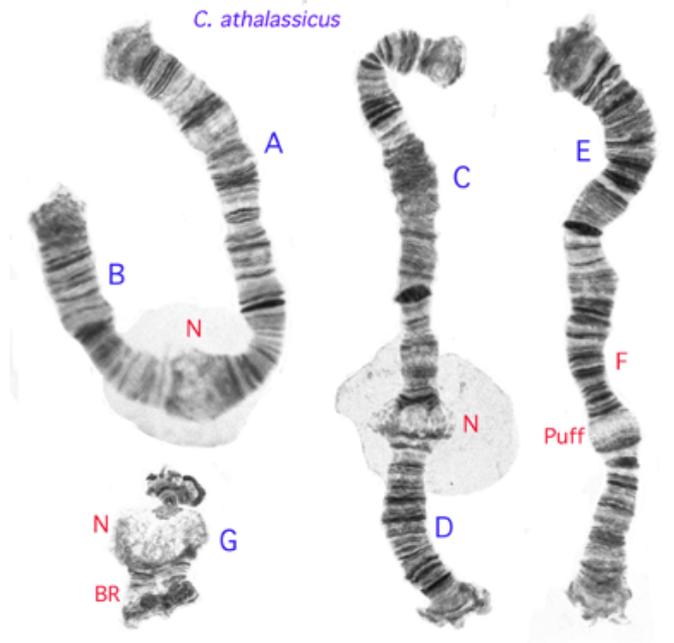
Premandible with outer tooth about half the width of the inner teeth, but about the same length. Mandible (e, below) with relatively pale fourth tooth partially separated (type IIB), about 17-21 furrows on outer surface near base (arrowed in figure), 14-18 taeniae in Pma; and 2 spines.



Mouth parts of *C. athalassicus*: a. Mentum; b. Antenna; c. Pecten epipharyngis; d. Ventromentum; e. Mandible (striae arrowed).

Cytology: 4 polytene relatively short chromosomes with the thummi arm combination AB, CD, EF, G. Centromeres heterochromatic, forming a chromocenter in BC specimens from saline habitats. Polymorphism in arms B (only in males?), D and and F 1, seen only in male larvae. Arm G relatively short and closely paired, with a nucleolus about in the center. Nucleoli also near the center of arms B and D. Inversions in arms B (only in males?), D and F.

athA1:	1 - 2c, 10 - 12, 3 - 2d, 9 - 4, 13 - 19	i.e. as <i>holomelas</i>
athB1:	Nucleolus one third from centromere, puff (group 7) distal as in <i>atrella</i> .	
athB2:	inversion of about one third of arm near distal end.	
athB3:	small inv. just distal of nucleolus.	
athC1:	1 - 2g, 6b-2h, 11c - 8a, 15 - 11d, 6g-h, 17a - 16, 7d-a, 6f-c, 17b - 22	
athD1:	1 - 3, 11 - 18d, 7 - 4, 10 - 8, 18e - 24	i.e. as in <i>longistylus</i> , <i>atrella</i>
athE1:	1a - 3e, 5a - 10b, 4 - 3f, 10c - 13	i.e. as <i>cucini</i> , <i>plumosus</i> , etc.
athF1:	1 - 23	i.e. Standard
athF2:	1a-d, 9 - 8d, 12 - 10, 2 - 3d, 1i-e, 3e - 4b, 13 - 14c, 8c - 4c, 14d - 23	



Polytene chromosomes of *C. athalassicus*
N - Nucleolus; **BR** - Balbiani Ring.

Found: **Alberta** - Banff National Park; Elk Island National Park; Jasper National Park (all BOLD)
British Columbia - Barnes Lake; Boitano Creek, and L. Boitano (51.95°S, 122.13°W), Springhouse (**Type locality**); Jackson Lake; Sorenson Lake (all Cannings 1975); 10 Km W Kamloops (BOLD).
Yukon Territory - Ivvavik National Park (BOLD)
North Dakota - Clearwater Lake (48.50°S, 120.33°W), Mountrail, Co.; Lake Isabel (46.819°S, 99.750°W), Kidder Co.

Originally described from saline lakes, but the North Dakota localities are freshwater.

Fourth instar larva, pupa and adults described by Cannings (1975), much of whose information is used above. He states that *C. athalassicus* is closest to *C. atritibia*. This is *C. sp.* Is Andreeva of Kiknadze *et al.* (2004, 2010), the latter reference with a labeled karyotype.

Species 2w. *C. calligraphus* Goeldi

Type 1 is in BOLD Bin: [BOLD:AAP1715](#)

Type 2 is in BOLD Bin: [BOLD:ABZ9507](#)

Adult:

Male:

Spies *et al.* (2002) compare the measurements to previous descriptions from South America and note that the usual characters of AR, and LR are correlated to wing length.

AR of Californian material 2.95-3.52; LR 1.55-1.72; Fe1/Ti1 1.16-1.19; Ta5/Ti 0.19-0.20. 5-11 setae on tergite IX; Superior volsella closest to D(e)-type of Strenzke (1959).

Female: No significant variation from original descriptions or between individuals from different localities.

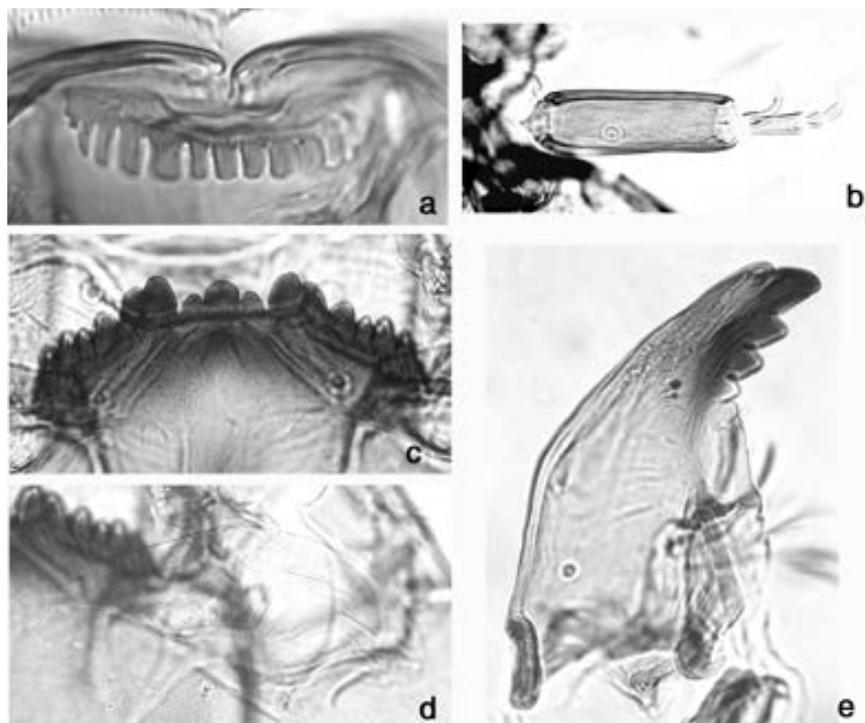
Pupa: Length 5.5-8.8 mm. Abdominal sternite I and II with weak shagreen of variable extent, and less extensive on tergite III. Pedes spurii A of V-VII a field of small points
Postero-lateral spur of segment VIII with usually 2-4 spines, but may be from 1-5.

Fourth instar larva a small to medium plumosus-type (9.3 - 13.3 mm). Gula darkened on posterior third, FC also darkened, although variable and FC may be pale (Spies *et al.* 2002). VT about length of segment VIII (Ant. 1.24 - 2.12 mm; Post. 1.08 - 2.16 mm), posterior pair coiled, shorter than described by Fittkau for South American specimens Those from California are shorter than those from Kansas or Florida. PLT well developed (280 - 420 μ m). AT relatively short, about 2.5 times or less longer than wide.

Mentum (c, below) with somewhat rounded teeth; c1 tooth relatively narrow and rounded, c2 teeth moderately well separated (type IIB), with reduced 4th lateral (type II). PE (a, below) with about 12 somewhat irregular teeth.

Antenna (b, below) with relatively narrow basal segment, about 3.3 times as long as wide; AR about 1.8; A2/A1 about 0.22-0.28; A4/A3 about 1.23-1.82.

Mandible (e, below) with 3rd inner tooth relatively well developed but only partly colored (type IIB).

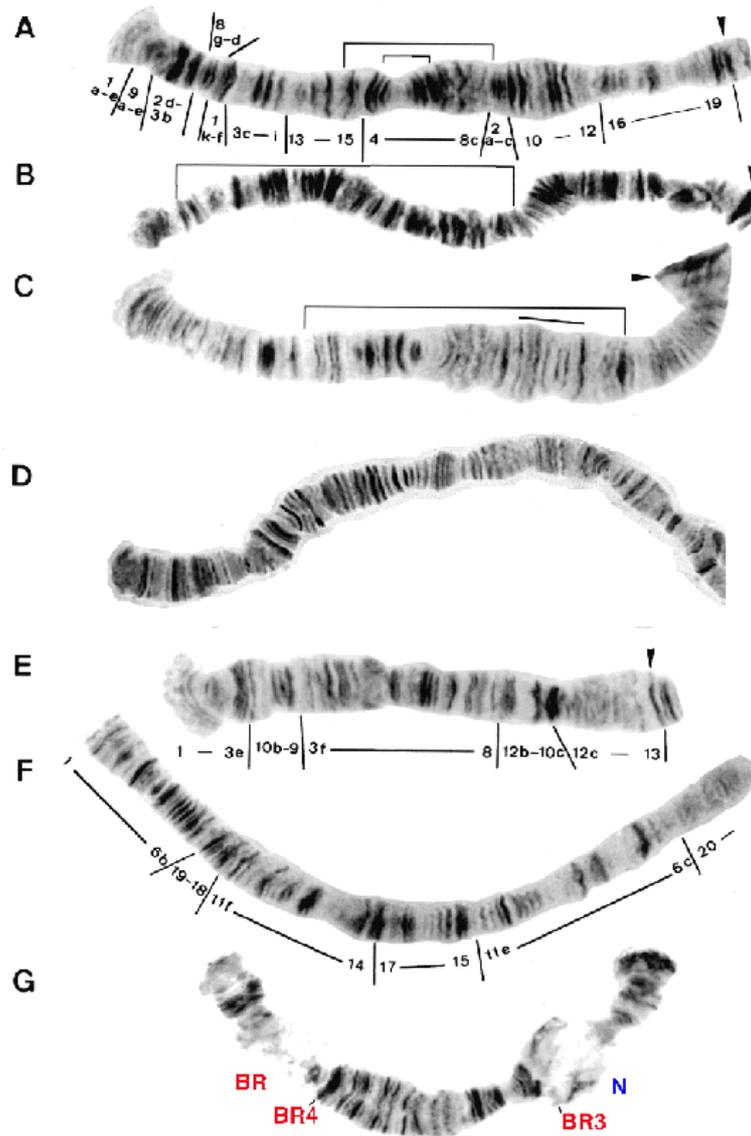


Cytology: 4 polytene chromosomes with the pseudothummi arm combination AE, BF, CD, G. Arm G relatively long, closely paired with a nucleolus about $\frac{1}{4}$ from one end and a BR near the other end. No nucleolus in other chromosomes. Moderate amount of heterochromatin at the centromeres. Arm B with bulb and distal dark bands about $\frac{1}{3}$ from end of arm. Only a small inversion in arm A of the Kansas specimen has been observed in North American samples, but polymorphism for arms A, B, and C is present in Central or South American samples.

cagA1: 1a-e, 9a-e, 2d-3b, 8g-d, 1k-f, 3c-i, 13a-15e, 4-8c, 2a-c, 10-12, 16-19

- cagA2: 1a-e, 9a-e, 2d-3b, 8g-d, 1k-f, 3c-i, 13-14, 8c-4, 15e-a, 2a-c, 10-12, 16-19 as
 sp. Villa Paz
 cagA3: approx. 1a-e, 9a-e, 2d-3b, 8g-d, 1k-f, 3c-i, 13a-15e, 4a, 6b-4b, 6c-8c, 2a-c, 10-12, 16-19
 cagB1: Bulb and distal dark bands about 1/3 from end of arm.
 cagB2: Inversion of about half of arm near distal end, Moves bulb to near center of arm.
 cagC1: Typical band group 3-4 about 1/3 from centromere.
 cagC2: Inversion of about central half of arm, moving group 3-4 to about middle of arm.
 cagE1: 1a-3e, 10b-9a, 3f-8, 12b-10c, 12c-13
 cagF1: 1a-6b, 19-18, 11f-14, 17-15, 11e-6c, 20-23 as in sp. WOC

C. calligraphus



(after Spies et al. 2002)

Polytene chromosomes of *C. calligraphus* type 2

Found: California - South Gate and Long Beach, Los Angeles River; Bellflower, San Gabriel River; Whittier; Cerritos, Coyote Creek (type 1), all Los Angeles Co.; Huntington Beach (type 2); Anaheim, Santa Ana River (type 2); all Orange Co.; Good Samaritan

retirement home, Corona; Hidden Valley golf course, 2 mi. w. Pedley; Valley Seminary District, all Riverside Co.

Florida - Gainesville, Alachua Co. (type 2); Winter Haven, Polk Co.

Georgia - Unidentified pulp plant in coastal Georgia (Gray *et al.* 2012)

Kansas - Mill Creek, nr Craig, Johnson Co. (37.95°N, 94.80°W).

Also Panama, Colombia, Brazil (Type locality - Belém)(type 1 & 2) and Peru.

Found in a wide variety of habitats, and may become a pest in some habitats (Gray *et al.* 2012)

C. calligraphus in North America appears to be a complex of at least two species. Both are present at the type locality at Belém, Brazil, but the form with the described chromosomes appears to be less frequent. The common form at Belém is therefore designated as Type 1, and the other form is type 2. Hence the larva and cytology described here are *C. calligraphus* Type 2.

Referred to in some published work as 'Sp. 52' or 'species Coyote Creek (see Spies *et al.* 2002).

Wülker & Morath (1989) give the sequence of arms A, E and F; and larva and cytology are described by Spies *et al.* (2002). A form with a different karyotype has been found in Argentina, but this form has not been found in North America.

Shows relationship to *C. anonymus* and species WOC.

Species 2x. *C. decumbens*(?)

Could be *C. decumbens* Malloch.

Adults of this species are in the collection of J.E. Sublette, at the University of Minnesota, St. Paul, MN. He noted that the adults show some relationship to *C. atritibia* and *C. pilicornis*.

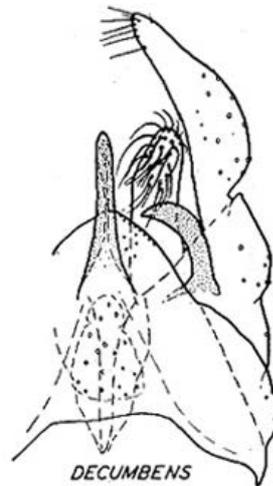


Hypopygium, anal point and superior volsella of *C. spec. 2x*.

Description of *Chironomus decumbens* from information in Townes (1945)
(known only from type specimen)

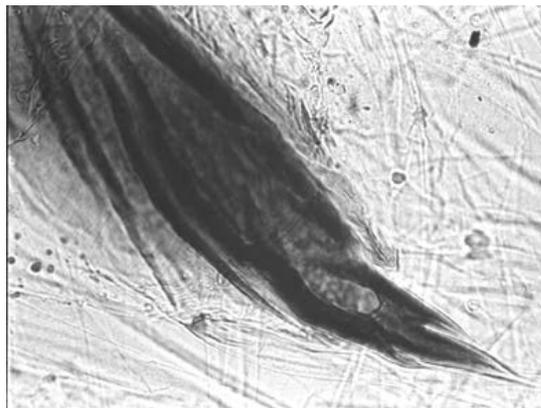
- Male: Wing length 4.7 mm; fore LR 1.27; BR about 4.0; antennal ratio 4.5.
 Body of medium stoutness.
 Frontal tubercles of moderate size, clypeus rather small.
 Middle portion of pronotum hardly widened; mesoscutum without a tubercle.
 Fore tarsus with a rather short depressed beard, arising at about 40° to 45°.
 Blackish brown, legs slightly paler.

Hypopygium with very narrow anal point; superior volsella of Strenzke's E-type. Townes figure appears to show about 17 setae on tergite IX, Sublette's adult has only about 10.



Female: Unknown.

Pupa: Caudolateral spur of segment VIII with one large and perhaps two smaller spines.



Fourth instar larva a medium sized (abt. 13.2 mm) salinarius type. Gular region sl. dark – dark, at least on posterior third. AT moderately long, dorsal shorter (400 x 300 µm), ventral relatively longer (600 x 120 µm), about 2.7 times longer than wide

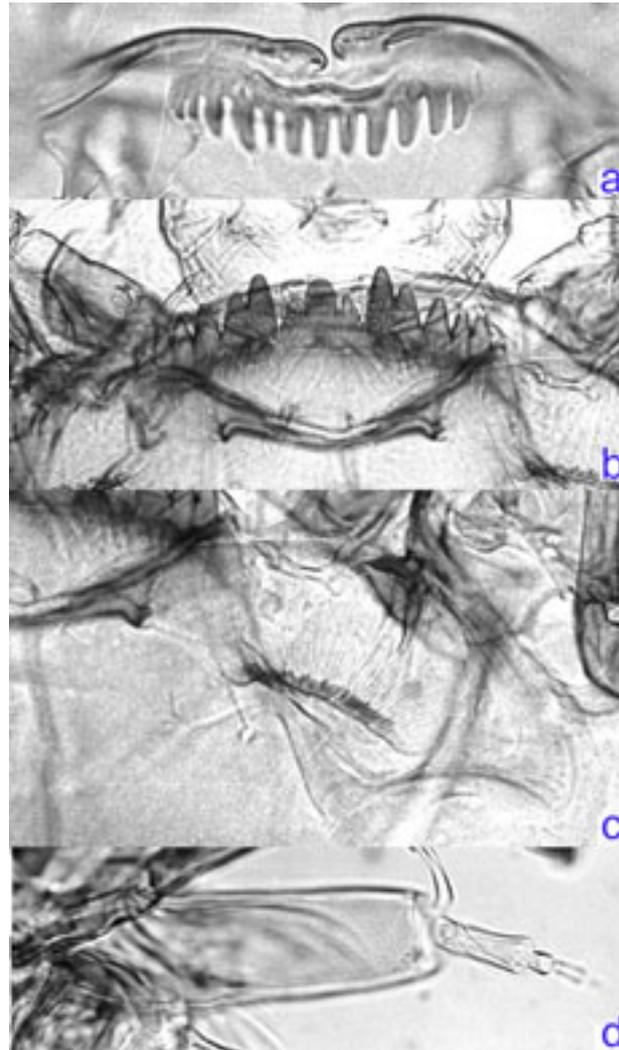
Mentum (Fig. b, below) relatively flat, c1 tooth relatively broad with parallel sides, c2 teeth quite well separated (Type IIA); 4th laterals slightly reduced (essentially Type I).

Ventromentum (Fig. c, below) with about 45 striae; VMR about 0.28. PE (Fig. a, below) with about 13 teeth, an occasional one reduced in size.

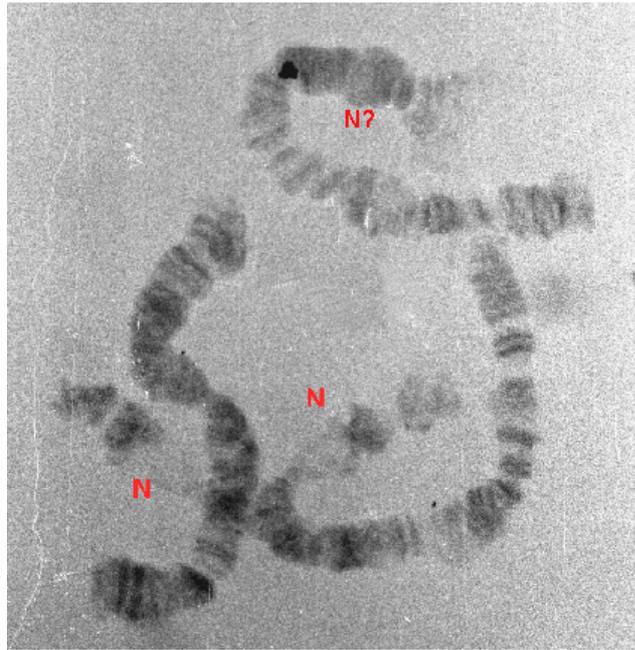
Premandible with outer tooth shorter than the inner tooth, which is about 2.7 times wider.

Antenna (Fig. d, below) with basal segment about 3.6 times as long as broad; AR about 2.6; A1/A2 about 4.3, A4/A3 about 1.14; antennal proportions µm) 152 : 35 : 9 : 10 : 5.

Development of 3rd inner tooth of mandible not clear.



Cytology: 3 polytene chromosomes with a modified thummi arm combination AB, CD, GEF. Arm G region unpaired with nucleolus near end of arm. Possibly a nucleolus also in the CD chromosome, just proximal to the characteristic constriction of groups 3-4.



Found: Alaska - Harding Lake.

The **type locality** of *C. decumbens* Malloch is Nunavut (formerly North West Territories) - Southampton Island, Keewantin.

The cytology of this species suggests no close relationship to the species noted as *C. nr. decumbens* (species h).

Species 2y. *Einfeldia* sp.

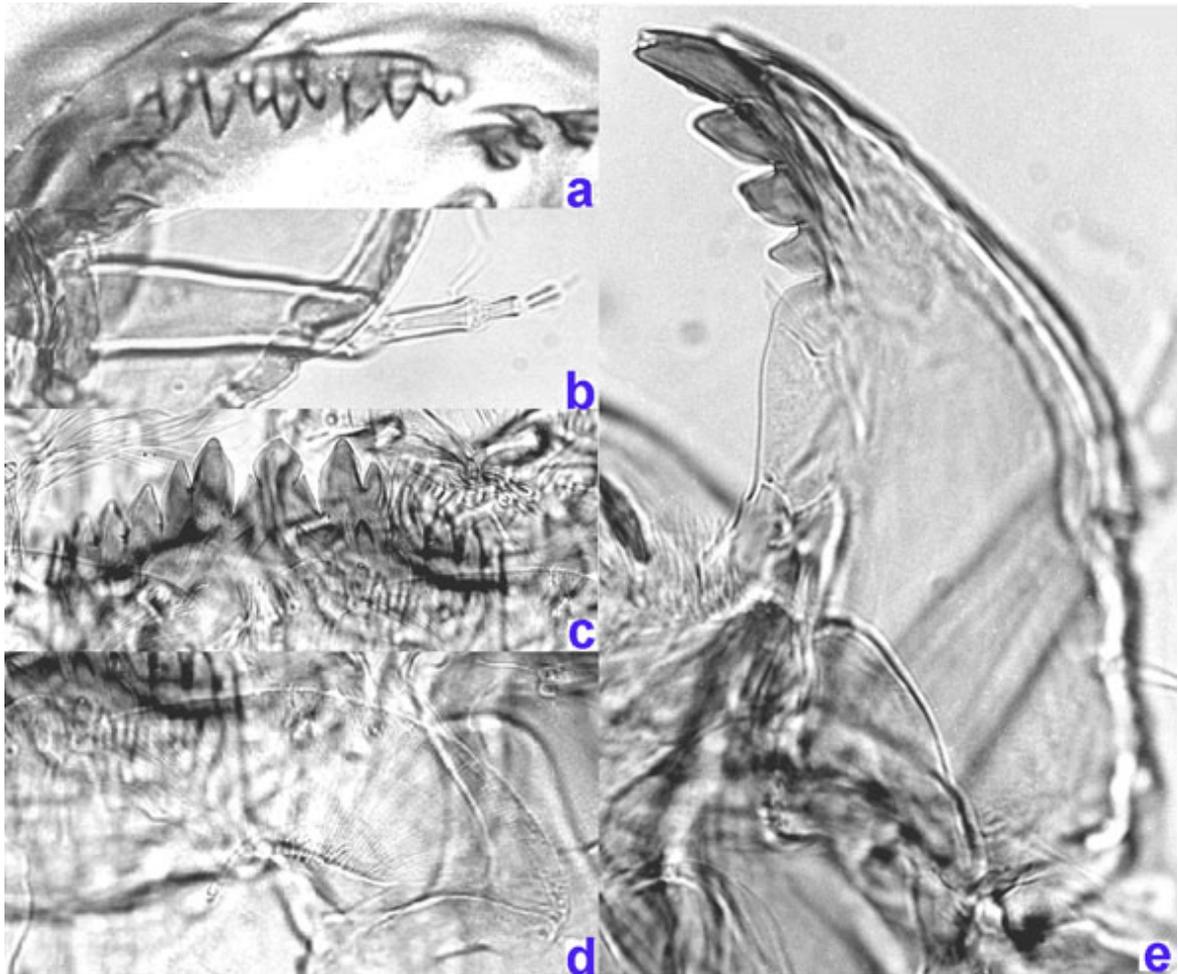
Fourth instar larva not a typical *Chironomus* type, relatively small; presence of VT unknown.

Mentum (Fig. c, below) with flanged teeth; c1 tooth definitely trifold with notches of c2 teeth at about 45° (type I).

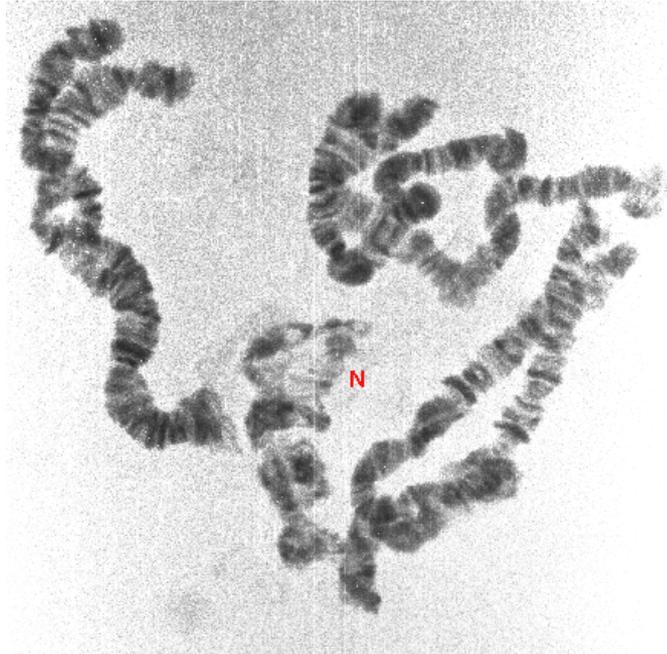
VM (Fig. d, below) with about 30 striae. PE (Fig. a, below) with about 17 irregular teeth (closest to type D).

Antenna (Fig. b, below) with basal segment relatively long and narrow, about 3.6 times as long as wide, AR about 1.75; A1/A2 about 3.5; A4/A3 about 1; relative lengths of segments: 100 : 27 : 11 : 11 : 6.

Mandible (Fig. e, below) with third inner tooth clearly separated and darkened (type IIIC)



Cytology: 4 polytene chromosomes, Keyl pattern cannot be readily determined. Arm G paired; nucleolus subterminal. Long chromosomes often largely unpaired (chromosomal polymorphism?)



Found: Alaska - Harding Lake.

Species 2z. *C. harpi* Sublette, 1991

This species is in BOLD Bin: [BOLD:AAJ4275](https://www.boldsystems.org/index.php/AJ4275)

Adult:

Described by J.E. Sublette in Wülker, Sublette & Martin (1991).

Pupa: Described by J.E. Sublette in Wülker, Sublette & Martin (1991).

Fourth instar larva a small to medium (male 11.2 mm) plumosus- or thummi-type (may be pH dependent?), with posterior VT usually slightly longer (ant 1.56 mm; 1.60 mm). Anal tubules relatively long, ventral pair longer (480,540 µm) and 4.8-5.4 times longer than wide. Gular region slightly darkened, FC pale.

Mentum with relatively pointed teeth; c1 tooth relatively broad with short parallel sides, c2 teeth moderately well separated.

Cytology: 4 polytene chromosomes with thummi arm combination AB, CD, EF, G.

Arm G usually closely paired with a BR about $\frac{1}{3}$ from one end, although specimens from South Dakota had a nucleolus immediately distal to the BR. Nucleolus is near the centromere in arm D. Polymorphism in arm G near distal end, which is homozygous in South Dakota specimens and instead may be heterozygous for an inversion of about $\frac{2}{3}$ of arm G. Polymorphism for arm F also occurs in South Dakota.

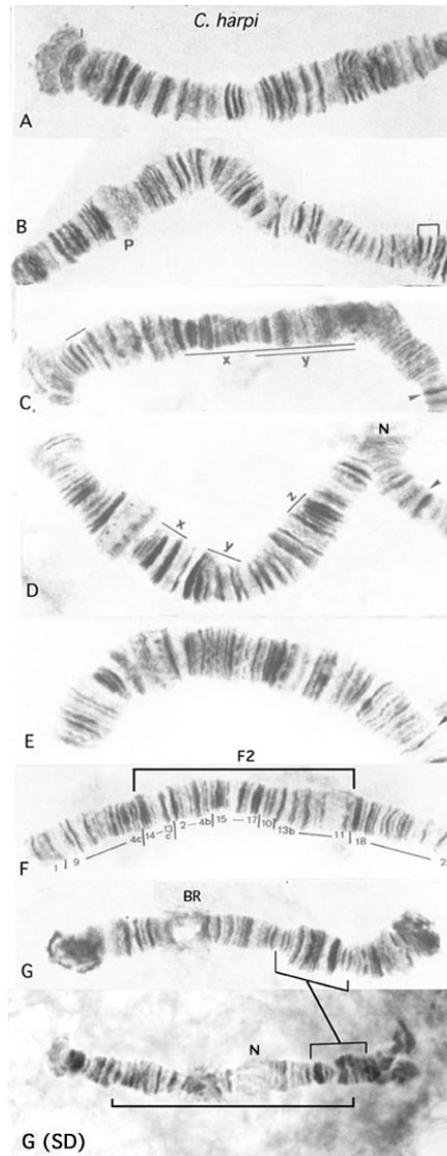
harA1: 1a-e, 8-9, 2d-3, 15-13, 4-7, 3f-i, 12c-10, 2c-1f, 16-19 from *utahensis* by In7-8

harB1: Puff, with distal dark bands (groups 7 - 8), at distal end of arm, but lacks proximal BR found in *utahensis*.

harC1: rearranged c.f. *utahensis*

harD1

- harE1: 1-3e, 5-7c, 10c-12, 3f-4, 10b-7d, 13 from *utahensis* by In12-10c
 harF1: 1, 9-4c, 14-13c, 2a-4b, 15-17, 10, 13b-11, 18-23
 harF2: approx 1, 9-4c, 14-13c, 11-13b, 10, 17-15, 4b-2a, 18-23 (South Dakota)
 harG1: BR about 1/3 from one end
 harG2: inversion near distal end
 harG3: inversion of 2/3 arms from harG2



- Found:** Ontario – Point Pelee National Park (41.959, -82.518) (NCBI)
 Arkansas - 40 km sw. Little Rock, Saline Pa. (**Type locality**) (plumosus-type)
 Illinois - Bradley's Acid Pit (37.90, -89.53), Jackson Co. (thummi-type)
 New York - 2-2.5 km e. Middleport (43.22, -78.47), Orleans Co. (plumosus-type)
 South Dakota - 3.5 km w., 5 km s. Lake Andes, Charles Mix Co.

Pools with low pH.

Morphology of all life stages, and cytology described by Wülker, Sublette & Martin (1991). Some ecological data given by Harp and Campbell (1973), as *C. plumosus*; Harp and Hubbard (1972), as *C. n.sp.* and Bates and Stahl (1985), as *C. nr. maturus*. The South Dakota population may represent

a distinct species, however more samples are required to clarify this. In the meantime it is assumed that this is just geographic differentiation.

The Barcode sequence of the mitochondrial COI gene, from a larvae collected along with the paratypes from Bradley's Acid Pit, is available on the BOLD database (CotW024-08). Further sequences from Pt. Pelee National Park, Ont., Canada are available in NCBI (incl. KJ165251).

Species 3a. *C. decorus* Johannsen 1905

C. decorus was originally described by Johannsen in 1905, with later additions (e.g. Johannsen 1937) varying, possibly due to inclusion of other members of the species-group. Sublette examined the holotype specimen(?) in the Johannsen collection (Sublette *et al.* 1998) and concluded that this species best fitted Johannsen's material (Wülker *et al.* 2009). This is the species studied by Rothfels and Fairlie (1957).

Johannsen 1905

60. *Chironomus decorus* n. sp.

(Pl.23, figs. 7 to 13; pl.29, fig.12)

Larva. The larvae were found everywhere in the ponds and ditches around Ithaca N. Y. They are blood red, and about 12 mm. long. The head is dark blackish brown; the antennae are short, normal. The dorsal sclerite is narrow ovate, posterior end pointed, truncate anteriorly, with three setae along each lateral margin, the first at the extreme anterior end, the last one half way between the anterior and the posterior end, the second midway between these. Articulated to the cephalic margin, and overhanging the mouth opening is the labrum. There are two pairs of prominent setae upon its dorsal surface; numerous papillae, two or which are quite prominent on the anterior margin and upon the anterior ventral surface. The arrangement of the setae and the armature of the epipharynx shown in fig.10. The epipharyngeal comb (c) has relatively long and uniform teeth; the lateral arms are dark brown in color. Each eye consists of two distinctly separated pigment spots. The mandibles (fig.7) are black-tipped, with a fringe of apical setae, a prominent lateral spine, and a group of mesad projecting branched setae; the hypopharynx has its usual papillae upon the fore margin; the maxillae are prominent, each with two lateral setae, the palpus is short and thick. The labium has a black margin with an outline as shown in fig.8. In many specimens the teeth appear to be slightly longer in proportion than shown in this figure. The anterior prolegs have very numerous curved setae. The body is nearly devoid of even minute setae. The anal prolegs are normal, claws dark, bilobed. Anal setae as usual. The eleventh body segment has four long white blood gills on the ventral surface, and caudad of the dorsal setae of the twelfth segment are four short ones.

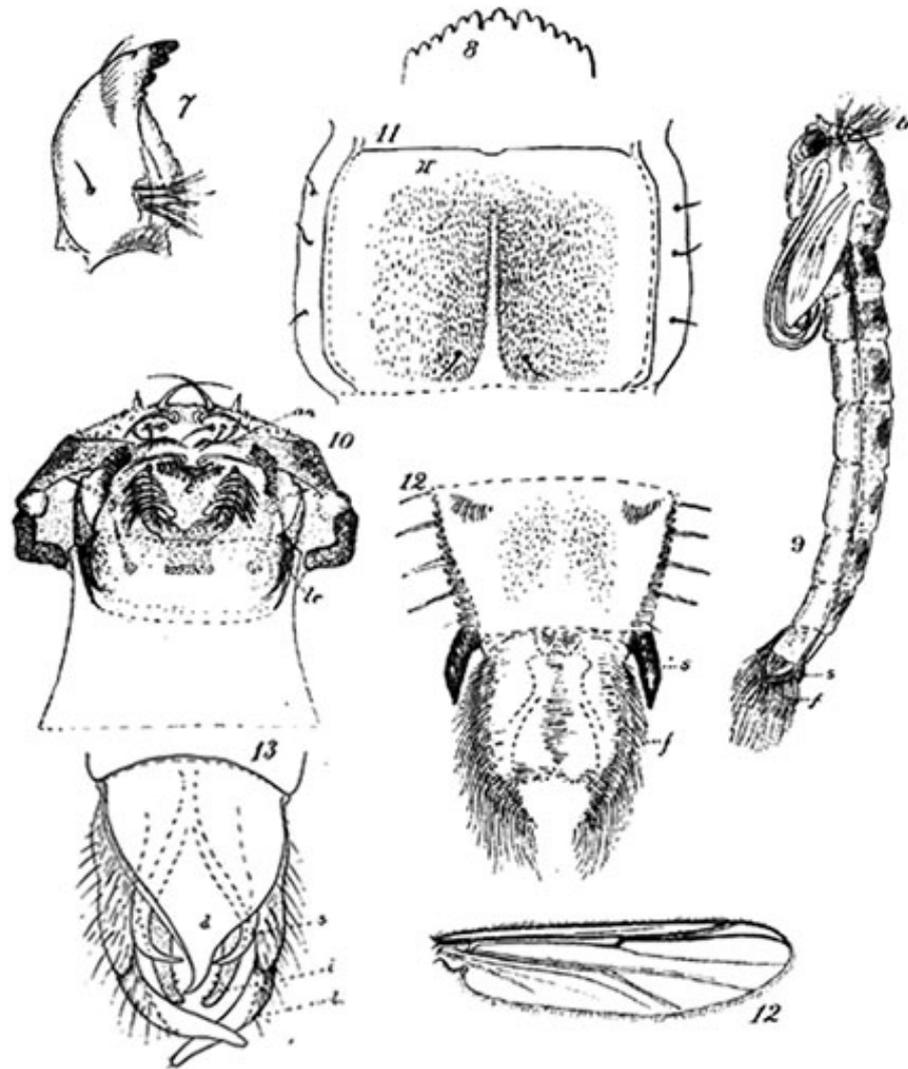
The larva (1) mentioned by Garman (1888) is probably this species.

Pupa. Dusky greenish brown, the colors of the imago showing through the integument. Length 7 to 8 mm. Tracheal filaments prominent, white and much branched. Thorax with a few scat-

tered setae. Segments of the abdomen with a seta-pattern as shown in fig. 11 and 12; the pattern more indistinct on the last two segments. On each lateral margin of the fifth to the eighth segment there is a brown longitudinal dash, most conspicuous and half the length of the segment on the fifth. The black chitinated lateral spur of the eighth segment is prominent and without teeth (fig.12). The anal appendage has the usual fringe of matted hairs.

Imago, male. Length 6 to 7 mm. Head yellow, antennae and proboscis more or less brownish, large basal joint of the antennae and the palpi reddish brown, the latter sometimes fuscous. Thorax greenish yellow with a whitish sheen, the pleura and the scutellum the same color; the three thoracic stripes, some pleural spots, the metathorax and the pectus dull testaceous or reddish, sometimes even brownish; the middle dorsal line divided by a fine line. Abdomen hairy, pale yellow or greenish yellow, in life more distinctly green, infuscated toward the tip; each segment with a brownish transverse fascia slightly in front of the middle. These fasciae are widest on the dorsal line, and are obsolete on the last few segments. Genitalia brownish yellow, hairy, moderately elongated (pl.32, fig.13). Legs including the coxae pale greenish yellow, short haired; tarsi, particularly towards the tip, infuscated; tips of tibiae and of all tarsal joints fuscous, fifth joint wholly fuscous. Tarsal claws simple, pulvilli small, empodium stout, curved, blunt, and pectinate on the convex side. The fore metatarsus about 0.6 longer than its tibia. Wings hyaline, cross-vein conspicuously clouded with dark brown, anterior veins yellow, posterior ones hyaline, the two branches of the cubitus and the anal vein accompanied by a faint brown streak. Venation as shown on pl.29, fig.12.

Female. Differs from the male as follows: Slightly shorter, antennae yellow, last joint fuscous; thorax more greenish than yellow, abdomen greenish with dark bands as in the male, but the bands are always wider and usually cover the whole surface of the segment excepting the apical third or fourth. In other respects like the male. This species seems to be very common in many parts of the country. New York, Ohio, Illinois, Iowa, Kansas, Washington State, and Nebraska.



Johannsen's original description (1905)

Townes (1945) listed seven synonyms for this species, however some have subsequently been removed from synonymy and other classed as nomina dubia.

Chironomus anonymus Dyer 1902 – subsequently recognized as a distinct species (see species 2o).

Chironomus attenuatus Walker 1848 – on basis of an adult female. Townes noted it as a member of the *C. decorus* group, but in 1959 revised it to a valid name. It became a senior synonym of *C. decorus* until Sublette & Sublette (1974) classed it as a nomen dubium on the basis that the original description and the fact it was a female, meant it could not be accurately identified.

Chironomus cayugae Tilbury 1913.

Chironomus cristatus Malloch 1915 and Kieffer 1917 – misdeterminations of *C. cristatus* Fabricius

Chironomus distinguendus Kieffer 1917

Chironomus maturus Johannsen 1908 – subsequently recognized as a distinct species (see species m)

Chironomus similis Johannsen 1905 – on basis of female.

Adult:**Male:**

Length 6 – 7 mm. Wing length about 3.44-3.74 mm; width about 0.91-0.94 mm; VR about 1.01. LR about 1.44-1.50 (Johannsen, gives 1.6, so may include several species).

Thorax greenish yellow, stripes and postnotum testaceous or reddish.

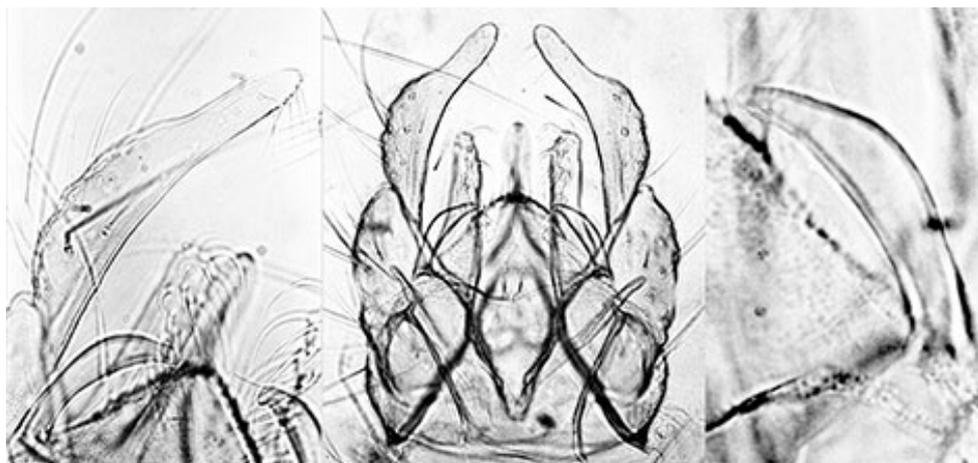
Setae: Achrostichal – at least 10-13; Dorsolateral – 21-29 (beginning about level with the lateral vittae); Prealar - 6-7; Supra-alar -1-2; Scutellar – about 13-18 in posterior row and 11-12 in about two anterior rows.

Legs greenish, with tips of tibiae and all tarsi brownish, completely so on 5th tarsus.

Leg lengths (micron) and proportions:

	Fe	Ti	Ta1	Ta2	Ta3
PI	1405	1370	1920	1000	785
PII	1505	1380	850	495	365
PIII	1675	1650	1265	725	540
	Ta4	Ta5	LR	F/T	BR
PI	725	305	1.44-1.50	1.06-1.09	2.0-2.56
PII	230	170	0.62-0.63	1.08-1.09	
PIII	325	190	0.77-0.80	1.01-1.02	

Note in PI, Ta3 and Ta4 are subequal in length, but Ta4 is slightly shorter.



Hypopygia of *C. decorus* - two variants of hypopygium; note also the long superior volsella.

The male has a brown band about a third from base of each abdominal segment, wider in the mid-line and becoming more extensive although paler on segments VI-VIII – these bands are narrower than those of *C. bifurcatus* or *C. blaylocki*. About 4-7 setae in center of tergite IX. Typical *C. decorus* hypopygium; the SVo (between S and E-type), while darkened, is paler and longer than that of *C. bifurcatus*. Setae on the IVo not forked. The GS mostly narrows sharply at the distal third, similar to *C. bifurcatus*, but may also narrow less sharply from a narrower gonostylus.

Female:

Johannsen notes that the thorax is more greenish and the abdomen greenish with wide dark bands covering most of the segment.

Additional data are available from females reared from egg masses from Wisconsin:

Wing length about 3.24-3.48 mm; width about 0.80-1.02 mm, VR about 1.00-1.05; 15-23 setae in the squamal fringe and 3-4 SCf on brachiolum.

Head with cephalic tubercles about 35-71 μm long and 1.6-3.0x as long as wide. Antennal segments virtually mirror images around A3; AR 0.34-0.39; A5/A1 0.96-1.11; proportions (micron): 197 : 120 : 119 : 120 : 205. Palpal proportions (micron) 58 : 51 : 156 : 200 : 260. Clypeus about 1.5-3x the width of the antennal pedicel; about 42-55 clypeal setae. Thoracic setae: acrostichal – 18-21; dorsolateral – 35-41; prealar – 7; supra-alar – 1-2; scutellar setae in about 3 rows, 15-19 in the posterior row and 8-17 in the 2 anterior rows. Dorsolateral setae extend almost to pronotum. Legs as in male. Fore Ta4 slightly longer than Ta3. BR about 1.3-2. Lengths (micron) and proportions:

	Fe	Ti	Ta1	Ta2	Ta3
PI	1375	1175	1865	955	775
PII	1430	1340	810	425	320
PIII	1580	1580	1145	660	505
	Ta4	Ta5	LR	F/T	Ta4/Ti
PI	785	335	1.56-1.68	1.16-1.35	0.66-0.69
PII	220	170	0.58-0.62	0.99-1.14	0.16-0.17
PIII	305	195	0.69-0.76	0.96-0.98	0.19-0.20

Note that on PI, Ta3 and Ta4 are subequal, but Ta4 is slightly longer.

About 4-5 setae on Segment GcIX and 7-10 on GpVIII

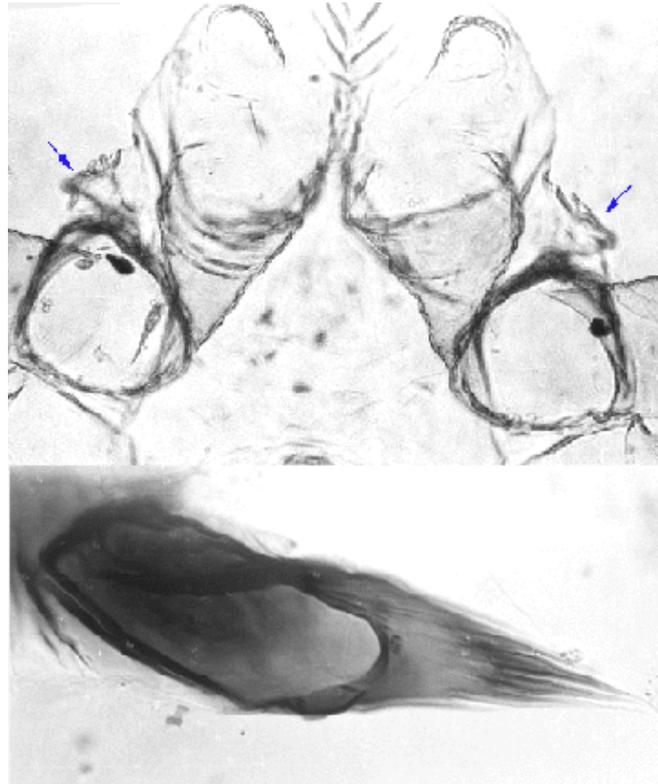
Pupa: Length of exuviae about 7.4-10.2 mm, inner margin of wing case about 1.57-1.89 mm long. Exuvia pale, fine shagreen over most of the abdominal tergites, stronger at distal ends, but only a posterior patch on segment VI.

The pupa has a definite secondary tubercle on the cephalic tubercles; primary tubercles about 75-185 μm long and about 1.1-2x longer than wide; secondary tubercle about 40-54 μm long and 0.4-0.9x times as long as wide. The respiratory base is slightly kidney shaped, with the basal trunk either kidney shaped or partially constricted in the middle. There is a rough patch just anterior to the respiratory base about 37-90 x 24-80 μm which either includes 2 small setae or they are nearby on the lateral side.

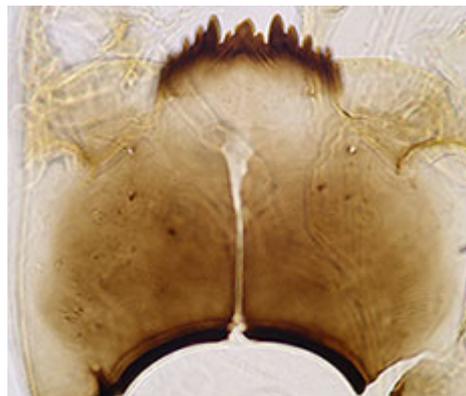
About 64-100 recurved hooks at posterior margin of abdominal segment II, central hooks with 2 small knobs on the top and not as downturned as those at either end; hook row about 57-75% of width of segment (higher values probably due to folding of the abdominal segments of the exuviae).

Pedes spurii B well developed on segment II; a large (180-220 μm long) pedes spurii A on segment IV; other pedes spurii smaller (about 55-95 μm on seg. V; 56-63 on seg VI, often with patches of spines). L-setae present on the posterior margin of the preceding segment of the intersegments III/IV and IV/V, may be 50-90 μm long.

Usually 4-5 (range 1 - 6) closely applied, spines only at the tip of the caudolateral spur of segment VIII (below). About 80-138 taeniae, in a double row posteriorly, on each side of the swim fins.



Fourth instar larva a small to medium sized (female 10.7-12.4 mm) (12 mm according to Johannsen, 1905) bathophilus- or melanotus-type (see below); anterior pair of VT slightly longer (ant. 0.9-1.55 mm; post. 0.8-1.45 mm). In his original description of the larva, Johannsen (1905) did not mention PLT, it was only in his 1937 revision that he mentions them (Johannsen 1937). AT 2-3 times longer than wide, often with a constriction in the middle. Gular region very dark over at least posterior half, FC pale.



Gula region of *C. decorus*.

Mentum with relatively sharp teeth; c1 tooth relatively broad with parallel sides; c2 teeth relatively well, but not completely, separated (type I-II); 4th laterals slightly reduced, down to about height of 5th laterals (type (I)-II).

Ventromental plates separated from each other by 0.37-0.42 of the width of the mentum, with about 33 (30-38) striae. PE with about 13 (10-15) teeth.

Premandible with the inner tooth about 2-3 times wider than the outer tooth.

Antenna relatively short, less than half VHL; AR about 2.19-2.75; basal segment about 2.6-3.7 times as long as wide, ring organ about a third to a half way up the segment from the base; segment lengths (micron) 123 : 27 : 6 : 11 : 6.

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

Mandible with the third inner tooth slightly darkened and sometimes slightly separated (type I-IIB), about 12-17 grooves on outer surface near base.

Larvae from southern regions are bathophilus-type, while those from Wisconsin and Ontario seem to be semireductus- or even plumosus-type.

Cytology: 4 polytene chromosomes with the thummi arm combination AB, CD, EF, G. Very polymorphic with inversions in all arms.

Arm G with a nucleolus near one end - Rothfels and Fairlie (1957) indicate it is in a region about 10 bands from the end. However the whole region at the end may appear heterochromatic (see figure below) with no nucleolus obvious. There are three BRs whose relative position depends on the inversion sequence present. Arm G is often only paired at end away from nucleolus. No nucleolus in the long chromosomes. Chromosome AB is somewhat difficult to recognize from the Keyl pattern, since the "olive" in arm A is not obvious and the 4 characteristic bands of arm B (groups 22-24) are not near the centromere but in variable positions due to inversion polymorphism. A large puff in group 7 is sometimes developed about a third from the end of arm B. Polymorphism occurs for all arms. Rothfels and Fairlie, in their study of 354 individuals, recorded about 30 inversions, including most of those in our smaller studies, with the exception that they found only one sequence for arm F in their Ontario populations, while at least 6 inversions were present in our New Mexico samples. The inversions from our samples are listed below, with comparison to the R & F sequences where possible.

decA1: Pattern difficult to identify as the bands of the typical "olive" are dispersed.

decA2: Large medial inversion.

decA3: A distal inversion of A2. May correspond to inversion A of R & F.

decA4: A small medial inversion.

decB1: Characteristic bands 20-23 not near centromere, puff towards distal end of arm.

decB2: Inversion of about half of the arm, with proximal breakpoint only 10-12 bands from the centromere.

decB3: Small inversion just proximal to the puff.

decB4: Small inversion adjacent to the centromere.

decB5: Small inversion of the more distal region of B2 and apparently sharing the distal breakpoint.

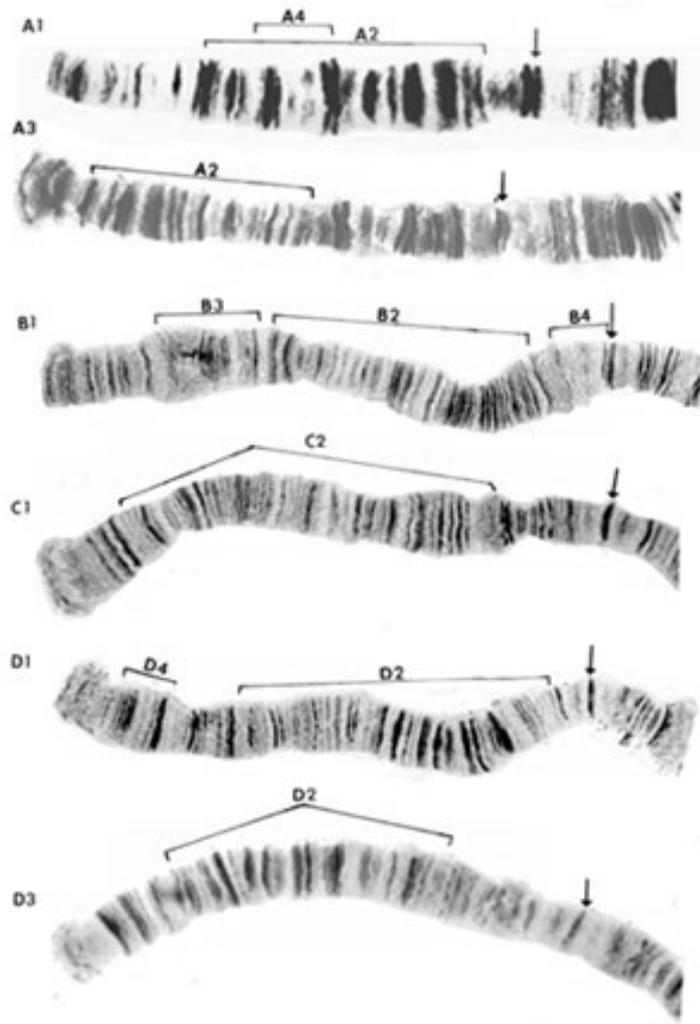
decC1: Typical groups 3-4 towards the distal end.

decC2: A very large inversion of about 60% of the arm, with one break distal of the typical bands; as inversion B of R & F.

decD1: Band groups 16-18 probably towards the distal end of the arm.

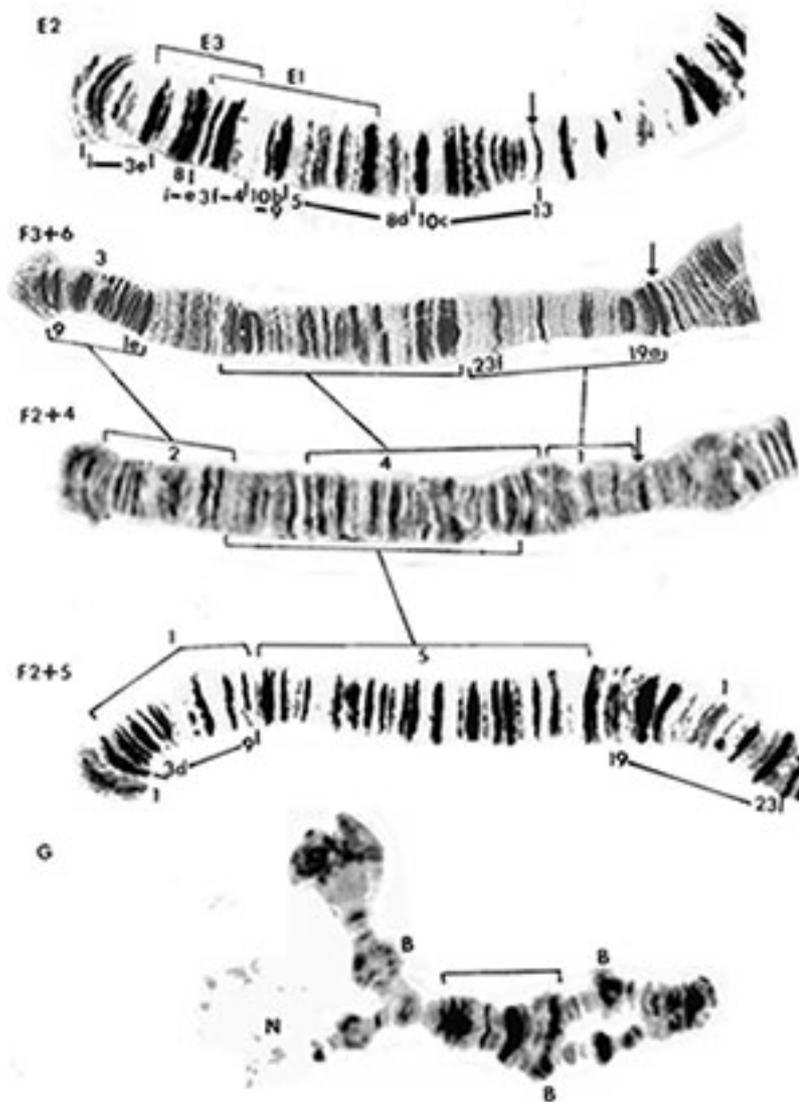
decD2: Large inversion of about 2/3 of arm, proximal breakpoint probably in group 23.

decD3: Large inversion derived from decD2.



Polytene chromosome arms A-D of *Chironomus decorus* (sp. 3a)

- decE1: 1-3e, 8-5, 9-10b, 4-3f, 10c-13 i.e. as *maturus*, *stigmaterus* and Inv A of R & F.
 decE2: 1-3e, 8i-e, 3f-4, 10b-9, 5-8d, 10c-13 i.e. as Inv. S of R & F.
 decE3: approx. 1a-d, 4-3f, 8e-i, 3e-a, 1i-e, 10b-9, 5-8d, 10c-13 i.e. inv of E2
 decF1: 1a-g, 9 - 2, 10 - 23 i.e. as *blaylocki*, *utahensis*
 decF2: 1a-g, 3d - 9, 3c - 2, 10 - 23
 decF3: 1a-d, 9 - 3d, 1g-e, 3c - 2, 10 - 23 (?) from F2
 decF4: 1a-g, 3d - 9, 3c - 2d, 18 - 10, 2a-c, 19 - 23 from F2
 decF5: 1a-g, 3d - 9, 17 - 10, 2 - 3c, 18-23 from F2
 decF6: 1a-d, 9 - 3d, 1g-e, 3c - 2, 10-18, 23-19 from F3?
 dec F3+4: 1a-d, 9 - 3d, 1i-e, 3c - 2d, 18 - 10, 2a-c, 19 - 23
 decG1: Terminal nucleolus and 3 BRs, usually only paired at distal end.
 decG2: A small inversion in the center of the arm
 decG3: A larger inversion of almost half the arm, towards the distal end, illustrated in Fig. 1 of Rothfels & Fairlie (1957)



Polytene chromosome arms E-G of *Chironomus decorus* (sp. 3a)

Type locality: Johannsen (1905) does not give a type locality but, while noting it is widespread, initially states that it is common in ponds and ditches and, later, in the vicinity of sewage contaminated streams, around Ithaca, New York (1905,1937). Townes (1945) lists all localities in the Johannsen collection as type localities (noted there as “Johannsen1905” although this is not to imply that they are all this species).

Found: Ontario - Copanspin Farm, Dunrobin(45.75°N, 75.87°W), and South March nr. Mud Lake (44.88°N, 78.27°W), both Carleton Co.; Don River, Toronto (Rothfels & Fairlie 1957).

Illinois - (Johannsen1905).

Iowa - (Johannsen 1905).

Kansas - (Johannsen1905).

Michigan - Menominee River, Stephenson (45.42°N, 87.61°W), Menominee Co.

Nebraska - (Johannsen1905).

New Mexico - Eagle Nest Lake (36.55°N, 105.25°W), Colfax Co.; Taylor Springs, Colfax Co.; Rio Grande River, Dona Ana Co.; Hill Tank, Eddy Co.; Pecos River, at Puerto de

Luna, Guardalupe Co., also in San Miguel Co.; Gila River, nr. Virden, Hidalgo Co.; Rio Hondo, 2 ml e. Hondo (33.38°N, 105.26°W), Lincoln Co.

New York - Ithaca, Tompkins Co. (Johannsen 1905, 1937).

Ohio - (Johannsen 1905).

South Dakota - L. Poinsett, 12 ml n. Arlington; James River, Yankton, Yankton Co.

Washington - (Johannsen 1905).

Wisconsin - Murphys Creek, Arboretum (43.03°N, 89.42°W), and University Houses (43.07°N, 89.42°W), Madison Dane Co.

Windmill tanks, ponds, ditches, pools in rivers, shallows of lakes. In some localities it occurs along with *C. bifurcatus*. At least where this occurs, the larvae of the two species can be separated by the greater region of gula darkening and the longer AT of *C. decorus* (3A).

Note that although the data for adult females and the pupae all comes from a single reared egg mass, there is considerable variation in some characters – mostly these characters are related to overall size of the individual.

Some information on arm F given in Fig. 3 of Martin (1979) and Wülker, Devai & Devai (1989). The karyotype was described in some detail in a Report to New Mexico Energy Institute by Martin, Sublette and Sublette (1979). Also the chromosomes and chromosome polymorphism was described by Rothfels and Fairlie (1957).

Species 3b. *C. nr. anthracinus* (nr. *aberratus* C according to Wülker)

Also called *C. 'Apple Valley'* (Wülker 1980)

Adult and Pupa: not known.

Fourth instar larva a plumosus type larva, although VT length and shape could not be determined. Posterior of gular region and the FC darkened. C1 tooth of mentum relatively wide with well separated c2 teeth; 4th laterals not visibly reduced. 4th tooth of mandible clearly demarcated.

Cytology: 4 relatively short polytene chromosomes with the thummi arm combination AB, CD, EF, G. Arm G partly unpaired with a subterminal nucleolus; only about a dozen visible bands. Nucleolus in arm B and possibly a smaller one in arm F. Polymorphic in arm B.

Arm A1: 1-2c, 10-12, 3-2d, 9-4, 13-19 i.e. as in *holomelas*, *cucini*, *tardus*, *magnus*, etc.

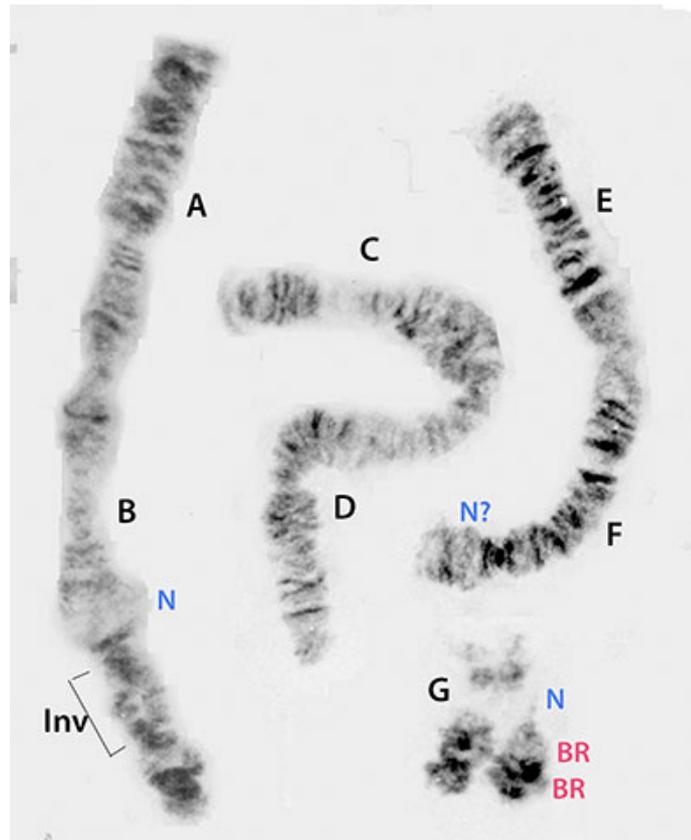
Arm B1: differs from *longistylus* by a distal inversion.

Arm C1: 1-6b, 15c-e, 8-11c, 15b-11d, 6gh, 17a-16, 7d - a, 6f - c, 17b-22 as *cucini*, *islandicus*

Arm D1: proximally similar to *longistylus*

Arm E1: 1-3e, 5-10b, 4-3f, 10-13 i.e. as in *cingulatus* and *tardus*.

Arm F1: 1 - 23 i.e. Standard as in *piger*.



Found: California - Spring Lake, nr. Hesperia, Apple Valley, San Bernadino Co..

High altitude lake.

Cytology described as 'C. species Apple Valley' by Wülker (1980) some information on Arm F given in Fig. 3 of Martin (1979) and a photo of arm C with an incorrect sequence given in Devai *et al.* (1989).

From the locality ecology information given by Egan and Ferrington (2015), it is likely that this is their "*Chironomus aberratus*".

Species 3c. C. nr. *anthracinus*

Adult and Pupa: not known.

Fourth instar larva a medium to large (fem. 14.8 - 19.5 mm; male 17.4 mm) plumosus-type; VT relatively long, posterior pair longer (ant 1.68 - 1.81, post 1.91 - 2.44 mm), PLT about 320 - 360 μ m. AT long, ventral pair with a median constriction, 2.7 - 4.0 times longer than wide.

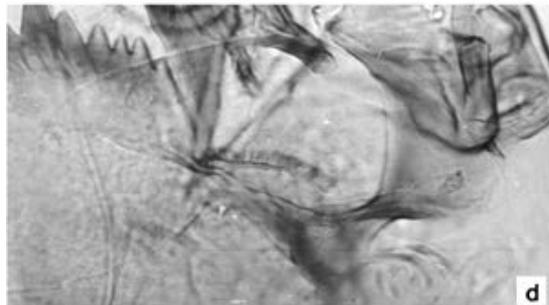
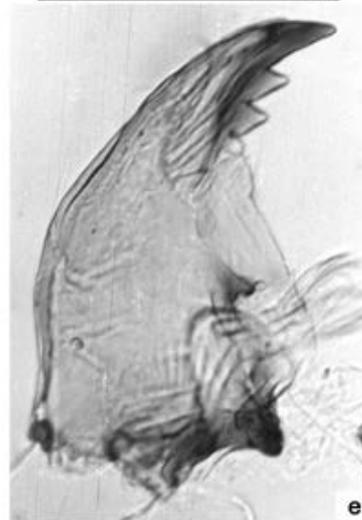
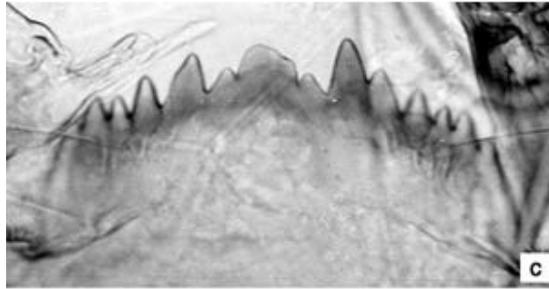
Gular region dark over $\frac{3}{4}$ or more, FC darkened.

Mentum (c, below) with pointed teeth; c1 tooth broad with short parallel sides, c2 teeth relatively well separated (type IIA); 4th laterals slightly reduced (type I-II).

VM (d, below) with inner margin downturned. PE (a, below) with about 16 somewhat variable teeth.

Antenna (b, below) with relatively long basal segment.

Mandible (e, below) with third inner tooth slightly reduced and pale (type IIA).



Cytology: 4 short polytene chromosomes with the thummi arm combination AB, CD, EF, G. Arm G cloudlike with an almost terminal nucleolus and only one or 2 obvious bands; paired only at the nucleolus. No nucleoli in other chromosomes.

Arm A1: 1 - 2c, 10 - 12, 3 - 2d, 9 - 4, 13 - 19

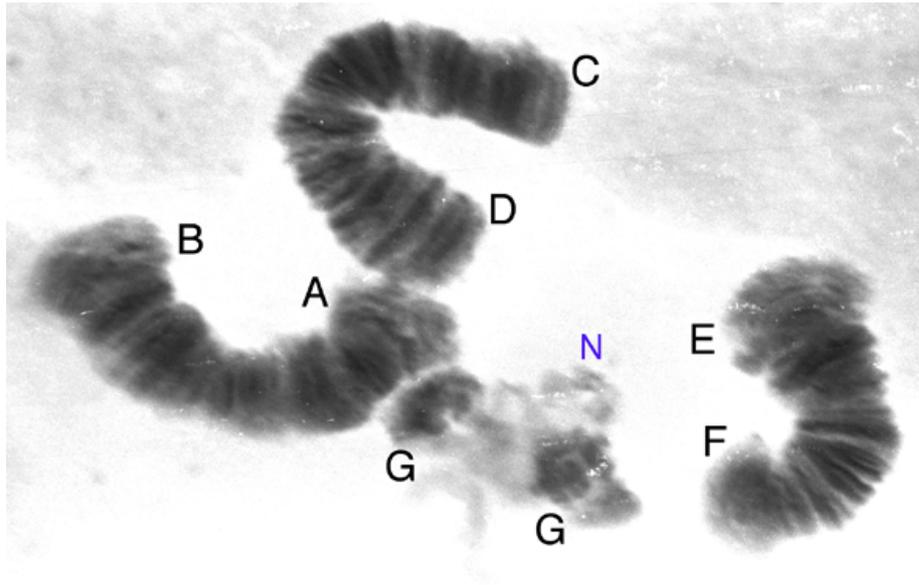
i.e. as *holomelas*, *tardus*, etc.

Arm E1: 1 - 3e, 5 - 10b, 4 - 3f, 10 - 13

i.e. as *cingulatus*, *tardus* and sp. 3b.

Arm F1: 1 - 10, 17 - 11, 18 - 23

i.e. as in *cucini*, *tardus* and *tenuistylus*.



Found: Wisconsin - Friebauer Lake, Bayfield Co.

Lakes

Species 3d. *C. annularius* sensu Strenzke, 1959

Species 9 – Martin (1979) and Wülker, Devai & Devai (1989).

In BOLD Bin: [BOLD:ABA9112](#)

Some specimens in this bin are called *C. cingulatus*, but there is no record of that species in North America.

Currently European specimens called *C. annularius* are listed in 3 other BOLD bins: [BOLD:AAU4046](#); [BOLD:AAU4047](#) and [BOLD:AAW3973](#)

I am grateful to Prof. P. Michailova for pointing out that this North American species is identical to material of *C. annularius* from Russia.

Adult:

Male (Based on description of Strenzke, 1959):

AR 4.0 (abt 3.72-4.28)

Wing length 3.9 (abt 3.6-4.2) mm.

Thorax greyish yellow, bands black or red-brown with more or less darker flecking. Setae – acrostichal abt 18-27; dorsolateral abt. 27-36; prealar about 5-8; supra alar abt 1-2; scutellar abt 33-48.

Legs with tarsi darkened. LR1 abt 1.35-1.45; F1/Ti1 abt 1.04-1.08.

Abdomen with most of seg I yellow brown, segs II-V darker, II-IV with anal border extended medially.

Hypopygium with abt 4 setae in patch in center of TIX; SVo of E-type (variable); IVo markedly narrowed at the tip, GS narrowing gently over posterior half.



Female (from specimens in BOLD):

Wing length abt 4.5 (3.5-5.0) mm, VR 1.04

General coloring dark brown; palps brownish black; thorax yellow with bands brown, postnotum dark; abdomen dark brown, with lighter posterior margin on segments 2-4;

Legs yellowish with darkening at knees and tarsal segments darkening to black from Ta1.

Antennae brown, darkening towards the tip; AR about 0.36-0.44 ; A5/A1 about 1.13-1.17; approximate segment lengths (micron) 210 : 140 : 130 : 140 : 242.

Approx. lengths of palpal segments 2-5 (micron) 50 : 225 : 275 : 420.

Legs: Approximate lengths and proportions (micron):

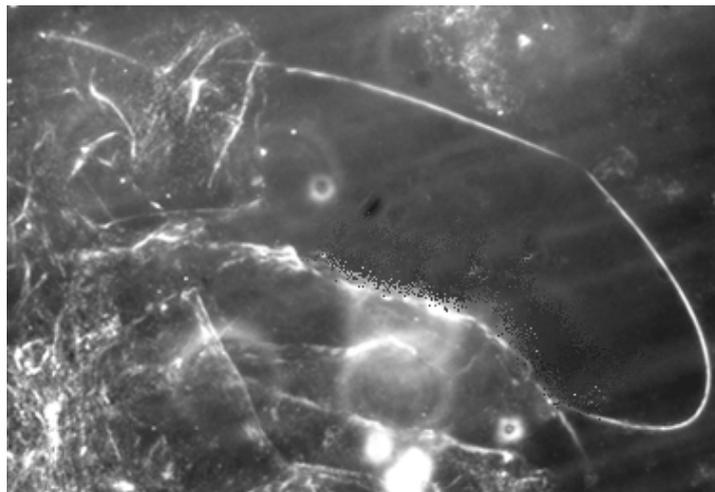
	Fe	Ti	Ta1	Ta2	Ta3
PI	1525	2925	2275	1080	710
PII	1590	1275	1000	500	280
PIII	1765	1760	1065	690	485
	Ta4	Ta5	LR	F/T	Ta4/Ti
PI	565	225	1.53	0.93-1.15	0.38
PII	250	195	0.90	1.40	0.25
PIII	300	205	0.52-0.69	0.92-0.94	0.15-0.18

Pupa: some pupal characters known from a late prepupa.

Caudolateral spur on segment VIII (below) with about 3 – 5 spines only near the tip. Anal fringe with about 94 taeniae in multiple rows.



Fourth instar larva a medium length plumous-type (15.3 – 17.8 mm), very similar to that of sp. 3b but gular region darker (posterior 2/3 dark to very dark), FC pale, and lateral tubules shorter (about 160 -240 μm). VT relatively long, about equal or anterior pair slightly longer (ant. 0.92 – 1.80, 1.42 mm; 0.92 – 1.80, 1.34 mm). AT relatively short (420-640 μm) with no constriction, about 2 to 3.2 times longer than wide, ventral pair usually shorter.



Anal tubule of *C. annularius*.

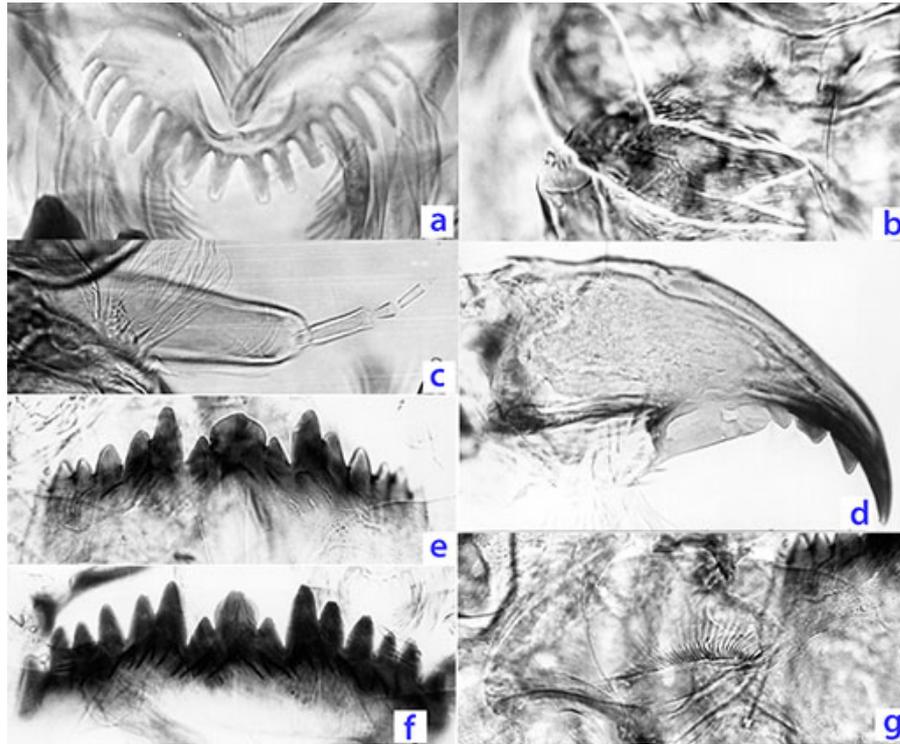
Mentum (Figs. e & f, below) with 4th laterals only slightly reduced (type I), central trifid tooth sometimes type IB and others type III, with c2 teeth separated to about 1/3 depth of c1 tooth, which can also look like type IIA if worn.

Ventromental plates (Fig. g, below) separated by about 40% of width of mentum, with about 42 – 43 striae.

Premandible (Fig. b, below) with outer tooth slightly longer, inner tooth about 2.5 – 3 times wider than the outer. Pecten epipharyngis (Fig. a, below) with about 16 - 17 pointed teeth.

Antenna (Fig. c, below) with basal segment almost 4 times longer than wide, RO just under half way up the segment; AR about 2.17 – 2.38, relative length of segments (μm) 170 : 35 : 9 : 15 : 8.

Mandible (Fig. d, below) with 3rd inner tooth relatively well separated, but still relatively pale (type IIIB), 16 – 19 grooves on outer surface at base.



Mouth parts: a. Pecten epipharyngis; b. Premandible; c. Antenna; d. Mandible; e. Mentum - Crooked Lake, Sask.; f. Mentum - East Horsehead Lake, Wisc.; g. Ventromental plate.

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

Arm G with a median and terminal BR, with a nucleolus and heterochromatin at the other end, separated from the BRs by a distinct constriction. Nucleoli developed subterminal in E (may be a double structure), proximally to the olive in arm A and also proximal in C. Polymorphism in arms A?, C, E and G.

h'annA2: 1a-2c, 10-12a, 13ba, 4a-c, 2g-d, 9-4d, 2h-3, 12cb, 13c-19 i.e. as h'antA1, h'pluA2.

h'annB2: Puff, with distal dark bands (gps 8-7), just distal to typical bands 24-27 as h'annB2.

h'annC2: 1a - 6b, 11c - 8a, 6c - 7d, 16 - 17a, 6hg, 11d - 15, 17b - 22 as p'annC2

n'annC4?: Simple inversion of about 1/3 of arm near the distal end. but could be p'annC1?

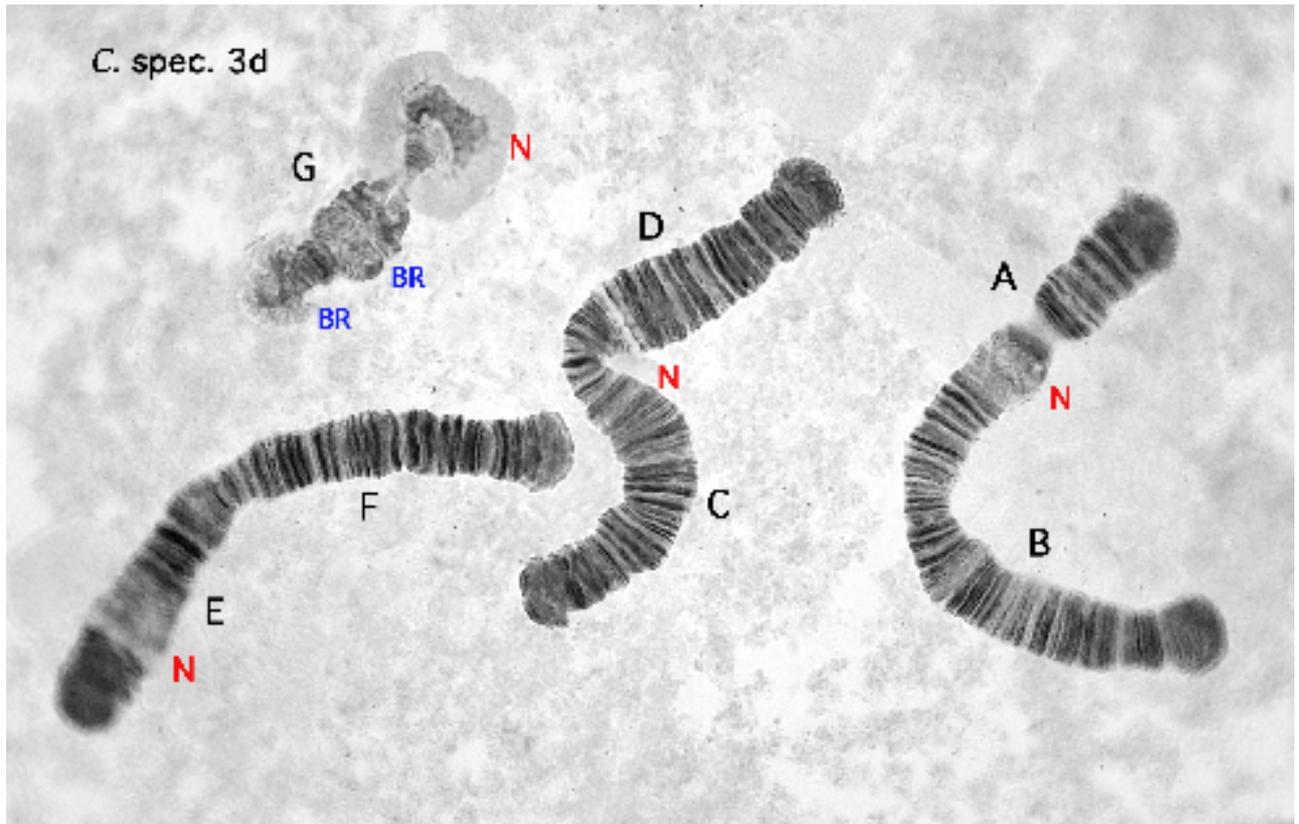
n'annD3: 1 - 3g, 11 - 13a, 10a, 7a - 4, 10e-b, 13b - 16, 8b - 9, 7b-g, 18a-d, 8a, 17a-f, 18e - 24

h'annE1: 1-3e, 5a-e, 4hg, 10b-6, 4f-3f, 10c-13 i.e. probably derived from h'annE2

h'annE2: 1 - 3e, 5a - 10b, 4h - 3f, 10c - 13

n'annF3: 1 - 4b, 8c - 4c, 17 - 13, 10a-d, 18c -a, 11 - 12, 9f - 8c, 18de, 19 - 23

n'annG3: subterminal nucleolus and median and terminal BR this could be a subterminal inversion of p'annG1 (not p'annG2)



Found: **Alberta** - Amisk Lake; Astotin Lake, Elk Island N.P. (53.685°N, 112.86°W); Two Hills (53.7104°N, 111.744°W) (BOLD)
British Columbia - New Afton Mine, Kamloops (50.663°N, 120.504°W) (BOLD)
Manitoba - Riding Mountain N.P. (50.676°N, 99.898°W) (BOLD)
New Brunswick - Rothesay Park (45.338°N, 65.996°W) (BOLD).
Ontario - Hagersville (42.957°N, 80.051°W); Prairie Smoke, Carden Alvar (44.645°N, 79.095°W); Williamstown (45.146°N, 74.573°W) (all BOLD)
Prince Edward Island - Miscouche (46.432°N, 63.864°W) (BOLD).
Saskatchewan - Crooked Lake (50.60°N, 102.75°W), Pasqua Lake (50.78°N, 104.00°W) & Round Lake (50.53°N, 102.37°W), Qu'Appelle River; Mission Lake, 2 Km w. Lebret (50.75°N, 103.70°W); Big Quill Lake abt 1 ml s. Dafoe (51.55°N, 104.72°W).
Yukon Territory - Lake Laberge (60.958°N, 135.184°W) (BOLD).
Indiana - Crooked Lake, Angola.
Minnesota - Lake Christina (46.08°N, 95.75°W), Douglas Co.
North Dakota - Larimore Dam, Grand Forks Co. (47.90°N, 97.67°W); Warsing Dam, Eddy Co.; and Brewer, Williams, Blacktail, Clearwater Lakes; McVile Dam (Kiknadze *et al.* 2016).
Wisconsin - Booth Lake (Hilsenhoff & Narf 1968), East Horsehead Lake, Oneida Co.; Grand Portage Lake, Iron Co. (Hilsenhoff & Narf 1968); Kegonsa Lake, Dane Co. (Hilsenhoff & Narf 1968); Pine Lake, Pleasant Lake, Walworth Co.

Lakes and dams.

Fourth instar larva very similar to that of sp. 3b but gular region darker, frontoclypeus pale, and lateral projections shorter. Some information on arm F published by Martin (1979), Wülker, Devai & Devai (1989), under the name Species 9. Some larval characters given

in Hilsenhoff & Narf (1968) as *Chironomus* species D. Karyotype described by Kiknadze *et al.* (2012) and (2016)

It is possible the specimen sequenced in Guryev *et al.* (2001) may have been a misidentified *C. muratensis* as it is closest to that species in GenBank accessions.

Species 3e. *C. (Chaetolabis) ochreatus* Townes 1945 as *Tendipes (Chaetolabis) ochreatus*
This species is in BOLD Bin: [BOLD:AAP5112](#)

Adult:

Male:

Wing length 3.9 - 4.6 mm, width 0.93-1.03 mm, VR – 1.04-1.08.

Head yellowish green; antennae and palps dark. AR about 3.9 - 4.1. Frontal tubercles small, about 5 µm.

Palps (micron): 80 : 72 : 277 : 304 : 420. About 30-45 clypeal setae.

Thorax greenish, mesosternum and mesonotal vittae brownish yellow, posterior part of postnotum brown. Setae: Achrostichal – 12; Dorsocentral – 25 – 26; Prealar – 7; Scutellar, anterior (two rows) 4+10; posterior 13.

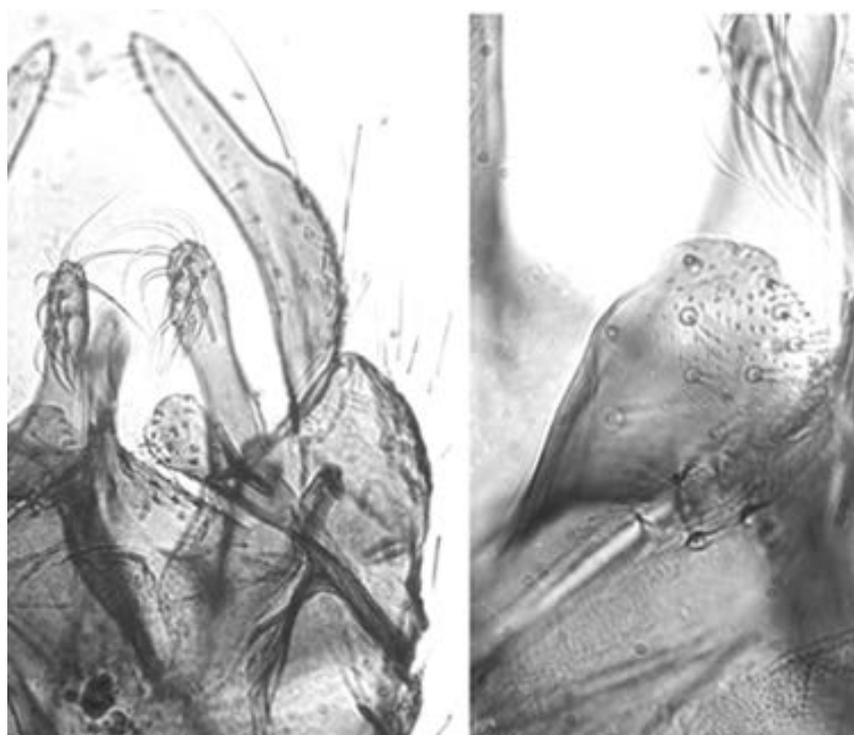
Legs yellowish green, anterior legs darkened at the knees, tibia and tarsi dark; other legs with tibiae yellow brown shading to black on distal tarsal segments. Anterior tarsus without a beard.

Leg lengths (in microns) and proportions as below:

	Fe	Ti	Ta1	Ta2	Ta3
PI	1690	1580	2480	1225	900
PII	1810	1740	1062	610	435
PIII	1950	2105	1428	850	583
	Ta4	Ta5	LR	F/T	BR
PI	780	355	1.55-1.70	1.07-1.08	2.06-2.11
PII	283	192	0.57-0.61	1.03-1.05	
PIII	350	228	0.68	0.92-0.94	

ForeTa5/Ti about 0.21; abt 7 sensilla chaeticae on mid Ta1, none seen on hindTa1.

Abdomen: Basal segment yellowish green, the rest blackish brown. Superior volsella club shaped, which is distinctive. 9 setae on tergite of segment IX.



Male hypopygium (left) and superior volsella (right) of *C. (Chaetolabis) ochreatus*

Female:

Median mesoscutal vitta dark brown and divided longitudinally by a pale line. Otherwise similar to the male except for the usual sexual differences. Further data based on one reared specimen:

Wing length 4.98 mm, width 1.40 mm. VR 1.12. 3 SCf on branchiolium, 23-26 setae in squamal fringe.

Head: Antennal segments (micron): 230 : 160 : 175 : 135 : 295 , segments not sufficiently swollen to give obvious necks (see figure below). AR 0.42, A5/A1 1.28.

Frontal tubercles small, about 10 x 12.5 μm .

Palpal proportions (microns): 75 : 60 : 293 : 333 : 426.

54 clypeal setae.

Thoracic setae: Achrostichal – abt 13; Dorsolateral – 38,41; Prealar – 8.9; supraalar – 1; Scutellar, anterior row 14, posterior row 21.

Leg lengths (in microns) and proportions as below:

	Fe	Ti	Ta1	Ta2	Ta3
PI	1920	1850	-	-	-
PII	2000	1940	1100	590	420
PIII	2120	2340	1580	820	610
	Ta4	Ta5	LR	F/T	BR
PI	-	-	-	1.05	-
PII	300	230	0.56	1.03	
PIII	360	260	0.68	0.91	

Sensilla chaetica on Ta1: about 57-60 on mid leg; 59 on hind leg.

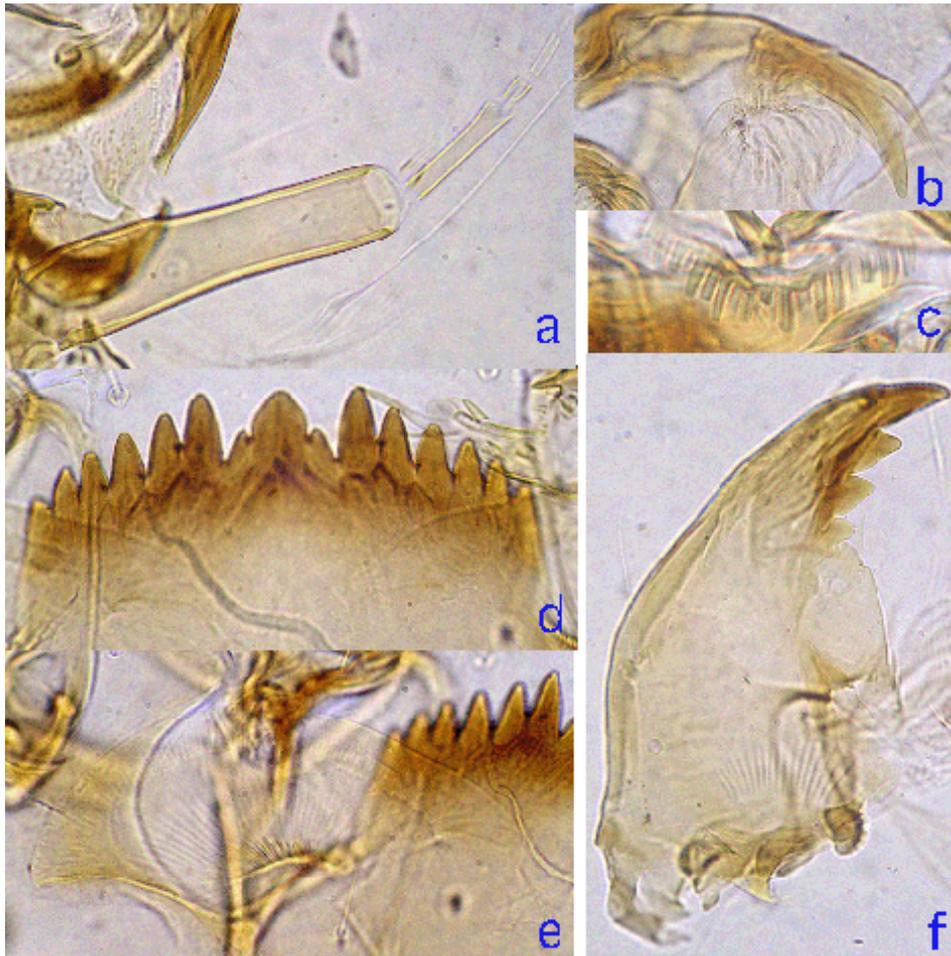
Setae on segment IX – 7,8 (?); setae on segment X – 4(?).



Adult female antenna (left) and ventral abdomen (right) of *C. (Chaetolabis) ochreatus*

Pupa: Length of exuviae about 10.3 mm (male), inner margin of wing case about 2.04 mm; color yellowish brown; with well developed narrow cephalic tubercles (70 x 20 µm) arising from a broad base, with subapical seta about 56-58 µm long.
 Basal ring kidney shaped, about 177 x 82 µm.
 Abdomen with a central patch of shagreen on segments II - V, grading from posterior 2/3 on seg. II, to whole length of segment on segment V; on segment VI the shagreen is restricted to the anterior third.
 Pedes spurii B and A are as usual for the genus. Numbers of L-setae on segments II-IV also as usual, the posterior two on segment IV arising reasonably separated.
 Hook row on segment II with about 93 hooks, occupying about 42% of width of segment.
 Posterolateral spur of segment VIII with 1 - 5 closely applied spines.
 About 142 taeniae in multiple rows on each side of anal lobe.

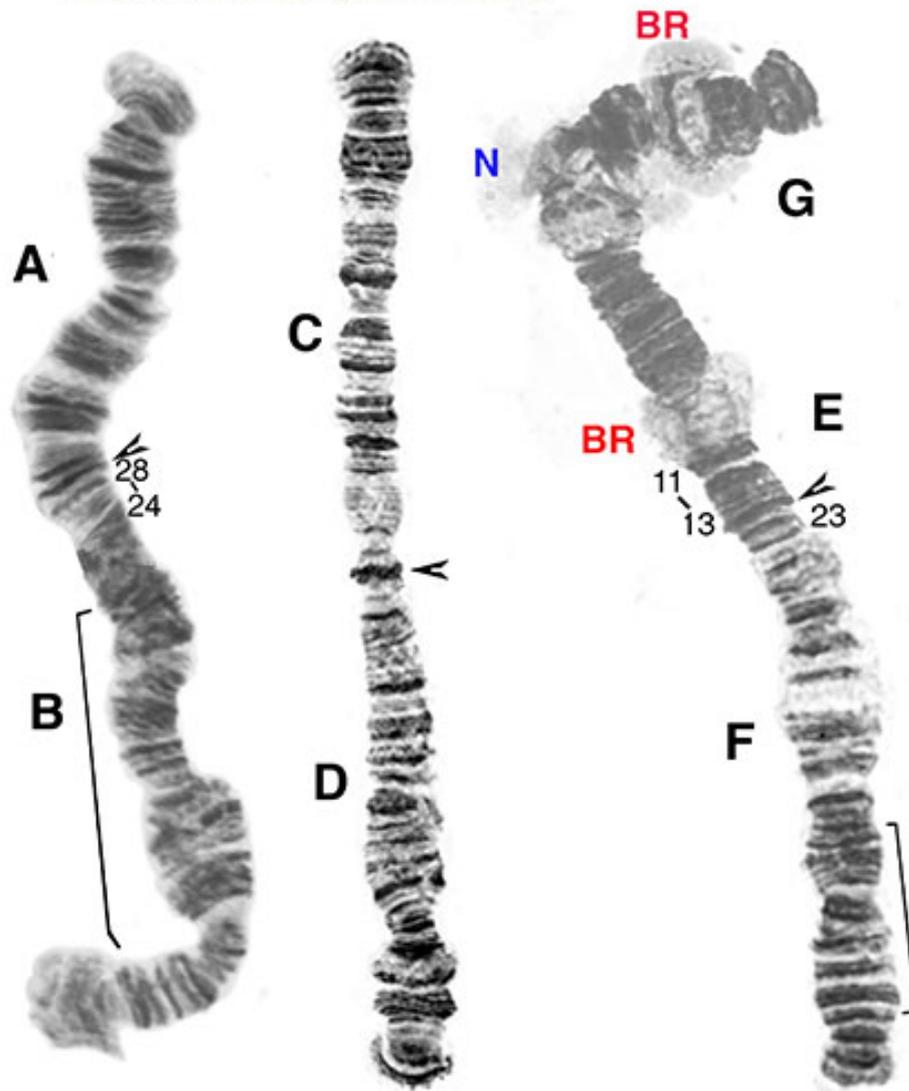
Fourth instar larva a medium sized thummi-type, length about 12.8-16.8 mm. (Female 14.8-16.8 mm; male 12.8 mm); posterior pair of VT longer and coiled (ant. 1.21-1.57 mm; post. 1.41-1.81 mm). AT very large, about 5.5-7 times longer than wide, with a constriction about one third from the base (dors: 1120 x 200 µm, vent. 1180 x 170 µm).
 Gular region pale, FC pale Width of FC between the antennal bases about 186-190 µm, greater than the distance between the S4 taeniae (about 160-164 µm).
 Mentum (d, below) with relatively pointed teeth; c1 tooth moderately broad with short parallel sides, c2 teeth moderately well separated. Ventromental plates (e, below) separated by about one third of mentum width; with about 39-45 striae (Webb *et al.* 1987). Premandible (b, below) with narrow, sharp outer tooth, shorter than the inner tooth, which is 2.3-2.8 times wider. PE (c, below) with about 24- 25 teeth, with small interstitial teeth.
 Antenna (a, below) with long second segment, over $\frac{1}{3}$ length of 1st (basal) segment, which itself is about 4.3-4.7 times longer than wide; ring organ just less than half way up from the base; AR 1.72-1.79; antennal segment proportions (micron) 171 : 51 : 11 : 18 : 8.
 Mandible (f, below) with 3rd inner tooth well developed but pale (type II); with about 15 - 20 grooves on outer surface at base.



Larval mouthparts of *C. (Chaetolabis) ochreateus*

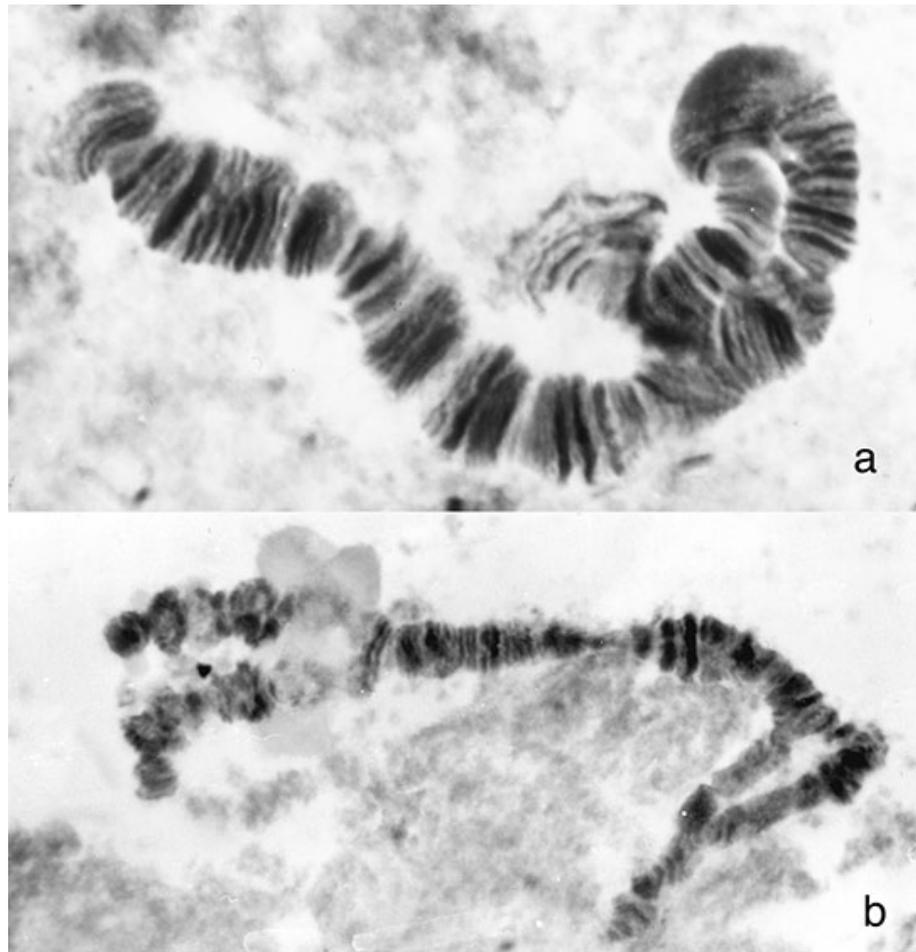
Cytology: 3 polytene chromosomes which have a modified thummi arm combination, AB, CD, GEF; but Keyl pattern very difficult to recognize. Nucleolus near the junction of arm G with E, arm G generally unpaired; two BRs between nucleolus and end of arm, with another in arm E, found in some cells of one larva only. No nucleolus in the long chromosomes.

C. (Chaetolabis) ochreatus



Polytene chromosome complement of *C. (Chaetolabis) ochreatus*

Polymorphism in arms B and F.



a. heterozygous arm B, b. heterozygous arm F.

Found: Quebec - Lake Opasatica, Rouyn-Noranda (48.17; -79.33).
Arkansas - Galloway (Townes)
Georgia - roadside pond (B. Caldwell, in Epler 2001)
Maine - Lincoln Co (Townes)
Massachusetts - Holliston (Townes)
Michigan - Empire (Townes)
New Jersey - Medford Lakes (**Type locality**); Chesilhurst; Glassboro (Townes)
New York - Lake Sebago, Bear Mountain State Park (Townes)
Rhode Island - Westerly; Wickford (Townes)
South Carolina - Greenville, Table Rock State Park, Pickens Co. (Townes)
Virginia - Four-mile Run; Norfolk Co. (Townes)
Wisconsin - Little John Jr Lake, Vilas Co. (46.00, -89.63); Mud Lake, Vilas Co. (46.02, -89.62).

At depth of about 4 m amongst *Drepanocladus exannulatus*.

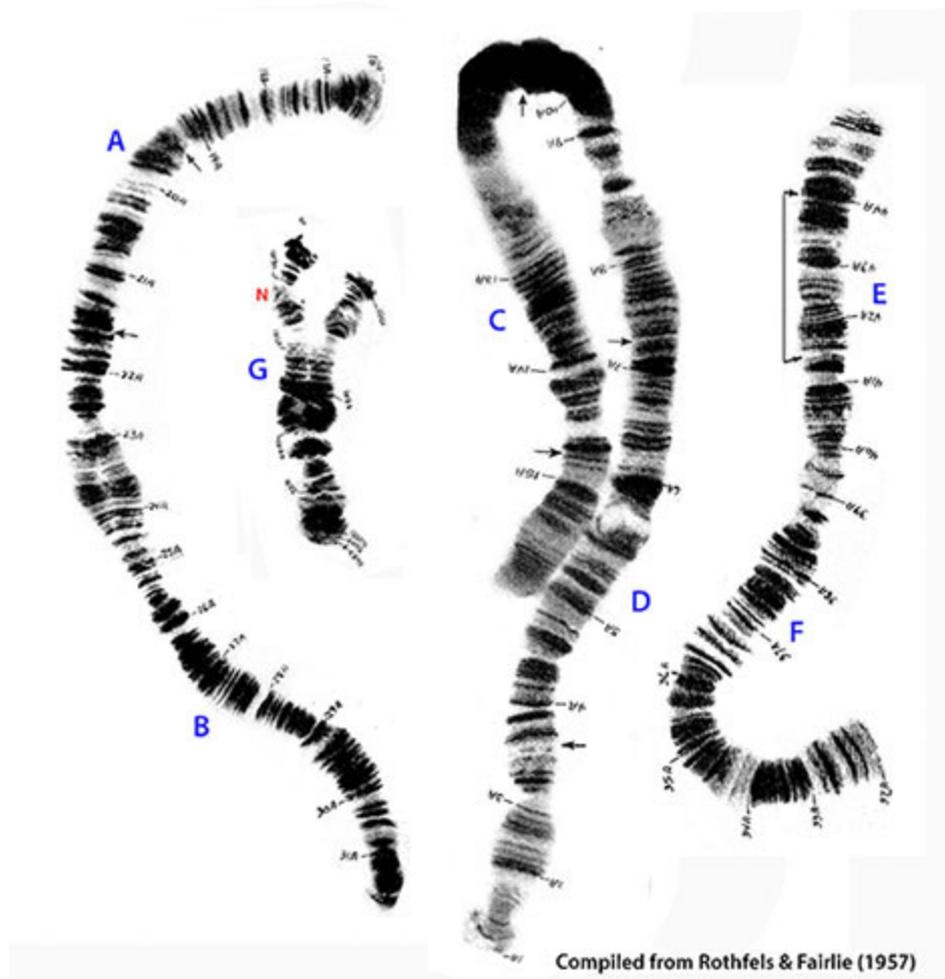
Wiederholm (1979) considered *Ch. ochreatus* to be a synonym of *Ch. atroviridis*, but did note that this was subject to confirmation by further analysis. Detailed features of the larval ventromental plates are given by Webb *et al.* (1987).

DNA analysis: Sequence for the mitochondrial *COI* and the nuclear *gb2 β* genes are available.

COI: Gene bank accession numbers KF278351; KF278327; KF278328.

Species 3f. *C. decorus* of Rothfels and Fairlie (1957)

see *C. decorus* Johannsen (species 3a)

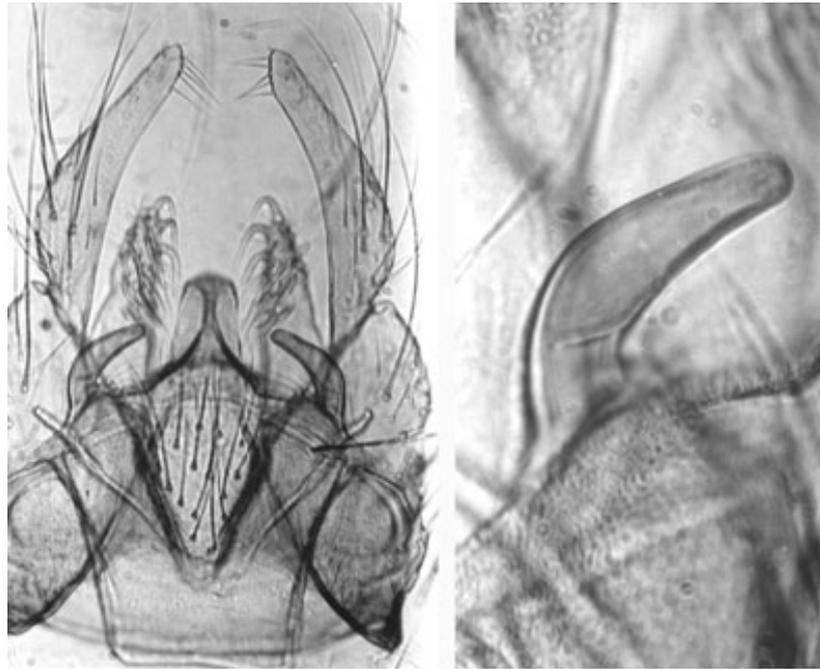


Polytene chromosomes of the *C. decorus* material of Rothfels and Fairlie

Species 3g. *C.*

Adult: Probably in the collection of J.E. Sublette, in the Museum of the University of Minneapolis. This reared male may not be the same species as the larva – they are just both from the same pool.

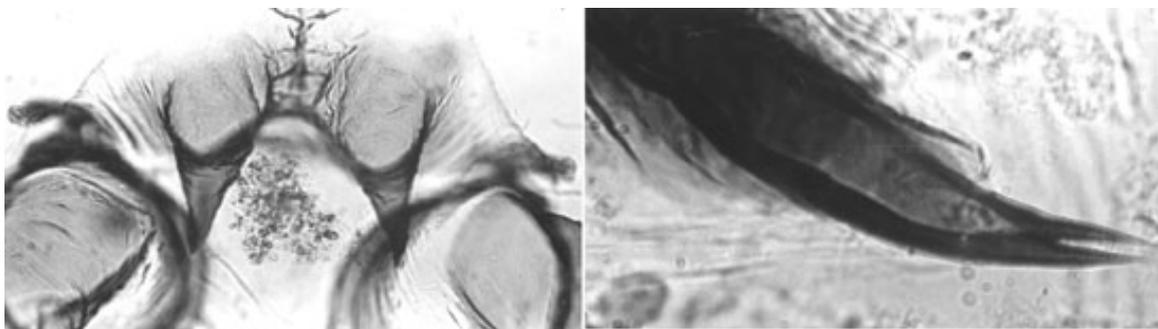
Male: Only the hypopygium was available for study:
Anal point broad; SVo darkened and strongly curved, E-type of Strenzke (1959); setae on IVo probably simple; GS narrowing gently over posterior half. About 13 setae in a large patch on tergite IX.



Male hypopygium (left) and Superior volsella (right).
Note the broad Anal point and the darkened Superior volsella.

Female: not known.

Pupa: Cephalic tubules of male quite large, about 1.5 times longer than wide. Caudolateral spur on segment VIII with two spines.



Fourth instar larva (based on one female larva): a small (abt 11.4 mm) plumosus-type; posterior pair VT slightly longer (ant. 1.01mm; post 1.13 mm). Lateral projections about 280 μ m. AT about 380-405 μ m long and about 2.3-2.5 times longer than wide; dorsal pair may be slightly longer. Gular and FC pale.

Mentum (Fig. d, below) of type I; with somewhat rounded teeth; c1 tooth relatively narrow with very short diverging sides, then rounded; c2 teeth moderately separated (type III).

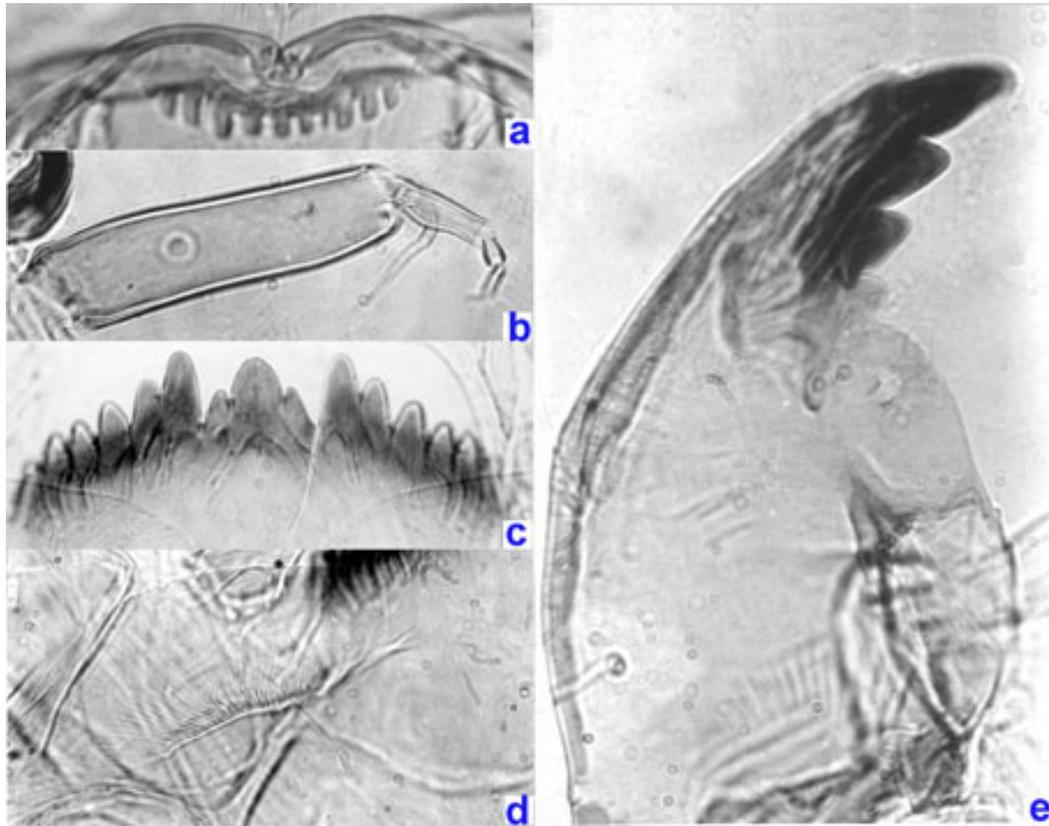
Ventromental plates (Fig. c, below) separated by about 0.22 of mentum width, about 39-40 striae, VMR 0.30.

PE (Fig. a, below) with 13 short, thick teeth (type B).

Antenna (Fig. b, below) with A1 3.8 times longer than wide, RO almost halfway up from base, and 0.4 of VHL; AR 1.91; A2/A1 about 0.27. Segment lengths (μ m): 134 : 36 : 11 : 15 : 8.

Distance between S4 setae just greater than distance between antennal bases.

Mandible (Fig. e, below) with short heel, length about 228 μm , 15 furrows on outer surface near the base, 3rd inner tooth partly separated and colored (type IIB), PMA with 13 taeniae, 3 spines on margin.



Cytology: 4 polytene relatively short chromosomes with the thummi arm combination AB, CD, EF, G. Arm G short and usually unpaired with a subterminal nucleolus. No nucleolus in longer chromosomes. Arm E often unpaired. Bulb with distal dark bands just near the 4 characteristic bands of arm B.

Found: Minnesota - Eagle Creek, Eagle Bend, Todd Co. (46.13°N, 95.05°W)

The cytology suggests that this species may be related to *C. atrella* (species i), however there are obvious differences: The anal point of the adult male is much broader than that of *C. atrella* and, even if the adult and pupa are not actually associated with the larvae, there are also some possible differences in larval morphology (pale gula, anterior VT longer than posterior pair, AR apparently lower) and most notably in the cytology is the absence of a nucleolus in arm B.

Species 3h. *C. decorus*-group

Adult:

Male: Wing length abt 3.3 mm. Fore LR about 1.50.

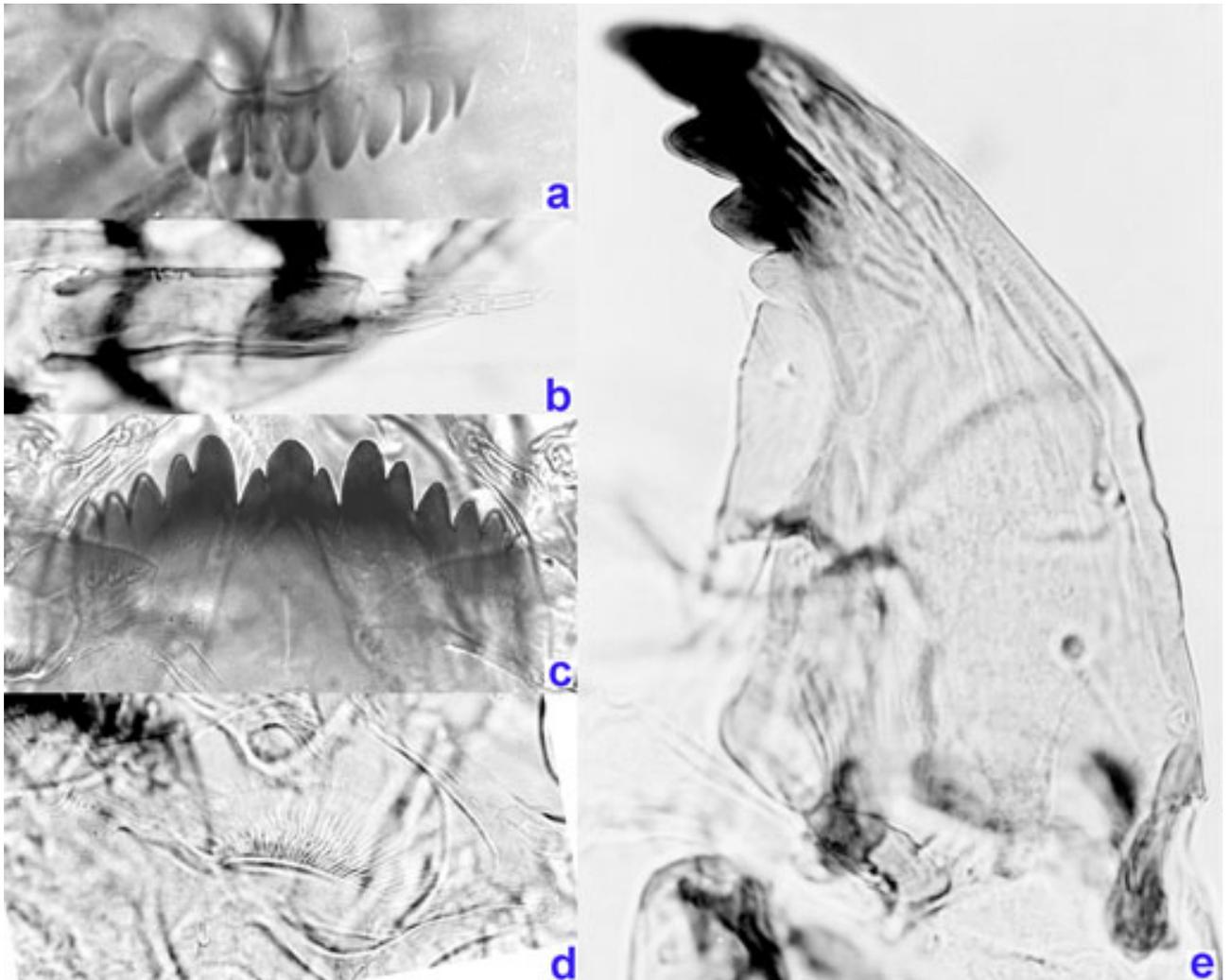
Frontal tubercles large.

Abdominal coloration as in *C. maturus*, but paler.

Superior volsella very slightly darker than the rest of the terminalia. Anal point broad.

Pupa: Not known.

Fourth instar larva a medium sized (13.7 – 16.3 mm) plumosus-type; PLT about 240 – 360 μm . VT moderately long and about equal length (ant. 1.34 - 2.56 mm; post. 1.98 - 2.44 mm). AT about 2 - 2.5 times longer than wide (len. 330 - 480 μm), without a constriction, ventral one tending to be longer but narrower. Gular region dark on posterior half, FC usually pale, but may be slightly darkened.



Mentum (Fig. c, above) with somewhat rounded teeth; c1 tooth relatively narrow, top sometimes rounded; c2 teeth moderately separated (probably type III if not worn); 4th laterals generally not reduced (type I-II).

Ventromental plates (Fig. d & c, above) separated by about a third of mentum width, about 45-46 striae reaching about half way to anterior margin; VMR about 0.35.

PE (Fig. a, above) with about 12 - 15 relatively broad teeth. Premandible with inner tooth slightly longer and about 2.5 times the width of the outer tooth.

Antenna (Fig. b, above) with RO between a third and half way up A1; AR about 2.0 - 2.2; A1 about 3.4 – 4.3 times longer than wide, relative length of segments (μm) 152 : 34 : 10 : 14 : 7.

Mandible (Fig. e, above) with third inner tooth moderately separated but pale (type IIB); PMa with about 10-14 taeniae; about 14 - 17 furrows on outer surface at the base.

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

Arm G relatively short and thick with a sub-terminal nucleolus, probably in terminal heterochromatic cap, and a BR near the center, followed by a definite constriction and dark bands; commonly only paired at the nucleolus. Arm B may have a nucleolus just near the center of the arm, also with a bulb (group 7?) near the end of the arm with some dark bands proximal.



Polytene chromosome complement of *C. sp. 3h*. One homolog of arm G is broken.

Found: New Brunswick - Kouchibouguac National Park (48.8583°N; 64.9750°W).
 Ontario - South March nr. Mud Lake (44.88°N, 78.27°W), Carleton Co.

Pools and rivers.

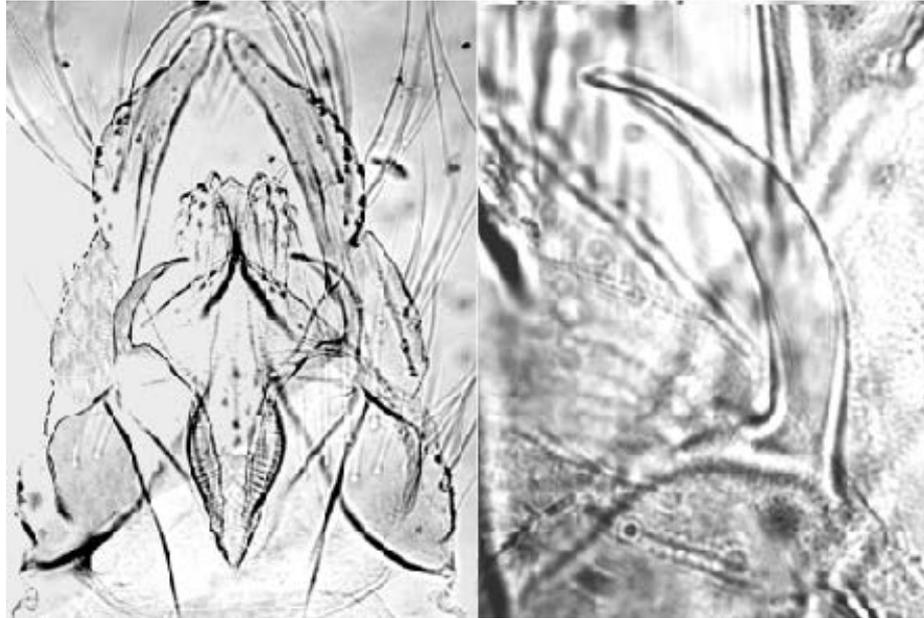
Appears to show relationship to *C. sp. u*.

Species 3i. *C. decorus*-group?

Adult:

Male

This specimen not necessarily associated as other species were also present.

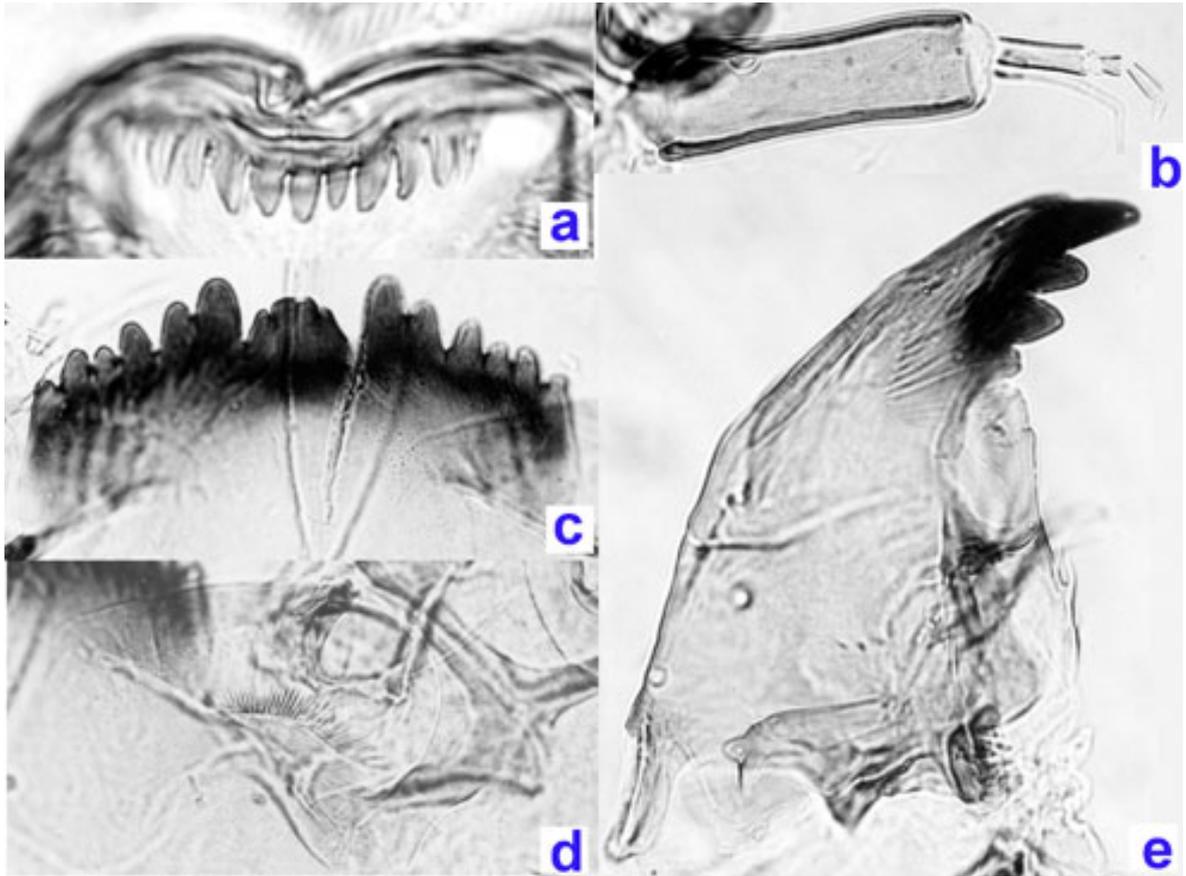


Male terminalia of *C. ?sp. 3i* (left) and superior appendage (right)

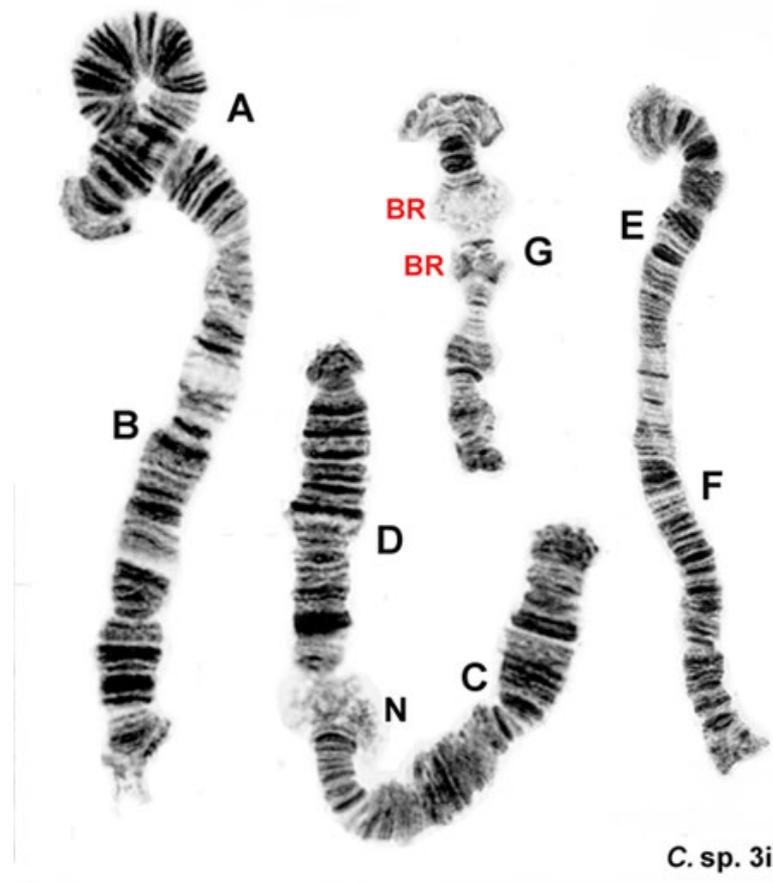
Superior volsella of E-type (g - i.e. as *C. cingulatus*); style narrowing relatively sharply over distal third.

Pupa: Not known

Fourth instar larva a medium sized plumosus-type (about 14.5-15.5mm); VT relatively long, posterior pair longer (ant. 2.04-2.64, post. up to 2.86). Gular region slightly darkened, FC pale. Mentum (Fig. c, below) with somewhat rounded teeth, c2 teeth of center trifid tooth not well separated (type IB); 4th laterals slightly reduced (type II). Ventromentum (Fig. d, below). PE (Fig. a, below) with about 11 sharp but broad teeth (type B). Antenna (Fig. b, below) with A1 about 3.6x longer than wide, RO about a third up from base. Mandible (Fig. e, below) with third inner tooth partly to fully separated and partly colored (type II-III B).



Cytology: 4 polytene chromosomes with thummi arm combination AB, CD, EF, G. Arm G closely paired with 2 BRs near middle of the arm. Nucleolus in arm D near centromere. Arm A with groups 4-6 approximately as in pigA1 (could be groups 1-6 at that end); arm B with bulb (gp 7?) in proximal third.



Found: Ontario - 4 m E Sudbury (46.52°N, 80.90°W).
 Pennsylvania - vicinity Pittsburgh.

Pools

Species 3j. *C. decorus*-group sp. 3j

Adult: Not associated.

Pupa: Not known.

Fourth instar larva a small to medium bathophilus-type (about 11.7 - 14.1 mm); VT relatively long, anterior pair longer (ant 1.44 - 1.56 mm; post. 0.96 - 1.32 mm). Sometimes a melanotus-type larva with PLT slightly developed (up to 160 μ m). AT about 380-420 μ m long and about twice as long as wide, ventral pair may be longer and narrower (2.6x longer than wide). Gula dark over more than the posterior half, FC pale.

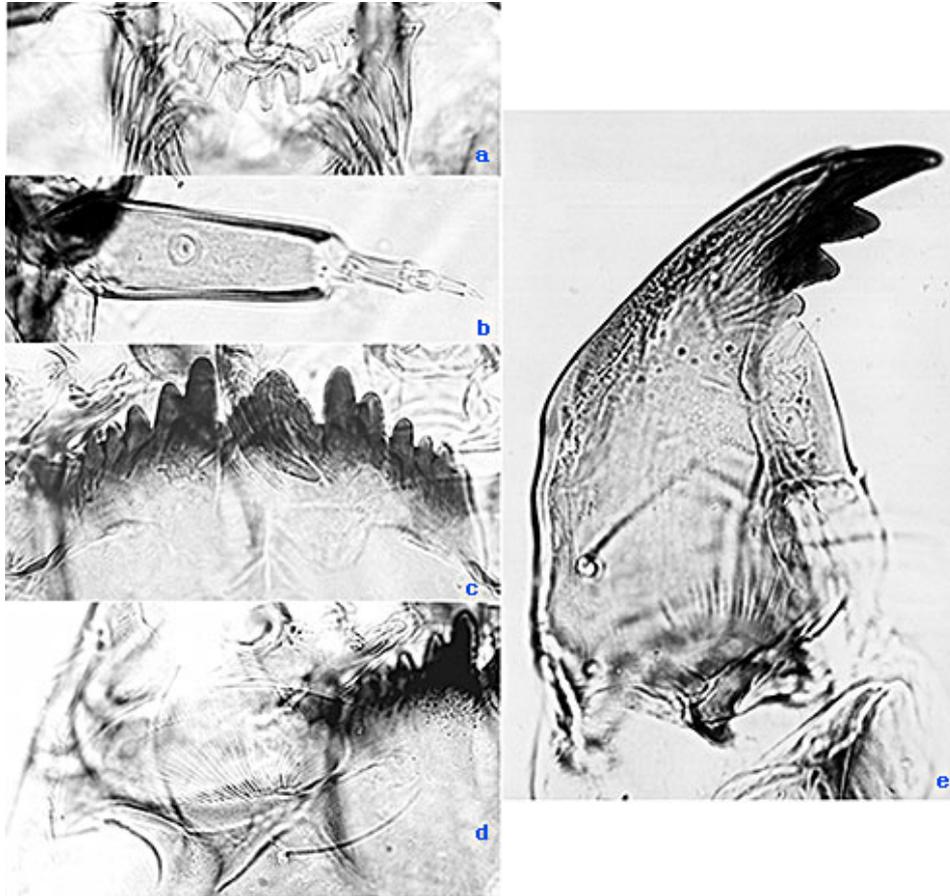
Mentum (Fig. c, below) with somewhat rounded teeth; c1 tooth relatively broad with c2 teeth closely applied, not well separated (type IB); 4th laterals slightly reduced (type I-II).

PE (Fig. a, below) with about 11 relatively broad, but irregular teeth. Ventromental plates (Fig. d, below) separated by about 43% of mentum width; about 33-36 striae that reach about half way to the smooth margin.

Premandible (note can be seen across the central tooth of mentum in Fig. c, below) with outer tooth shorter (due to wear?) and inner tooth about twice the width of the outer tooth.

Antenna (Fig. b, below) with RO just below middle of A1, AR about 2.1; relative length of segments (micron): 127 : 30 : 9 : 13 : 8.

Mandible (Fig. e, below) with third inner tooth only slightly separated and darkened (type IA), about 16 - 17 grooves near the base..



Cytology: 4 polytene chromosomes with the thummi arm combination AB,CD, EF, G. Arm G at least partly paired, with a subterminal nucleolus and a BR about $\frac{1}{3}$ along the chromosome. No nucleolus in the long chromosomes. Olive in arm A not obvious, puff not usually developed in arm B.

ArmA1: could be as decA1

ArmB1: typical bands (groups) at least 15 bands away from centromere. Could be close to decB2+3.

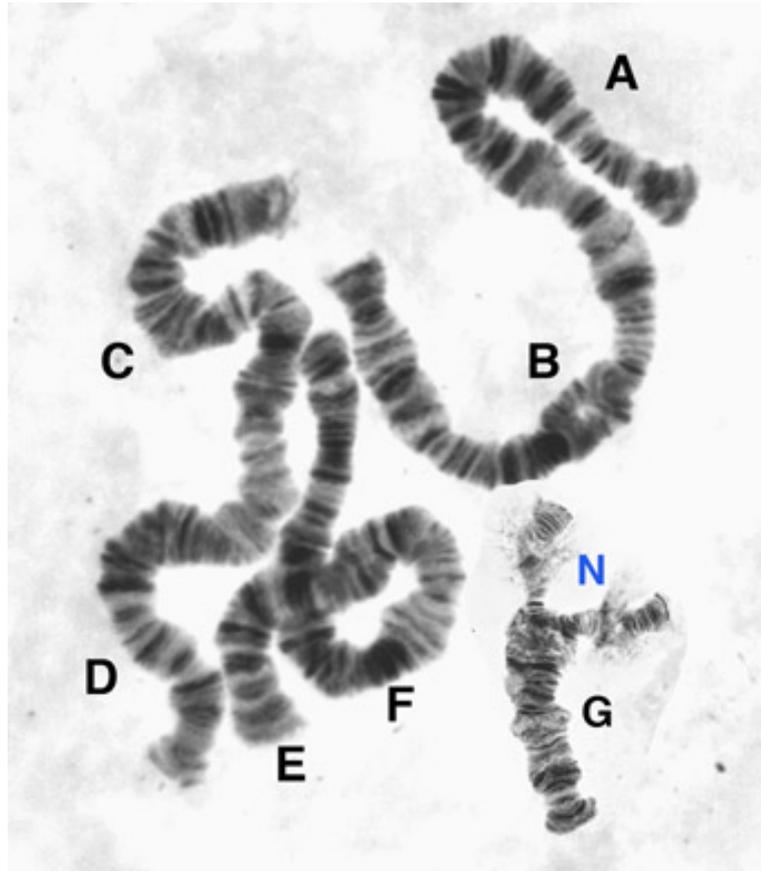
ArmC1:

ArmD1:

ArmE1: 1-3e, 8-5, 9-10b, 4-3f, 10c-13 i.e. as *decorus*, *maturus*, *stigmaterus*, etc.

ArmF1:

ArmG1: Nucleolus further from end than in *C. decorus*.



Found: Saskatchewan - North Saskatchewan River (53.25°N, 105.08°W) (P.G.Mason).

Shows relationship to *C. decorus* (sp. 3a).

Species 3k. *Benthalia brunneipennis* (Johannsen)
Chironomus brunneipennis – Johannsen 1905
Tendipes (Einfeldia) brunneipennis – Townes 1945.

The immatures of this species have not previously been described.

Adult:

Male:

The adult male is characterized by its brown thorax, abdomen and haltere knob; large frontal tubercles; strongly spatulate anal point and pediform basal part of superior volsella. Wing length 2.8-3.1 mm; LR 1.70-1.86; AR 2.81-2.86; frontal tubercles large; front tarsus without beard.

Frontal tubercles 41-50 µm high, 22-23 µm wide. Clypeus with 19-22 setae. Palpal proportions (micron): 50-64, 58-68, 168-183, 185-196, 283-303.

Thorax: Anteprenotum bare. Dorsocentrals 13-18, acrostichals absent, prealars 4-5, supraalar 1. Scutellum with 15-21 setae.

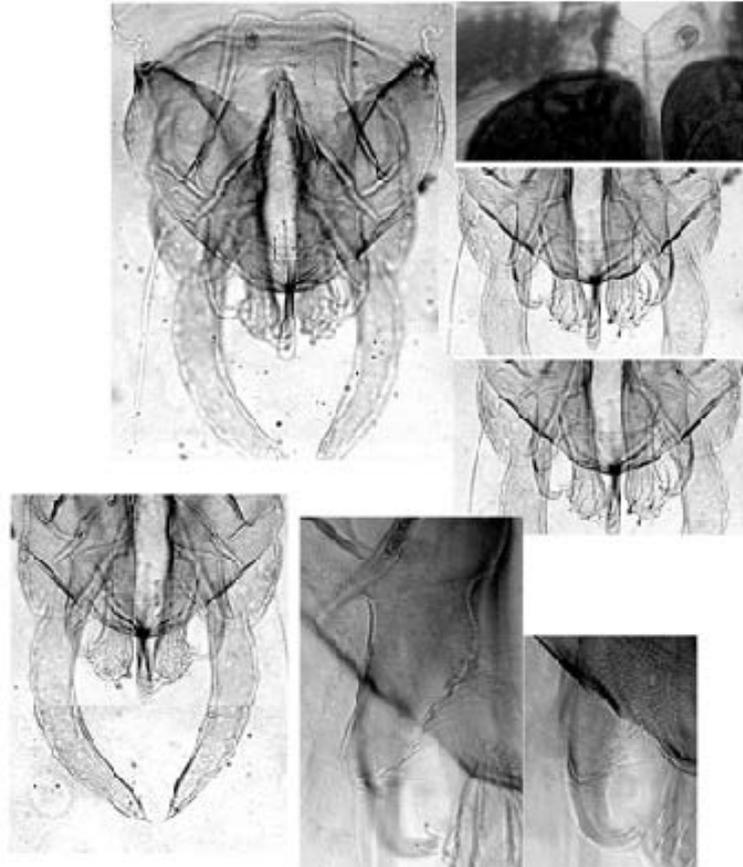
Lengths and proportions of legs (micron)

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	Ta5/Ti
PI	1613	890	1644	724	600	485	184	1.83-1.90	1.79-1.86	0.21
PII	1157	1055	625	322	233	132	92	0.57-0.60	1.0-1.10	

PIII	1245	1316	963	473	365	184	120	0.71-0.73	0.94-0.95	
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Ch. (Einfeltia) brunneipennis Joh.
[det. H. K. Townes]

IA: L. Okuboji 12-VII-1939
[Hauber Coll.] Hypo 332 cf. pin
332



Male terminalia of *B. brunneipennis* (left), with frontal tubercles (upper right) and superior volsella, inferior volsella and anal point. (Photo courtesy of J. E. Sublette)

Tergite IX with 30-36 setae. Base of Superior volsella pediform.

Female: Townes states only that they are similar to the male except for the usual sexual differences.

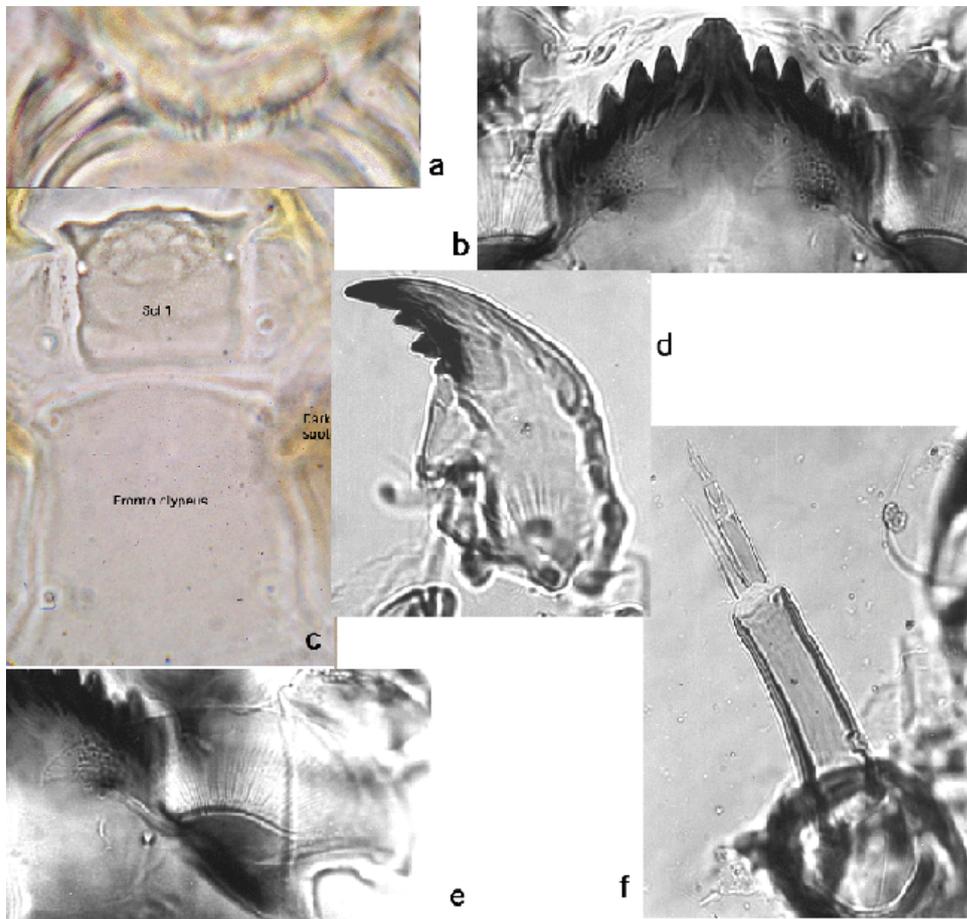
Pupa with frontal warts, lacking comb or spur on abdominal segment VIII.

Fourth instar larva not a typical *Chironomus* type; small, with only one pair of VT. Gula region dark and dark spots at base of antenna. FC (Fig. c) without a depression. Dorsal sclerite S1 (Fig. c) with slight rugosity anteriorly.

Mentum (Fig. b) also not typical *Chironomus*; c1 tooth narrow with only slight notches near the apex (Type I), which may be easily lost due to wear; all lateral teeth lower than the central tooth; 4th laterals quite reduced (Type III).

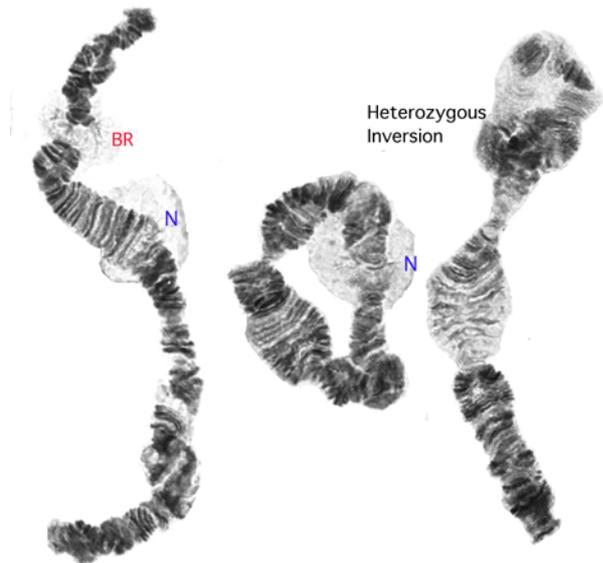
VM (Fig. e) similar to that of *Chironomus*, about 3.6 times longer than deep, with about 38 striae; separated by about one quarter of width of mentum; VMR about 0.26. PE (Fig. a) partially tripartite, with about 30 fine teeth.

Antenna (Fig. f) relatively short, AR about 1.3; basal segment about 3 times as long as wide, RO about 0.3 up from the base; A2/A1 about 0.19; A4/A3 about 1.63.
Mandible (Fig. d) with 3 internal teeth (Type IIIC), and with grooves near base.



Parts of head capsule of *Benthalia brunneipennis*. a. Pecten epipharyngis; b. Mentum; c. dorsal sclerites; d. Mandible; e. Ventromentum, f. Antenna.

Cytology: 3 polytene chromosomes with no obvious sign of Keyl pattern. Fused chromosome 4 visible as narrow section following a BR, on longest chromosome; 2 nucleoli present, one of which is on the longest chromosome. A third small nucleolus may sometimes be developed on the longest chromosome. Some inversion polymorphism present.



- Found:** **Manitoba** - Lake Winnipeg (Sæther 2012)
Ontario - Mooney's Bay (45.35°N; 75.68°W), Ottawa, Carleton Co.
Arkansas - Galloway, Pulaski Co. (Townes 1945).
Florida - Orlando; West Palm Beach (Townes 1945).
Iowa - Davenport (Townes 1945).
Massachusetts - Amherst (Townes 1945).
Michigan - Manistee Co.; Midland Co. (Townes 1945).
Minnesota - Cass Lake; New Brighton; Nisswa (Townes 1945).
New Jersey - Moorestown (Townes 1945).
New York - Bemus Point, Buffalo; Ithaca; Mayford; Milford Center; Peekskill (Townes 1945).
North Carolina - Raleigh (Townes 1945).
South Dakota -

The characters of the larva indicate that this species does not belong to *Einfeldia* (s.s.). They suggest it belongs to Group B or D of Pinder & Reiss (1983), which probably should be combined. The name *Benthalia* Lipina 1939 is available for this combined grouping (Spies, personal communication). However, Spies also points out that Townes (1945) description of the adult describes characters, such as large frontal tubercles and small base to superior appendage, that do not fit the diagnosis of *Einfeldia* (s.l.). The unexpanded base of the superior volsella is, however, not consistent with specimens identified as this species by Townes himself. The species is very similar to the Japanese specimens described as *B. dissidens* (Walker), so may be Holarctic in distribution. The larva of *B. natchitochae* (Sublette) is quite similar. The presence of grooves on the mandible suggests that this group belongs in an expanded *Chironomus*.

The adult was briefly redescribed by Sæther (2012).

Species 31. *C. decorus*- or *riparius*- group

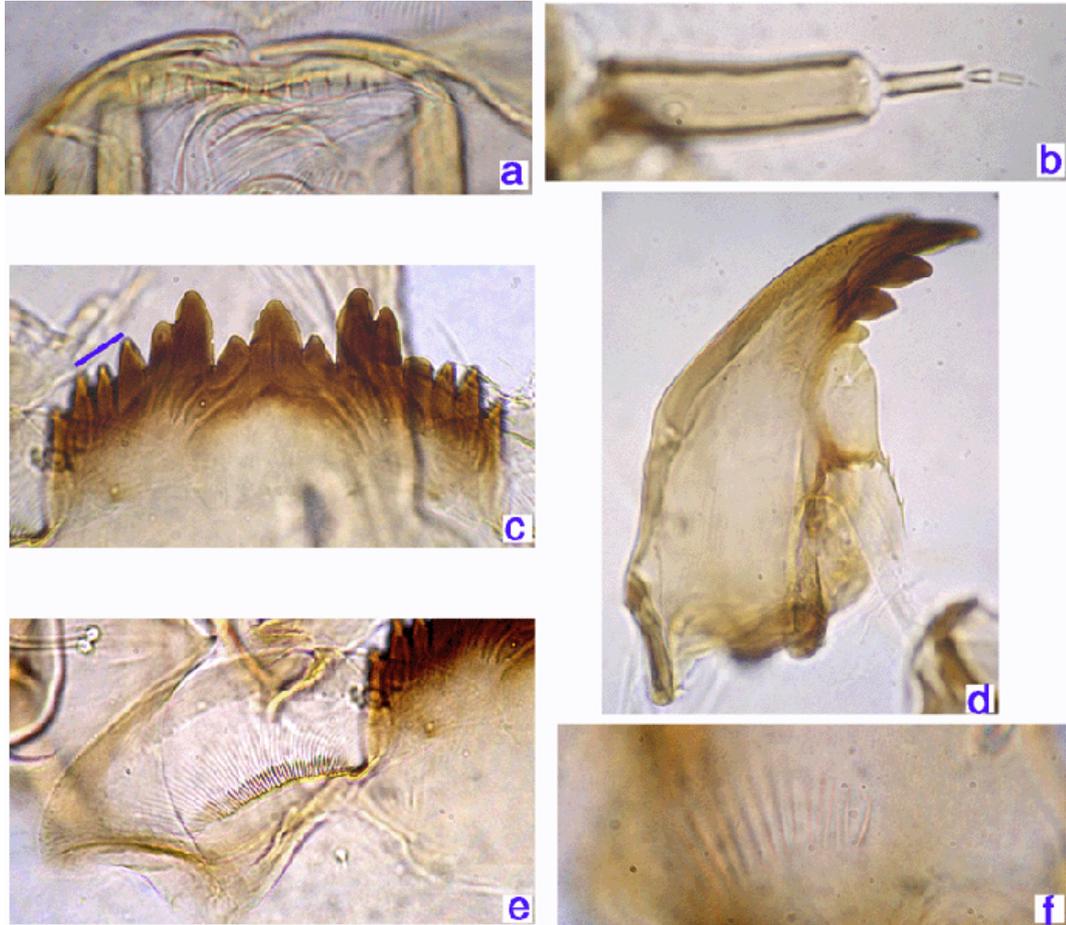
Fourth instar larva a medium sized plumosus-type (len. female 13.5 - 15; VT well developed, posterior pair longer (ant 1.68 - 1.72 mm; post 2.08 - 2.16 mm). AT relatively long, with a slight constriction in the middle (372 x 140 µm). Gular region pale or only slightly darkened, FC pale.

Mentum (c, below) of type I, with c2 teeth well separated from the c1 tooth (i.e. type III), the whole central grouping possibly being lower than the arc of the other teeth.

PE (a, below) with about 15 broad teeth. VM (e, below) with about 41 - 48 striae.

Antenna (b, below) with relatively long and narrow basal segment, about 3.6 times as long as wide; AR about 1.95 - 2.15; antennal segments 134 : 35 : 10 : 14 : 7 micron.

Mandible (d, below) of type III, with about 15-17 grooves on the outer surface at the base (f, below).



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

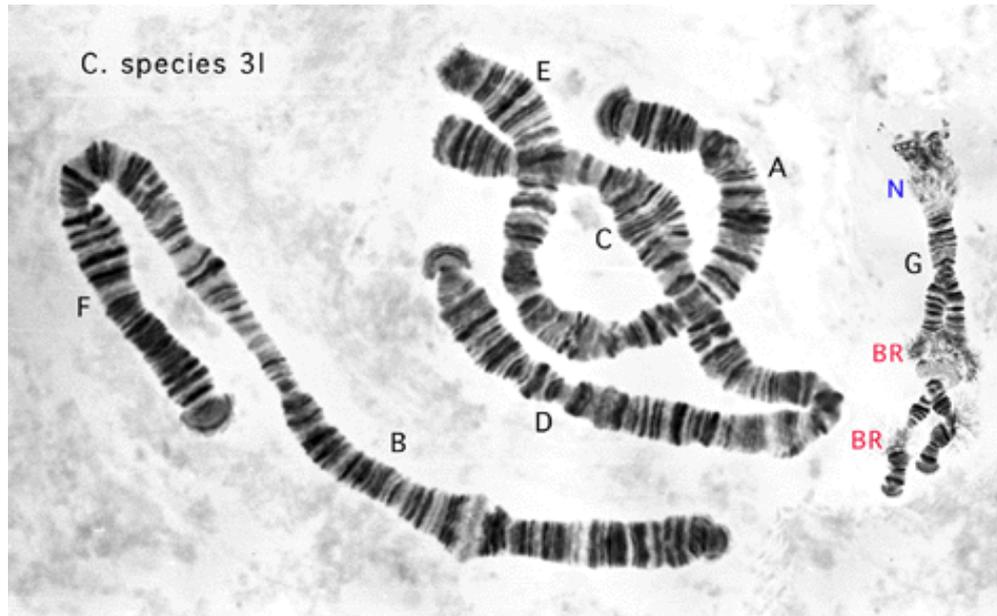
Arm G with an almost terminal nucleolus, with 2 BRs approximately equally spaced in the other half of the length of the chromosome. No nucleoli in other chromosomes. Arm B with bulb and some distal dark bands about $\frac{1}{3}$ from end of arm.

Arm A:

Arm E: approx. 1-2e, 9d-10b, 3a-e, 8-3f, 10c-13

i.e. as *anonymus*

Arm F:



Found: Kansas - Mill Creek, near Craig, Johnson Co. (38.95, -94.80) (B.Coler).

This species has not been associated with an adult.

Species 3m. *C. tenuistylus* Brundin 1949

European specimens are in BOLD Bin: [BOLD:AAW3994](https://www.boldsystems.org/#AAW3994)

Adult:

(based on European specimens in Wülker 1991)

Male:

Black, with a dark SVo. Fore tarsi without beard. Anal point may be more slender than that of *C. tenuistylus*. Brundin (1949) showed a slight constriction at the base of the anal point, but this was not seen at other localities.

Wing length 4.58 - 5.5.

AR 3.73 (3.65 - 3.81); anterior LR 1.36 - 1.60; BR 1.55 - 1.8

Frontal tubercle 30 - 40 μ m in length.

Setae: achrostichal 18; dorsocentral 26 - 30; prealar 5 - 6; scutellar 22.

5 - 6 setae on anal tergite.

Pupa:

Fourth instar larva of the plumosus-type, larger than larva of *C. longistylus*. Gular region completely dark, FC with dark stripe and antennal pedicel darkened as in *C. utahensis*, ring organ about 0.4 of the distance from the base of antennal segment 1.



Cytology: 4 polytene chromosomes with the thummi arm combination AB, CD, EF, G. Arm G frequently paired in the constricted region, nucleolus at this end with a large BR near the opposite end but separated from it by dark bands. No nucleoli in other chromosomes. Although polymorphism in arms A and B is known in Europe, no polymorphism has been recorded in North America.

tstA1:	1-2c, 10-12, 3-2d, 9-4, 13-19	i.e. as <i>holomelas</i> , <i>longistylus</i> , etc.
tstB1:	about 1 – 3, 19 – 21, 8a – 4, 17 – 18, 16, 8b – 15, 22 – 25 (based on Wülker 1991a)	
tstC1:	1-6b, 11c-8, 15-11d, 6gh, 17a-16, 7d-a, 6f-c, 17b-22	i.e. as <i>aberratus</i> , <i>longistylus</i> , etc.
tstD1:	1-3, 11a-c, 17-12, 18a-d, 7-4, 10-8, 18g-24.	
tstE1:	1 - 3e, 5 - 10b, 4 - 3f, 10c - 13	i.e. as <i>longistylus</i> , etc.
tstF1:	1 - 10, 17 - 11, 18 - 23	i.e. as in <i>cucini</i> , <i>magnus</i> & <i>tardus</i> .

Found: Wisconsin - Crystal Bog (Lake 27-2), Vilas Co.
Type locality - Lake Grimsgöl, Vontjärn, Southern SWEDEN
 Also Finland and Norway. report from Netherlands needs checking.

Morphology and cytology described by Wülker (1991a).

Species 3n. *C. longistylus* Goetghebuer 1921

In BOLD Bin: [BOLD:AAI4305](#)

Adult:

(based on European specimens in Wülker 1991)

Male:

Black, with a dark SVo. Anal point may be less slender than that of *C. tenuistylus*.

Wing length 4.22 (4.15 - 4.30).

AR 3.8 - 4.5; anterior LR 1.33 - 1.53; BR 2.41 - 3.1

Frontal tubercle 30 - 40 µm in length.

Setae: achrostichal 19-25; dorsocentral 33-44; prealar 7-14; scutellar 34-53.

5 - 14 setae on anal tergite.

Fourth instar larva of the plumosus-type but smaller than *C. tenuistylus*. Gular region darkened only at posterior, FC pale, ring organ about 0.3 of the distance from the base of antennal segment 1.

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

Arm G generally unpaired with a nucleolus near the heterochromatic centromere, the other end forming a fan-like structure terminated by dark bands, 2 BRs near the nucleolus. A nucleolus is also present in arm C. Polymorphism known in arms B (Holarctic), D, F & possibly E (Nearctic).

lonA1:	1-2c, 10-12, 3-2d, 9-4, 13-19	i.e. as <i>holomelas</i> , <i>tenuistylus</i> , etc.
lonB1:	1 – 8a, 21 - 16?, 8b – 15, 22 – 25	i.e. as <i>staegeri</i> , ‘tigris’ B1 (Kiknadze)
lonC1:	1-6b, 11c-8, 15-11d, 6gh, 17a-16, 7d-a, 6f-c, 17b-22	i.e. as <i>aberratus</i> , <i>tenuistylus</i> , etc.
lonD1:	1-3, 11-18d, 7-4, 10-8, 18e-24	i.e. as <i>tardus</i> , <i>cucini</i> , <i>pilicornis</i> .
lonE1:	1-3e, 5-10b, 4-3f, 10c-13	i.e. as <i>tenuistylus</i> , etc.
lonF1:	1 - 23	i.e. Standard, as <i>piger</i> , sp. 3b, etc.

Found: [Newfoundland & Labrador](#) - Torngat Mountains National Park (58.4505N, 62.7982W) (BOLD)
[Northwest Territories](#)- Nailoicho, Nahanni National Park (61.606°N, 125.758°W) (BOLD)
[Yukon Territory](#)- Ivvavik National Park (69.162°N, 140.155°W); Kluane National Park (60.748°N, 137.513°W) (both BOLD)
[Alaska](#) - No name Lake, Haul Road, South Slope.

Morphology and cytology described by Wülker (1991a).

Species 3o. *C. entis* Shobanov & Djomin

In BOLD Bin: ([BOLD:ADD4190](#)), now in Bin: [BOLD:ADM7020](#)
as is *Chironomus plumosus*.

Adult essentially similar to *C. plumosus*. Shobanov shows some differences exist in Palearctic specimens, but these have not been confirmed in the Nearctic. No description of the adults or pupae of the Nearctic specimens appears to have been published, so the data for Palearctic specimens from Shobanov (2005) will be used.

Male:

Body length generally larger than *C. plumosus*, but ranges overlap. AR 5.52 (5.09-6.29).

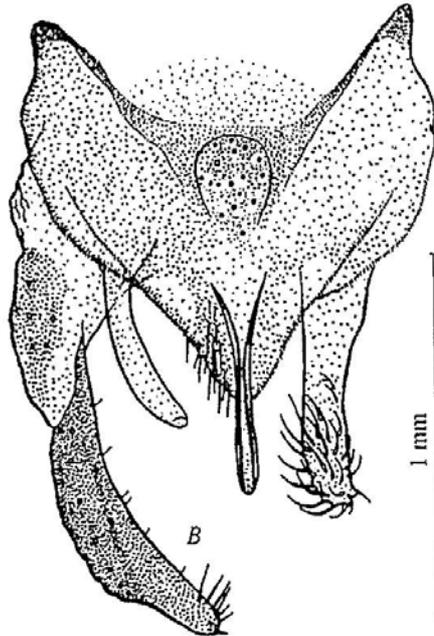
Clypeal setae 75.9 (61-92). Palp segs (3-5) μm : 339 : 375 : 534.

Thoracic setae: Dorsolateral 90.3 (77-115); Scutellar 101.4 (79-130).

Selected leg measures (mm) and ratios:

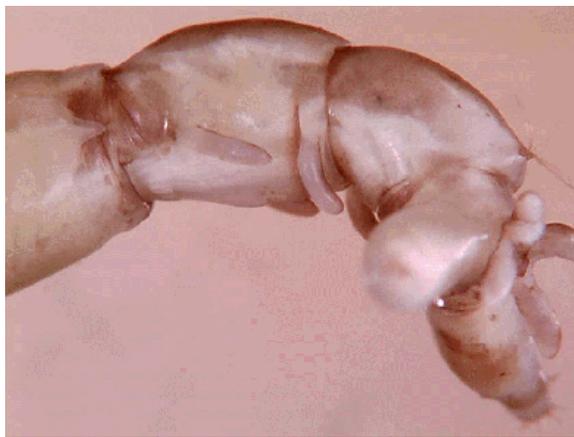
	Fe	Ti	Ta1	LR	F/T
Fore	2.07-2.34	2.30-2.54	2.83-3.12	1.15-1.31	0.90-0.92
Mid	2.41-2.66	2.39-2.68	1.39-1.59	0.58-0.59	0.99-1.01
Hind	2.85-3.32	3.00-3.45	2.05-2.37	0.68-0.69	0.95-0.96

About 9-13 setae on TIX, mostly in individual clear spots; SVo possibly closest to E(g) of Strenzke (1959); gonostylus narrows relatively sharply over posterior third.



From Shobanov (2005)

Fourth instar larva a large (fem. 21.3-22.8 mm; male 18.3-23.4 mm), generally semireductus-type, anterior VT straight and taper only at end (Butler, unpubl.) The VT are generally shorter (ant. 0.26 - 0.80 mm; post. 0.17 - 0.68 mm) than those of *C. plumosus* with the anterior pair longer, The VT also seem to be quite variable in length between localities, with those from Lake Waskesiu, Saskatchewan much shorter (ant. 0.26 μ m; post. 0.17 μ m) than those of other localities for which measurements are available. PLT relatively short (90-220 μ m).



)

(Picture courtesy M.G. Butler)

AT well developed, about 2.5 - 2.75 times longer than wide.



Anal tubules of C. entis

Pale FC, dark to very dark gular region. Russian workers report differences in head coloration pattern to those of *C. plumosus*, but these have yet to be confirmed in North American material. Mentum (c, below) of type I tending to type II (i.e. 4th laterals reduced slightly but not down to level of 5th laterals); 1st laterals sloping outwards.

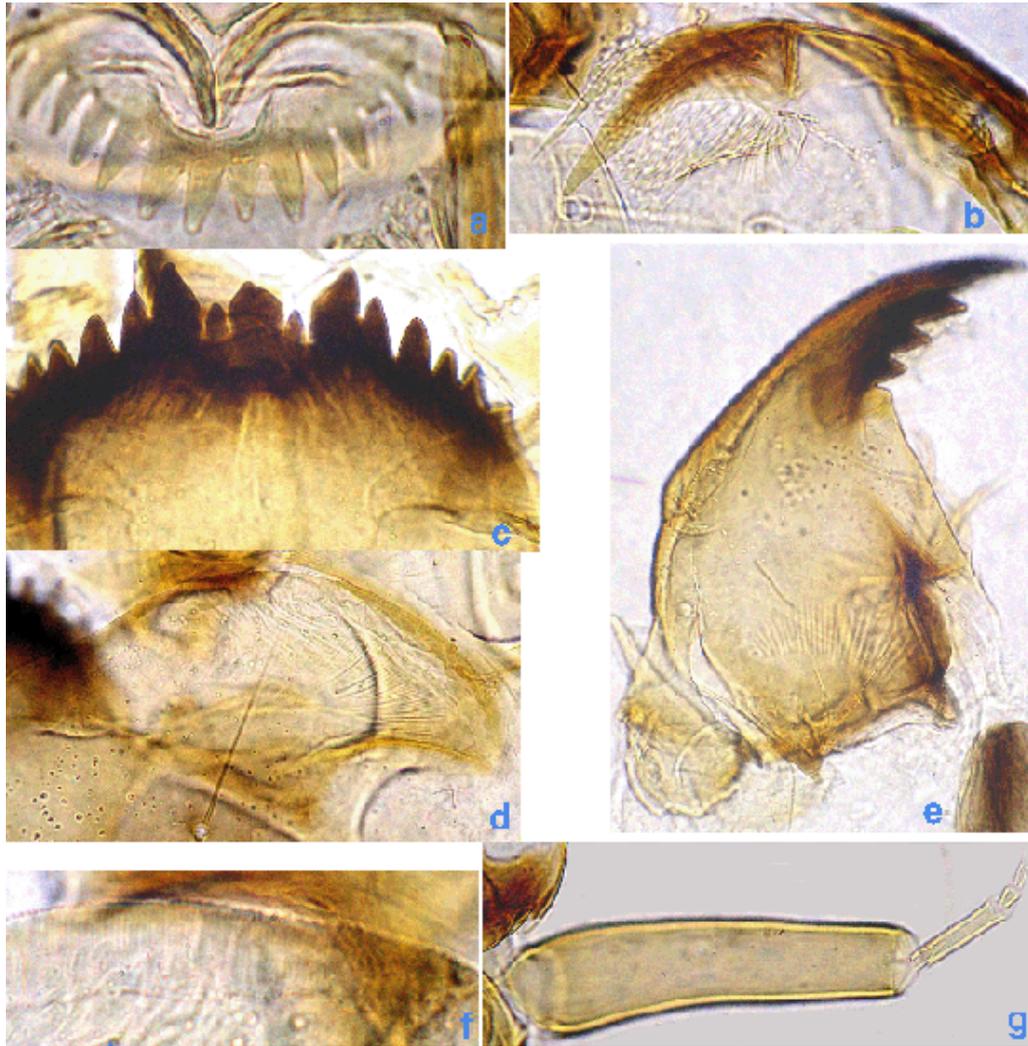
Ventromental plates (d, below) longer than mentum width about 4.1-4.7 times longer than deep, separated by about 0.36-0.38 of width of mentum, and about 1.07-1.10 times longer than the mentum; anterior edge, particularly near the middle, appears rough due to outer hooks (f, below) projecting past the edge; and with about 85-93 striae (lower than Palearctic specimens where the mean is 103) reaching to the anterior margin; VMR 0.23-0.32.

Premandibles (b, below) with narrow outer tooth, inner tooth about 1.4 to 3.2 times as wide, and slightly longer. PE (a, below) with about 15-16, often irregular, teeth.

Distance between antennal bases generally greater than that between the S4 setae, which are separated by about 0.74-0.81 of FC width at that point.

Basal segment of antenna (g, below) about 3.25-3.7 times longer than wide; AR about 2.32-3.1; segment lengths (microns) 210 ; 40 ; 12 ; 16 ; 9.

Mandible (e, below) with third inner tooth well developed and dark (type IIIC), about 24-29 furrows on outer surface near the base; about 15 (13-17) taeniae in PMA.

Mouth parts of *C. entis*

Cytology: 4 polytene relatively short chromosomes with thummi arm combination AB, CD, EF, G. Very similar to *C. plumosus* (species p)

Arm G more commonly partly paired, with a large virtually terminal nucleolus; BR near middle of arm below the nucleolus. Arm A most commonly with A4 sequence. Polymorphism in arms A, D, E and F.

h'entA4:	1-2c, 10-12a, 13ba, 4a-c, 2g-d, 9-4d, 2h-3, 12c-b, 13c-19	
n'entA11:	1-2c, 10-12, 14f-13, 3-2h, <u>4d-9, 2d-g, 4c-a</u> , 14g-19	
n'entA12:	1-2b, <u>12a-10, 2c</u> , 12bc, 14f-13, 3-2h, 4d-9, 2d-g, 4c-a, 14g-19	
n'entA13:	1-2c, 10-12, 14f-13, 3-2h, 4d-9, 2d-g, 4c-a, 14g-i, <u>17d-15</u> , 17e-19	
n'entA14:	1-2c, 10-12, 14f-13, 3-2h, 4d-9, 2d-g, 4c-a, 14g-i, 17-15, 18-19	
n'entA15:	1-2c, 10ab, <u>7d-9, 2d-g, 4c-a, 13ab, 12a, 11-10c</u> , 7c-4d, 2h-3, 12cb, 13c-14, 17-15, 18-19	
h'entB1:	BR near distal end of arm.	
n'entC3:	1a, 11h-d, 6gh, 17a, 16h-a, 7d-a, 6f-c, 2c, 5-6b, 11c-8, 15-12, 1b-2b, 4-2d, 17b-22	
h'entD1:	1-2d, 15e-16c, 18cd, 8-10a, 13a-12, 18ba, 7-4, 10e-b, 13b-15d, 2e-3, 11a-c, 16d-17, 18e-24	
n'entD4:	1-2d, 15e-16c, 18cd, 8, <u>19-18e, 17-16d, 11c-a, 3-2e, 15d-13b, 10b-e, 4-7, 18ab, 12-13a, 10a-9, 20-24</u>	
h'entE1:	1-2e, 10g-c, 3f-4, 10b-5, 3e-a, 11-13	i.e. as <i>muratensis</i>
(alt. E1):	1-2b, 11b-10c, 3f-4b, 3b-e, 10b-4c, 3a, 2e-c, 11c-13	(see Kiknadze <i>et al.</i> 1998c)

n'entE5: 1a-g, 10c-11b, 2b-1h, 3f-4, 10b-5, 3e-2c, 11c-13 (from alt E1)
 n'entEF(E6+F5): simple pericentric inversion of about Egp6 - Fgp7
 h'entF1: 1a-d, 6-1e, 7-10, 17-11, 18-23
 n'entF4: 1a-d, 6-1e, 19-18, 11-17, 10-7, 20-23 i.e. as *plumosus* F3
 h'entG1: Terminal nucleolus
 n'entG3: Small distal inversion

Found: **British Columbia** - Near Opposite Crescent, Bechers Prairie, Cariboo and Chilcotin Parklands (Canning);
Manitoba - Winnipeg (P. Chang); Lake Winnipeg (Sæther 2012).
Ontario - Bay of Quinte, Belleville (O. Johannsen); White Lake, Three Mile Bay (D.R. Oliver);
Quebec - Lake D'Alembert (48.38°N, 79.03°W), Lake Dasserat (48.28°N, 79.42°W), Lake Marlon (48.27°N, 79.07°W), Lake Opasatica (48.17°N, 79.33°W) and Lake Pelletier (48.22°N, 79.05°W).
Saskatchewan - Lake Waskesiu (53.92°N, 106.08°W), Prince Albert National Park; Crooked Lake, Pasqua Lake, and Round Lake, Qu'Appelle River (all W. Warwick).
Colorado - Vega Reservoir (39.23°N, 107.79°W), Mesa Co. (Kiknadze *et al.* 2000)
Indiana - Crooked Lake (41.40°N, 85.02°W), Angola Co.; Manitou Lake (41.03°N, 86.11°W), Fulton Co.
Michigan - Saginaw Bay, Lake Huron, Bay Co. (43.45°N, 83.67°W).
Minnesota - Lake Itasca (R. Hellenthal), Clearwater Co.; Lake Christina (46.08°N, 95.75°W), Douglas Co., Turtle Lake (46.79°N, 96.28°W) Kiknadze *et al.* 2000)
North Dakota - Blacktail Dam (48.26°N, 103.44°W), Williams Co.; Brewer Lake (47.25°N, 97.77°W); Fuller Slough (47.32°N, 97.77°W), and South Golden Lake (47.31°N, 97.50°W), both Steele Co.; Crooked Lake (47.39°N, 100.54°W), McLean Co.; Dead Colt Creek Dam (46.43°N, 97.68°W), Ransom Co.; McVile Dam (47.77°N, 98.17°W), Nelson Co.; Lake Elsie (46.04°N, 96.53°W), Richland Co.; Lake Isabel (46.49°N, 99.40°W), and Lake Williams (47.06°N, 90.17°W), both Kidder Co.; Lake Metigoshe (48.57°N, 100.22°W), Bottineau Co.; Red Willow Lake (47.88°N, 98.40°W), Griggs Co.; Silver Lake (46.05°N, 97.95°W), Sargent Co.; Warsing Dam (47.83°N, 99.12°W), Eddy Co.; Wilson Dam (47.06°N, 99.40°W), Dickey Co.;
Oklahoma - Buncombe Creek, Marshall County.
South Dakota - Lake Alice (44.53°N, 96.38°W), Deuel Co.
Wisconsin - East Horsehead Lake (45.42°N, 89.37°W), and Pine Lake (45.49°N, 89.55°W), both Onieda Co.; Grand Portage Lake (46.10°N, 90.80°W), Iron Co.; Green Lake (43.72°N, 89.00°W), and Little Green Lake (43.44°N, 80.59°W), both Green Lake Co.; Lake Kengonsa (42.977°N, 89.205°W), Dane Co.; Pepin Lake (44.26°N, 92.09°W), Pepin Co.; Pleasant Lake (42.47°N, 88.33°W), Walworth Co.; Winnebago Lake (44.01°N, 88.27°W), Calumet Co. (W. Hilsenhoff); Yellow Lake (45.55°N, 92.24°W), Burnett Co. Many localities from Kiknadze *et al.* 2000).

Found in lakes, often with *C. plumosus*.

Cytology described by Kiknadze *et al.* (2000a and b) and arm A revised by Golygina and Kiknadze (2008); larvae described by Shobanov (1989a and b).

Kiknadze *et al.* (1991) describe the outer hooks on the anterior margin of the VM as being longer and sharper than those of *C. plumosus* in Palearctic populations, but does not seem to apply in North America - besides being very difficult to see. Although the VT are generally shorter than those of *C. plumosus*, and where the two species occurred together at Lake Itasca, MN, the two

species could be accurately separated on this character, there is considerable overlap and could only be used if the VT were less than 0.4 mm in length. Shobanov (1989b) notes that the basal antennal segment of *C. entis* (abt 210 μm) is longer than that of *C. plumosus* (abt 167 μm). *C. entis* and *C. plumosus* cannot be separated on the basis of the DNA “barcode” sequence of *COI*, or *CytB* (Guryev *et al.* 2001) but can be separated by the sequence of the globin gene *gb2 β* (Guryev and Blinov 2002).

Species 3p. *C. species* Anchorage

This species is in BOLD Bin: [BOLD:AAI4309](#)

Fourth instar larva: A thummi-type larva, VT relatively long. Dark gula (and FC?) No other information available.

Cytology: 4 polytene chromosomes with the thummi arm combination AB CD EF G.

Nucleolus in arm C, in region 15-11, and in G. Polymorphism in at least arms B and D.

Arm A1: 1 - 2c, 10 - 12, 13 - 14e. 4a - 9 2d - 3i, 14f - 19 (unclear dividing region 14)

Arm B1: Puff (group 7) may be about middle of the arm, just proximal to inverted region

Arm B2: Small inversion about a third from distal end (see figure).

Arm C1: 1 - 6b, 11c - 8a, 15e - 11d, 6gh, 17a - 16a, 7d-e, 6f-c, 17b - 22

Arm D1:

Arm D2: Large inversion of most of the arm (see figure).

Arm E1: 1 - 3e, 10b - 3f, 10c - 13 as pluE1, *aprilinus*, etc.

Arm F1: 1a-I, 15a - 17d, 10d - 2a, 14a - 11a, 18a - 23

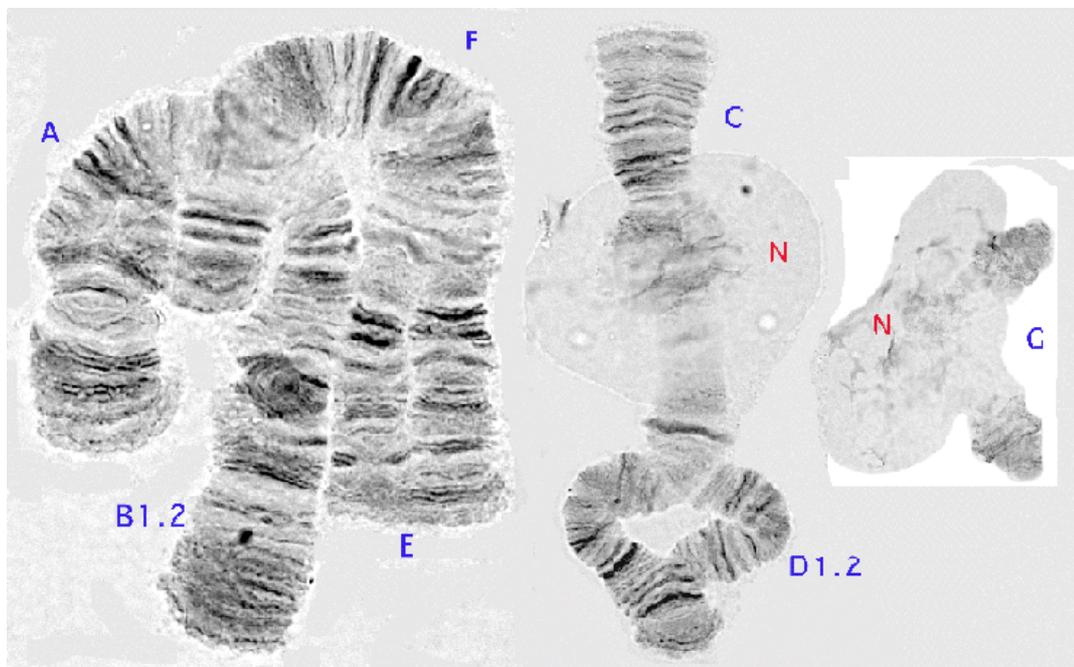


Photo courtesy of Prof. Iya Kiknadze

Found: **Manitoba** - Churchill (T. Ekrem)
Alaska - Potter Marsh, Anchorage Co.

Preliminary mapping by Iya Kiknadze.

Species 3q. *C. balatonicus*

Misidentification in Dinsmore & Prepas 1997, p.2171

See *C. annularius* (species 3d)

Species 3r. *C. species* WOC of Wülker & Morath (1989).

Adult and Pupa: not known, but may be similar to *C. calligraphus*.

Fourth instar larva: a medium plumosus-type larva; length (female) about 11.8mm (VHL abt. 320-340 μ m). PLT well developed, about 720 μ m. VT long, posterior pair longer and coiled, and may be over 40% of the larval length; AT long, about 3.3-3.6 times longer than wide (dorsal) to 5.7 (ventral). Gula dark to very dark on posterior third to half, FC slightly to dark, some darkening elsewhere on dorsal head.

Mentum (fig. c, below) with pointed teeth; c1 tooth relatively broad with parallel sides, c2 teeth well developed and separated (type III), 4th laterals reduced about to level of 5th laterals (type II-III).

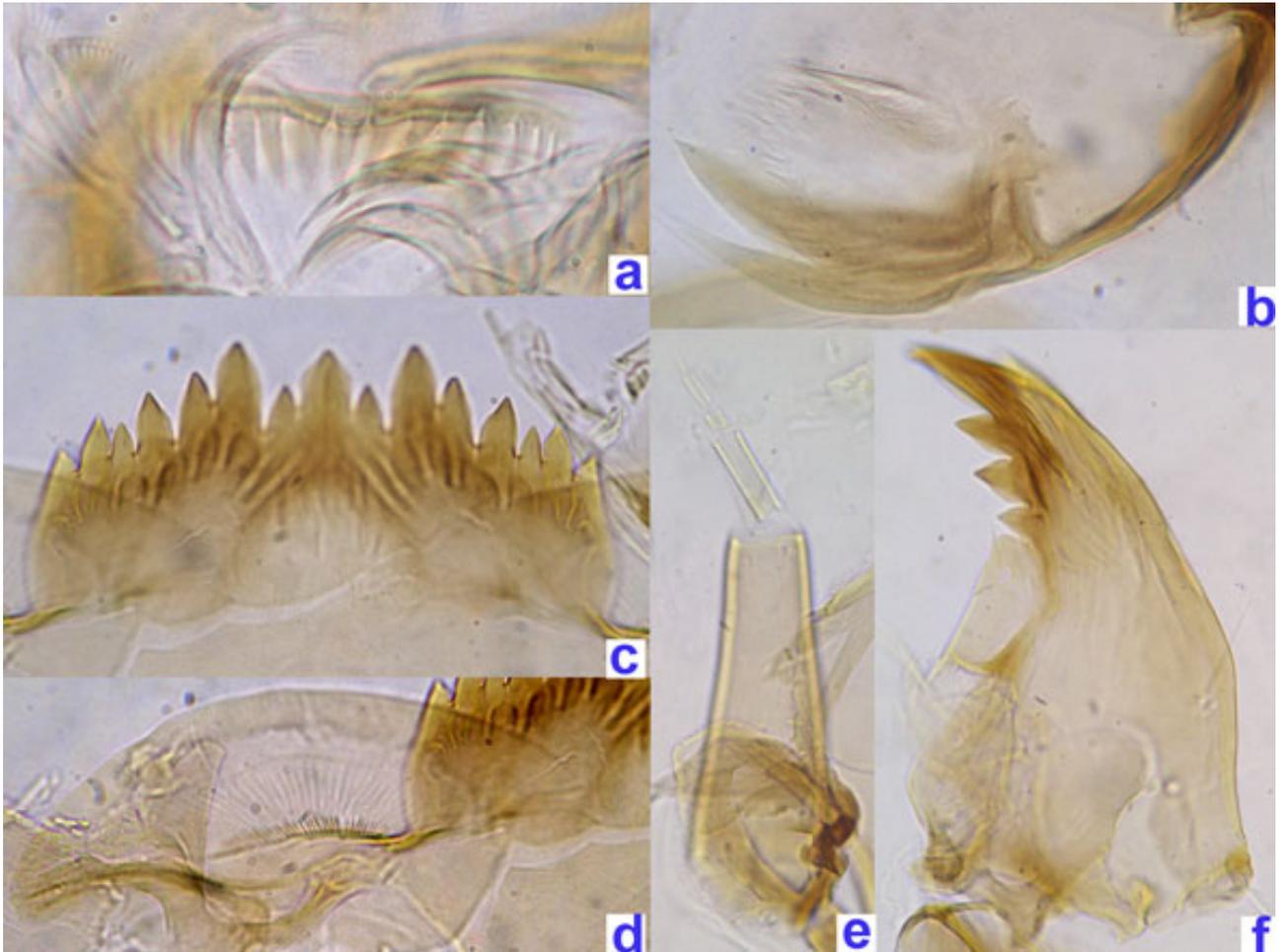
Ventromentum (fig. d, below) with smooth anterior margin; about 38-41 striae; VMR about 0.25; IPD about 28-32% MW. PE (fig. a, below) with about 15-16 sharp teeth.

Premandible (fig. b, below) with relatively fine sharp teeth, about equal in length, the inner tooth about 1.4-1.7 times wider than outer tooth.

Antenna (fig. e, below) with relatively long basal segment, abt. 4.25-4.4 times longer than A2 and abt. 3.4-3.5 times longer than wide; RO abt. a third to half way up from base; AR about 2.06-2.16; A3 shorter than or as long as A5; segment proportions (μ m): 135 : 31 : 7 : 13 : 8.

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

Mandible (fig. f, below) with third inner tooth fully developed and separated, and darkened (type IIIC); about 13-15 furrows on outer surface at base, PMA with about 10-11 taeniae.



Mouthparts of *C. species* WOC.

- a. Pecten epipharyngis with sharp teeth; b. Premandible showing narrow outer tooth; c. Mentum with square, sharp (type III), 4th laterals reduced about to level of 5th laterals (type II);
- d. Ventromentum with about 40 striae; e. Antenna with relatively long basal segment about 3.5 times longer than wide; f. Mandible type IIIc, with the 3rd inner tooth well developed and colored.

Cytology: 4 moderately long polytene chromosomes with pseudothummi arm combination: AE, BF, CD, G.

Arm G with a terminal nucleolus. No nucleolus in other arms.

Centromeres moderately heterochromatic.

No polymorphism known in the small sample of specimens.

WOC A1: 1a-e, 9a-e, 2d-3b, 7d-4a, 3i, 13a-15e, 3h-c, 1f-k, 8d-g, 8a-c, 2a-c, 10a-12c, 16a-19f

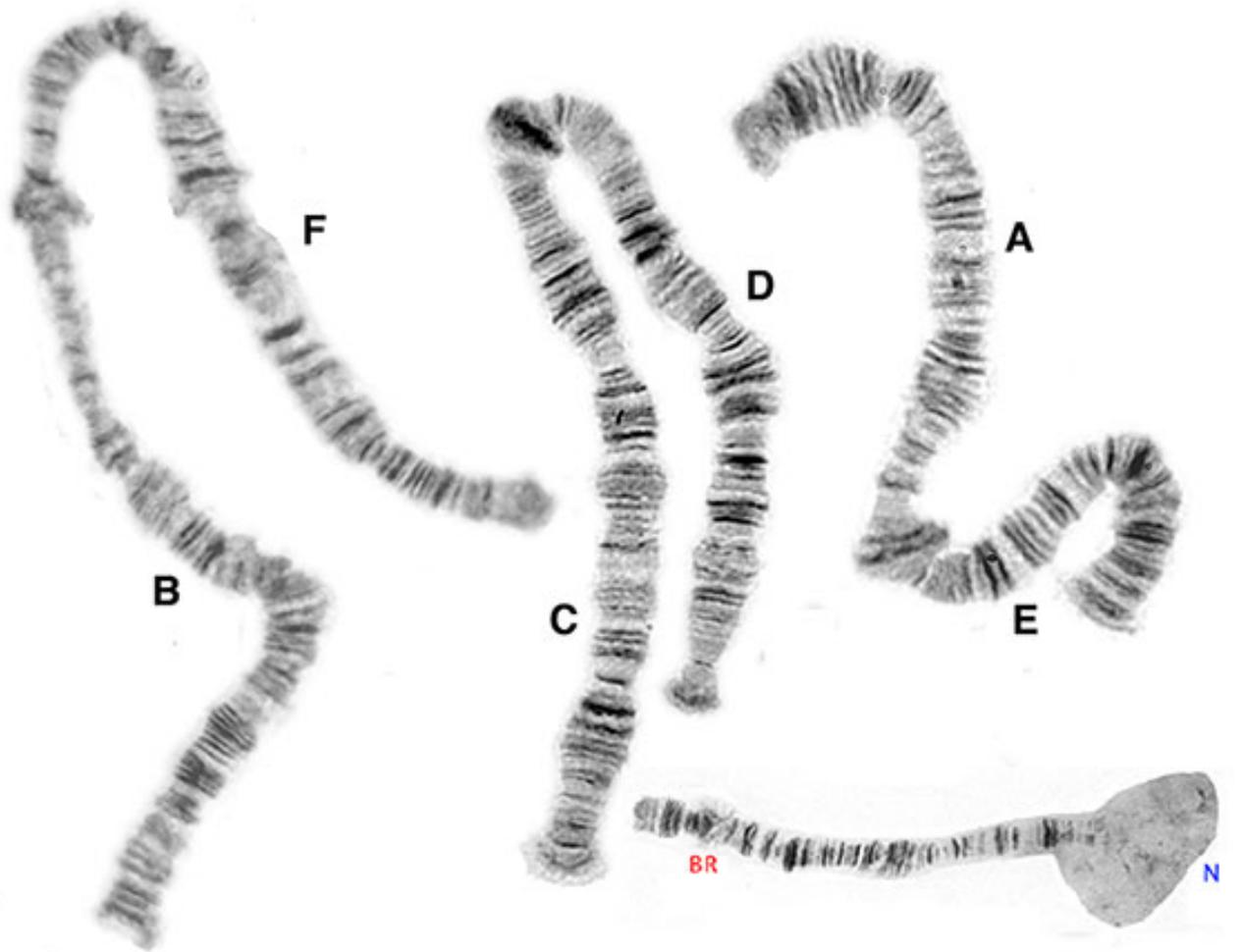
WOC B1:

WOC C1 typical bands, groups 3 and 4, about the middle of the arm

WOC D1:

WOC E1: 1 - 10b, 12b - 10c, 12c - 13

WOC F1: 1a - 6b, 19d - 18a, 11f - 14h, 17d - 15a, 11e - 6c, 20a - 23f i.e. as in *calligraphus*



Found: Florida - Winter Haven;
Georgia - Camden subdivision, n. Athens, Clarke Co. (33.95; -83.37).
Louisiana - Many, Sabine Parish.
Tennessee - White Oak Creek, Knox Co.
COI sequence in GenBank suggests it occurs as far north as Aylmer (42.7706°N,
80.992°W) in Ontario

Creeks and pools in the southeastern USA, but possibly up to Canada.

Sequences of arms A, E and F given in Wülker & Morath (1989) and photographs of chromosomes in Spies *et al.* (2002).

Shows affinities to *C. anonymus* (species2o), *C. calligraphus* (species 2w) and to a group of South American species.

Molecular sequence:

mtCOI: There is sequence of an apparently identical species in the BOLD database, but since it is “Private” the Bin no. cannot be determined, but may be the same specimen as in Genbank.

Species 3s. *C. tardus* Butler 1982

Information based on Butler (1982) and Wülker & Butler 1983).

Adult

Male: Dark species, AR 5.09 - 5.78 (mean 5.39); frontal tubercles 20 - 40 μm .

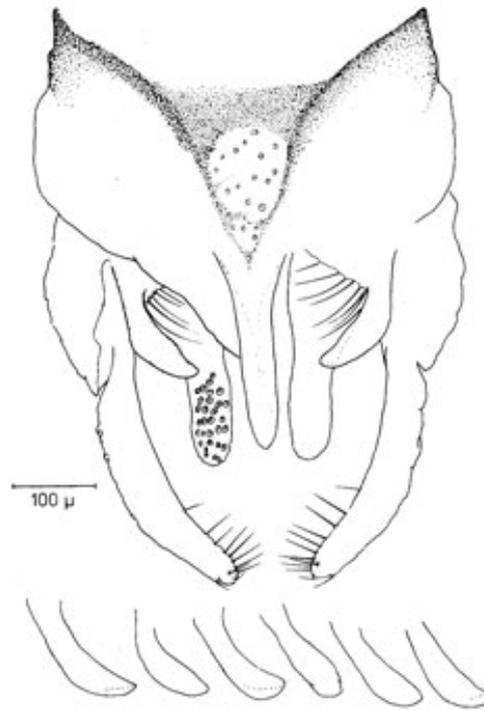
Weak or absent scutal tubercle

Abdominal segments dark, but often pale on posterior margins.

Fore leg with moderate beard, BR 4 - 7.

LR₁ 1.01 - 1.14; LR₂ 0.56 - 0.64; LR₃ 0.67 - 0.73.

Sensilla chaetica: Leg₂ 21 - 46; Leg₃ 15 - 34 (higher than *C. prior*; and when taken in conjunction with the lower LR, is useful for separating males of the two species)



Hypopygium and SVO variation of *C. tardus* (from Butler 1982)

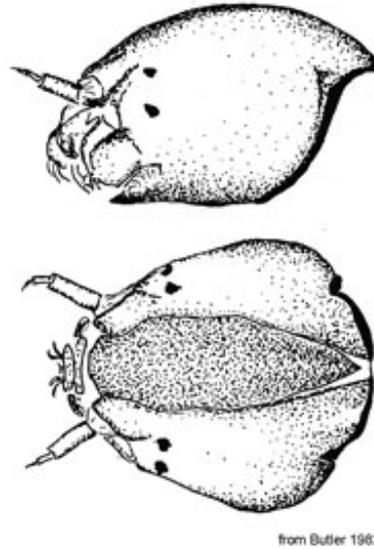
Anal point relatively narrow; SVO of the D-type;

Ivo parallel over entire length (unlike *C. prior* where they turn outward over the distal third); 8 - 31 setae on 9th segment.

Female: Thoracic color slightly lighter than that of the males, base color light to medium brown, with scutal stripes, postnotum, etc., dark brown. Abdomen similar color to males.

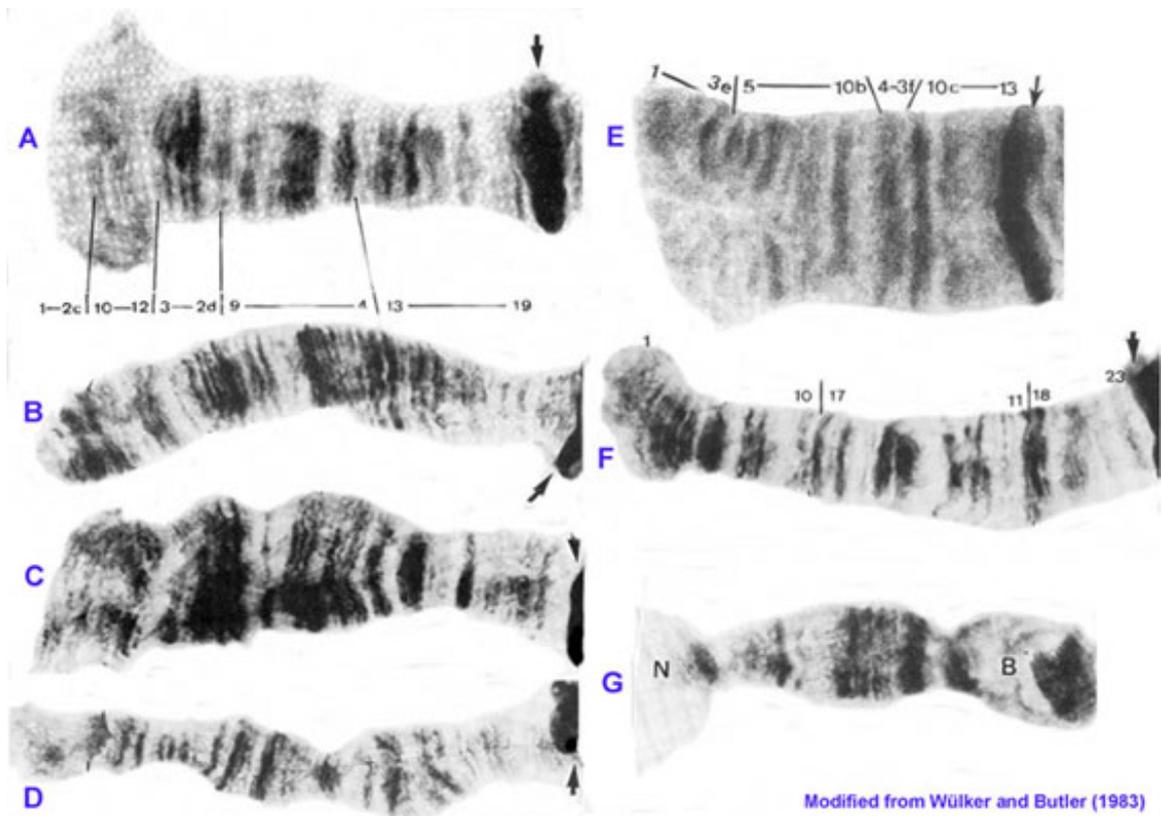
Pupa not studied in detail, but noted that the hooks on abdominal segment II have a relatively straight point at quite a sharp angle, and the convex margin often has several small teeth. In this regard they differ from those of *C. prior* which are sickle shaped, generally with a smooth outer margin.

Fourth instar larva a salinarius type. Very dark gular region, dark FC, but rest of head paler. VHL 320 - 386 (mean 351) μm ; head width 629 - 717 (mean 662) μm Head capsule larger and paler than that of *C. prior*.



Cytology: 4 polytene chromosomes with the thummi arm combination: AB, CD, EF, G. Centromeres heterochromatin zed. Nucleolus terminal on arm G and proximal on arm D. No polymorphism known.

- tarA1: 1 - 2c, 10 - 12, 3 - 2d, 9 - 4, 13 - 19 i.e. as *holomelas*, *cucini*, *magnus*, etc.
- tarB1: similar to *magnus* except for a small inversion about 1/3 from distal end.
- tarC1: may be similar to *neocorax*; inverted *c.f. islandicus* and *cucini* just distal to middle of arm.
- tarD1: 1 - 3, 11 - 18d, 7 - 4, 10 - 8, 18e - 24 i.e. as in *longistylus*, *cucini*, etc.
- tarE1: 1 - 3e, 5 - 10b, 4 - 3f, 10 - 13 i.e. as *cingulatus* & *cucini*.
- tarF1: 1 - 10, 17 - 11, 18 - 23 i.e. as in *cucini*, *magnus* & *tenuistylus*.
- tarG1: terminal nucleolus



Found: Alaska - Pond S, Barrow; Loon Pond, Prudhoe Bay (**type locality**).

Tundra ponds.

Description of larva in Butler (1982) and cytology given by Wülker & Butler (1983).

This species is the sister species to *C. prior*.

Species 3t. *C. muratensis*

Misidentification in Dinsmore & Prepas 1997, p. 2171
See *C. annularius* (species 3d)

Species 3u. *C. mozleyi* Wülker.

Adult

The adults of this species are not known for sure, but adults reared from fluviatilis-larvae in the area are similar to those of *C. decorus*-group species.

Pupa - not known.

Fourth instar larva of fluviatilis-type. Length 5.4 – 15.9 mm (presumably the very small specimens are early fourth instar); no PLT. VT longer than width of abdominal segments, posterior pair longer. AT well developed, sometimes with a median constriction. Head capsule of normal width, with gula sometimes slightly darkened, frontoclypeus pale.

Mentum of type II, with the fourth laterals about as high as the fifth laterals; central trifold tooth with tall c1 tooth and c2 teeth moderately separated (type III).

About 29 - 31 striae on each ventromental plate. AR 2.1 - 2.3; basal antennal segment (115 - 127 µm) about 2.5 - 2.9 times longer than wide (41 - 47 µm), Ring organ about a third of the way up from base of the segment; A2 length 27 - 32 µm.

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

Centromeres not heterochromatic. Arm G with a nucleolus at one end and a constriction near the other. Distal of the constriction, and also near the middle of the arm are two BRs. No nucleolus in the long chromosomes. Sometimes a puff is developed in arm B. Polymorphic for arms A, B, C, D, E and F.

mozA1: 1a-e, 10-12, 3if-, 15a-e, 3e-2d, 9e-a, 7-4, 8g-a, 14-13, 2c-1f, 16-19

mozA2: 1a-e, 8a-g, 4-7, 9a-e, 2d-3e, 15e-a, 3f-i, 12-10, 14-13, 2c-1f, 16-19

mozB1: Obvious dark bands at distal end.

mozB2+3: Differs from B1 by an included inversion, such that dark bands are now proximal, but median section of arm is in same order as in B1

mozC1: approx. 1-2c, 17a-16, 6b-5c, 8-11c, 15-13, 5b-2d, 7d-6c, 17b-22

mozC2: approx. 1-2c, 17a-16, abt. 14-15, 11c-8, 5c-6b, abt. 13f-a, 5b-2d, 7d-6c, 17b-22

mozD1: 1-3, 11-12, 15-13d, 4(?) - 8, 13c-a(?), 16(?), 9-10, 17-24

mozD2: 1-3, 11-12, 23a-17, 10-9, 16(?), 13a-c(?), 8-4(?), 13d-15, 23b-24

mozE1: 1-3e, 5-10b, 4-3f, 10c-13 i.e. as *aberratus*, bifE1, etc.

mozE2: 1-3e, 5a-6, 12c-10c, 3f-4, 10b-7, 12d-13

mozF1: 1a-i, 9-5d, 16-17, 10a-d, 13b-11, 13cd, 18-19b, 2-5c, 15-14, 19c-23
 mozF2: 1a-i, 9-5d, 16-17, 10a-d, 13b-12, 19dc, 14-15, 5c-2, 19b-18, 13dc, 11a-i, 20-23

Found: Michigan - Lake Michigan (Type locality).

From depths of 11 - 15 m in fine sand sediments

This species is a member of the *C. decorus*-group. Sequences for arms A, E and F given in Wülker, Devai and Devai (1989), as *C. species Michigan A*.

Full description given by Wülker (2007)

Species 3v. *C. winnelli* Wülker, 2007

Originally *C. species Michigan B* - Wülker, Devai and Devai (1989)

Adult

The adults of this species are not known for sure, but adults reared from fluviatilis-larvae in the area are similar to those of *C. decorus*-group species.

Pupa - not known.

Fourth instar larva of fluviatilis-type, with no PLT. Length 5.2 – 12.5 mm (presumably the very small specimens are early fourth instar). VT longer than width of abdomen, posterior pair shown as longer. AT well developed, figured as at least 4 times longer than wide, sometimes constricted at midpoint. Head capsule unusually narrow (width 0.39 – 0.49 mm), gula sometimes darkened distally, or may be pale; FC pale.

From published figure, fourth laterals of mentum appear to be only slightly reduced (type I), and center trifid tooth type IIA.

About 23 – 25 striae on each ventromental plate.

AR 2.1 – 2.3; basal antennal segment (94 -121 µm) about 2.7 - 3.5 times longer than wide (30 – 39 µm), RO just over a quarter way up from base of the segment; A2 length 21 – 30 µm.

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

Centromeres not heterochromatic. Arm G with terminal nucleolus and BR near middle of the arm. No nucleoli in the other chromosomes. Sometimes a puff developed in arm B. No polymorphism recorded.

win A1: 1a-e, 9a-e, 2d-3e, 17-16, 1f-2c, 13-14, 15e-a, 3f-i, 12-10, 4-7, 8g-a, 17e-19

win B1: Puff with dark bands (groups 7-8) near middle of the arm, with typical groups 24-28 just proximal to them.

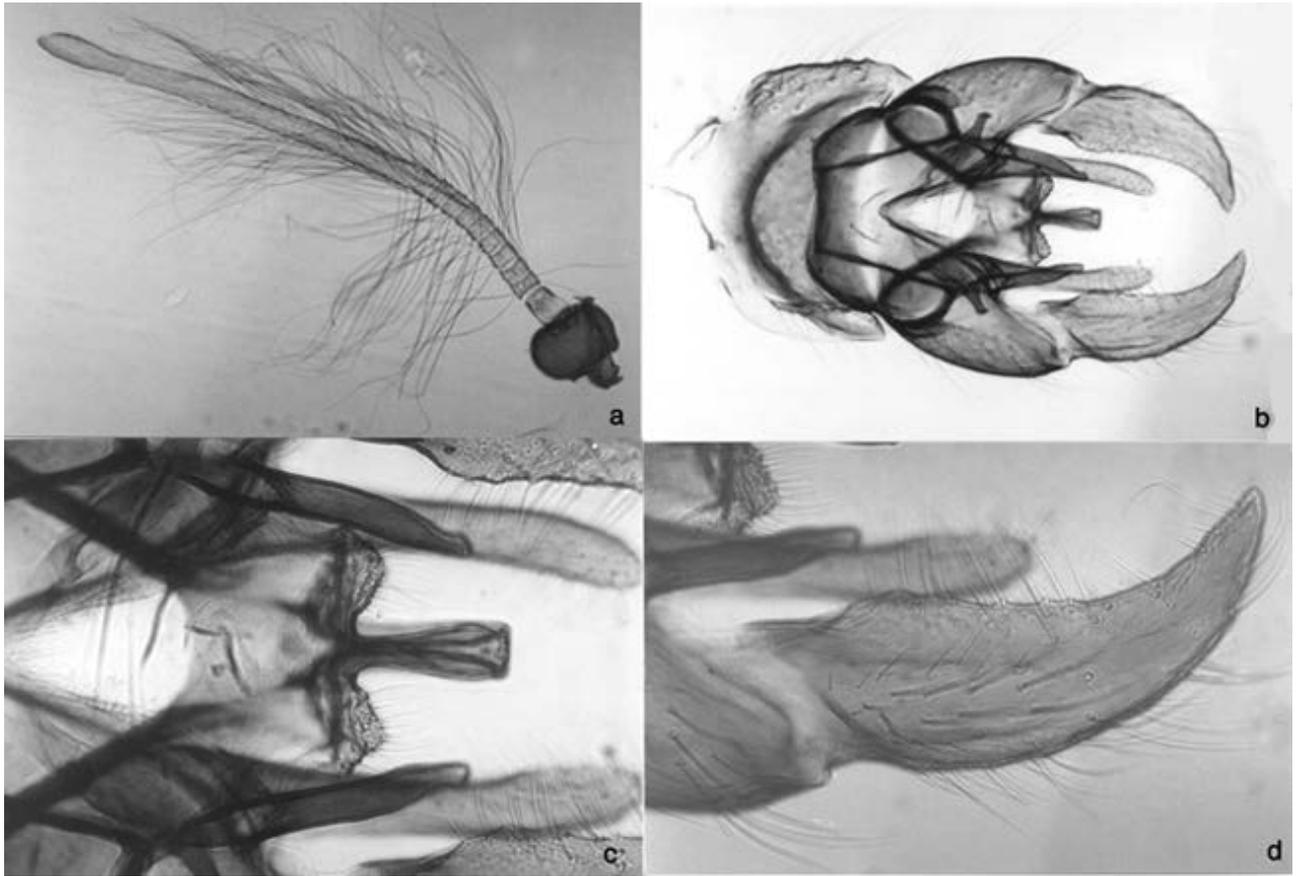
win C1: typical group 2d-5b near middle of the arm, a puff developed near the centromere

win D1: 1-3, 11-12, 15-13d, 4(?) -8, 13c-a(?), 16(?), 9-10, 17-24 i.e. as *mozleyi*
D1

win E1: 1-2b, 11b-10c, 3f-4, 10b-5, 3e-2c, 11c-13

win F1: 1a-1, 9-5d, 14-17, 10a-d, 13b-11, 13cd, 18-19b, 2-5c, 19c-23

win G1: terminal nucleolus, median BR



Paratype male of *C. vockerothi*

a. antenna; b. hypopygium; c. Superior volsella (note the length); d. gonostylus.

Wing length 3.1-3.8 mm, wing width abt 0.96 mm, VR 0.95-1.0. AR 1.89-2.35. Fore LR 0.95-1.09; no tarsal beard.

Wing squama with 19-25 marginal setae.

Head: Frontal tubercles present, length about 250 µm. Palpal proportions (segs 2-5)(µm): 68 : 188 : 182 : 245. Clypeus with 21-38 setae.

Thorax: Mesonotal tubercle well developed. Setae - Acrostichal 8-18; Dorsocentral 25-54, uni- to tri-serial; Prealars 7-14, uni- to bi-serial; Supraalars 1-2; Scutellars 29-46, uniserial laterally to multiserial medially, about 14-16 in most posterior row.

Leg proportions (micron):

	Fe	Ti	Ta1	Ta2	Ta3
PI	1610	1310	1450	820	620
PII	1530	1550	690	470	370
PIII	1680	1760	940	580	510
	Ta4	Ta5	LR	F/T	BR
PI	440	260	0.95-1.09	1.14	1.05-1.24
PII	270	200	0.44-0.45	0.99	-
PIII	310	210	0.53	0.95-0.96	-

Male terminalia enlarged, suggesting the species mates on the substrate. Gonostyli strongly curved; anal point broad with a squared off end, with two setose lobes flanking it. SVo large, darkly pigmented, curved ventrally towards the apex, and lacking setae. IVo long and narrow.

Female:

Coloration, squamal setation, and thoracic characters stated to be similar to those of the male. Additional information from paratype 18183:

Wing length abt 3.50 mm, width abt 0.94 mm., VR 1.00-1.01. SCf on brachiolum – abt 4.

Antennal proportions (μm): 105 : 80 : 98 : 113 : 185. AR about 0.47, A5/A1 about 1.76.

Palp proportions (segs. 2-5) (μm): 80 : 180 : 173 : >245 (shriveled). 37 clypeal setae

Thoracic setae: abt. 12 acrostichals; 19-23 dorsomedial; 6 prealar; scutellars in 2 approximate rows 24 in anterior, 12 in posterior row.

Leg proportions of 1 specimen (micron):

	Fe	Ti	Ta1	Ta2	Ta3
PI	1080	1120	1080	620	500
PII	1300	1260	620	380	300
PIII	1420	1420	900	540	460
	Ta4	Ta5	LR	F/T	Ta5/Ti
PI	360	180	0.96-1.25	0.96	0.16
PII	200	180	0.42-0.49	1.03	0.14
PIII	260	180	0.57-0.65	1.00	0.13

Genitalia: Dorsomesal lobe somewhat reduced, with inner margin distinctly sclerotized. Gonocoxite IX small with 1-2 setae. Segment X large and produced into posterolateral lobes, each bearing 22-35 setae. Ventrolateral lobe short, apodemal lobe small and on most specimens indistinct

Pupa not known.

Fourth instar larva and Cytology not known.

Found: Alberta - Elkwater; Hastings Lake (Type locality).

Adult alone described by Rasmussen (1984). Distinguished from *C. dilutus* and *C. pallidivittatus* by the smaller size and well developed mesonotal tubercle. The males can be distinguished by the long superior volsella; females by the long extended gonopophysis X.

Species 3x. *C. sp.* Le1 of Kiknadze *et al.* (1996)

Close to *C. riihimakiensis* – Kiknadze *et al.* (2016)

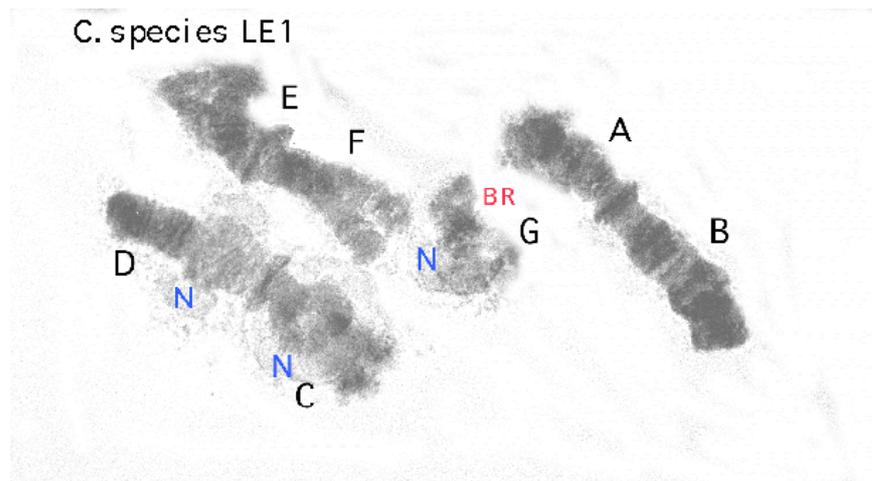
Adult and Pupa not known.

Fourth instar larva possibly a salinarius-type, but Kiknadze *et al.* (1996b) describe the Russian larvae as bathophilus-type. Dark gular (and FC?).

Mentum with rounded teeth, c1 tooth relatively broad and c2 teeth well separated (type IIA), fourth laterals only slightly reduced (type I-II).

Cytology: 4 relatively short polytene chromosomes with the thummi arm combination AB, CD, EF, G. Centromeres recognizably heterochromatic.

Arm G with nucleolus near the centromere, followed by a constriction and a large median BR; superficially similar to that of *C. cucini*. Nucleoli in the long arms in both C and D; homologues often partially unpaired. All sequences, other than LE1A2 and LE1F2, have a Holarctic distribution.



- Le1A1: 1-2c, 10-12, 3-2d, 9-4, 13-19 i.e. as *holomelas*2
 Le1A2: 1-2c, 10, 8d-9, 2d-3, 12-11, 8c-4, 13-19
 Le1B1: Puff about 1/3 from distal end.
 Le1C1: 1-6b, 11c-8, 15-11d, 11h-d, 6gh, 17a-16, 7d-a, 6f-c, 17b-22 (Kiknadze *et al.* 2016)
 Le1D1: 1-3, 11-18f, 7-4, 10-9, 18g-24 (Kiknadze *et al.* 2016)
 Le1E1: 1-3e, 5-10b, 4-3f, 10c-13 i.e. as *aberratus*, *cucini*, etc.
 Le1F1: 1-10, 17-11, 18-23 i.e. as *aberratus*, *riihimäkiensis*F1, etc.
 Le1F2: 1-8c, 12-17, 10-8d, 11i-a, 18-23 i.e. as *riihimäkiensis*F2
 Le1G1: Subterminal N, median BR.

Found: Nunavut (formerly Northwest Territories) - Permanent Pond #78, Hazen, Ellesmere Island (81.82; -71.17) (Oliver & Corbet, 1966).

Alaska - Point Barrow, Pond B.R.

Russia - Lena delta.

Karyotype described by Kiknadze *et al.* (1996 and 2016) and redescribed by Wülker & Martin (2000).

Species 3y. *C. tentans* Fabricius.

Previously placed in the subgenus *Camptochironomus*.

Adult and Pupa

The adults and pupae of the Alaskan population have not been described.

Fourth instar larva a large plumosus-type. Gular region slightly darkened with FC darkened particularly in the center.

Cytology: 4 polytene chromosomes with the camptochironomus arm combination AB, DE, CF, G. Arm G with 3 BRs. Nucleoli in arms B and D, as in Palearctic populations. Polymorphism in arms A, B, C, D, and F; males particularly are heterozygous for arm F.

ten h'A1: 1a-g, 7a-3i, 7b-8e, 17f-13, 1h-2c, 9c-8f, 10-9d, 11-12c, 3h-2d, 17g-19

ten h'A2:

ten h'B1:

ten n'B2:

ten h'C1: 1-2d, 11d-14c, 19f-16, 7-6c, 8a-g, 6b-4, 14d-15, 9-11c, 3-2e, 20-22

ten n'C2: 1-2d, 4g-6b, 9-11c, 3-2e, 11d-14c, 19f-16, 7d-6c, 8a-g, 15-14d, 4a-f, 20-22

ten n'C3(1Lz):

ten n'D1:

ten n'D2:

ten h'E1: 1-2b, 7h-10b, 3e-2c, 07g-3f, 10c-13

ten h'F1: 1a-d, 9b-12, 3b-2f, 13-14c, 5d-6, 9a-7a, 14d-16, 5c-3c, 1e-2e, 17-23

ten n'F2: 1a-d, 9b-12, 3b-2, 13a-d, 1i-e, 3c-5c, 16-14d, 7-9a, 6-5d, 14c-a, 2a-e, 17-23

ten n'F3(1Rjk):

ten h'G1:

Found: Alaska - Potter Marsh, Anchorage (61.054; -149.792).

There is some doubt that this species actually occurs in North America. However the data of Acton (1962) suggests that Alaskan populations should still be considered to be this species.

Species 3z. *C. prior* Butler.

All information based on Butler (1982) and Wülker & Butler (1983)

Adult

Male: Dark species, AR 4.89 - 5.48 (mean 5.20); frontal tubercles 20 - 40 μ m.

Wing length 4.44 (4.04-4.80) mm.

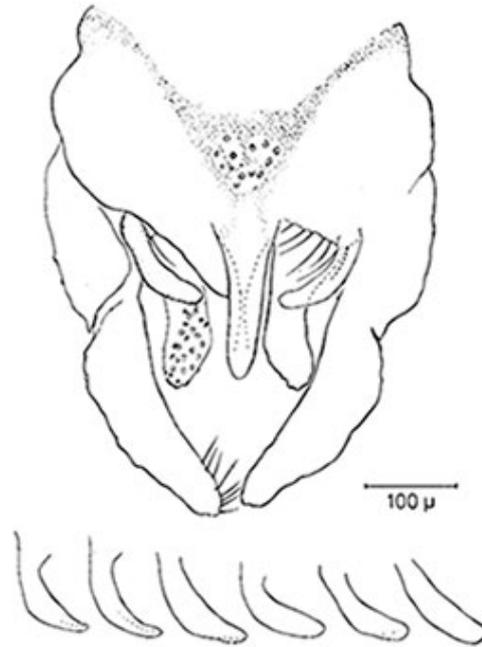
Weak or absent scutal tubercle

Abdominal segments dark, but often pale on posterior margins.

Fore leg with moderate beard, BR 4 - 7.

LR₁ 1.16 (1.10 - 1.22); LR₂ 0.60 (0.58 - 0.63); LR₃ 0.69 (0.65 - 0.71).

Sensilla chaetica: Leg₂ 8 - 21; Leg₃ 5 - 15 (lower than *C. tardus*; and when taken in conjunction with the higher LR, is useful for separating males of the two species)



Hypopygium and SVo variation of *C. prior* (from Butler 1982)

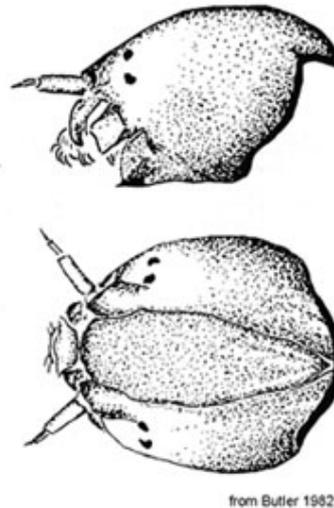
Anal point relatively narrow; SVo of the D-type;
IVo turns slightly outward over distal third; 2 - 17 setae on segment IX.

Female: Thoracic color slightly lighter than that of the males, base color light to medium brown, with scutal stripes, postnotum, etc., dark brown. Abdomen similar color to males.

Wing length 4.48 (3.98-4.91) mm. LR₁ 1.17 (1.10-1.24); LR₂ 0.61 (0.60-0.63); LR₃ 0.73 (0.71-0.76).

Pupa not studied in detail, but noted that the hooks on abdominal segment II are sickle shaped, generally with a smooth outer margin. In this regard they differ from those of *C. tardus* which have a relatively straight point at quite a sharp angle, and the convex margin often has several small teeth.

Fourth instar larva a salinarius type. Gular region and FC completely brown, with darkening of the rest of the head capsule except for a pale area just posterior to the eye spots. VHL 309 - 342 (mean 325) μm.; head width 529 - 618 (mean 569) μm. Head capsule smaller and darker than that of its sibling *C. tardus*.



Cytology: 4 polytene chromosomes with the thummi arm combination: AB, CD, EF, G.
 According to Butler (1982) there are differences in arms F and G compared to *C. tardus*.
 pri A1: 1 - 2c, 10 - 12c, 3 - 2d, 9 - 4, 13 - 19 i.e. as *tardus* A1
 pri E1: 1 - 3e, 5 - 10b, 4 - 3f, 10c - 13 i.e. as *tardus* E1

Found: Alaska - Pond J, Barrow; Loon Pond, Prudhoe Bay.

Tundra ponds.

Description and a brief comment on the karyotype in Butler (1982).

This species is the sister species to *C. tardus*.

Species 4a. *C. columbiensis* Wülker, Sublette, Morath & Martin

Adult:

This species is in BOLD Bin: [BOLD:AAJ0163](#)

Male (based on South American specimens)

Wing length 2.59 (2.47-2.70) mm; venarum ratio 1,03

Antennal ratio 2.2 (2.1-2.4).

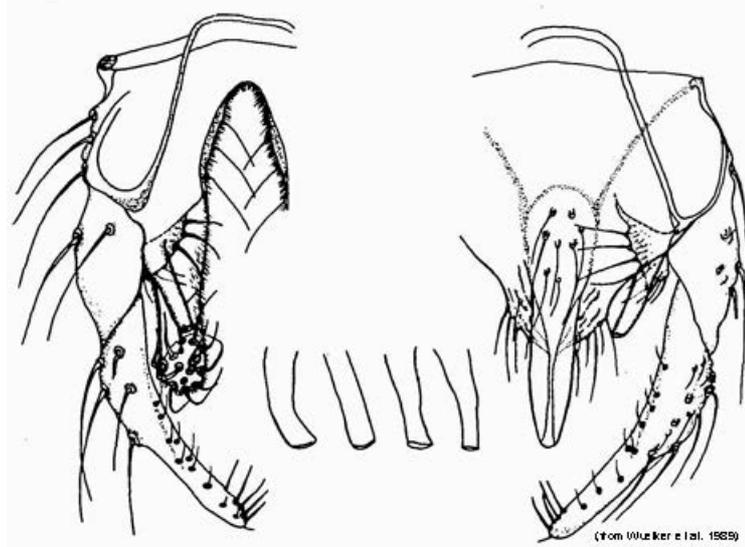
Leg ratios: Ant. - 1.76 (1.73-1.80); Mid - 0.64 (0.61-0.67); Hind- 0.76 (0.75-0.77); Beard ratio: 2.08 (2.0-2.2).

Whole body yellow-brownish with darker markings, middle and lateral mesonotal vittae separate, scutellum pale. All femora with a narrow apical dark fascia, the basal third of fore tibiae dark, in middle and hind tibiae bases only slightly infuscate; tarsomeres 1-4 with an apical dark fascia.

Abdominal segment I with broad median fascia, II-IV with saddle-shaped fasciae, V and VI with longitudinal oval dark spot, VII darker than the light segment VIII.

Head: Palpal proportions (segs 2-5, μm) 58 : 225 : 228 : 297. Clypeus with 29 (26-33) setae; frontal tubercles 30 μm long, 9.2 μm wide.

Thoracic setae dorsolateral 28.8 (24-35), acrostichal 12.8 (10-19) in double row, prealar 5, scutellar 30.8 (24-40).



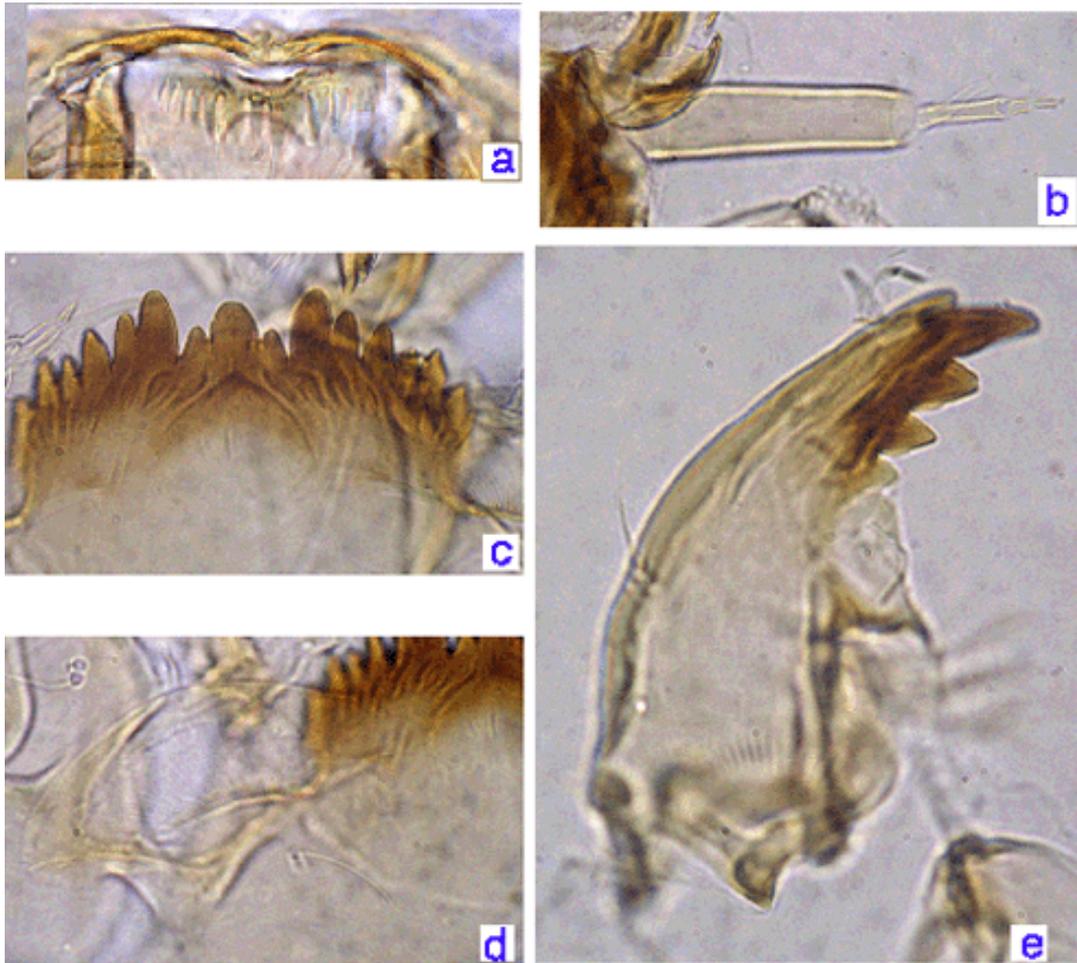
Male terminalia of *C. columbiensis*, with superior volsella variants (center)

Genitalia: Anal point parallel sided, in its middle slightly widened, terminally rounded; SVo comparatively long, straight, but dorsally curved, blunt-tipped, basal lobe with remarkably strong setae; IVo parallel sided, reaching to the middle of gonostyle. Setae of anal tergite 10.4 (8-13), gonostyle inner setae 4.5 (4-5).

Similar to that of *C. anonymus* Williston. Best distinguished by the lower AR (2.1-2.4 in South America)

Pupa: not described.

Fourth instar larva: a medium-sized (abt 9 mm) plumosus-type with well developed lateral (0.4 - 0.5 mm) and VT, posterior pair of VTs slightly longer (ant 1.9 - 2.3 mm; post 2.5 - 2.65 mm). Dorsal pair of AT constricted in the middle (abt 1 mm). Gular region slightly darkened on the posterior edge; dorsal head sometimes with slight darkening paralleling the frontoclypeus near its posterior end. Mentum (c, below) with 4th laterals reduced to level of 5th laterals, c1 tooth moderately broad with c2 teeth well developed (type II). VM (d, below) with about 40 - 42 striae. PE (a, below) with about 14 teeth. Antenna (b, below) with relatively long narrow basal segment, almost 4.5 times as long as wide; AR about 1.8; ratio of segments (microns) 110 ; 31 ; 7 ; 11 ; 6. Mandible with third inner tooth only partially separated (type IIB).



Cytology: Four polytene chromosomes with the columbiensis-cytocomplex combination: AG, BF, CD, E. Nucleolus on arm G near the centromere. Arm G also with two BRs, one near the middle of the arm and the other near the distal end. No polymorphism yet found in North American populations, but heterozygosity of arms A and B was found in a Guatemalan population (Wülker *et al.* 1989).

colA1: 1a-e, 6c - 4, 10 - 12, 6d - 9, 2d - 3b, 2c - 1f, 3c-i, 13 - 19

colB1: Large puff (group 7) near center of arm with distal dark bands (group 8)

colC1: The typical dumb-bell (group 4 plus parts of 3 and 5) is about one third from centromere

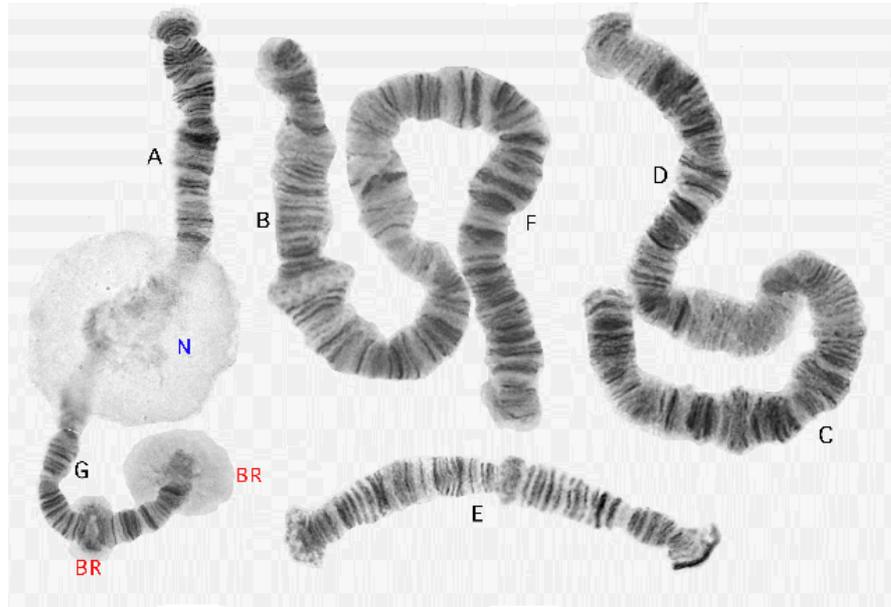
colD1:

colE1: 1 - 2, 9 - 10b, 3e-a, 8 - 3f, 10c - 13

as *anonymus* E1

colF1: 1, 16 - 19, 6b - 2, 15 - 14, 12 - 13, 6c - 11, 20 - 23

as *anonymus* F1



Found: Florida - Grassy Key, Munroe Co. (Hribar *et al.* 2008)
Virgin Islands (USA) - Lameshur Bay, St. John Island
This species has also been found at Cali, Colombia (Type locality) and Jocotan, Chiquimula, Guatemala.

So far found in man-made habitats, in Colombia associated with algae.

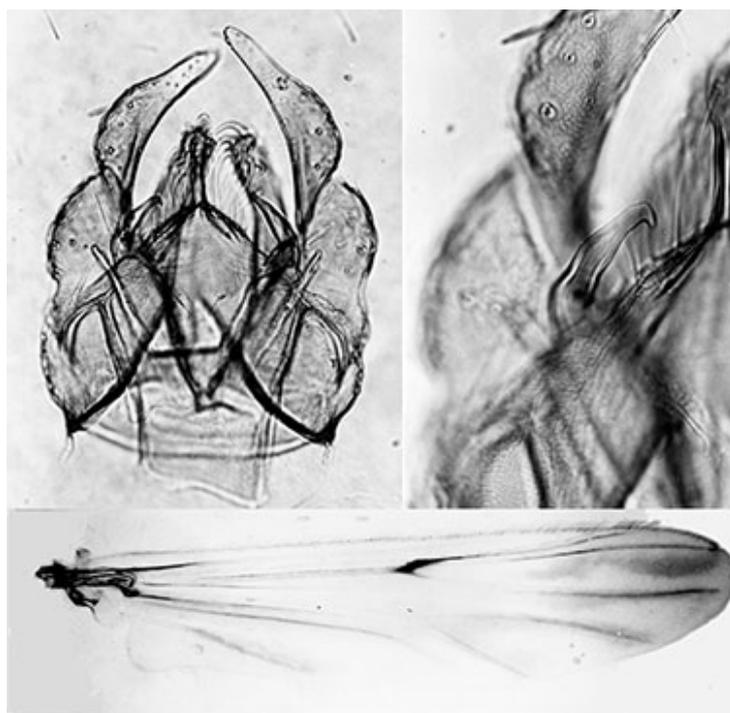
The banding sequences of arms A, E and F were described by Wülker & Morath (1989) as *C. spec. Cali*. The species was described for all stages and the polytene chromosomes pictured by Wülker, Morath, Sublette and Martin (1989).

Species 4b. *C. striatipennis* Kieffer, 1910.

Original identified as *C. strenzkei* Fittkau, 1968, but morphological, cytological and DNA analysis revealed that *C. strenzkei* was a junior synonym of *C. striatipennis* (Martin 2017).

Adult:

Material from California was described by Sublette and Mulla (2000). Information below is for the California material but supplemented by data from other populations of this widely distributed species.

Male hypopygium, SVo and wing of Brazilian *C. striatipennis*.**Male:**

Head – Cephalic tubules long, about $65 \times 18 \mu\text{m}$ (3.7x longer than wide); about 16 clypeal setae; palp proportions (μm) $60 : 35 : 145 : 160 : 225$.

Wing length 2.04-2.18 mm; VR about 1.04-1.08; AR 2.71-2.95; LR 1.69-1.78.

Thoracic setae: Acrostichal abt 9-15; Dorsocentral 12-17; Prealar 4-5; Scutellar 2-4 in anterior row, 8-14 in posterior row.

Abdominal setae: TIX 2-9; SVo 12-15; IV 22-24, simple.

Wings (see above) with a pattern of dark markings

Leg lengths and ratios (μm):

	Fe	Ti	Ta1	Ta2	Ta3
PI	1130	930	1610	880	615
PII	1180	1090	670	400	275
PIII	1260	1350	990	595	445
	Ta4	Ta5	LR	F/T	BR
PI	470	265	1.69-1.78	1.18-1.21	4.5-5.0
PII	195	145	0.62-0.63	1.04-1.12	3.3-3.4
PIII	266	170	0.72-0.74	0.93-1.01	4.4-4.6

SVo closest to type E(h) of Strenzke (1959). Style narrowing fairly sharply about 1/3 from distal end.

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 $80 \mu\text{m}$ long and $65 \mu\text{m}$ in diameter at the base.

Prealar tubercle present, not simple, but small, about $25 \mu\text{m}$ long and $6 \mu\text{m}$ wide. Basal ring of respiratory horn with edge thicker at the anterior end, and pinched at the center, about $119-126 \mu\text{m}$

long and 60-63 μm wide. There are about 3 rough short spines immediately anterior to the basal ring, and a large, possibly muscle scar just posterior to it.

Abdomen: About 62-72 recurved hooks on posterior margin of segment II, the hook row covering about 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. striatipennis*.

Fourth instar larva (based largely on South American specimens) a small plumosus-type, length about 9.3-11.3 mm,

PLT about 280-360 μm , VT long, coiled, posterior pair usually longer (Ant. 1.40-1.68; post. 1.44-1.84 mm). Anal tubules relatively short (160 x 60 μm), about 2.5 times longer than wide.

Head capsule with pale to slightly dark gula, frontoclypeus pale to slightly dark.

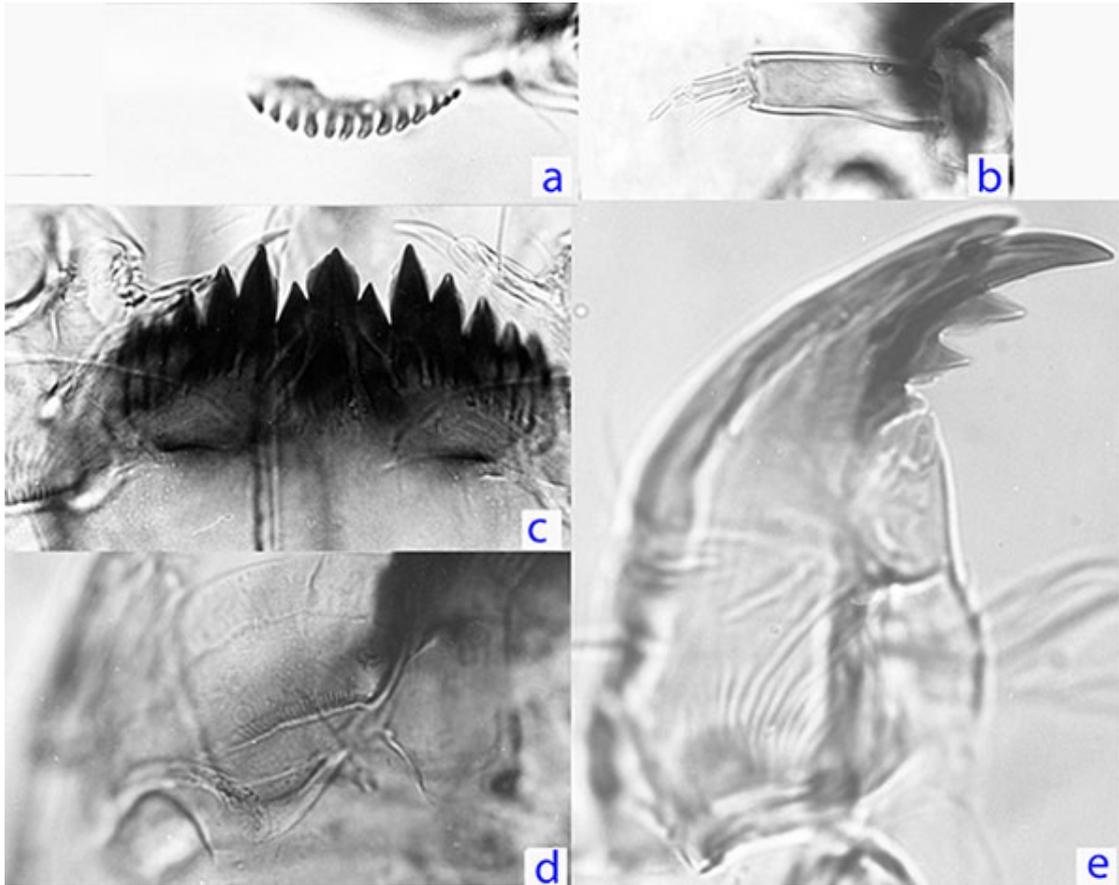
Teeth of mentum (c, below) with flanges, c2 teeth of the central trifid group moderately well separated (type IB or III), 4th laterals slightly reduced (type I+).

Ventromentum (d, below) with about 34-35 striae, VMR about 0.32-0.36. PE (a, below) with about 11-13 even sharp teeth.

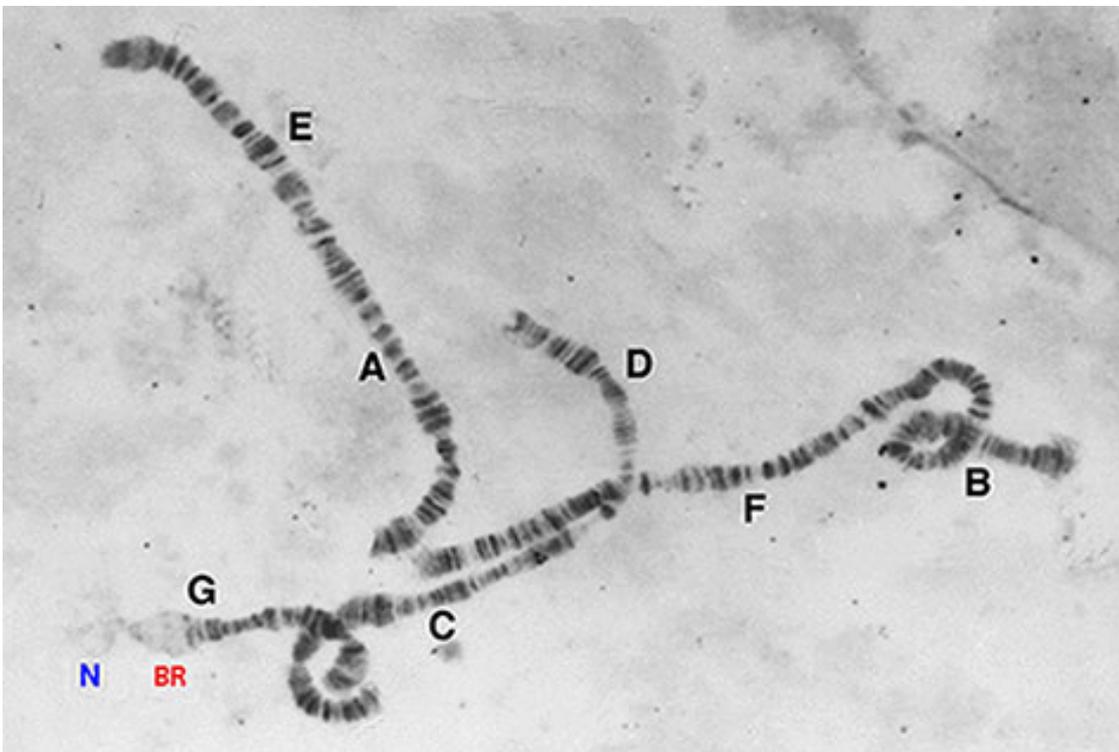
Antenna (b, below) with basal segment about 3-3.1 times longer than wide, RO about middle of the segment, AR about 1.62- 1.77; relative lengths of segments 92 : 28 : 8 : 12 : 8.

Premandible with relatively narrow sharp teeth, outer longer, inner tooth about 1.8x width of outer tooth and with an obvious narrow outer edge.

Mandible (e, below) also with flared teeth and with a characteristic, relatively long, sharp dorsal tooth; 3rd inner tooth partially separated and colored (type IIB); about 13-14 grooves near base, PM with about 8-13 filaments.



Larval mouthparts of *C. striatipennis*



Polytene chromosomes of *C. striatipennis*

Cytology: 4 polytene chromosomes with the pseudothummi arm combination: AE, BF, CD, G (Wülker & Morath 1989).

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.

stpA1: 1 - 2c, 11 - 7, 4 - 6, 2d - 3, 12 - 19
 stpB1: Bulb of group 7 not obvious, does not appear to be one of the Indian sequences.
 stpC1: no sequence available.
 stpD1: no sequence available.
 stpE1: 1a - 13g i.e. Standard
 stpF1: 1 - 2a, 15e - 11f, 2b - 15f-a, 11a-e, 16 - 23
 stpG1: subterminal nucleolus

Found: - **Type localities:** India - **Bhim tal and Kumaon, Uttar Pradesh**
 California - El Segundo, Los Angeles Co. (Sublette & Mulla 2000)
 Brazil - Manaus; Belém. (Fittkau 1968)
 Peru - Pucallpa. (Fittkau 1968)
 also Japan, Singapore, Thailand and other south-east Asian countries

Shallow pools with high nutrient content (e.g. algae-rich puddles in the bottom of dugout canoes). Larval habitat in California was not determined, but adults were collected in the vicinity of a wastewater treatment plant.

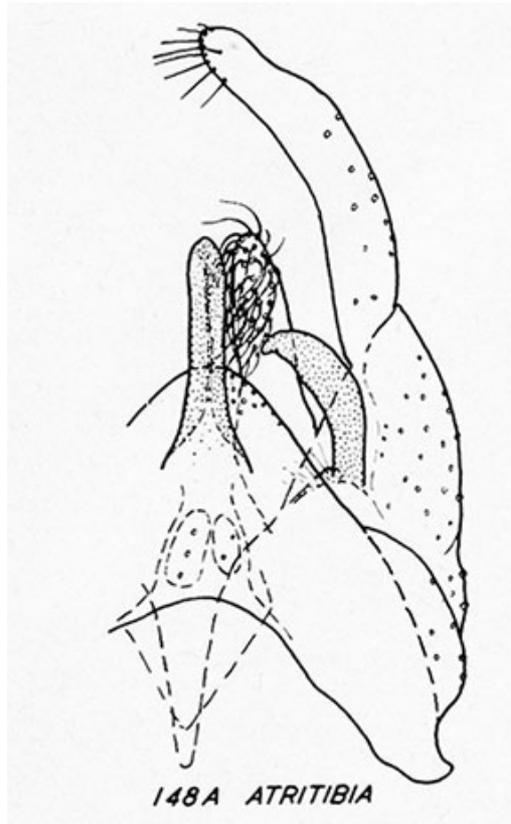
Adult redescribed and immatures described by [Chaudhuri, Das & Sublette \(1992\)](#) for Indian material, while [Sasa \(1978\)](#) and [Sasa & Hasegawa \(1983\)](#) redescribed Japanese material as *C. kiiensis*. Morphology described as *C. strenzkei* by Fittkau (1968), while Sublette & Mulla (2000) have identified the species in southern California, suggesting it was a recent hitchhiker from South America as it had not been found in earlier surveys – since it is not native to South America, it is just as likely that it is a separate introduction from the area of Japan. They also state that the cytology had been studied by Wülker and Morath (1989), but that paper only notes that it has the pseudothummi-complex arm combination and the banding pattern is not related to other South American species they studied.

Species 4c. *C. atritibia* Malloch.

Adult:

A large dark species, legs brown, no beard on fore tarsi.

Male: Wing length about 5.2 mm; LR about 1.3, AR about 4. Frontal tubercle and clypeus large.



Hypopygium drawn from type by Townes (1945),

From figure of hypopygium the following features can be noted:
Anal point differs from *C. cucini* in being long and narrow. SVo closest to Strenzke's E(i) type. IVo about as long as the anal point. GS long and relatively narrow, narrowing on posterior quarter.

About 6 setae near center of 9th tergite.

Pupa: Not known.

Fourth instar larva has not been seen. Wuelker and Butler (1983) state this species has a salinarius-type larva, quoting a Ph.D. thesis by M.G. Johnson (1969).

Cytology: Chromosomes are not known.

Found: Manitoba - Lake Winnipeg (Sæther 2012).

Nunavut - (formerly Northwest Territories) - Southampton Island, Keewatin (**Type locality**).

Adult described by Malloch (1934). Note that most specimens listed by Townes (1945), other than the type, are probably *C. cucini*. Townes (1945) notes that the adult should also be compared with *C. biseta* and *C. hyperboreus*.

Species 4d. *C. tuberculatus* Townes.

Known only from adult male and female.

Adult

Male (from Townes 1945): Wing length 4.6 mm; fore LR 1.15; antennal ratio 6.0.

Body rather stout.

Frontal tubercles small, clypeus of medium size.

Middle portion of pronotum slightly broadened; mesoscutum with a strong, more or less double, tubercle

Fore tarsus with a long dense beard.

Blackish brown, legs brown.



Drawn from type (Townes 1945)

Superior volsella of D type.

Female: Described only as similar to the male except for the usual sexual differences.

Fourth instar larva: not known

Cytology: Not known.

The strong mesoscutal tubercle is stated as an easy recognition point. Otherwise species noted as superficially similar to *C. utahensis*.

Found: 'Hudson Bay Territory' (Type)

Alberta - Lesser Slave Lake.

South Dakota - ♂ (Oliver et al. 1990)

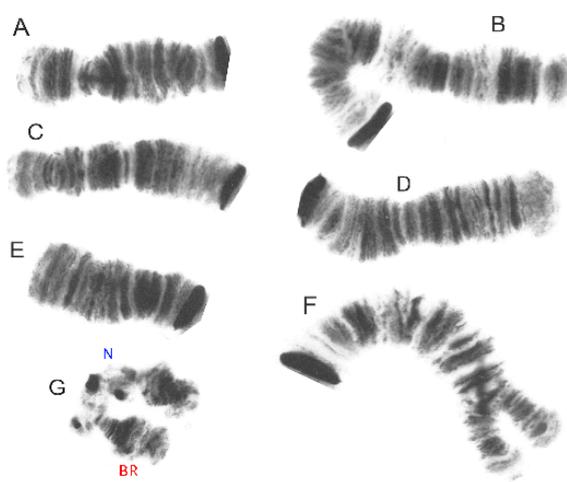
Species 4e. *C. jonmartini* Lindeberg & Wiederholm 1979.

Fourth instar larva of thummi-type. Head with dark gular region and dark head stripe on the FC. Mentum with 4th laterals reduced almost to level of 5th laterals (type II), C1 tooth of mentum moderately wide with c2 teeth moderately separated (type IB). Premandible with teeth about equal in length, inner tooth about twice as wide as the outer tooth. Mandible possibly type IIB or C, about 17 striae near base.

Cytology: 4 polytene chromosomes with the thummi-cytoplex arm combination (AB, CD, EF, G).

Centromeres heterochromatic. Arm G often unpaired, with a subterminal nucleolus after a heterochromatic terminal band, and an apparently heterochromatic interstitial band. At least one BR, but not clear enough to be sure if others are developed. Polymorphism in arms A, D and F in the Palearctic, but only arm F known to be polymorphic in North American populations. However, arm A seems to be the sequence A3, which is less common in the Palearctic.

C. jonmartini sensu Kiknadze et al.



h'jom A3:	1-2c, 10-12, 4-5, 3-2d, 9-6, 13-19	as Wülker 1991b
h'jom B1:	1-7, 8b-15, 22-28 - according to Hirvenoja & Michailova (1997), but this leaves many bands unaccounted for.	
h'jom C1:	1-6b, 11-8, 15-11d, 6gh, 17a-16, 7d-a, 6f-c, 17b-22	as Kiknadze <i>et al.</i> 2004
h'jom D1:	1-3, 11-18d, 7-4, 10-8, 18e-24	as Kiknadze <i>et al.</i> 2004
h'jom E1:	1-3e, 5-10b, 4-3f, 10c-13	i.e. as <i>aberratus</i> , <i>pluE1</i> , etc.
h'jom F1:	1-10, 17-11, 18-23	i.e. as <i>cucini</i> , <i>tenuistylus</i> , etc.
h'jom F3:	1-2, 5-3, 6-10, 17-11, 18-23	from Kiknadze <i>et al.</i> 1996

Found: Northwest Territories - tundra pond FBV, Horton River area (M.G. Butler)

C. jonmartini was proposed by Lindeberg & Wiederholm as a new name for *C. neglectus* Lindeberg. However it is not clear that the present material is identical to that of Lindeberg & Wiederholm, which was partly cytologically described by Wülker (1973). That material from Fennoscandia had a plumosus-type larva, and arm G may differ. However, studies from other parts of the Palearctic indicate that the larval morphology and chromosomal banding patterns are variable (Kiknadze *et al.* 1996, Rakisheva *et al.* 2001). The North American material seems to be identical to that described by Kiknadze *et al.* (1996) and most of the larval description above is based on their description.

Species 4f. *Chironomus acidophilus* Keyl, 1960.

This species is in BOLD Bin: [BOLD:AAC0903](#)

Adult:

The adults of the original European material were called *C. meigeni* by Thienemann and Strenzke (1951), since the cytology of Keyl’s original description comes from the same material. Keyl states only that the coloration and hypopygium are similar to *C. pseudothummi* Str. It is not clear why Keyl considered that it was not *C. meigeni*.

Male:

Subsequently the morphology of Palearctic specimens was described by Orel *et al.* (2015). The following information comes from that work.

Male:

Wing length 2.7-3.0 mm. AR 2.81-3.06. VR 1.05. BR 2.78-3.89.

Antenna dark brown, ground color of thorax and scutellum yellowish; mesonotal stripes and postnotum dark brown, abdomen and legs brown or dark brown.

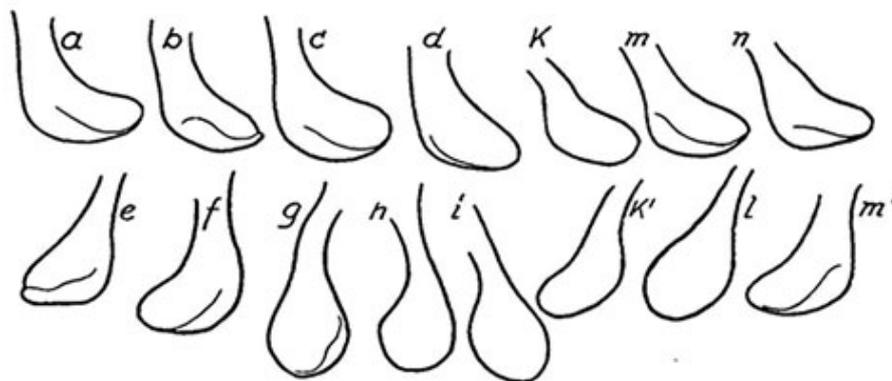
Head with frontal tubercles 24-34 µm long, 10-17 µm wide. 25-28 verticals, 35-38 clypeal setae. Proportions of palp segments 2-5 (µm) 64 : 228 : 200 : 280.

Thoracic setae: acrostichals 15-21; dorsocentrals 18-29; prealars 4-6; supraalars – 1; scutellars 27-42.

Leg proportions (µm):

	Fe	Ti	Ta1	Ta2	Ta3
PI	1240	1124	1628	861	672
PII	1323	1229	725	430	326
PIII	1500	1522	1075	641	467
	Ta4	Ta5	LR	F/T	BR
PI	504	284	1.33-1.51	1.07-1.14	2.8-3.9
PII	221	158	0.58-0.61	1.06-1.09	
PIII	305	200	0.70-1.03	0.97-1.00	

Genitalia similar to that of *C. pseudothummi*, SVo of European specimens variable, often due to positioning of hypopygium, but stem narrower than in *C. riparius*; end may appear more rounded (see figure below) i.e. closest to S(b) of Strenzke (1959), but stem narrower



Variability of the SVo of European *C. acidophilus*

From Thienemann and Strenzke (1951)

Tergite IX with 9-14 median setae. Anal point expanded in apical 1/3. GS widest at proximal third.

Pupa: The Palearctic pupa is included in Langton and Visser (2003).

Fourth instar larva: a medium plumosus-type with well developed lateral and ventral tubules. Gular region and FC pale or slightly darkened.

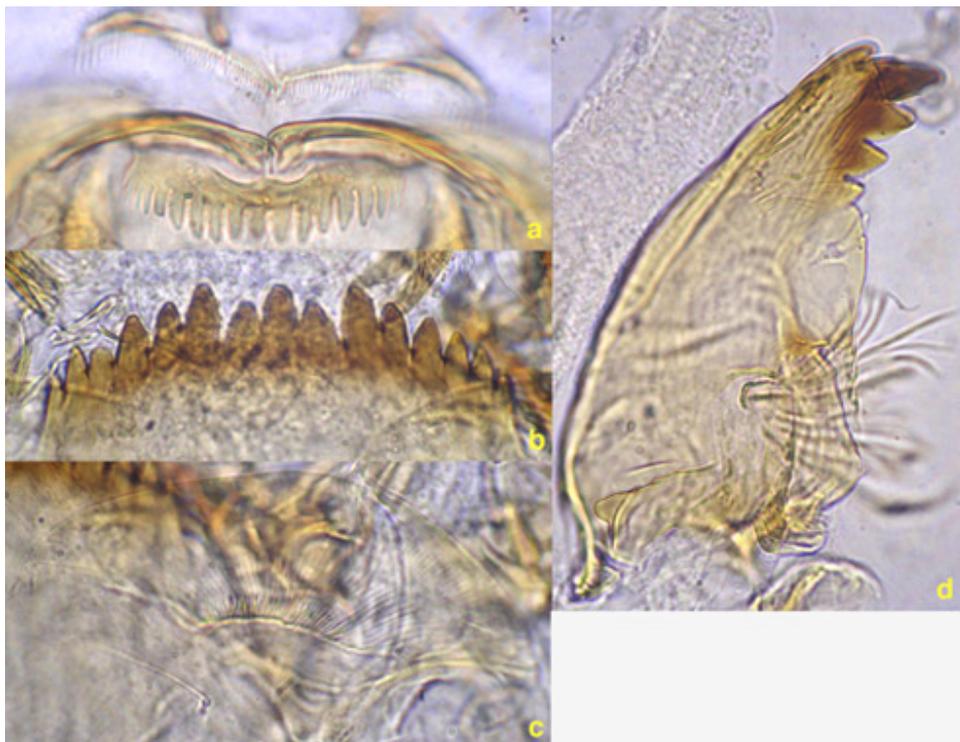
Center trifold tooth of mentum (b, below) with the c2 teeth well separated (type IV), lateral teeth grading evenly to edge of the mentum (type I), although 4th laterals may be slightly reduced in some specimens.

VM (c, below) with smooth anterior edge and about 45-47 striae (41-48 in Palearctic) extending at least half way to margin. PE (a, below) with about 18 teeth (11-15 in Palearctic).

Premandible (b, below) with outer tooth slightly longer, inner tooth about 1.6 times wider than the outer.

Mandible (d, below) with third inner tooth moderately to well separated and only slightly darkened (type II or IIIB).

Antenna with basal segment over 4.5 times longer than wide and 3.5 - 4 times longer than segment 2; RO about 1/3 up from base of segment; AR abt 2.25, ratio of segments (μm): 168 : 40 : 11 : 11 : abt 6.



Cytology: 4 polytene chromosomes with the pseudothummi-cytocomplex combination AE, BF, CD, G. Centromeres not heterochromatic.

Arm G with a terminal nucleolus and two BRs towards the other end of the chromosome. No nucleolus in long chromosomes. Polymorphism in arms B, C, E, F and G of Palearctic material. Arm A differs between European and Siberian material (not a simple inversion), and the Alaskan sequence is the same as that in Siberia (A2). Arm E in Alaska is E1 as in Europe (E2 according to Kiknadze *et al.* 2004), arm G in Alaska is as Palearctic G1.

Sequences, based on Palearctic material:

- h'aciA2: 1-2c, 15-13, 10-12, 3-2d, 6c-4, 9-6d, 16-19 Siberia (Kiknadze *et al.* 1996)
 h'aciB1: Puff (gp. 7) near 4 characteristic bands, but dark bands near middle of arm.
 h'aciC1: 1a-e, 13e-11d, 21-17b, 7a-d, 16-17a, 15-13f, 5c-6, 11c-8, 1f-5b, 22 (Kiknadze *et al.* 2004)
 h'aciD1: 1-2g, 13-15b, 17-15c, 7-2h, 12-8, 18-24 Siberia (Kiknadze *et al.* 2004)
 h'aciE1: 1 - 3e, 10b - 3f, 10c - 13 i.e. as *luridus*, etc., Ya4E2
 h'aciF1: 1a-i, 11 - 12, 19 - 16, 2 - 10, 15 - 13, 20 - 23



Found: Alaska - Potter Marsh, Anchorage Co.

Also described from Reinbeck, Germany (**type**); Yakutia, Russia; and Chlepfibeeri Moos, Switzerland.

Supposedly only occurs in acidic waters.

A species with a Holarctic distribution.

There are some differences in the larvae from those described for Germany and Switzerland by Webb and Scholl (1990), notably that Palearctic larvae are thummi-type.

The karyotype, with a heterozygous inversion in arm C, was first figured by Keyl (1960), then the sequences of arms A, E and F for European species given by Keyl (1962), and karyotype of Siberian specimens, as species Ya4, by Kiknadze *et al.* (1996), revised by Kiknadze *et al.* (2004). Lindeberg and Wiederholm (1979) state that this species is a sibling species to *C. pseudothummi* and *C. uliginosus* (now *C. vallenduuki* Ashe & O'Connor 2015) (incorrectly attributed to Wülker 1973, a paper that does not consider any of these species) and have noted this might still be a junior synonym of *C. meigeni* Kieffer.

Species 4g. *Chironomus (Lobochironomus) dorsalis* Meigen, 1818.

Syn: *Chironomus longipes* Staeger, 1839.

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

The name *Chironomus dorsalis* was misapplied to a *Chironomus* (s.s.) species by Edwards (1929). Townes (1945) indicated that the terminalia of the Meigen specimen was consistent with the present species rather than a *Chironomus* (s.s.) and placed it as *Tendipes (Einfeldia)*. After further 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). 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. Egan & Ferrington (2015) incorrectly attribute this species to Strenzke, but the species described by Strenzke (1959) is not a *Lobochironomus* species and is now considered to be a synonym of *C. alpestris*, and found only in the Palearctic.



Chironomus (Einfeldia)
dorsalis MEIG.
Museum Paris

Male terminalia of the type specimen of *C. (Lobochironomus) dorsalis* Meigen.
Drawn from the 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, frontal tubercles 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.

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

Pupa

Fourth instar larva a medium (female about 7.2 mm) plumosus-type (with small PLT 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.

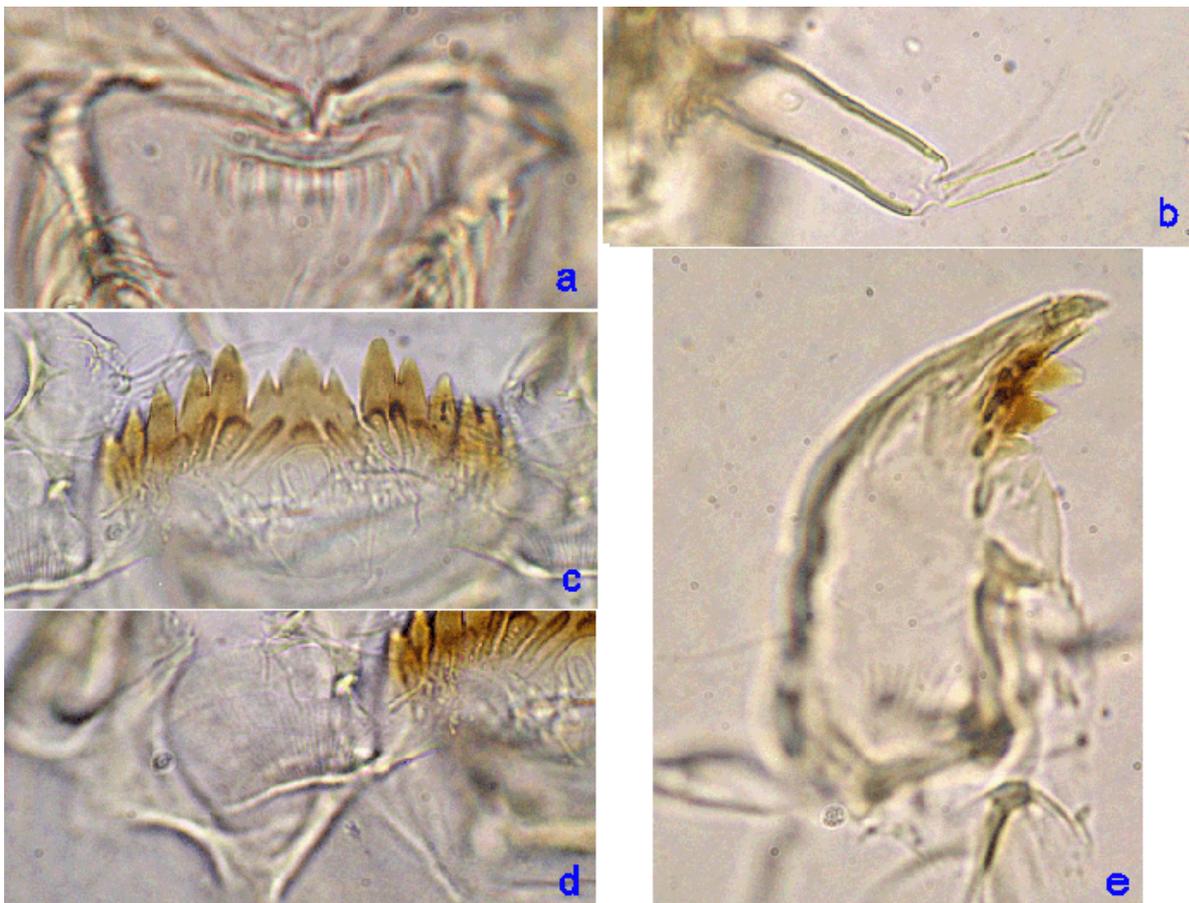
Mentum (c, below) with 4th lateral slightly reduced (type I-II), c1 relatively narrow and tall, with c2 teeth relatively well separated (type III).

Ventromental plates (d, below) separated by about 37-47% of mentum width; with about 42 – 47 striae reaching about half way to smooth anterior margin.

PE (a, below) with about 20 – 21 teeth (14 normal teeth, the others thinner teeth interspersed between the normal teeth). Premandible teeth sharp, the longer inner tooth about 50% wider than the outer tooth.

Antenna (Fig. b) 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.

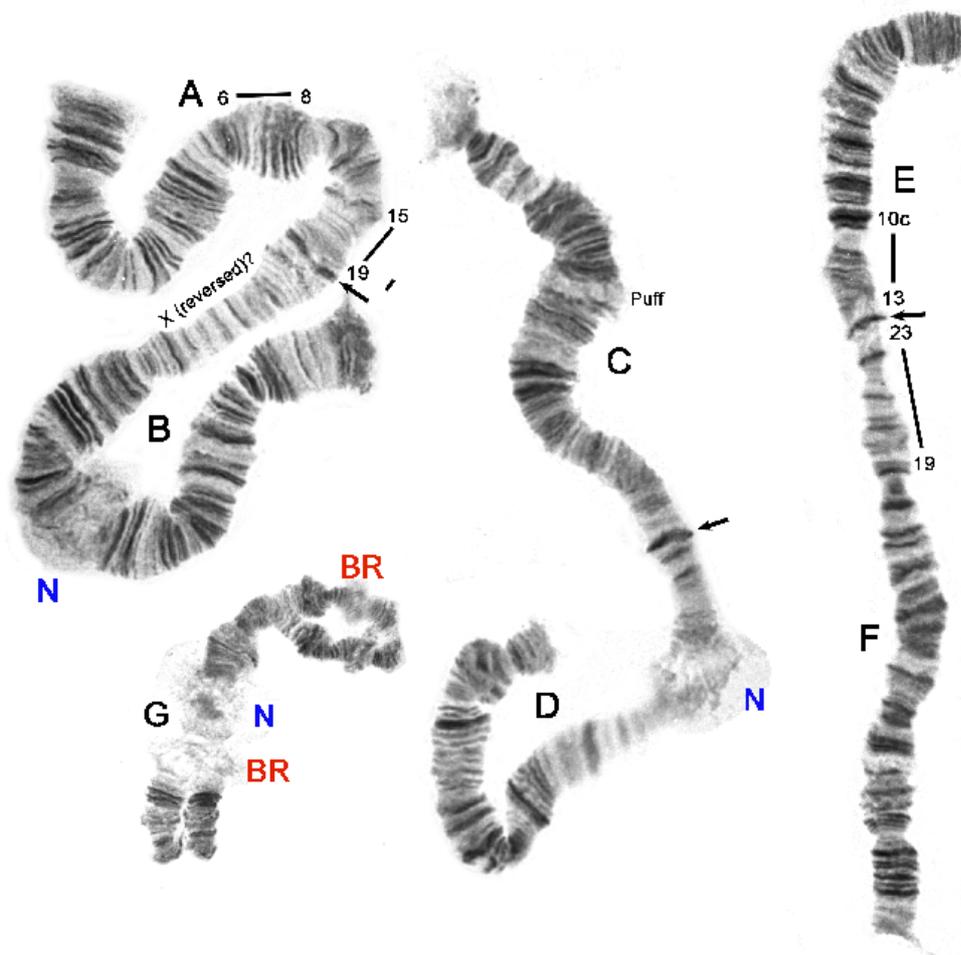
Mandible (e, below) with third inner tooth partly separated and slightly darkened (type IIB), and with 12 – 15 grooves on outer surface at base.



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

dlsA1: Only a few bands of the Keyl system can be recognized, such as 15-19 proximally.

- dlsB1: Nucleolus (could be the BR found in other *Lobochironomus* species) near middle of the arm, typical bands 24-28 slightly removed from the centromere (region “X” of Ryser *et al.* (1985) reversed?).
- dlsC1: Large puff about one third from distal end.
- dlsD1: Nucleolus near the centromere.
- dlsE1: possibly 1 - 3c, 9 - 10a, 8i-a, 3ed, 10b, 5 - 7, 4 - 3f, 10c - 13.
- dlsF1: Bands 8-9 about one third from centromere.



- Found:** Florida – (Townes 1945)
 Idaho - Coeur d'Alene Lake (Townes 1945)
 Iowa - Davenport (Townes 1945)
 Massachusetts - Worcester (Townes 1945)
 Missouri - Atherton and St. Louis (Townes 1945)
 New Jersey - Atsion, Medford Lakes, Moorestown and Westville (Townes 1945)
 New York - Buffalo, Canadarago Lake, Canajoharie, Hudson, Ithaca, Niskayuna, Oneonta, Otsego Lake, and Ringwood, Tompkins Co. (Townes 1945)
 North Carolina - Raleigh (Townes 1945)
 Ohio - Summit Co. (Townes 1945)
 Rhode Island - Westerly (Townes 1945)
 South Carolina -(Epler 2001)
 Wisconsin – Arboretum, Madison, Dane Co. (43.03, -89.42).

Also occurs in Europe (?France (**Type locality**); Denmark (type locality of *C. longipes* Staiger)

DNA sequence: *COI* sequence in GenBank, Accession number DQ648200.
cytb sequence in GenBank, Accession number DQ648243.
18S rDNA sequence in GenBank, Accession number DQ657926

The larva of *C. dorsalis* from the Palearctic has been described by Vallenduuk and Langton (2010), who noted some differences between their German material and the more eastern samples of Shilova (1980). The antenna of our North American specimens has some characters similar to those of Shilova's (seg. 3 shorter than seg. 4), and others (AR) similar to the German specimens. Some larvae from Why Not Bog Lake in Wisconsin are similar to those of this species, but have very long PLT, rather than the short ones found in the Madison egg mass larvae (see sp. 4v).

Species 4h. *Chironomus (Lobochironomus) austini* (Beck & Beck), 1970..
(Description based on Beck & Beck 1970).

Einfeldia austini Beck & Beck, 1970. transferred to *Chironomus (Lobochironomus)* by Epler (2001, p. 1.3)

Adult:

Male:

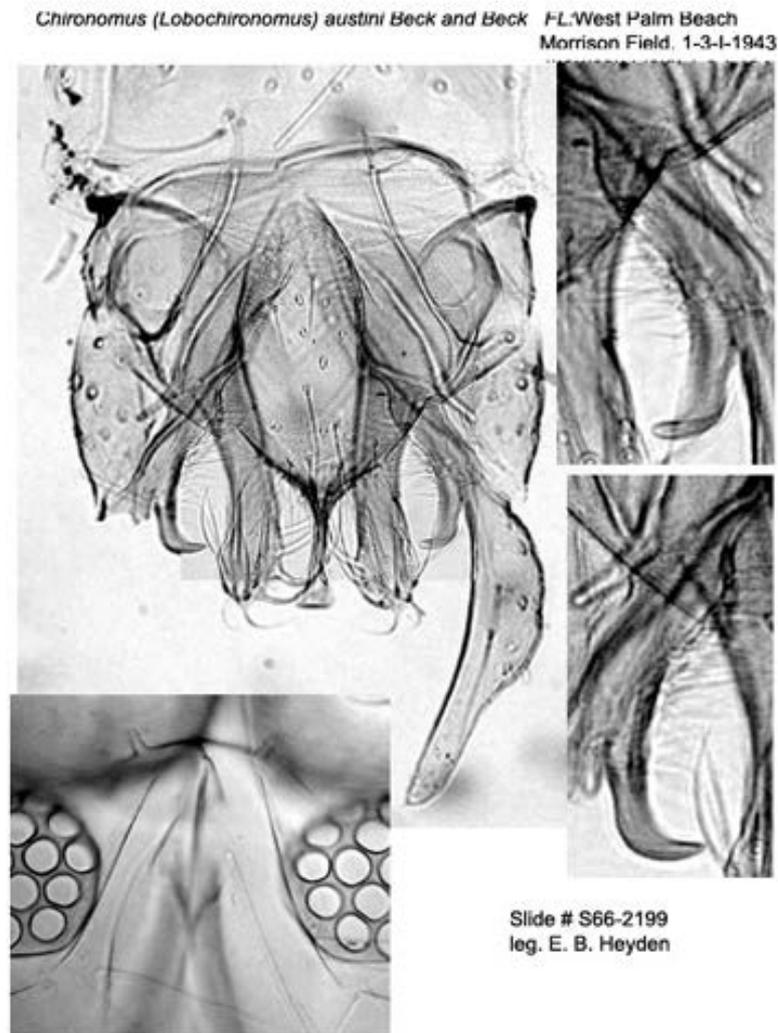


Figure courtesy of J. E. Sublette

A brownish, ochraceous species. Frontal tubercles twice as long as basal width. Thorax light brown, mesonotal vittae, scutellum and sternum medium brown to ochraceous, postnotum almost black.

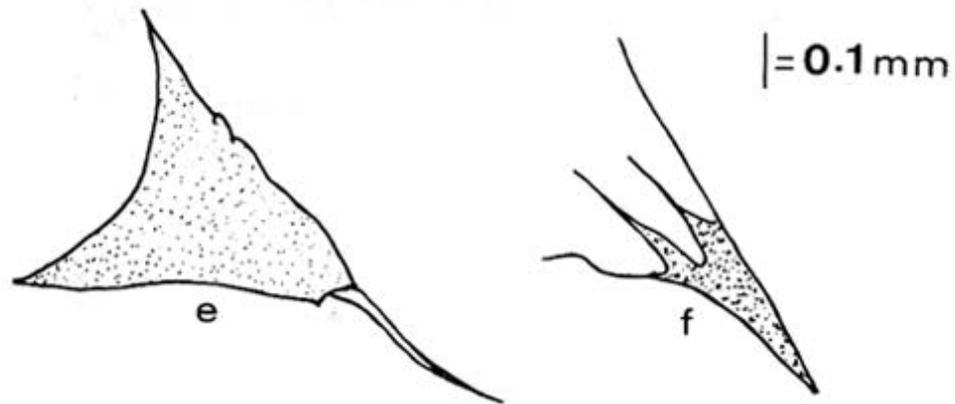
Thoracic setae - dorsolateral – about 10; prealar – 3; scutellar 48 (36 – 62).

AR – 2.76, wing length 1.95 mm.

Legs – darker at apices of tibiae and of tarsal segments brown. Fore tarsus apparently without beard, fore LR 1.9 – 2.0.

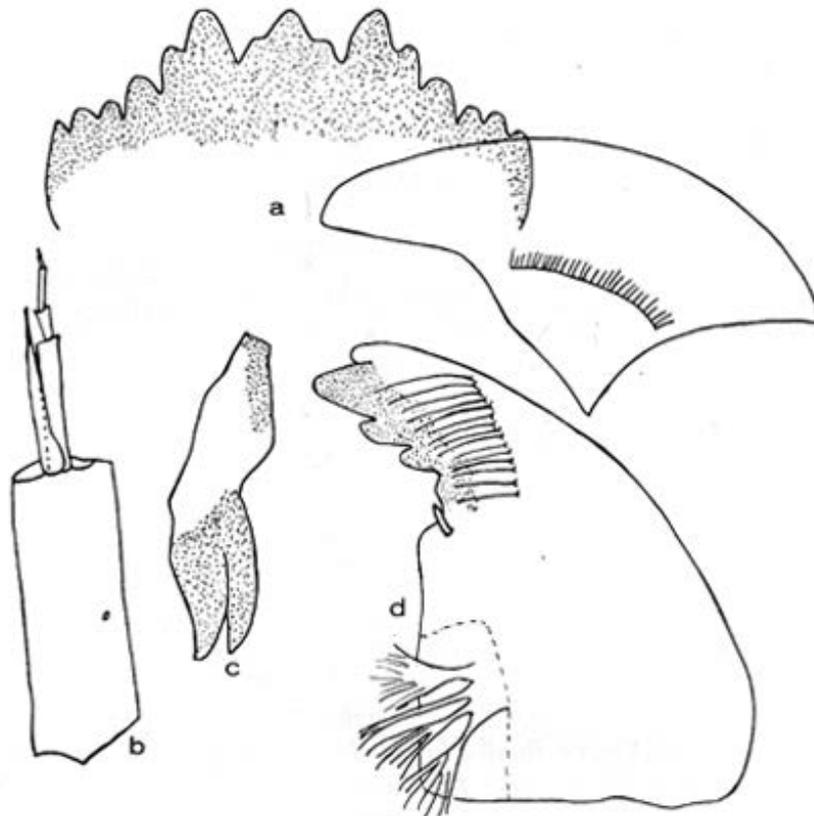
Hypopygium as in figure. Superior volsella closest to an E-type, but not really as any of Strenzke's illustrations. Anal point narrow.

Pupa: About 5.7 mm long, brown in color. Cephalic tubercles (e, below) fairly large, with preapical bristle. Tergite I bare, II with median longitudinal band of shagreen and posterior row of approximately 60 hooks. Tergites III-V with broad median longitudinal shagreen band; VI with antero-lateral patches of shagreen, and VIII with an area of fine shagreen on either side of midline; lateral filaments on V-VIII: 4-4-4-4; caudolateral spur of segment VIII with a single spine ((f, below). Anal fins with 44 lateral filaments, plus a small filament near outer margin, about half way from base of fin.



Pupal cephalic tubercle and caudolateral spur of segment VIII (from Beck & Beck 1970)

Fourth instar larva with pale head capsule. 2nd laterals of mentum less separated from 1st laterals than in *C. longipes*, 4th lateral teeth reduced about to level of 5th lateral (type II). Pecten epipharyngis with some thinner teeth interspersed between normal teeth. Premandible with two broad lobes, about equal in length, but inner tooth perhaps twice as wide as the outer. Antenna with basal segment about three times longer than wide, Ring organ about half way up the segment; AR about 1.2; ratio of antennal segments 50 : 24 : 6 : 8 : 3. Mandible with 3rd inner tooth not separated, but possibly darkened to some extent; grooves on outer surface at base not mentioned.



Larval mouthparts of *C. (Lobochironomus) austini*

a. Mentum and ventromentum, b. Antenna, c. Premandible, d. Mandible. (From Beck & Beck, 1970)

Cytology: Not known.

Found: Florida - Duval Co. (Type)

North Carolina - Juniper Swamp, Onslow Co (Epler 2001)

South Carolina - (Epler 2001)

A very similar species, *C. antonioi*, has been described from Brazil (Correia & Trivinho-Strixino 2007).

Streams associated with swamps, possibly acidic.

All life stages briefly described by Beck & Beck (1970) and some larval characters in Epler (2001).

Species 4i. *Chironomus (Lobochironomus) pseudomendax*(?).

This North American material was initially identified as *C. mendax* by W. Wülker in Ryser *et al.* (1985). However, the Palearctic material was subsequently shown not to be *C. mendax* Storå, and given the new name “*pseudomendax*”; by Wülker (1998), on the basis of a difference in chromosome number. Although not specifically stated, the larval mentum of the North American material was apparently similar to that of *C. pseudomendax*, not like that of *C. mendax*. Since the cytology of the North American material is not known, it is not certain as to what species it really belongs.

Adult:

Male

Lighter in color than *C. montuosus*, with a yellow mesonotum,

The superior volsella is rather similar to that of *Einfeldia* species, but the narrower curved lobe arises from the dorsal surface near its base, whereas in *Einfeldia* it arises apically or subapically from the ventral lobe (Grodhaus and Ferrington (1989).

Pupa: Not described but there may be some specimens in the collection of the Kansas Biological Survey (Grodhaus and Ferrington, 1989) and that of Palearctic specimens is given in Langton and Visser (2003). The hook row of tergite II is interrupted and the spur of segment VIII has 1 or 2 spines.

Fourth instar larva: Apparently similar to that of European *C. pseudomendax*, i.e. a plumosus-type larva with unpigmented head capsule. PLT longer than 150 µm. c2 teeth of central trifold tooth of mentum relatively well separated (perhaps type III), as are the 2nd laterals. Antennal segments (µm) A1 109-136 : A2 31-44; RO a quarter to a third up from base of segment A1.

Cytology: Not known for North American material. If it is *C. pseudomendax* it will have 4 polytene chromosomes with the thummi-cytocomplex combination AB, CD, EF, G, as in Ryser *et al.* (1985), but if nearer *C. mendax*, it will only have 3 chromosomes (AB, CD, GEF). Palearctic *C. mendax* is more polymorphic than *C. pseudomendax*.

Arm A: Groups 15-19 can be recognized near the centromere.

Arm B: Groups near the centromere as in *C. montuosus*, etc. Medial inversion in *C. mendax*.

Arm C: Polymorphic in Palearctic populations of both *C. mendax* and *C. pseudomendax*, but nearer the distal end in *C. pseudomendax*.

Arm D: Polymorphic for a simple inversion of distal region in *C. mendax*.

Arm E1 of *C. mendax* is identical to that of *C. montuosus* and differs from *C. pseudomendax* by an inversion that includes band group 9. E2 of *C. mendax* is an inversion of about the middle third of the arm

Arm F should have a puff (called a BR by Wülker) about a third to half way from centromere.

Arm G will be short with a large nucleolus near the presumed centromeric end (end attached to arm E if only three chromosomes) and a large BR near the other end.

Found: California - Dana Meadows (37.89°N, 119.26°W), Yosemite Ntl. Pk., Tuolumne Co. (Grodhaus & Ferrington 1989); Yosemite National Park (Ryser *et al.* 1985).

The larva is given by Ryser *et al.* (1985). Grodhaus and Ferrington (1989) give notes on the adult of North American specimens.

Species 4j. *Chironomus acerbiphilus* Tokunaga, 1939

Synonym: *C. crassimanus* Strenzke 1959.

In BOLD Bin: [BOLD:AAJ9507](#)

Adult and pupa

The adult and pupa of North American populations are not known.

It is therefore not known whether the adults are as dark as the Japanese specimens, or paler like the European species described as *C. crassimanus*.

The European pupa (from Rodrigues *et al.* 2009) is 8.2-10.0 mm long, cephalic tubercle 70-120 µm high. Basal ring of thoracic horn 140-180 µm long by 60-90 µm wide. Pedes spurii B well developed on segment II. Postero-lateral spur of segment VIII with 1-4 long-acuminate spines. Anal fringe with 86-116 taeniae.

Fourth instar larva: A small-medium plumosus-type larva. PLT turn ventrally as described by Sasa (1978) for Japanese specimens. VT well developed. Head capsule generally brownish; gula very dark over posterior two thirds, FC darkened, as well as some darkening along the outside edges of the apotome.

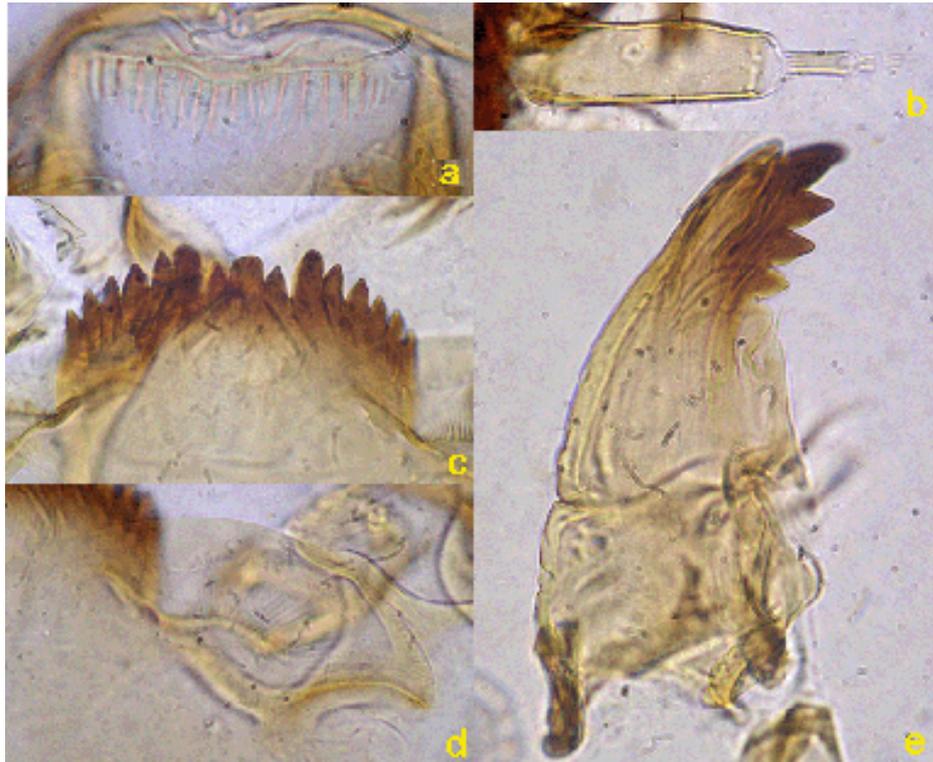
c1 teeth of mentum (c, below) relatively broad, with c2 teeth well separated and sharp; lateral teeth sharp, 4th laterals hardly reduced (type I), but 5th laterals slightly above the graduated level of the other lateral teeth. Sasa (1978) shows small notches near the tip of the center tooth, but these will only be seen if the mentum is not worn.

Ventromental plates (d, below) separated by about 39 - 40% of mentum width; with about 38 striae. PE (a, below) with about 15 - 20 sharp graded teeth.

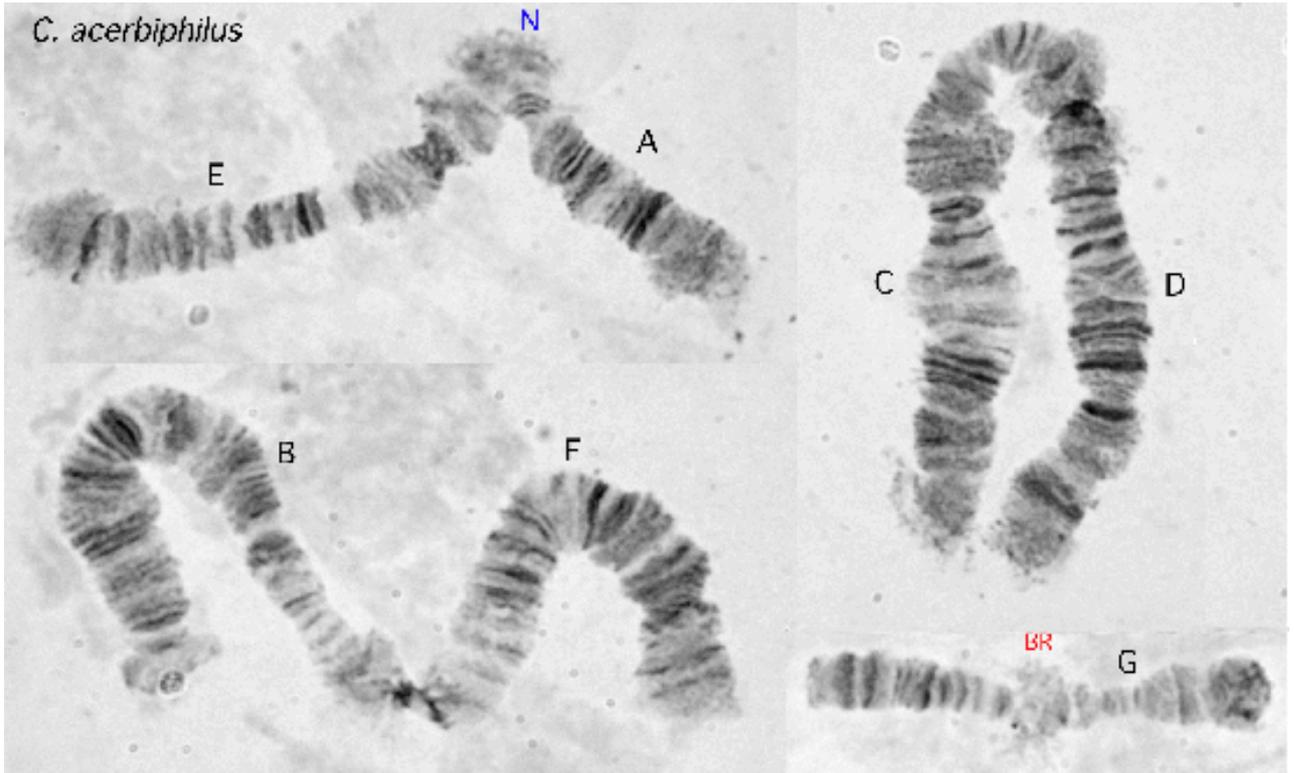
Antenna (b, below) with basal segment moderately long, about 2.9 - 3.4 times longer than wide; RO about middle of segment; AR about 2.02; segment 3 quite short, shorter than segment 5; relative length of segments (µm) 118 : 28 : 7 : 10 : 8.

Premandibles with outer tooth slightly longer (when not worn); inner tooth about 1.7 times wider than outer tooth.

Mandible (e, below) with 3rd inner tooth defined and darkened (type IIIC), at least 12 grooves on outer surface near the base.



Cytology: 4 polytene chromosomes with the pseudothummi-cytocomplex combination, AE, BF, CD, G. Centromeres strongly heterochromatic and constricted. Pairing may occur between 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, or alternatively it may be related to the duplication of the CD centromere region reported in other pseudothummi-cytocomplex species such as *C. alpestris* (Wülker, pers. comm.; Kiknadze *et al.* 2008, as *C. dorsalis*). 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 *aprilinus*, etc.
- aceF1: 1, 12p - 11, 2 - 6 14 - 12p, 16 - 17, 10 - 7, 18 - 23 (Wülker, prelim)
- aceF1: (alternate) 1-7, 17-16, 11-14a, 15-14b, 4-6, 9-8, 1-3, 10, 18-20 (clarified from Jablonska-Barna *et al.* 2010)
- aceG1: BR near middle of arm.



Nymph Creek YNP, Wyoming. (Photo courtesy Kathy Sheehan)

In acidic waters (pH3), and also elevated temperatures (35C, but some up to 45C) in North America.

DNA sequence: MtCOI sequence is in the BOLD database. Sequence of Japanese specimens are also in GenBank and/or BOLD database. BOLD places them in a separate Bin (BOLD:AAJ4234). However there is currently no reason to believe that the difference is due to anything other than geographic isolation.

Found: California -
Wyoming - Nymph Creek, Yellowstone National Park.
also found in Japan - Lake Katanuma, Honshu (**Type locality**).
and in Europe - Reinbeck, Germany (Keyl 1962)

The adult, pupa and larva of Japanese specimens were described and figured by Sasa (1978) and much more fully by Yamamoto (1986), and European specimens by Jablonska-Barna *et al.* (2012). 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*.

Species 4k. *C.* species 'Cape Cod'.
Probably a member of the *C. decorus*-group.

This species is in BOLD Bin: [BOLD:AAV7387](#) and [BOLD:AAV7388](#)

No adult is definitely associated, but slightly larger males than those of *C. quinnitukqut*, which occurs at the same location, may belong to this species.

Fourth instar larva: A small to medium sized (fem. abt. 13.2 mm) bathophilus-type. VT short, abt equal length (0.52-0.86 mm). No information recorded for AT.

Gula very dark on post 2/3 or almost to the base of the mentum; FC pale, but some darkening towards rear of head and at base of antenna.

Mentum with 4th lateral often only slightly reduced (type I), 6th lateral slightly lower than 4th lateral; c2 teeth little more than notches on side of c1 tooth (type IA) but may be well separated (type IIA).

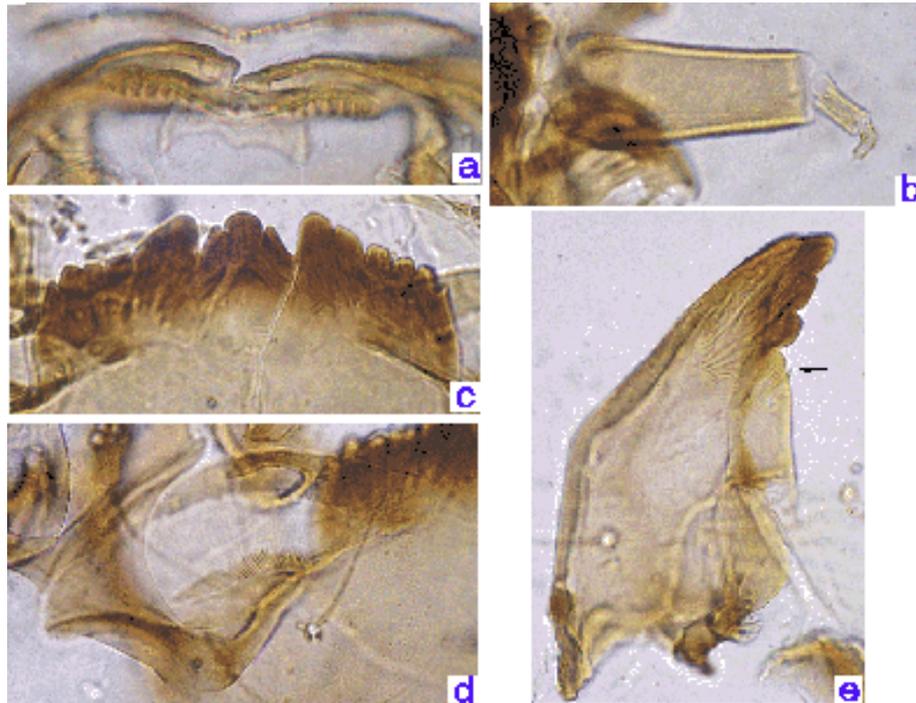
Ventromental plates (d, below) separated by about 30% of the width of the mentum, with about 39 - 43 striae; VMR about 0.25-0.27. PE (a, below) of about 21 (19 - 24, 5) relatively even teeth.

Premandible usually with inner tooth longer, and about 1.7-2.3 times wider than, the outer tooth.

Antenna (b, below) with relatively squat basal segment, about 2.8 - 3.4 times as long as wide, RO about a quarter to a third up from the base; AR about 2.05-2.46; A1/A2 about 5.1-5.9; A4/A3 about 1.5-1.7; proportions of the antennal segments (micron) 133 : 24 : 6 : 12 : 6.

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

Mandible (e, below) with fourth inner tooth only partially developed and pale (type I - IIA; with about 12.5 (10-16, 5) grooves on outer surface near the base.



Cytology: Four polytene chromosomes with the thummi-arm combination AB, CD, EF, G. Arm G with a sub-terminal nucleolus, next to a heterochromatic cap; BR immediately distal of nucleolus; homologs either unpaired or paired at the heterochromatic cap. Second nucleolus about 2/3 along arm D. No polymorphism in the specimens examined.

Arm A1:

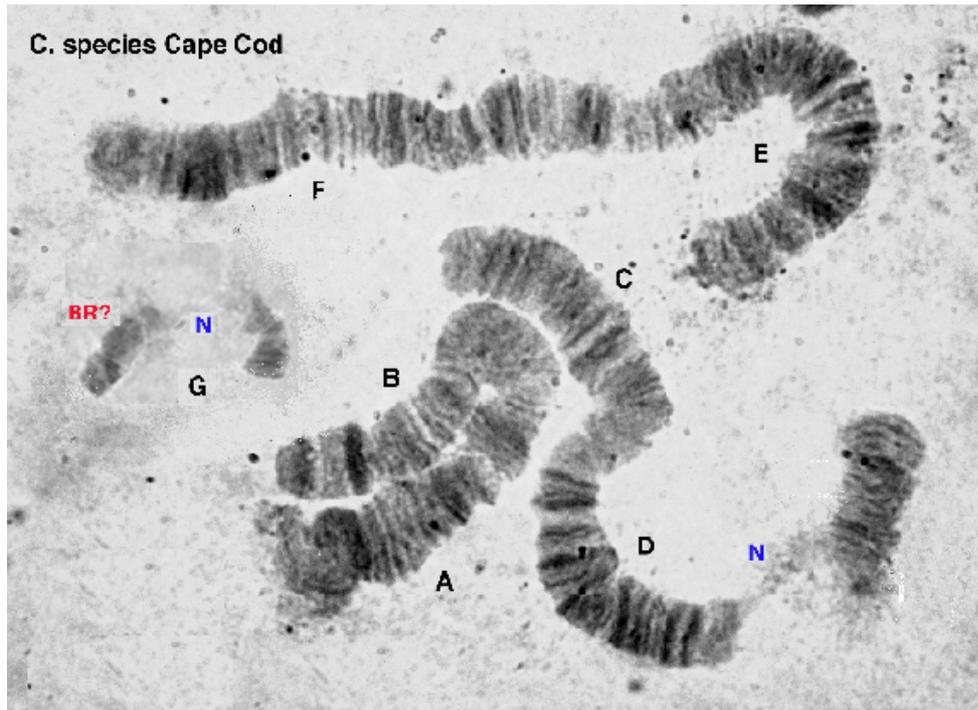
Arm B1: No obvious large puff. Bands 24-28 removed from usual position close to centromere, as in B1 of *C. quinnitukqut*.

Arm C1:

Arm D1: Nucleolus distal of middle of arm

Arm E1:

Arm F1: May differ by only a small median inversion from F1 of *C. quinnitukqut*.



Found: Massachusetts - East Harbor (Truro), Cape Cod National Seashore, Barnstable Co.

Marine, organic sediments.

Species 41 *C. species 41* (*C. decorus*-group?)

Adult not known.

Pupa not known.

Fourth instar larva: A medium sized semireductus-type larva (length (2) 12.7-13.5 mm), VT well developed and about equal in length (ant. 1.24-1.56; post 1.28-1.52.); PLT about 156-160 μ m.

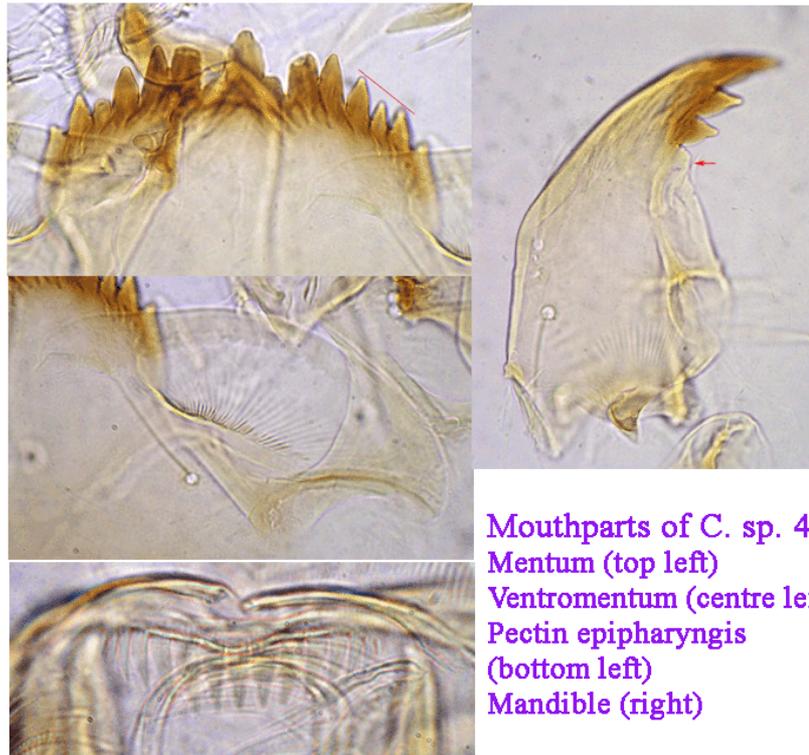
Anal tubules 2-4 times as long as wide. Gular region dark, FC pale.

Mentum with 4th laterals reduced to about the level of 5th lateral (type II); c1 tooth narrow and tall, c2 teeth separated (type III).

VM with about 31-34 striae; VMR abt. 0.25. PE with about 14 16 mostly even sized, sharp teeth, but distal teeth smaller.

Antenna with basal segment relatively long and narrow, about 3.4-3.6 times as long as wide; AR about 2.1; A2/A1 about 0.19-0.21; A4/A3 about 1.5-1.7.

Mandible with 3rd inner tooth pale and almost completely fused (type I).



Mouthparts of *C. sp. 4l.*
 Mentum (top left)
 Ventromentum (centre left)
 Pecten epipharyngis
 (bottom left)
 Mandible (right)

Cytology: 4 polytene chromosomes with thummi-cytocomplex arm combination, AB, CD, EF, G. Arm G often largely unpaired and with a virtually terminal nucleolus and a BR separated by a further 7-10 bands.

Found: **Kansas** - Mill Creek, nr. Craig, Johnson Co..
Louisiana - Bar ditch, Many, Sabine Parish.

Species 4m *C. species 4m.*

This species is in BOLD Bin: [BOLD:AAW3991](https://www.boldsystems.org/index.php/AWW3991)

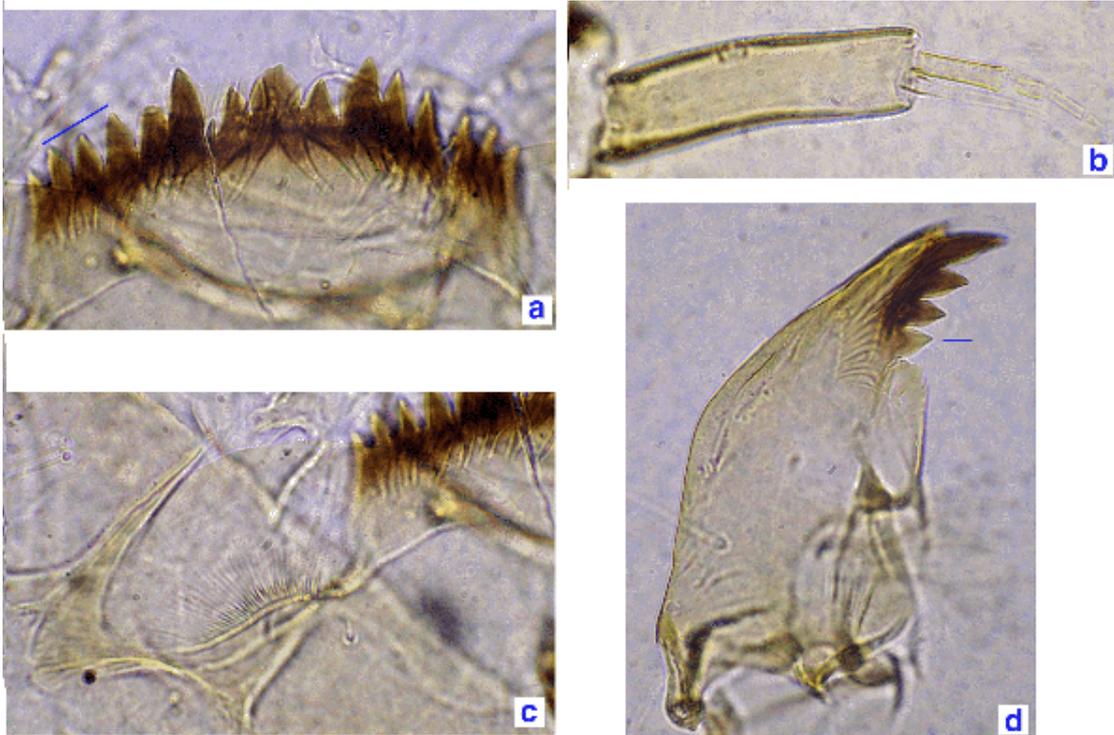
Adult not known

Pupa not known

Fourth instar larva: A medium sized plumosus-type species. Gula slightly darkened, FC also slightly darkened. Mentum (Fig. a, below) with 4th laterals reduced virtually to level of the 5th laterals (i.e. type II), and center trifid tooth with c1 broad and the c2 teeth relatively well separated (i.e. type II). VM (Fig. c, below) with about 40 – 41 striae, plates separated from each other by about 0.3 of the width of the mentum. PE with about 19 teeth.

Antenna (Fig. b, below) with basal segment about 4.2 times as long as wide; AR about 1.80; ratio of segments (micron) 144 : 38 : 12 : 15 : 8 .

Mandible (Fig. d, below) about 255 micron long, with third inner tooth well developed (Type III), and about 12 – 13 striae on inner margin near the base.

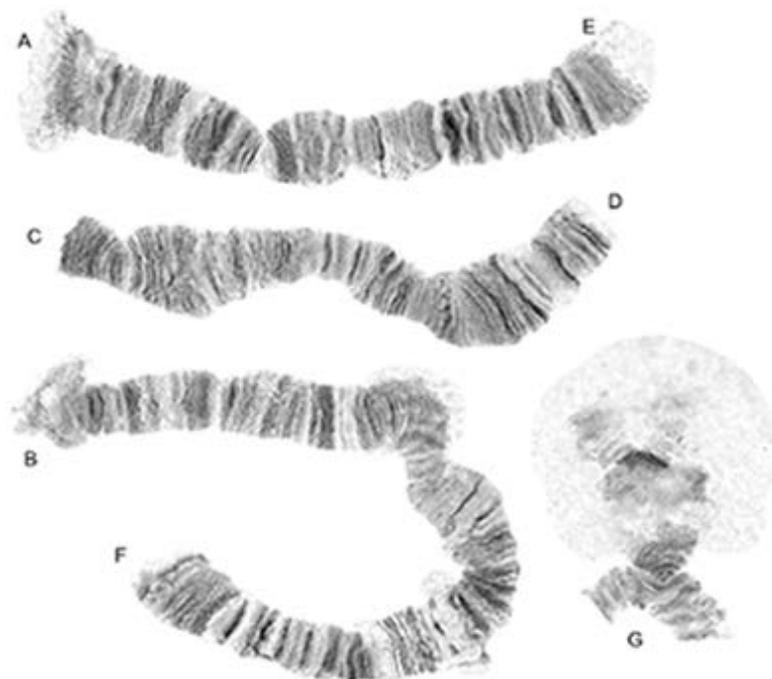


Cytology: Not known for certain, but most likely candidate at the only known locality is a pseudothummi-cytocomplex species, i.e. 4 polytene chromosomes with arm combination AE, BF, CD, G.

Arm G paired at the median nucleolus; no nucleolus in long chromosomes. Puff not formed in arm B; characteristic band group (25-27) in normal position close to centromere.

Arm E1: 1a - 3e, 10b - 3f, 10c - 13

i.e. as in *aprilinus*



Karyotype figure courtesy of I. I. Kiknadze.

Found: Alaska - Potter Marsh, Anchorage.

Fourth instar larva collected by Dave Wartenbee; thorax taken by Iya Kiknadze; head and rest of larval body by Jon Martin. Unfortunately the original coordinated labelling became lost, but this combination of cytology and morphology is the only one not accounted for.

Mitochondrial *COI* sequence indicates that this is a species that has not been barcoded previously, with relationships to pseudothummi-cytocomplex species.

Species 4n *Benthalia natchitocheae* (Sublette)

Chironomus (*Einfeldia* gp.) – Sublette 1964.

Einfeldia (s.l.) Oliver 1981

Adult: Described by Sublette

Male:

Wing length 2.39-2.70. AR 2.82-3.10. LR 1.85-2.20

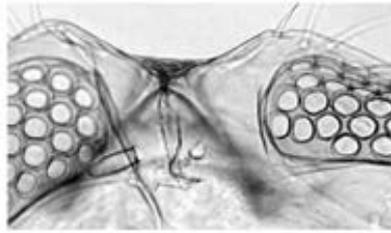
Head brownish; frontal tubercles developed; palp segments (2-5): 5 : 12 : 20 : 27.

Thorax yellowish brown, vittae, postnotum and sternopleuron blackish brown, mesonotum with a slight central hump. Abdomen entirely blackish brown.

Legs darkened on distal third of femur and on tarsi. Leg proportions:

	Fe	Ti	Ta1	Ta2	Ta3
PI	57	40	88	44	34
PII	58	50	30	15	10
PIII	60	65	48	23	17
	Ta4	Ta5	LR	F/T	BR
PI	28	11	1.85-2.2	1.42	absent
PII	5	4	0.60	1.16	
PIII	10	6	0.74	0.92	

Chironomus (Lobochironomus) natchitochae Sublette



SC: Aiken Co.,
Lower 3 Runs Cr.
Savannah R. Plant
30-IX-1X-1979
P. L. Hudson



Head with frontal tubercle, hypopygium, and SVo (on right).
(Photographs courtesy of J. E. Sublette)

Segment IX about 5 setae on anterior part, and smaller setae flanking the anal point. SVo with chitinous hook on a pedicel covered with small setae and some longer setae (as above); IVo with a terminal knob covered in setae; anal point broadening towards the tip.

Female: (Allotype)
Wing length 3.15mm.
Coloration essentially as in male.
Leg proportions:

	Fe	Ti	Ta1	Ta2	Ta3
PI	60	45	98	38	33
PII	65	55	32	16	12

PIII	68	70	50	23	18
	Ta4	Ta5	LR	F/T	Ta4/Ti
PI	27	12	2.18	1.33	0.60
PII	6	5	0.60	1.18	0.11
PIII	11	8	0.71	0.97	0.16

Pupa: Length about 8 mm; almost entirely blackish. Cephalic tubercle long and pointed with a conspicuous preapical bristle. Tergite II with posterior row of about 81 upturned hooks. Postero-lateral comb on segment VIII with about three spines; caudal fin with about 116 setae in an approximate double row.

Fourth instar larva: One pair of VT. Gula darkened, dark spot at base of antenna. Median tooth of mentum projecting far beyond first lateral teeth; 5th lateral tooth of mentum larger than 4th and 6th; apotome without fenestra; mandible with 2 inner teeth and wide radial grooves near base; PE composed of three small scales (Epler 2001).

Cytology: Not known.

Found: Louisiana - U.S. Fish Hatchery, Natchitoches (**Type locality**)
South Carolina - Lower 3-runs Creek, Aiken Co.

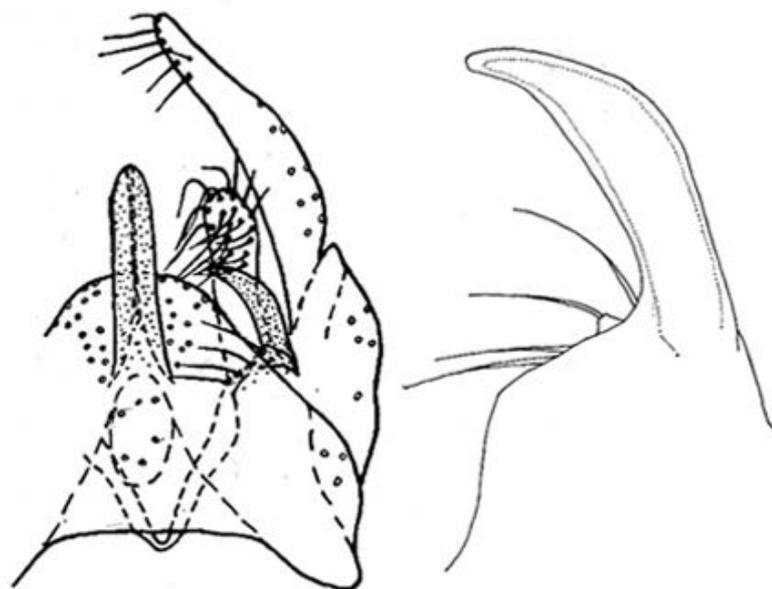
Common in eutrophic lakes and ponds on the Coastal Plain of the Carolinas, but also occurs in rivers and streams.

Has been included in *Einfeldia* (sens. lat.) (Epler 2001), and also suggested to be *Chironomus* (*Lobochironomus*), but appears to fit into that section of *Einfeldia* (sens. lat.) for which the name *Benthalia* has been suggested., although Cranston (chirokey.skullisland.info/genus/Einfeldia/) suggests it fits best with *Fleuria*.

All life stages described by Sublette (1964), partial description and some figures of larva in Epler (2001).

Species 4o *Chironomus tuxis* Curran, 1930

Adult



Male hypopygium of Chironomus tuxis

Drawn from type by Townes, 1945 (left) and Sublette 1966 (right)

Male (from Townes 1945; Sublette 1966, Sæther 2012): Wing length 3.4 mm (type 3.46 mm, VR1.02); fore LR 1.63 (type 1.67); antennal ratio 3.22 - 3.8 (type 3.92).

Body moderately slender.

Frontal tubercles small, clypeus small.

Middle portion of pronotum hardly at all broadened.

Fore tarsus without a beard.

Blackish brown and pruinose, legs brown towards their apices, pale towards the base. 6 – 8 sensilla chaetica on pII, 7 on pIII.

Acrostichal setae in single staggered row; dorsolaterals in double staggered rows; 5 prealars; 1 supra-alar; scutellars with 14 - 16 setae strewn in anterior row, 12 erect in posterior row.

Leg proportions:

	Fe	Ti	Ta1	Ta2	Ta3
PI	780	700	1170	580	440
PII	780	780	460	260	200
PIII	900	920	720	410	300
	Ta4	Ta5	LR	F/T	BR
PI	380	160	1.63-1.67	1.11	absent
PII	120	80	0.59	1.00	
PIII	180	90	0.78	0.98	

Abdominal segments without the yellowish apical segmental bands seen in *C. riparius*. Genitalia similar to those of the *C. decorus*-group, but D-type SVo shorter and stouter.

Pupa and Fourth instar larva: Not known

Cytology: Not known

Found: **Manitoba** - (Oliver *et al.* 1990); Lake Winnipeg (Sæther 2012)
Ontario - (Oliver *et al.* 1990)
Florida - (Caldwell *et al.* 1997)
Georgia - (Caldwell *et al.* 1997)
Maine - (Oliver *et al.* 1990)
Michigan -(Oliver *et al.* 1990)
Minnesota - (Oliver *et al.* 1990)
New Jersey - Lakehurst; Riverton (Townes 1945)
New York - Tuxedo (**Type locality**); Hudson; Moorestown; Prattsville; Westchester Co.
(all Townes 1945)

Found in lakes (Hudson *et al.* 1990)

Adult redescribed by Townes (1945), Sæther (2012), and from type by Sublette (1966).

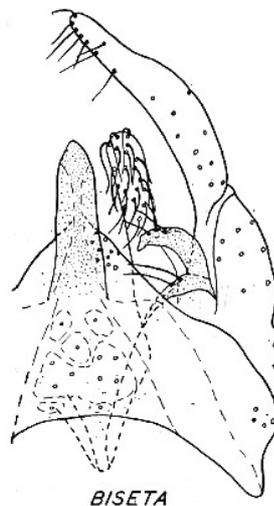
Species 4p *Chironomus biseta* Townes

Confirmed as *Chironomus* by Sublette and Sublette (1965).

Known only from the adults.

Adult

From the description of Townes (1945):



Male genitalia of *C. biseta* (Townes 1945)

Male: Wing length 5.5 mm; fore LR 1.4; antennal ratio 4.0.

Frontal tubercles small, clypeus of moderate size.

Middle portion of pronotum moderately broadened; mesoscutum without a tubercle

Fore tarsus without a beard.

Dark brown, legs pale brown at their bases, dark brown towards the apices; abdomen with the apical part of each segment pruinose and slightly paler than the rest.

The genitalia is unusual in having several setae on the SVo, which otherwise is an E-type closest to E(h) of Strenzke (1959).

Female: Described only as similar to the male except for the usual sexual differences.

Pupa: Not known

Fourth instar larva: Not known

Cytology: Not known

Found: Hudson Bay Territory - (Type locality)

Townes (1945) notes that it is similar to *C. atritibia* in size, coloration and lack of tarsal beard, but differs in the genitalia and the smaller clypeus.

Species 4q. *Kiefferulus pungens* (Townes) 1945
Tendipes (Tendipes) pungens - Townes 1945.
Transferred to *Kiefferulus* by Epler (1995).

Adult:

Male: from Townes 1945

Wing length 2.7 mm; LR 1.65, AR 2.9.

Pea green body of medium build. Frontal tubercles and clypeus small; middle portion of pronotum slightly widened, fore tarsus without a beard. Thoracic markings ochreous. Femora and middle and hind tibia green, tarsi and fore tibia light brown.

Anal struts separate and extending posteriorly. Anal point broad, SVo very slender.

Female: - not described.

Pupa: Rows of needle-like spines on sternites I-III.

Fourth instar larva: A typical *Kiefferulus* larva with one pair of ventral tubules. Epler gives postmentum length (shorter than VHL) as 255-290 μm , fewer than 75 striae on VM, basal antennal segment 75-98 μm long.

Cytology: Not known

Found: District of Columbia - Little Falls. (Townes 1945)
Florida - Canoe Creek, 12 miles south of St. Cloud on Vermont Avenue (Type locality)
(Townes 1945)
Georgia - (Caldwell *et al.* 1997)

Found in lakes (Hudson *et al.* 1990)

This species belongs to that section of *Kiefferulus* in which the anal struts of the adult male are separate and extend posteriorly. Such species have been placed in the subgenus *Wirthiella*, as Elper (2001) did with this species. However, it is currently disputed as to whether *Wirthiella* can be maintained as a subgenus, since no consistent characters seem to exist for any other life stage.

Species 4r: *Goeldichironomus holoprasinus* (Goeldi), 1905
Syn: *Chironomus fulvipilus* Rempel (1939) - Fittkau 1965.

Tendipes (Tendipes) fulvipilus (Rempel) - Townes 1945.

Apparently no data in BOLD

Adult:

Male: from Townes (1945) and Fittkau (1985)

Wing length 2-2.7 mm. LR 1.65, AR 2.4; VR 1.2. Body slender.

Pale green with head, and thoracic vittae ochreous.

Frontal tubercles small, clypeus very small.

Thoracic setae – acrostichal 10 (8-12); dorsolateral 5 (4-8); prealar 4 (3-4); supraalar 1; scutellar 4 (4-6)

Apex of fore femur, apex and basal half of fore tibia, and tarsi, except the basal part of mid and hind tarsi, brown. Fore tarsi without a beard.

Leg Proportions (Fittkau):

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	BR
PI	1.41	1	1.63	0.88	0.77	0.77	0.32	1.63	1.41	2.0
PII	1.15	1	0.59	0.31	0.25	0.16	0.11	0.59	1.15	
PIII	0.93	1	0.68	0.35	0.30	0.17	0.10	0.68	0.93	

Tergite IX with a group of 10-15 setae. Anal point long and evenly narrow, apically with a small hook; SVo curved, narrow; gonostylus swollen, but sharply narrowing at posterior end.

Female: Similar to male except for usual sexual differences.

Antennal proportions (Fittkau): 140 : 105 : 105 : 90 : 160. AR 0.36; A5/A1 1.14.

Thoracic setae – acrostichal 8.8 (8-10); dorsolateral 11.7 (11-13); prealar 4; supraalar 1; scutellar 5 (4-6).

Leg Proportions (Fittkau):

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	Ta4/Ti
PI	1.34	1	1.59	0.83	0.73	0.78	0.32	1.59	1.34	0.78
PII	1.09	1	0.55	0.29	0.22	0.14	0.11	0.55	1.09	
PIII	0.94	1	0.62	0.33	0.27	0.16	0.10	0.62	0.94	

Anal segments as in *Chironomus*.

Pupa: Length 0.5-1.55 mm. Exuvia hyaline; thorax tan, sometimes heavily pigmented in the region of the mesonotum. Basal ring kidney shaped. Dorsal hook row on TIII; Pedes spurii B on segment II, Pedes spurii A present on segment IV. Posterolateral spur of segment VIII with 2-6 small thorn-like spines. Anal swim fins with about 50 lateral taeniae in a single row and 1 elongate, broad dorsal seta.

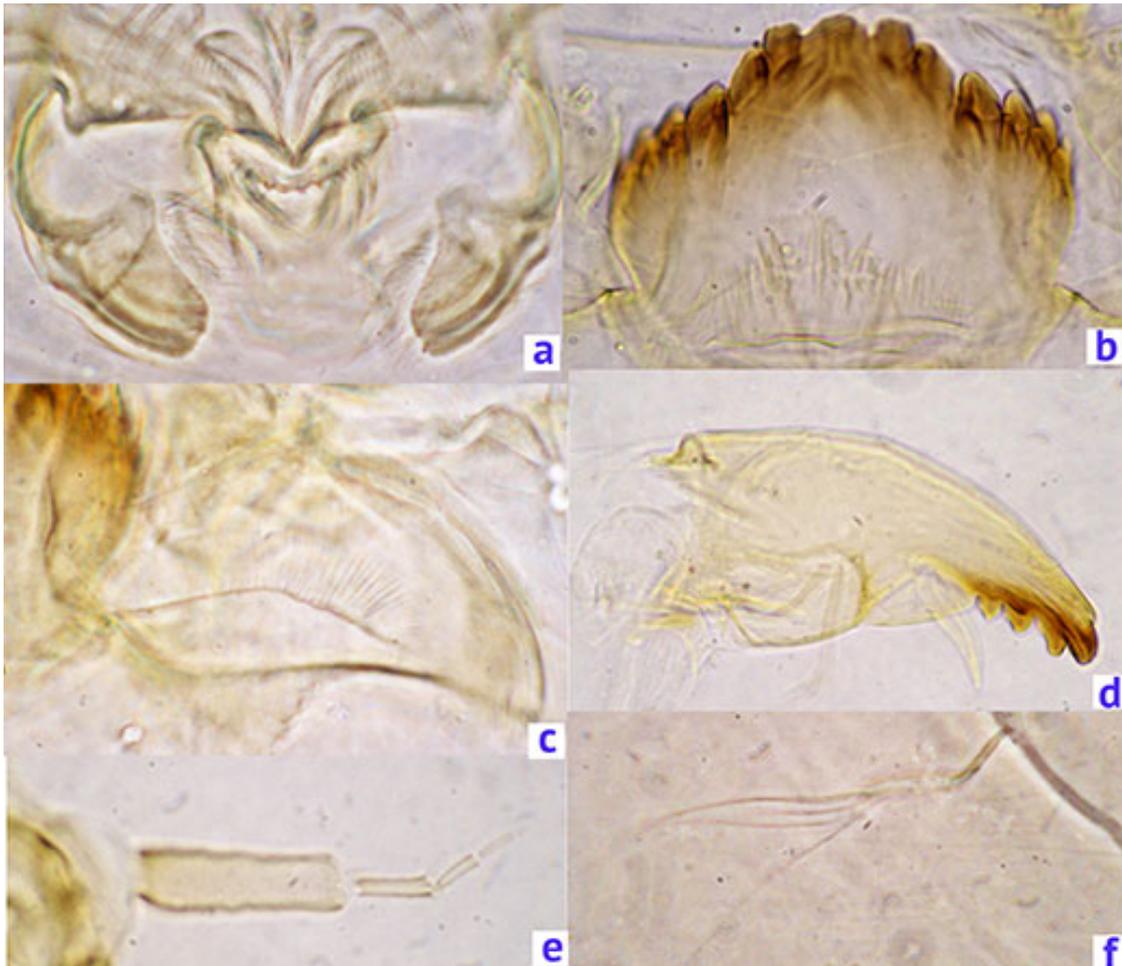
Fourth instar larva: Medium sized. Not a typical *Chironomus* larva – there are two pairs of ventral tubules, but the anterior pair are bifurcate, and where lateral tubules may be developed in *Chironomus*, there are split feathery bristles (Fig. f, below). The head capsule is tawny without markings. The dorsal head is basically similar to that of *Chironomus*, as is the mentum (Fig. b, below) (roughly type IA) although the center tooth and 1st laterals are raised compared to other laterals; 4th laterals not reduced.

Ventromental plates (Fig. c, below) elongated (longer than mentum width) and almost touching in the midline, separated at most by width of center teeth (in *Chironomus* it is usually by the distance to between the 1st and 2nd laterals).

PE (Fig. a, below) with about 11-13 alternating small and large teeth (closest to type D, but not rounded). Premandible (Fig. a, below) of available specimens worn, but comprised of two teeth, the inner much broader than the outer.

Antenna (Fig. e, below) with five segments. A1 about 3.5 times longer than wide, RO in basal 1/4 to 1/3; AR about 1.17: segment proportions 21 : 7 : 5 : 4 : 2.

Mandible (Fig. d, below) with 4 darkened inner teeth; seta subdentalis large with a row of small teeth along the inner margin. No furrows near base.



Cytology: 4 polytene chromosomes. Chromosome 4 long with a subterminal nucleolus and at least 2 BRs, a large one about 1/3 of arm length from nucleolus, and a possible smaller one near the other end of the arm.



Chromosome 4 of *G. holoprasinus*

Type locality: Belem, Para, BRAZIL

Found: Florida - St. Augustine; West Palm Beach (Townes 1945)

Maryland - Berlin (Townes 1945)

Texas - Austin, Travis Co.; Sugar Land.

Hawaii (probably by human transport).

Also found in Central and South America.

Species 4s. *Chironomus* possibly near to *C. tenuistylus*

Adult:

Male: At least one male specimen is in the J. E. Sublette collection in the Museum of the University of Minnesota, St. Paul, MN., and a reared male is currently in my collection. This latter male is the basis of the adult and pupal descriptions here.

Wing length about 3.8 mm, width 0.84 mm, VR 1.05. AR about 3.7-3.9., LR 1.47.

A brownish species.

Head: frontal tubercles small, about 26 x 10 µm. Palpal proportions (micron): 48 : 51 : 190 : 228 : 300. Clypeus almost rectangular in appearance with about 25 setae.

Thorax with dark vittae. Setae: Achrostichal – 20; Dorsocentral – 15–16; Prealar – 5;

Scutellar, anterior 9; posterior 13.

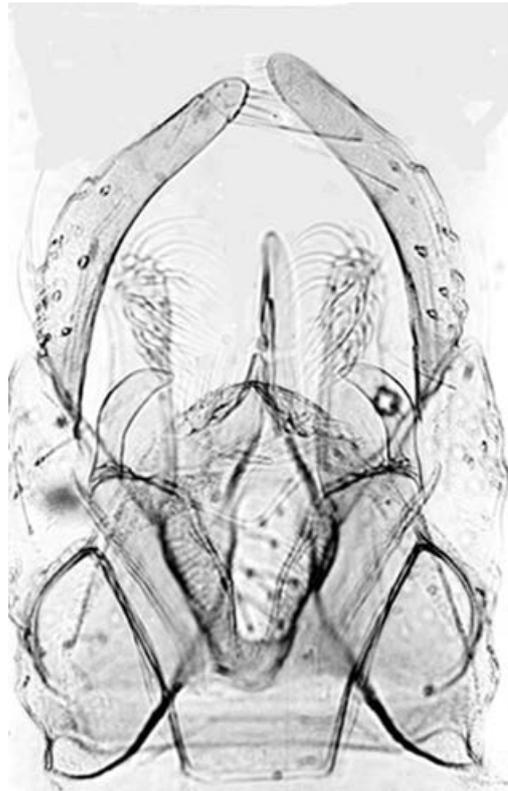
Leg proportions (micron):

	Fe	Ti	Ta1	Ta2	Ta3
PI	1420	1380	2040	1000	820
PII	1420	1440	820	550	380
PIII	1640	1780	1320	653	820
	Ta4	Ta5	LR	F/T	BR
PI	720	320	1.47	1.02	2.2
PII	270	180	0.57	0.99	
PIII	340	200	0.74	0.92	

No sensilla chaetica seen on mid Ta1, only 2 on hind Ta1

Note mid tibia is as long, or slightly longer than the femur

Most setae on fore Ta1 about 2.2 times diameter of Ta1, with a few longer.



Hypopygium of *C. sp. 4s.*

The anal point is relatively fine, styles are slender, and the SVo is a D-type, most similar to “e” of Strenzke 1959

Abdominal tergites with brownish black band covering at least the anterior 2/3 of segment, whitish in posterior region.

The anal point is relatively fine, styles are slender, tapering over posterior half, and the superior volsella is a D-type, most similar to “e” of Strenzke (1959), but is not dark as in *C. tenuistylus*.

Pupa: - from a male exuvia: Length about 8.7 mm; inner margin of wing case about 1.8 mm.

Cephalic tubercles about 105 μm long, 78 μm wide at base, with a subbasal seta about 38 μm long.

Abdomen with a central patch of shagreen on segments II – V, grading from posterior 2/3 on seg. II, to whole length of segment on segment V; on segment VI the shagreen is restricted to the anterior third. Pedes spurii B and A are as usual for the genus. Numbers of L-setae on segments II-IV also as usual, the posterior two on segment IV arising very close to each other.

Hook row on segment II with about 78 hooks, occupying about 40% of width of segment.

Caudolateral spur of segment VIII with 1 or 2 spines.

About 72 taeniae on each side of anal lobe, in two rows posteriorly.

Fourth instar larva: A small plumosus-type larva, length about 8.8 – 11.2 mm (fem. 11.0-11.2 mm; males 8.8 - 9.7 mm); PLT (200-280 μm), ventral tubules with anterior pair usually longer (ant. 0.84 – 1.16 mm; post. 0.80 - 1.16 mm (post.)). Anal tubules relatively long (3.2- 4.6 times longer than wide), posterior pair usually longer and thinner (3.7 – 4.6).

Gula slightly darkened on posterior third, FC pale to dark, often with a stripe outside the margin. Mentum (Fig. c) with sharp teeth; 4th lateral slightly reduced compared to the 3rd and 5th laterals (type I-II); central trifid teeth tall and linear in outline, with the c2 teeth well developed (type III).

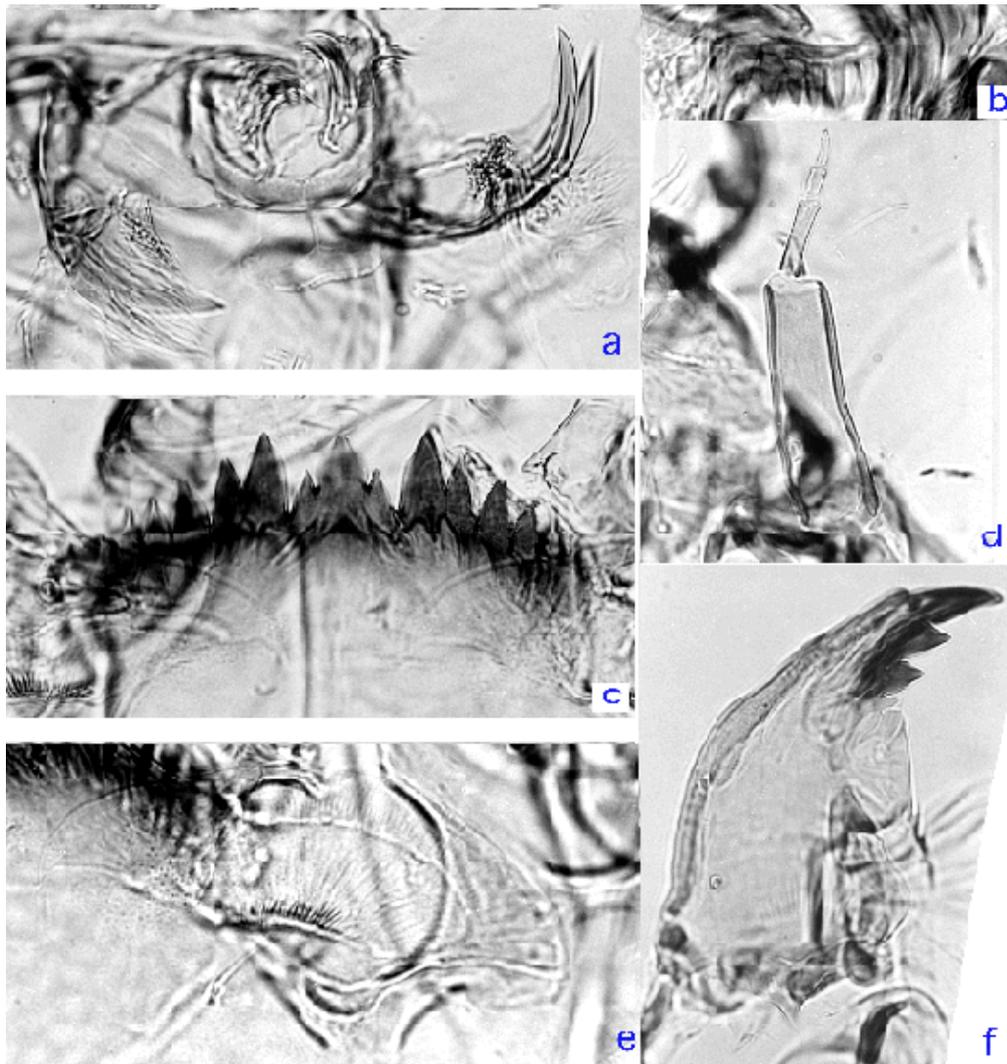
Ventromental plates (Fig. e) separated by about 0.2-0.35 of mentum width, with about 39-40 striae which extend at least $2/3$ to anterior margin; VMR 0.32-0.35.

PE (Fig. b) with about 11 or 12 sharp teeth. Premandible (Fig. a) with inner tooth at least twice (2.0, 2.4 x) the width of the outer, teeth about equal in length.

Mandible (Fig. f) with teeth relatively pale, 3rd inner tooth sometimes pale and hardly developed, but in others partly to well developed and grading in coloration (type IA-IIIIC).

Antenna (Fig. d) with basal segment relatively long, and slightly curved, about 3.7-4.3 times longer than wide, and 3.3-3.7 times longer than segment A2; RO between 0.33 and 0.5 up from base of segment; AR about 1.8-1.65; segment proportions (micron): 129 : 36 : 10 : 13 : 8.

Distance between the antennal bases greater than the distance between the S4 setae on the frontoclypeus.

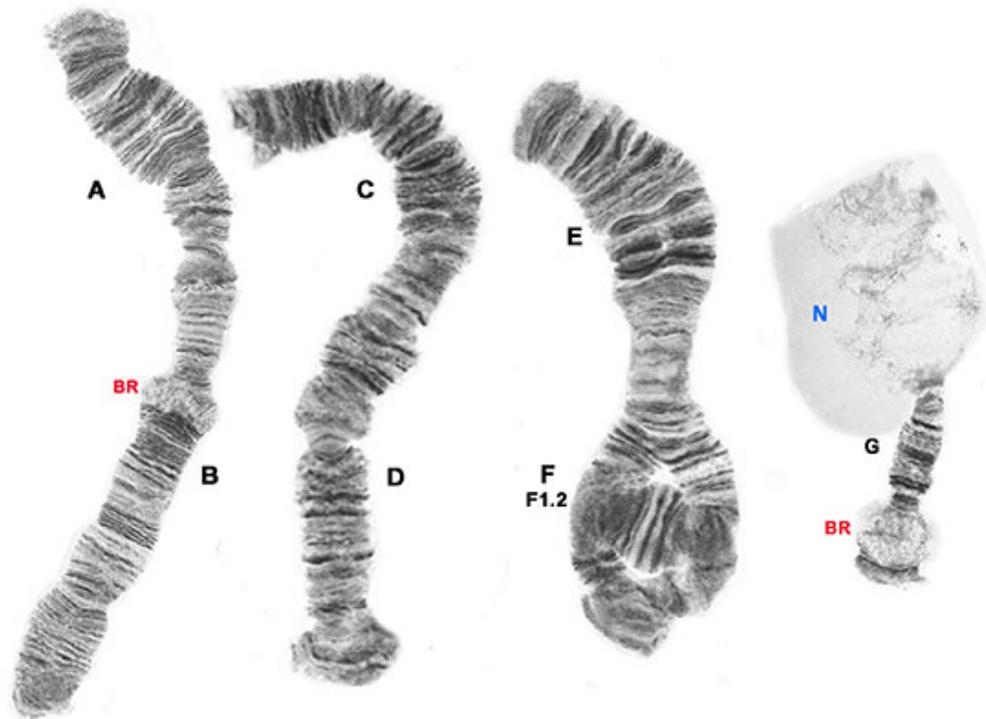


Distance between the antennal bases greater than the distance between the S4 setae on the frontoclypeus.

Cytology: 4 polytene chromosomes with the thummi-cytocomplex arm combination AB, CD, EF, G.

Nucleolus only in arm G, virtually terminal, but a heterochromatic cap visible in some specimens; two Balbiani rings, one distal, the other just distal of middle of the arm. Another BR, or a puff, proximal in arm B.

- Centromeres not heterochromatic. Polymorphism at least in arm F, and F2 may carry the MD gene.
- Arm A1: 1 - 2c; 10 - 12, 3 - 2d; 9 - 4; 13 - 19 i.e. as *holomelas*, *tenuistylus*, *longistylus*, etc.
- Arm B1: BR ring or puff just distal to characteristic bands (25-27), which are in the usual position near the centromere.
- Arm E1: 1 - 3e, 5 - 10b, 4 - 3f; 10c - 13 i.e. as *tenuistylus*, etc.
- Arm F1: possibly Standard, i.e. 1 - 23, if so, as *longistylus*, etc. Homozygous in females.
- Arm F2: simple inversion of at least middle half of the arm, possibly In17-11, i.e. as *tenuistylus*. Heterozygous in males.
- Arm G1: middle of arm rearranged compared with *C. tenuistylus*.



Found: Wisconsin- Why Not Bog Lake, County Road N, Vilas Co (46.02; -89.62).

All known specimens reared from two egg masses at the edge of a bog lake.

Although the adult appears similar to *C. tenuistylus*, the cytology makes it clear that this is a different, but probably related species. Arms A, E, and F have similar sequences, but arms B, C, D, and G show differences that cannot be explained by simple inversions.

Species 4t: *Chironomus* sp. NAII of Proulx *et al.* (2013) *Chironomus* sp. NAII of Proulx *et al.* (2013)

[BOLD:AAG5454](#)

Adult: Some data for males from BOLD specimens.

Male:



Adult male 08bbdip-1839+1234984344 from BOLD Database

A dark species: thorax dark brown, vitta and postnotum black. Abdomen dark brown, with narrow anterior pale region on segment I, and a posterior pale band on segments II-VII, becoming wider on segment VII. Anterior tibia paler basally, but becoming darker and femur and tarsi all darkened, no obvious beard; other legs all darkened. Wings pale, but anterior veins slightly darkened, particularly at crossvein.

Wing length about 4.75 mm, width abt. 1.15 mm, VR about 0.98.

Approximate leg measurements and proportions (micron):

	Fe	Ti	Ta1	Ta2	Ta3
PI	1200+	1200	1800	1000	800
PII	1520	1440	950	400	240
PIII	1400	1550	1210	790	550
	Ta4	Ta5	LR	F/T	BR
PI	800	280	1.5	abt 1	low
PII	180	240	0.7-0.75	1.05	
PIII	400	220	0.75-0.78	abt 0.9	

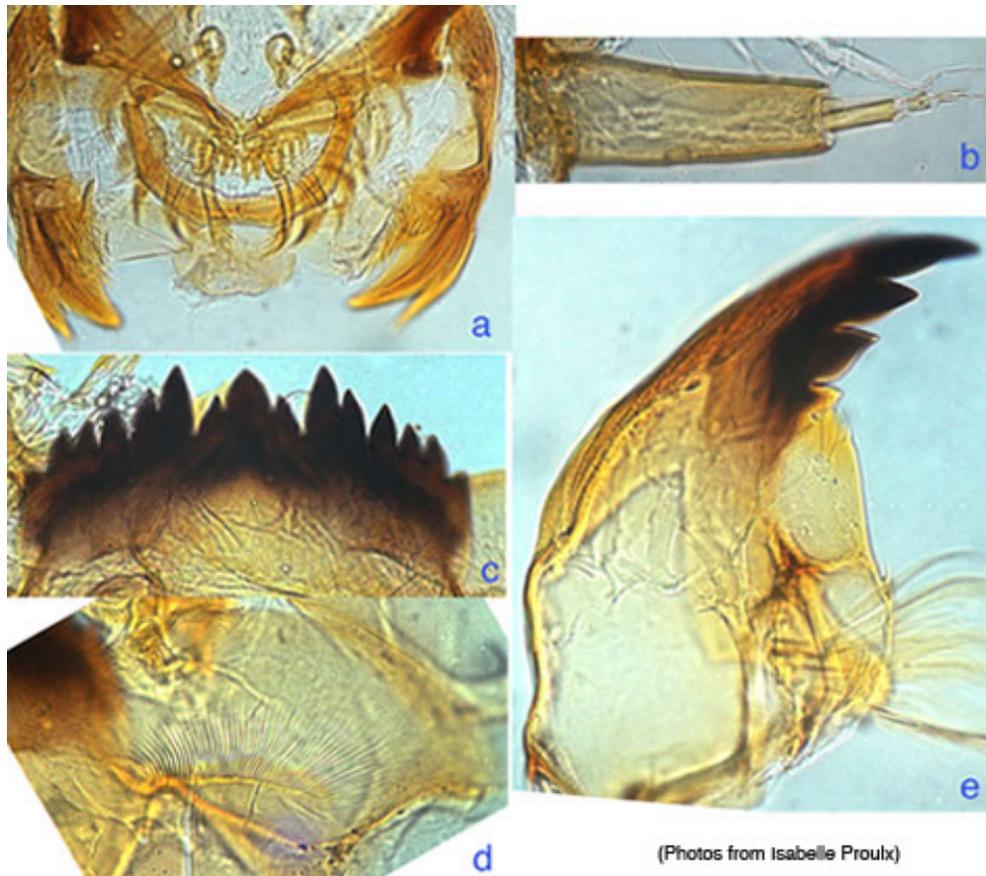
Female: Not known

Pupa: Not known.

Fourth instar larva: A medium sized salinarius-type larva; length about 11 – 13 mm. The frontoclypeus has a dark stripe and the gular region is darkened on posterior half. The c2 teeth of the mentum (Fig. c, below) trifid tooth are almost completely separated from the c1 tooth (type III); 4th laterals reduced to about the same height as the 5th lateral teeth (type II). Anterior margin of the ventromental plate (Fig. d, below) is smooth, with about 51-52 striae reaching just beyond middle of the plate, and with faint striae reaching at least half the remaining distance to the anterior margin, VMR about 0.25. PE (Fig. a, below) with 12-14 pointed and rather uniform teeth. Premandible (Fig. a, below) with inner tooth about 1.9 - 2.7 times wider, and slightly longer than, the outer tooth.

Antenna (Fig. b, below) with A1 about 3.41 (3.25-3.50) times longer than wide; AR about 2.23 (2.06 – 2.38); ratio of segments (μm) 141 : 34 : 12 : 15 : 7.

The 3rd inner tooth of the mandibles (Fig. e, below) is partially colored and fused to the lower margin (type IIB), at least 11 furrows on the outer surface near the base.



Cytology: Cytology of available specimens was not good. 4 polytene chromosomes, probably with the thummi arm combination AB, CD, EF, G. Arm G often unpaired and with a virtually terminal nucleolus.

Found in an oligotrophic lake at a depth of 4 m.

Found: Alberta- Johnson Lake, Banff N.P. (51.198°N, 115.479°W)(BOLD).
 Northwest Territories- Pontoon Lake, Yellowknife (62.535°N, 113.976°W)(BOLD)
 Ontario- G.Hall Public School, Little Britain (44.2817°N, 78.858°W)(BOLD); Silver Lake (46.43°N, 81.03°W), Sudbury area. (Proulx *et al.* 2013)
 Saskatchewan- La Loche Community School (56.482°N, 109.435°W)(BOLD)

This larva does not correspond to any of the other currently known salinarius-type from North America or the Palearctic.

Species 4u. *Chironomus* sp. NAIII of Proulx *et al.* (2013)

In BOLD Bin: [BOLD:AAV3582](https://www.boldsystems.org/index.php/Taxonomy/req.do?req=show_bin_content&bin_id=AAV3582)

Adult specimens in same Bin labelled *C. c.f. venustus*

This presumably refers to *C. venustus* sensu Pinder 1978, not sensu Staeger 1839 which has an S-type SVo. The Pinder species probably requires a new name, pending further investigation (Spies & Sæther 2004).

Adult:

based on photos associated with the BOLD Bin.

A dark species, with lighter patches on sides of thorax.

Male:



SVo closest to E(g) of Strenzke (1959), but not tapering towards the end; IVo extending to about the end of the anal point. GP relatively long and narrow, tapering gradually over posterior third.

Female:



Wing length about 5.25 mm.
Rear F/T about 1.
Appears haltere may be white.

Pupa: Not known.

Fourth instar larva: A medium sized salinarius-type larvae; length about 10 - 18 mm.. The frontoclypeus is pale and the gular region (below) is strongly darkened on posterior half.



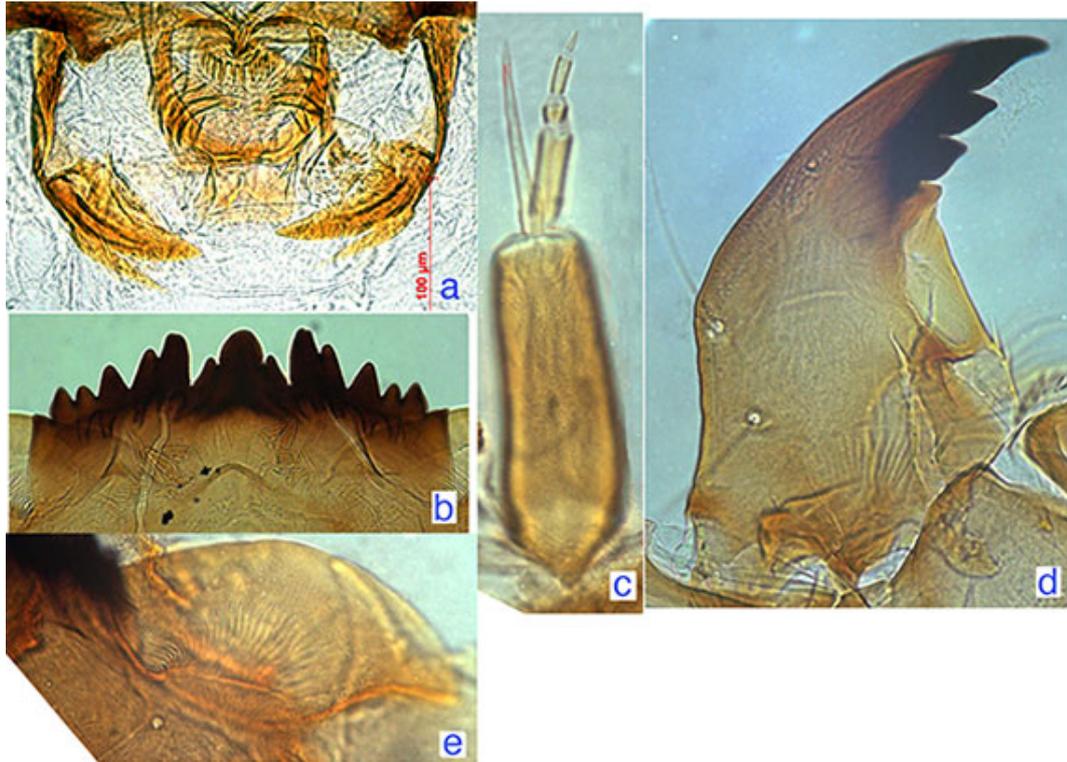
The c2 teeth of the mentum (Fig. b, below) trifid tooth are partially separated from the c1 tooth (type IB). The mentum 4th lateral teeth are reduced (type II).

The anterior margin of the ventromental plate is smooth (fig. e, below), with about 36 - 42 striae reaching to about center of the plate and then with fewer striae reaching about 2/3 of way to anterior margin.

PE with 9-15 pointed and rather uniform teeth. Premandible (Fig. a, below) with inner tooth about 2.5 - 3.2 times wider than the outer tooth, and slightly longer.

Antenna (Fig. c, below) with ratio of A1/A2 from 3.1 - 3.8; which is slightly lower than that of the very similar *C. cucini* (3.6-4.3); AR about 1.77 (1.58-2.03); A1 about 2.95 (2.02-3.38) times longer than wide; ratio of antennal segments (μm) 126 : 36 : 10 : 15 : 8.

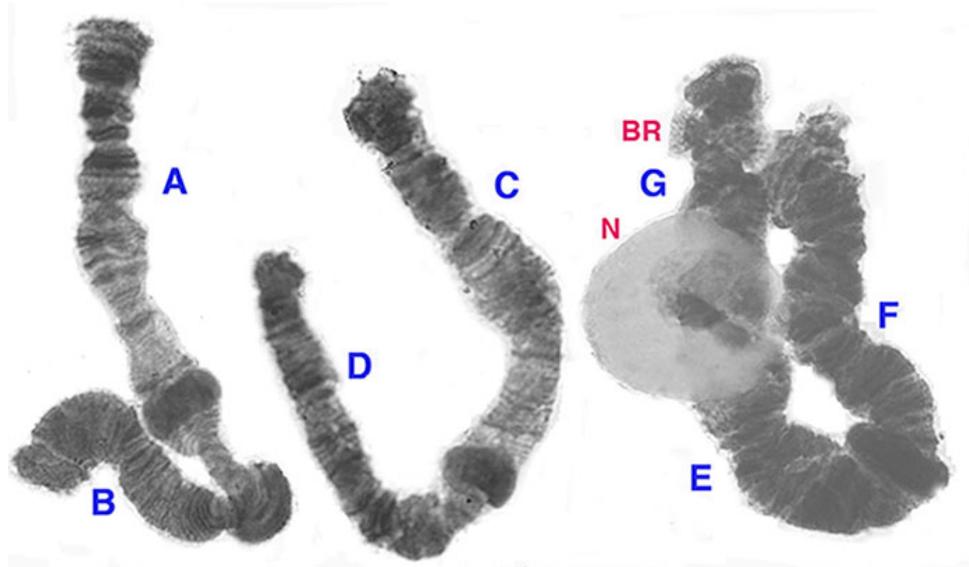
The 3rd inner tooth of the mandible (Fig. d, below) pale and fused to the lower margin (type 1A), at least 13 - 21 grooves on the outer surface at the base.



(Photos courtesy Isabelle Proulx)

Cytology: 3 polytene chromosomes with the modified thummi-complex combination AB, CD, GEF.

Centromeres are heterochromatic. A nucleolus is located near the junction of the arm G with arm E and a BR is located towards the distal end of arm G. Arm G closely paired.



This species was found in oligotrophic to mesotrophic lakes at depths varying from 5-12 m and at pHs varying from 7.1-7.9.

Found: **Ontario-** Lake McFarlane (46.42°N, 80.95°W), Hannah Lake (46.45°N, 81.03°W), Ramsey Lake (46.47°N, 80.95°W) - all nr. Sudbury (Proulx *et al.* 2013); St. Charles College, Sudbury (46.516°N, 80.926°W) (BOLD).
Quebec- Lake D'Alembert (48.38°N, 79.02°W), nr. Rouyn-Noranda.
 Norway – Finnmark (70.1545°N, 23.7212°W)(BOLD)

Cytology of this species suggests that this species might be related to *C. decumbens*. The *C. sp.* NAIII larval morphological description is comparable to that of *C. ?decumbens* (sp. 2x), but the only known larva of that species does not have heterochromatic centromeres.

Species 4v. *Lobochironomus* sp.

Adult: Not known.

Pupa: Not known.

Fourth instar larva: A small plumosus- or melanotus-type larva, about 8.7 (male) - 10.2 (female) mm. VT relatively long, posterior pair may be longer (ant. 1.03 - 1.67 mm; post 1.09 - 1.1+ mm), PLT long (400 - 720 μ m).

Head capsule darkened only around the posterior margin.

Mentum with 4th laterals barely reduced (type I), central tooth relatively tall with c2 teeth partly distinct (type III or could be type II). First and second laterals well separated

Ventromental plates separated by about 21 - 27% of width of mentum, with about 39 - 40 striae.

PE with about 17 - 19 teeth, including small interstitial teeth between some of the normal teeth.

Premandible with inner tooth about 1.7 - 2.5 times wider than the shorter outer tooth.

Antenna with A1 about 3.8 - 4 times longer than wide, RO between a third and a half way up from the base of segment; AR about 1.25 - 1.5; relative lengths of antennal segments (μ m) 112 : 41 : 10 : 14 : 7.

Mandible with third inner tooth hardly separated, but somewhat darkened (type I-IIB-C), and with about 12-15 grooves at the base.

Cytology: not known.

In thick mud, at depth of about 1m in a bog lake.

Found: Wisconsin - Why Not Bog Lake, County Road N, Vilas Co.

The presence of smaller interstitial teeth in the PE and of PLT suggests that this is a species of *Lobochironomus*. The larger PLT suggest it may be a previously unknown species, but it is possible that this is a polymorphism or an effect of environment. The mentum is similar to that described for *C. mendax*, but the second antennal segment is relatively longer.

Species 4w. *Chironomus* species "Florida" of Epler (2001).

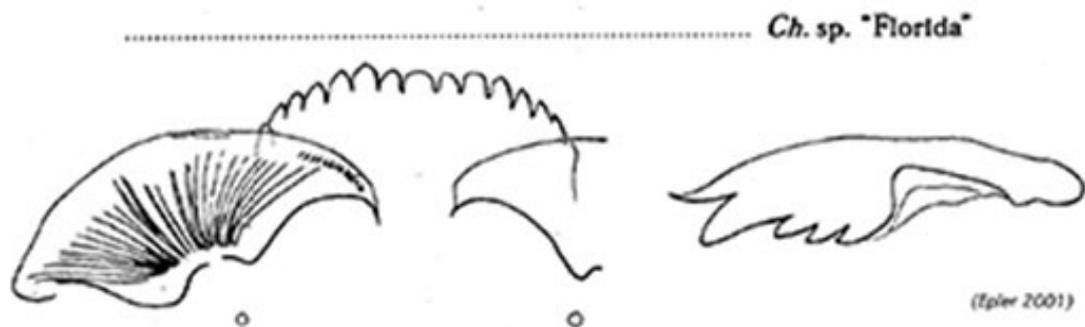
Adult: Not known.

Pupa: Not known.

Fourth instar larva: a plumosus- or semireductus-type, PLT as long as the segment width (Bolton 2012).

Mentum with simple central tooth and 14 lateral teeth, although it seems likely that this can be interpreted that the c2 teeth are relatively large and quite separate from the c1 tooth, and the first laterals are hardly higher than the other teeth.

Premandible with numerous teeth (figure shows 5).



Cytology: not known.

Inhabits burrows in *Nuphar* made by the aquatic moth *Bellura* (Pyralidae). In NE Ohio reported from a wetland stream and a natural lake (Bolton 2012).

Found: Florida- peninsular Florida.
Ohio- NE Ohio.

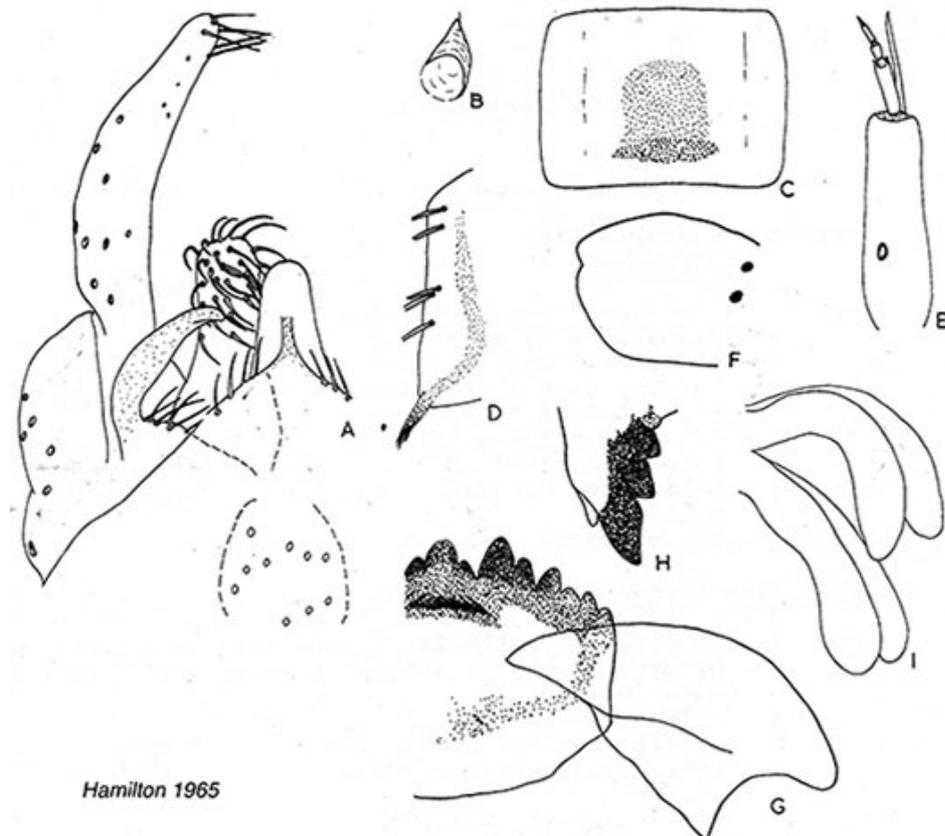
Epler notes that a species in which the larva (only known stage) has a similar premandible was described from Amazonia by Reiss (1974), however it is likely that this is *C. phytophylus* Correia & Trivinho (2007), which is certainly not this species, as it has a thummi-type larva and a normal central trifid tooth on the mentum.

Species 4x. *Chironomus* sp. NAI of Proulx *et al.* (2013)
also *Chironomus* nr. *anthracinus*

In BOLD Bin: [BOLD:AAG5476](https://www.boldsystems.org/#genid:AAG5476)

Some as *Chironomus anthracinus*-group.

Adult: Described as *C. rempelii* by Hamilton (1965):



Male:

AR: 5.23 – 5.58 (5.37,4)

Wing length 4.2 – 4.9 mm, VR about 1 or slightly higher.

LR 1.23 – 1.44 (3); fore tarsus with a long sparse beard.

Black or blackish with grey bands along the caudal margins of each abdominal tergite.

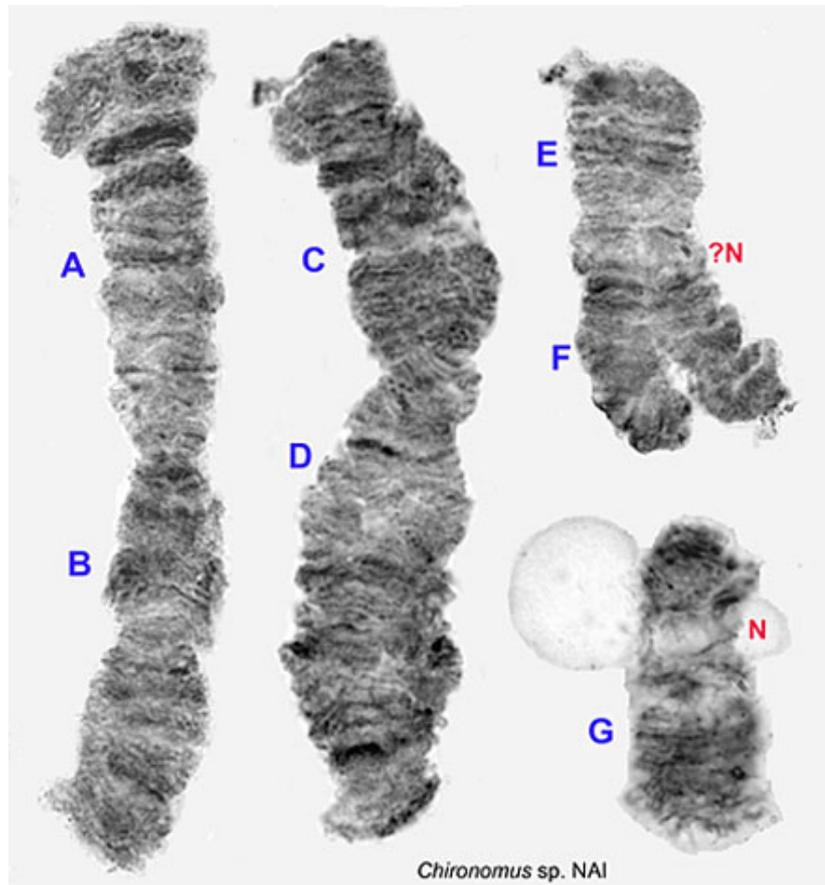
Head: frontal tubercles long, about 3x longer than broad., temporal setae in double irregular rows which extend medially to points midway between vertex angles of eyes and mid line of head. Palpal proportions (segs 2-5) 8 : 28 : 26 : 34. Clypeus large with 49 - 62 setae.

Thoracic setae: dorsocentrals in a double irregular row; prealar – 5-9; scutellum with two irregular rows and some random setae near center line between these two rows.

Anal point very broad, superior volsella curved, E-type of Strenzke (1959) – Hamilton's illustration shows the distal end turned down, and different from the illustration of Townes (1945) for *C. anthracinus*. About 10 setae on tergite IX.

Pupa: Described as *C. rempelii* by Hamilton (1965).

Cytology: 4 polytene chromosomes with the thummi arm combination AB, CD, EF, G. Chromosomes quite short. Appearance and sequences essentially as in *C. anthracinus*: Arm G generally paired with a nucleolus about 1/3 from the end. Arm F probably with a nucleolus near the characteristic bands. Nucleoli in arm G, and also in arm F. No polymorphism identified.



Molecular: This species is largely identified by the mtCOI DNA sequences, which differ from those of *C. anthracinus* by 22 fixed differences (Table S4 of Proulx *et al.* 2013).

GenBank accession numbers: KF278219-20, KF278344

There is no difference in the *gb2β* sequences between this species and *C. anthracinus*.

GenBank accession numbers: KF278390-92

Oligotrophic, near-neutral lakes at depth of 4 to 7.5 m. A single generation per year.

Found: British Columbia - Marion Lake, Squamish (49.55; -123.18).

Ontario - Kasten Lake (46.37; -80.97), Sudbury area (Proulx *et al.* 2013)

Species 4y. *Chironomus* species TE11, from BOLD database

In BOLD Bin: [BOLD:AAB4581](https://www.boldsystems.org/index.php/Taxonomy_Reports.asp?report=BOLD:AAB4581)

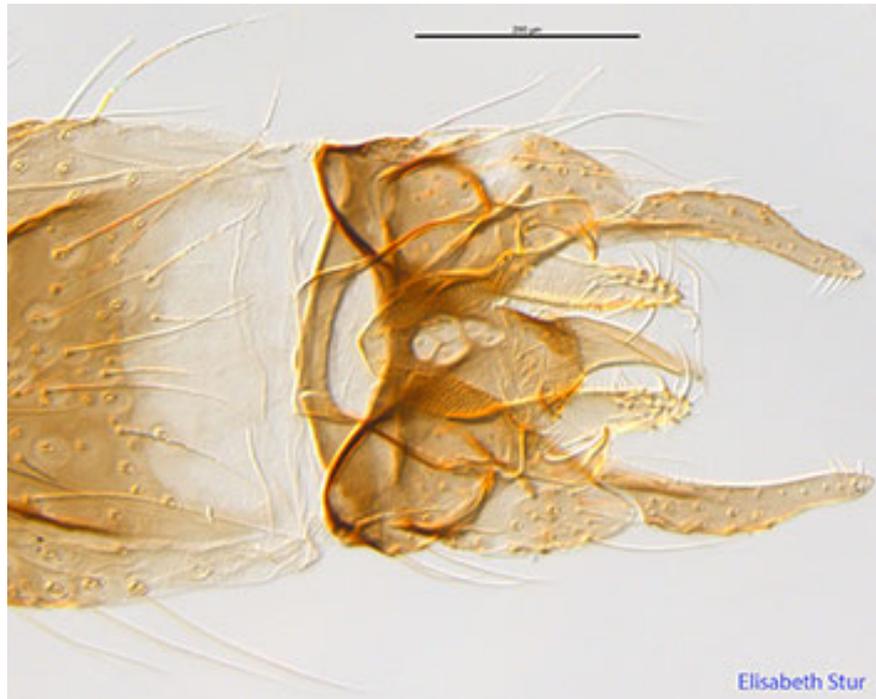
Adult:

Male

Some specimens in the BOLD database are almost completely dark brown-black, while others are much lighter, as indicated below.

AR about 3.5-4

Legs – LR about 1.52-1.57; femurs yellowish, knees darkened; Anterior femur and tarsal segments dark; other femurs yellowish, with darkened tarsi.



Abdominal tergites largely dark with a narrow yellowish band at posterior margin. About 6-11 setae near center of tergite IX in 3 or 4 discrete patches. SVo closest to Strenzke's S(c), but end quite pointed with a ridge making it appear like the bill of a bird. Styles slender, tapering over posterior third.

Pupa not known.

Fourth instar larva: Medium sized thummi-type larva (fem. abt. 14mm), anterior VT longer than posterior pair (1.24 cf. 1.18). Gula dark on posterior 1/3, FC very slightly dark, with slight darkening elsewhere.

Cytology: 4 polytene chromosomes with the thummi-arm combination AB, CD, EF, G. Arm G with a virtually terminal nucleolus and a prominent BR about a quarter from the other end. Paired only at nucleolus.. No nucleoli in the other chromosomes. Centromeres obvious.

Arm A1:

Arm B1: Puff (group 7) near distal end of the arm..

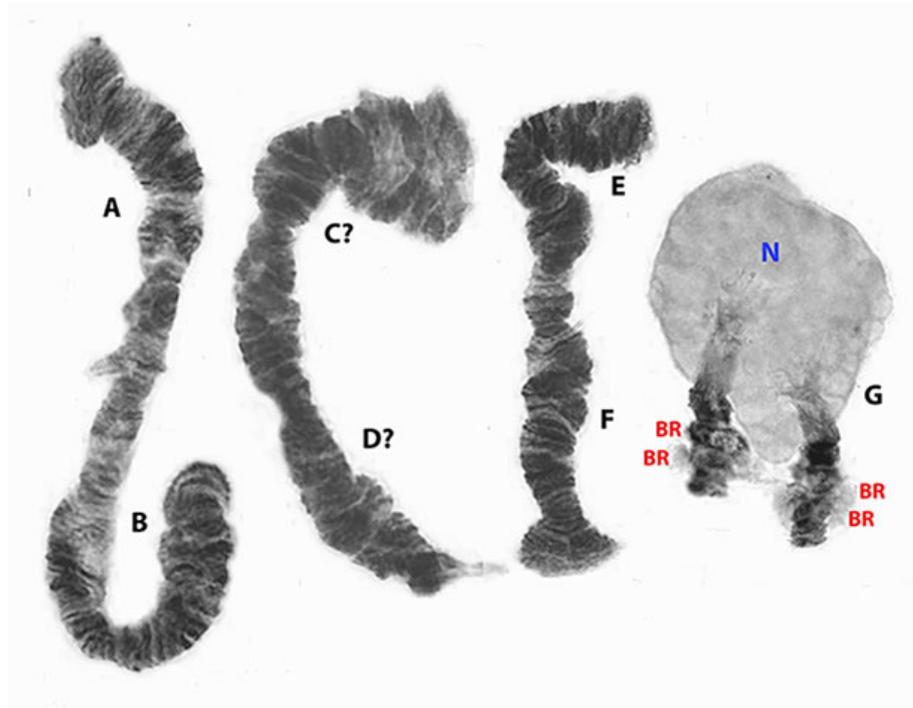
Arm C1: Constriction (group 4) about one third from centromere.

Arm D1:

Arm E1:

Arm F1:

Arm G1: Virtually terminal N, two BRs about a quarter from other end with only a few bands between them.



Ontario sample from shallow pool with leaves and debris.

Found: **Ontario**- – about 4.5 km S. & W. Clarence Creek, Russell Co. (45.50°N, 75.22°W).
Manitoba- – Churchill (Ekrem & Stur)
Yukon Territory- - Ivvavik National Park (69.162°N, 140.155°W) (BOLD BIOUG17183-B09)

Species 4z. *Chironomus* species 4z. *C. species* Obatanga

Adult and Pupa: Not known.

Fourth instar larva: Single known larva is a small (8.1 mm) halophilus-type. AT relatively long (3.1 or 4.7 longer than wide) with a constriction near the base, abt. 355 µm long but ventral pair narrower. Gula and FC pale.

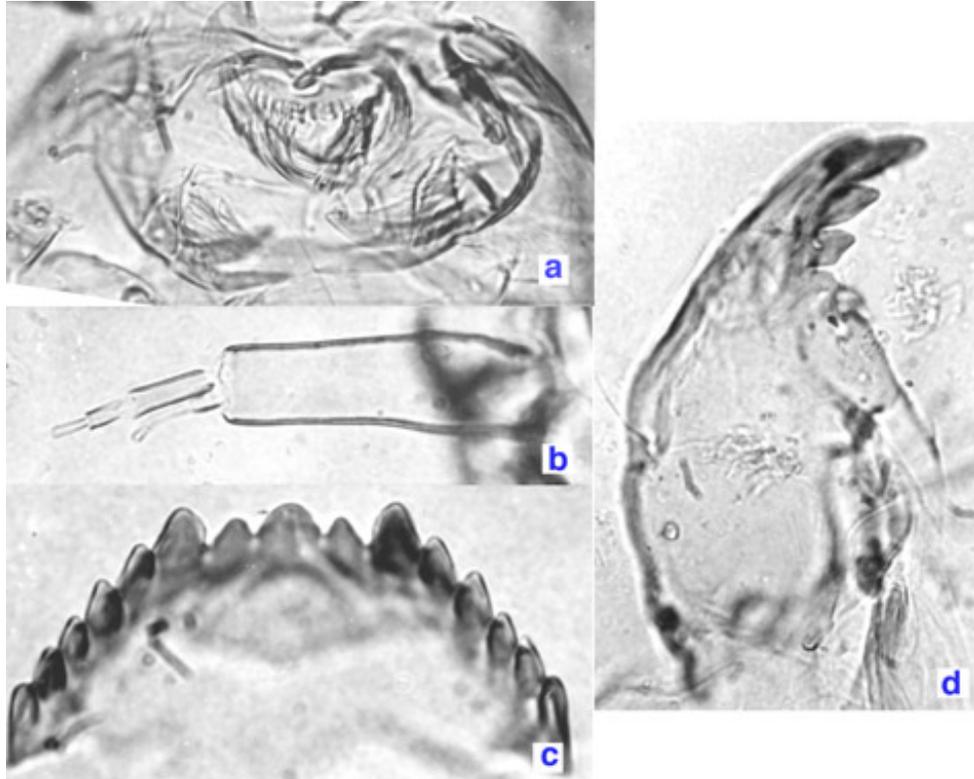
Mentum with 4th laterals slightly reduced (type I-II), central tooth with c2 teeth well separated (much more so than apparent in fig. c, below) and about ¾ height of c1 tooth (type IV).

VMs about 170 µm long, about 3.05 times longer than deep and 1.22 times the width of the mentum; with smooth outer margin and 35-36 striae which reach about halfway to margin, VMR about 0.36; possibly separated by about 0.44 of mentum width.

PE with about 15 teeth, at least two small and fine (type D, but with sharp teeth). Premandible with outer tooth longer, and inner tooth around 2-2.2 times wider than the outer.

Distance between antennal bases greater than that between S4 setae, which are separated by about 0.79 of the FC width.

Antenna with segment 1 about 3.8 times longer than wide, RO about 30-35% up from base of segment; AR about 2.16; segment proportions (μm) 123 : 28 : 10 : 13 : 6.
Mandible with 3rd inner tooth pale and only partly separated (type 1A), about 11-12 furrows on outer surface near base; 11-12 taeniae in PMA; distance from tip of dorsal tooth to apical tooth 24 μm .



Mouthparts of *C. sp. Obatanga*. a. Pecten epipharyngis and premandibles, b. Antenna, c. Mentum, d. Mandible.

Cytology: Polytene chromosomes of only larva in poor condition. Arm G has a subterminal nucleolus. One chromosome appears to be EF.

In small pools amongst leaves on the bottom.

Found: Ontario- – Obatanga Provincial Park (48.32; -85.09), Algoma Co.

It is possible that this is a species of *Chaetolabis* or *Lobochironomus*.

Species 5a. *Chironomus* species 5a. *C. (Lobochironomus) storai*, Goetghebuer, 1937-54 *Tendipes storai* – Goetghebuer (1937-54)
Einfeldia storai – Ashe & Cranston (1990)

This is BOLD Bin: [BOLD:ADD2757](https://www.boldsystems.org/index.php/Taxonomy_browse.asp?BINID=ADD2757)

This species has been reported from California by Deiner et al. (2013), with the note that the identification was confirmed from the mtCOI sequence by comparison to two specimens from

northern Finland and Sweden in the BOLD database from the Norwegian University of Science and Technology.

This means that *C. storai* is Holarctic in distribution at either high latitude or high elevations. No morphological information is available for the Californian specimens, so descriptions and cytology must be based on Palearctic material.

Adult:

Male: AR 3.46-4.21, LR 1.44-1.64, BR 2.77-5.27.

Wing length 3.30-3.92 mm.

Thoracic setae – acrostichal 9-20; dorsolateral 21-36; prealar 6-9; supraalar 1-2; scutellar 39-64.

Abdomen - setae near middle of tergite IX - 2-17. SVo bent almost at right angles.

Pupa: Caudolateral spur of segment VIII often with only one spine.

Fourth instar larva: A plumosus-type larva, PLT about 150 µm (abt. half segment length). Head capsule pale.

Mentum appears to be of type 1A-B, with the c2 teeth little more than notches on the C1 tooth, 4th laterals not figured.

Cytology: Four polytene chromosomes with the thummi cytochrome complex arm combination AB, CD, EF, G. Centromeres obvious and heterochromatic on some chromosomes (CD and EF?).

Polymorphism of arm A found in one Swedish population.

Alpine lakes (littoral).

Molecular sequence:

mtCOI: Sequence for specimens from Finland and Sweden is on BOLD, while the California sequence is in GenBank (accession number KF000109)

Found: California- – Sequoia National Park, Sierra Nevada (Deiner *et al.* 2013)

Finland: Kuusamo kyrkoby; Isosuo (Type locality)

Species 5b. *Einfeldia* species A, Epler 2001

Adult: The adult of this species has not been described, but it may bear some resemblance to those of *E. pagana*, since J. E. Sublette apparently misidentified an adult and pupa of this species as *E. pagana*.

Pupa: See note above concerning the adult.

Fourth instar larva: Frontal apotome with fenestra and rugosity anterior to it..

Mentum with central tooth with slight notches (type I), lateral teeth grading evenly (type I).

PE weakly tripartite and covered with minute spinules.

Mandible with three inner teeth and no grooves near base.

Cytology: Not known.

Found in wetlands, lakes and streams in the south-eastern states.

Found: Florida- – (Epler 29001)
Georgia- – (Epler 2001)
Michigan- – (Curry 1961 as *E. pagana*)
North Carolina- – (Epler 2001)
Ohio- – (Bolton 2012)

Species 5c. *Chironomus* sp. 1TE, from BOLD Database
Also referred to in BOLD database as *C. cf. saxatilis*.

In BOLD Bin: [BOLD:AA00592](https://www.boldsystems.org/index.php/Taxonomy/bold_bin/BOLD:AA00592)

It is possible that this is the species recorded as *C. riparius* in Greenland.

Adult:

Male

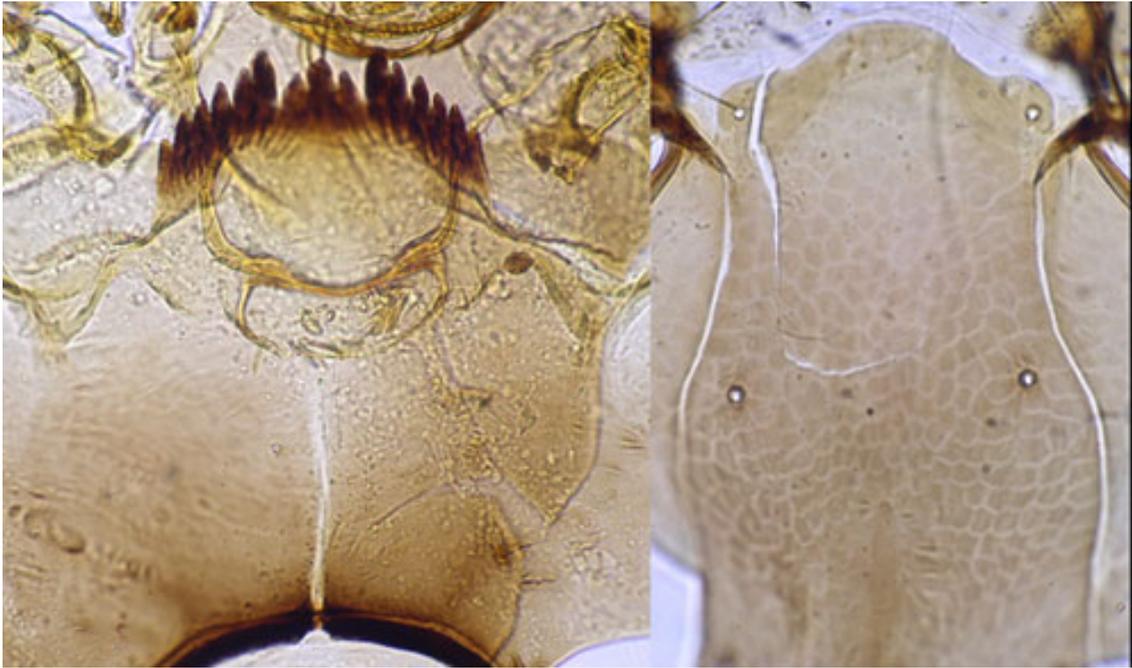


Dark species, thorax, postnotum and abdomen and legs blackish brown.
Wing length about 3 mm, width about 0.8 mm, VR about 0.94; AR perhaps 3-3.5; LR about 1.4-1.5
About 6-9 setae on tergite IX, each in a separate patch. Anal point narrow, SVo similar to *C. holomelas*, *C. saxatilis* closest to Keyl's S(c)-type; style narrowing over posterior half.

Pupa: Not known

Fourth instar larva: (based on Greenland specimens): A small-moderate halophilus-type 11.7-12.5 (males 11.7-12.2 mm.), VT short, posterior pair usually longer (0.24-0.40; 0.28-0.40 mm), AT long with constriction in middle, dorsal abt. 380-825 μ m; abt 2-4 times longer than wide; ventral abt. 400-700 μ m, abt 2-4 times longer than wide).

Darkening of head capsule variable: gula pale to dark; frontoclypeus dark, sometimes with darkening outside the FC, particularly near the posterior margin, but capsule generally yellowish brown.



Mentum with 4th laterals reduced about halfway to height of 5th laterals (type I-II), central trifid tooth probably type III, but wear may make it appear as type IB or type IV.

Ventromental plates separated by at least a third to half the mentum width, with about 35-48 striae, VMR 0.22-0.34. PE with about 11-15 relatively broad teeth (type C).

Premandible with teeth about equal in length or outer slightly longer, inner tooth about 2.5-3 times wider than outer tooth.

Distance between antennal bases slightly longer than that between the S4 setae, which are separated by about 3/4 of the width of the FC.

Antenna with A1 about 0.4-0.45 of the VHL and 3.5-4 times longer than wide, RO variable - from 0.15 to 0.36 up from base of segment; AR abt 1.75-2.51. Antennal proportions (μm) 125-150 : 32-40 : 9-11 : 13-15 ; 6-10.

Mandible with 3rd inner tooth partly to fully separated and partially darkened (type II-III B), with about 12-13 furrows on the outer surface near the base, and 11-13 taeniae in the PMan.

Larval characters, particularly of the antenna, are quite variable. While nothing is known of the larval habitats, it is possible that this is due to ecological difference which may influence the length of the life cycle, which is known to extend up to 7 years in some high northern species (Butler 1982a & b), i.e. there may be members of different cohorts.

Cytology: 4 polytene chromosomes with the pseudothummi arm combination AE, BF, CD, G. Arm G with a terminal nucleolus and no clear BRs. No nucleoli in other chromosomes.

Inversion in arm A.

Arm A1: Inverted towards distal end cf. *holomelas* sequence.

Arm A2: simple inversion of about 1/3 of arm distal to middle of arm – possibly as *holomelas*.

Arm B1: Puff (group 7) near distal end, with dark bands (group 8?) on proximal side.

Arm C1: 1, 6 – 2, 7 – 10?, etc. Possibly as *holomelas*, *saxatilis*.

Arm D1: proximally possibly 16-24. Inverted cf. *saxatilis*

Arm E1: probably 1 - 3e, 10b – 3f, 10c-g, 11 – 13 i.e. as *luridus*, *halophilus*, etc.

Arm F1: ?? – 21-23

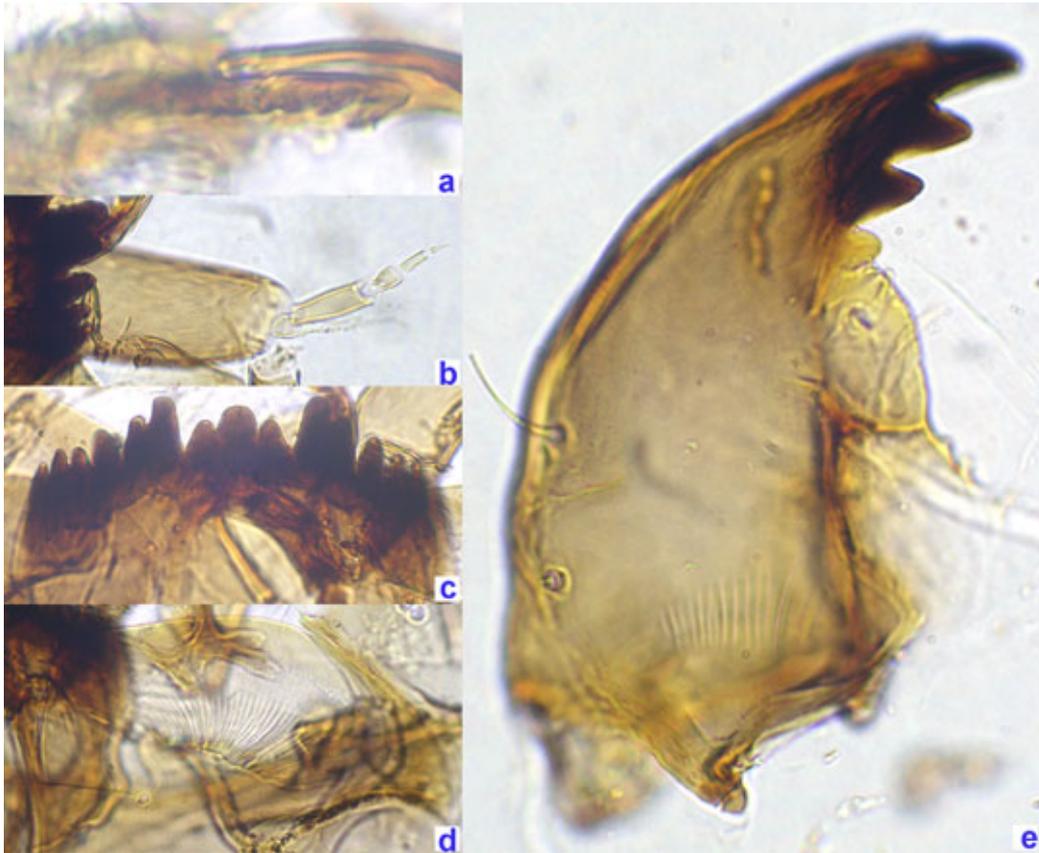
Arm G1: Terminal nucleolus. Probable BR about middle of the chromosome. May be closely paired or paired only at nucleolus.



Molecular sequence:

mt*COI*: Sequence for this species is in the BOLD database where it is placed in BOLD BIN AAC0592. However, the sequence for one larva shows only about 94% similarity, and is described below as a potential closely related species, *C.sp. 5h*, for which there is no sequence in GenBank or the BOLD database.

Another larva from Peary Land has a *COI* sequence most closely related to Sp. 1TE, and there are some differences in the larvae – however, the larva shows a number of malformations so is not certain just how real some of these differences are.



Fourth instar larva GP8.1.1 12F: A halophilus-type larva, very similar to those of Sp. 1TE. Length about 10.8 mm, ventral tubules shorter than those of other available specimens: anterior 0.18 mm. posterior 0.24 mm; anal tubules much shorter 300-400 μm (ventral pair longer) and about 1.9-1.8 times longer than wide. Head capsule generally dark, gula darkened over posterior 2/3. Distance between the S4 setae about the same as that between the antennal bases, but the setae are closer to the margin (80% of width of frontoclypeus between them).

Mentum with 4th laterals reduced about to level of 5th laterals (type II) and central tooth probably type IB.

Ventromentum and PE as in other larvae; Premandible not clear.

Antenna also essentially as in the other larvae, but A5 is the same length as A3.

Mandible of type IIB, and with similar number of PMA taeniae; with 14-15 furrows on the outer surface near the base.

Found: Alberta- - (from BOLD database)

Northwest Territories - Aulavik National Park (73.71°N, 119.92°W), Banks Island.

Nunavut - Auyuittuq National Park (67.88°N, 65.02°W) and Sirmilik National Park (72.99°N, 81.14°W), Baffin Island; Quttinirpaaq National Park (82.22°N, 72.22°W), Ellesmere Island.

Yukon Territory - Ivvavik National Park (69.162°N, 140.155°W).

Greenland - Nedre Midsommer Sö, Peary Land, sample GP8 (82.63°N, 32.50°W); Northeast Greenland NP.

Norway – Svalbard

Sweden – Borgholm, Barnaesuddern, Oeland (BOLD)

C. saxatilis was described by Wülker *et al.* (1981) with the type specimen a polytene chromosome squash. It has been suggested that it is a synonym of *C. lugubris* (Lindeberg, unpubl.), although this is not supported by *COI* sequence data. It is very similar in morphology to *C. holomelas*, such that Wülker *et al.* did not see the necessity of illustrating the male terminalia. The polytene chromosomes of a specimen, not yet confirmed from the Barcode, suggest that the present species cannot be *C. saxatilis*, but is closely related and does not match any cytologically studied species from the Holarctic.

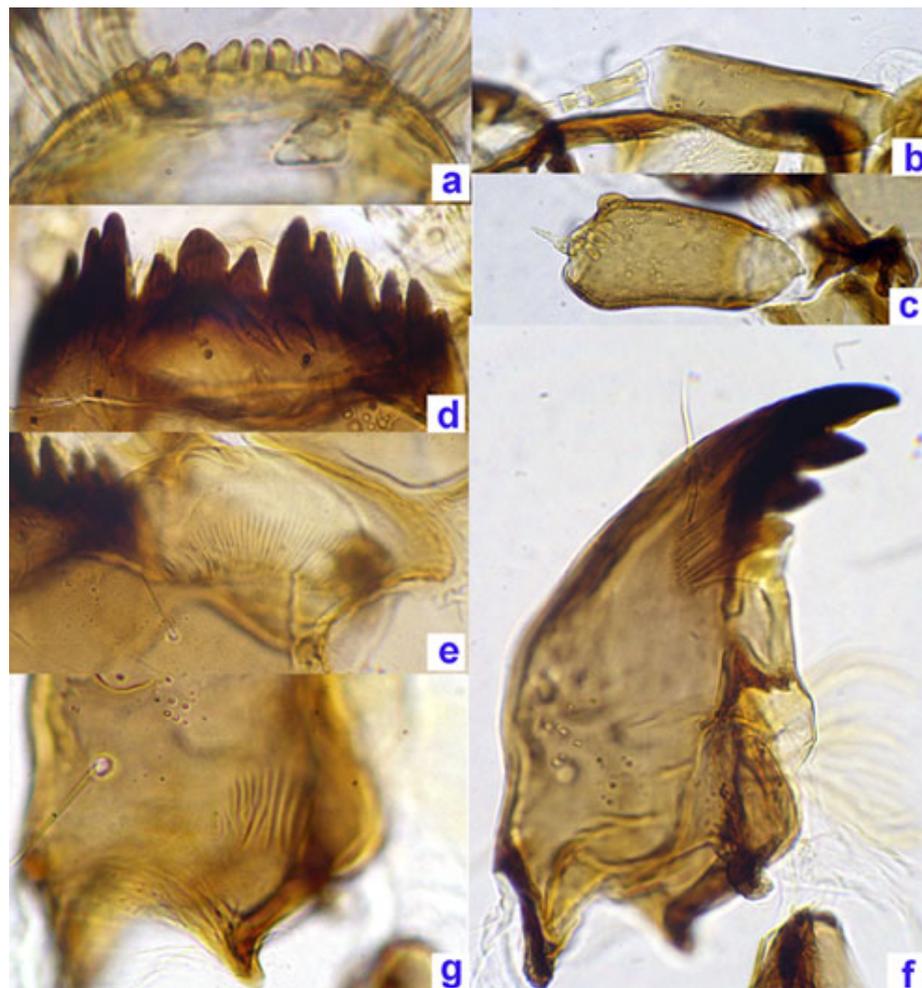
Species 5d. *Chironomus* sp.

Currently known from only a single larva, with no DNA sequence yet available.

Adult and Pupa: Not known.

Fourth instar larva (GP8.2.1 22): A medium sized (12.2 mm) salinarius-type larva. Dorsal ATs essentially spherical in shape (400 x 380 μm), ventral pair about 2 times longer than wide (540 x 280 μm).

Gula slightly dark on the posterior third, frontoclypeus slightly dark and slightly dark outside it, becoming darker towards the posterior margin.



Mentum (Fig. d, above) width about 0.7 of the VHL, with 4th laterals hardly reduced (type 1) and c2 teeth relatively well separated from c1 (Type 4 or possibly a slightly worn type 3).

VM plates (Fig. e, above) separated by about 40% of the mentum width, VMR about 0.23, and either notches or small hooks near inner margin (as in other Greenland species studied); about 45-46 striae.

PE (Fig. a, above) with about 11 teeth of type C. Premandible with teeth about equal in length, inner tooth about 3 times the width of the outer tooth.

Distance between the antennal bases just slightly larger than that between the S4 setae, which are separated by 78% of the FC width.

Antenna (Fig. b, above) with A1 about 40% of VHL, 3.3 times longer than wide, RO between a third and half way up from the base; AR about 2.35; antennal proportions (μm) 152 : 32 : 10 : 15 : 8.

Mandible (Fig. f, above) with 3rd inner tooth partially to fully separated, but only partly colored (type II-IIIB); 13 furrows on outer surface near the base; and 13 taeniae in the PMA.

This larva has a number of deformities, such as a very aberrant antenna (Fig. c, above) and irregular furrows on the mandible (Fig. g, above).

Cytology: 4 polytene chromosomes. Cytology of only known specimen not clear – but only 1 nucleolus, essentially terminal on arm G.

Found: **Greenland-** - Nedre Midsommer Sö, Peary Land, sample GP8 (82.63°N, 32.50°W).

Species 5e. *Chironomus* sp. 5e

This is probably BOLD BIN: [BOLD:AAG5437](#)
(some entries incorrectly under the name *C. pilicornis*)

Adult:

Torbjørn Ekrem and Elisabeth Stur (pers. comm.) state that the adult of this species matches the Wuelker (1996) description of *C. pilicornis*. In the case of the female this is not quite true, as *C. pilicornis* is described as having a completely black thorax, while the female below clearly has a yellowish scutellum. The chromosomes are also different from those of *C. pilicornis*. The species is therefore another member of the pilicornis-group for which one of the names listed as synonyms of *C. pilicornis* may be the valid name.

Male

LR about 1.0.



From BOLD GL25

About 13 setae, in discrete fields, central on tergite IX. SVo long and curved, closest to type E(i), reaching at least halfway up the IVo. Style relatively narrow and narrows sharply in distal quarter.

Female



From BOLD BIOUG16470-A05

Blackish species, pale band at posterior of abdominal segments; halteres and scutellum yellow.

Wing length about 5.2 mm, width about 1.4 mm; VR about 1.07.

Legs yellowish, with darkened knees.

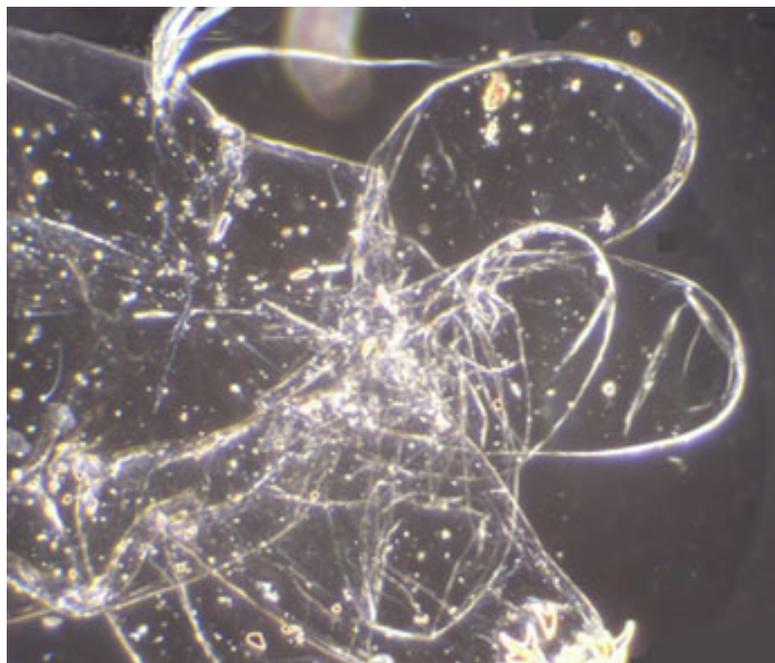
Pupa: Not known.

Fourth instar larva:



From BOLD HLC-30527
(labelled as *C. pilicornis*)

A medium sized (12.3-13.2 mm) salinarius-type larva. Dorsal ATs shorter but wider than the ventral pair (480 x 300 vs. 610 x 210 μ m).



Head capsule generally brownish, gula slightly dark to dark on posterior third to half, FC slightly dark, also slightly dark outside it.

Distance between antennal bases sometimes greater and sometimes about the same as that between the S4 setae or up to 21% greater; setae separated by about 0.72 of the FC width. Mentum (Fig. d, below) with 4th laterals slightly reduced (type I-II), although worn in available specimens, the c1 tooth is high, with relatively well separated c2 teeth (i.e. type III).

Ventromental plates (Fig. e, below) separated by about 0.4 of the mentum width, about 3.36 time longer than deep, with about 46-56 striae; about 7 notches (or teeth?) at the inner margins, VMR about 0.29-0.36.

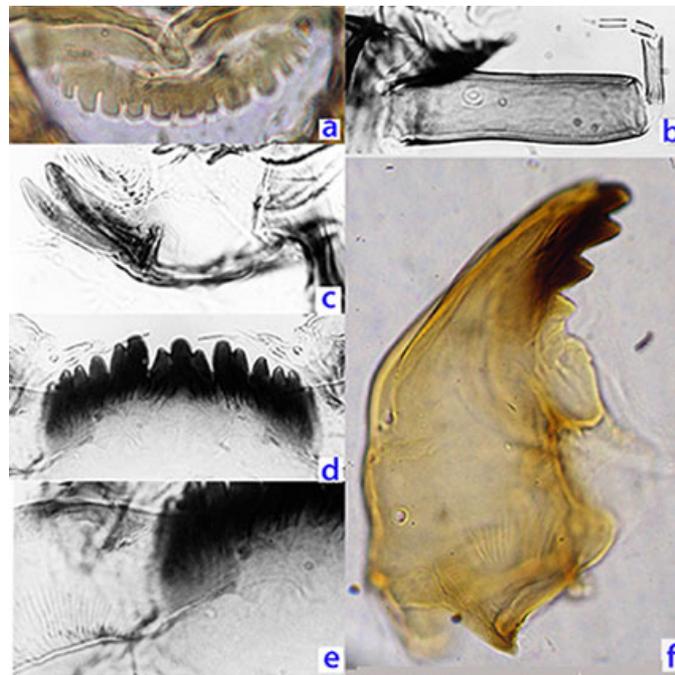
PE (Fig. a, below) with about 10-12 relatively broad (but worn) teeth, probably type C.

Premandible (Fig. c, below) with teeth about equal in length; inner tooth about 2.5-3 times wider than the outer tooth.

Antenna (Fig. b, below) has A1 about 3.5-4 times longer than wide; RO from 0.15-0.36 up from base; AR about 1.75-2.51; antennal proportions (μm); 125-147 : 32-40 : 9-11 : 13-15 : 6-10.

Distance between the antennal bases may be about the same as that between the S4 setae.

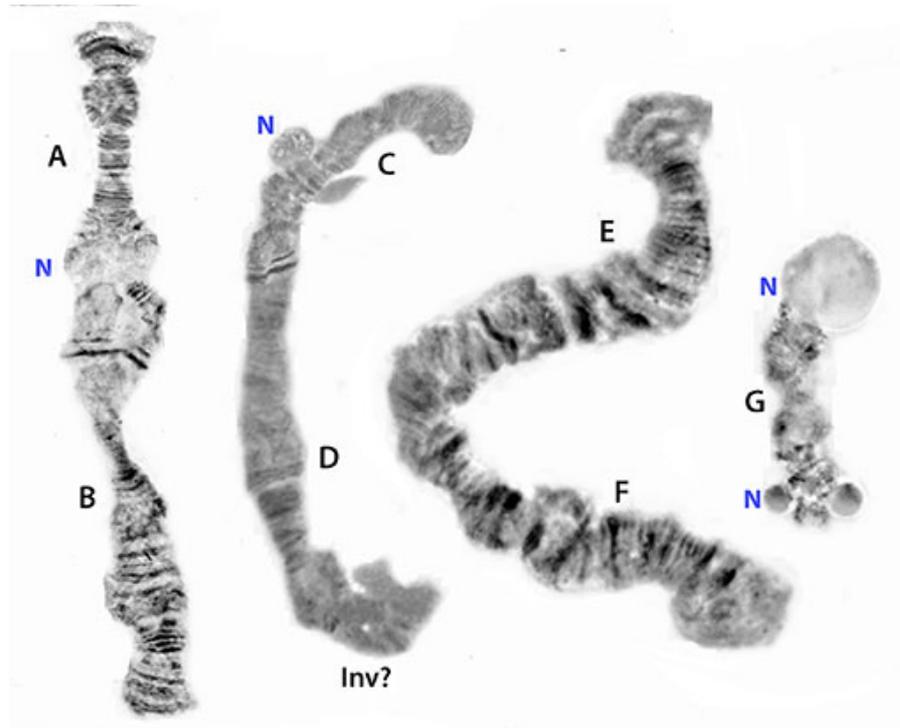
Mandible (Fig. f, below) with 3rd inner tooth partially or completely separated, but only partly darkened (type II-III B); about 12-13 furrows on outer surface near the base and about 12-13 taeniae in the PMA.



Larval characters, particularly of the antenna, are quite variable. While nothing is known of the larval habitats, it is possible that this is due to ecological difference which may influence the length of the life cycle, which is known to extend up to 7 years in some high northern species (Butler 1982), i.e. there may be members of different cohorts.

Cytology: 4 polytene chromosomes with the thummi-cytocomplex arm combination AB, CD, EF, G.

Centromeres obvious, but not heavily heterochromatic as in *C. pilicornis*, and at least 3 nucleoli - one near the centromere of arm A, one near middle of arm C, a third subterminal in arm G (probably the major one) and probably an additional one subterminal at the other end of the arm. Possible polymorphism distal in arm D, which also differs by a medial inversion from that of *C. pilicornis*.



Molecular sequence:

mtCOI: The sequence of this species is not found in GenBank, but in the BOLD database it matches the specimens incorrectly identified as '*C. pilicornis*'.

Found: **Greenland**- - Nedre Midsommer Sø, Peary Land, sample GP8 (82.63°N, 32.50°W), Zackenberg (74.4701°N, 20.576°W)(BOLD).

Nunavut- - Devon Is. (HLC-30527);

Quttinirpaaq Natl. Pk, Ellesmere Is. (81.402°N, 76.873°W)(BIOUG16470-A05) (both from BOLD)

Species 5f. *Chironomus (Lobochironomus) montuosus* Ryser, Wülker and Scholl. 1985,

Egan and Ferrington (2015) reported *C. (Lobochironomus) montuosus* from Yosemite National Park on the basis of pupal exuviae, but the correct locality is coastal rock pools in Isle Royale National Park, Michigan, which may mimic the alpine conditions from which it is reported in Europe.

There is currently no independent confirmation for the existence of *C. montuosus* in the Nearctic. If confirmed, this species is of Holarctic distribution.

Adults: No adults are known from the Nearctic.

Male: Based on Palearctic material, the ground color is dark, with the thoracic segments uniform deep black and the abdominal segments dark brown, the rear edge of segment VII brightly colored. The femur and tibia are dark brown, clearly darker than the tarsal segments. Wing with crossvein darkened.

About 13 setae in a clear patch on tergite IX. Svo with a hooked end; Ivo a little stretched and slightly bent. Gonostylus reduces to be very narrow over posterior third.

The female is also very dark, with the genitalia very similar to those of the subgenus *Chironomus*.

Pupa: (from 2 exuviae collected by Alex Egan – data and photos used with his permission). These pupae fit the Langton description.

Length abt. 8 mm. General brown color except for intersegments and anterior anal lobe, marbling of tergite armament laterally, dense small granulation on thorax, small lateral seta at conjunctive IV/V; rims of tergites II-VI rather heavily pigmented; PsB conspicuous.

Cephalic tubercles about 1.3 times longer than wide. Hook row medially broken, 32-33 hooks with a 25 μ m gap. Postero-lateral spur of segment VIII with 2 dark teeth.

About 80 taeniae on the anal lobe.



Fourth instar larva: Not known from North America.

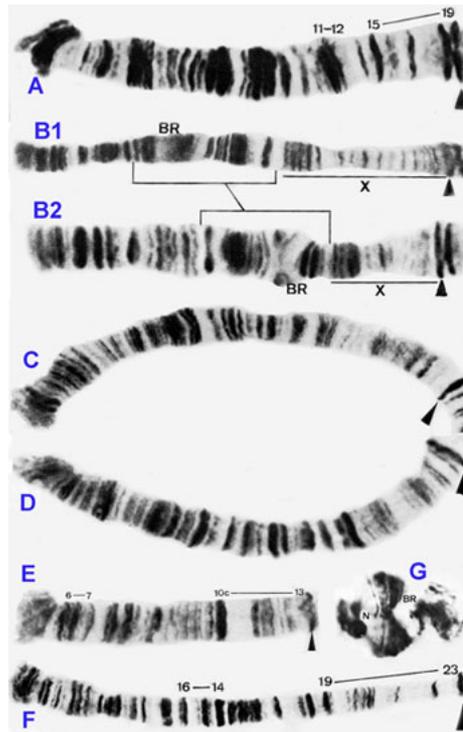
Based on Palearctic material, the larva should be a plumosus-type with relatively short PLT (<150 μ m). Head capsule pale.

16-25 teeth in the PE. Antennal segment 1 about 104 μ m and segment 2 about 34 μ m.

Cytology: 4 polytene chromosomes with the thummi-cytocomplex arm combination AB, CD, EF, G. Nucleolus subterminal in the very short arm G; a BR just near the middle of the arm – further from the end than in the other described *Lobochironomus* species.

Only a few bands can be identified on the Keyl-system. A large puff, or a BR according to Ryser *et al.*, perhaps group 7, is just distal of the middle of arm B1, with a group of dark bands (perhaps group 8) distally.

The only recorded polymorphism in the Palearctic material is a simple inversion of about the central third of arm B, with one break just distal to the puff, moving it much closer to the centromere, now with two groups of dark bands immediately proximal to it in sequence B2 (below).



(modified from Ryser *et al.*, 1985)

Found: Michigan- Isle Royale National Park (abt. 48.10°N, 88.50°W).

Species 5g. *Chironomus sanctipauli* Sublette 1966
New name for *C. conformis* Malloch 1923

Adult:

Original description:

“♂. Deep back, opaque. Antennal plumes fuscous; thorax with slight indications of 3 longitudinal grayish pruinescent lines; abdomen with faint brownish posterior margins to segments; legs fuscous, tibiae and tarsi yellowish; wings slightly brownish, veins distinct, cross vein darkened; halteres yellowish brown; hairs on body black, on legs brownish.

“Hypopygium similar to that of *decorus* Johannsen, the superior process and apical portion of lateral arm as in Plate XIII, Figure 13. Basal joint of fore tarsi very little longer than fore tibia (82:78), second joint very much longer than third (52:30); fore tarsi and mid and hind legs with very long and rather dense hairs. Radius slightly arcuate apically, ending as far before apex of wing as does media behind it.

“♀. Agrees in color with male. Fore tarsi without long hairs; basal joint about as long as fore tibia.

Length, 8–9 mm.”

To this may be added:

Holotype male, number 26470, St. Paul Island, Bering Sea, August 16, 1914, E. A. Preble.

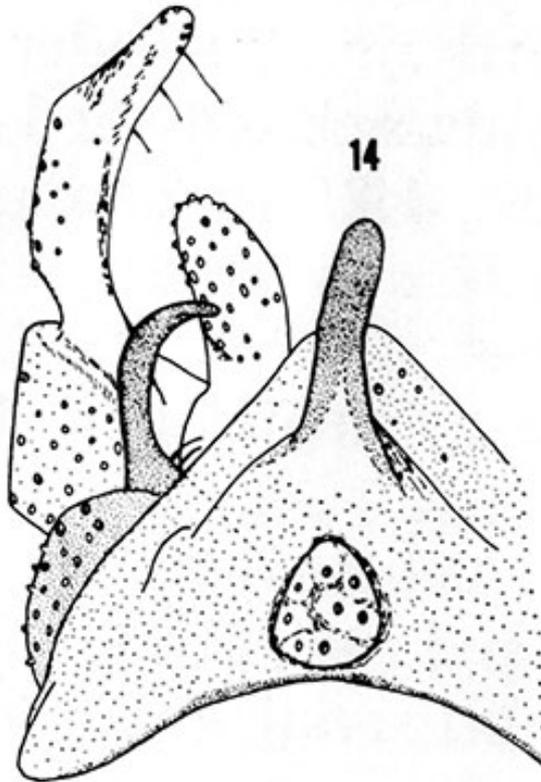
Head and thorax dark brown to blackish-brown, abdomen dark brown; legs paler brown. Back of head whitish pollinose. Postocular bristle very dense, multiserial. Antennal segments not clearly discernible on dry mount. Frontal tubercles minute, 0.041 mm long. Palpi four-segmented but distorted so measurements were not made. Clypeus slightly narrower than antennal pedicel.

About fifteen prealar bristles, posteriorly becoming two rows. Dorsomedial bristles in two rows. Dorsolateral bristles multiserial. Pronotum rather strongly projecting anteriorly. Mesonotum with a slight tubercle.

Leg ratios: foreleg, 1.00; middle leg, 0.58; hind leg, 0.65. Beard eight times as long as tarsal diameter; at almost right angles to leg.

Anterior wing veins brown; r-m darker. Venarum ratio, 1.04. Wing length, 5.33 mm. Halteres pale.

Description of *C. sanctipauli*, including original description as *C. conformis*, from Sublette (1966).



Hypopygium of holotype male (from Sublette 1966)

Pupa, Fourth instar larva and Cytology: Unknown

Found: Alaska- St. Paul Island, Bering Sea (57.18°N, 170.27°W).

Townes (1945) considered *C. conformis* to be a synonym of *C. pilicornis* but, in renaming it, Sublette noted that it differed in significant ways: the anal point is broader, the SVo more conspicuously hooked, the dististyles more distinctly tapered apically (not obvious from his drawing) and the ninth tergite with a conspicuous patch of setae, so considered it a new species closely related to *C. pilicornis*. It would also be closely related to Species 5e, but there is no mention of a pale scutellum.

Species 5h. *Chironomus* sp. 5h

Only a single larva is known for this species. It is quite similar to that of species 5c (sp. 1TE).

Fourth instar larva GP8.2.1 21F: A halophilus-type larva, very similar to those of Sp. 1TE. Length about 10.8 mm, VT shorter than those of other available specimens: anterior 0.18 mm. posterior 0.24 mm; anal tubules much shorter 300-400 μ m (ventral pair longer) and about 1.9-1.8 times longer than wide. Head capsule generally dark, gula darkened over posterior 2/3. Distance

between the S4 setae about the same as that between the antennal bases, but the setae are closer to the margin (80% of width of FC between them).

Mentum with 4th laterals reduced to about the level of the 5th laterals (type II) and central tooth probably type IB. Ventromentum (about 45 striae) and PE (12 teeth of type C) as in other larvae; Premandible not clear. Antenna also essentially as in the other larvae, but A1 is half the VHL; A5 is the same length as A3: AR 2.3. Antennal proportions (micron) 157 : 35 : 11 : 13 : 11. Mandible of type IIB, and with similar number of PMa taeniae (11-12); with 14-15 furrows on the outer surface near the base.

Cytology: 4 polytene chromosomes with the thummi-cytocomplex arm combination AB, CD, EF, G. Nucleolus essentially terminal on arm G.

Found: Greenland - Nedre Midsommer Sø, Peary Land, sample GP8 (82.63°N, 32.50°W).

Species 5i *Chironomus* sp. 8TE from BOLD Database

The current identity of this species is unknown – it may be one of the previously named Arctic species, of which there are a few possibilities such as *C. biseta*.

In BOLD Bin: [BOLD:AAC0595](#)

Adult:

Some characters of the adult males can be determined from photographs in the BOLD Database:

Male: Color dark blackish-brown, halteres pale; abdomen with a thin pale stripe at the posterior margin of segments II-VII; legs apparently paler, knees slightly darkened.



Adult male of *C. sp.8TE* from Greenland (BOLD Database)

AR about 3.

Wing length about 5.38-5.43 mm, width about 1.1 mm, VR about 1.0.
 Palps pale, segment lengths (segs. 2-5) (micron) 114 : 400 : 315 : 485.
 Legs with a weak beard. Approximate proportions (micron):

	Fe	Ti	Ta1	Ta2	Ta3
PI	1665	1765	2600	1170	750
PII	1715	1590	950	570	240
PIII	2140	2460	1715	945	600
	Ta4	Ta5	LR	F/T	BR
PI	645	265	1.48	11.07	low
PII	490	280	0.65-0.70	1.05	
PIII	490	245	0.65-0.70	abt 0.8	

Pupa: Not known.

Fourth instar larva: The larva from Manitoba is either a thummi- or plumosus-type larva, but this does not mean that this is the case for Greenland larvae, as no such larval type is currently known there.



Larva of *C. sp. 8TE* from Manitoba, Canada (BOLD Database)

Larval head capsule is relatively dark, with gula darker. Presence of LP could not be determined; VT long, and posterior pair coiled. AT appear to be relatively long and possibly with a constriction in the middle.

Cytology: Unknown.

Molecular sequence:

mtCOI: There is sequence in the BOLD Database.

Found: **Manitoba**- - nr. Churchill (58.738°N, 93.819°W) (BOLD)

Greenland- - Lake Tasersuaq, Kitaa, Kujalleq (60.2643°N 44.5389°W); Narsarsuaq, Kujalleq (61.1556°N, 45.3785°W) (both BOLD).

Species 5j from BOLD Database

The current identity of this species is unknown – it may be one of the previously named Arctic species, of which there are a few possibilities.

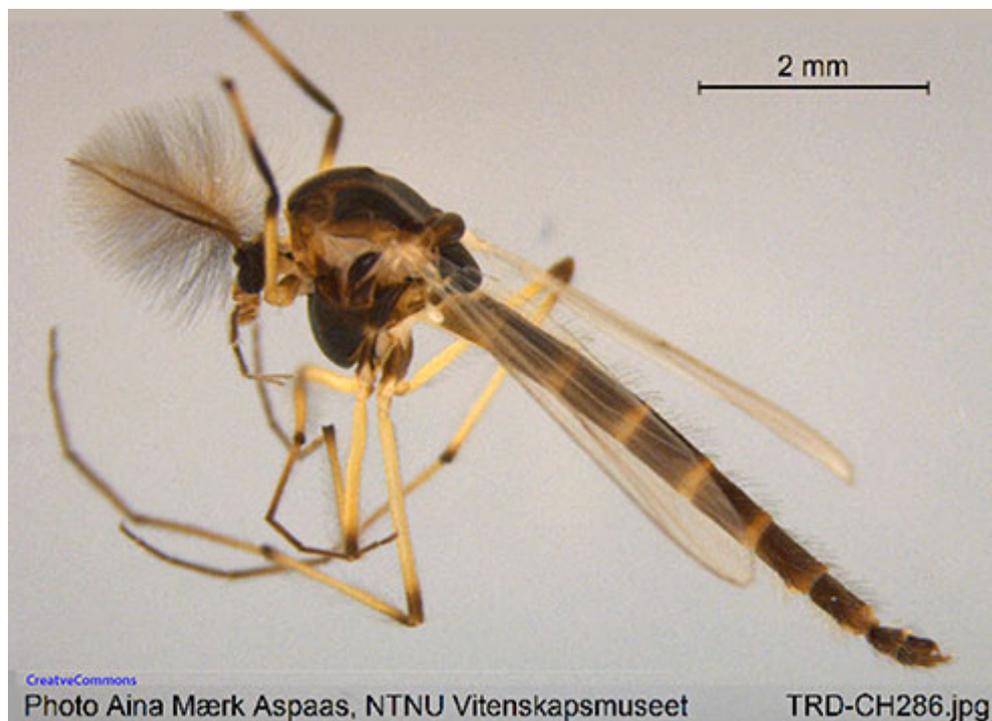
In BOLD Bin: [BOLD:ADA8845](#)

Adult:

Some information on the adult male can be obtained from a photograph from the BOLD Database:

Male: The male of this species is very similar to that of *C. sp. 5i* (8TE), and the Norwegian specimen had been identified as that species.

Color dark brown, some pale brown on lateral thorax; haltere pale, abdomen also with a thin pale stripe at the posterior margin of segments II-VII, but base color not as dark; legs apparently pale, but with distinctly darkened knees, and tarsi becoming darker.



Adult male of *C. sp. 5j* from Norway (BOLD Database)

AR about 3.

Wing length about 4.3 mm

Palps dark, approximate segment lengths (segs 2-5) (micron): 120 : 325 : 265 : 430.

Few leg measurements able to be made, but Hind LR abt 0.6 and F/T abt 0.88.

Pupa and Fourth instar larva: Unknown.

Cytology: Unknown.

Molecular sequence:

mtCOI: There is sequence in the BOLD Database.

Found: Yukon Territory - Lake Laberge (60.958°N, 135.184°W). (BOLD).

Species 5k. *Chironomus* sp. Greiner Lake

Known from 2 larvae from Greiner Lake (#17), Victoria Island, Nunavut

Available DNA sequence does not match anything in GenBank or the BOLD database, closest is *C. salinarius* with about 92% similarity.

Adult and Pupa not known.

Fourth instar larva: A halophilus-type larva, length about 14.2-15.8 mm; no LP; posterior VT about 0.48-0.56 μ m. AT a single lobe, dorsal (len. about 280 μ m and about 2-2.2X longer than wide), shorter than ventral (len. about 320-360 μ m and 2.3-3.2X longer than wide). Gula dark on posterior 1/3-1/2; FC sl.-dark with a streak, and outside a slightly dark line.

Mentum quite wide compared to VHL (about 0.74 VHL length) with 4th laterals reduced to at least the level of the 5th laterals (type III), center tooth probably type III, with c1 quite wide on one larva.

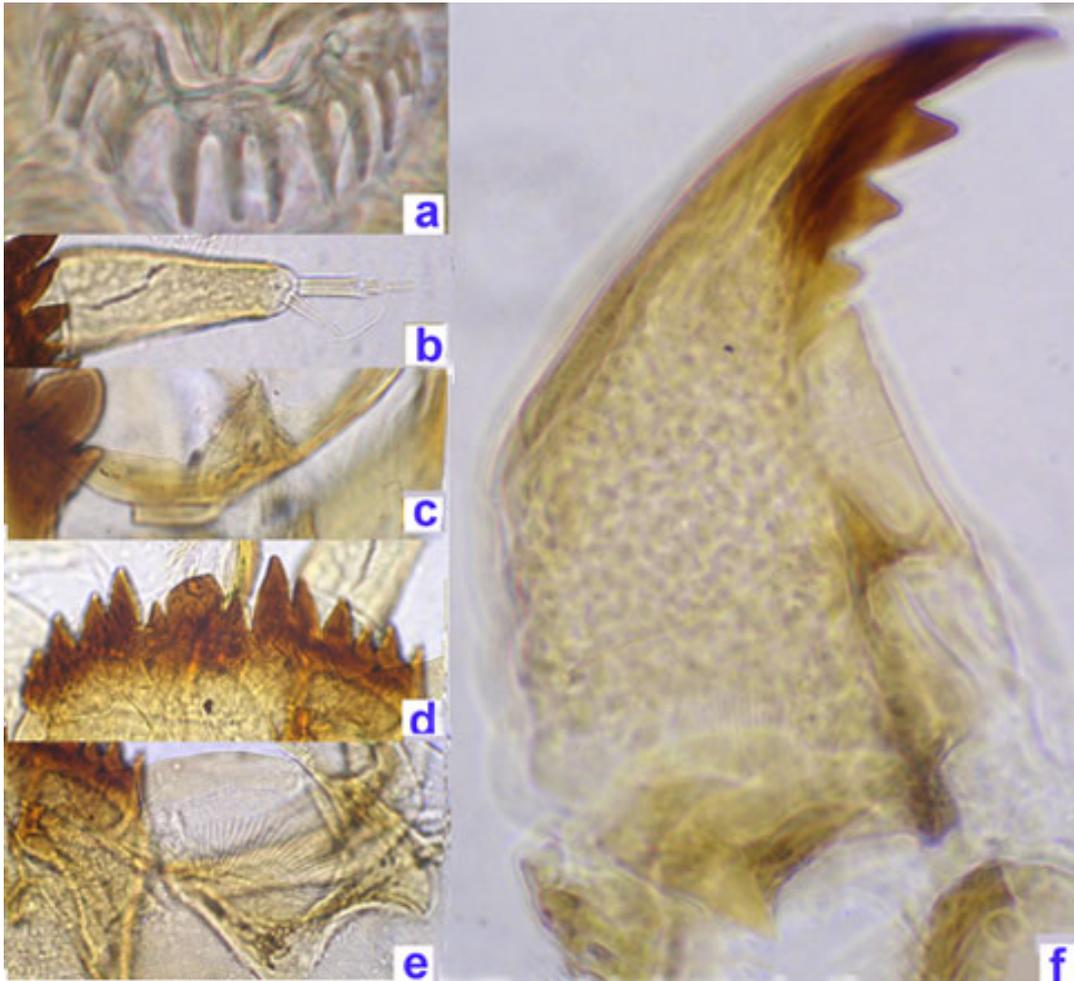
Ventromental plates separated by about 0.34-0.38 of mentum width, with about 38-40 striae; VMR about 0.28-0.36. PE with about 13-14 somewhat irregular teeth and smaller teeth at the outside edges (type C).

Premandible possibly with outer tooth longer and inner tooth about 3 times wider.

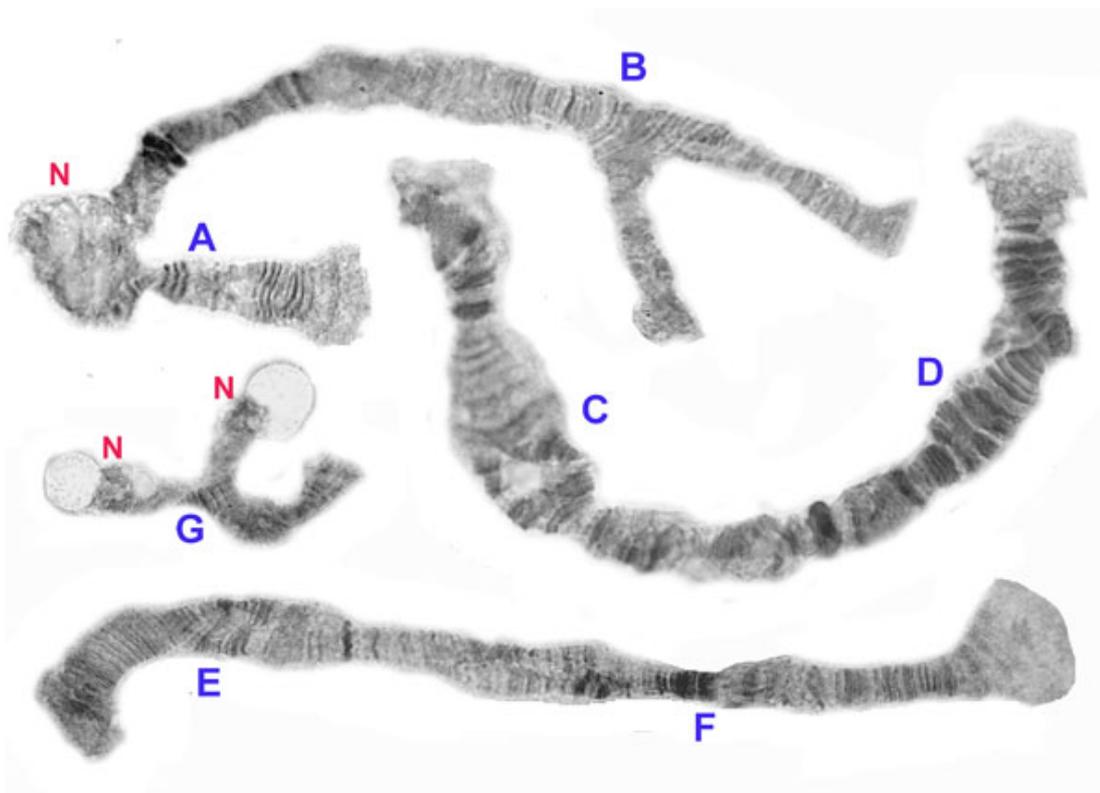
Distance between the antennal bases larger than that between the S4 setae, which are separated from each other by 80% of FC width.

Antenna has A1 about 3.5 times longer than wide and equivalent to about 45% of VHL, DRO about 0.4-0.5 up from base of segment; AR abt 2.14-2.33; antennal proportions (μ m) 154-158 ; 37-40 : 8 : 15-17 : 7-8.

Mandible with third inner tooth partly or completely separated and partly colored (II-IIIB); 15-19 furrows on the outer surface at the base; 11 taeniae in PMa.



Cytology: Cytology of available specimen relatively poor, but some information was obtained: 4 polytene chromosomes with the thummi-cytochrome arm combination AB, CD, EF, G. Nucleolus terminal or subterminal on arm G; there could be a BR about a third from the other end. A second nucleolus is between the centromere and the “olive” of arm A. End of arm B unpaired, possibly due to inversion heterozygosity but the sequence is not clear enough to be certain.



Found: Nunavut - Greiner Lake, Victoria Island (69.19°N, 104.93°W).

Species 51. *Chironomus* sp. Julianehåb.

There is no equivalent BARCODE sequence in the BOLD Database or in GenBank.

Adult: No associated adult is known. Claus Lindegaard (personal communication) has wondered if it could be the larva of the true *C. staegeri*.

Pupa: Not known.

Fourth instar larva: Normally a bathophilus-type larva, but only examined specimen was a melanotus-type with a very small LP (60µm). Length abt 11.7 mm, VT about 0.72 mm, equal in length, AT with ventral pair longer (dorsal 340 µm, 2.8x longer than wide; ventral 400 µm, 4x longer than wide. Gula and FC pale.

Aperture of the epipharynx shorter and wider than that of *C. plumosus* or *C. entis*.

Mentum width about 0.56 of VHL; central tooth type IIA, 4th laterals reduced almost to level of 5th laterals (ty. II). VM about 3.2X longer than deep (i.e. to base of striae) and separated by about 0.34 of mentum width; VMR abt 0.26-0.29; about 48 striae.

PreM with teeth about equal in length; inner tooth about 2.7x wider than outer tooth. PE with about 15 broad, somewhat irregular teeth (type C).

Distance between S4 setae less than that between antennal bases and about 0.66 of FC width at that level.

Antenna with A1 about 3.8x longer than wide, RO about 0.4 up from base; AR about 1.89, A2 about 0.28 length of A1; segment proportions (micron): 133 : 37 : 13 : 13 ; 9.

Mandible with 3rd inner tooth pale and only partly separated (type IA), about 15 furrows on outer surface near base; about 11 setae in PecM.

Cytology: Polytene chromosomes of only available specimen relatively poor, but 4 chromosomes probably with the thummi-cytocomplex arm combination, although only arms E, F, and G were identified. Arm G with a terminal nucleolus.

Molecular sequence:

mtCOI: A partial BARCODE sequence has been obtained. It will be submitted to the BOLD Database when more sequence is available.

Found: Greenland – Julianehåb, Qaqortog.

Species 5m. *Chironomus vancouveri* Michailova & Fischer 1986a

While this species is generally considered to be a synonym of *C. plumosus*, there are a number of features that indicate some degree of separation. It is known only from one small collection and many comparisons to *C. plumosus* are made to Palearctic material rather than Nearctic specimens, which may obscure the true degree of differentiation from nearby populations.

Adult:

Male: Thorax, abdomen and legs light brown, but brownish middle spots on abdomen.

Leg measurements and ratios (micron)

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	F/T	Ta5/Ti
PI	2130	2100	2680	1805	1025	885	435	1.27-9	1.01-3	0.21
PII	2300	2240	1415	885	625	410	305	0.61-5	1.01-4	
PIII	2665	2745	1845	1160	850	525	345	0.67	0.96-8	

Hypopygium with a rounded pale area with about 18 setae. Anal point narrow, downcurved; SVo closest to D(g) type of Strenzke (1959); gonostylus long, relatively narrow and narrowing over posterior third; Ivo slightly outcurved and extending to about the end of the anal point.

Female brown. Gonosternite VIII with darkly colored edges and long setae; Gonopophysis VIII with short setae.

Pupa: Not yet described.

Larva: About 23-25 mm. long; VT essentially same length; PLT present. Mentum with c1 and c2 teeth well separated (type IIA); fourth laterals do not appear to be reduced (type I). Aperture of clypeus shorter but wider than that of *C. plumosus* – about twice as long as wide in *C. vancouveri* compared to 3.8-5.5 times longer in *C. plumosus*.

Antenna with RO about the middle of A1. Mandible with all inner teeth dark (type IIIC).

Cytology: Four polytene chromosomes with the thummi arm combination AB, CD, EF, G, as *C. plumosus*. Nucleolus essentially terminal in arm G, with a BR near the other end of the arm. Major banding sequences appear the same as those found in Nearctic *C. plumosus*, but the major differences come in incomplete pairing of similar sequences in hybrids with Nearctic *C. plumosus* (Michailova & Fischer 1986a & b) and quite different C-banding patterns: *C. plumosus* has C-

banding only at the centromeres while *C. vancouveri* has numerous C-banded sites along the length of the chromosomes (Michailova 1994, 2014), but the centromeres are thinner.

vanA1: 1 – 2c, 10 – 12a, 13ba, 4a-c, 2g-d, 9 – 4d, 2h – 3, 12cb, 13c – 14, 15b – 19	i.e. as h'pluA2
vanB1: not mapped on the Devai <i>et al.</i> system.	i.e. as h'pluB1
vanC1: 1 – 2c, 6c-f, 7a-d, 16 – 17a, 6hg, 11d – 15, 8 – 11c, 6b – 2d, 17b – 22	i.e. as h'pluC2
vanD1: 1 – 3g, 10b-e, 4 – 7, 18a-d, 8 - 10a, 13a – 11, 13b – 17, 18e – 24	i.e. as h'pluD2
vanE1: 1 – 3e, 10b – 3f, 10c – 13	i.e. as h'pluE2
vanF1: 1a-d, 6 - 1e, 7 – 10, 18ed, 17 – 11, 18a-c, 10dc, 19 – 23	i.e. as h'pluF1
vanG1: essentially as h'pluG1, central region often unpaired, distal bands often unclear.	

Although the sequences in *C. vancouveri* are similar to sequences in Nearctic *C. plumosus*, the latter have high frequencies of n'pluA9, which has not been found in *C. vancouveri*. However, h'pluA2 is common in some Nearctic populations of *C. plumosus*, so it is possible that this is a situation similar to that of the species pair *C. riparius* and *C. piger*, although the appearance of the bands is not as markedly different, being generally thinner bands including the centromere in *C. vancouveri*.

In addition to the cytological studies of the hybrids, Michailova & Fischer (1986b) note that hybrids between *C. vancouveri* and Nearctic *C. plumosus* develop at about 90% of the rate of intra-form crosses.

These data raise questions as to the status of *C. vancouveri*. Kiknadze *et al.* (2016) consider it a highly divergent Nearctic population of *C. plumosus*, but this is on the basis that the Palearctic and Nearctic populations of that species are considered a single species, which is really irrelevant to the status of *C. vancouveri*. The differences in pairing of hybrids and the significantly different C-banding patterns indicate that *C. vancouveri* must have had some degree of isolation, and presumably for a significant period of time, from *C. plumosus*, so that the accumulation of heterochromatic regions could evolve. There are no molecular data for this material.

It is unfortunate that the natural distribution of *C. vancouveri* is not known and that no further specimens have been found near Vancouver, raising the possibility that this sample was the result of a chance migration from a source population of unknown location. The status of Vancouver as an international air- and sea-port offers the opportunity for such migration from numerous regions. The finding of other populations could help confirm the status of this 'species'.

Found: British Columbia - Deer Lake (49.24°N, 122.98°W), Burnaby, Vancouver.

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