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). Some of these species have been described subsequently, but many remain undescribed.
This list gives some information on the larval morphology, karyotype and distribution of those 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In many cases the assigned names result from unpublished studies with the late Jim Sublette, and without the assistance of Jim, and of Wolfgang Wülker, this list would not have reached even the present degree of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 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). 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
BR - Balbiani Ring
BV - length of (fe + ti + ta1) / length ta2-5
FA - Frontoclypeal Apotome
IPD - distance between the Ventromental Plates
MD – male determining (gene)
MW - width of Mentum
N - Nucleolus
PE - Pecten Epipharyngis
PLT – Posterolateral tubules
PM – Pecten Mandibularis
S4A - distance between S4 bristles
SSV - length of (fe + ti) /length of ta1
SV - Superior Volsella
VHL - Ventral Head Length
VM – Ventromental plates
VT - Ventral tubules.
¿ - presence at locality not confirmed.

In the adult descriptions reference is made to the types of SV 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:

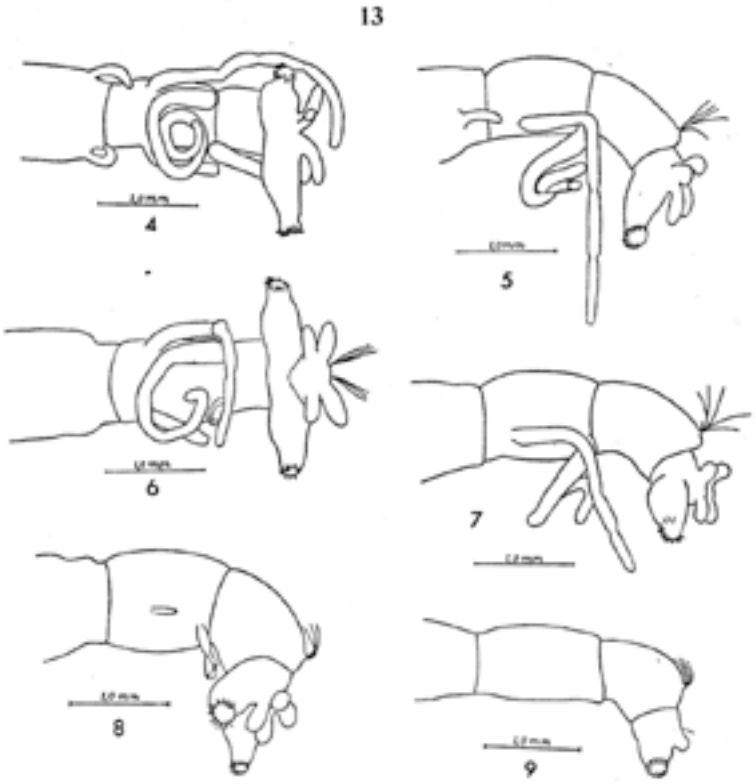
S-type: The SV is shoe shaped, i.e. it is drawn out distal-medially into a broad, rounded lobe (Fig. a-c, below) (Strenzke's figure suggests the most distal point will be at the toe of the shoe),
D-type: The SV is ribbon-like: distally it may have a weakly thickened shoulder (Fig. d, below) (most distal point is not at the internal margin), or bent in a shallow sickle-shape (Fig. e-f, below).
E-type: The SV 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 SV).

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
bathophilus – moderate to long, essentially straight VT.
fluviatilis - VT slightly curved and coming to a point at ends. (often hard to distinguish from bathophilus-type, particularly in some fixed material)
thummi – long, anterior VT with 'elbows', posterior VT coiled

Possessing PLT:
reductus – lacking ventral tubules.
semireductus – short straight or slightly curved VT.
melanotus – moderate to long, essentially straight VT.
plumosus – long, anterior VT with 'elbows', posterior VT coiled.

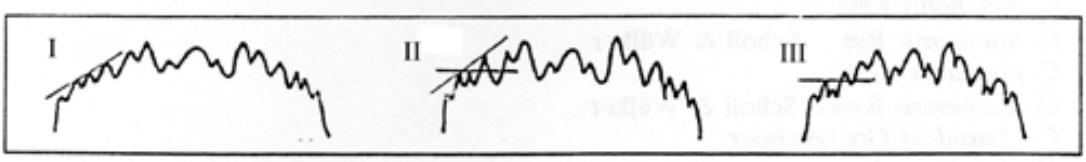


Figs. 4–9. Hind parts of larvae.
4. plumosus type (total length 15 cm; loc. 12; 13.VII.1943); ventral view; right tubuli cut off.
5. as 4, but seen from the left; left tubuli only drawn.
6. thummi type (total length 17 cm; loc. 1; 5.VII.1944) ventral view; right tubuli cut off.
7. as 6, but seen from 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.

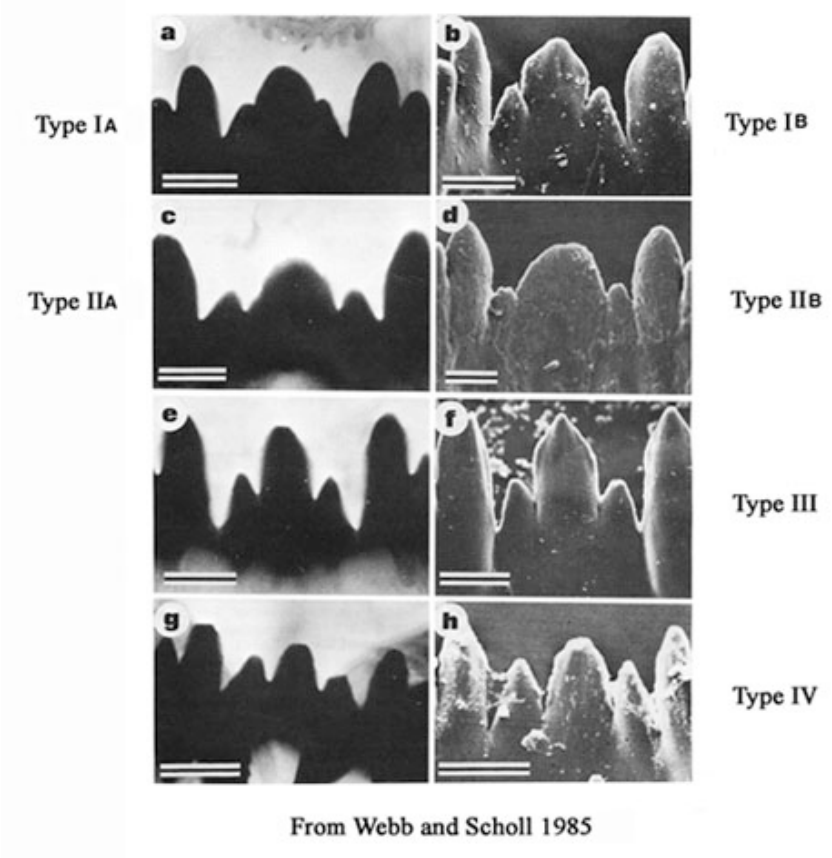
The mentum type is defined only by the degree of development of the 4th lateral teeth:
Type I - height in same line as the rest of the lateral teeth;
Type II - 4th laterals reduced, height about equal to that of the 5th laterals;
Type III - 4th laterals further reduced, height less than that of the 5th laterals.



From Vallenduuk and Moller Pillot 1997

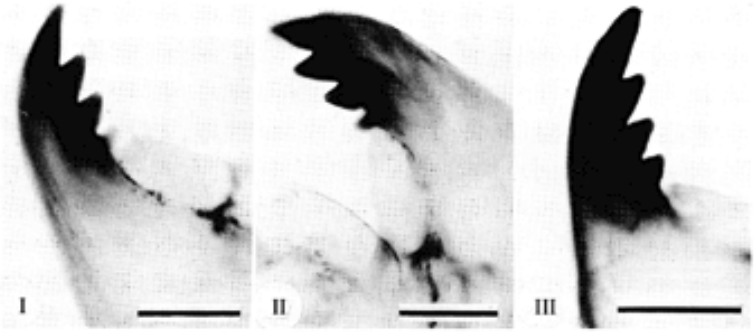
Central tooth type: The mentum may be further classified by the characters of the central trifid tooth:

Type IA - c2 teeth only partially separate from c1, i.e. as shoulders on c1. (figure a)
Type IB – c2 teeth slightly more separated (figure b)
Type IIA - c1 broad, c2 teeth distinctly separated (figure c).
Type IIB – c1 very broad, c2 less separated (figure d).
Type III - c1 tooth relatively narrow and much higher than the separated c2 teeth (figs e and f).
Type IV - c2 teeth well separated, not much lower than the relatively narrow c1 tooth (figs g and h)



From Webb and Scholl 1985

The mandible type is defined by the degree of darkening and separation of the 3rd inner tooth. 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

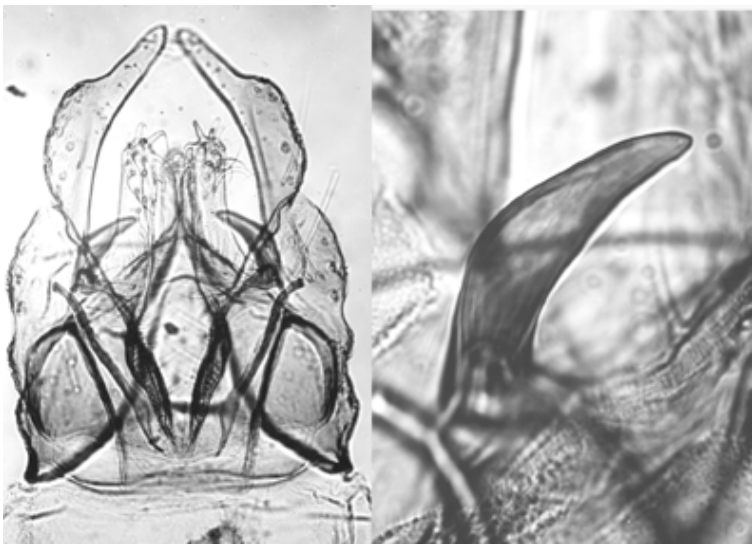


From Webb and Scholl 1985.
This figure would show IA, IIB, and IIIC respectively

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 trifid 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.

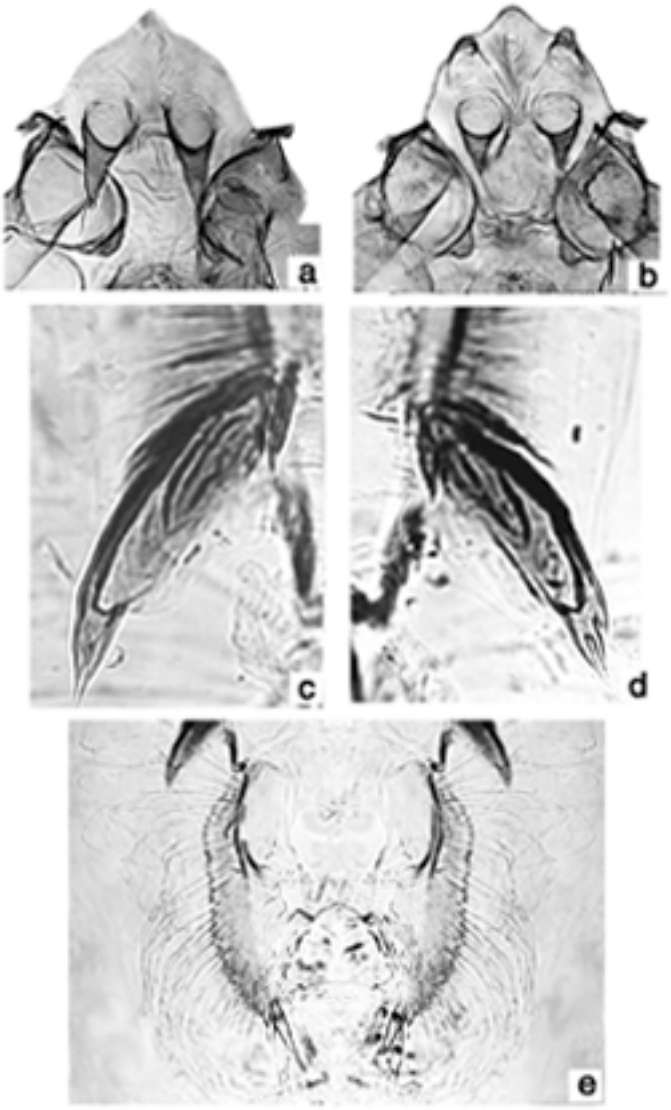
Adult:
Male: The adult male is a typical member of the *C. decorus*-group. Rather similar to those of *C. maturus* Johannsen in coloration and in the darkened SV of the male genitalia. There is a broad dark band across the basal part of the abdominal segments, which may move a little towards the center of the segment at about segment 6. The SV is shorter and darker than that of *C. decorus* (sp. 3a).



Male terminalia of *C. bifurcatus*
Adult from same egg mass as the Holotype.

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

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. Caudolateral spur normally with about 3 spines, but varying from 1 to 6. It differs from *C. maturus* in the usually higher number of spines.

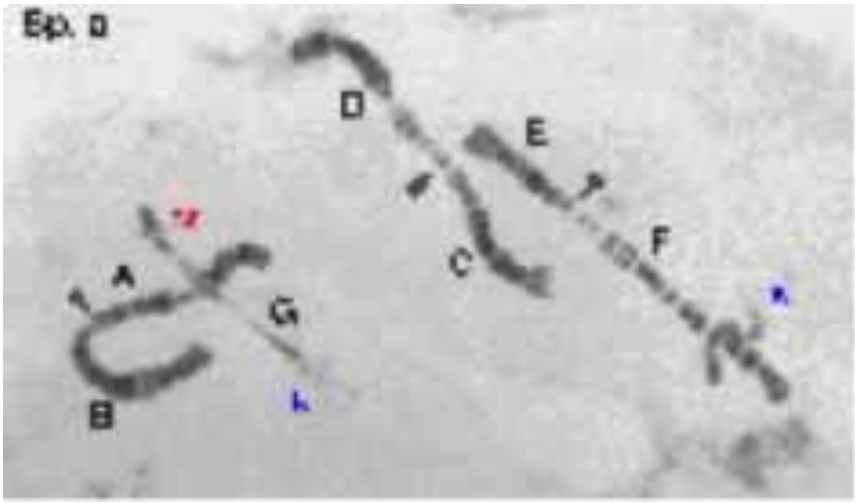


a, c-e - Pupal characters of *C. bifurcatus.* b. Frontal apotome of *C. decorus* (sp, 3a) showing the secondary tubercles not found in other species of the *C. decorus*-group. d. Spur from pupa from same egg mass as the Holotype

Larva small to moderate size, length 10.2 – 13.8 (15) (female), 11.3 – 13.4 (5) (mm (male); essentially of the bathophilus-type but sometimes a melanotus-type with some development of PLT in Canadian specimens 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. 0.72 – 2.28 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, 360 - 660 µm long, 100 - 155 µm wide, ventral pair sometimes longer and often wider (ratio len/wdth 3.0-6.2 (dorsal) 2.4-6.6 (ventral)).
Gula dark, FA pale or only slightly darkened.
Mentum with pointed teeth, c2 teeth only partly separated from the c1 tooth (type I or III); 4th laterals reduced about to level of 5th laterals (type II).

VM with about 30 - 43 striae, and separated by a third or more (0.32-0.43) of the mentum width.. PE with about 11 - 15 generally sharp, even teeth. Premandible with inner tooth about 2-3 times the width of the outer, which may be slightly shorter or slightly longer.
Antenna relatively short, about half to two thirds VHL; basal segment about 2.8 – 4.8 times as long as wide; RO almost half way up (0.32-0.51)segment 1; segment proportions (microns) 110, 27, 7, 12, 6; AR 1.6 - 2; A3 much shorter than A4, but slightly longer than A5.
Mandible with the third inner tooth pale and not separated (type IA), about 14 - 20 furrows on outer surface near base.

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 possibly 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 ie. 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
bifF3: approx 1, 9 - 7, 14 – 17, 11e, 5 - 2, 10 – 11d, 13 – 12, 6, 18 - 23

Found: Manitoba - Lake Winnipeg (Sæther 2012)
Ontario - Algonquin Provincial Park; Bear Creek, Carlsbad Springs (45.37, -75.47); Copanspin Farm, Dunrobin, and 0.5 ml Dunrobin, all Carleton Co.; Arboretum and Lac Deschêne (45.37, - 75.85) (Type locality), Ottawa, Carleton Co: McFarlane L. (46.42, -80.95) and Tilton L. (46.35, -81.07), Sudbury area (Proulx *et al*.)
Quebec - Brewery Creek, Hull; L. D'Allembert (48.38, -79.02), St. Joseph (46.88, -71.63), L. Arnoux (48.25, -79.33), L.Kinojévis (48.13, -78.90) and L. Duprat (48.33, -79.12) (Proulx *et al*.)
Kansas - Lone Star Lake and Natural History Reserve, Univ. of Kansas, Douglas Co.
Massachusetts - Lake Pleasant, nr. Montague, Franklin Co.
Michigan - Lake Michigan, Epoufette.
Minnesota - Anderson Lake, Clearwater Co.; Turtle Lake, Becker Co.; Bad Axe Lake, Hubbard Co. (M.G. Butler)
Wisconsin - Arboretum, Madison, Dane Co.

Creeks, pools, the shallows to the profundal of lakes.

All stages and the salivary gland chromosomes described by Wuelker *et al.* (2009). 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 *cox 1*and the nuclear *gb2ß* genes are available. This data (Proulx *et al.* 2013) is suggesting that the species may comprise two closely related components. The data is for only a small number of specimens, but they show distinct bases between the groups at seven bases (see Table below).

(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	
L. D'Allembert QC 12	C C T T A T C C A A
L. Arnoux QC 11	C C T T A T C C A A
St Joseph QC	C C T T A T A C A A
Pleasant L.,MA21f	C C T T A T C C A A
Group 2	
McFarlane L. ON 7	T G A C T A T T T T
Tilton L. ON 8	T G A C T A T T T T
St Joseph QC	T G A C T A T T T C
Madison WI em#8	T A A C T A T T A C
Madison WI em#7	T A A C T A T T A C
L.Kinojévis, QC	T G A C T A T T T C

Bases that differ between the two groups of *C. bifurcatus* in the *cox1* tree

As well these specimens show alternative banding sequences on some chromosome arms, one set of which corresponds to those of the type egg mass (see Table below).

\ Arm Specimen \	A	B	D	E	F	G(med BR)
Group 1						

Pleasant L MA 21	A2	B1	D2	E1	F1	abs
L.Dupret QC 10	A1	B1	D2	E1	F1	abs
L.Arnoux QC 11	A1.2	B1	D1.2	E1	F1	abs
L.D'AlembertQC 12	A1	B1	D2	E1	F1	abs
Group 2						
Madison WI em#8	A3	B2	D2.3	E2	F2	pres
Madison WI em#7	A3	B2	D2	E2	F2	pres
McFarlane L.ON 7	A1	B2	-	E1*	F2	pres
Tilton L.ON 8	-	B2	-	E1?	F2	pres
Type material						
Type egg mass	A1.2	B1	D1	E1	F1	abs

* it is just possible that this is E1.2

Sequences of *Chironomus bifurcatus* specimens used in *cox1* ananlysis

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.

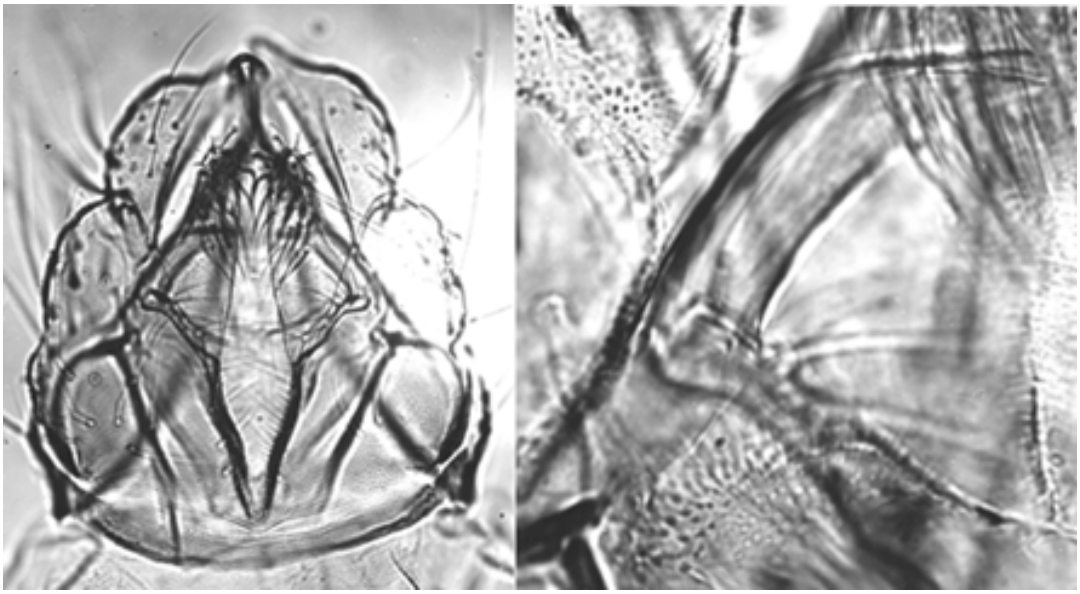
Pupa: Caudolateral spur of known pupa has only 2-3 spines. as shown above.

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 (1.6 – 2.6); 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 gonostylus is relatively short and stout compared to those of *C. bifurcatus* or *C. blaylocki*. The SV shows similarities to that of C. *blaylocki*.



Male terminalia of *C.* species b
Note relatively short gonostylus, and the superior volsella similar to that of *C. blaylocki*.

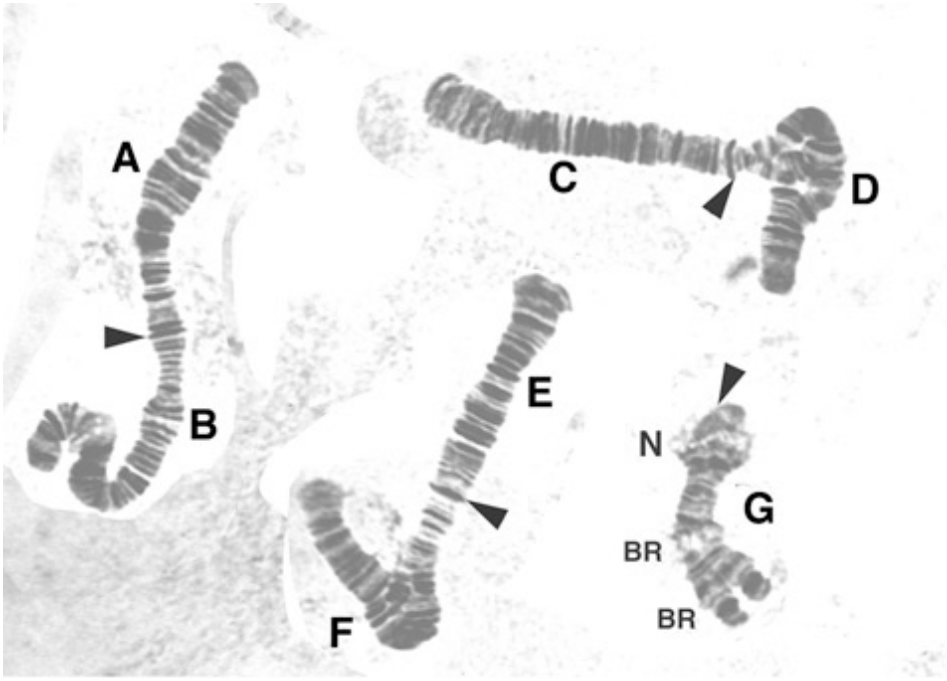
Pupa: Caudolateral spurs (below) with about 5 spines along the outer edge.

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, aboout 4.4 times longer than wide; with a median constriction, length about 550 - 700 micron, ventral pair may be narrower.
Gular region darkened, FA normally darkened, occasionally pale. Mentum width about half the ventral head length; with rounded teeth, c2 teeth of center trifid tooth well seperated (type II or IV); fourth laterals not reduced (type I). Ventromental plates separated by about one third of the mentum width, with about 44 - 47 striae. PE with about 14 teeth. Premandible with outer tooth probably longer, but often broken or worn to about equal length, inner tooth about twice the width of the outer.
Antenna with basal segment about 3.6 times as long as wide; AR about 2.08 - 2.14; RO just less than halfway up A1; A3 just shorter than A4, and just longer than A5.

Mandible about 240 - 250 mm long, with 3rd inner tooth relatively darkened, but not well separated (type II), 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)



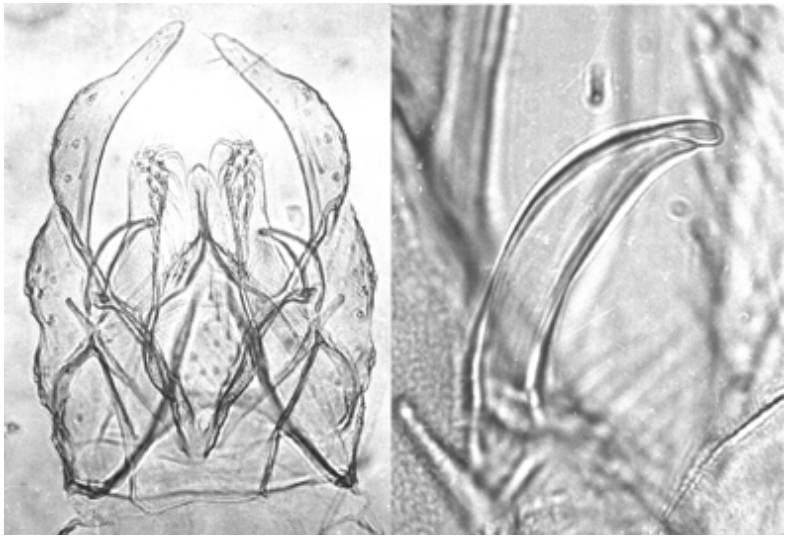
Found: Ontario - Dunrobin, Carleton Co.; Bear Creek, Carlsbad Springs (45.37, -75.47), Carleton Co.
Wisconsin - Arboretum, Madison, Dane Co.

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).

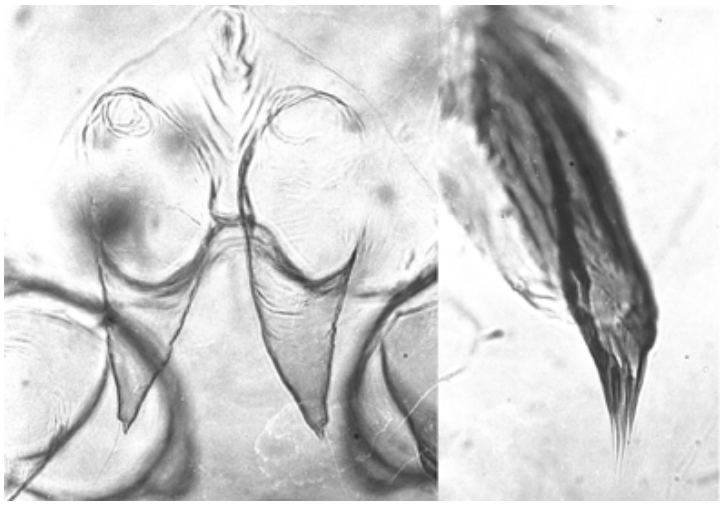
Species c. *C. decorus* group

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



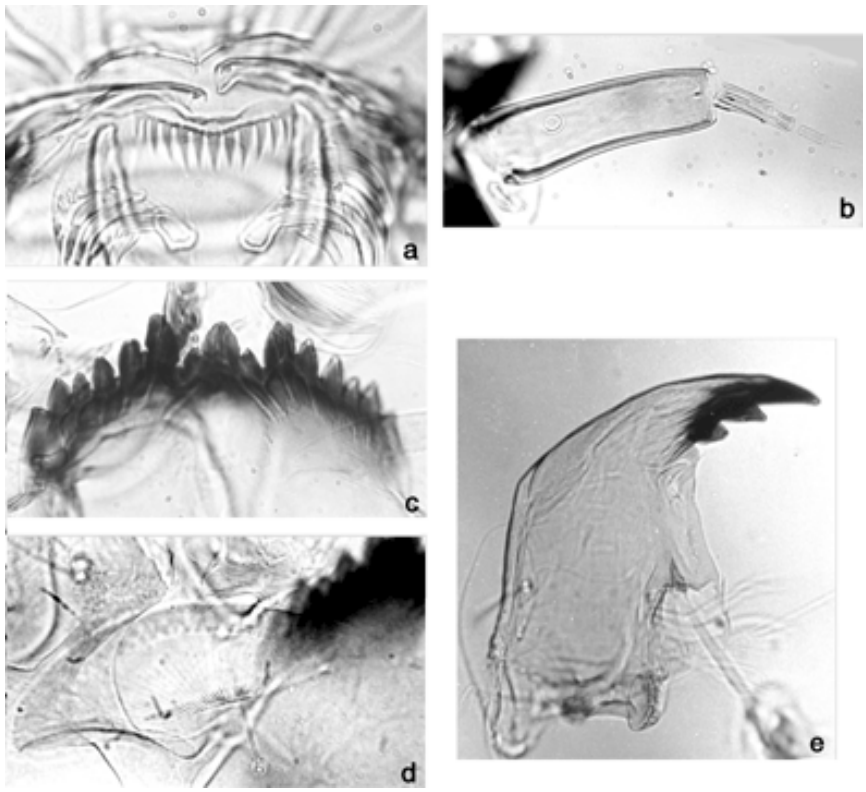
Male terminalia of *C.* species c.
A typical *C. decorus*-type hypopygium

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.

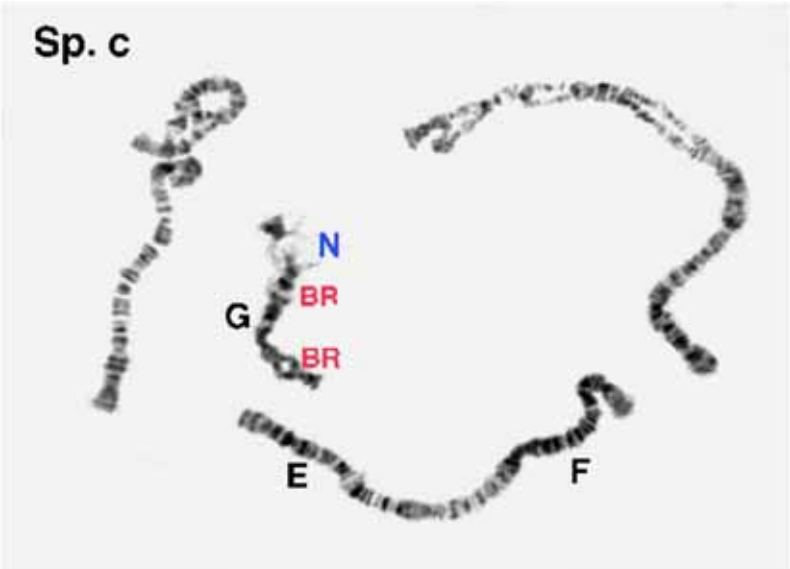


Larva of the semireductus-type with moderately long tubules, on average of equal length (anterior 0.7 - 1.84 mm; posterior 0.6 - 1.84). Larval length, females 10.8 - 14.1; males 11.3 - 12.3 mm). PLT relatively short, 31 - 250 micron). AT about 3 - 5 times longer than wide, dorsal pair usually slightly longer and with a constriction about a third from the base. Gular region darkened over most of central region, FA 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 I); 4th laterals reduced part way or about to level of 5th laterals (type I-II). VM with about 31 - 40 striae, IPD abt. 0.38. PE (a, below) with about 11 -15 sharp pointed teeth. Premandible with teeth about equally long, outer tooth about 2.5 - 3 times wider than inner tooth. Mandible (d, below) with the

third inner tooth slightly colored and not separated (type II) and about 14 - 17 furrows on outer surface near base. 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.



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

Found: Ontario - Dunrobin, Ottawa, Rideau River, and Black Rapids, all Carleton Co.; Vittoria, Norfolk Co.
Vermont - White River, Sharon, Windsor Co..

Farm pools and pools in rivers.

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

Adult:

Male
Wing length about 3.64 mm; width about 0.83 mm; VR 1.06.
Foretarsus bearded, BR about 5.
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*.
AR about 3. Frontal tubercles present, about 25 µm long. Clypeus with at least 14 setae, scutellum with an anterior row of about 12 long setae, and a main row of about 6 scattered setae.

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 withabout 64 - 96 broad flattened setae.

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, FA 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.
Mandible with third internal tooth well developed but not darkened (type II).

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 hypothesised for G3

Found: Manitoba - Southern Indian Lake (Rosenberg *et al*. 1984)
Ontario - Copanspin Farm & Dunrobin, Central Experimental Farm & Hogs Back, Ottawa, all Carleton Co., Mile 14.3, Highway 60, Algonquin Provincial Park, Nipissing Co.
Quebec - Lake Bédard (47.27, -71.12).
Alaska - Potters Marsh, 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, 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 Bernadino 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 & Chaplain's Lake, Natchitoches, Natchitoches Ph.
New York, - Ithaca, Tompkins Co. (Type locality)
New Mexico, - Bonito Dam, Lincoln Co.
South Dakota - 3 ml. w. Yankton, & Yankton, Yankton Co.
Wisconsin: Trout Lake Limnological Station, Vilas Co.

Shallow pools, often temporary and often polluted.

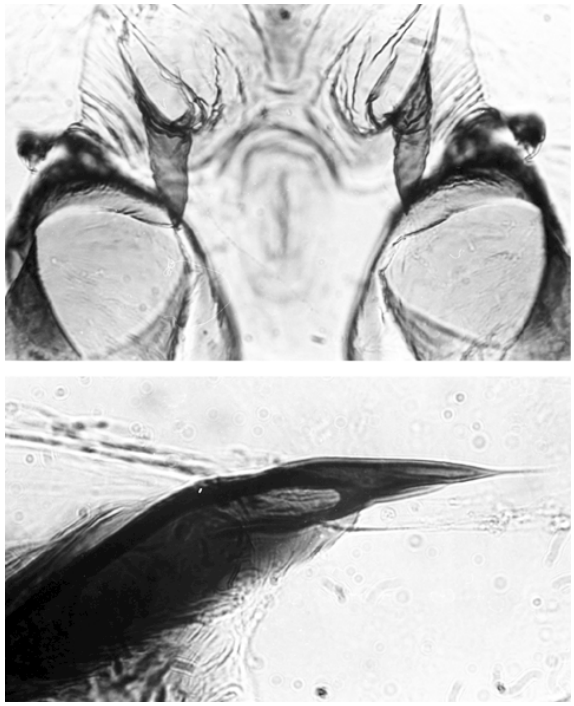
Morphology of larva, pupa and adult described by Sublette (1974). Cytology described by Wülker and Martin (1974) with arm C1 and D1 in Kiknadze *et al*. (2004).
Barcode: COI sequence oin GeneBank, Accession no. DQ648204

Species e. *C. riparius* group

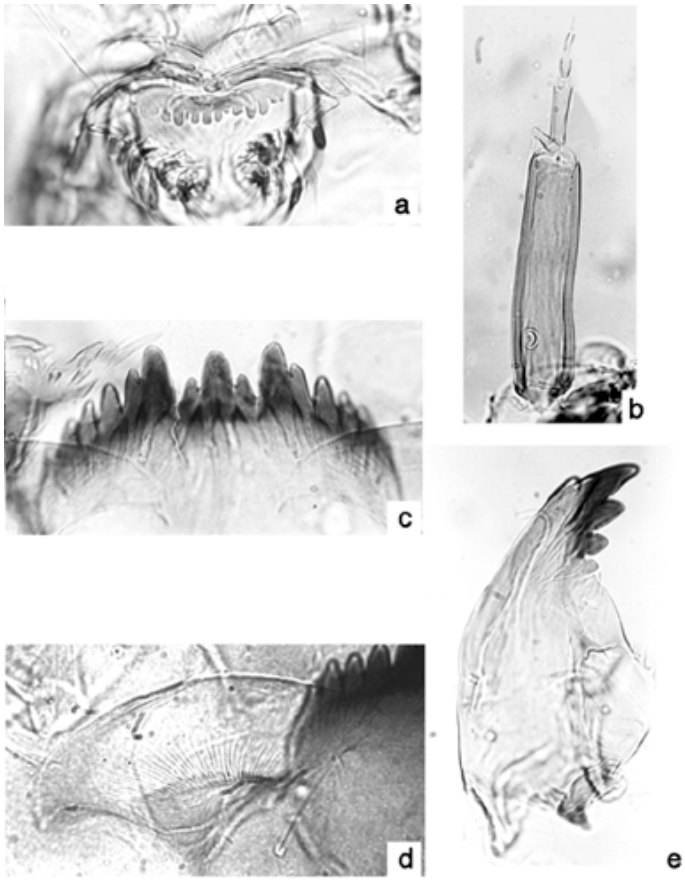
Adult:

Male with terminalia similar to that of *C. riparius*, i.e. SV of the S-type. Setae of inferior volsella not forked.

Pupa with narrow cephalic tubercles and with about 2 spines on the posterolateral spurs of segment VIII.

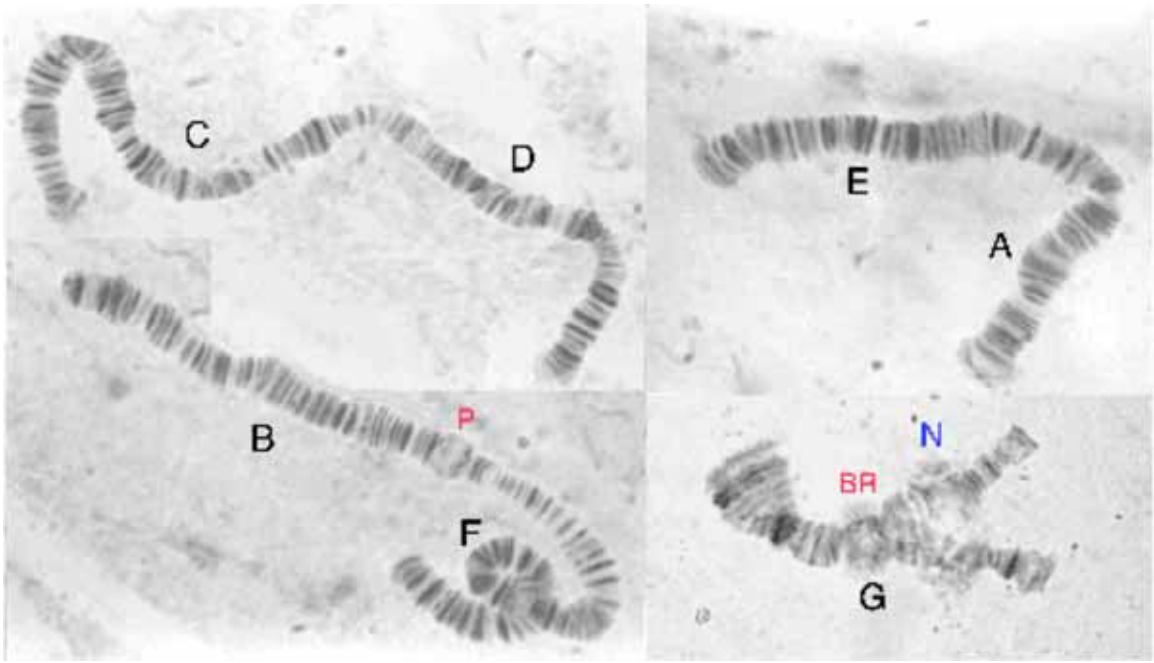


Larva a medium sized (length, female abt 14.6 - 16.5 mm) thummi-type with VT of equal length (ant. 1.35 - 2.75 mm; post. 1.85 - 2.73 mm). Gular region pale to slightly dark, FA pale or slightly darkened. Mentum (c, below) with pointed teeth; 4th laterals hardly reduced (type I); c1 tooth long and narrow with c2 teeth well separated (type III). VM (d, below) with about 37 - 43 not very obvious striae. PE (a, below) with about 13 - 17 somewhat irregular, sharp teeth. Antenna (b, below) with relatively long, narrow basal segment, about 4 (3.9 - 4.3) times as long as wide; ring organ between a third and half way from base of A1; AR about 2.2 - 2.4; ratio of segments (in microns) about 185 ; 40 : 11 : 14 : 8.Mandible (d, below) with 3rd inner tooth only slightly darkened and hardly separated (type II), and with about 11 - 14 furrows on the outer surface at the base.



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.

Arm A1:	1 - 2c, 10 - 12, 3i - 2d, 9 - 4, 13 - 19	ie. as *holomelas*
A2:	1 - 2c, 10 - 12, 3i - 2d, 16 - 13, 4 - 9, 17 - 19	
Arm B1:	Typical puff (group 7) near centromere	
Arm E1:	1 - 2b, 4c - 12b, 4b - 2c, 12c - 13	(preliminary)
Arm F1:	1 - 2, 16 - 19, 13 - 15, 3 - 12, 20 - 23	(preliminary)

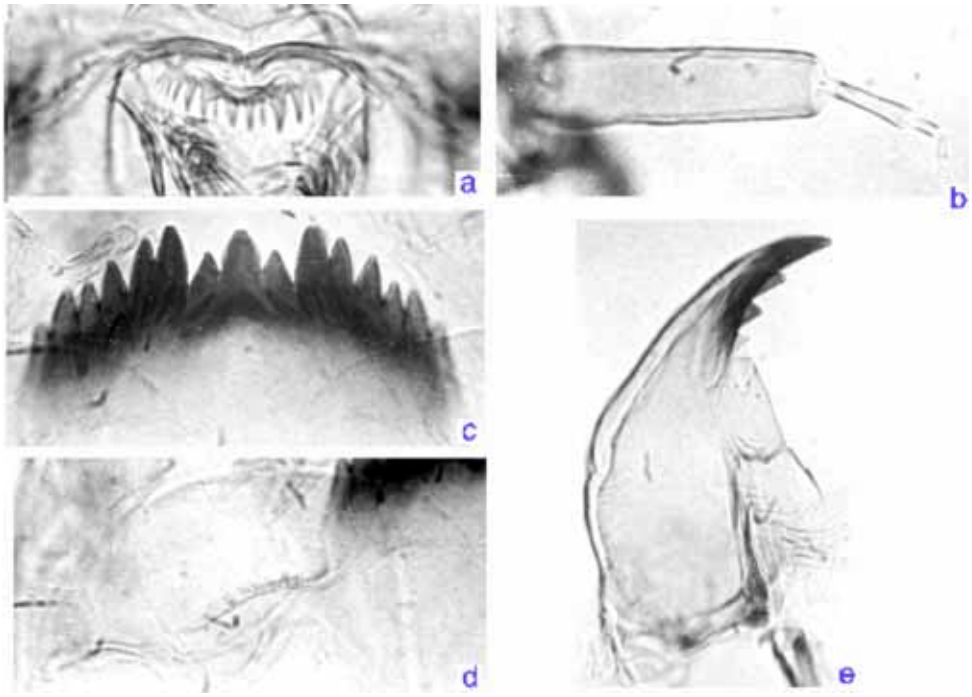


Found: Ontario - Clarence Creek, Russell Co.; Dunrobin, Carleton Co.
Wisconsin - Arboretum, Madison, Dane Co.; Trout Lake Limnol. Stn., Vilas Co.

Temporary pools, especially snow melt pools.

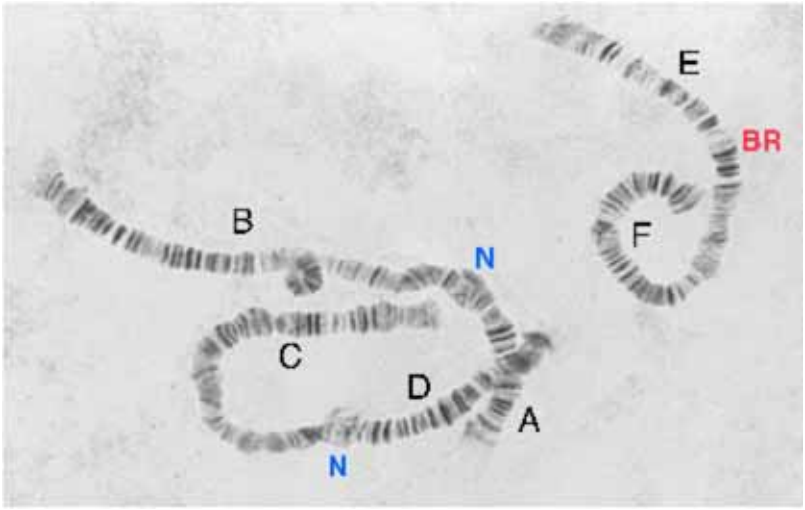
Species f. *C. riparius* group

Larva of the plumosus-type, length about 16 mm; VT quite long. Gula slightly darkened, FA 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) with about 39 - 40 striae. PE (a, below) with about 14 sharp but irregular teeth. Antenna (b, below) with basal segment about 4 times as long as wide; AR about 2. Mandible (e, below) with third inner tooth pale but separated (type II - III). 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 ie. 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).



Found: Ontario - Clarence Creek, Russell Co., Barron Creek, nr. Squirrel Rapids, Algonquin Provincial Park.
Quebec - King Mt., Gatineaus.

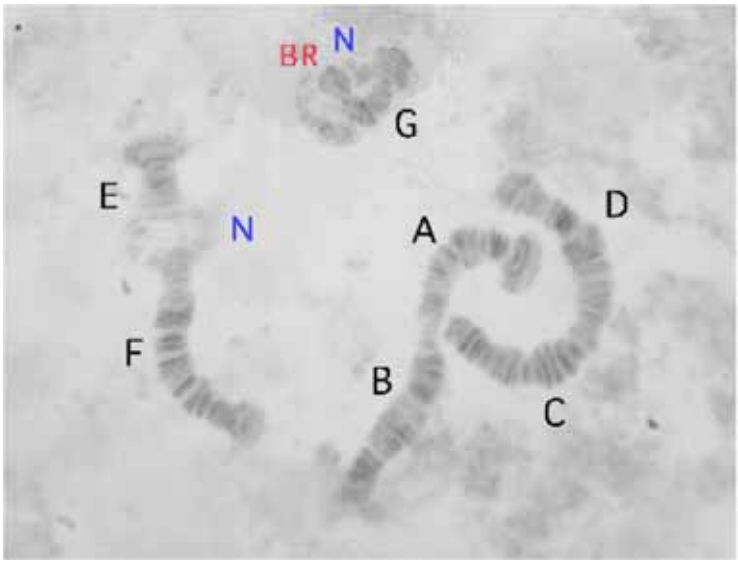
Snow melt pools and other small pools.

Species g. *C.* species 'algonquian'

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

Larva of the semi-reductus type, of medium size (fem. 12.9 – 14.0 mm; male 12.2 -13 mm), lateral projections 170 – 250 µm). 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 FA also darkened. Mentum with pointed teeth, c1 tooth broad, c2 teeth moderately separated but tend to continue edgeline of c1 tooth (type I); 4th laterals markedly reduced (type III).

Cytology: 4 polytene relatively short 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 in arm E. No inversion polymorphism in specimens seen.



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

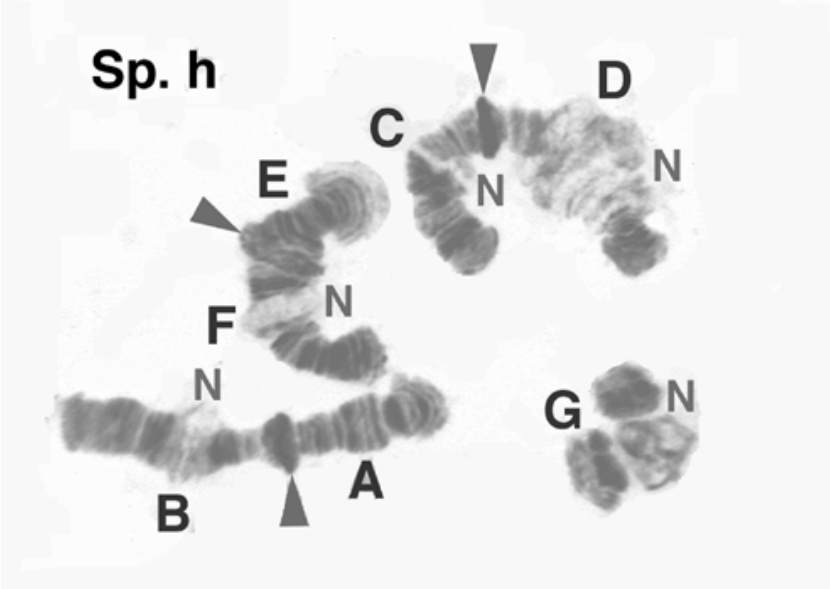
Found: Ontario - Bat Lake, Algonquin Provincial Park, Nipissing Co.

Amongst deep organic litter in highly eutrophic lake.
The manuscript name is one of the version of the spelling for the Provincial Park in which it was found

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

Larva of the plumosus-type, medium to large size (fem. 15 – 17.5 mm; male 10 -16.7 mm), lateral projections from 130 – 280 µm. Anterior pair of VT usually longer (ant. 0.72 – 1.6 mm; post. 0.72 – 1.3). AT long, about 3.8 – 6.4 times longer than wide. Gular region only slightly darkened on posterior third, FA pale or slightly darkened. Mentum with pointed teeth; c1 tooth broad, possibly with a flanged edge, c2 teeth moderately separated but tend to continue edge line of c1 tooth.

Cytology: 4 polytene relatively short 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.



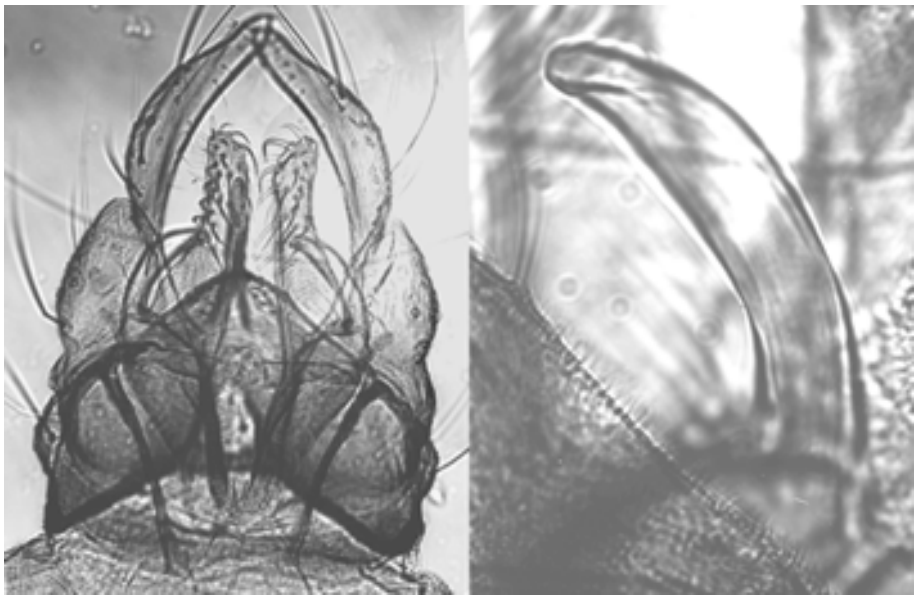
Arm A1: 1 - 2c, 10 - 11? 9, 2d - 3, 12, 8 - 4, 13 - 19 (Wülker)
Arm B1: 1-?, 20 - 18, ?, 9(?)- 13, ?- 8b, 17 - 14, 23 - 28 i.e. derived from *heteropilicornis*
Arm C1: Nucleolus about one third from centromere.
Arm D1: Nucleoli near middle of the arm
Arm E1: 1 - 3e, 5 - 10b, 4 - 3f, 10c - 13 i.e. as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

Found: Ontario - Bat Lake, Algonquin Park.

Amongst deep organic litter in a highly eutrophic lake.

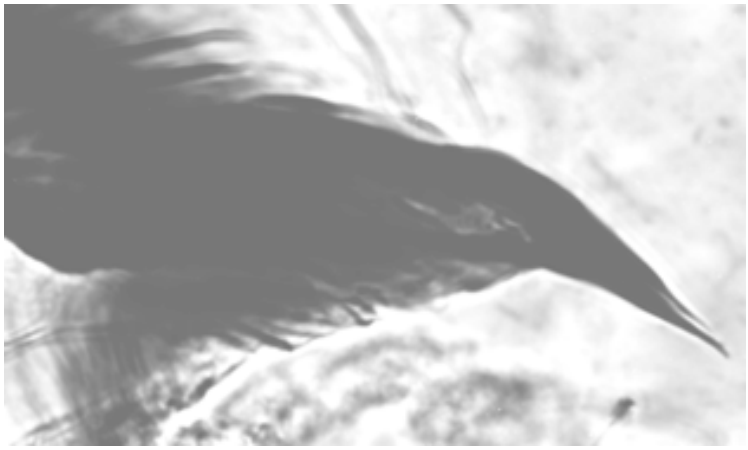
Species i. *C. atrella* Townes, 1945 *C.* nr. *anthracinus* – Butler *et al*. (1995)

Adult described by Townes (1945).



Male terminalia of *C. atrella*

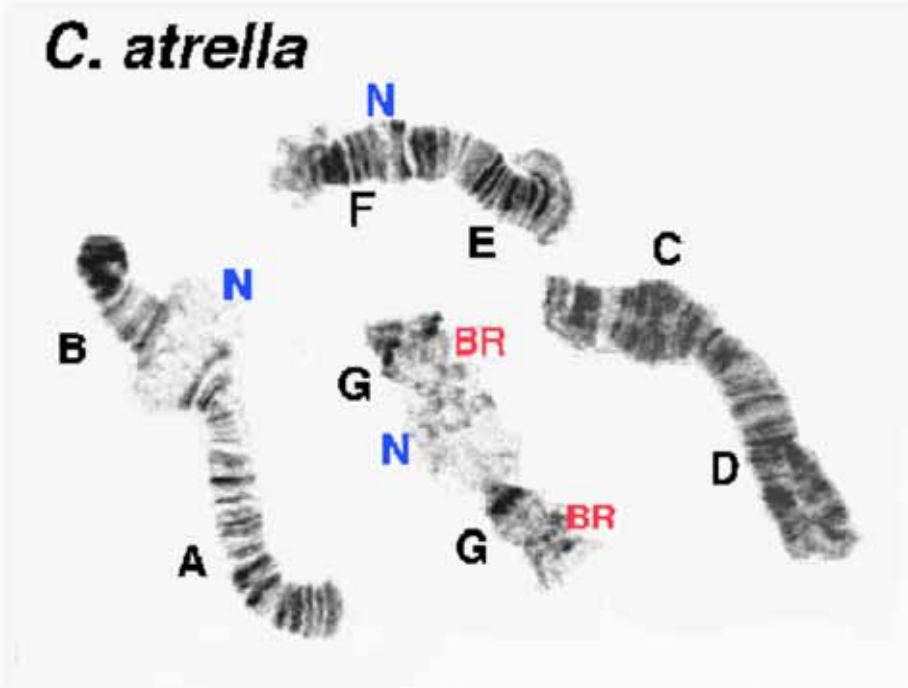
Pupa: Caudolateral spur of segment VIII with about one or two spines.



Pupal spur of *C. atrella*

Larva a small to medium plumosus type (len. female abt 9.4 - 16.5 mm; male 10.4 - 11.5 mm), VT moderately long and on average about equal length (ant. 0.84 - 2.9 mm; post. 0.90 - 3.45 mm).
Gular region darkened on posterior third, FA pale.
Mentum with rounded teeth, c1 tooth rather narrow, c2 teeth moderately separated (type I).
PE with about 11 - 14 teeth.
Mandible with 3rd inner tooth only partly separated (type II).

Cytology: 4 polytene relatively short chronosomes 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.
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, 4c-a, 11c - 9e, 4d-i, 6b - 5, 15 - 11d, 6gh, 17a - 16, 7d-a, 6f-c, 17b - 22
atrC3: 1 - 3, 8 - 11c, 4a-i, 6b - 5, 12 - 15e, 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 *longistylus*
atrD2: 1 - 3 11 16c - 12 16d - 18d 7d - 4 10 - 7e 18e - 24
atrD3: 1 - 3e, 5d - 4, 10, 7d - 5e, 11 - 15d, 18d - 15e, 3fg, 9 - 7e, 18e - 24
atrE1: 1a - 3e, 10b - 3f, 10c - 13 i.e. as in *aprilinus*
atrE2: 1 - 3e, 10b - 9, 7 - 8, 6 - 3f, 10c - 13
atrF1: 1a-f, 9 - 3c, 14 - 10, 1g - 3b, 15 - 23 i.e inv 3g-14 from *'blaylocki'* & 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 3c - 9 16 - 15 3b - 1g 10 - 13 17 - 23 i.e. from F2

Found: Alberta: - Nordegg (Paratype - Townes 1945)
Manitoba - Aweme, Caroll (Paratypes - Townes 1945); Lake Winnipeg (Sæther 2012)
Ontario - 'Copanspin Farm' Dunrobin; 0.5 ml e. Dunrobin; South March nr Mud Lake (44.88, -78.27); Hogs Back, Ottawa (all Carleton, Co.).
Prince Edward Island - Brackley Beach, Canadian National Park (Paratype - Townes 1945)
California - Tahoe City (Paratype - Townes 1945) Lake Davis, Plumas Co.; Spring Valley, San Diego Co.

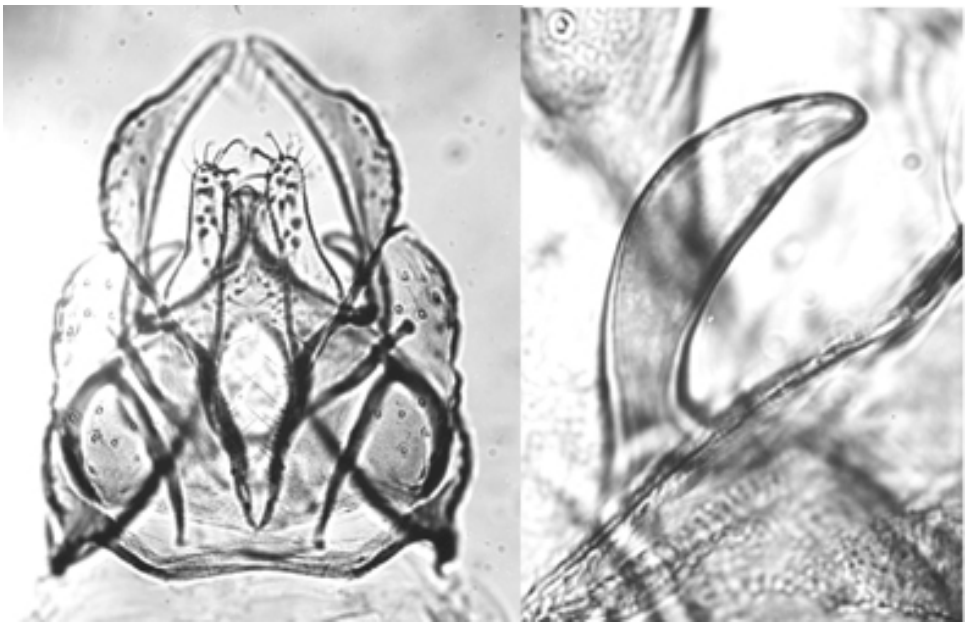
Colorada - Denver; FortCollins (Paratypes - Townes 1945).
Indiana - Crooked Lake, Noble Co.
Massachusetts - Oak Bluffs (Paratype - Townes 1945).
Minnesota - Luverne; Nine Mile Creek, Anoka Co. (Paratypes - Townes 1945); Lake Christina, Douglas Co.; Audubon, Becker Co.
Nevada - Reno (Type locality)
New Mexico - Eagle Nest Lake, Colfax Co.
North Dakota - Fuller Lake; Larimore Dam, Grand Forks Co.; McVille Dam, Nelson Co.; Warsing Dam, Eddy Co.
South Dakota - Brookings, Erwin (Paratypes - Townes 1945).
Wisconsin - Reader Farm, 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

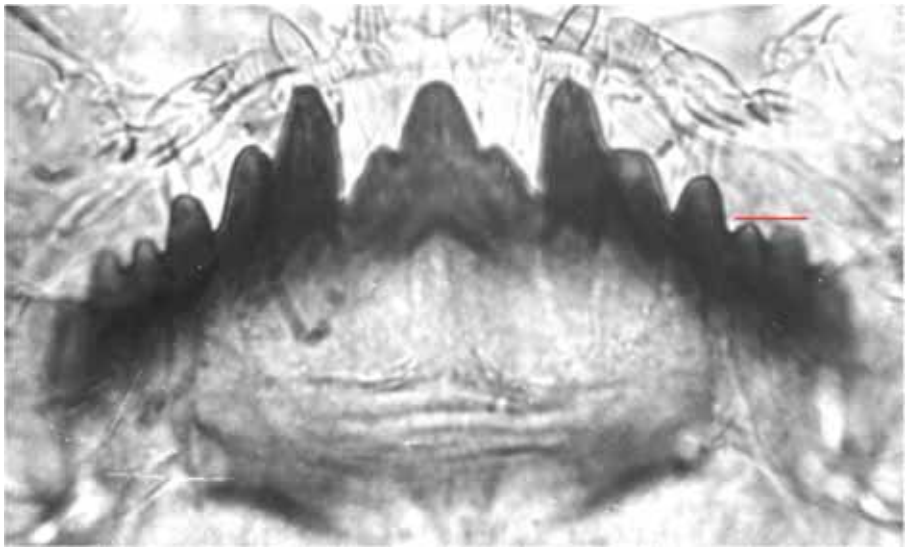
Adult male:
Specimens in the J. E. Sublette collection in the Museum of the University of Minnesota.



Male terminalia of *C*. sp. j.
A typical *C. decorus*-type hypopygium, with superior volsella similar to that of *C. bifurcatus* and *C. maturus*.

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

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 FA pale or with darkened edges.
Mentum with rounded teeth; 4th laterals reduced 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 epipharygis with about 9 - 10 relatively broad teeth.
Premandible with teeth about equal in length, inner tooth less than 2.5 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 pale or slightly colored and only partly separated (type I-II); 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 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:
ArmE1:
Arm F1:
Arm G1: Subterminal nucleolus.

Found: New Brunswick - Kouchibouguac National Park
Ontario - Algonquin Provincial Park, Nipissing Co.; Bear Creek, Carlsbad Springs (45.37, -75.47), Carleton Co.
Quebec - Notch Road, Gatineaus

Slow moving creeks and pools.

Species k.
Adult not certain

Larva a small to medium plumosus-type. Gular region and FA slightly darkened. Mentum with pointed teeth; c1 tooth high and almost parallel sided, c2 teeth moderately developed.

Cytology: 4 polytene chromosomes with thummi arm combination AB, CD, EF, G.
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.
Arm A:
Arm B: Slight distal puff.
Arm C:
Arm D:
Arm E:
Arm F:
Arm G Large terminal nucleolus, BR near other end.

Found: Ontario - Costello Creek, Algonquin Provincial Park
New Hampshire - Lancaster

Creeks and pools.

Species l. *C. blaylocki* Wülker *et al.*
A member of the *C. decorus*-group, described as *C. tentans* by Blaylock, Auerbach and Nelson (1964).

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. Dark gular region and pale or slightly darkened FA. Mentum with rounded teeth, 4th laterals reduced at least to the level of the 5th laterals (type II-III); c1 tooth moderately broad with well developed c2 teeth (type II). VM with about 36-38 striae. PE with about 13 to 16 teeth, the

most lateral ones being somewhat narrower. Premandible with two teeth as typical for the genus, outer tooth narrower. Mandible with 3 spines on the inner margin; about 15 - 16 furrows on outerer surface near the base; 3rd inner tooth clearly separated (type III). Antenna with relatively long basal segment, almost 4 times as long as wide; AR about 0.43; segment proportions (microns) 163 : 38 : 10 : 13 : 8 ; A1/VHL about 0.46; A2/A1 about 0.23. AT with a medial constriction.

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 *C. bifurcatus*.
blaC2:	1 – 2e, 12b, 6b – 2f, 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, 19g - 18, 12 - 11, 19h, 13 - 17, 4 - 7, 10 - 8, 20 - 24	
bla E1:	1 - 3e, 8 - 5, 9 - 10b, 4 - 3f, 10c - 13	ie. as *maturus* & *stigmaterus.*
bla F1:	1, 9 - 2, 10 - 23	
bla F2:	1, 9 - 5d, 16 - 10, 2 - 5c, 17 - 23	

Found: Tennessee - White Oak Creek (Type locality) and McCoy Branch, Clinch River, nr. Oak Ridge, Knox Co; Ten Mile Creek,.Knox Co.

Pools in creeks.

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.

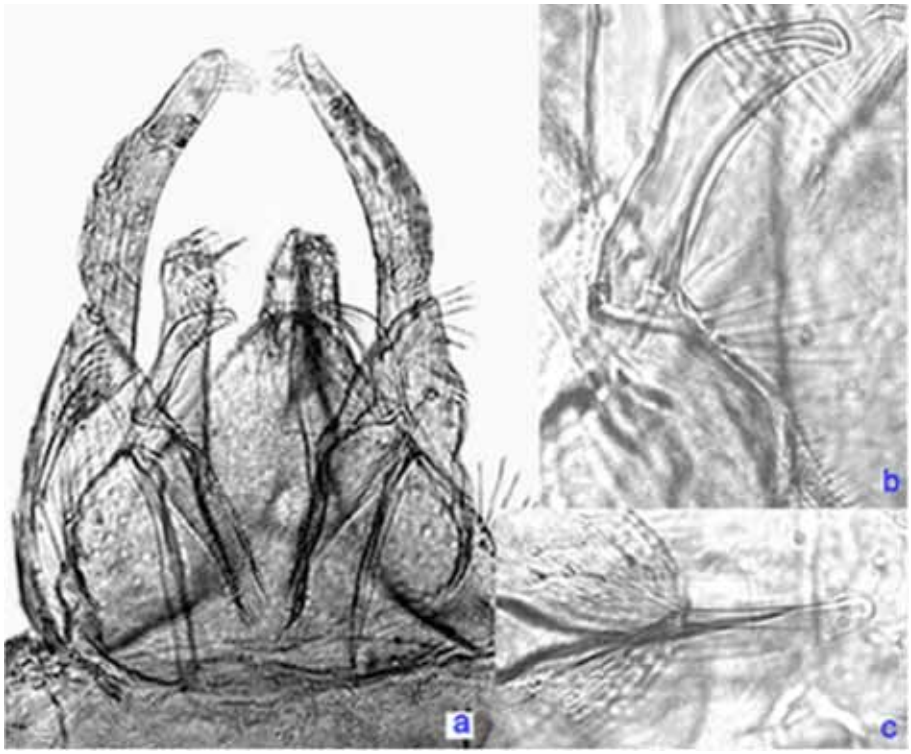
Species m. *C. pilicornis* (Fabricius 1787) as *Tipula pilicornis/*

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

Male:
LR 0.95-1.0.
Anal Point narrow (unusual among dark species)

Female: Not described, but inferred to be as Palearctic material.

A pupa with a pharate male was collected along with the larvae described here. It does not appear to be *C. pilicornis*, howver it cannot definitely be associated with those larvae. It is figured here for information:



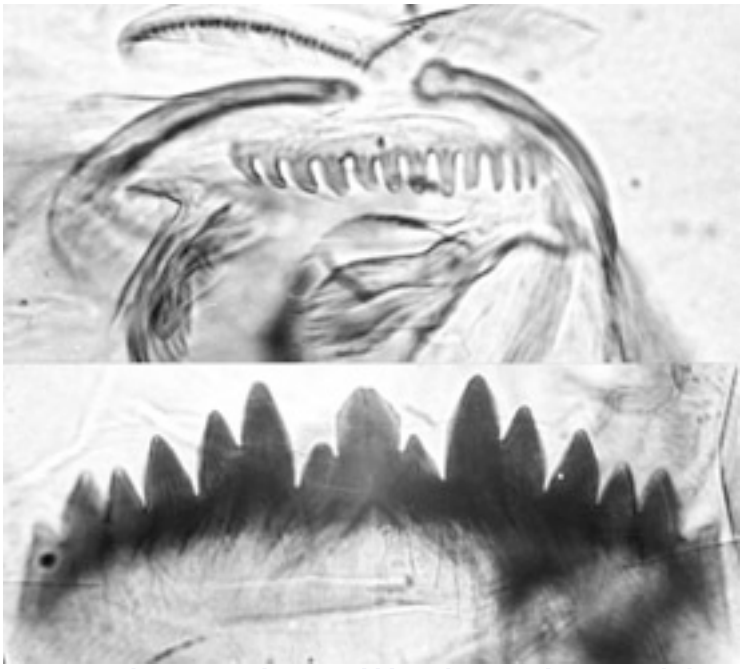
a. Hypopygium, b. Superior volsella, and c. anal point of a pharate male collected with *C. pilicornis* larvae

Pupa: A pupal exuvia is was associated with the pharate male. The caudolateral spur of segment VIII had 4 closely appressed spines.

Caudolateral spur of pharate male

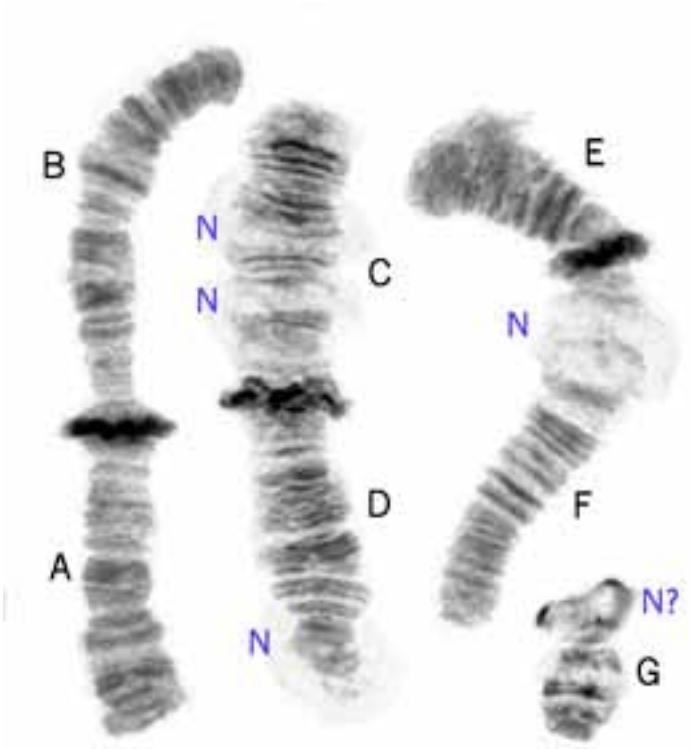
Larva a medium sized plumosus-type (lenght female about 12.2 mm), PLT 240 - 260 µm, VT quite long (Ant about 1.00 - 1.48 mm; post about 0.92 - 1.76 mm). Dark gular and pale or slightly darkened FA. Mentum with pointed teeth, c1 tooth quite broad and parallel sided, c2 teeth well separated and pointed (Type III); 4th laterals reduced. PE with about 12 - 18 relatively broad teeth. Antnnal ratio about .59 - 2.17, ratio of segments µm) 154 : 37 : 13 : 15 : 9 . Premandible with inner tooth about 2 - 2.3 times the width of the outer tooth. Mandible with third inner tooth partly to completely separated (type II-III); about 17 - 18 furrows on outer surface near the base.

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.



Pecten epipharyngis and premandibles (above) and mentum (below)

Cytology: 4 relatively short polytene chromosomes with distinct heterochromatic centromeres. Arm combination is thummi-cytocomplex, 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 or Babiani ring in G, but N probably sub-terminal as in Palearctic material. Nucleoli developed in all three larger chromosomes, in arm B, proximal in F, 2 in D and a terminal nucleolus is sometimes present in C. In the Palearctic, polymorphism has been reported in arms A, B, and D (Kiknadze *et al*. 1996). In North America, so far, polymorphism has only been reported in arm D in the region of the nucleoli.



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 ie. as *aberratus, tenuistylus*
pilD1: 1 - 3, 11 - 18d, 7 - 4, 10 -8, 18e - 24 ie. as *longistylus, tardus, cucini*
pilE1: 1a-3e, 10b-3f, 10c-13g i.e. as in *aprilinus, atrella, athalassicus*
pilF1: could be 1 - 6, 12 - 7, 13 - 23 ie. as Palearctic *pilicornis*

Found: Alberta - Rosebud; Waterton Lakes (adult).
Manitoba - 7 ml S of Erickson;. Southern Indian Lake (Rosenberg *et al*. 1984).
Northwest Territories- Trough Pond, Horton River area (M.G.Butler)
Saskatchewan - Oxbow, Saskatoon (Townes 1945).
South Dakota - Emanuel Cr., 2 ml W of Springfield (Sublette, pers. comm.).
Also found in the Palearctic, Type locality: Kiel, Germany.

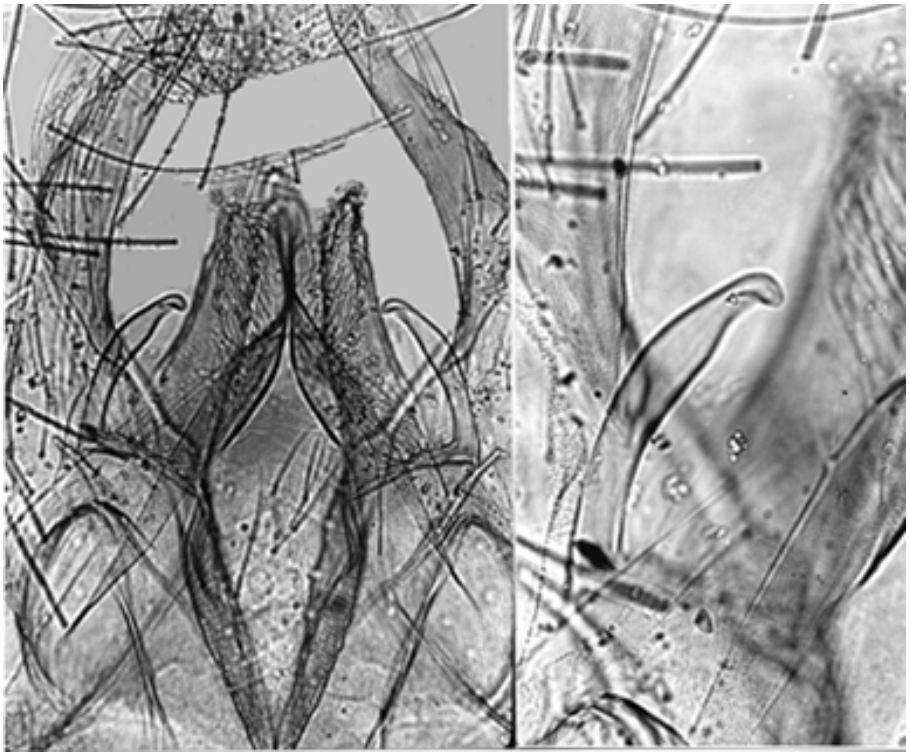
Prairie sloughs and pools.

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). Although the chromosomes of North American specimens are essentially identical in sequence to Palearctic *C. pilicornis*, there are difference in nucleolus location. A rearing from Rosebud, Alberta was not *C. pilicornis*. However it remains to be proven that rearing was conspecific with the larvae used for cytological analysis. Alternatively this may be a new species closely related to *C. pilicornis* Fabricius.

Species n. *C. stigmaterus* Say 1823

Adult

Male:



Superior volsella long and slender, E-type, between h and i, of Strenzke (1959).

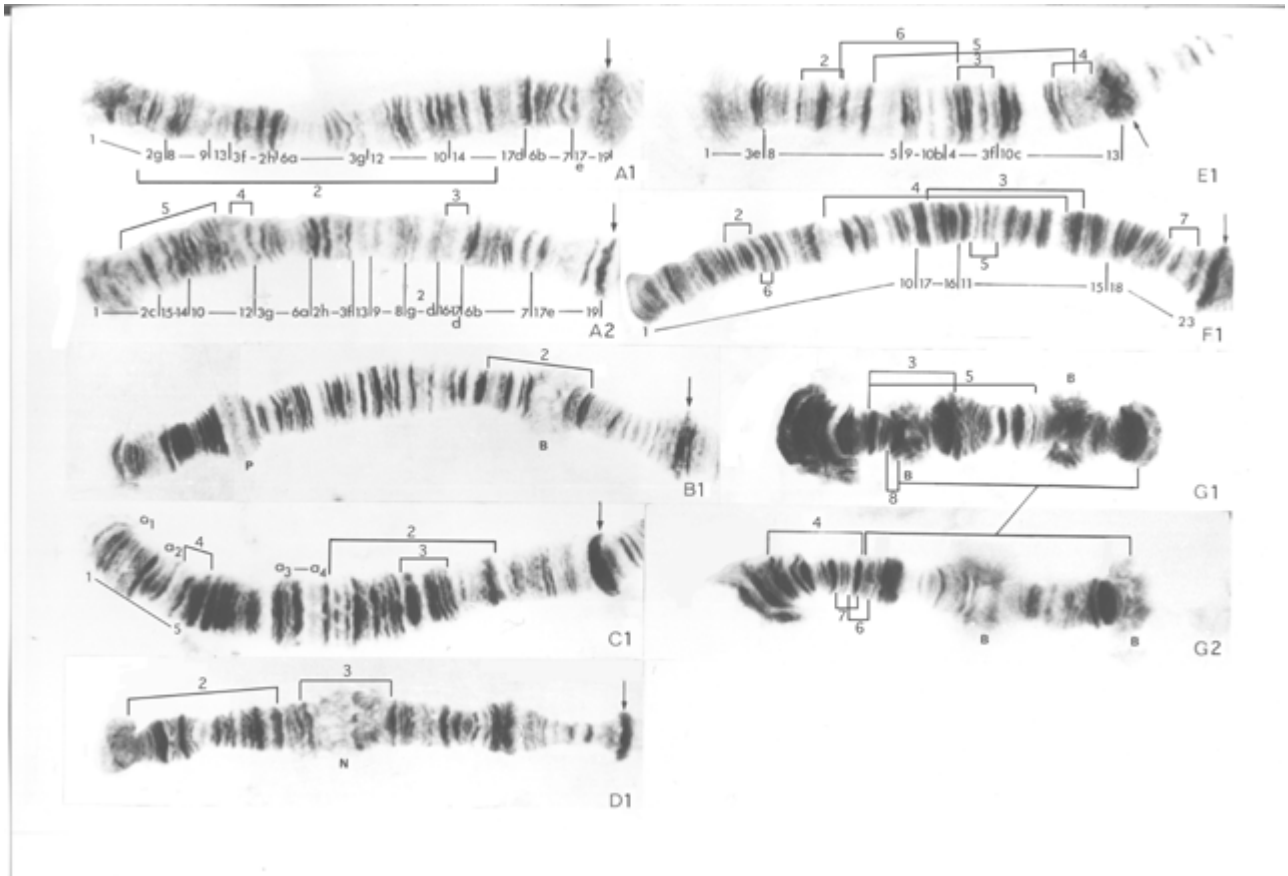
Pupa

Larva a medium to large plumosus-type (Length, female about 16.8 mm). VT long with posterior pair longer (Female, Anterior about 2.8 mm, posterior about 3.2 mm). Darkened gular and FA (which may be darker in center). Mentum with somewhat rounded teeth, which in trifid center tooth causes c1 tooth to narrow at base.

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 areknown in all arms, with some populations quite polymorphic (Hilburn 1979).

stiA1: 1a-2g, 8-9, 13a-f, 3f-2h, 6a-3g, 12c-10, 14-17d, 6b-7, 17e-19
stiA2: 1a-2c, 15-14, 10-12, 3g-6a, 2h-3f,13f-a, 9-8, 2g-d, 16-17d, 6b-7, 17e-19
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
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
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
stiB1: Puff with distal dark bands (groups 7 & 8) near end of arm, BR near characteristic 4 bands (24-26)
stiB2: Inversion of region around BR, about groups 21-23
stiC: Four sequences are known, only C1 and C2 common
stiD: Three sequences known, but only D1 common
stiE1: 1-3e, 8-5, 9-10b, 4-3f, 10c-13 ie. as *maturus* (differs from *aberratus* by In8-5)
stiE2: approx 1-3e, 8-7h, 6e-7g, 6f-5, 9-10b, 4-3f, 10c-13

stiE3: approx 1-3e, 8-5, 9-10b, 4hg, 4a-f, 3f, 10c-13
stiE4: approx 1-3e, 8-5, 9-10b, 4-3f, 10c-12b, 13f-12c, 13g
stiE5: approx 1-3e, 8-5c, 13a-10c, 3f-4, 10b-9, 5ab, 13b-g
stiE6: approx 1-3e, 8-6f, 4a-h, 10b-9, 5-6e, 3f, 10c-13
stiF1: 1-10, 17-16, 11-15, 18-23 ie. derived from *aberratus* by In11-5
stiF2: 1-4, 6a-5, 6b-10, 17-16, 11-15, 18-23 found heterozygous in 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)
stiF4: approx 1-8b, 14d-11, 16-17, 10-8c, 14e-15, 18-23
stiF5: approx 1-10, 17-16, 11a-c, 11i-d, 15, 18-23
stiF6: approx1-5, 7a-6a, 6b-10, 17-16, 11a-15, 18-23
stiF7: approx 1-10, 17-16, 11a-15i, 18-20g , 22d-20h, 22e-23
stiG1: Two BRs, one near each end of arm
stiG2: Inversion of about two thirds of the arm; takes one BR to terminal position
stiG3: Inversion of the region around proximal BR of G1
stiG4: Inversion of slightly more proximal region than in G3, but in G2
stiG5: Inversion of about half the arm from G1
stiG6: Small inversion sharing distal break of G4 and within the region of the G4 inversion
stiG7: Duplication of small proximal region of G2
stiG8 Small inversion of G1, proximal to, and sharing proximal breakpoint of, G2



Found: Numerous populations in:
Arizona - Tucson, Pima Co.; Douglas (Townes, 1945)
California - Hayward, Alameida Co.; Napa, & 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 -- 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 Expltl 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)

Often in sewage oxidation ponds, windmill tanks, etc.

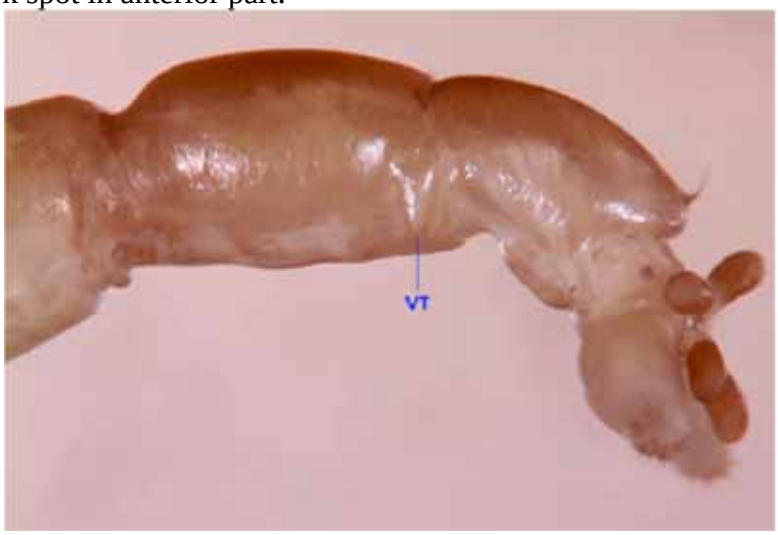
Morphological description by Sublette and Sublette (1983). Note that pupa has distinctive rugose stripes on abdominal tergites. Cytology described by Martin and Wülker (1974). The work of Hilburn (1978) suggests the Californian populations are a distinct species from those in Texas and New Mexico. This was species 11 of Wülker.

Species o. *C. cucini* Webb

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

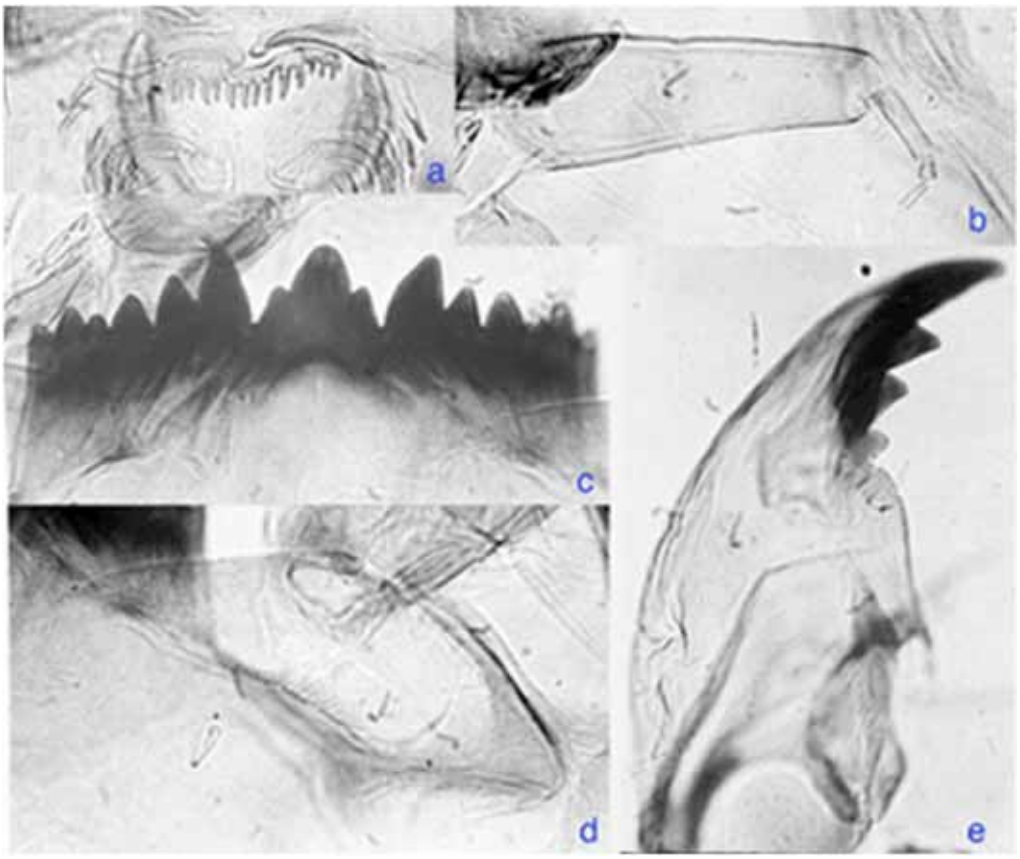
Pupa: Length 10.2-11.8 mm. Cephalic tubercles slightly longer than wide, len. about 50 µm, apical setae as long as tubercle. Posterolateral spur of segment VIII with about 4 (2 - 7) spines.

Larva a large (length 18.0 - 19.4 mm) salinarius or halophilus-type, i.e. posterior VT sometimes present. Gula darkened posteriorly, FA 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.

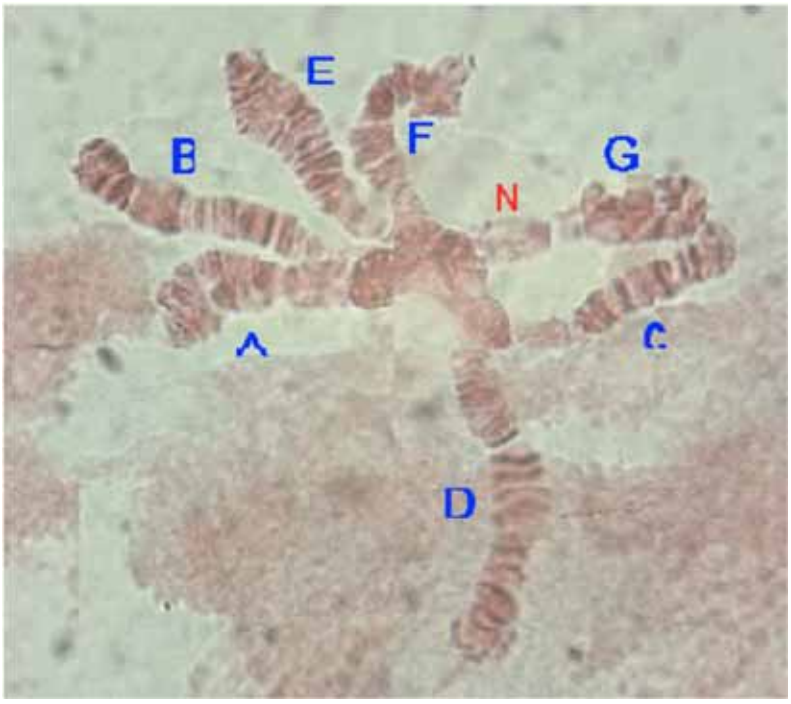
Mentum (Fig. c, below)with relatively shallow curve, teeth pointed; center tooth moderately broad, c2 teeth moderately separated (type B of Proulx *et al.* 2013); first laterals slope away from center; fourth laterals definitely reduced (type III).
VM (Fig. d, below). PE with 12-19 pointed irregular teeth (Fig. a, below).
Antennal segment 1 relatively long: 3.20 (2.67-4.10) times longer than wide; AR about 2.3; A1/A2 about 4.3; ratio of segments (µm) 143 : 34 : 7 : 14 : 8 (Fig. b, below).
Mandible with third inner tooth pale, but separated to varying degrees (type A or D of Proulx *et al.*2013) (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, major* & *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, Algonquin Provincial Park (Type locality); Lake Nipissing(?)
Quebec - Lake Bousquet, Lake Opasatica, Lake St. Joseph, Lake Vaudray (Proulx *et al*. 2013); Manatek Lake
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.* Karyotype figured by Martin (1979) and described by Wülker & Butler (1983). This was Species 7 of Wülker. This may be *Chironomus* species B of Hilsenhoff and Narf (1968).

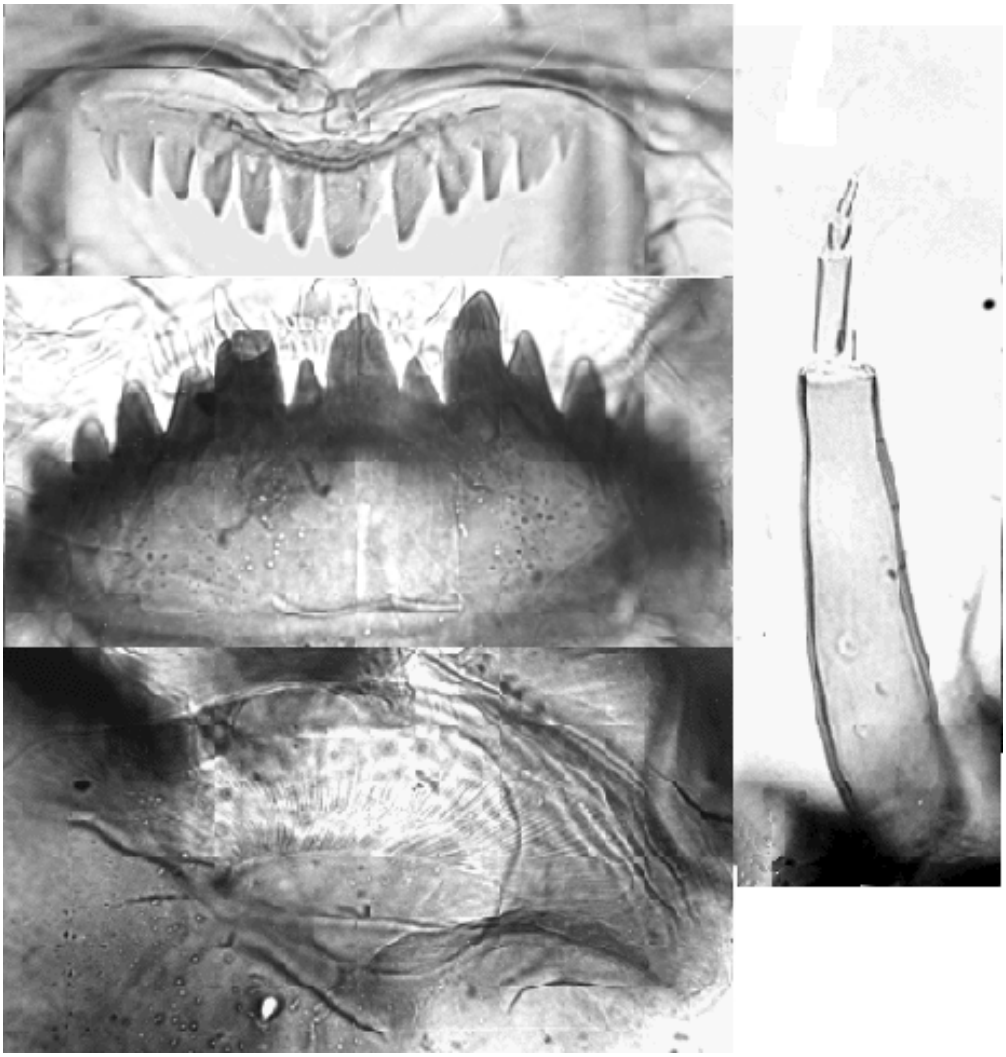
Species p. *C. plumosus* (Linn.) (= *C. vancouveri*)

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

Larva a large (13.7-29.9 mm) semireductus- to plumosus-type; anterior VT often with a flexure in basal half (Butler, unpubl.), and often longer than posterior pair (ant. 0.4-1.41 mm; post. 0.4-1.29 mm). PLT variable, from 90- 550 µm in length. Gular region dark, FA 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 of Type I; c1 tooth relatively narrow, c2 teeth well separated (Type IV, or II). VM with a slightly jagged edge, particularly near the center, due to the presence of protruding outer hooks, striae reaching to margin. PE with about 12 broad teeth. Antenna with relatively long narrow basal segment, about 4.4 times as long as wide.



Cytology: 4 polytene relatively short 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 h'pluA2. Polymorphism in arms A, B, D, but also rarely in E (California).

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 - 14, 13f-c, 12bc, 3 - 2h, 4d - 9, 2d-g, 4c-a, 13ab, 12a - 10, 2cb, 18 - 19
h'pluB1: 1 - 4c, 20c - 23a, 20b - 19, 15 - 17, 6d - 4d, 6e - 8b, u, 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, u, 13 - 8c, 18 - 19a, u, 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
h'pluE1: 1 - 3e, 10b - 3f, 10c - 13 (Butler *et al.* 1998b)
h'pluE2: 1 - 2, 4e-h, 10b - 5, 3e-a, 4d - 3f, 10c - 13
h'pluF1: 1a-d, 6 - 1e, 7 - 10, 17 - 11, 18 - 23
h'pluG1: as Palearctic specimens (i.e. h'G1)

Found: Numerous lakes in Canada and U.S.A.: Alberta - South Baptiste Lake.
British Columbia - Deer Lake, Near Opposite Crescent, Bechers Prairie, Cariboo and Chilcotin Parklands (Cannings);
Manitoba - Lake Winnipeg (from figures of Sæther 2012)
Ontario - Milhaven Bay; White Lake, 3 Mile Bay;
Saskatchewan - Lake Waskesiu, Prince Albert National Park.
Alabama - Farm pond, Auburn;
California - Clear Lake; Lake Merced, San Francisco; Indiana - Crooked Lake, Angola Co.; Crooked Lake, Noble Co.; Manitou Lake; Shafer Lake; Sylvan Lake;
Kentucky - Lake, Campbell Co.
Michigan - Saginaw Bay, Lake Michigan.
Minnesota - Lake Itasca; Lake Christina, Douglas Co.
New Mexico - Eagle Nest Lake, Colfax Co.; Upper Abbot Lake, Harding Co.; Lower Abbot Lake, Harding Co.;
North Dakota - Brewers Lake; Dead Colt Creek Dam, Ransom Co.; Larimore Dam, Grand Forks, Co.; Red Willow Lake, Griggs Co.; Silver Lake, Sargent Co.
Ohio - (Bolton 2012)
Oklahoma - University of Oklahoma Biological Station, Willis, Marshall Co.
South Dakota - Lake Kampeska;
Wisconsin - East Horsehead Lake, Onieda Co.; Grand Portage Lake, Iron Co.; Green Lake; Little Green Lake, Green Lake Co.; Lake Kengonsa, Dane Co.; Lake Onalaska, 1m. NW La Crosse; Lake Wingra, Dane Co.; Murphy's Creek, Madison, Dane Co.; Pepin Lake; Pine Lake, Oneida Co.; Pleasant Lake; Yellow Lake.

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

North American material has been described as *C. vancouveri* by Michailova and Fischer (1986), but it is almost certainly a synonym of *C. plumosus* (Butler *et al.* 1998b). Some workers (e.g. Hilsenhoff and Narf 1968) have suggested the existence of more than one species on ecological grounds. 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 byGolygina 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.
C. plumosus and *C. entis* cannot be separated on the basis of the DNA "barcode" sequence of *cox1*, but can be separated by the sequence of the globin gene gb2ß (Guryev and Blinov 2002).

Species q. *C. anthracinus* Zetterstedt

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.

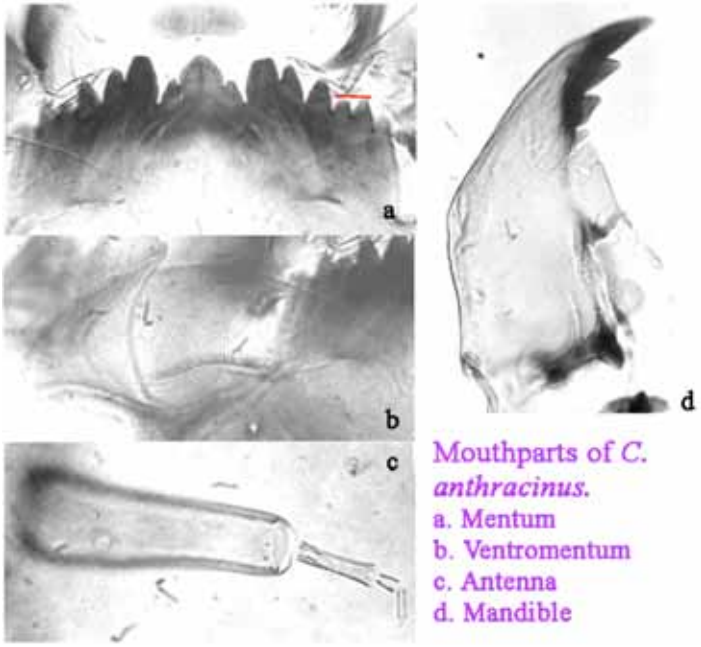
Male hypopygium of *Chironomus anthracinus* (from Townes 1945)

The anal point and appendages unusually short and broad. SV 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.

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 µm (female), 385 µm (male). Gular region dark over at least the posterior two thirds and commonly right up to the base of the mentum; FA pale. 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 FA is darkened. The significance of these differences is uncertain. 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 I - II). 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, although the pale 3rd inner tooth may be well separated; about 16 - 20 furrows on outer surface near base.

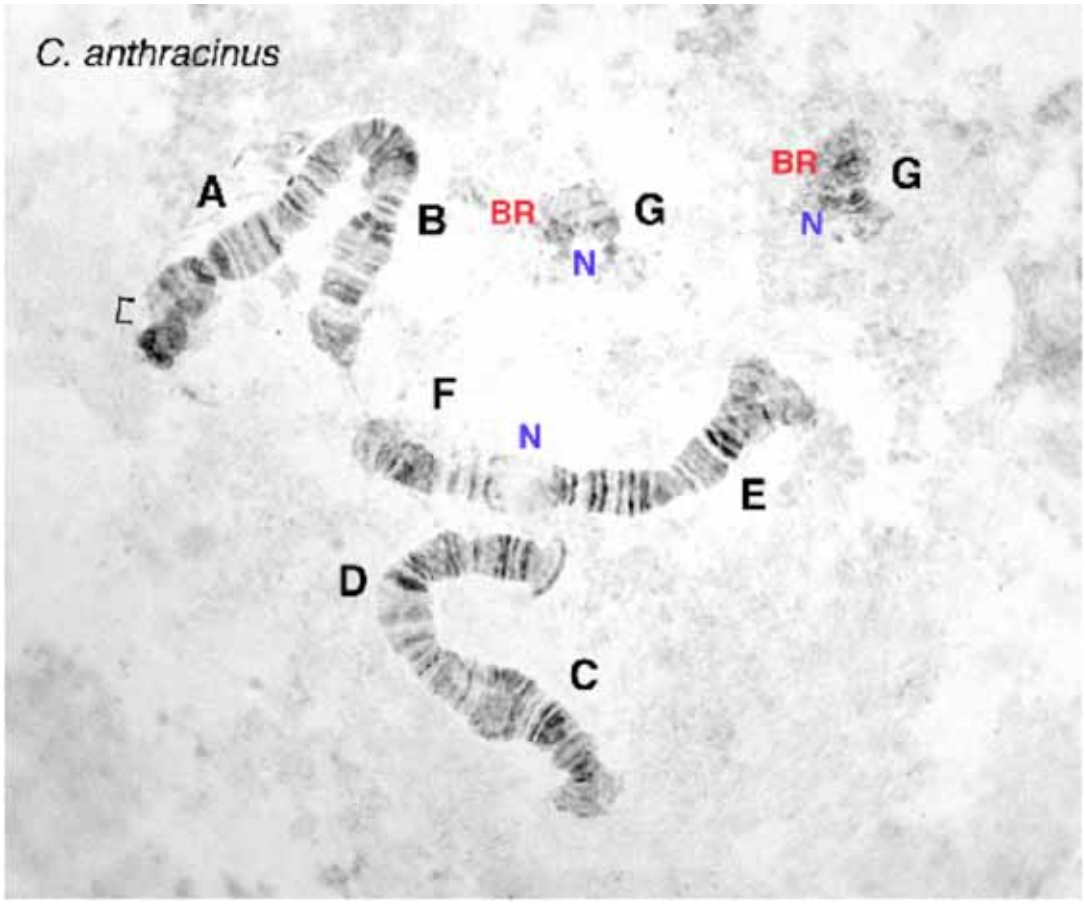


Mouthparts of *C. anthracinus*.
a. Mentum
b. Ventromentum
c. Antenna
d. Mandible

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.

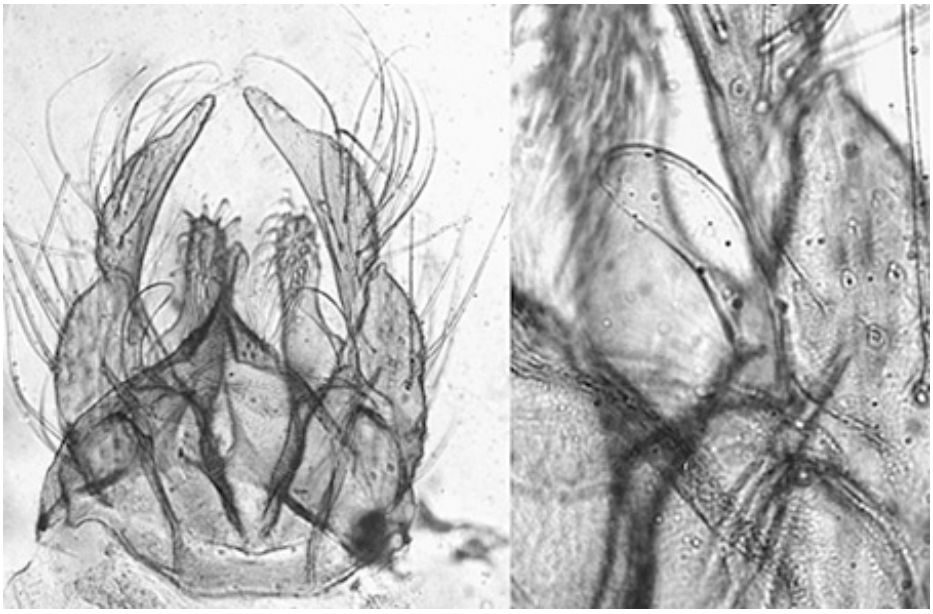
Found in lakes.

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 is currently unclear. It may correspond to *C. rempelii*, but unfortuately 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)

Adult:

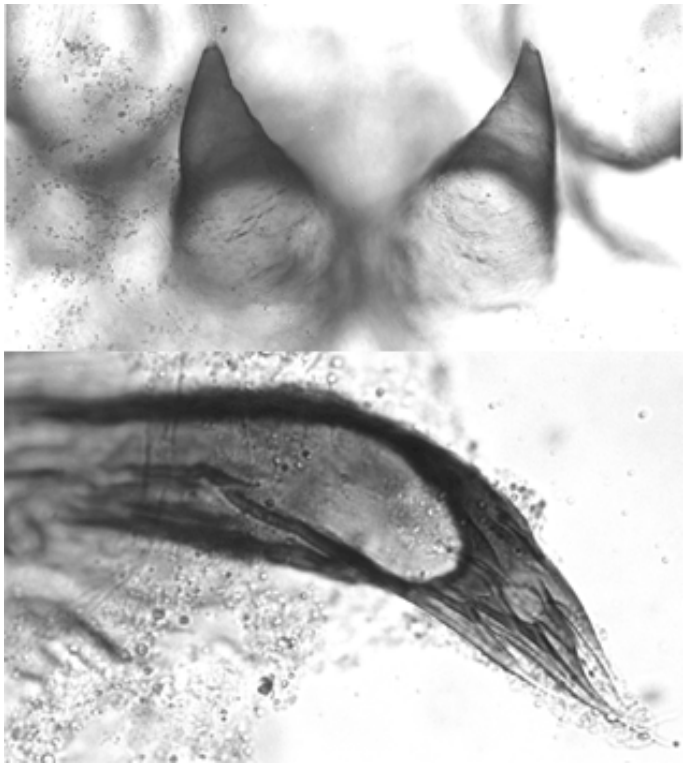
Male: Derives its name from the yellowish base colour and blackish stripes.



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

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

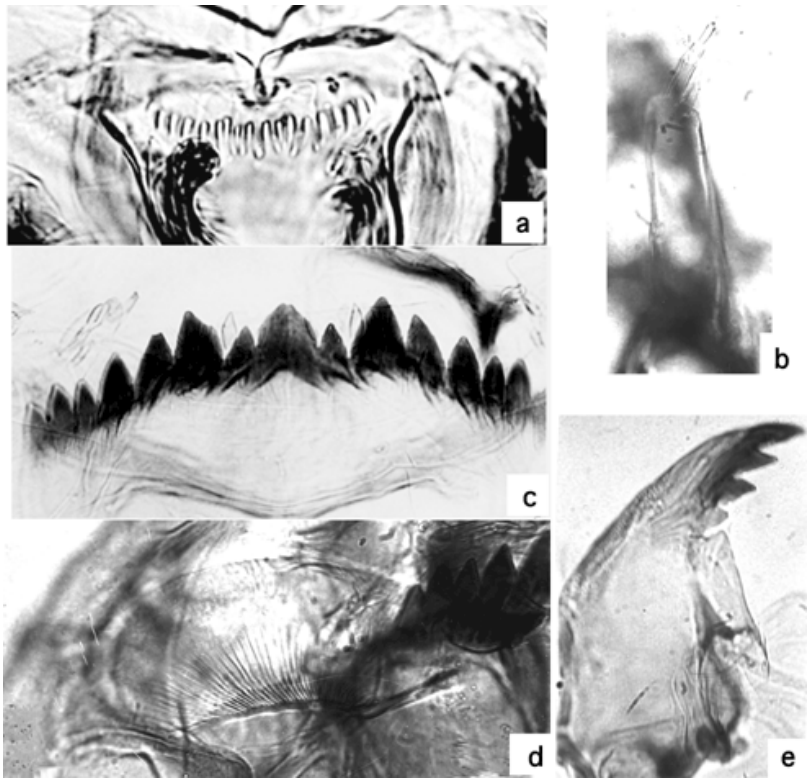
Pupa: Caudolateral spur of segment VIII with about 5 or 6 spines.



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

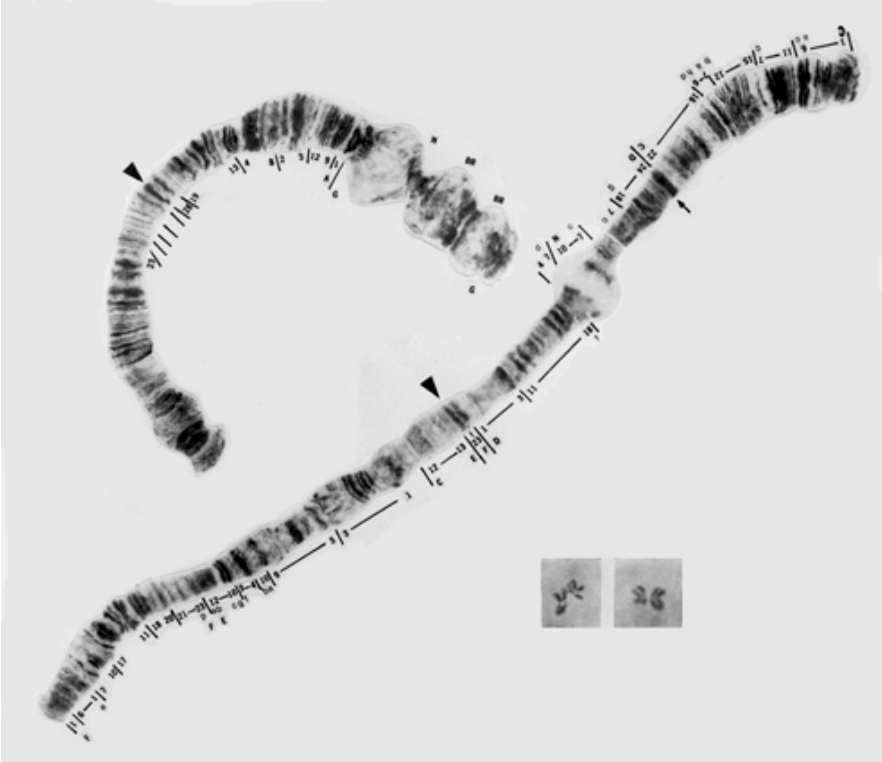
Larva a large plumosus-type (length, female: 17.6 - 20.4 mm) with anterior VT longer (female: ant. 1.5 - 2.4 mm; post. 1.3 - 2.1 mm). Gular region and FA darkened. Mentum with a relatively

shallow curve, teeth pointed, 4th laterals slightly reduced (type II); c1 tooth broad with short parallel sides, c2 teeth well developed (type II). PE with about 18 - 19 somewhat irregular teeth. VM (d, below) with about 35 - 39 striae; anterior margin relatively smooth. Antenna (b, below) with relatively short, broad segment 1, about 2.6 - 2.75 times as long as wide; AR about 2.18, antennal segments 152 : 31 : 10 : 15 : 8 micron. Mandible (e, below) with third inner tooth separated but still relatively pale (type II - III), about 15 furrows on outer margin at the base.



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 F, along with adjacent proximal bands of arm E, translocated to distal end of arm E at junction with arm D, where it presumably forms the functional centromere of this arm.

‘tig’A1: 1, 9-12, 3-2, 8-4, 13-19
‘tig’C1: 1-6c, 11-7c, 15-12, 7b-6d, 16-22
‘tig’D1: 1-3, 11-18,f, 4-7d, 10-7c, 18g-24
‘tig’E1: F23f, 13-12c, 1-3, 5-10b, 4-3f, 10c-12b
‘tig’F1: 1a-d, 6-1e, 7-10, 17-11, 18-20, 21-23e



(after Kiknadze *et al*. 1993)

Found: Ontario - Clarke Lake, Algonquin Provincial Park
Quebec - Lake St. Joseph
Minnesota - Lake Itasca, Clearwater Co., Spearhead Lake, Beltrami Co.; Turtle Lake, Becker Co.
Wisconsin - Friebauer Lake, Bayfield Co.

In thick mud at depths around 6 m in lakes.

Cytology mentioned in Martin *et al.* (1974) and Martin (1979), described by Kiknadze *et al.* (1993) as *C.* sp. Am1. Redescribed and named by Butler & Kiknadze (in preparation). Corresponds to Species 1 of Wülker.
It may be worthwhile checking the adults of this species against the type specimens of *C. imperator* Walley (1926).

Species s. *C. staegeri* Lundbeck 1898
Synonym: *C. fasciventris* Malloch 1915

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

Male: Wing length 5.58 mm (3.86 – 6.30); 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).
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: SV long and curved, ending bluntly, E-type, closest to i 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 µm. Palpal proportions (segs. 2-5) 7 : 26 : 34 30 (somewhat shrivelled).
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 µm 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).

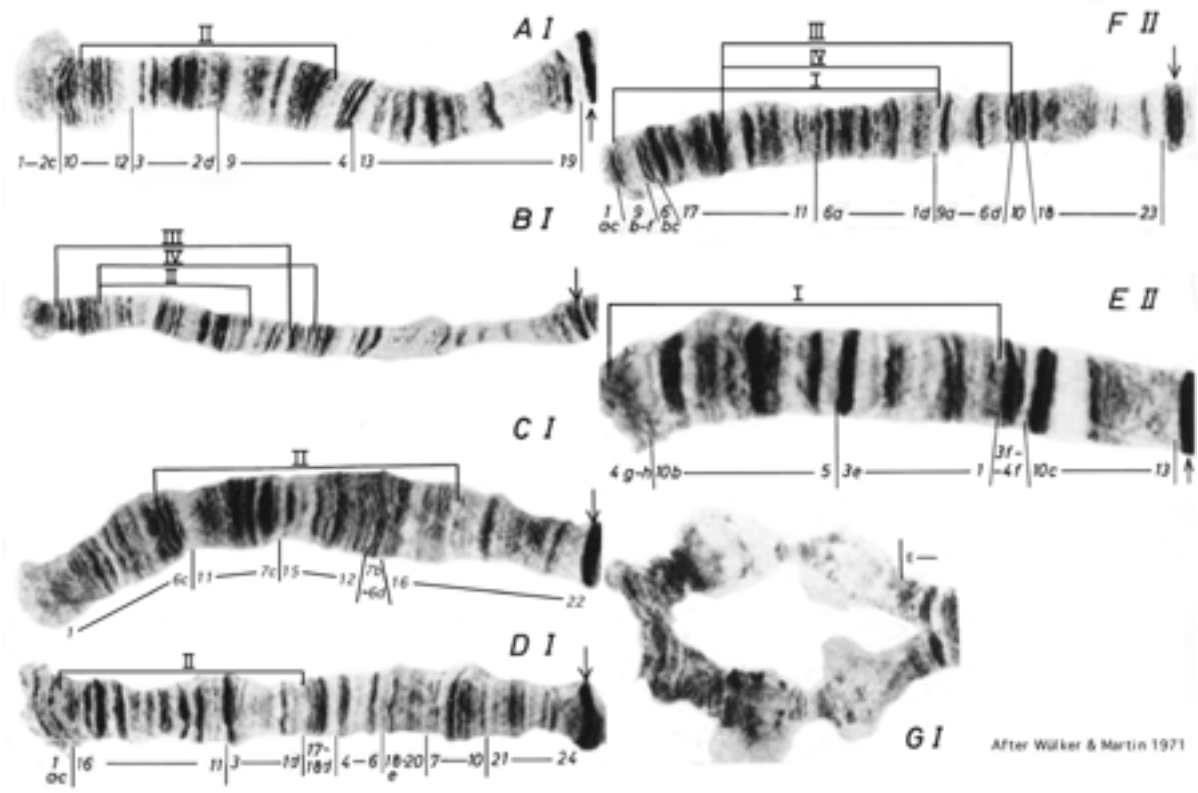
Larva a large plumosus-type larva (fem. 13.5 – 25 mm; male 15.6 – 24.2 mm), anterior pair of VT usually shorter (Female: Ant. 3.12 mm (1.60 - 4.44), Post. 3.37 mm (1.60 - 4.52); Male: Ant. 2.51 mm (1.60 - 3.52), Post. 2.78 mm (1.48 - 3.68)). VHL about 418 micron (375 - 425); width of head capsule greater than 0.85mm (Hilsenhoff & Narf 1968). Gular region dark, FA pale or slightly darkened.
Mentum with somewhat rounded teeth; c1 tooth quite broad, c2 teeth well developed and very pointed (type II); fourth laterals slightly reduced (type I-II).
Central part of anterior margin of ventromental plates crenulate; about 88 - 99 striae. Premandible with teeth about equal in length.
Antenna 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; ratio of segments (micron) 156 : 34 : 10 : 13 : 7.
Third inner tooth of mandible lighter than other teeth (type II).

Identification: The larva of this species can be recognized by the combination of characters: large plumosus-type, dark gula but pale FA, 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; bands distal to nucleolus often not clear.
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* I
staA2: 1 - 2c, 10, 5e - 9, 2d - 3, 12 - 11. 5d - 4, 13 - 19
staB1: Puff with distal dark bands (groups 8 - 7) about middle of arm.
staB2: Puff with proximal dark bands (groups 7 - 8) near distal end of arm.
staB3: Puff approximately as sta B2.
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
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 sta F2
staF4: 1a-c, 9b-f, 6b-c, 17 - 14f, 1d - 6a, 11 - 14e, 9a - 6d, 10, 18 - 23 i.e. from sta F2
staG1: Nucleolus near attachment to arm E.



Found: British Columbia- Royal Oak & Victoria (Townes 1945).
Labrador- Hopedale (Townes 1945)
Manitoba- Southern Indian Lake (Rosenberg *et al.* 1984); Aweme (Townes 1945).
Northwest Territories- Cameron Bay on Great Slave Lake (Townes 1945).
Ontario- Copanspin Farm, Dunrobin; Central Experimental Farm and Hogs Back, Ottawa; and South March, nr Mud Lake (44.88, -78.27), – all Carleton Co.; Lake Potier, w. Sudbury; Clarke Lake, Algonquin Provincial Park; Smokey Falls on Mattagami River (Townes 1945).
Quebec- Rowyn-Noranda.
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.
New York - Barge canal, nr Knowlesville, Orleans Co.; McLean, Sea Cliff & Syracuse (Townes 1945)
North Carolina - Raleigh (Townes 1945)
North Dakota - McVille 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, Dane Co.; Freibauer Lake, Bayfield Co.; East Horsehead Lake, Oneida Co.; Grand Portage Lake, Iron Co.
Greenland - Egedesminde (Type specimens) (Townes 1945)

Often in lakes but also present in shallow permanent pools. Martin and Wülker (1971) suggest these may represent seperate species.

Morphology and cytology has 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. Was Species 4 of Wülker.

Species t. *C. dilutus* Shobanov *et al.* Synonym: *Chironomus pallidivittatus* Malloch 1915 (not sensu Beermann 1955 - see species 2l)

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 ITa_1; LR_1 2.04 (1.79 - 2.27), BR_1 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.

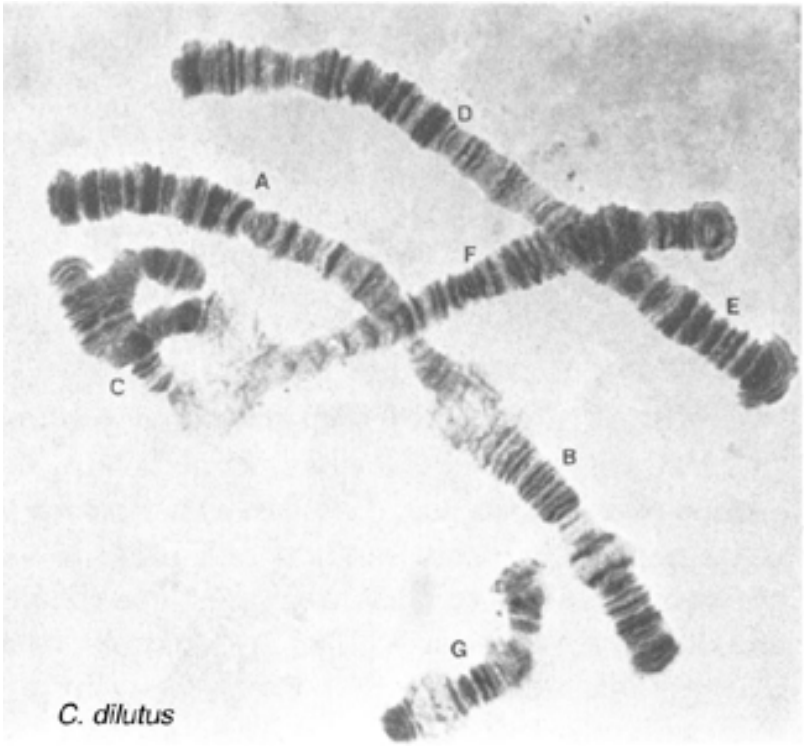
Pupa: Antennal sheath 1.89 (1.74 - 2.04), wing sheath 2.80 (2.53 - 3.16), abdomen length 9.51 (8.2 - 10. 7), no. of hooklets on tergite 2, 92 (67 - 113); anal spur dark or black-brown with about 5 - 6 spines of varying length and width.

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 FA 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 furrows 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).

dil n'A1: 1a-b, 8c-7b, 3i-7a, 1g-c, 8de, 17-13, 1h-2c, 9c-8f, 10-9d, 11-12, 3h-2d, 17g-19
dil n'A2:
dil n'B1:

dil n'B2:
dil n'B3:
dil n'C1: 1-2d, 4g-6b, 9-11c,3c-2e, 11d-14c, 19-16, 7d-a, 6h-c,8, 15-14d,4a-f, 20-22
dil n'C2:
dil n'D1: 1-2b, 15-14, 10, 4-7, 2c-3, 13, 22-18e, 8-9,17-18d, 12-11, 16e-a, 23-24 as pD1, except for nucleolus and extra band in 10B.
dil n'D2: as pD2?, except for nucleolus and extra band in 10B
dil n'D3:
dil h'E1: 1 - 2b, 7h - 8, 9 - 10b, 3e - 2c, 7g - 3f, 10c - 13
dil n'E2:
dil n'E3: 1 - 2b, 10a-c, 3f - 7g, 2c - 3e, 10b - 7h, 11 - 13
dil n'F1: 1 - 2, 7 - 9, 16, 6 - 3, 15 - 10, 17 - 23 as pF3 in Europe
dil n'F2:
dil n'F3: 1a-d, 9b-12, 3b-2, 13a-d, 1i-e, 3c-5c, 16-14d, 7-9a, 6-5d, 14c-a, 2a-e, 17-23
dil n'F4:
dil h,G1: BR1 and BR2 separated by about 1/3 of length, towards the centromeric end.
dil h'G2: Inversion of virtually the whole arm, so the close BRs are now at the distal end.
dil n'G3: Inversion including BR2, so that BR1 and BR2 are separated by over half the chromosome length.
dil n'G4: Reported by Acton (1962) as rare, but limits not defined.



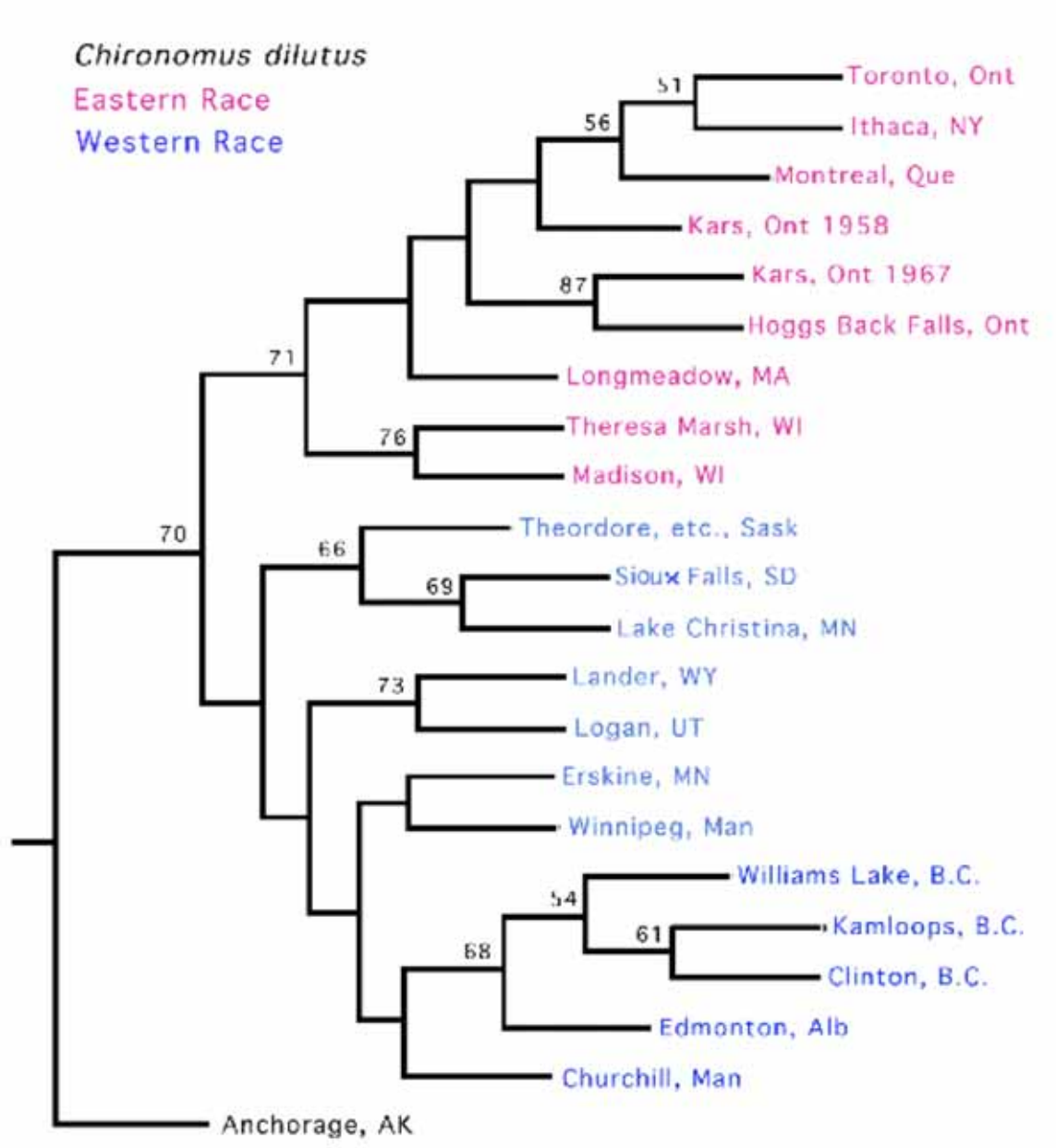
Chromosome complement of a member of the Western race

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; 122.17) (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, -96.00) Lake Christina, Douglas Co.
New York (ER) - Ithaca.
North Dakota(WR) - Warsing Dam, Eddy Co.(47.83, -99.12); Braddock Dam, Emmons Co.; Fullers Slough; Hankinson.
South Dakota (WR) - Lake Francis Case, Gregory Co. (43.27, -99.00); Gavins Point National Fish Hatchery, Yankton Co. (42.87, -97.47); Su-Falls.
Utah (WR) - Logan.
Wisconsin (ER) - Stevens Pond & U.W. Arboretum, Madison.
Wyoming (WR) - 6ml s Lander.

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

Larva described by Johannsen (1938). 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).
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 frequencis 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 *cox1*, but can be separated by the sequence of the globin gene gb2ß (Martin *et al*. 2002).

Molecular sequences:
mt *cox1* sequences in GenBank, Accession nos. AF110160 – AF110162.
mt *cytB* sequences in Genbank, Accession nos. AF109700 - AF109709.
gb2ß sequences in Genbank, Accession nos. AF110173 - AF110174.

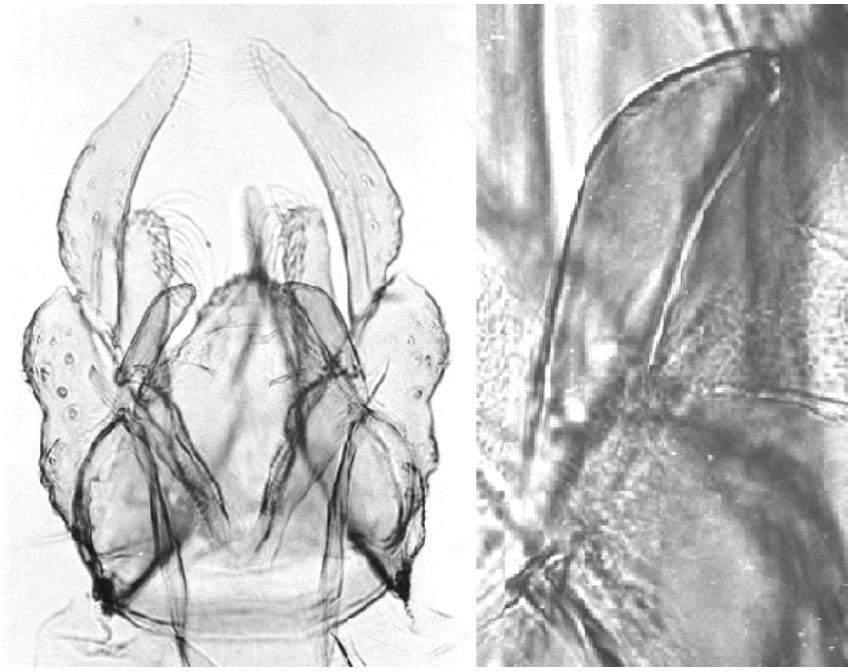
Species u. *C.* species

Near *C. hyperboreus*, *C. aberratus* or *C. sororius*.

Adult

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

Only information on the male genitalia can be given here:



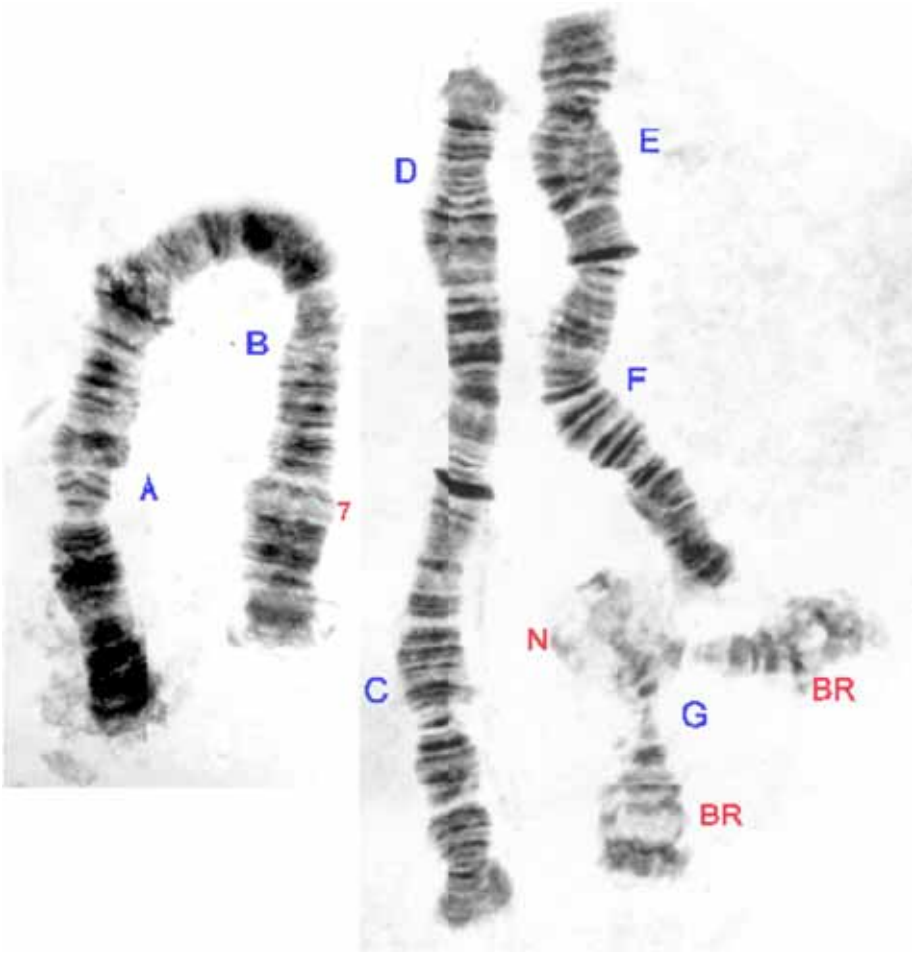
SV rather stout and blunt, D-type, most similar to “d” of Strenzke 1959.
No, or only 1 or 2, median setae on tergite 9.

Pupa with about 4 spines on the caudolateral spur. of segment VIII.

Larva a medium size plumosus-type (female 14.1 - 16.5 mm); lateral projections about 200 - 320 µm; anterior VT 1.10 - 2.36 mm, posterior 1.30 - 2.13 mm. AT about 2 - 2.5 times longer than wide (455-600 x 185-280 µm).
Gular region dark on posterior half, generally more at outer edges, and in rare cases reduced to a "V"; slightly dark to dark FA. Mentum with rounded teeth; c1 tooth with short sides sloping outwards, c2 teeth moderately separated (type I), sometimes c1 wider, so appears as type II; fourth laterals slightly reduced (type I-II). Ventromental plates separated by about 0.3 to 0.4 of the width of the mentum, with about 44 - 53 striae.. PE with about 8-14 teeth. Premandible with outer tooth shorter and narrower than the large inner tooth, which is 2 - 2.5 times as wide.
Mandible with 3rd inner tooth well developed and darkened (type III) , about 14 - 22 furrows on outer surface near base.
Antenna with basal segement abt 3.5 – 4.0 times as long as wide, ring organ a third to a half way up from base of segment; AR about 1.8 - 2.3; antennal proportions 152 : 38 : 11 : 14 : 7.

Cytology: 4 polytene chromosomes with the thummi arm combination AB, CD, EF, G.
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 ie. as *aberratus*, *cucini*, etc.
Arm F1: 1, 5 - 2, 6 - 10, 17 - 11, 18 – 23. i.e. inv2-5 from *aberratus*, *sororius*, etc.



Found: Alberta - Huntington, Calgary.
Saskatchewan - Theodore.
A related species occurs at South Dakota - 3 ml. w Yankton, Yankton Co. (see below)

Prairie pools.

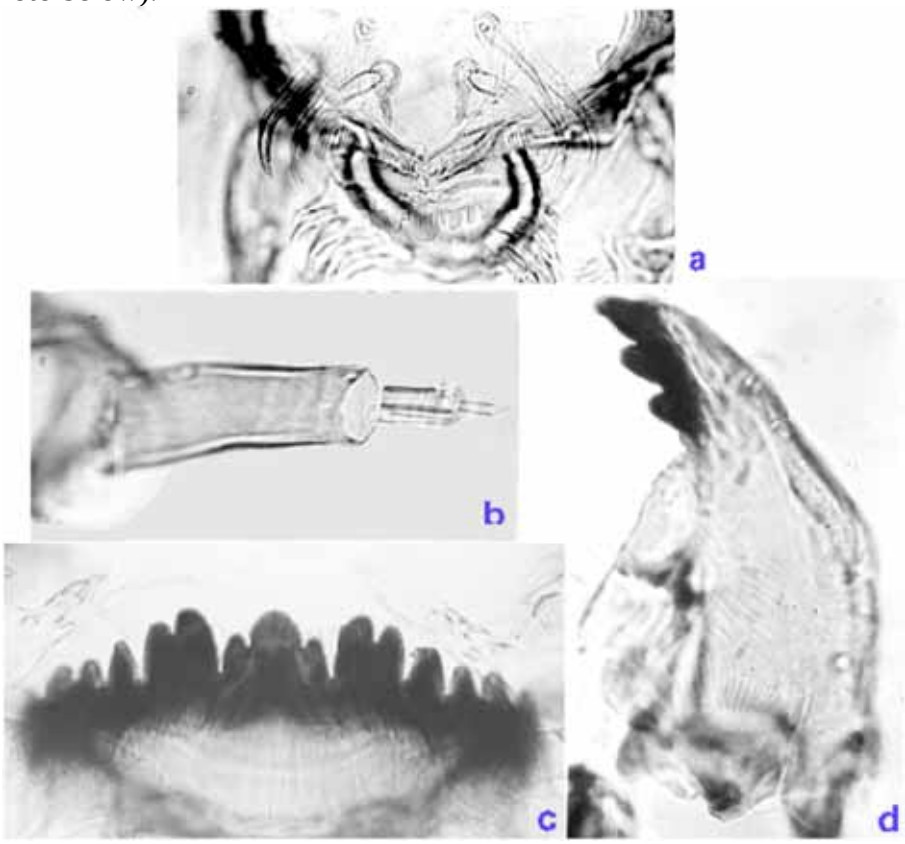
Although the adult is similar to *C. hyperboreus* amongst North American species, the larvae and cytology are different and the cytology and mt*Cox1* sequence suggest a closer relationship to Palearctic species such as *C. aberratus* Keyl 1961 and *C. sororius* Wülker 1973.

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).
Larva: Larval type not known, as only the head capsule was mounted on the slide.

Species v.

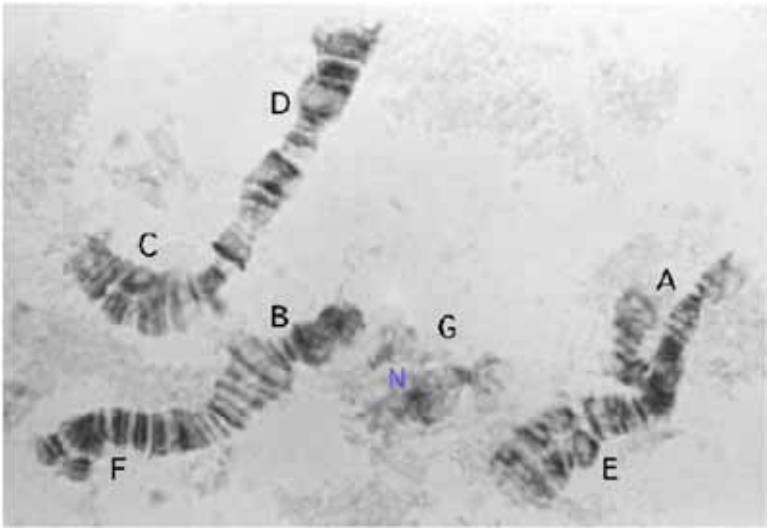
Larva a large halophilus-type. Dark gular region and FA. Mentum (see c, below) with rounded teeth; c1 tooth with short outward sloping sides, c2 teeth well separated. Fourth laterals slightly reduced. PE (see a, below)with about 10 - 11 irregular, often broad and rounded, teeth. Antenna (see b, below) with relatively long basal segment (about 4.5 times longer than wide). Mandible

(see d, below) with at least 13 striae on inner surface near base, 3rd inner tooth developed (damaged in photo below).



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 recognise.
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 ie. as *holomelas*

Found: Nunavut (formerly Northwest Territories) - Hazen Camp Pond, Ellesmere Island.

Possibly also Greenland - Nedre Medsommer Sö.

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

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

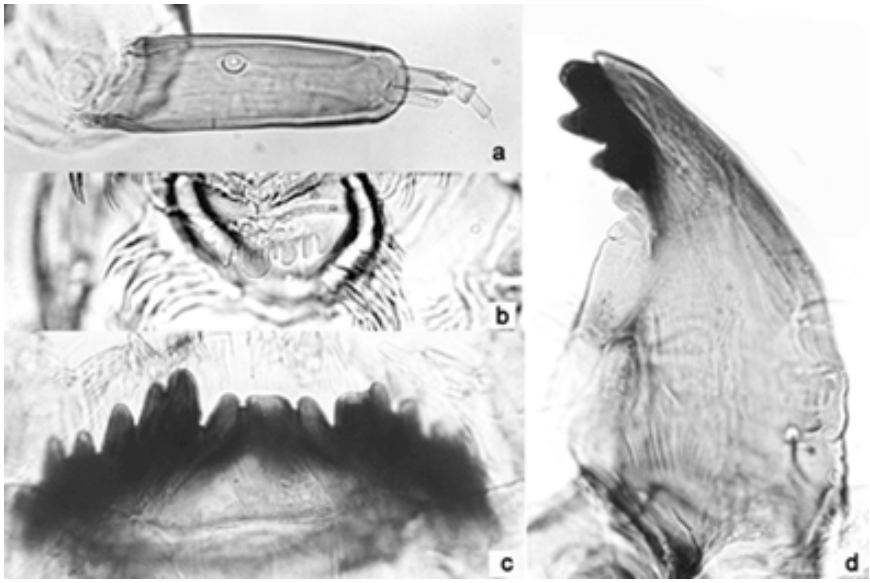
Male: Dark species, thorax almost black, abdomen brown to dark brown, tergites uniformly colored. Sternite I with about 11 - 36 setae, sternite II with 2 - 6 lateral and about 70 medial setae. Ratio of 3rd-5th maxillary palpomeres (µm) 416 : 386 : 411. AR 5.8 - 7.3. Anterior basitarsus with beard, BR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

Superior volsella of the E-type, with thickening on the inner side. Inferior volsellae conical. Gonostylus broad, usually uniformly colored but sometimes with an obvious light area on external side. Anal point brown narrowing from base to top.

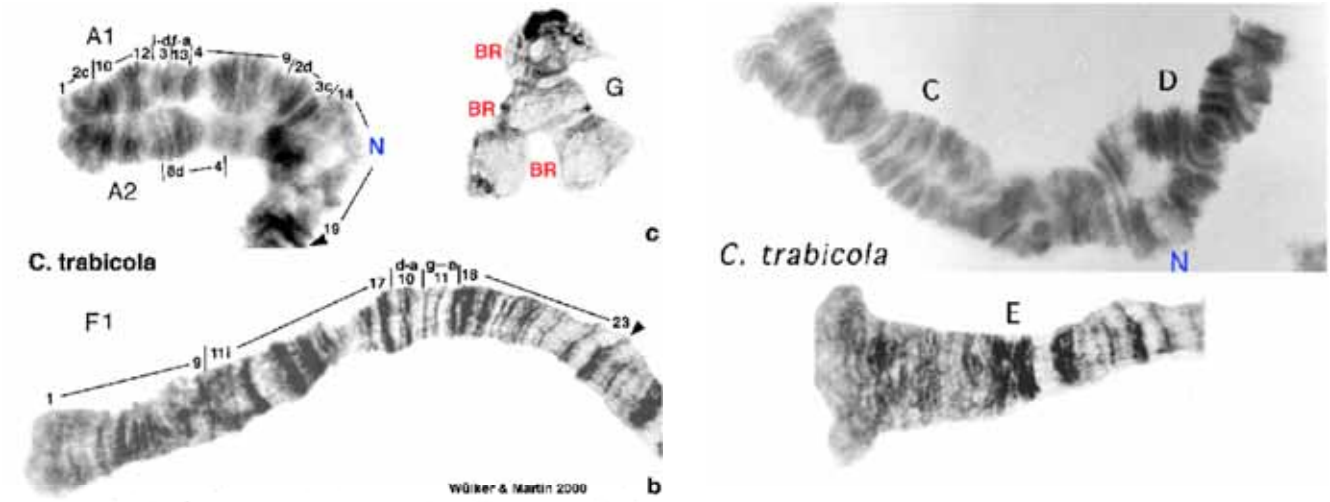
Pupa: Thorax dark brown, tergites of abdomen with grey spots, congruent with shagreen areas. Laterosternites dark brown. Abdomen length about 9.9 - 11.6 mm. Wing sheath length about 2.58 - 3.02 mm. Caudolateral spur of segment VIII almost black, usually with one spine, but sometimes with up to three,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

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 FA. Mentum ((c, below) of only specimen worn; c2 teeth well separated (type II), fourth laterals appear reduced, but in Russian specimens it appears only slightly reduced (Shobanov et al. 2002). PE (b, below) with 11 - 16 teeth, some broad and irregular. 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 striae on inner surface near the base.



Cytology: 4 polytene chromosomes with the thummi arm combination AB, CD, EF, G.
Arm G partly unpaired and relatively short (about 20 bands), with three BR.
Nucleolus in region 9 of arm D and small nucleolus in arm A near the centromere.
The Ellesmere specimen has traB1 and traF1, the occurrence of the alternative sequences traB2 and traF2 in North America is unknown.

traA1: 1-2c, 10-12, 3i-d,13f-a, 4-9, 2d-3c, 14-19 ie. as *holomelas* 2
traA2: 1-2c, 10-12, 3ih, 8d-4, 13a-f, 3d-g, 8e-9, 2d-3c, 14-19
traB1: with the typical position of groups 8-9 in the middle of the arm, flanked distally by dark band groups.



traC1: 1-3, 8-11c, 13-15, 4-6b, 12-11d, 6gh, 17a-16, 7d-a, 6f-c, 17b-22 ie. as *heteropilicornis*
traD1: 1-3, 11-18d, 9-10, 4-8, 18e-24
traE1: 1a-c, 2e-3e, 5a-8g, 2d-1d, 8h-10b, 4h-3f, 10c-13g ie. as *albimaculatus*
traF1: 1-9f, 11-17, 10d-a, 11g-a, 18-23

Wülker (pers. comm.) notes relationship to *C. neocorax*.

Found: British Columbia - Springhouse (51.97; -122.13) (R.A. Cannings)

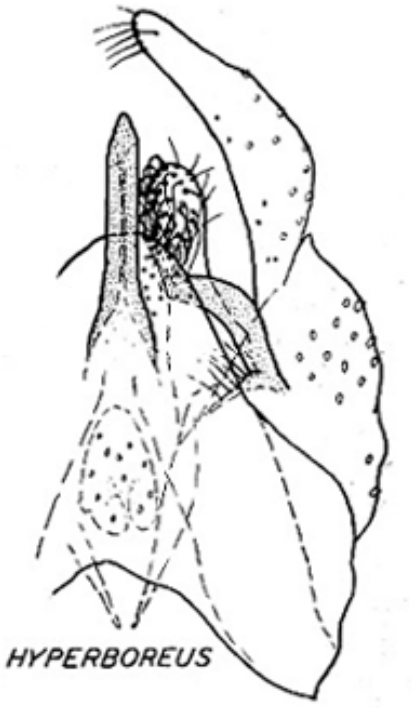
Nunavut (formerly Northwest Territories) - Skeleton Lake, Hazen, Ellesmere Island (Tarn 34 of Oliver & Corbet, 1966) (81.826; -71.483).
Alaska - west shore of Prudhoe Bay, EWD1, tundra pond east of West Doc pad.
Russia - Ice Sea coast: Lena Delta (Ust'Lena reserve, Danube Island, pool on polar station 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

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 slightlyly 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

Larva a medium sized salinarius-type. Gular region, FA and often other parts of the head, darkened. Mentum of all specimens badly worn, but side teeth are well separated (type II) and fourth laterals reduced (type II). PE with 9 - 15 teeth, sometimes irregular and broad. Premandible with outer tooth relatively broad, inner tooth only about 1.2 - 1.4 times as wide. Mandible with 3rd inner tooth partly developed (type II), and with about 14 – 15 furrows on the outer surface near the base.

Cytology: 4 polytene short chromosomes with the thummi arm combination AB, CD, EF, G, but Keyl pattern hard to recognise. 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	ie. 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	ie. as *longistylus, tenuistylus*, etc.
Arm E1:	1 - 3e, 5 - 10b, 4 - 3f, 10c - 13	ie. 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: Nunavut (was Northwest Territories) - Hazen Camp Pond, Skeleton Lake and its inlet marsh, Hazen, Ellesmere Island (Pond 33 & Tarn 34 in Oliver & Corbet, 1966). Greenland - Egedesminde (Townes 1945); Lake 517, Stoe Kvaneso; West Greenland (Type locality).

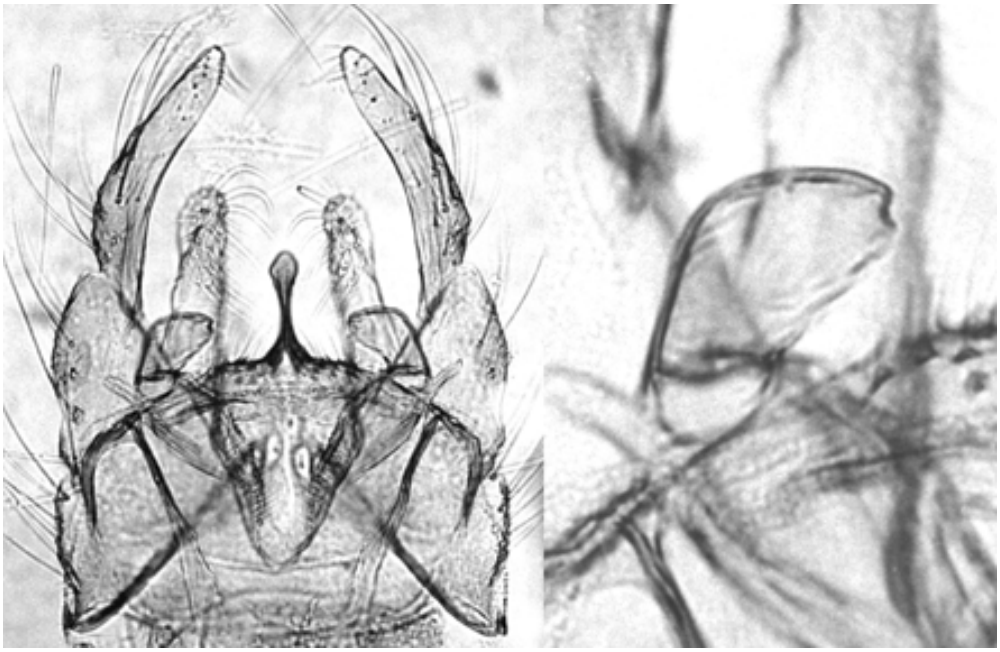
Arctic lakes and pools.

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

Species y. *C. riparius* Meigen, 1804
Syn: *C. thummi thummi* Meigen – Credland (1973a)
C. serus Malloch, 1915
C. cristatus Branch 1923
C. militaris Johannsen 1938

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.

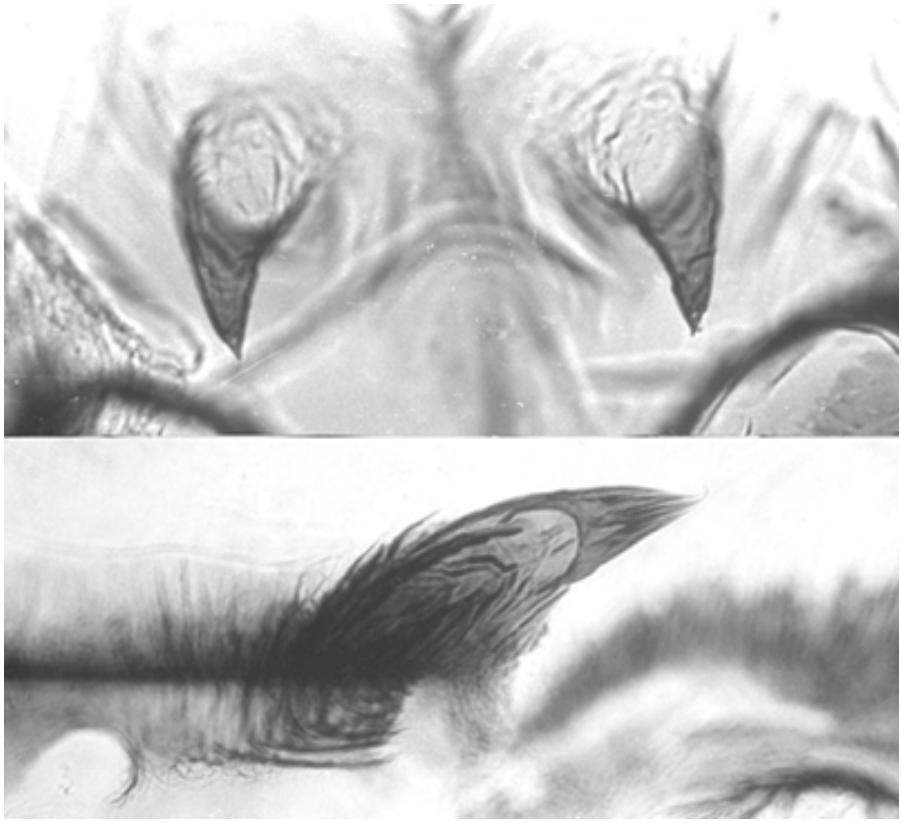


Terminalia of adult male

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.

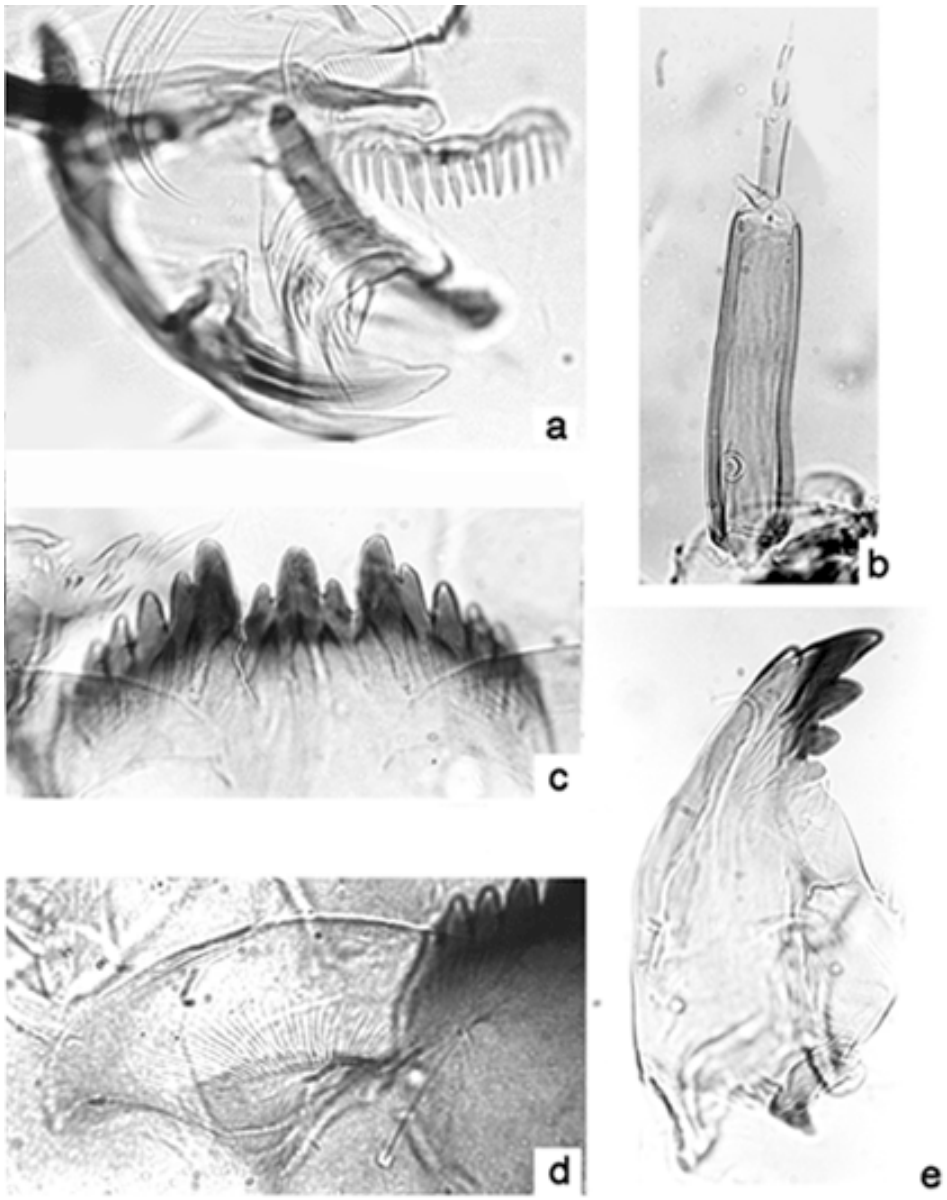
Pupa:



Pupal cephalic tubules, and caudolateral spur of segment VIII

Spur with about 3 – 4 closely applied spines.

Larva a medium sized thummi-type. Gular region dark, FA 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).
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; 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.

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

Adult re-described by Townes (1945).
Larvae described by Johannsen (1938) 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.

Larva small to medium plumosus-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. Gular region pale, FA pale or slightly darkened. Mentum (Fig. c, below) relatively pale with pointed teeth; c1 tooth long, narrow and tapering, c2 teeth very well developed about 2/3 height of c1 tooth (type IV), 4th laterals not reduced (type I).
PE (Fig. a, below) with about 12-13 teeth. Premandible (Fig. c, blue arrow) with outer tooth slightly longer than the inner tooth which is about twice as wide.
Ventromentum (Fig. d, below).
Antenna (Fig. b, below) with basal segment about 4.5 times longer than wide and about 3.4 times longer than A2; AR about 1.7.
Mandible (Fig. e, below) with 3rd inner tooth well developed and darkened (IIIB-C).

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).

[Return to Index | Return to *C.* species z]

Mouthparts of *C.* species z

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 and D.
Arm A1: approx. 1 - 2c, 3 - 2d, 15 - 13, 9, 4 - 8, 10 - 19 i.e. Inv8-15 from *holomelas*.
Arm B: Puff (group 7) proximal in arm, with distal dark bands. Complex inversion begins in this group.
Arm C1: typical constriction (groups 3 & 4) just distal of middle of the arm.
Arm D: Inversion of about 1/3 of arm, distal of the centre.
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.

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

Pools in creek.

Species 2a. Possibly *C. decorus* group

Adult and Pupa not known.

Larva a small to medium 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 FA. 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).
Ventromentum with about 47 striae. PE with about 11 - 12 teeth. Premandible broken.
Basal antennal segment about 3.6 times longer than wide, RO about 0.4 up from base of A1; AR abt 1.62; antennal proportions (µm) 125 : 39 : 12 : 13 : 8.
Distance between the antennal bases about the same as the distance between the S4 setae.
Mandible with 3rd inner tooth not completely separated and pale (type IIIB); 13 - 15 furrows at the base.

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 (45.37, -75.47), Carleton Co.

Pools in creek.

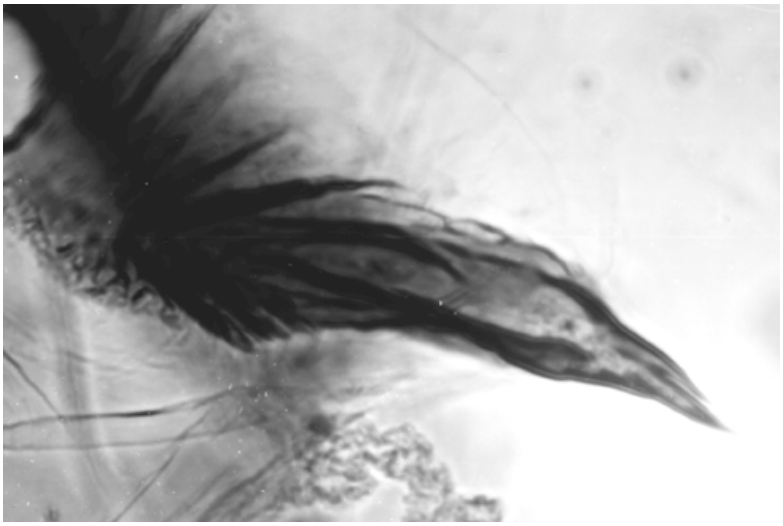
Species 2b. *C. decorus* group

Adult:
Male

Male terminalia of *C.* sp. 2b (left) and superior appendage (right)

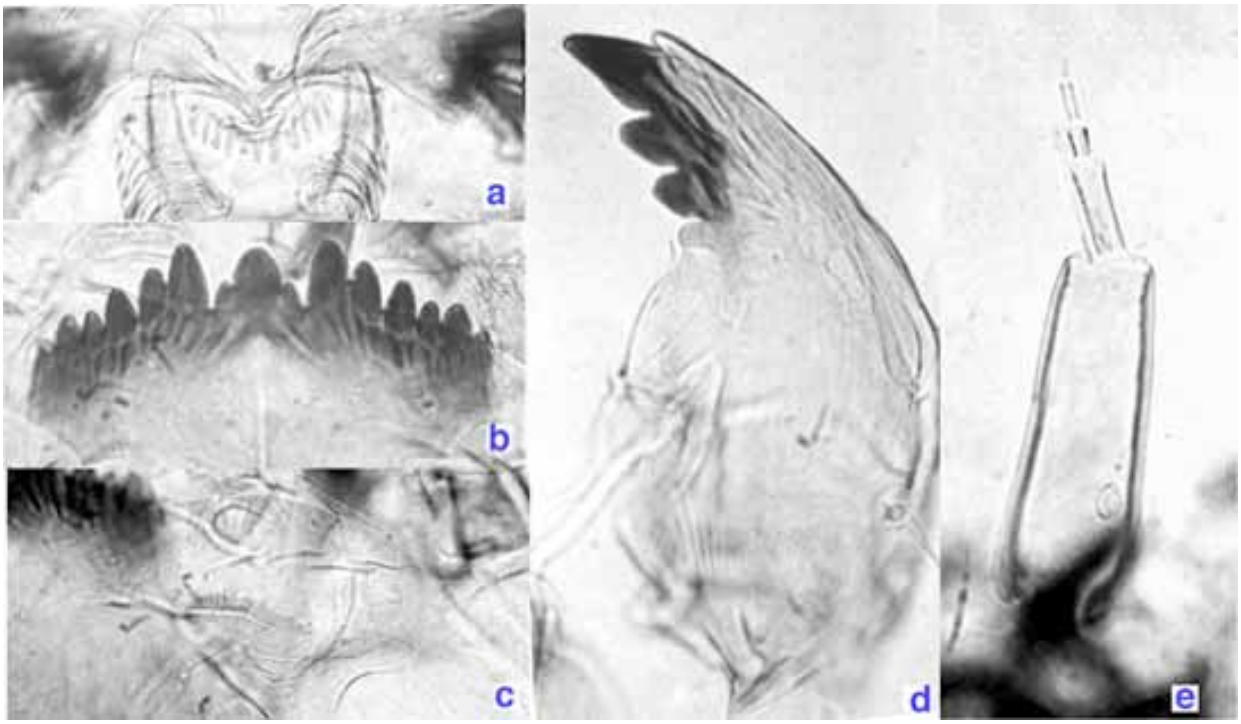
Superior volsella of E-type (g - i.e. as *C. cingulatus*)

Pupa: Caudolateral spur of segment VIII with only one or two spines.



Pupal spur of *C.* sp. 2b

Larva a small to medium (about 12 mm) melanotus-type (lateral projections only slightly developed); VT about 1.8 mm long, posterior pair usually longer. Dark gular region, FA pale. Mentum (Fig. b, below) with generally rounded teeth; c1 tooth fairly broad with c2 teeth only moderately developed - little more than shoulders (type I); fourth laterals slightly reduced (type I-II); 2nd, 3rd and 5th laterals about in line, 1st laterals higher.
VM with smooth anterior margin. PE with about 11 teeth.
Mandible (Fig. d, below)with 3rd inner tooth only partially separated and pale (I-IIA)



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

Arm A1 "olive" (gp. 6-7) about 1/3 from distal end.
Arm A2: a large inversion of much of the arm.
Arm B1: Puff (gp. 7) with proximal dark bands, about 1/3 from distal end.
Arm C1:
Arm D1:
Arm E1: 1 - 3e, 5 - 10b, 4 - 3f, 10c - 13 i.e. as *aberratus*, bifE1.
Arm F1:
Arm F2: small inversion a few bands distal of the characteristic bands.

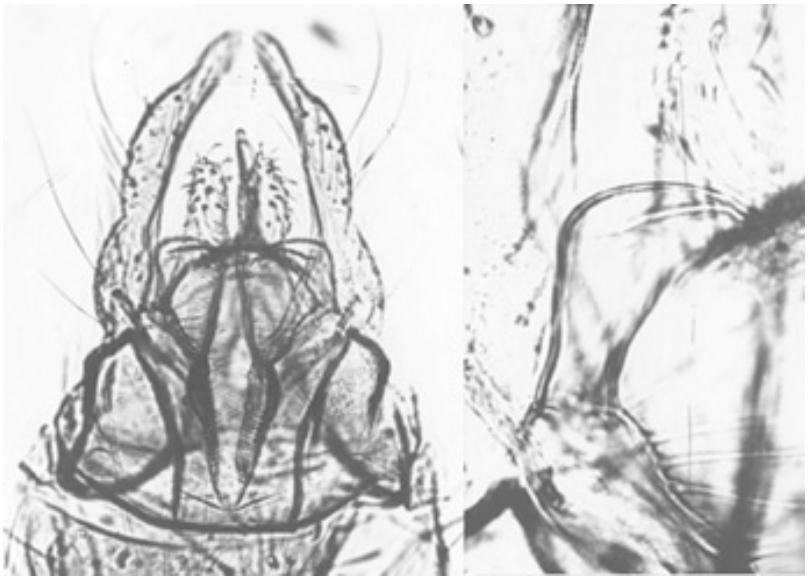
Found: New Brunswick - Kouchebouguac National Park.
Ontario - Sudbury.

Pools and creeks.

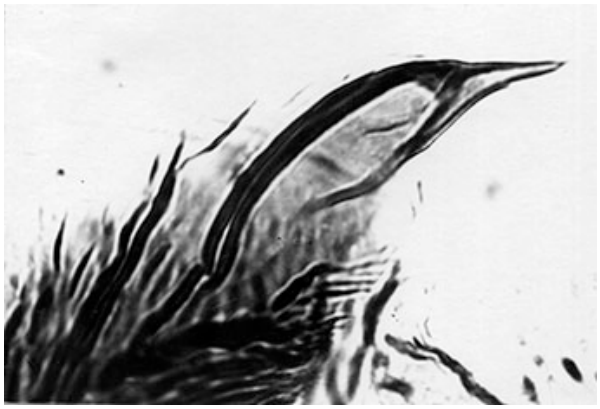
Species 2c. *C.* species pararipariusAdult:

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

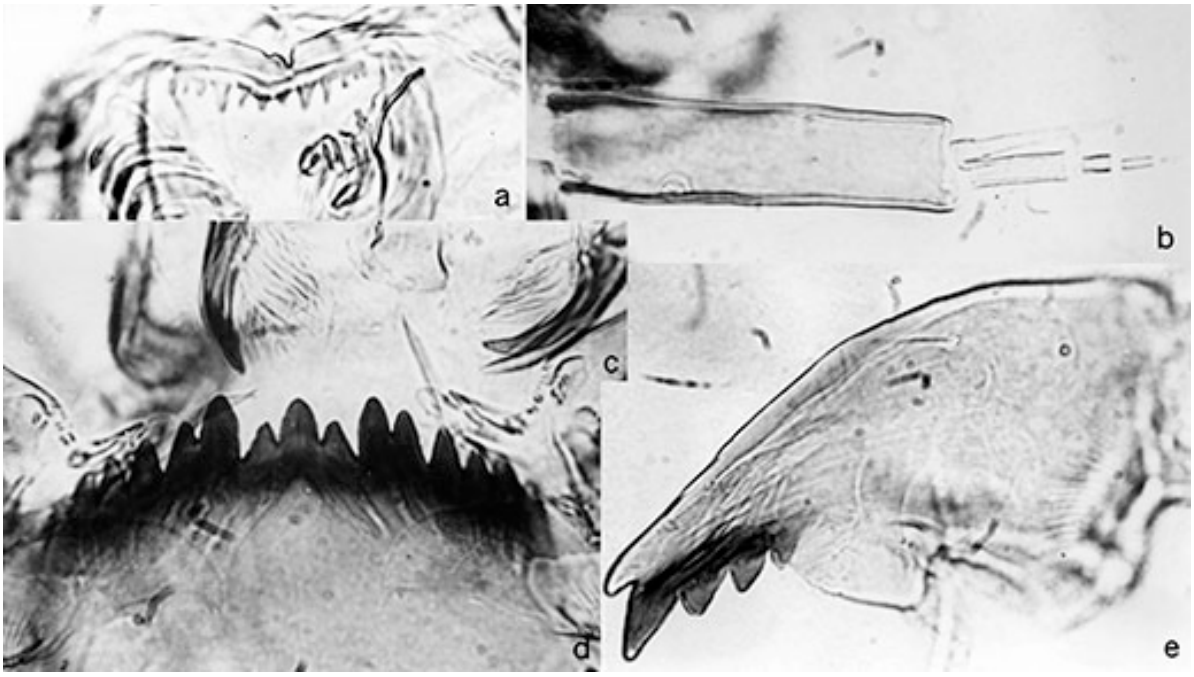
Male: Only available information is the photograph of the terminalia and superior volsella (below)



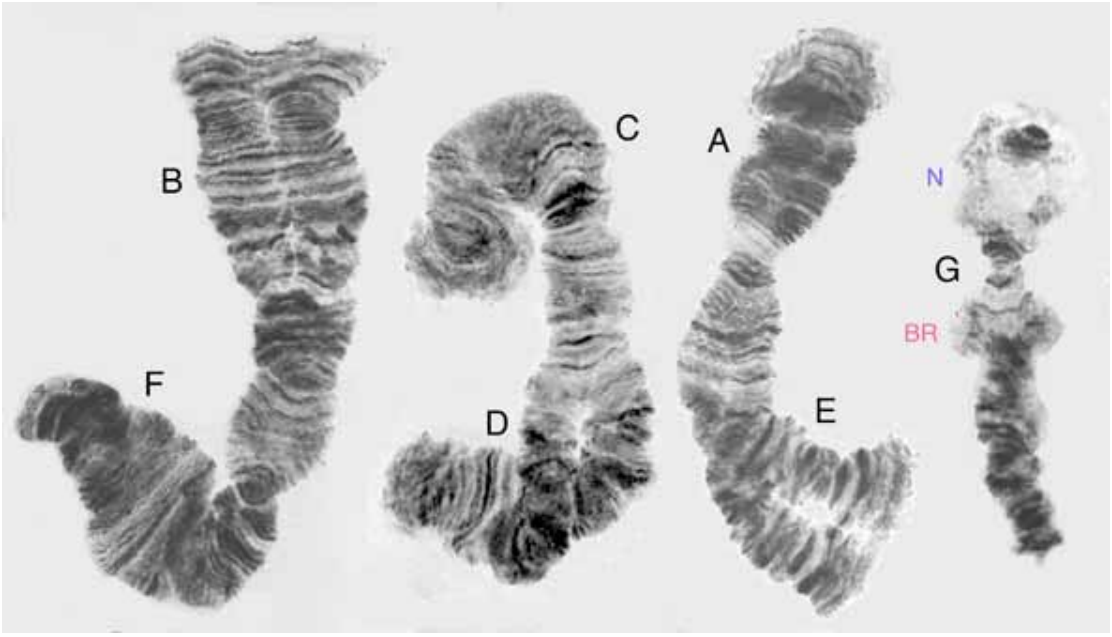
Pupa: Caudolateral spur of segment VIII with about one spine.



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 FA 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 furrows 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

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

Pupa: Cephalothorax brown, abdomen pale yellowish with brown markings. Frontal tubercles short and conical, subterminal seta about 35 µm long. Length 9.19 - 14.0 mm (Female: about 12.9 - 14.0 mm, Male: about 9.2 - 13.3 mm). 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 setae.

Larva a large plumosus-type (length: female - about 18.5 - 22.8 mm; male - about 17.3 – 20 mm).
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 µm long. AT short and relatively cone shaped, less than 1.5 times longer than wide.
Dark to very dark gular region, pale FA. VHL about 290 micron (330 - 430). Mentum with pointed teeth; c1 tooth with parallel sides, c2 teeth well developed (type IIA); 4th laterals slightly reduced (type I-II). VM with finely crenullated anterior margin; about 75 – 88 striae. 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.
Ventromental plates separated by 0.32 - 0.37 of mentum width, with anterior margin finely crennulated; about 59 - 88 striae.
PE with about 11 - 19 teeth, larger near the center, diminishing in size laterally. Premandible with teeth about equal in length, inner tooth about 2.1 - 2.9 times wider than the outer tooth.
Antenna with basal segment 2.7 – 4.3 times longer than wide, although values less tham 4 may be an artefact of slide mounting; 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 furrows 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 FA, 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? - 11?, 4? - 5d, 17e - 19	
fro B1:	Puff with proximal dark bands (groups 7 and 8) at distal end of arm. Nucleolus about group 21.	
fro C1:		
fro C2:		
fro D1:		
fro D2:		
fro E1:	1 - 3a, 10b - 3f, 10c - 13	i.e. as *aprilinus*, etc.
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	

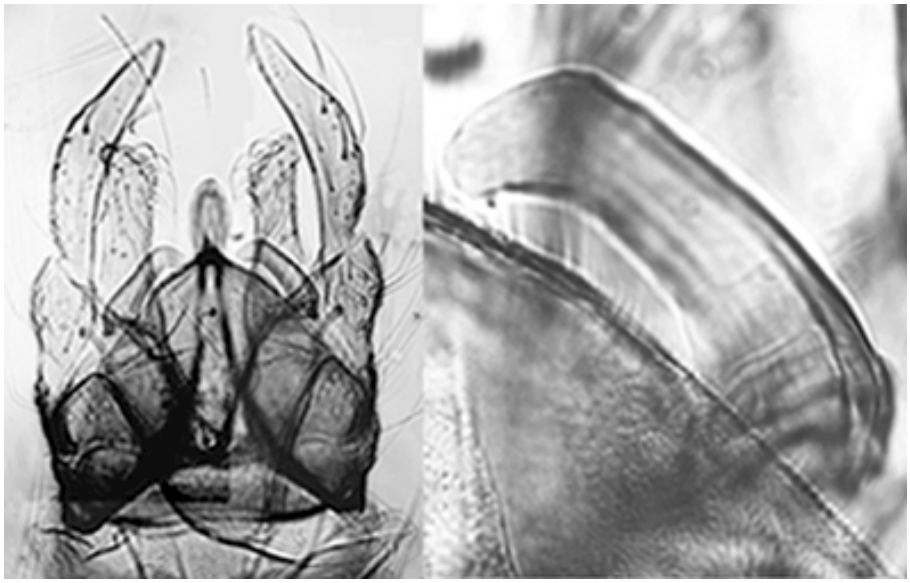
Found: Quebec - near Trois-Rivières.
California - Antioch, Contra Costa Co.: 4 ml e. Olive, Los Angeles Co.; O'Neil Forebay and San Luis Reservoir, Merced Co.; Lake Crowley, Bishop, Mono Co., Greenfield, Monterey Co.; 1 ml s. Napa, Napa Co.; Lake Elsinore, Riverside Co. (type locality); Lake Merced,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

Lakes, oxbows and permanent ponds.

The morphology and cytology have been described by Wülker *et al*. (1971). This was Species 8 of Wülker. Sublette & Sublette originally designated the species authors as Atchley and Martin, 1971, but Spies (2000) designated a lectotype and changed the author designation.

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.

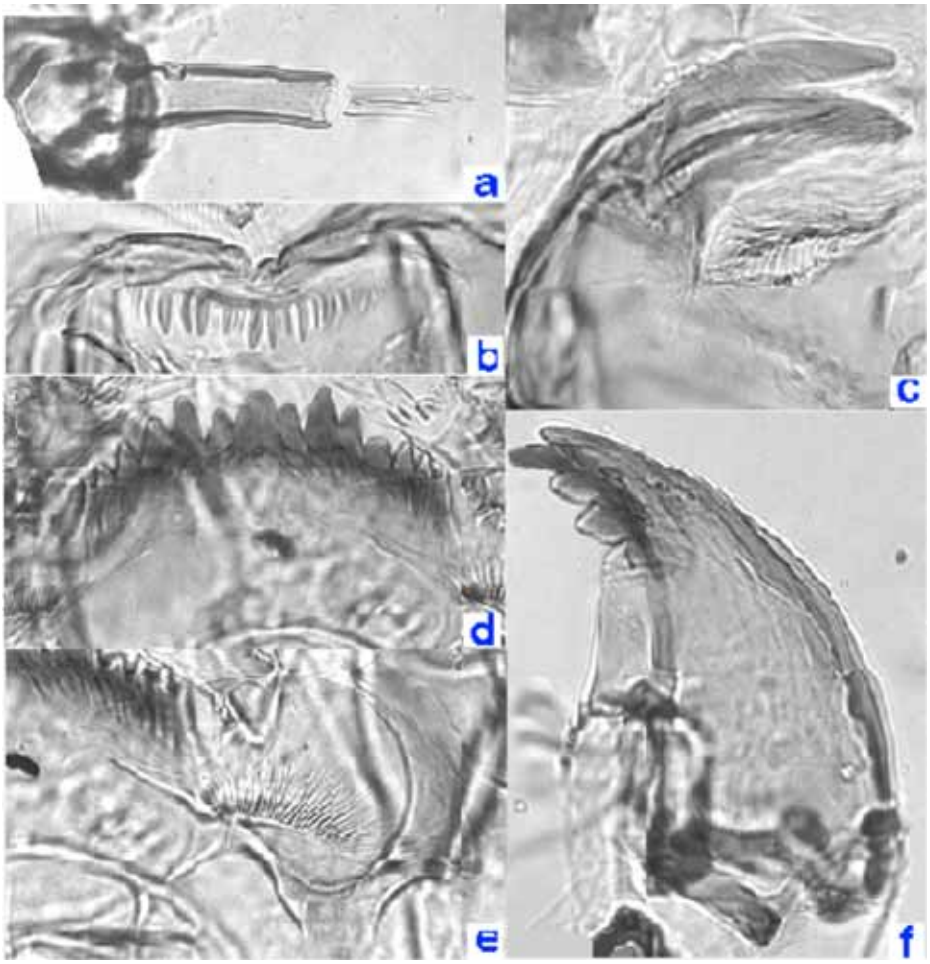


Male hypopygium (left) and superior volsella (right) of *C* (*Lobochironomus*) ?nr. *austini*

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

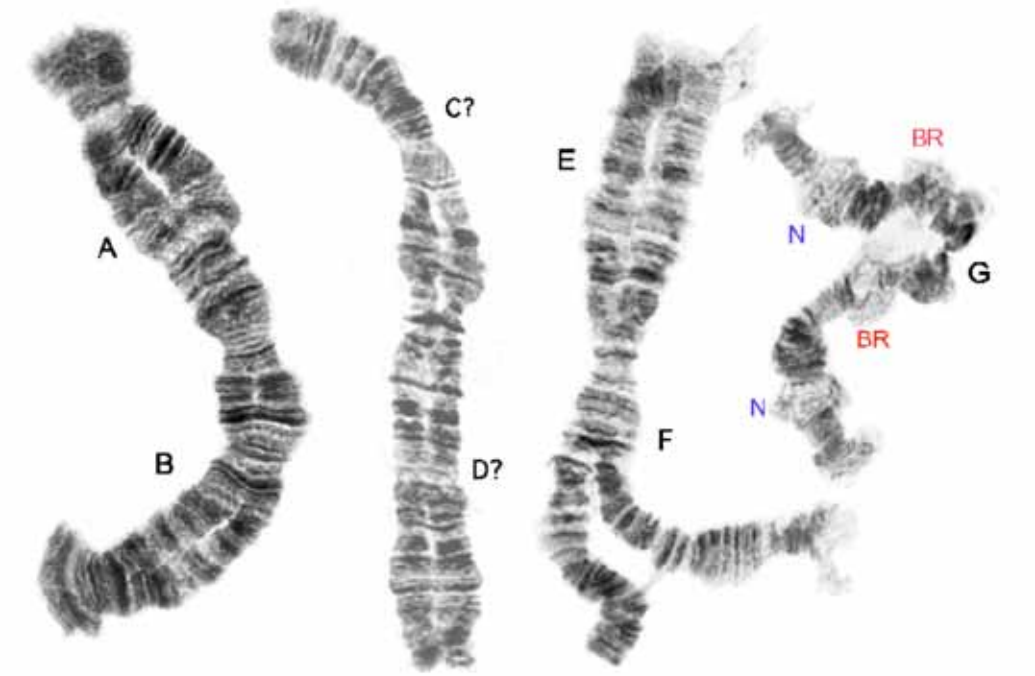
Caudolateral spur of *C* (*Lobochironomus*) ?nr. *austini*

Larva a small thummi-type (length, fem. 10.1 - 13.5 mm); posterior pair of VT usually longer (ant 0.69 - 1.02 mm; post. 0.82 - 1.19 mm). Gula and FA 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 reduced (type I-II).
VM (Fig. e, below). PE (Fig. b, below) with over 20 teeth, including many small teeth.
Premandible (Fig. c, below) with both teeth equally long, inner tooth about half as wide again as the outer tooth.
Antenna (Fig. a, below); AR about 1.8.
Distance between antennal bases greater than that between S4 setae.
Mandible (Fig. f, below) with third inner tooth pale and poorly separated (type IA).



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.

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 SV.

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

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.
LR ant. 1.42 - 1.67; mid 0.58 - 0.62; hind 0.70 - 0.76.
Abdominal segments with broad basal fasciae which extend all the way to the base of most terga.

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 setae.

Larva a small to medium (female 10.7 - 14.2 mm). thummi or semithummi-type (i.e. lateral projections up to about 0.05 mm long); posterior pair of VT usually longer. Gular region and FA pale.
Mentum with pointed teeth; c1 tooth tall and relatively narrow, c2 teeth well separated (type III) ; 4th laterals slightly reduced (type II).
VM with smooth outer margin. Pecten epipharyngis with 11 - 17 teeth.

Antenna 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 with 3rd inner tooth well developed and darkened (type IIIC).

Cytology: 4 polytene chromosomes with the maturus 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, pilicornis, 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: California - horse trough, Santa Clara Co. (Type locality); Berkeley, Alameda Co.; 2 ml n. Lafayette, Kennsington, 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.; 5 ml n. Vacaville, Solano Co.

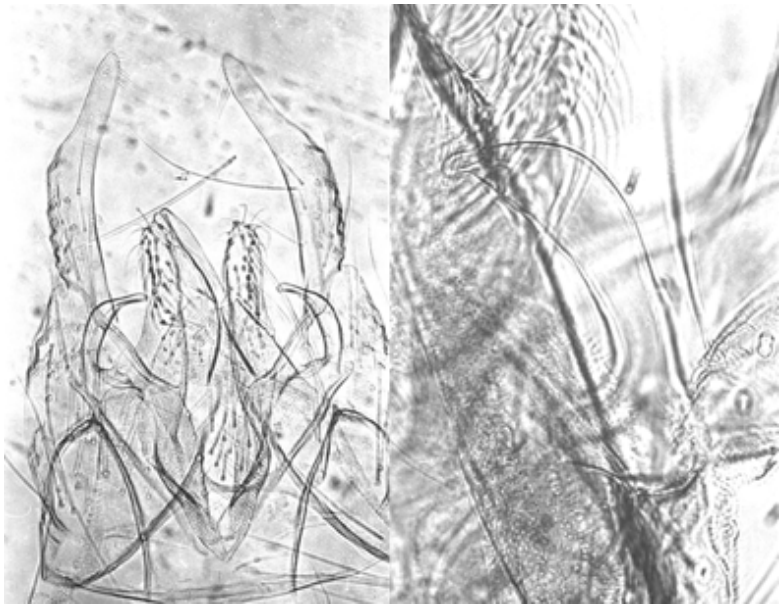
Pools and shallow flowing parts of creeks and rivers.

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. decorus* group species 2 of Butler *et al*. 1995

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. decorus*-group sp. 2.
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	

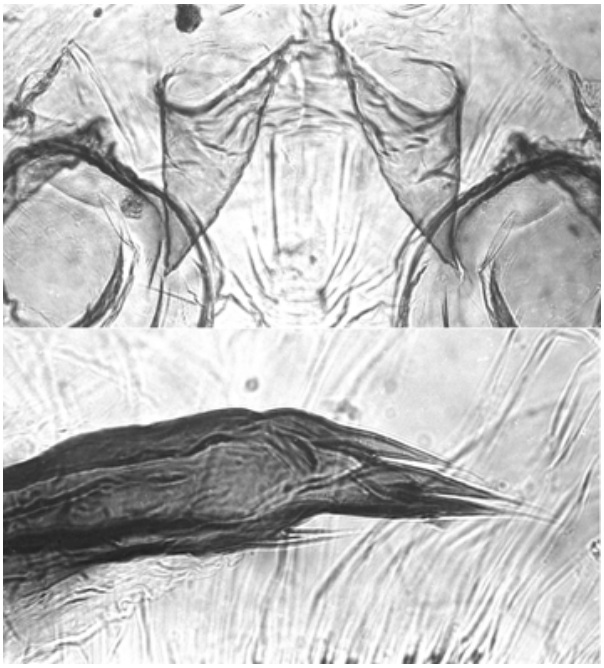
Abdomen: with saddle spots, about 10 setae on 9th tergite. Superior volsella generally of the D-type, but some specimens tend to that of *C. cingulatus*, which Strenke (1959) classes as an E-type. Setae on inferior volsella forked.

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	

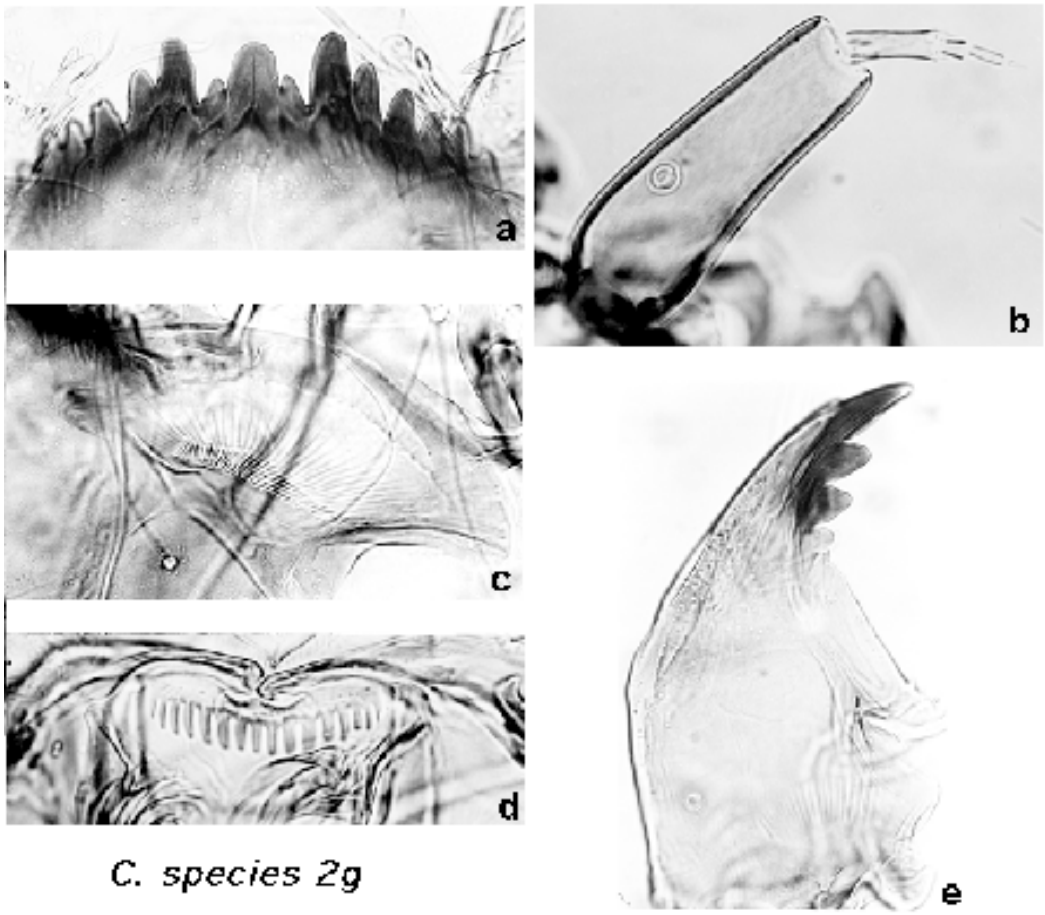
Pupa: Male about 9.75 mm. in length.

Caudolateral spur of segment VIII with about 4 - 9 closely applied spines ; cephalic tubercles simple, with no sign of a secondary tubercle.



Pupal cephalic tubercles (above) and spur (below) of *C*. species 2g
Note the simple tubercles without any secondary tubercles.

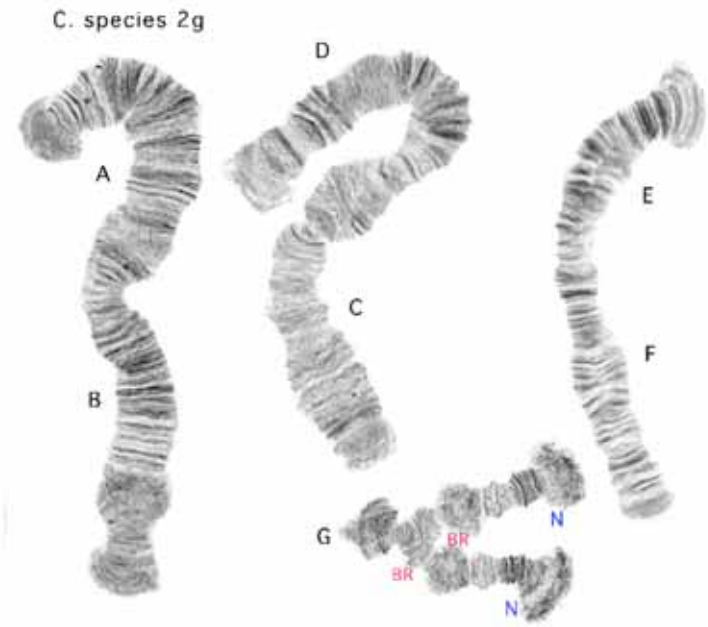
Larva a medium sized bathophilus-type, but sometimes a melanotus-type with PLT to about 130 µm long) (length abt. 11.5 - 20 mm, female; 12.5 - 17.5 mm, male); VT may be of fluviatilis-type, with anterior pair usually slightly longer (ant. 1-2 - 1.7 mm; post. 0.84 - 1.5 mm). AT about 360 – 600 µm long and about 3 times longer than wide.
Dark virtually all of gular region and pale FA. Mentum (a, below) with somewhat rounded teeth; c1 tooth tall and relatively broad, c2 teeth moderately well developed (type III, or II 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, 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.
Mandible (e, below) of type IIA or B and with about 14-22 furrows on the outer surface near the base.
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.



C. species 2g

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.

de2A1:	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)
de2A2:	Simple inversion.	
de2B1:	Puff near distal end of arm, with dark bands proximal (groups 5 and 4).	
de2B2:	Complex inversion Dark bands distal to puff (groups 4 and 5).	
de2C1:	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)
de2C2:	Inversion of about half the arm towards distal end.	
de2D1:	1-3e, 17-18d, 14f-10d, 14g-16, 21-18e, 10c-a, 7d-3f, 9-7e, 22-24	(Kiknadze)
de2E1:	1 - 3e, 10g-c, 3f - 4, 10b - 5a, 11 - 13	inv from bifE1
de2F1:	1a-i, 9 - 2, 13c - 17, 10 - 11d, 13b - 11e, 18 -23	inv from bifF1
de2F2:	Inversion of about 1/3 of arm distal to center.	
de2G1:	Virtually terminal N, central and distal BR	
de2G2:		



Found: Quebec? - Rowyn-Noranda.
Saskatchewan - Lake Waskesiu, Prince Alfred National Park.
California? - Lake Davis.
Indiana? - Crooked Lake, Angola; Lake Oneotta, Marinette(?); Shafer Lake.
Massachusetts - Connecticut R., Northfield, Franklin Co. and Northampton, Hampshire Co.
Michigan - Saginaw Bay, Lake Michigan.
Minnesota - Lake Christina, Douglas Co.
Mississippi - Belzoni, Humphreys Co., Jackson, 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, 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.

Found mostly in depths to over 10m in lakes.

This is Species 13 of Wülker, and the *C. attenuatus* of Hilsenhoff and Narf (1968) and *C. decorus*-group species 2 of Butler *et al*. (1995) who provide a karyotype photograph.

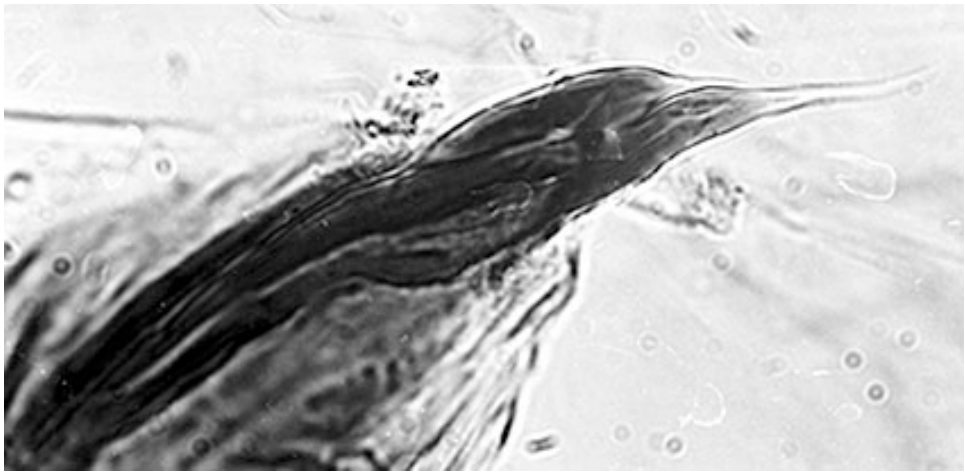
Species 2h. *C.* (*Chaetolabis*) *bitumineus* Langton & Vallenduuk, 2013
Chironomus (*Chaetolabis*) *macani* – misidentification by Wiederholm (1979)

Adult:

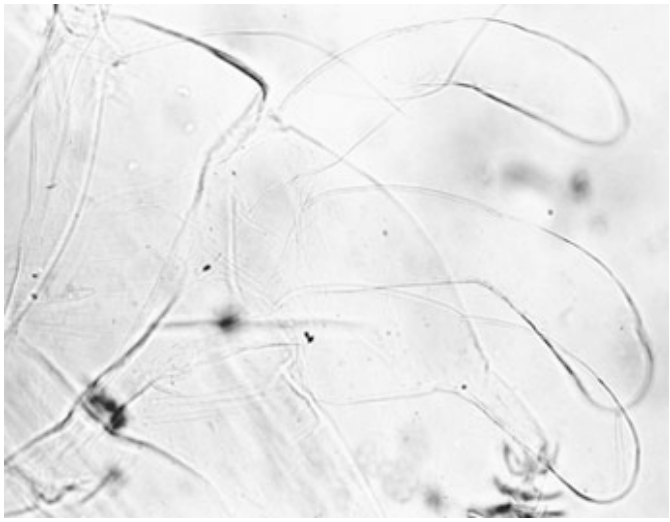
Adult male and female originally described by Wiederholm (1979) as *C. macani*.
Several reared males from Ontario are either in the Sublette Collection at the University of Minnesota, or in the Canadian National Collection of Insects.

Male hypopygium (left) and superior volsella (right) of *Chaetolabis bitumineus*.

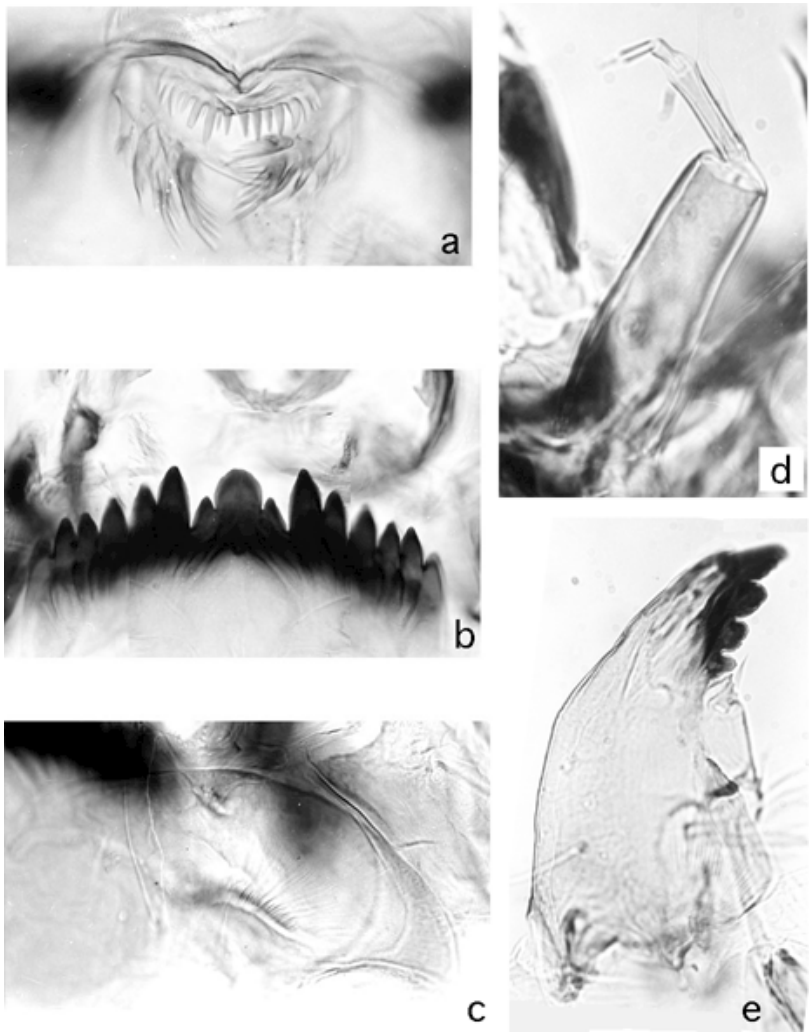
Pupa: (Largely based on European specimens) Length about 10.1-10.2 mm.
Conspicuous pedes spurii B on segment II; hook row with about 70 hooks.
Caudolateral spur of segment VIII with about 2 equally long spines on North American specimen (below), but only one on European specimens.



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. Gular region dark on posterior half, FA 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).

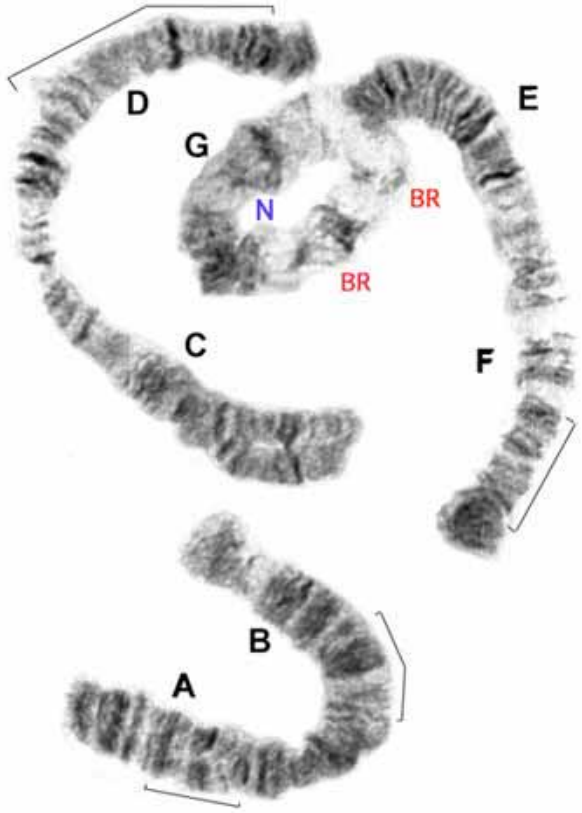


Long anal tubules with constriction



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; -78.32); Beaver swamp near Dunrobin (45.45; -76.00); Cranberry creek, abt. 1 km n. Kars, Carleton Co. (45.13; -75.63).
Quebec - Lake Marlon, Rouyn-Noranda (48.27, -79.07)(Proulx et al. 2013).
Also found in Palearctic: Venetjärvi, FINLAND (Type locality), SWEDEN.

Pools with grass on the bottom.

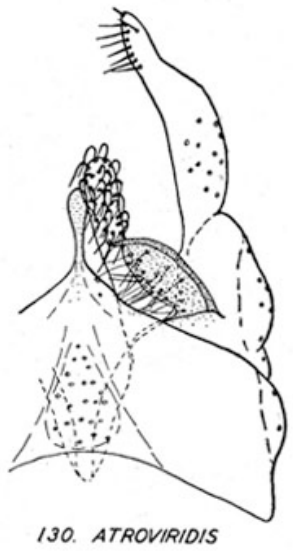
Morphology described by Wiederholm (1979) and Langton & Vallenduuk (2013). Cytology of European specimens described by Wülker (1987) (as *C. macani*), that of Nearctic specimens by Martin (2014).

The shared chromosome banding patterns and the extremely similar *coxI* DNA sequence to that of *C. atroviridis* suggestes 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* – Johnannsen 1938
It is possible some of these may refer to *C.* (*Chaetolabis*) *bitumineus.*

Adult: Based on description of Townes (1945).

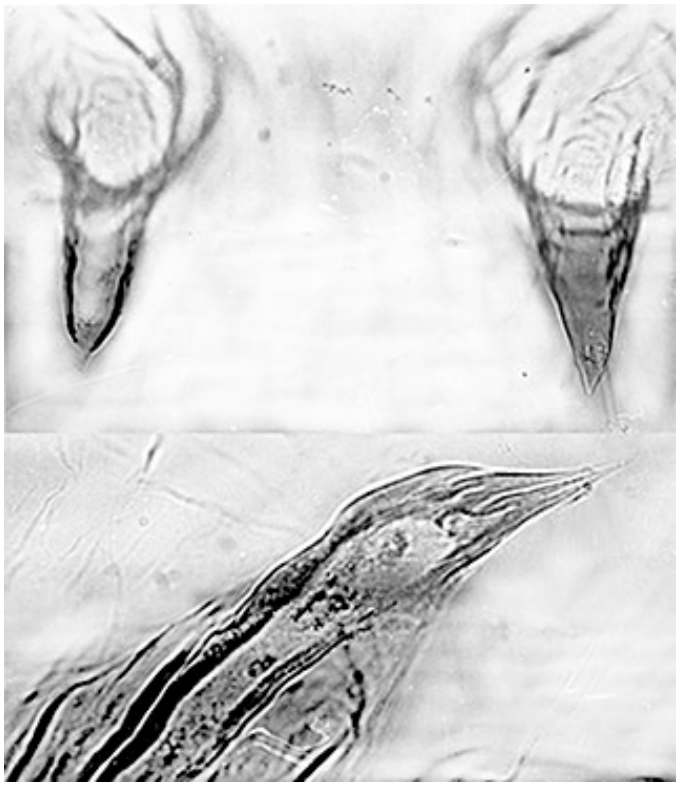
Male
Wing length 5.0 mm. LR 1.55, fore tarsus without a beard. AR 4.0
Frontal tubercles small but rather long.
Head brown, clypeus and appendages dark brown.
Thorax ochraceous slightly tinged with green, vittae and posterior part of postnotum dark brown, median vitta divided by a pale line.
Abdomen blackish 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*.



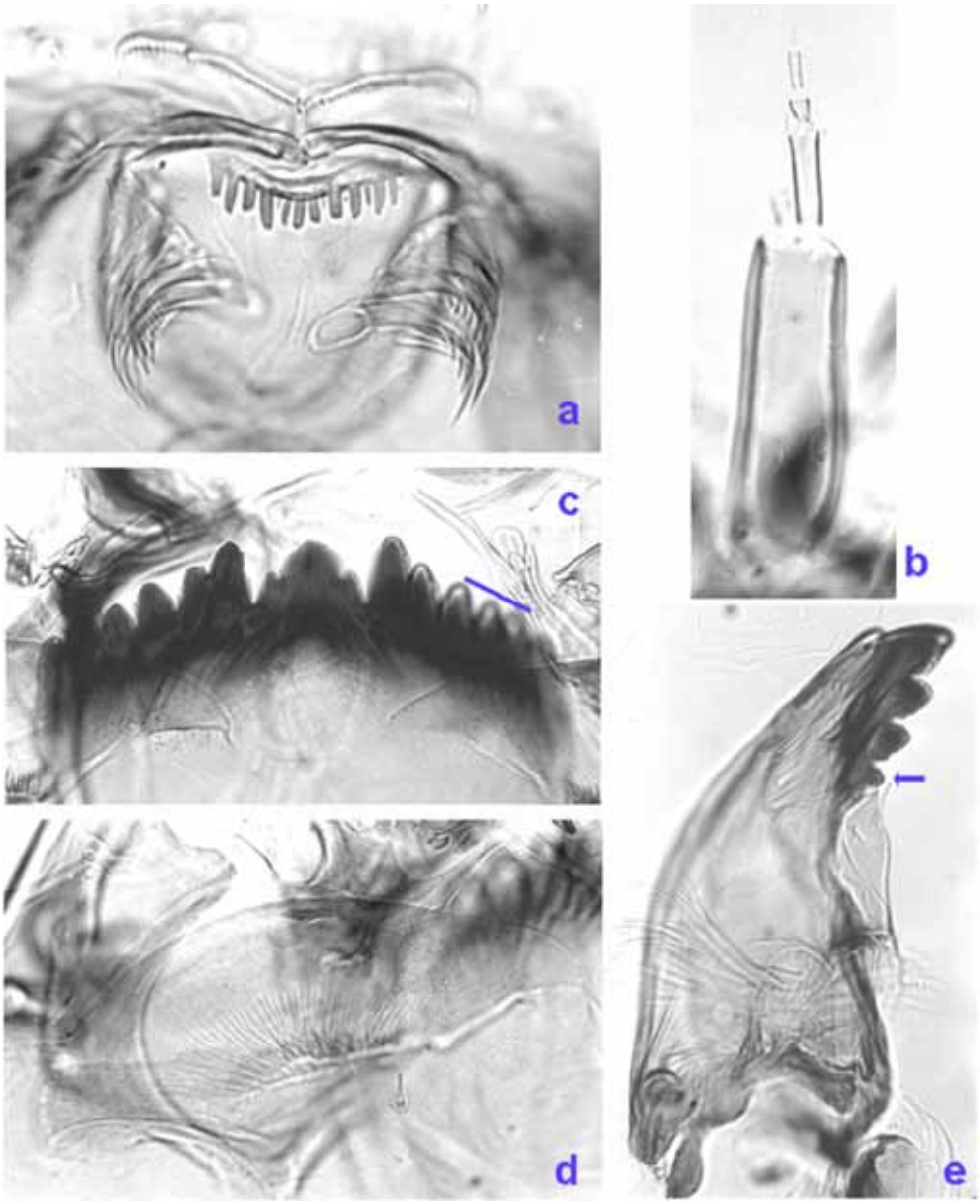
Townes (1945) figure of hypopygium

Female: Townes (1945) only notes that it is similar to the male except for the usual sexual differences

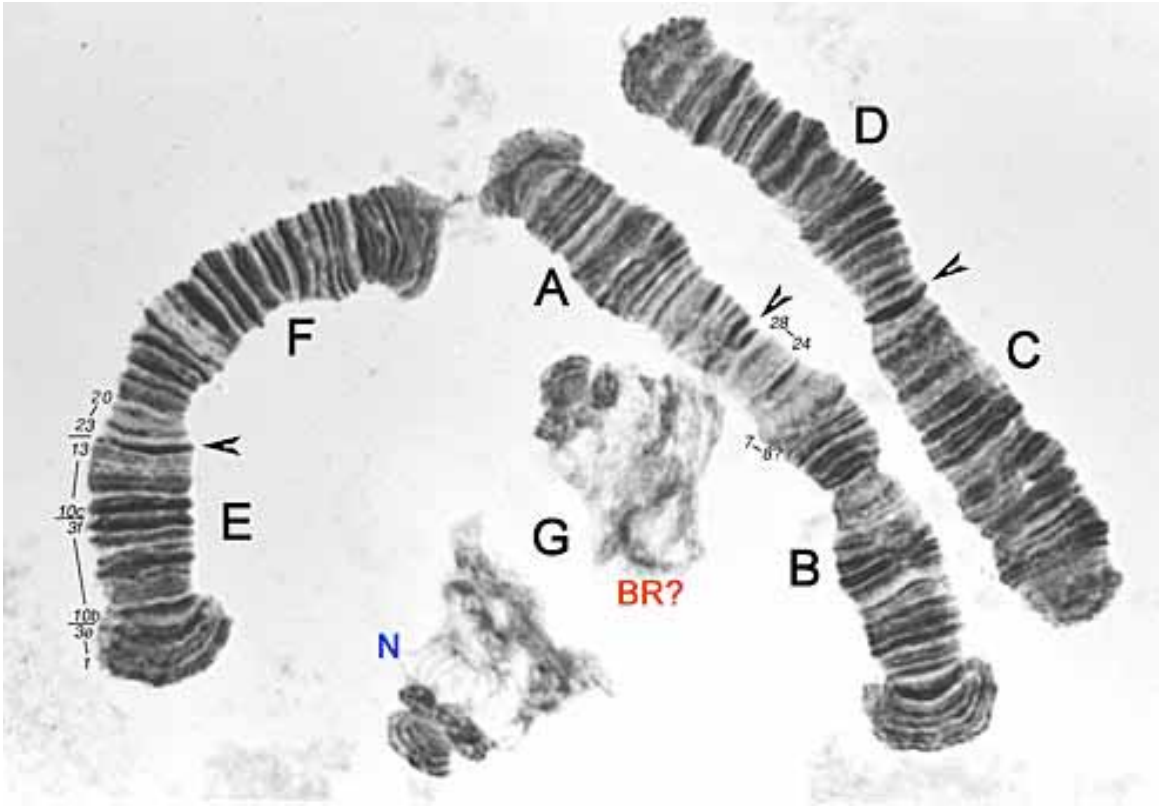
Pupa: Has not been described. Two characters are known: The cephalic tubercles (below) are long, almost twice as long as wide, with a subapical seta. The caudolateral spur of segment 8 (below) has about 4 closely applied spines .



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, FA 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^{o} (type I, but sometimes c1 tends to type II).
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 1/2 - 3 1/3 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 margin 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 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:
mt*coxI*: GenBank accession numbers KF278329.1 – 332.1, KF278342.1 & 360.1
gb7: GenBank accession number KF278450.
The *coxI* 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 (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).
Massachussetts - 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.

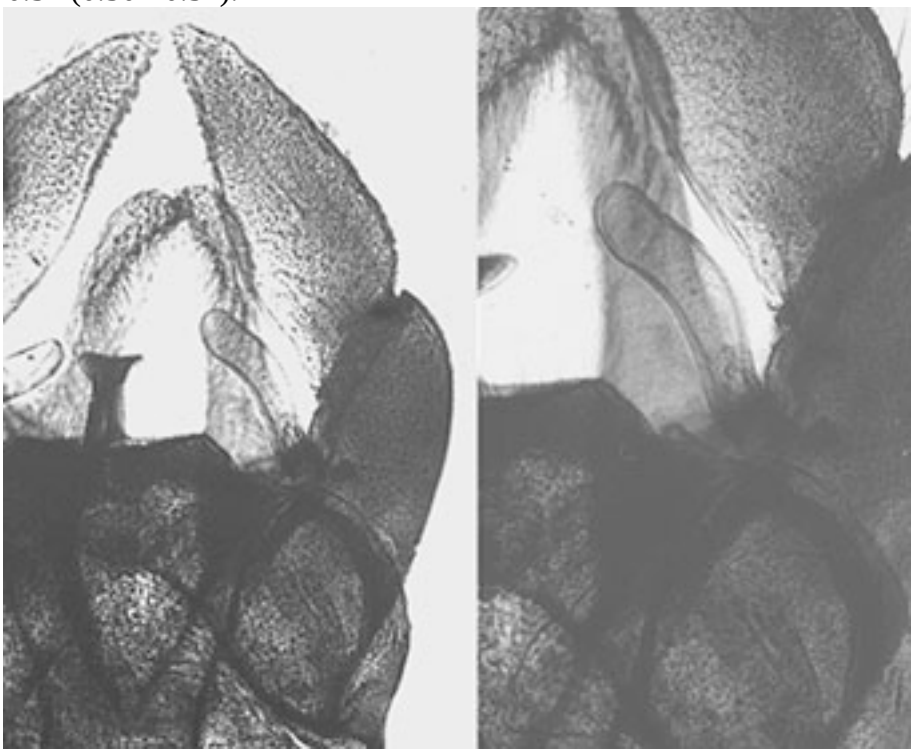
In lakes, possibly shallows with vegetation.

The adult male was described by Townes (1945). Notes on the larval morphology, cytology and DNA sequence were given by Proulx *et al*. (2013).
The shared chromosome banding patterns and the extremely similar *coxI* DNA sequence to that of *C. bitumineus* (see below), suggestes that recent hybridization has occurred and may still be occurring.

Species 2j. *C. crassicaudatus* Malloch 1915

Adult Adult redescribed by Townes (1945), with some additional data by Sublette and Sublette (1971).

Male: Wing length - 4.87 (4.35 - 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) µm; Clypeus of moderate size, clypeal setae - 60 (44 - 76)
Thoracic setae - dorsolateral - 47 (29 - 59); prealar – 10 (8 – 13); scutellar 48 (36 – 62).
Wing - VR - 1.03 (1.00 - 1.05).
Legs - pale brown, apices of tibae 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 SV 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.*

Larva a large plumosus-type. Very dark gular region, pale FA. Mentum with pointed teeth, c1 tooth broad, c2 teeth well separated and sharp pointed (type II); 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.
Antena 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 (typeI).

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:

Found: Manitoba - Lake Winnipeg (Sæther 2012)
Ontario - Trenton, Ottawa & Point Pelee (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 -
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.

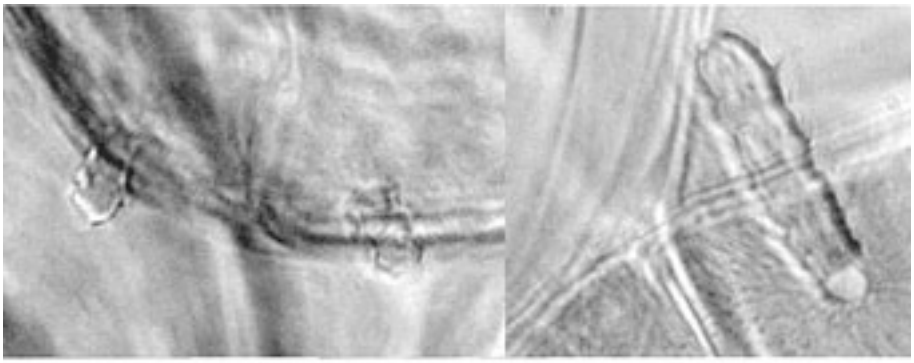
Lakes and other lentic habitats, where it can be a pest (Frouz *et al*. 2002)

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 speices 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* (Meigen)
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 to 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.

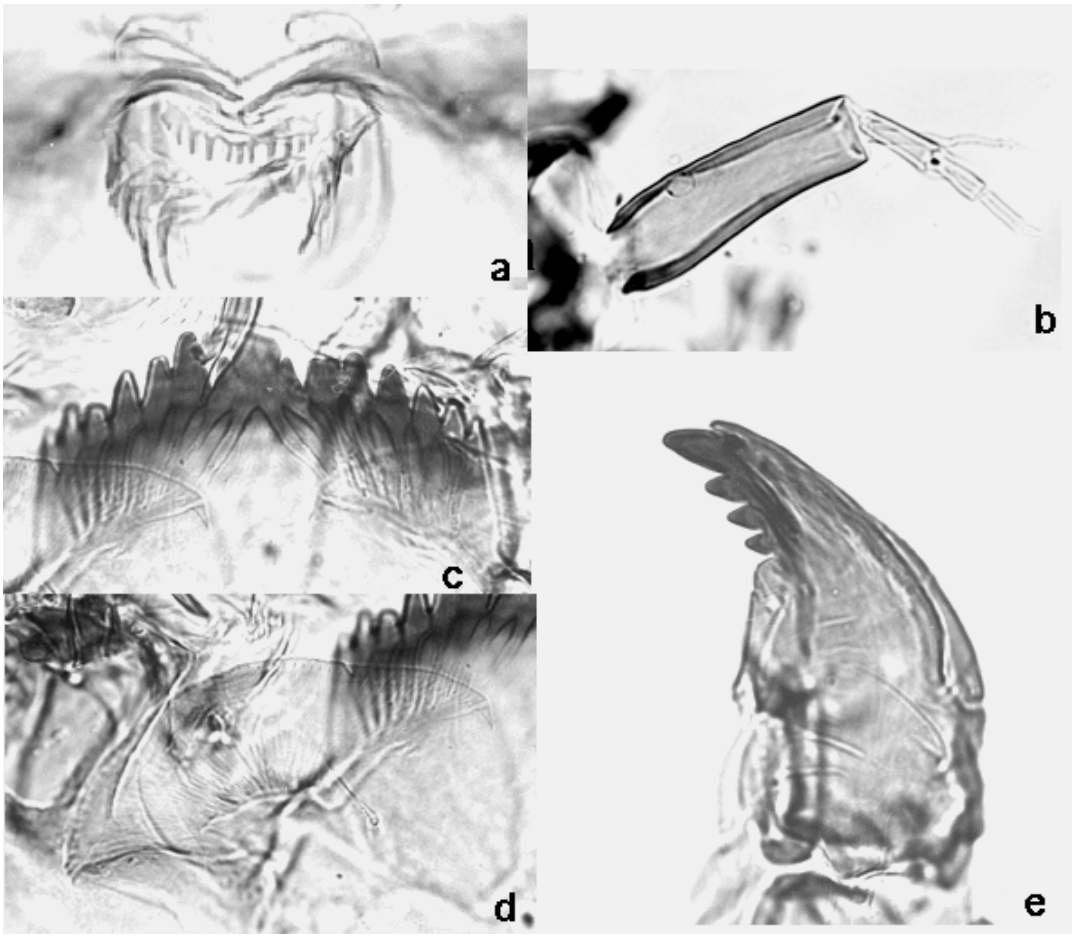


Frontal tubercles of *E. pagana* from Ontario (left) and British Columbia (right)

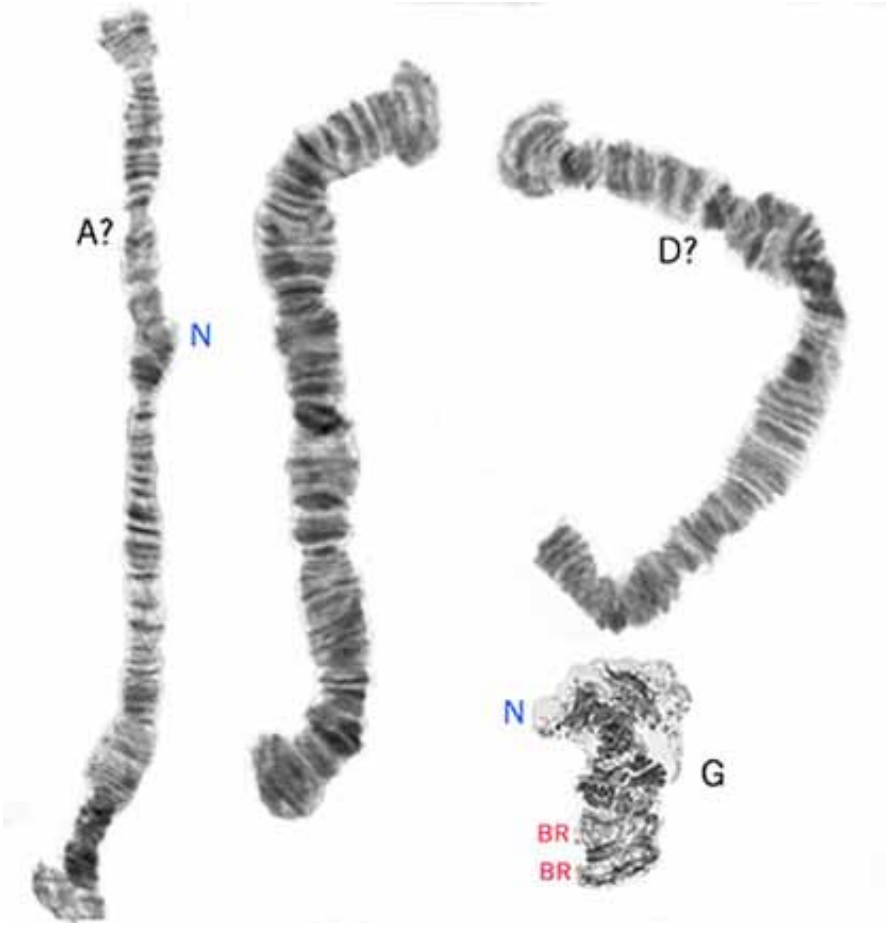
Thoracic setae: Acrostichals 5 - 11; Dorsocentrals 12 - 28, uni - to biserial; Prealars 5 - 6; Prescutella 1; Scutellar 7 - 13, uniserial laterally to multiserial medially. Scutellum with a small central hump.
Legs with sparse beard, BR 3 - 5. Front LR 1.39 - 1.56; Mid LR 0.55 - 0.62; Hind L.R. 0.61 - 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.
Genitilia: Cercus quadrate.

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 FA 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. 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 III).



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.

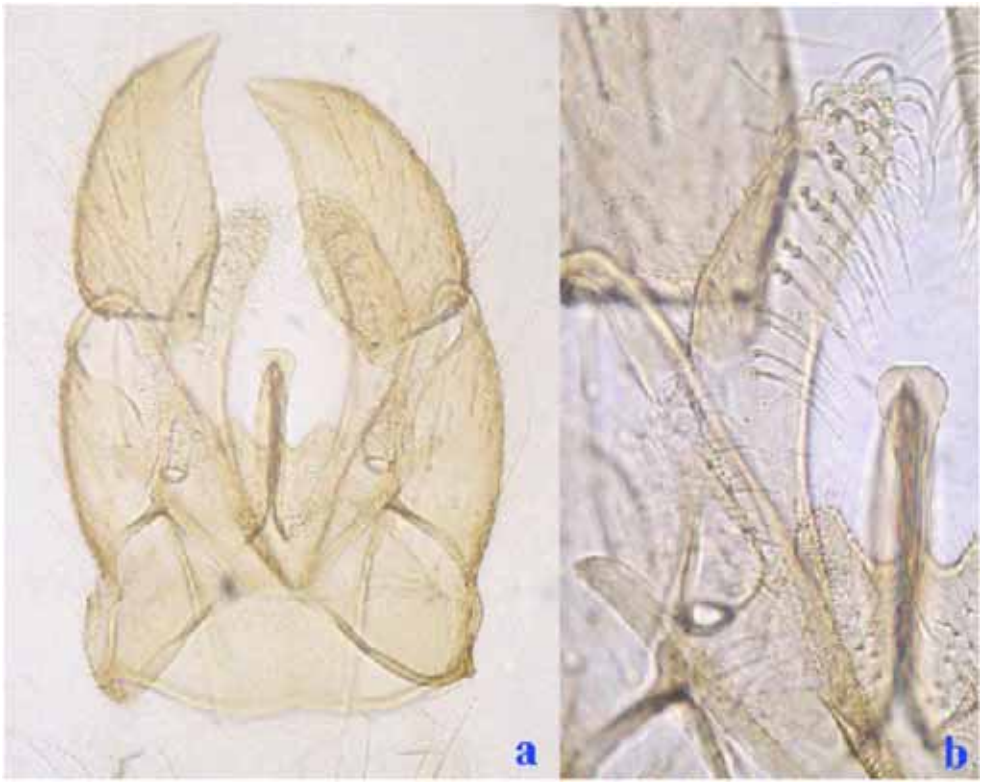
Found: British Columbia - (Sublette (unpubl.)
Manitoba - Lake Winnipeg (Sæther 2012)
Ontario - White Lake, Three Mile Bay (48.70; -85.75)
Idaho - Cataldo (Townes 1945)
Michigan - Isabella Co. (Townes 1945)
New York - Canadaroago Lake; Milford Center; Otsego Lake (Townes 1945)
South Dakota - Waubay (Townes 1945)
Also found in the Palearctic (Belgium - region of Liége; Type locality).

Larval description recorded in Oliver (1971), largely as the synonym *E. synchrona*.

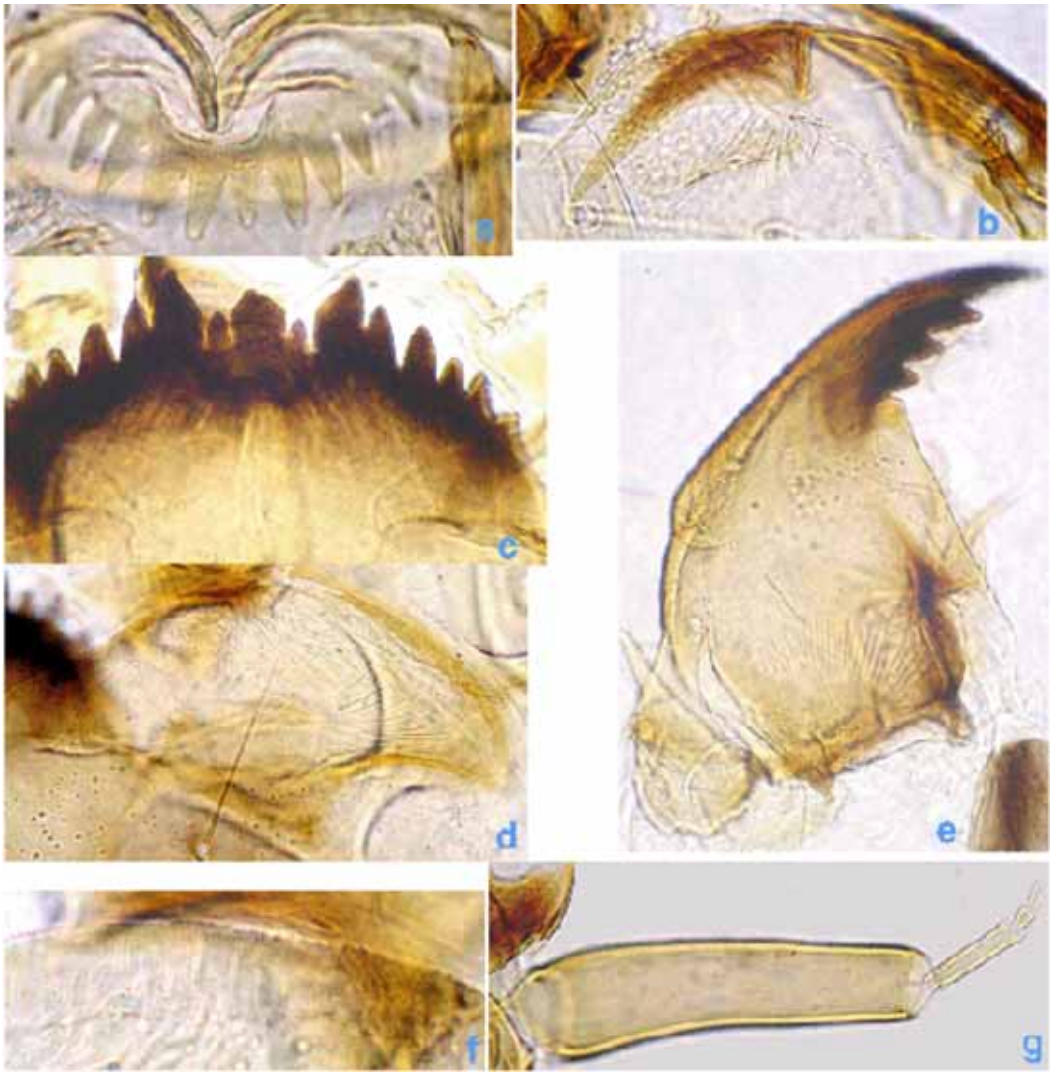
Species 2l. *C. pallidivittatus* sensu Beermann (1955)

Was 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 inferior appendage, the shorter superior appendage, narrower anal point, and the deep W-shaped indentation in tergite IX.



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 slightly darkened, FA slightly darkened posteriorly.
Mentum of type I, with relatively pointed teeth; c1 tooth moderately broad with parallel sides, c2 teeth well developed and sharp pointed (type II).
VM with serrations on inner edge.
Premandible with teeth approximately equal in length, inner tooth about twice the width of the outer.
PE with about 14 even sharp teeth.
Third inner tooth of mandible dark and well separated (type III).



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

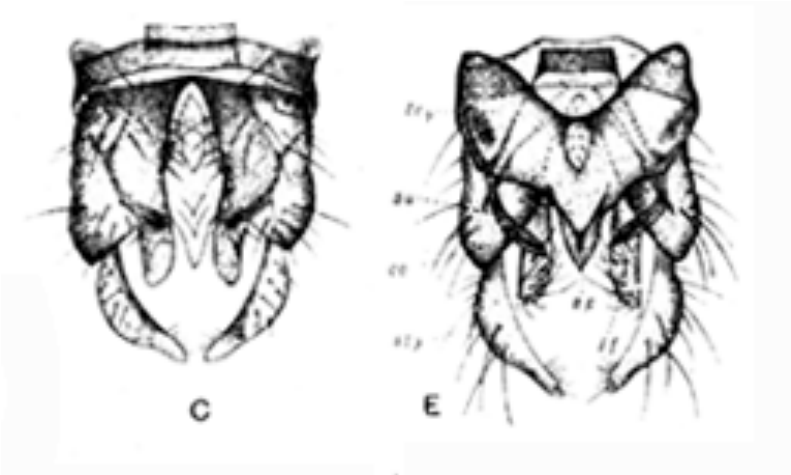
South Dakota - Vermillion, Clay Co.; Sioux Falls, Minnehaha Co.; Lake Francis Case, Yankton Co.

Generally at low frequency in prairie sloughs containing *C. dilutus*.

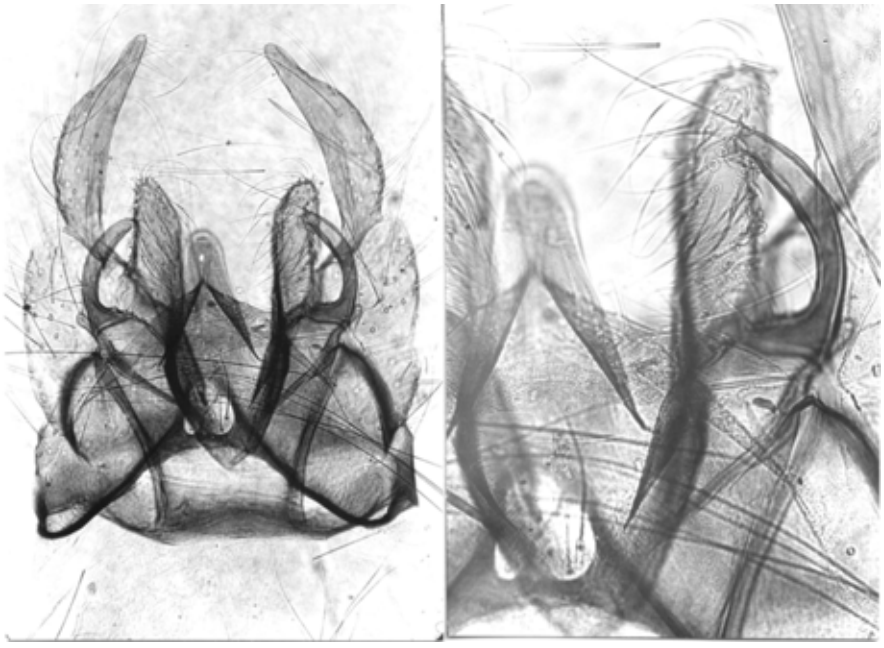
Hein and Schmulbach (1971) first described this species in North America, noting that it was not the same as *C. pallidivittatus* Johannsen. The cytology of North American populations in comparison to that of European populations was described by Kiknadze *et al.* (1998a). Kiknadze et al. (1991) noted 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 separting 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 *cox1*, but can be separated by the sequence of the globin gene gb2ß (Martin *et al*. 2002).
Barcode: *cox1* 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.



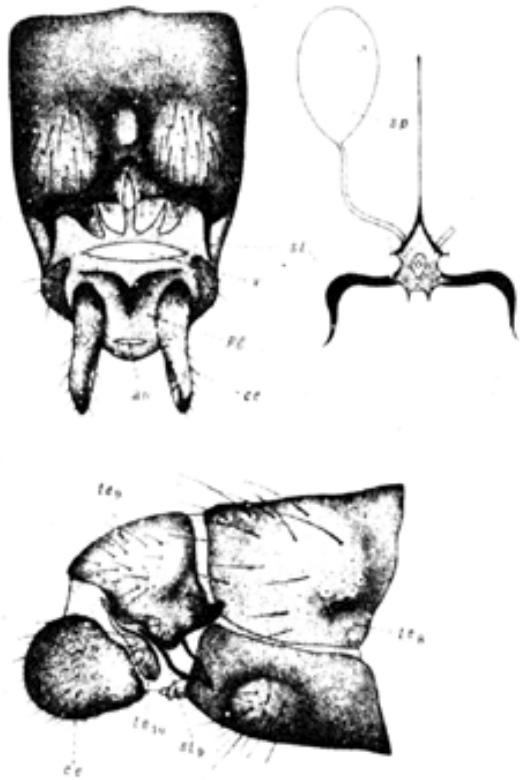
Male terminalia of *C. rempelii* (From Rempel 1936)
Ventral view (left), dorsal view (right)



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; SV 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 about 8 rather long spines.

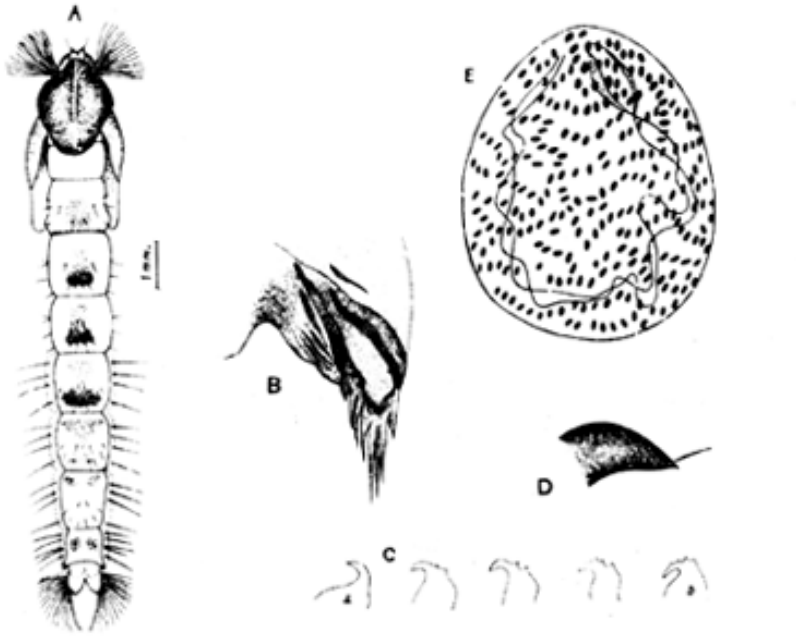


FIGURE 4. *C. hyperboreus*: A,—pupa (from exuviae); B,—lateral process of 8th segment; C,—series of setulae, *a* lateral to *b* median, distal margin of second abdominal segment; D,—frontal tubercle; E,—egg mass.

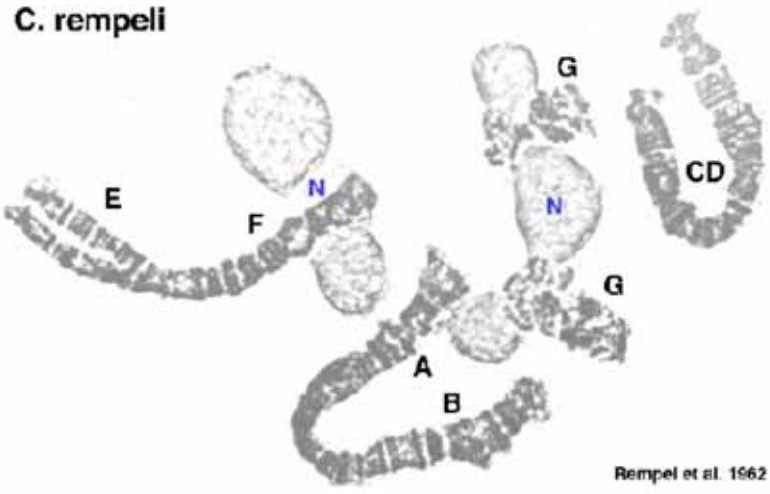
Egg mass and pupa of *C. rempelii* (From Rempel 1936)

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 µm, 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. rempelii* fromRempel (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).
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 larva described by Rempel (see above) is shown as a halophilus-type larvae, whereas the true *C. anthracinus* has a thummi-type larva. 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. 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 he absence

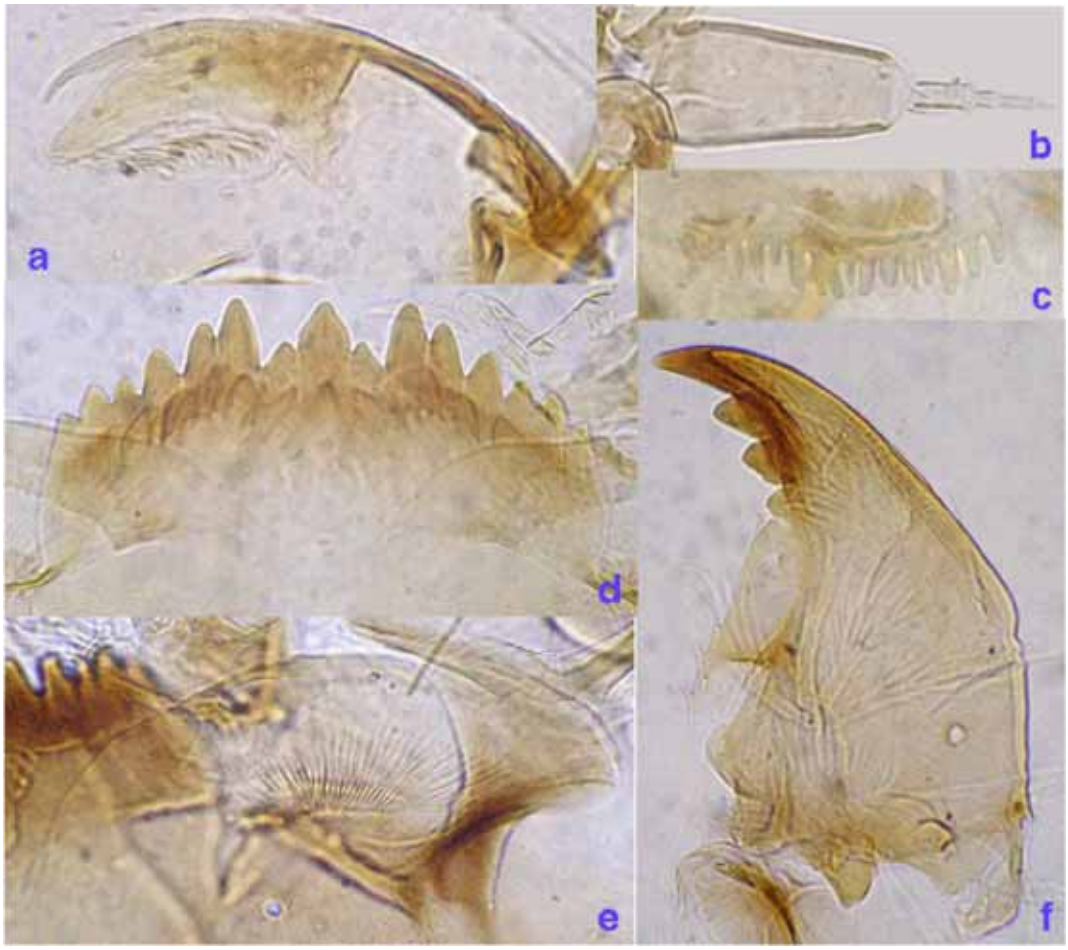
of material from the type locality. This material also has a thummi-type larva (see sp. 4x *C.* sp. NAI), so may be further member of this anthracinus-group of species.

Species 2n. *C. quinnitukqut* Martin, Sublette & Caldwell

Adult male identified by Townes as *C. atrella*, to which the species will key in his 1945 key.

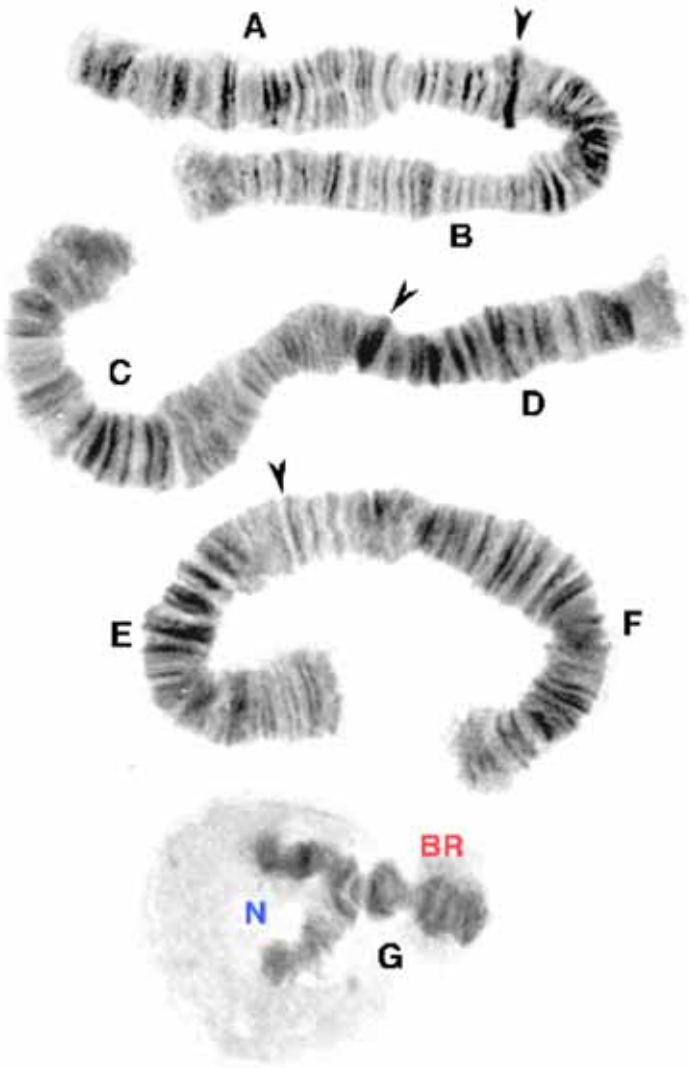
Pupa: No pupae were present in our samples, but some pupal characters were visible from a late prepupa. The spur has about three spines, progessively along the outer edge, in the available specimen.

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.). Gular region slightly dark to dark, FA 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-II); fourth laterals slightly reduced (type I-II); fourth laterals slightly reduced to just above the fifth laterals; sixth laterals often arising lower than other laterals. Ventromental plates (e, below) with a smooth anterior margin and about 38 – 42 striae. Premandible (a, below) with inner tooth 2 – 3 times wider than 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). Mandible (f, below) with third inner tooth relatively well developed and almost completely separated (type II-III), with about 12 – 16 furrows on the outer surface at the base. 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.



Cytology: 4 polytene chromosomes with the thummi arm combination AB, CD, EF, G. Keyl pattern difficult to recognise 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: differes 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 mt*coxI* gene has been obtained (GenBank access.no. xxx). 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 eustuarine waters.

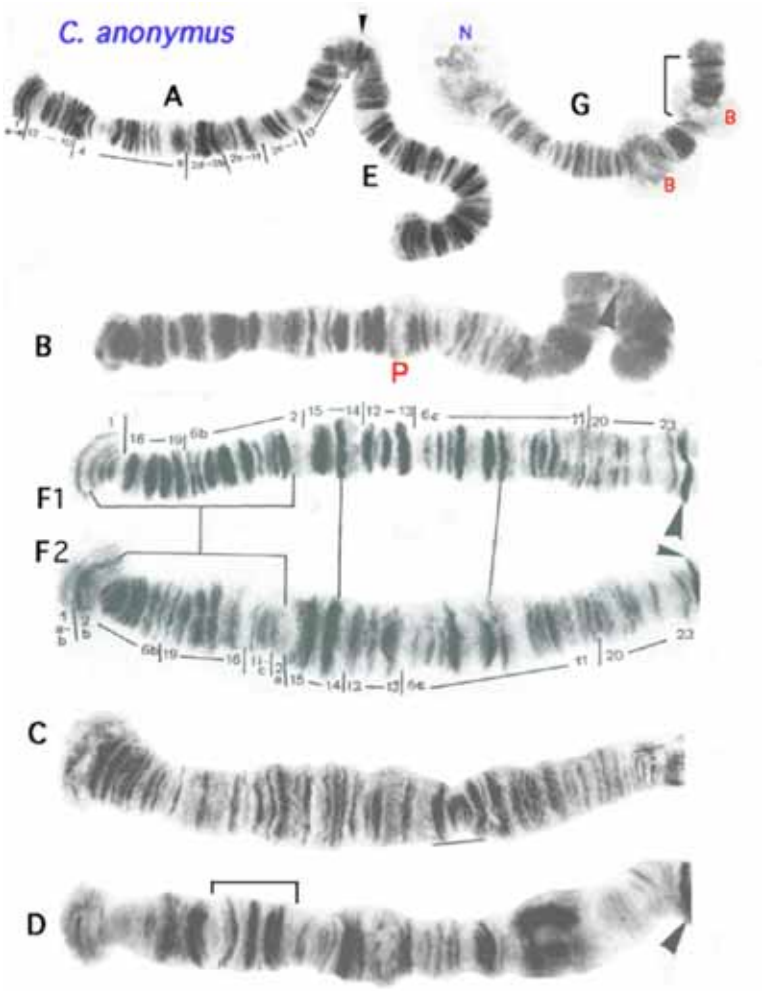
This species was identified as *C. atrella* by Townes and Roback (Hitchcock & Anderson, 1968), but is cytologically quite distinct from other *C. atrella* populations. In general the cytology suggests it could be a member of the *C. decorus*-group, with similarities to *C. decorus* (Sp. 3a) and *C.* 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 2o. *C. anonymus* Williston

Larva a small plumosus type. Pale gular and FA. Mentum with pointed teeth; c1 tooth moderately broad with parallel or slightly diverging sides, c2 teeth well developed and sharp pointed (ie. type II) ; 4th laterals at least slightly reduced (type I - II). Mandible with third inner tooth dark (generally type III). Ratio of antennal segments 25 : 5 : 1 : 2 : 1 (Bath and Anderson, 1969; AR about 2.1; basala segment about 4 times longer than wide; ring organ toward center of the segment. AT 4 - 6 times longer than wide (abt. 520 x 140 micron).

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) 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.

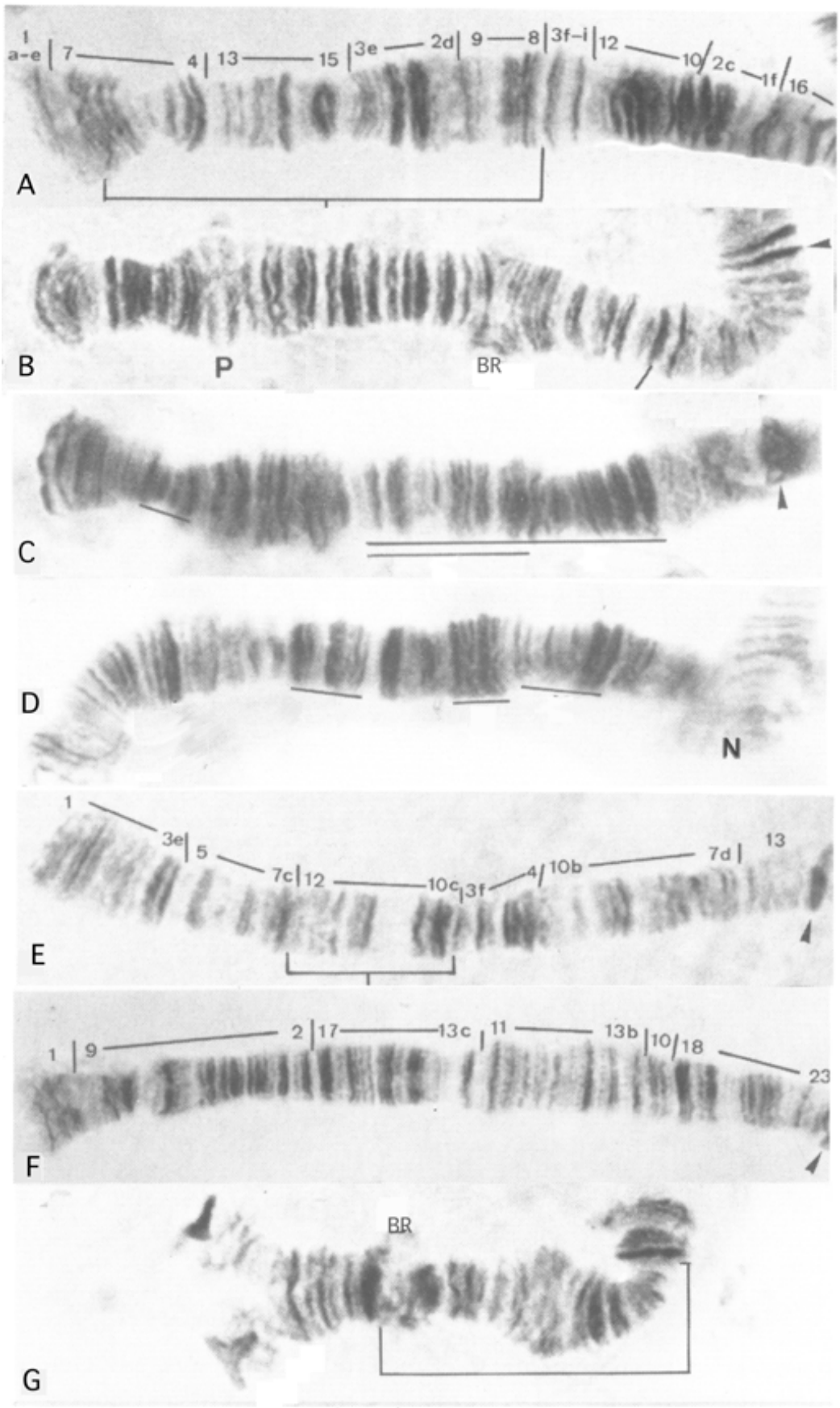
Adult redescribed by Townes (1945) and by Sublette in Wülker, Sublette and Martin (1991).
Male: Wing length 3.1-4.6, LR 1.07-1.27, fore tarsi with a long dense beard.

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.
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

Larva a medium sized bathophilus- or melanotus-type (i.e. some larvae have lateral projections up to 0.12 mm 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). Dark gular region, pale or slightly darkened FA and bases of antennae darkened. Mentum with somewhat rounded teeth; c1 tooth relatively narrow with short parallel sides, c2 teeth well separated (type III); 4th lateral reduced at least to the level of the 5th lateral (type II).
Ventromentum with 31-37 striae reaching about 2/3 to the anterior margin. PE with 11-13 relatively uniform teeth.
Premandible with narrow outer tooth slightly longer than the inner tooth, which is about 2.5 times wider.
Basal segment of antenna about 3.6-3.9 times longer than wide, RO between 1/3 and ½ way up from base of segment.
Mandible with 3rd inner tooth well separated but relatively pale (type IIIB).

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 ie. 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: Invsion of about two thirds of the arm, taking the obvious BR to near the distal end.



C. utahensis

Modified from Wülker *et al.* (1991)

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).

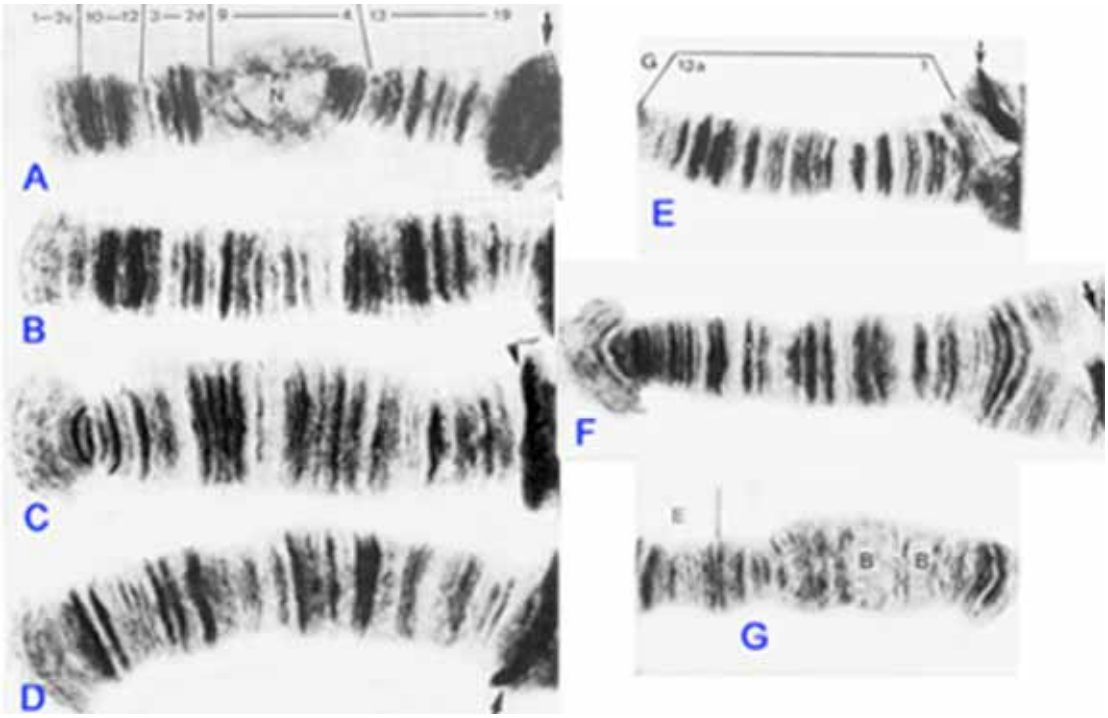
Species 2q. *C. major* Wülker & Butler, 1983

Adult and Pupa: Not described, but Epler (2001) states they are similar to *C. plumosus*.

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).
Gula region darkened on posterior half to two thirds, FA pale.
Mentum 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).
PE with about 10-15 broad and somewhat irregular teeth. Premandible with inner tooth about 2.0-2.8 times the width of the shorter outer tooth.
Antennal segment 1 relatively long, 2.97-3.78 times longer than wide), A_1/A_2 about 4.2-5.7; AR about 2.17-2.86; ratio of segments (µm) 174 : 37 : 9 : 14 : 9.
Mandible with third inner tooth often only partly separated and partially colored but may be completely separated and dark (type IIB-IIIA).

Cytology: 3 polytene chromosomes with a modified thummi arm combination AB, CD, GEF. Centromeres heterochromatic and may have a large vacuolated region. 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.

majA1:	1-2c, 10-12, 3-2d, 9-4, 13-19	i.e. as in *holomelas, cucini* and *tardus.*
majB1:	Puff and distal dark bands (groups 7-8) near distal end. Differs from tardusB1 by small inversion just distal of middle of arm.	
majC1:	Differs from neocoraxC1 by small distal inversion.	
majD1:	Differs from cucD1 by small distal inversion.	
majE1:	13a-10c, 3f-4, 10b-5, 3e-1, 13b-g	Long inv. from *cingulatus*
majF1:	1-10, 17-11, 18-23	i.e. as in *cucini, tardus* and *tenuistylus.*
majG1	Attached to distal end of arm E, with 2 BRs in middle of the arm	



Salivary gland chromosomes of *C. major* (modified from Wülker and Butler 1983.
B - Balbiani rings

Found: : Alabama - locality not recorded.
Georgia - 5 ml w. Athens, 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 - Buncombe Ck., Marshall Co.
Tennessee - Reelfoot Lake, Lake Co. (Epler 2001)

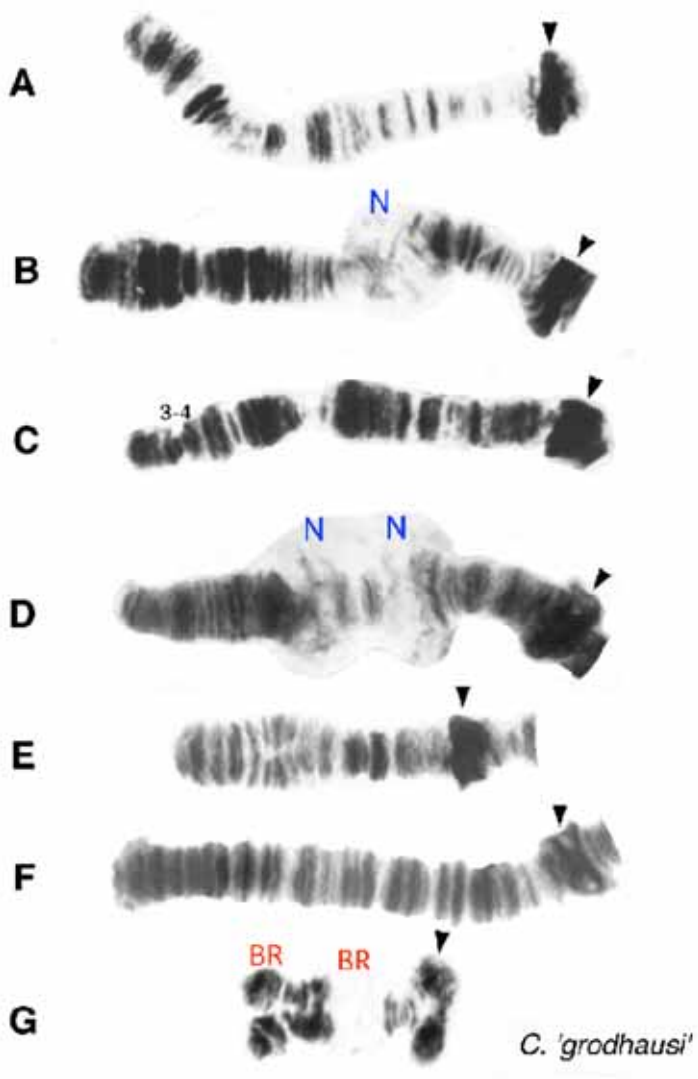
Lakes and ponds in southern U.S.A.

Described by Wülker and Butler (1983) (although a junior homonym), some information on arm F given in Fig. 3 of Martin (1979). This was Species 22 of Wülker.

Species 2r. *C.* ?nr. *atrella* Given manuscript name *C. grodhausi* by Sublette.

Larva a medium sized plumosus-type. Gular region darkened, FA probably darkened. Mentum with pointed teeth; c1 tooth relatively broad with diverging sides, c2 teeth, although well separated, virtually continue line of center tooth.

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 A: 1a-e 2d-3 12-10 2c-1f 9-4 13-19
Arm E: 1-3e, 5-10b, 4-3f, 10-13 i.e as *cingulatus*, *tardus* and sp. 3b.
Arm F: 1 - 23 ie. Standard, as *piger*

Found: California - Lake Davis, Plumas Co.

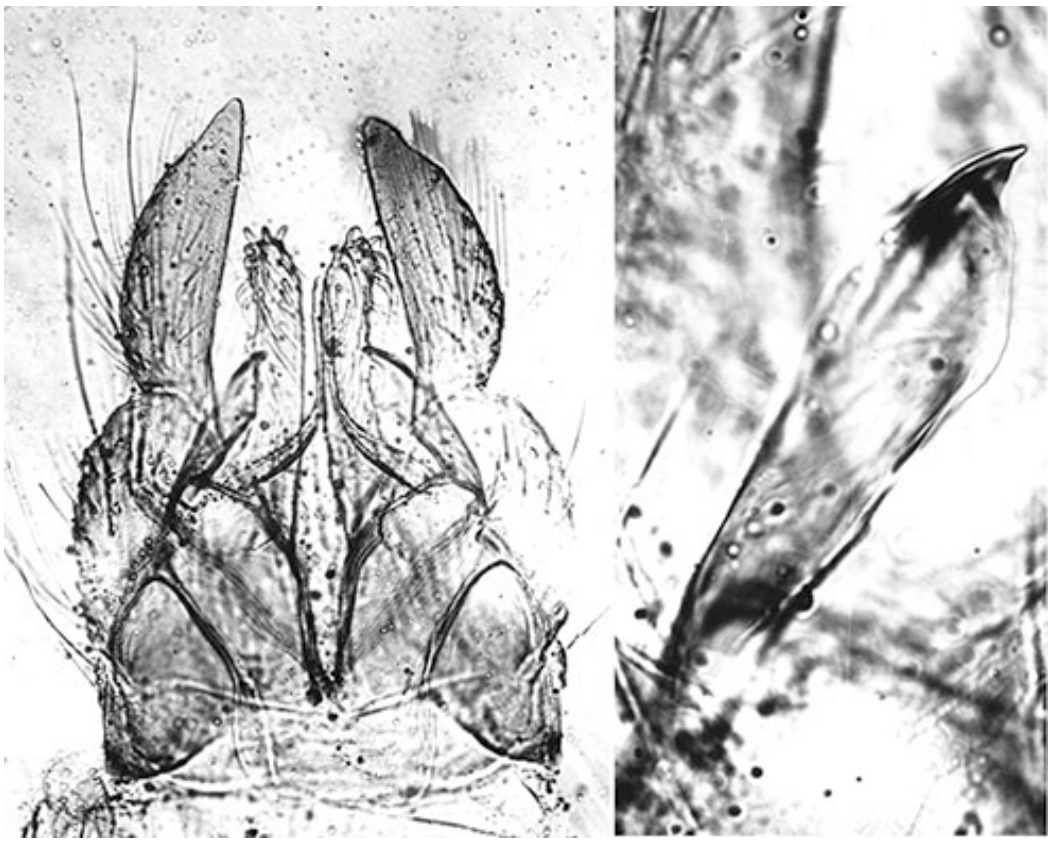
Sp. 23of Wülker (Unpubl.). Some information on arm F given in Fig. 3 of Martin (1979).

Species 2s. *Goeldichironomus carus* (Townes), 1945

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.

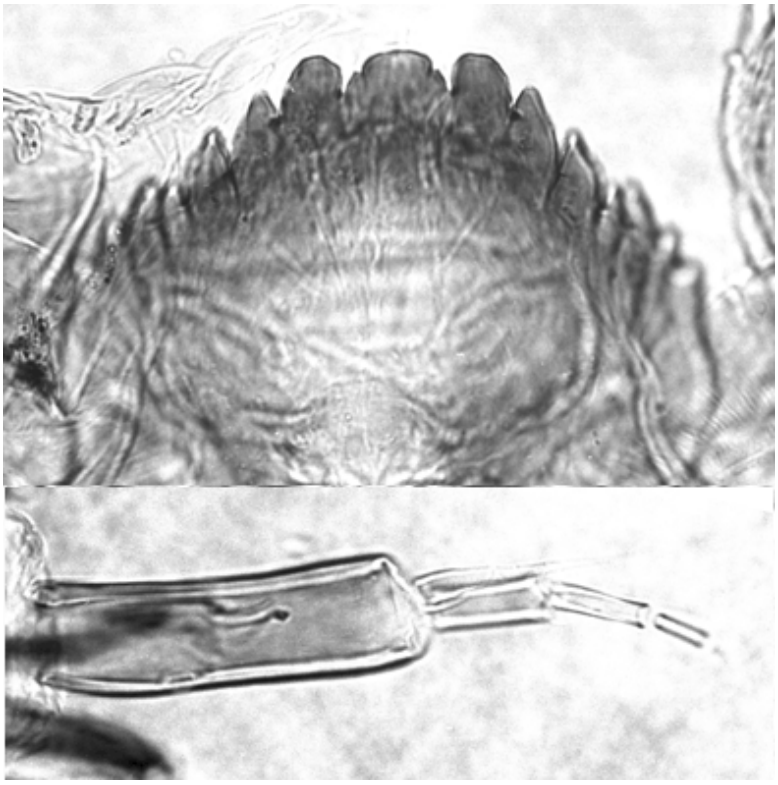
Pronotum slightly narrowed in the middle.
Fore tarsus with a short beard.
Ground color ochraceous more or less tinged with green or brown, apices of femora, tibiae, and tarsal segments light brown, apical tarsal segments brown.
Abdominal tergites 2-7 each with a more or less central rhomboidal brown patch.
Genitalia with narrow anal point and expanded superior volsella.



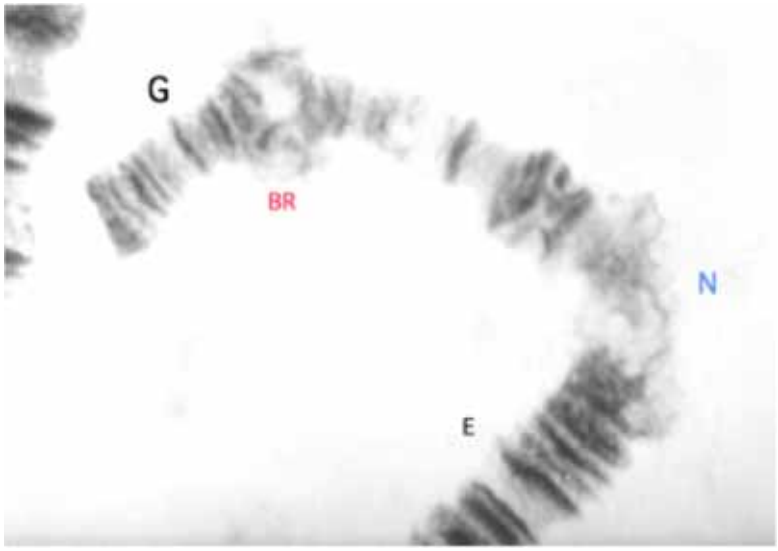
Male terminalia of *Goeldichironomus carus* from Townes (1945)

Female: Similar to male except for the usual sexual differences

Larva a small thummi type, but with a group of bristles at the rear margin of segment 10. Gula slightly darkened, FA as in *Glyptotendipes*, *Kiefferulus* and *Einfeldia* species. Mentum not typically *Chironomus*, but as some other *Goeldichironomus* species; center tooth with only notches on the side (type I); 4th laterals reduced (type II). Antenna with basal segment less than 4 times as long as wide, AR about 0.8; segment A3 relatively long, A4/A3 about 0.5.



Cytology: 3 polytene chromosomes with the carus arm combination AD, BEG, CF. Keyl patterns not easily recognised. Nucleolus where arm G joins arm E; BR about $^{1}/_{3}$ from end of arm G.



Fused arms G and E 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; Baranquila and Buenaventura, Columbia.

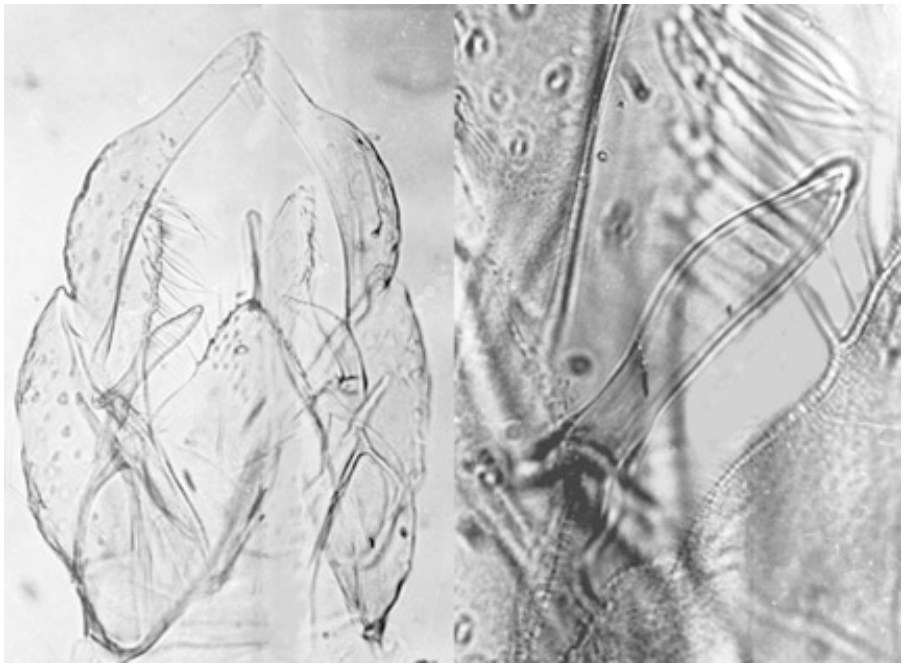
Townes notes that the species is easily recognized by the mesoscutum, which has a brown band around the edge, just above which are three velvety-black subtriangular spots on each side, grading down in size from anterior to posterior.
Originally described as *Chironomus, G. carus* was transferred to *Goeldichironomus* 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.

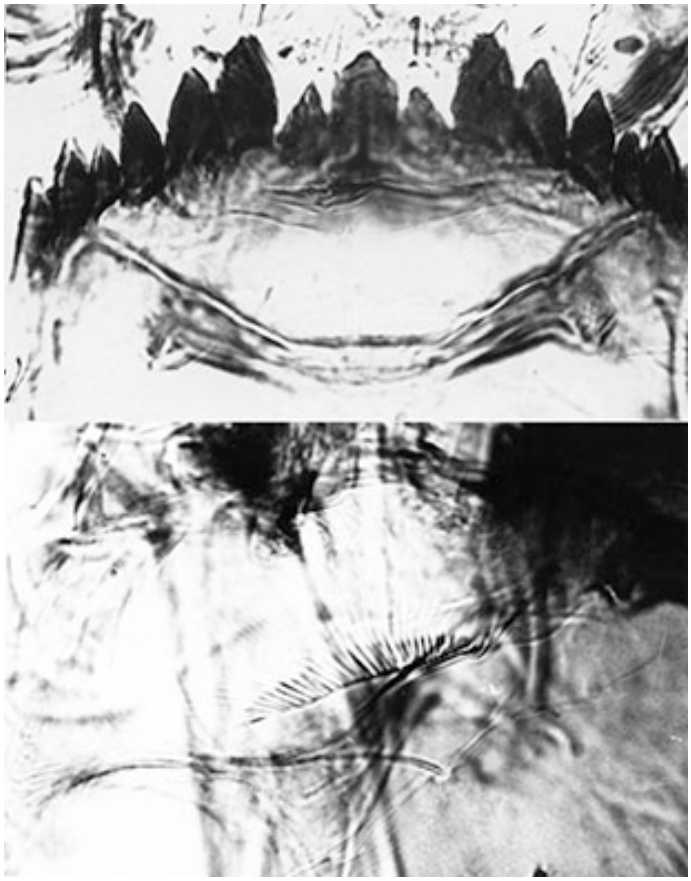
Male:



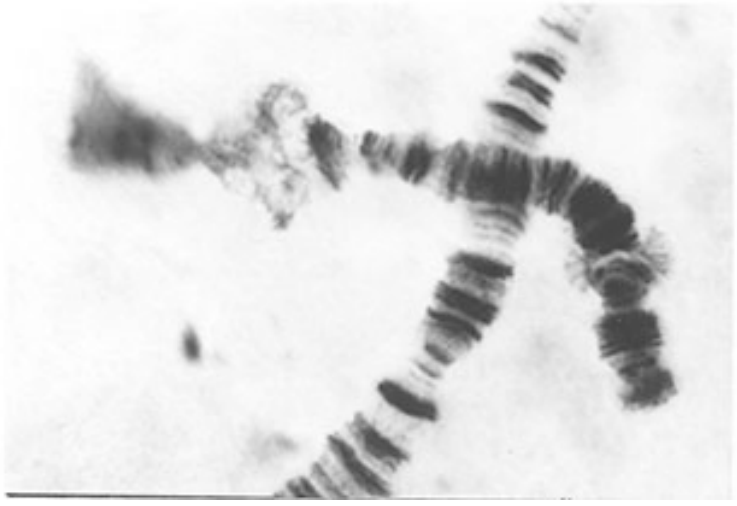
Male terminalia of *C*. species 2t (left), and superior volsella (right).

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.*

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 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*. Centromeres of long chromosomes sometimes inflated like a nucleolus.



Found: Florida - Winter Haven and Lake Cannon, Polk Co.

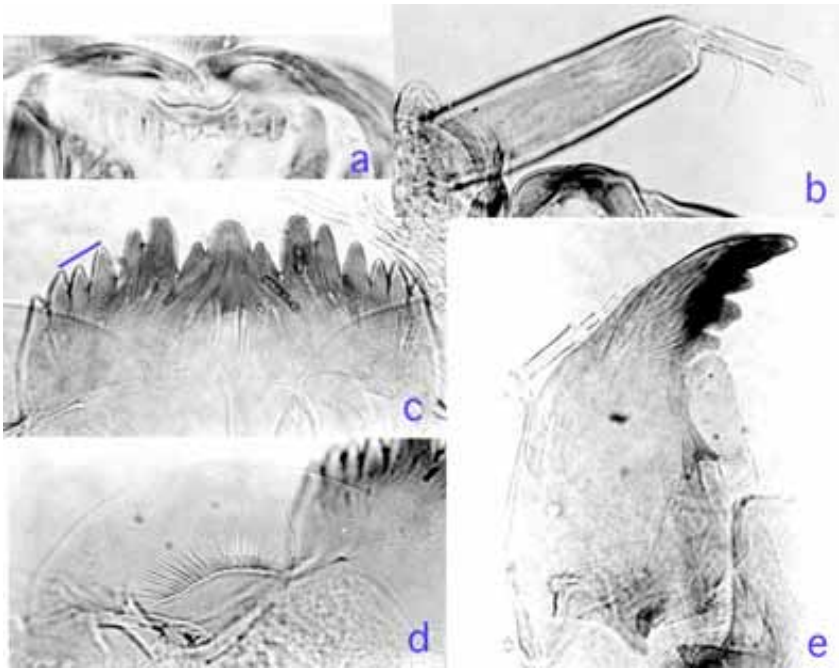
Corresponds to Species 15 of Wülker. He noted the existence of polymorphism in arm G, but did not indicate the nature or extent of this polymorphism in the Winter Haven material. It may reflect the difference between the G of *C. calligraphus* and *C.* sp. WOC.

Species 2u. *C.* nr. *tuxis*

Adult

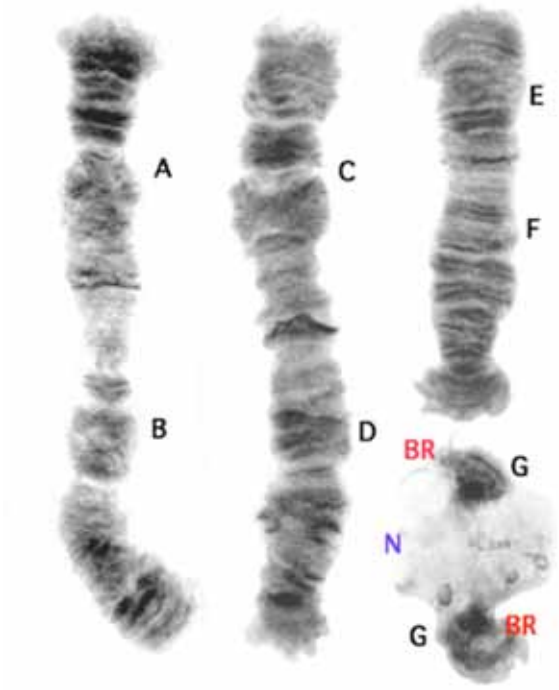
The adults of this species are in the Sublette Collection, now in the museum at the University of Minnesota, St. Paul, MN.

Larva a medium sized plumosus-type. Lateral projections about 260-275 µm. Mentum (b, below) with somewhat rounded teeth; c1 tooth quite broad with short diverging sides then rounded, c2 teeth quite well separated (type I - II); 4th laterals reduced about to the level of the 5th laterals (type II). Ventromental plates (d, below) with about 42 - 44 striae; separated by about 0.32 - 0.35 of mentum width. PE (a, below) with about 12 relatively short, blunt teeth. Antenna (b, below) with basal segment about 2.8 - 3.3 times as long as wide; AR about 1.9; RO from one third to one half up from bottom of basal segment; antennal segments 150 : 37 : 12 : 13 : 8 micron;. Premandible with outer tooth shorter to almost as long as the inner tooth, which is about 2.3 times wider. Mandible (e, below) with 3rd inner tooth lightly colored and partially separated (type II); about 19 - 22 striae near base; and 2 or 3 spines on inner surface.



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 polytene relatively short 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.



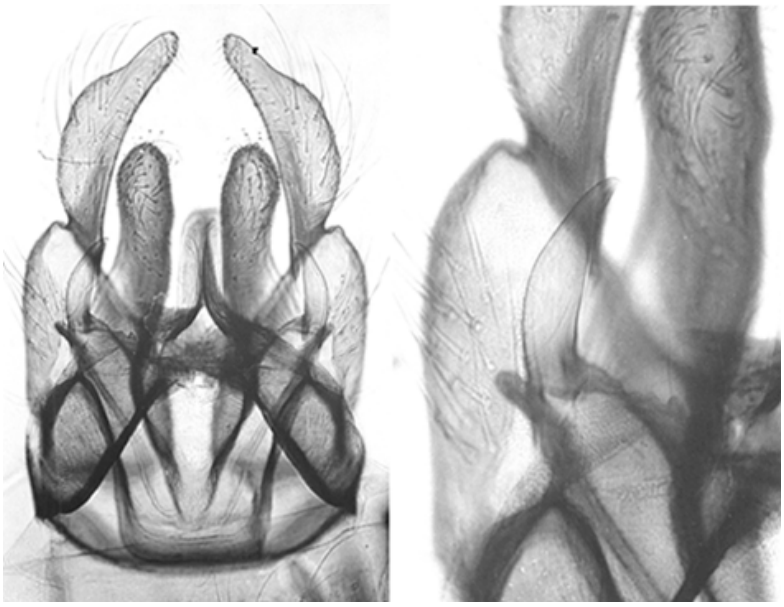
Chromosome complement of *C.* nr. *tuxis*.
Note that arm G comprises the two homologs paired end to end at the nucleolus
N - Nucleolus; BR - Balbiani Ring.

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

Species 2v. *C. athalassicus* Cannings, 1975

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
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.*

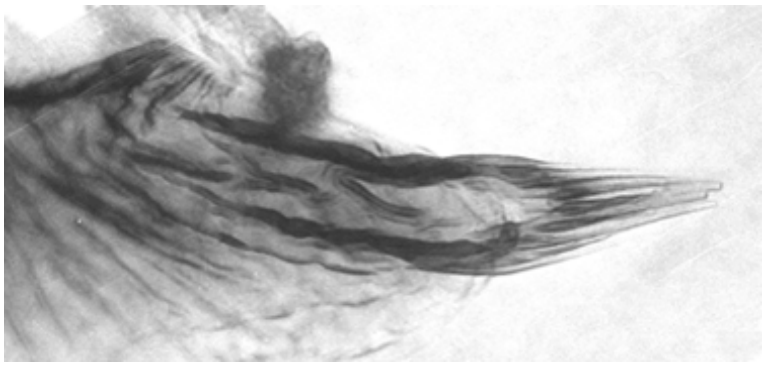
Abdominal terga reddish brown with a thin dark basal band. The apical one third to one half of segments 7 and 8 pale. In higher salinities the colors become paler.
Anal point broad, inner edge of superior volsella only slightly curved, superior volsella of D(f)-type.

Female: Color as male, but generally paler.

Wing length 5.0 - 5.2 mm; VR 1.10 - 1.14 (1.13); ant. LR 1.12 - 1.15, mid LR 0.50 - 0.54 (0.52), hind LR 0.60 - 0.68 (0.63).
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 47 - 97 (62) (56).
Genital lamina quadrate.

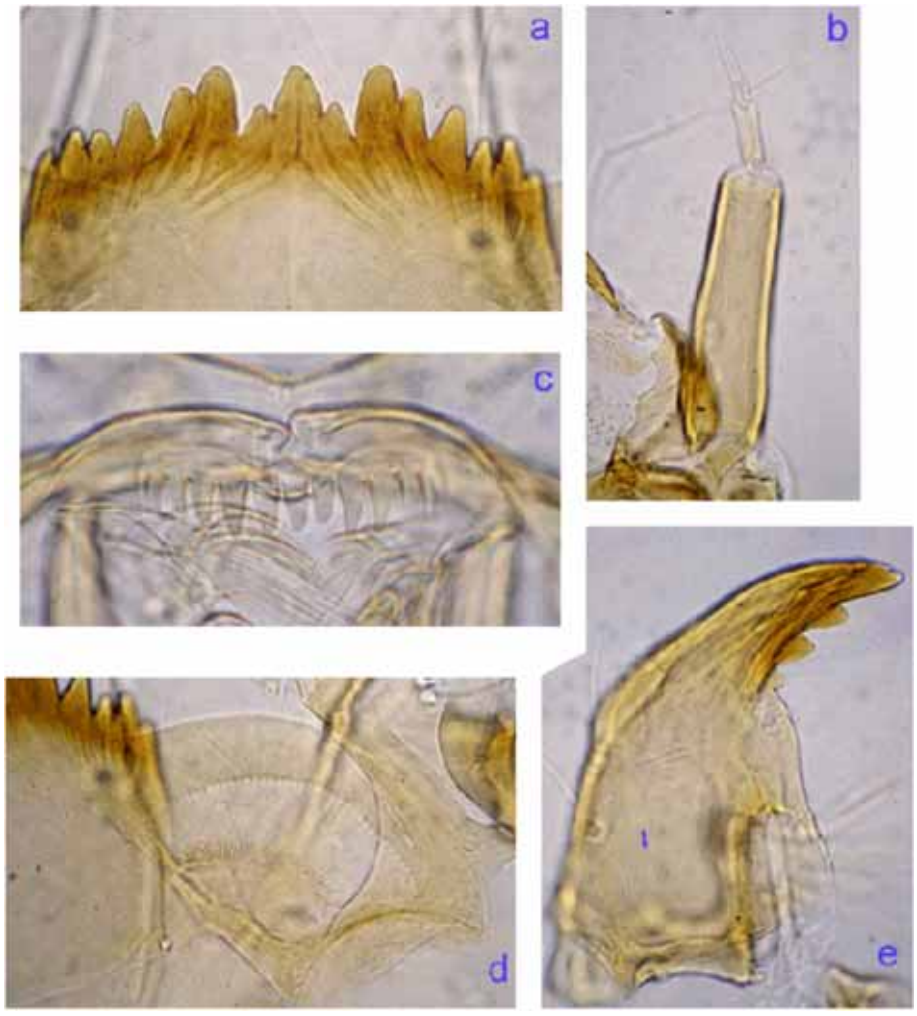
Pupa

Total length 10.0 - 13.8 mm (11.7 mm). Frontal tubercles 240 µm long, subterminal seta about one third of length of tubercle at about 75 µm 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.*

Larva a medium to large (fem. 13.5 - 20.8; male 17.0 mm) plumosus or semireductus-type, possibly depending upon salinity of habitat. Lateral projections 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). AT about 2.5 times longer than wide (len. 400-420 µm, wdth. 160-170 µm). Gular region generally darkened in posterior 1/3 to 2/3, FA pale, but darker around antennae and mouthparts. Mentum (c, below) with generally rounded teeth; c2 tooth relatively well separated (Type II); 4th laterals reduced, sometimes to about level of 5th laterals (type II). VM (Fig. d) with about 45 - 47 striae). PE (a, below) with 10-15 teeth. Antenna (b, below) with AR about 2.45; basal segment about 3.8 times as long as wide; antennal segments 179 : 33 : 10 : 16 : 7 micron (Cannings gives segment 5 as same length as segment 3); ring organ in middle third of basal segment. Premandible with inner tooth about half the width of the inner teeth, but about the same length. Mandible (e, below) with pale fourth tooth separated (type II), about 17 to 20 furrows on outer surface near base (arrowed in figure); and 2 spines, with partial development of a third, on the inner margin.

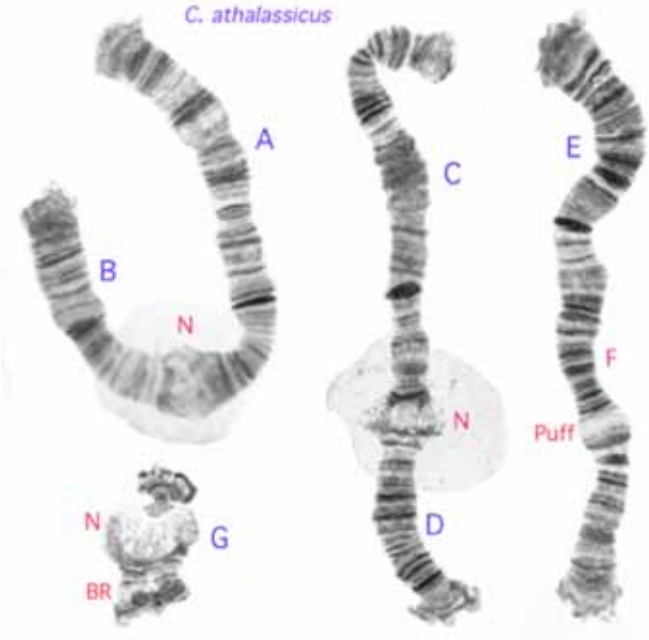


Mouth parts of *C. athalassicus*: a. Mentum; b. Antenna; c. Pecten epipharyngis; d. Ventromentum; e. Mandible (striae arrowed).

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, D and F.

athA1: 1 - 2c, 10 - 12, 3 - 2d, 9 - 4, 13 - 19 i.e. as *holomelas*
athB1: Nucleolus one third from centromere, region proximal as in *atrella*.
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 *longistylus, atrella*
athE1: 1a - 3e, 5a - 10b, 4 - 3f, 10c - 13 i.e. as *cucini, plumosus*, 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.

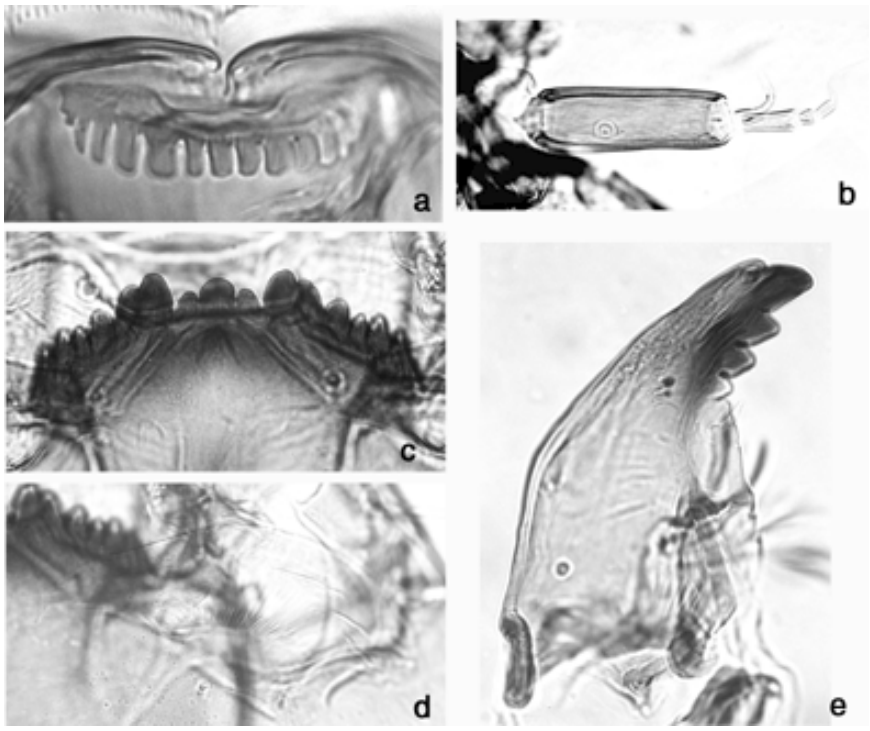
Found: British Columbia - Boitano Creek, and L. Boitano, Springhouse (Type locality).
North Dakota - Clearwater Lake, Mountrail, Co.; Lake isabel, Kidder Co.

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

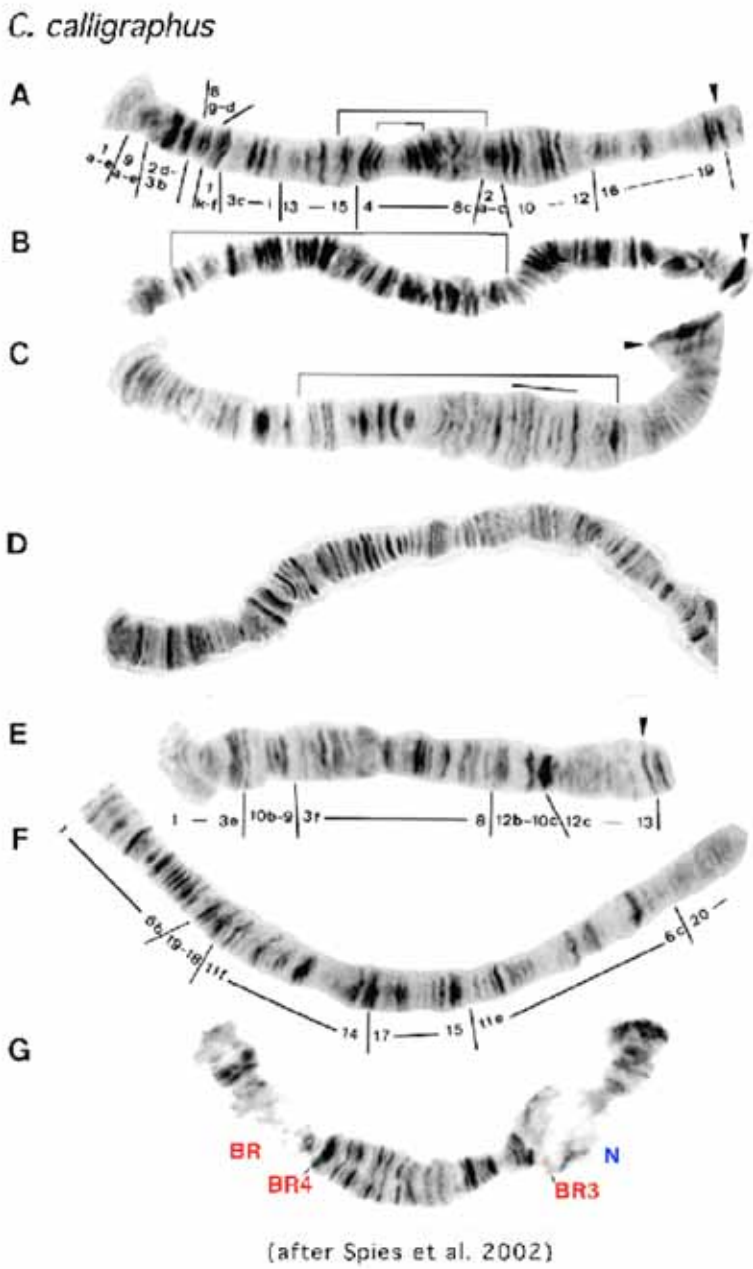
Larva a small to medium plumosus-type (9.3 - 13.3 mm). Gula and FA darkened, although variable and FA may be pale (Spies *et al*. 2002). VT about length of segment VIII (Ant. 1.24 - 2.12 mm; Post. 1.08 - 2.16 mm), posterior pair coiled, shorter than described by Fittkau for South American specimens Those from California are shorter than those from Kansas or Florida. PLT well developed (280 - 420 µm). 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, with reduced 4th lateral. PE (a, below) with about 12 somewhat

irregular teeth. Mandible (e, below) with 3rd inner tooth relatively well developed (type II). 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.



Cytology: 4 polytene chromosomes with the pseudothummi arm combination AE, BF, CD, G. Arm G relatively long, closely paired with a nucleolus about $^{1}/_{4}$ 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 $^{1}/_{3}$ 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



Polytene chromosomes of *C. calligraphus* type 2

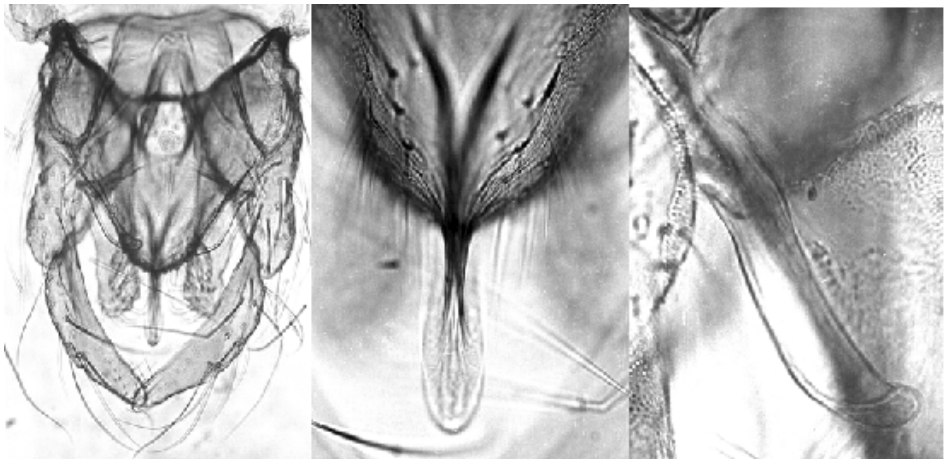
Found: California - South Gate and Long Beach, Los Angeles River; Bellflower, San Gabriel River; Whittier; Cerritos, Coyote Creek (type 1), all Los Angeles Co.; Huntington Beach(type 2); Anaheim, Santa Ana River (type 2); all Orange Co.; Good Samaritan retirement home, Corona; Hidden Valley golf course, 2 mi. w. Pedley; Valley Seminary District, all Riverside Co.
Florida - Gainsville, Alachua Co. (type 2); Winter Haven, Polk Co.
Georgia - (Gray *et al*. 2012)
Kansas - Mill Creek, nr Craig, Johnson Co. (37.95; -94.80).
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 Belem, 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.*

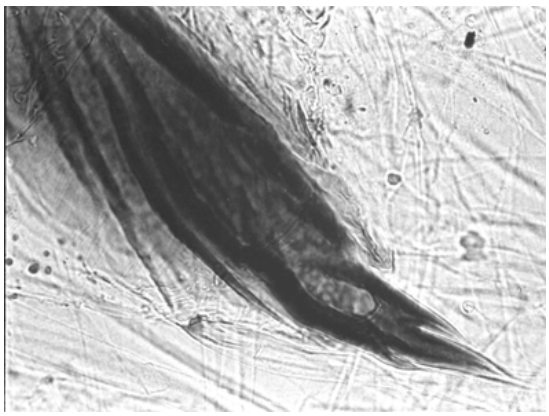


Hypopygium, anal point and superior volsella of *C.* spec. 2x.

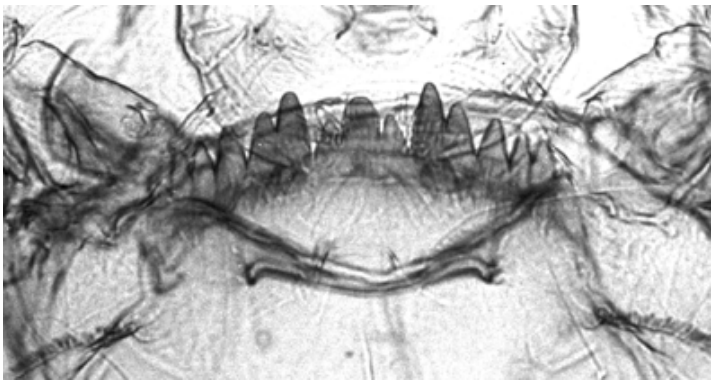
Description of *Chironomus decumbens* from information in Townes (1945)
(known only from type specimen)

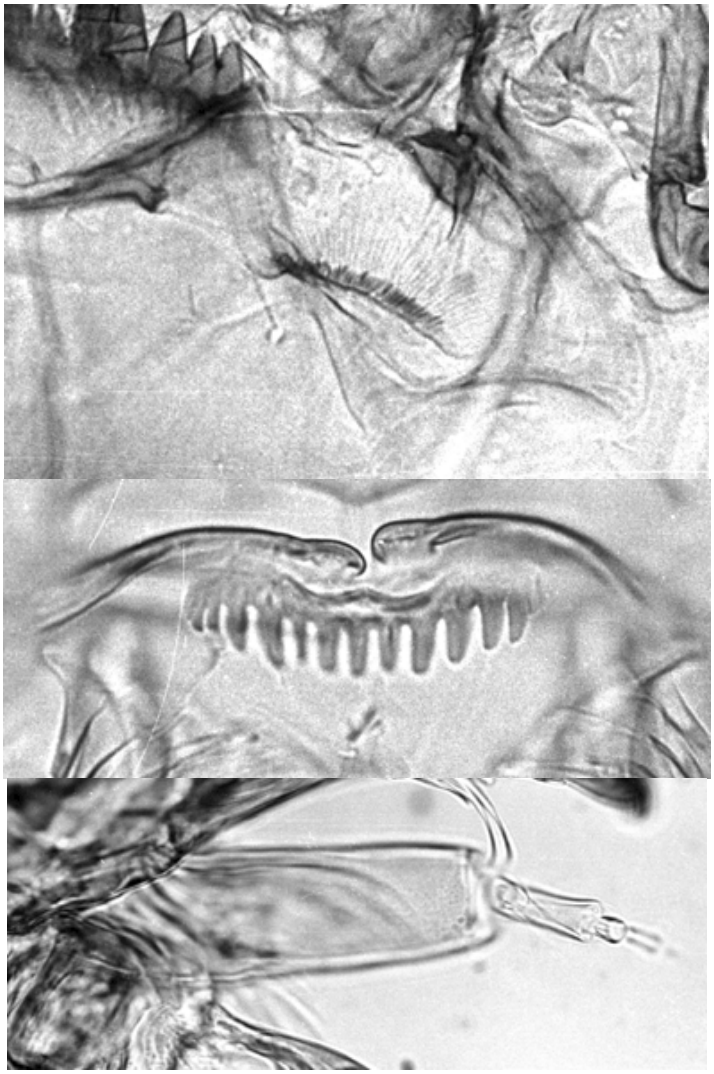
Male: Wing length 4.7 mm; fore LR 1.27; BR about 4.0; antennal ratio 4.5.
Body of medium stoutness.
Frontal tubercles of moderate size, clypeus rather small.
Middle portion of pronotum hardly widened; mesoscutum without a tubercle.
Fore tarsus with a rather short depressed beard, arising at about 40° to 45°.
Blackish brown, legs slightly paler.
Hypopygium with very narrow anal point; superior volsella of Strenzke’s E-type.

Pupa: Caudo-lateral spur of segment VIII with one large and perhaps two smaller spines.

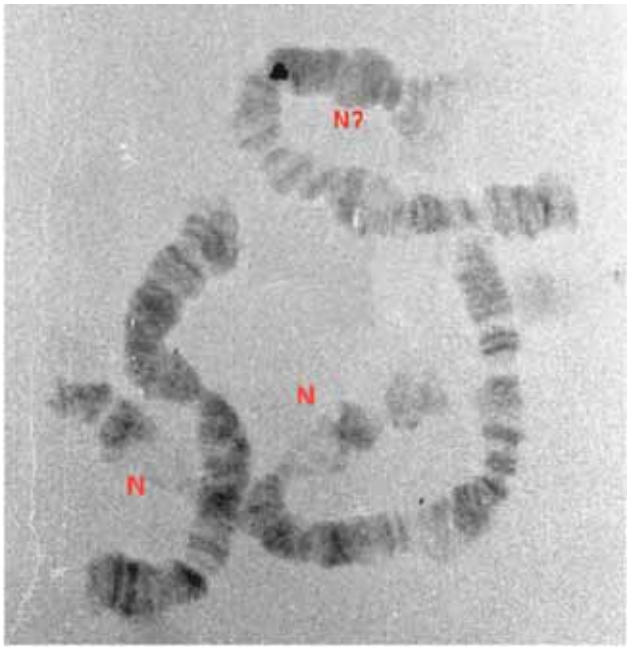


Larva a medium sized salinarius type. Gular region darkened. Mentum relatively flat, c1 tooth relatively broad with parallel sides, c2 teeth quite well separated (Type IIA); 4th laterals slightly reduced (essentially Type I). PE with about 13 teeth, an occasional one reduced in size. Basal segment of antenna about 3.6 times as long as broad; A2/A1 about 0.23, A4/A3 about 1.14.





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.

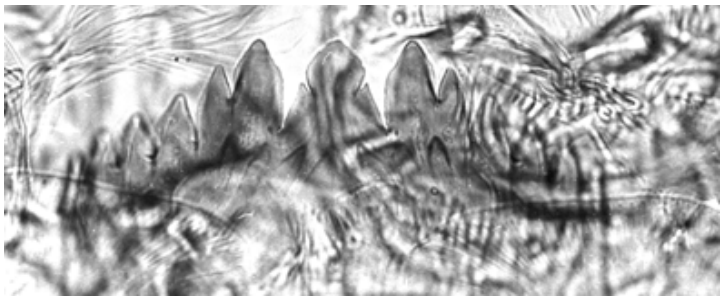


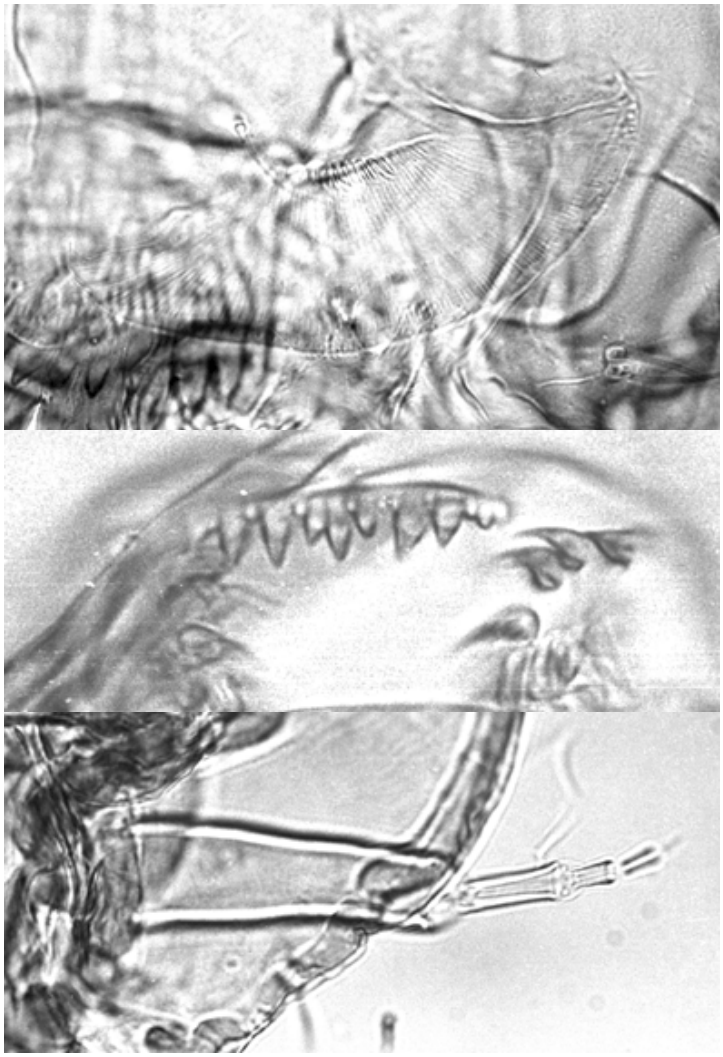
Found: Alaska - Harding Lake.
The type locality of *C. decumbens* Malloch is Nunavut (formerly North West Territories) - Southampton Island, Keewantin

The cytology of this species suggests no close relationship to the species noted as *C.* nr. *decumbens* (species h).

Species 2y. *Einfeldia* sp.

Larva not a typical *Chironomus* type, relatively small; presence of VT unknown.
Mentum with flanged teeth; c1 tooth definitely trifid with notches of c2 teeth at about 45° (type I).
VM with about 30 striae. PE with about 17 irregular teeth.
Basal segment of antenna 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 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?)

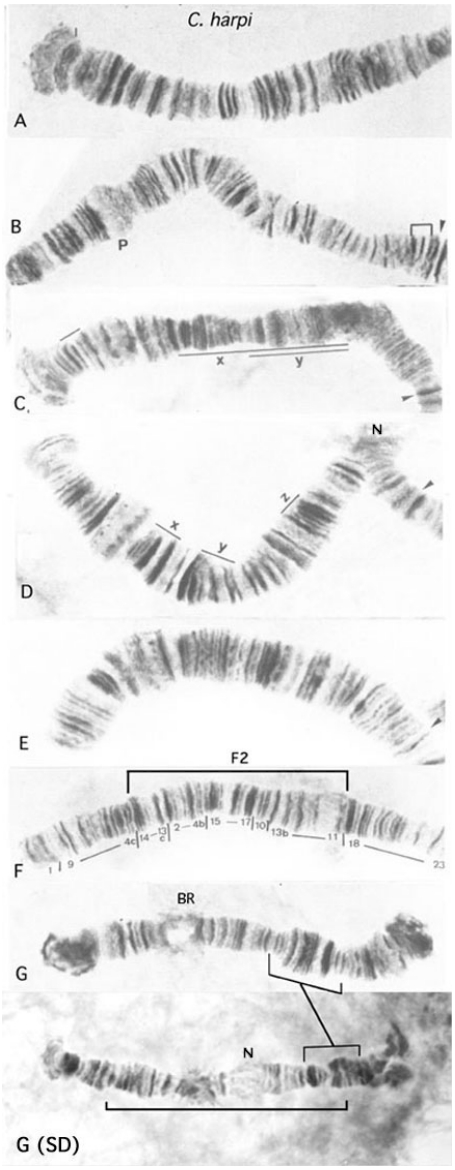
Found: Alaska - Harding Lake.

Species 2z. *C. harpi* Sublette, 1991

Larva a small to medium plumosus- or thummi-type (may be pH dependent?), with posterior VT usually slighlty longer. Gular region slightly darkened, FA pale. Mentum with relativley 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 $^1/_3$ 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, but homozygous in South Dakota specimens, which may be heterozygous for an inversion of about 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*.
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)



Found: Arkansas - 40 km sw. Little Rock, Saline Pa. (Type locality) (plumosus-type)
Illinois - Bradley's Acid Pit, Jackson Co. (thummi-type)
New York - 2-2.5 km e. Middleport, 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).

Species 3a. *C. decorus* Johannsen 1905

C. decorus was originally described by Johannsen in 1905, with later additions (e.g. Johannsen 1938) varying, probably due to inclusion of other members of the species-group.

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 scattered 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 chitinized 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, crossvein 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)

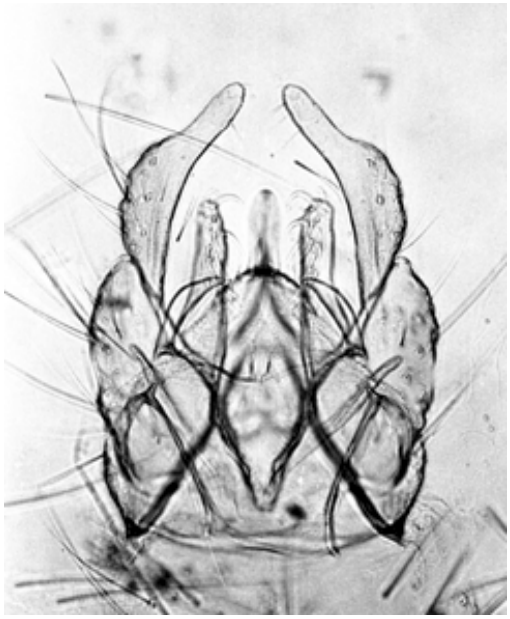
Adult:

Male:

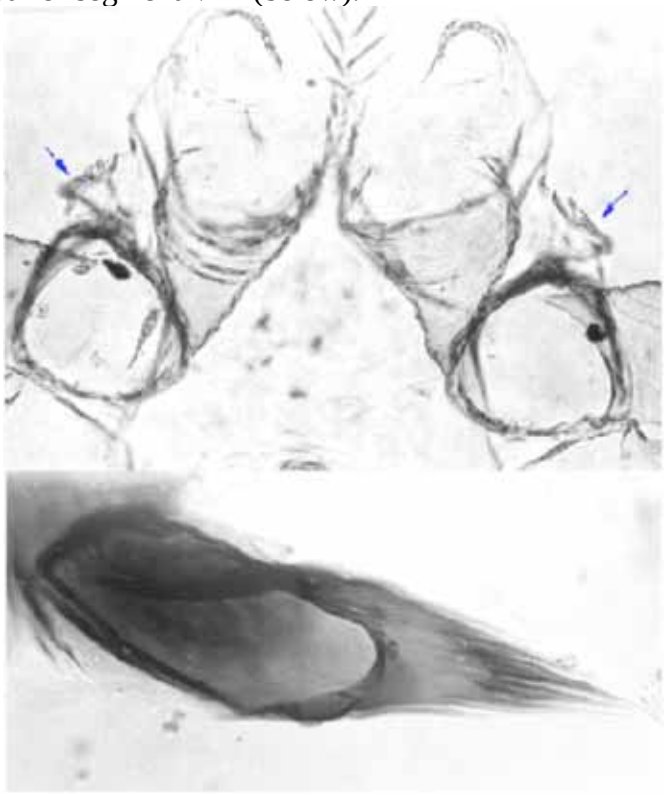
Length 6 – 7 mm.

Thorax greenish yellow, stripes and postnotum testaceous or reddish

The male has a dark band across the middle of each abdominal segment, with typical *C. decorus* hypopygium; the superior volsella (E-type), while darkened, is paler and longer than that of *C. bifurcatus*. Setae on the inferior volsella not forked (at least in Wisconsin specimens).



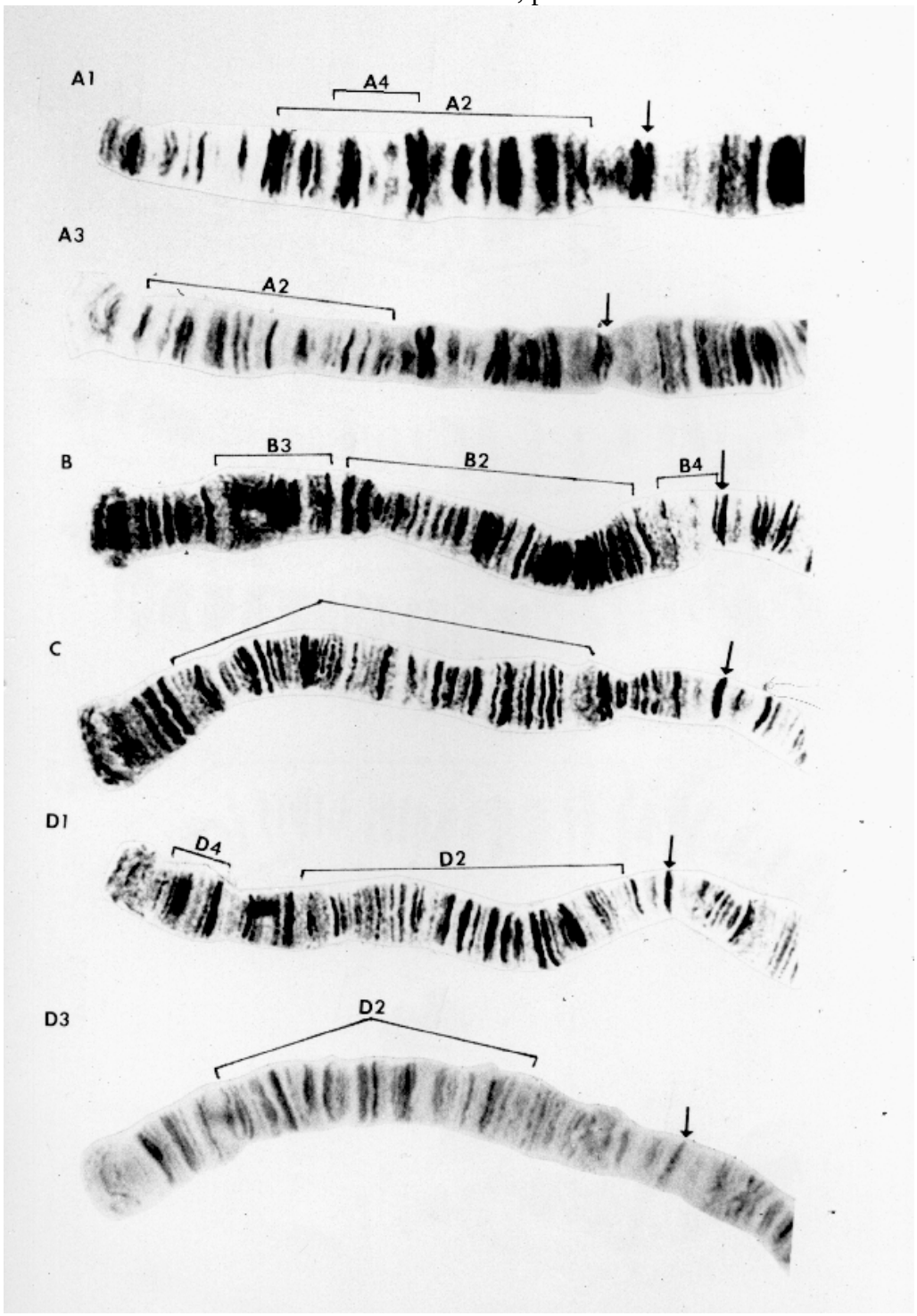
Pupa: The pupa has a definite secondary tubercle on the cephalic tubercles, and multiple spines (4 - 6) on the caudolateral spur of segment VIII (below).



Larva a small to medium sized (female 10.7 - 12.4 mm) (12 mm according to Johannsen, 1905) bathophilus- or melanotus-type; 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 1938 revision that he describes the larva as a plumosus-type (Johannsen 1938). AT 2 - 3 times longer than wide.
Gular region very dark over at least posterior half, FA pale.
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.
Mandible with the third inner tooth slightly darkened and sometimes slightly separated (type II), about 12 - 17 furrows on outer surface near base. Antenna relatively short, less than half VHL; AR about 1.93 - 2.33; 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) 121 : 26 : 6 : 11 : 6 . Larvae from southern regions are bathophilus-type, while those from Wisconsin and Ontario seem to be semireductus- or even plumosus-type.

Cytology: 4 polytene chomosomes with the thummi arm combination AB, CD, EF, G. Very polymorphic with inversions in all arms.
Arm G with an essentially terminal nucleolus and three BRs; often only paired at end away from nucleolus. No nucleolus in the long chromsomes. Chromosome AB is somewhat difficult to recognise 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 $\frac{1}{3}$ from the end of arm B. Polymorphism in arms A (4 sequences), B (at least 4 sequences), C (2 sequences), D (4 sequences), E (2 sequences), F (at least 6 inversions allowing 19 sequences) and G (2 sequences).
decA1: Pattern difficult to identify as the bands of the typical "olive" are dispersed.
decA2: Large medial inversion.
decA3: A distal inversion of A2.
decA4: A small medial inversion.
decB1: Characteristic bands 20-23 not near centromere, puff towards distal end of arm.



decE1: 1-3e, 8-5, 9-10b, 4-3f, 10c-13 i.e. as *maturus, stigmaterus* and sp. 3f (Seq. A).
decE2: 1-3e, 8i-e, 3f-4, 10b-9, 5-8d, 10c-13 i.e. as sp. 3f (Seq. S)
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?

The combination F3+4 appears to occur in species 3f:
dec F3+4: 1a-d, 9 - 3d, 1i-e, 3c - 2d, 18 - 10, 2a-c, 19 - 23
decG1:

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 around Ithaca, New York.

Found: Ontario - Copanspin Farm, Dunrobin and ¿South March nr. Mud Lake (44.88, -78.27), both Carleton Co.
New York - Ithaca, Tompkins Co. (Johannsen 1905)
New Mexico - Eagle Nest Lake, Colfax Co.; Taylor Springs, Colfax Co.; Rio Grande River, Dona Ana Co.; Hill Tank, Eddy Co.; Pecos River, Puerto de Luna, Guardalupe Co.; Gila River, nr. Virden, Hidalgo Co.; 2 ml e. Hondo, Lincoln Co.;
South Dakota - James River, Yankton, Yankton Co.
Wisconsin - Murphys Creek, and Arboretum, Madison, Dane Co.

Windmill tanks, ponds, ditches, pools in rivers, shallows of lakes.

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).

Species 3b. *C.* nr. *anthracinus* (nr. *aberratus* according to Wülker)

Larva a plumosus type larva, although VT length and shape could not be determined. Posterior of gular region and the FA 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, major,* 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..

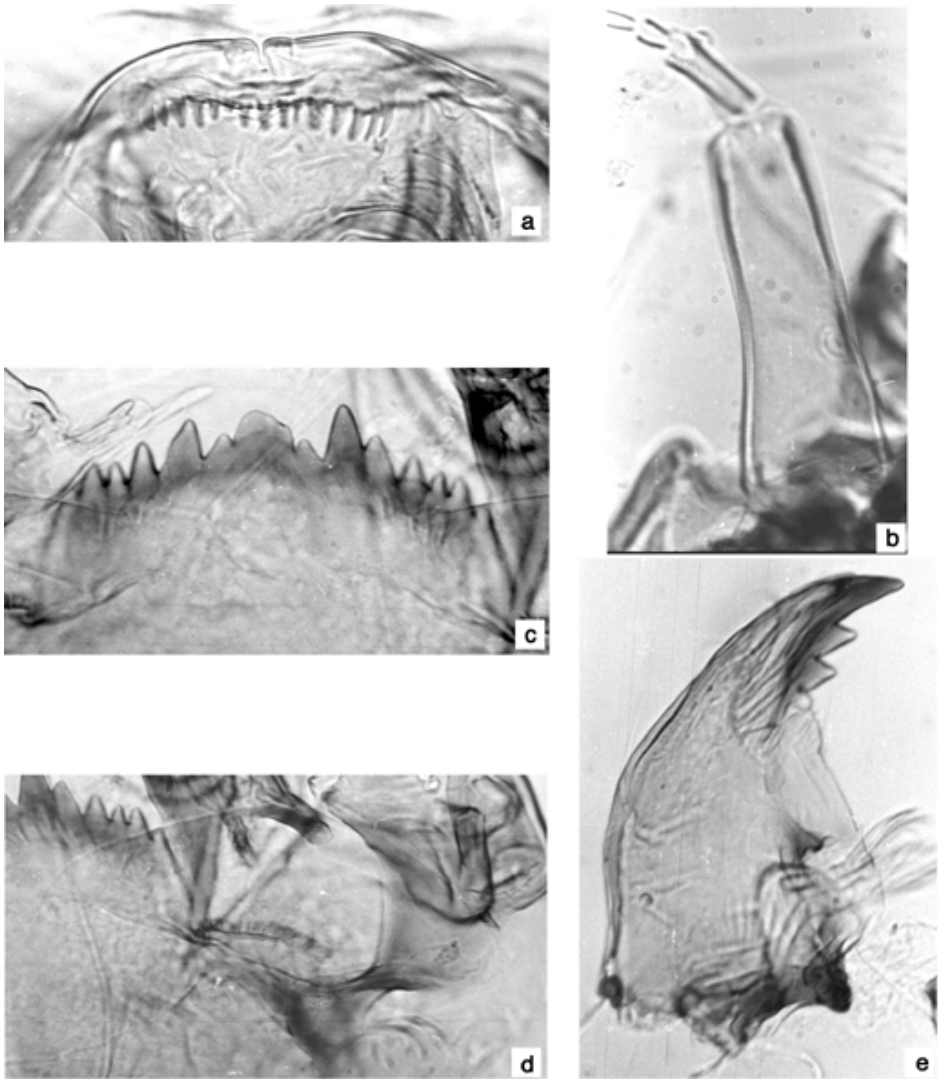
High altitude lake.

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). Was Species 24 of Wülker.

Species 3c. *C.* nr. *anthracinus*

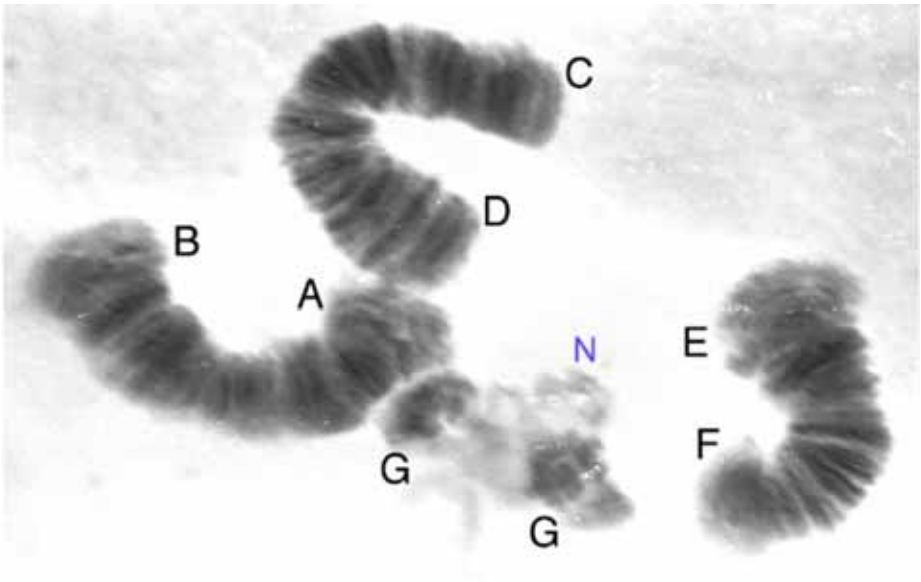
Larva a medium to large (fem. 14.8 - 19.5 mm; male 17.4 mm) plumosus-type; VT relatively long, posterior pair longer (ant 1.68 - 1.81, post 1.91 - 2.44 mm), PLT about 320 - 360 µm. AT long, ventral pair with a median constriction, 2.7 - 4.0 times longer than wide.

Gular region dark over ¾ or more, FA darkened.
Mentum (c, below) with pointed teeth; c1 tooth broad with short parallel sides, c2 teeth relatively well separated (type II); 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 II).



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

This corresponds to Species 18 of Wülker.

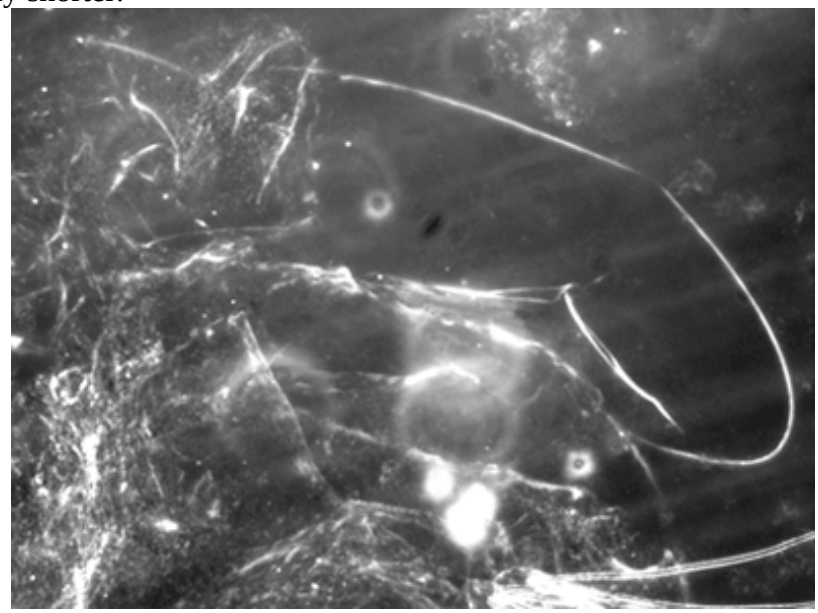
Species 3d. *C.* nr. *annularius*

Adult not associated.

Pupa: some pupal characters known from a late prepupa.
Caudolateral spur on segment VIII (below) with about 3 – 5 spines. Anal fringe with about 94 setae in multiple rows.

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), FA pale, and lateral projections shorter (about 80 -

240 µm). VT relatively long, about equal or anterior pair slightly longer (ant. 0.46 – 1.44, 0.92 mm; 0.46 – 1.28, 0.87 mm). Anal tubule relatively short, about 2 to 2.7 times longer than wide, ventral pair usually shorter.

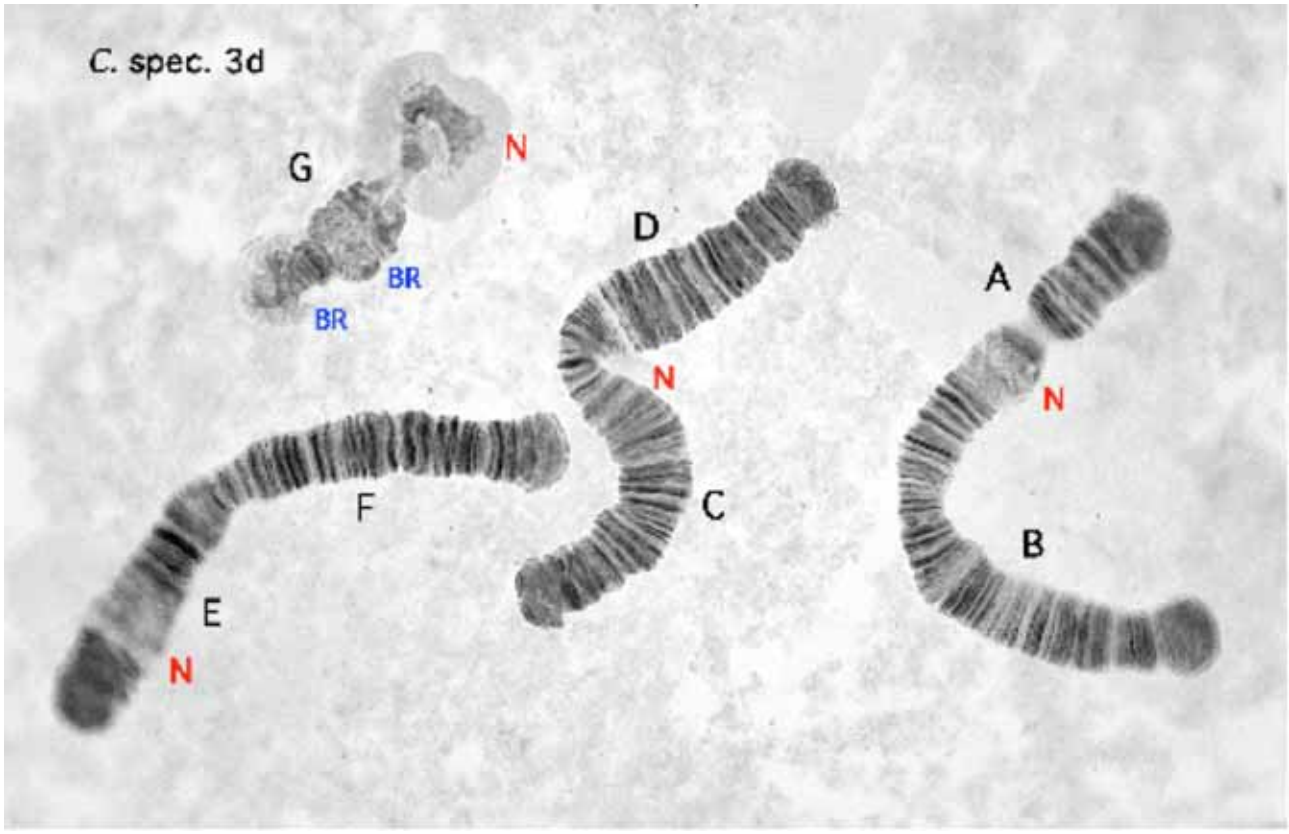


Anal tubule of *C.* sp. 3d. Note the bright crease towards the ventral side should not be confused with the actual edge of the tubule just below it.

Mentum with 4th laterals only slightly reduced (type I), central trifid tooth somewhere between type I and III, with c2 teeth separated to about 1/3 depth of c1 tooth, which can also look like type II if worn.
Ventromental plates separated by about 40% of width of mentum, with about 42 – 43 striae.
Prementum with outer tooth slightly longer, inner tooth about 2.5 – 3 times wider than the outer.
Pecten epipharyngis with about 16 - 17 pointed teeth.
Antenna with basal segent almost 4 times longer than wide, RO just under half way up the segmant; AR about 2.17 – 2.38, relative length of segments (µm) 170 : 35 : 9 : 15 : 8.
Mandible with 3rd inner tooth relatively well separated, but still relatively pale, 16 – 19 furrows on outer surface at base.

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.
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.

Arm A1:	1a-2c, 10-12a, 13ba, 4a-c, 2g-d, 9-4d, 2h-3, 12cb, 13c-19	i.e. as *anthracinus*
Arm E1:	1-3e, 5a-e, 4gh, 10b-6, 4f-3f, 10c-13	i.e. as *annularius*
Arm F1:	1-4b, 8c-4c, 17-13, 10-12, 9f-c, 8f-9b, 8ed, 18-23	



Found: Saskatchewan - Crooked Lake, Pasqua Lake & Round Lake, Qu'Appelle River.
Indiana - Crooked Lake, Angola.
North Dakota - Larimore Dam, Grand Forks, Co.; Warsing Dam, Eddy Co.
Wisconsin - Booth Lake (Hilsenhoff & Narf 1968), East Horsehead Lake, Oneida Co.; Grandportage Lake, Iron Co. (Hilsenhoff & Narf 1968); Kegonsa Lake, Dane Co. (Hilsenhoff & Narf 1968); Pine Lake, Pleasant Lake, Walworth Co.

Lakes

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.

Species 3e. C. (*Chaetolabis*) *ochreatus* Townes

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.

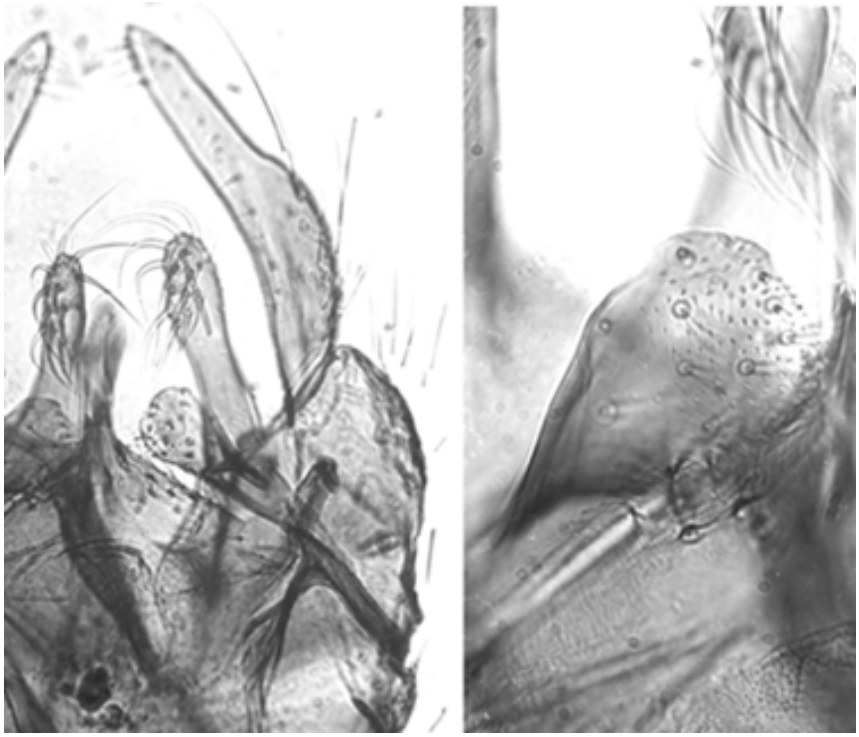
Legs yellowish green, anterior legs darkened at the knees, tibia and tarsi dark; other legs with tibiae yellow brown shading to black on distal tarsal segments. Anterior tarsus without a beard.

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 disctinctive. 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 setae on stem vein, 23-26 setae on anal 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.

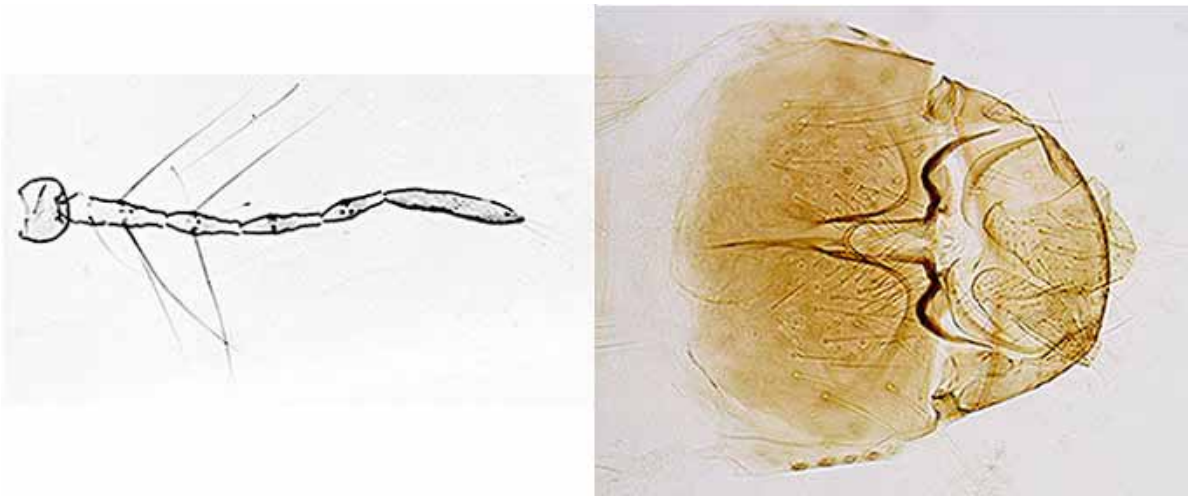
Frontal tubercles small, about 10 x 12.5 µm.
Palpal proportions (microns): 75 : 60 : 293 : 333 : 426.
54 clypeal setae.
Thoracic setae: Achrostichal – abt 13; Dorsolateral – 38,41; Prealar – 8.9; supraalar – 1; Scutellar, anterior row 14, posterior row 21.

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.

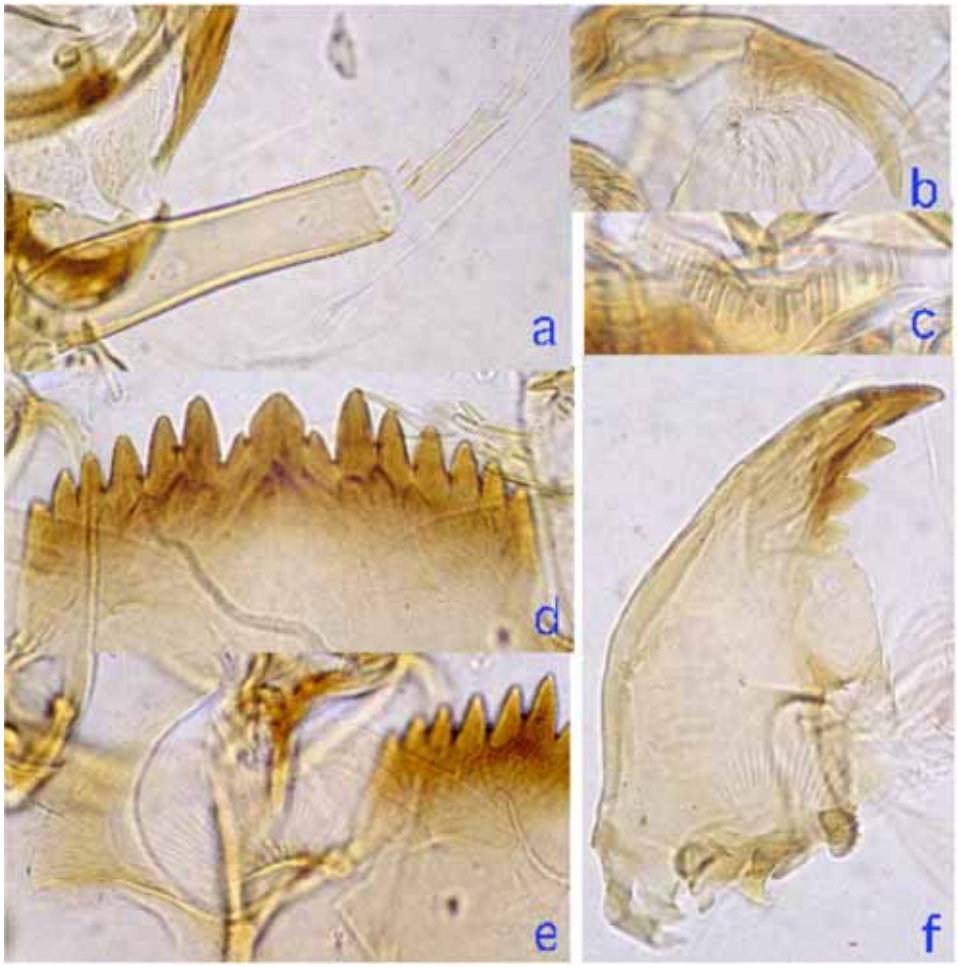
Setae on segment IX – 7,8 (?); setae on segment X – 4(?).



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.

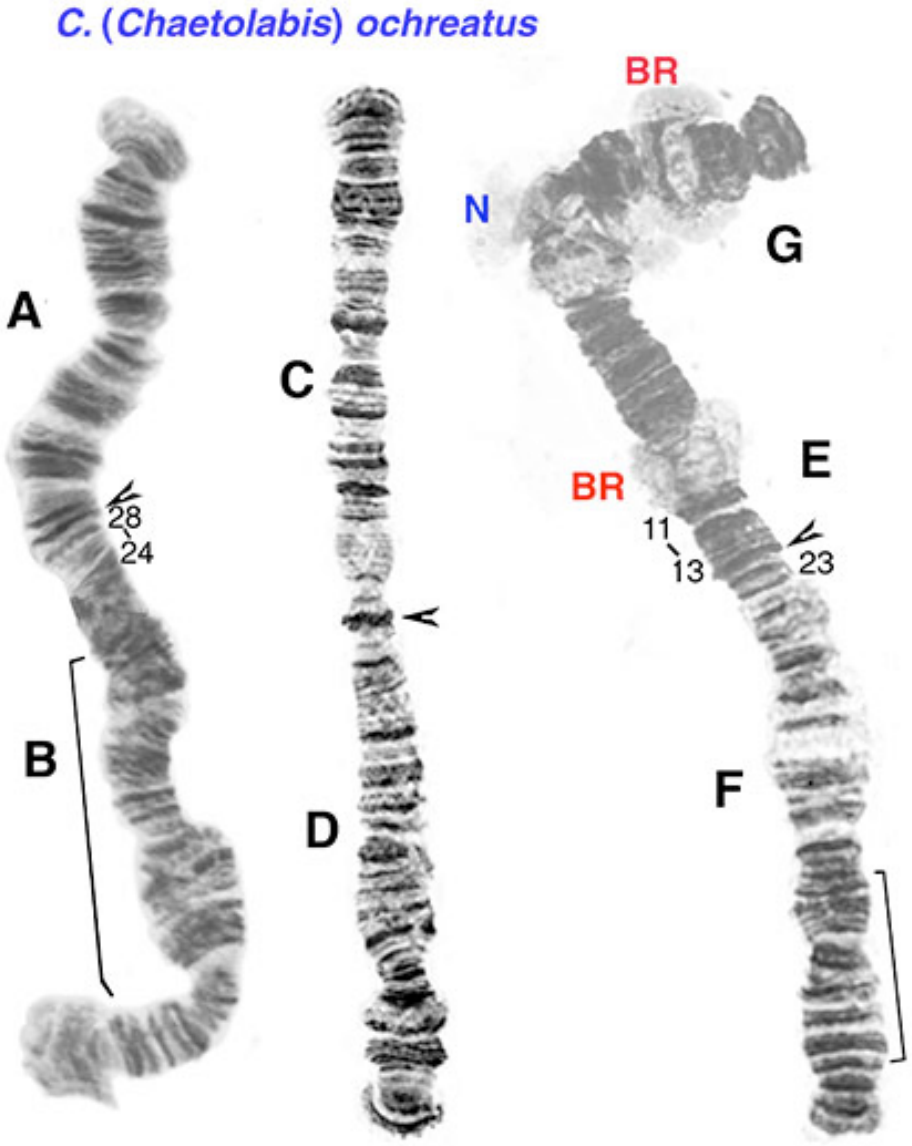
Larva a medium sized thummi-type, length about 12.8 - 16.8 mm. (Female 14.8 - 16.8 mm; male 12.8 mm); posterior pair of VT longer and coiled (ant. 1.21 - 1.57 mm; post. 1.41 - 1.81 mm). AT very large, about 5.5 - 7 times longer than wide, with a constriction about one third from the base (dors: 1120 x 200 µm, vent. 1180 x 170 µm).
Gular region pale, FA pale Width of FA between the antennal bases about 186 - 190 µm, greater than the distance between the S4 bristles (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 furrows on outer surface at base.



Larval mouthparts of *C.* (*Chaetolabis*) *ochreatus*

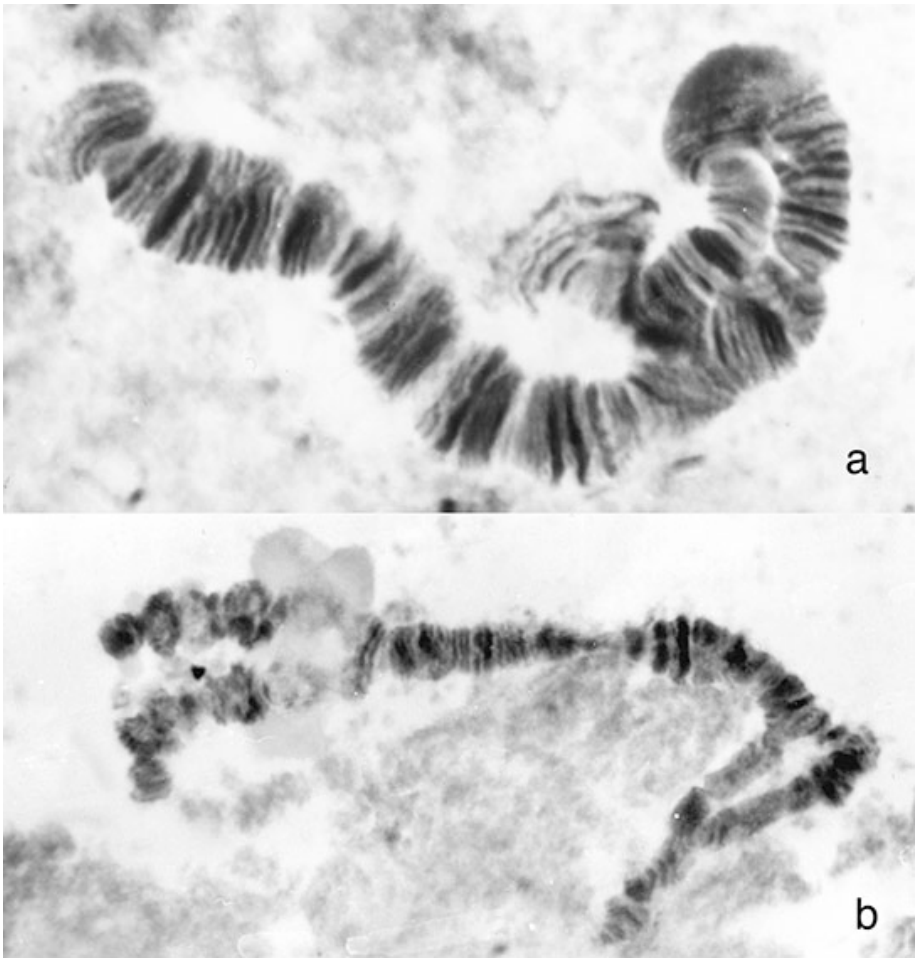
Cytology: 3 polytene chromosomes which have a modified thummi arm combination, AB, CD, GEF; but Keyl pattern very difficult to recognize. Nucleolus near the junction of arm G with E,

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.



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 *Drepandocladus 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 *cox 1*and the nuclear *gb2ß* genes are available.
cox1: Gene bank accession numbers KFxxxxxx; KF278327; KF278328.

Species 3f. *C. decorus* of Rothfels and Fairlie (1957).

Adult: Not associated.

Pupa: Not known.

Larva not available for study.

Cytology: 4 polytene chromosomes with the thummi arm combination AB, CD, EF, G.
Arm G generally paired only at one end, a virtually terminal nucleolus at the other end; 2 or 3 BRs, variable in position due to inversions. Arm F appears to be derived from F3+4 of Species 3a. Quite polymorphic with inversions in A, B, C, D, E and G.

Arm E (Seq. A):	1 - 3e, 8 - 5, 9 - 10b, 4 - 3f, 10c - 13	i.e. as *maturus*, dec E1, etc.
E (Seq. S):	1 - 3e, 8i-e, 3f - 4, 10b - 9, 5 - 8d, 10c - 13	i.e. as decE2
Arm F:	possibly 1a-d, 9 - 3d, 1i-e, 3c - 2d, 18 - 10, 2a-c, 19 - 23	as decF3+4?

Found: Ontario - Don River, Toronto.

Slow moving river?

Shows relationship to *C. decorus* (sp. 3a) and sp. 3j.

Chromosomes and chromosome polymorphism described by Rothfels and Fairlie (1957). Some feature of arm F given by Martin (1979).

Species 3g. *C.*

Adult: Not known.

Pupa: Not known.

Larva a small plumosus-type; posterior pair VT slightly longer. Gular and FA pale. Mentum with somewhat rounded teeth; c1 tooth relatively narrow with very short diverging sides, then rounded; c2 teeth moderately separated.

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.

Species 3h. *C. decorus*-group

Adult:

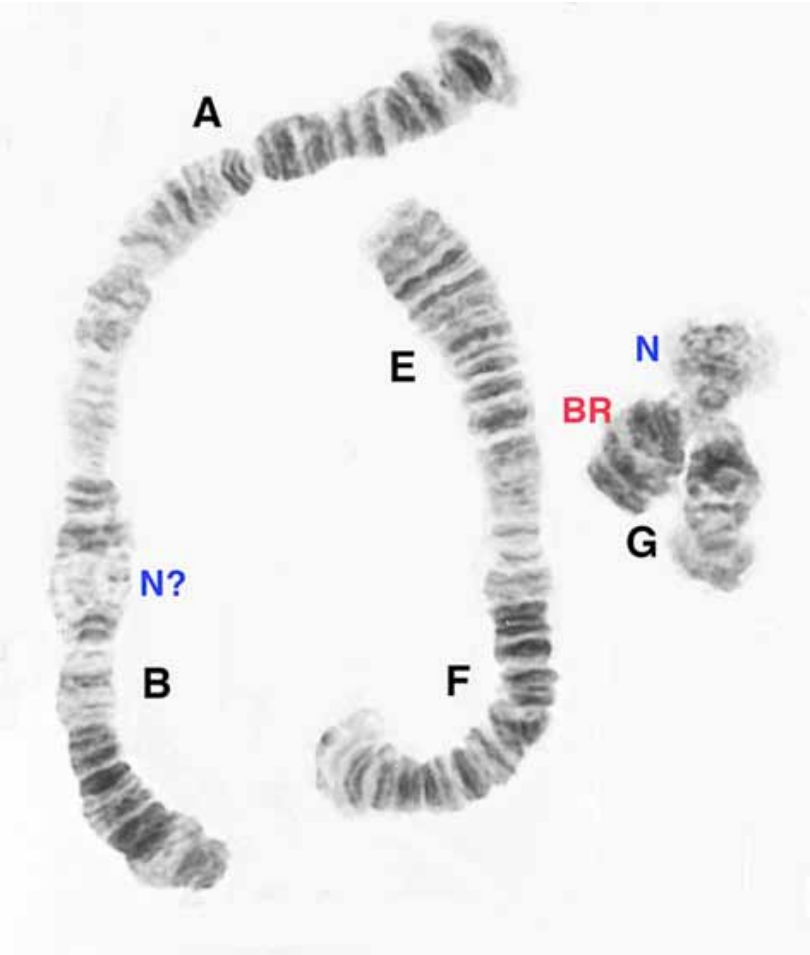
Male: Wing length abt 3.3 mm. Fore LR about 1.50.

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.

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). Gular region dark on posterior half, FA usually pale, but may be slightly darkened. AT about 2 - 2.5 times longer than wide (len. 440 - 490 µm), without a constriction, ventral one tending to be longer but narrower.
Mentum with somewhat rounded teeth; c1 tooth relatively narrow, top rounded; c2 teeth moderately separated (type II); 4th laterals generally not reduced (type I-II).
Ventromental plates separated by about a third of mentum width, about 45 - 46 striae reaching about half way to anterior margin
PE 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 with RO between a third and half way up A1; AR about 1.97 - 2.2; A1 about 3.4 – 3.8 times longer than wide, relative length of segments (µm) 148 : 33 : 10 : 15 : 8.
Mandible with third inner tooth moderately separated but pale(type IIB); 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.



Partial complement of *C.* sp. 3h. One homolog of arm G is broken.

Found: New Brunswick - Kouchibouguac National Park (48.8583; -64.9750).
Ontario -¿South March nr. Mud Lake (44.88, -78.27), Carleton Co.

Pools and rivers.

Appears to show relationship to *C.* sp. u.

Species 3i. *C. decorus*-group sp. 3i

Adult: Not associated.

Pupa: Not known.

Larva a medium sized plumosus-type (about 14.5-15.5mm); VT relatively long, posterior pair longer. Gular region slightly darkened, FA pale.
Mentum with somewhat rounded teeth, c2 teeth of center trifid tooth not well separated (type IB); 4th laterals slightly reduced (type II).

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.

Found: Ontario - 4 m E Sudbury.

Pennsylvania - vicinity Pittsburgh.

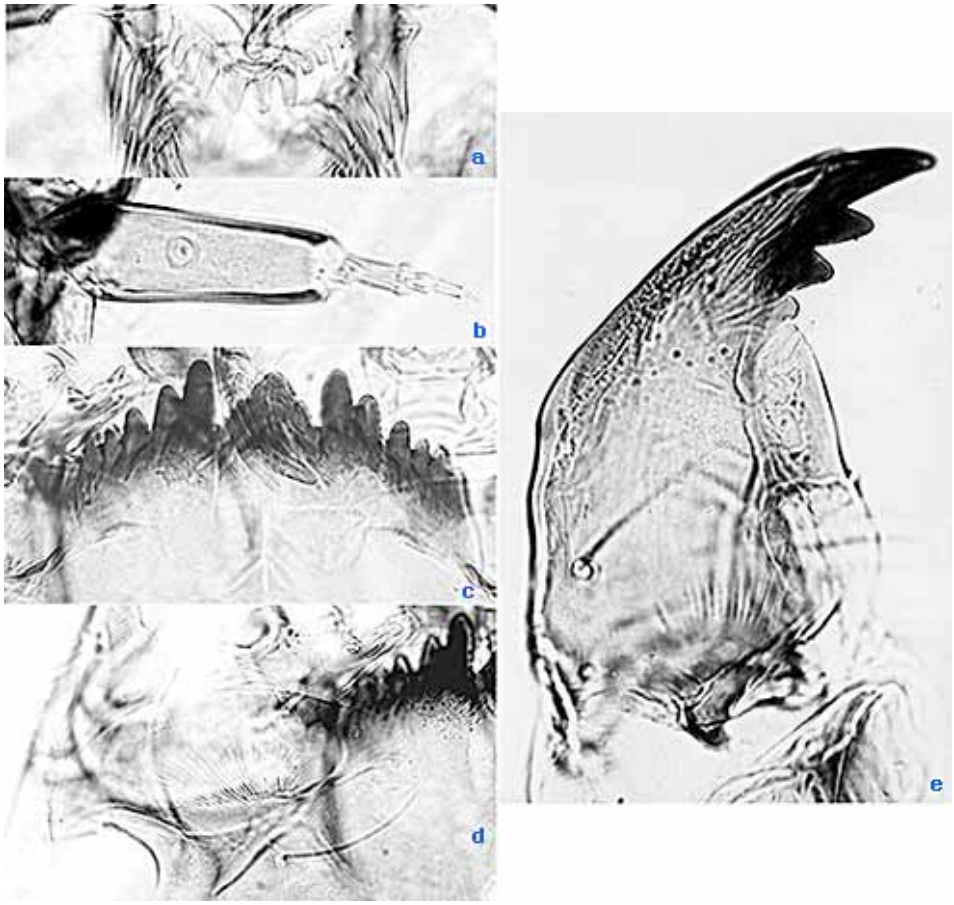
Pools

Species 3j. *C. decorus*-group sp. 3j

Adult: Not associated.

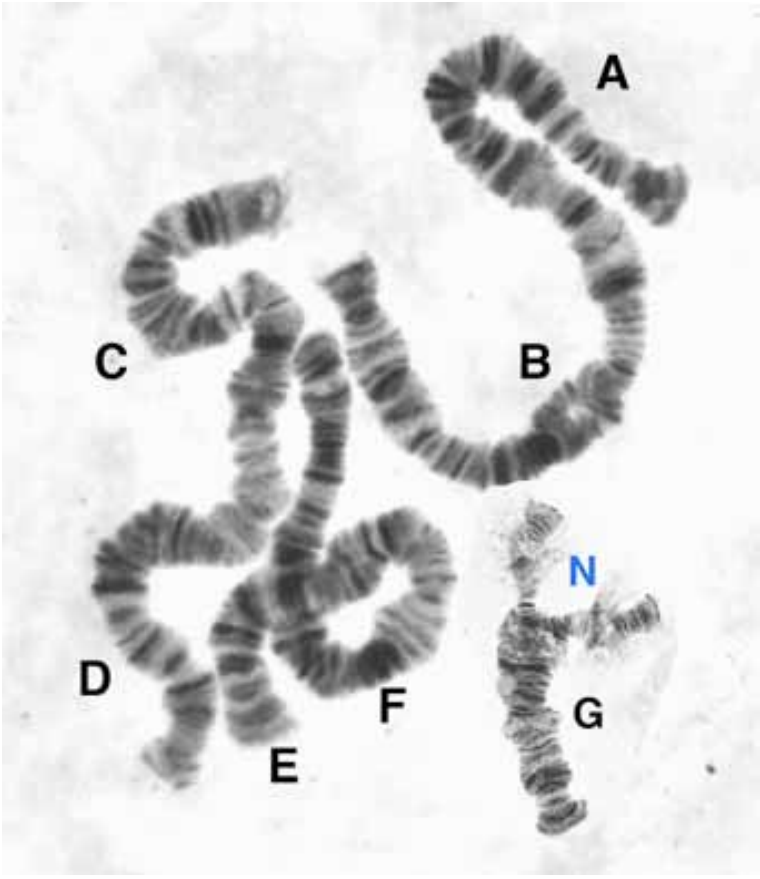
Pupa: Not known.

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 µm). AT about 380-420 µm 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, FA 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 furrows 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 $^{1}/_{3}$ 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 (gtroups) 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.*



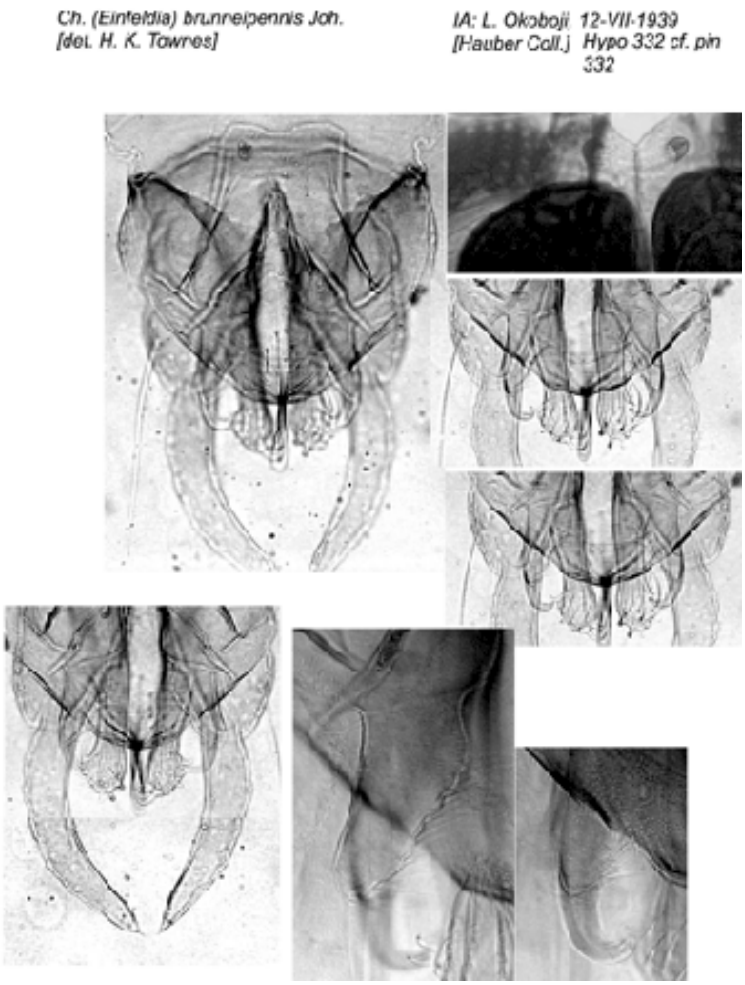
Found: Saskatchewan - North Saskatchewan River (53.25, -105.08) (P.G.Mason).

Shows relationship to *C. decorus* (sp. 3a) and sp. 3f.

Species 3k. *Benthalia brunneipennis* (Johannsen)
The immatures of this species have not previously been described.

Adult:

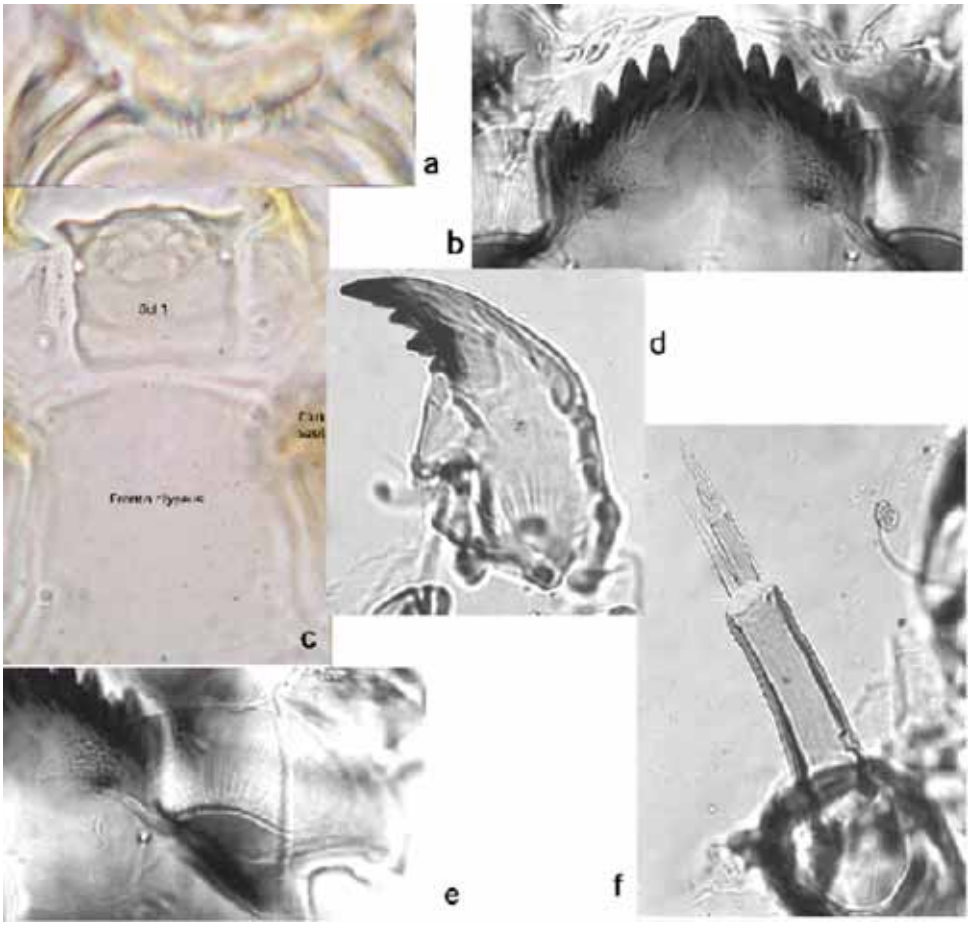
Male:



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)

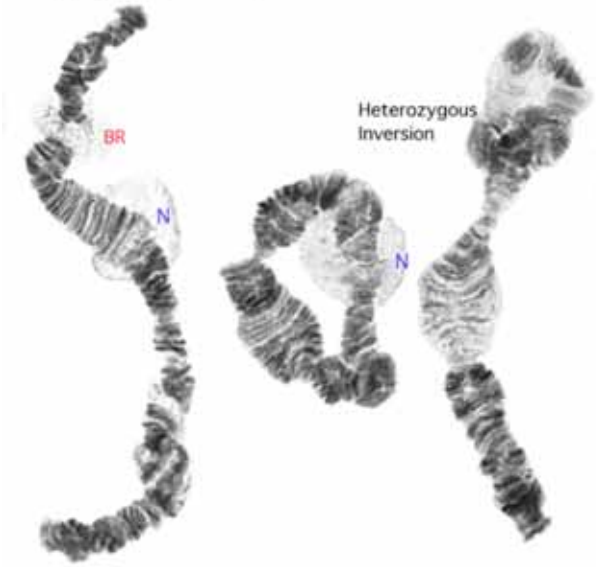
Pupa with frontal warts, lacking comb or spur on abdominal segment VIII.

Larva not a typical *Chironomus* type; small, with only one pair of VT. Gula region dark and dark spots at base of antenna. FA (Fig. c) without a depression. Dorsal sclerite S1 (Fig. c) with slight rugosity anteriorly.
Mentum (Fig. b) also not like *Chironomus*; c1 tooth narrow with only slight notches near the apex (Type I), which may be easily lost due to wear; 4th laterals quite reduced (Type III).
VM (Fig. e) similar to that of *Chironomus* with about 38 striae; separated by about one quarter of width of mentum. PE (Fig. a) partially tripartite, with about 30 fine teeth.
Mandible (Fig. d) with 3 internal teeth (Type IIIC), and withfurrows near base.
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.



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.



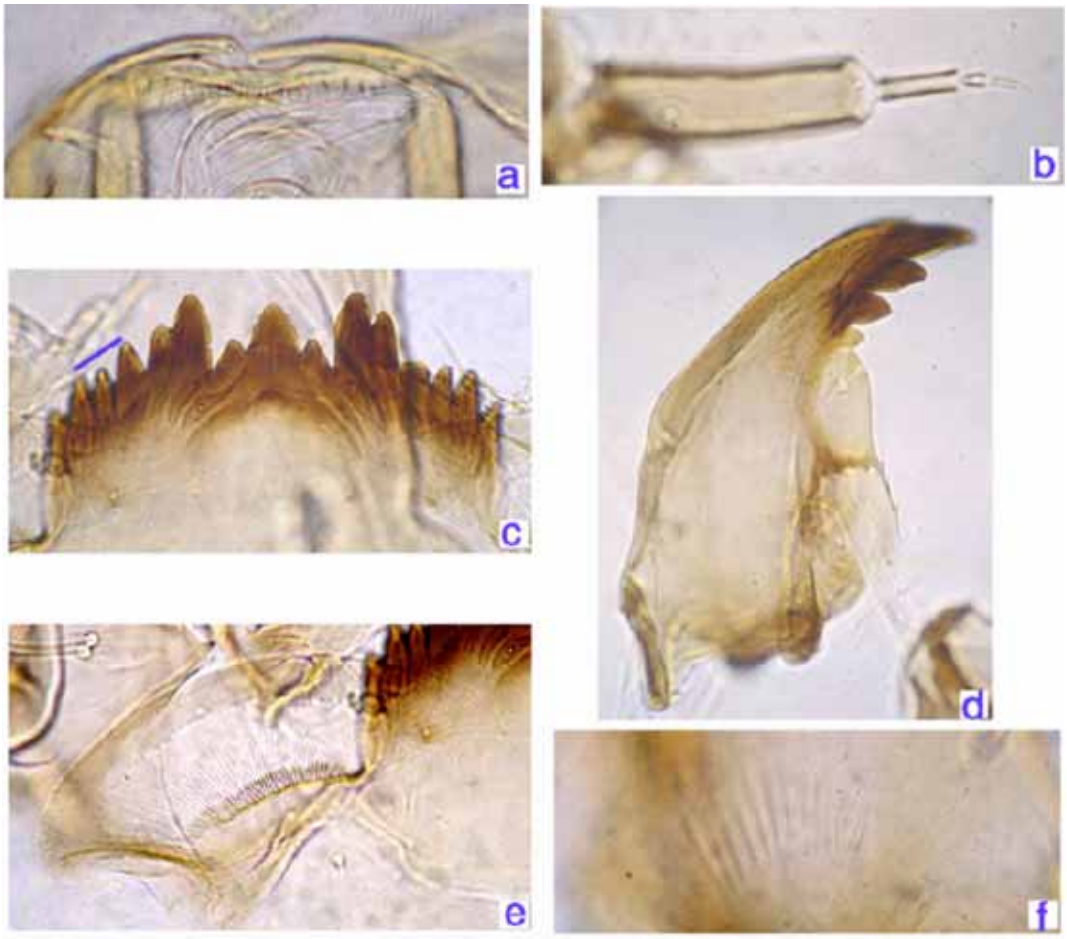
Found: Manitoba - Lake Winnipeg (Sæther 2012)

Ontario - Mooney's Bay (45.35; -75.68), 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* (Wallker), so may be Holarctic in distribtion. The larva of *B. natchitocheae* (Sublette) is quite similar.
The presence of furrows on the mandible suggests that this group belongs in an expanded *Chironomus*.
The adult was briefly redescribed by Sæther (2012).

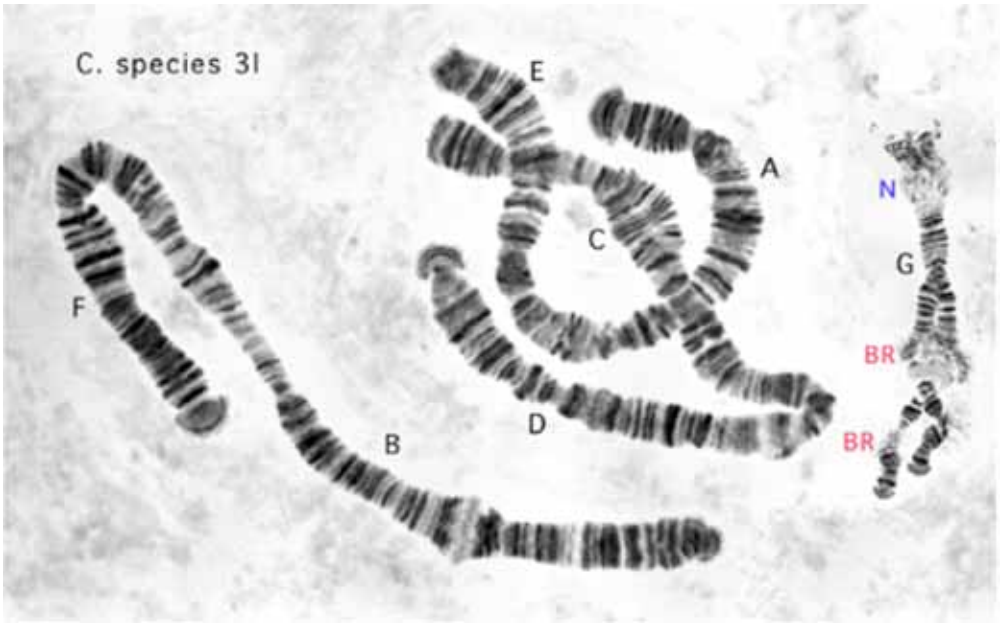
Species 3l. *C. decorus*- or *riparius*- group

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, FA 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 furrows 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 $^{1}/_{3}$ 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

Adult:
(based on European specimens in Wülker 1991)

Male:
Black, with a dark SV. 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 µm in length.
Setae: achrostichal 18; dorsocentral 26 - 30; prealar 5 - 6; scutellar 22.
5 - 6 setae on anal tergite.

Pupa:

Larva of the plumosus-type, larger than larva of *C. longistylus*. Gular region completely dark, FA 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 ie. as *holomelas, longistylus*, etc.
tstB1:

tstC1: 1-6b, 11c-8, 15-11d, 6gh, 17a-16, 7d-a, 6f-c, 17b-22ie. as *aberratus, longistylus*, 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 ie. as *longistylus*, etc.
tstF1: 1 - 10, 17 - 11, 18 - 23 i.e. as in *cucini, major* & *tardus.*

Found: Wisconsin - Crystal Bog (Lake 27-2), Vilas Co.
Type locality - Lake Grimsgöl, Vontjarn, Southern SWEDEN
Also Finland and Norway. report from Netherlands needs checking.

Morphology and cytology described by Wülker (1991a).

Species 3n. *C. longistylus* Goetghebuer 1921

Adult:
(based on European specimens in Wülker 1991)
Male:
Black, with a dark SV. 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; scutellar34 - 53.
5 - 14 setae on anal tergite.

Larva of the plumosus-type but smaller than *C. tenuistylus.* Gular region darkened only at posterior, FA 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 *holomelas, tenuistylus*, etc.
lonB1:
lonC1: 1-6b, 11c-8, 15-11d, 6gh, 17a-16, 7d-a, 6f-c, 17b-22ie. as *aberratus, tenuistylus*, etc.
lonD1: 1-3, 11-18d, 7-4, 10-8, 18e-24 ie. as *tardus, cucini, pilicornis*.
lonE1: 1-3e, 5-10b, 4-3f, 10c-13 i.e. as *tenuistylus,* etc.
lonF1: 1 - 23 i.e. Standard, as *piger,* sp. 3b, etc.

Found: Alaska - No name Lake, Haul Road, South Slope.

Morphology and cytology described by Wülker (1991a).

Species 3o. *C. entis* Shobanov & Djomin

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

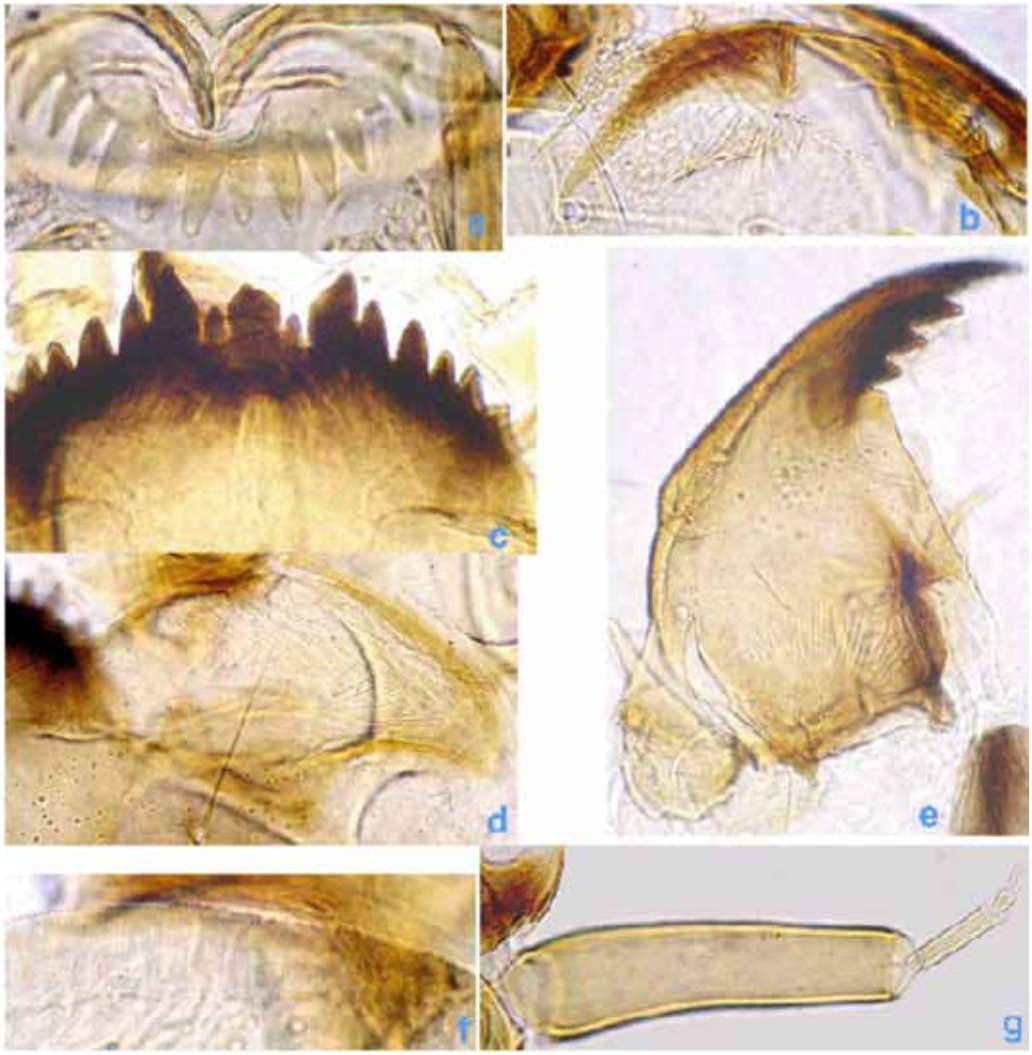
Larva a large (fem. 21.3 - 22.8 mm; male 18.3 - 23.4 mm), generally semireductus-type, anterior VT straight and taper only at end (Butler, unpubl.) The VT are generally shorter (ant. 0.26 - 0.80 mm; post. 0.17 - 0.68 mm) than those of *C. plumosus*, The VT also seem to be quite variable in length between localities, with those from Lake Waskesiu, Saskatchewan much shorter (ant. 0.26 µm; post. 0.17 µm) than those of other localities for which measurements are available. Lateral projections relatively short (90 - 220 µm).

(Picture courtesy M.G. Butler)

AT well developed, about 2.5 - 2.75 times longer than wide.

Anal tubules of *C. entis*

Pale FA, 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 slighlty but not down to level of 5th laterals). Ventromental plates (d, below) separated by about 0.36 - 0.38 of width of 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 reaching to the anterior margin. Premandibles (b, below) with narrow outer tooth, inner tooth about 1.4 to 3 times as wide, and slightly longer. PE (a, below) with about 15 - 16, often irregular, teeth. 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 (type III), about 24 - 29 furrows on outer surface near the base.



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 A1 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, 4d-9, 2d-g, 4c-a, 14g-19
n'entA12: 1-2b, 12a-10, 2c, 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, 17d-15, 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, 7d-9, 2d-g, 4c-a, 13ab, 12a, 11-10c, 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, 19-18e, 17-16d, 11c-a, 3-2e, 15d-13b, 10b-e, 4-7, 18ab, 12-13a, 10a-9, 20-24
h'entE1: 1-2e, 10g-c, 3f-4, 10b-5, 3e-a, 11-13 i.e. as *muratensis*
(alt. E1): 1-2b, 11b-10c, 3f-4b, 3b-e, 10b-4c, 3a, 2e-c, 11c-13 (see Kiknadze *et al.* 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 invsion 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; Lake Winnipeg (Sæther 2012).
Ontario - Bay of Quinte, Belleville; White Lake, ThreeMile Bay;
Saskatchewan - Lake Waskesiu, Prince Albert National Park; Crooked Lake, Pasqua Lake, and Round Lake, Qu'Appelle River.
Indiana - Crooked Lake, Angola Co.; Manitou Lake;
Michigan - Saginaw Bay, Lake Michigan.
Minnesota - Lake Itasca, Clearwater Co.; Lake Christina, Douglas Co.
North Dakota - Brewer Lake; Dead Colt Creek Dam, Ransom Co.; Silver Lake, Sargent Co.
Oklahoma - Buncombe Creek, Marshall County.
Wisconsin - East Horsehead Lake, Onieda Co.; Grand Portage Lake, Iron Co.; Green Lake; Little Green Lake, Green Lake Co.; Lake Kengonsa, Dane Co.; Pepin Lake, Pine Lake, Oneida Co., Pleasant Lake, Winnebago Lake, Yellow Lake

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).4 mm in length.
C. entis and *C. plumosus* cannot be separated on the basis of the DNA "barcode" sequence of *cox1*, but can be separated by the sequence of the globin gene gb2ß (Guryev and Blinov 2002).

Species 3p. *C.* species Anchorage

Larva: A thummi-type larva, VT relatively long. Dark gula (and FA?) 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

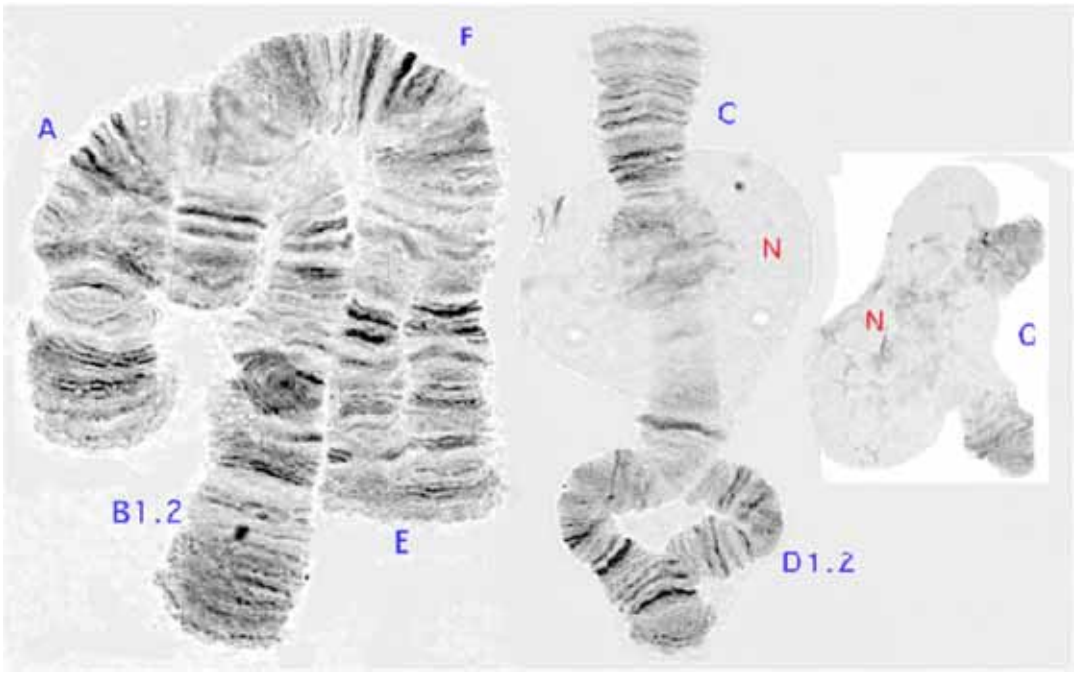


Photo courtesy of Prof. Iya Kiknadze

Found: Manitoba - Churchill (T. Ekrem)
Alaska - Potters Marsh, Anchorage Co.

Preliminary mapping by Iya Kiknadze.

Species 3q. *C. balatonicus* Devai, Wülker & Scholl

Larva: as *C. entis* in Palearctic material.

Cytology: 4 polytene chromosomes with the thummi arm combination: AB, CD, EF, G. Specific sequences of North American populations not described. If similar to European specimens, Arm F is identical to *tardus, cucini,* etc.

Found: Alberta - South Baptiste Lake

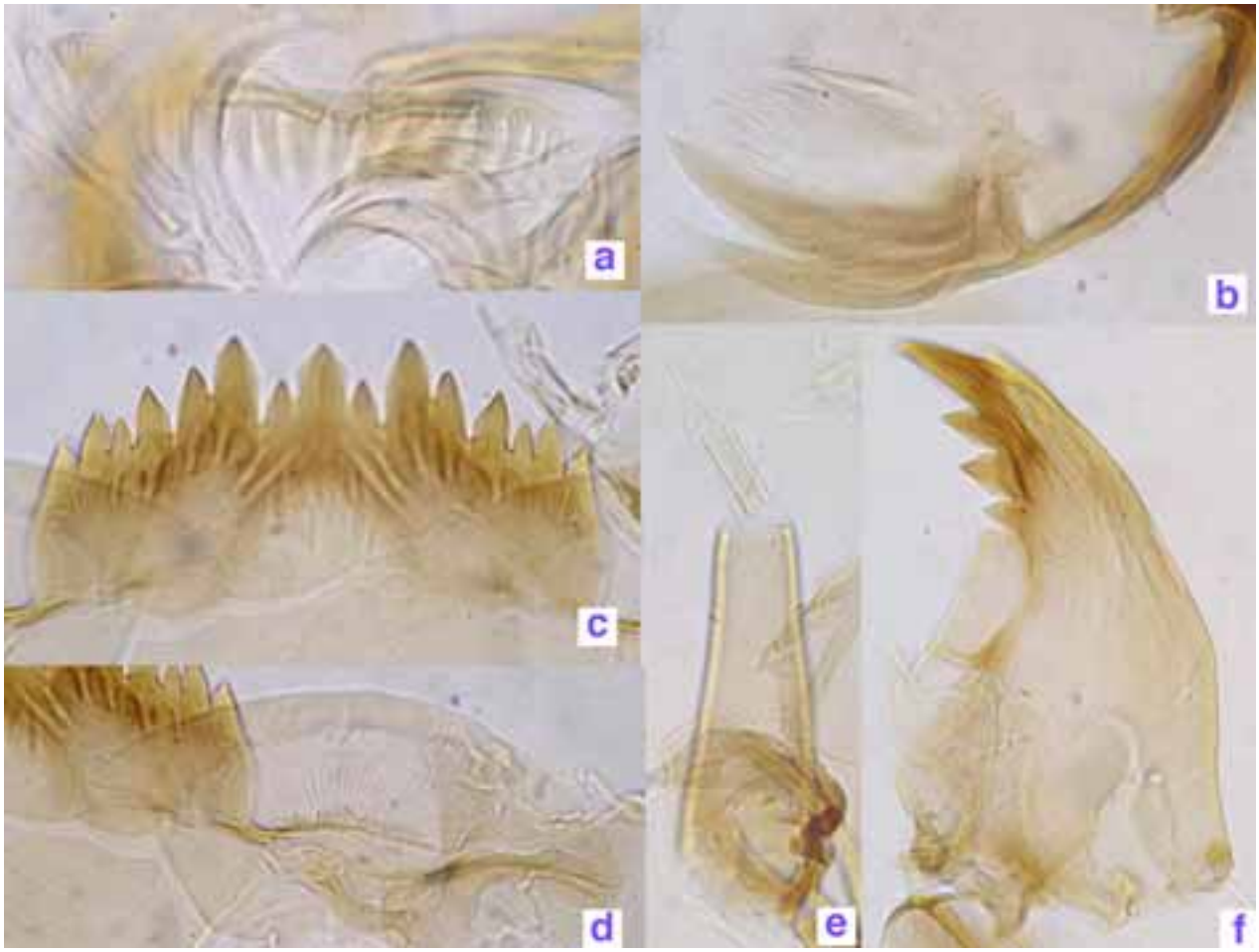
European specimens in deep open water sediments.

Identified by P. Michailova (Dinsmore & Prepas 1997, p.2171). Kiknadze (pers. comm.) found none in a small sample she checked.

Species 3r. *C.* species WOC of Wülker & Morath (1989).

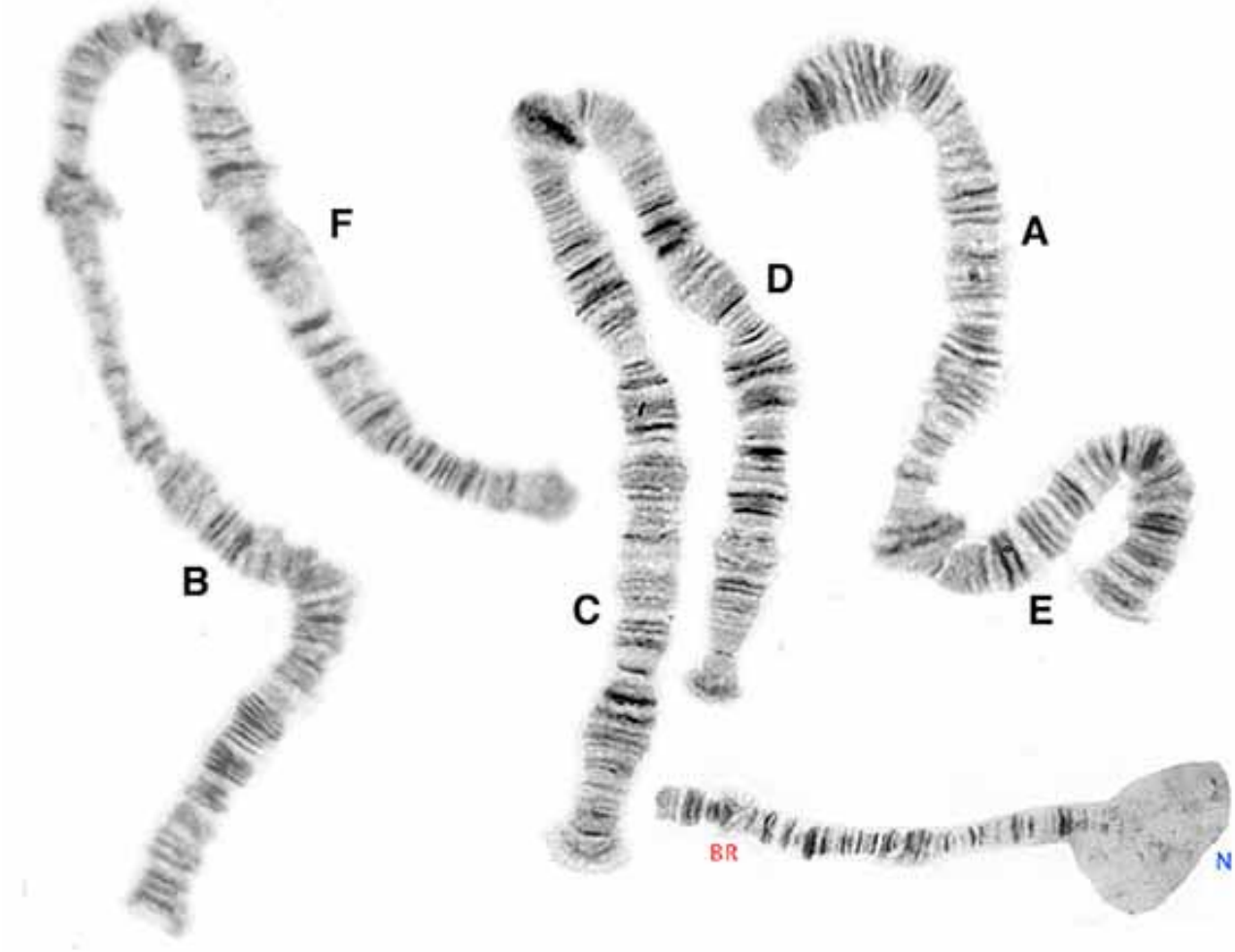
Larva: a medium plumosus-type larva; length (female) about 11.8mm (VHL abt. 320-340 µm). PLT well developed, about 720 µm. VT long, posterior pair longer and coiled, and may be over 40% of the larval length; AT long, about 3.3-3.6 times longer than wide (dorsal) to 5.7 (ventral).

Gula dark to very dark on posterior third to half, FA 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; 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.
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, PM with about 10-11 bristles.
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 (µm): 135 : 31 : 7 : 13 : 8.
Distance between antennal bases slightly larger than that between S4 setae.



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.

Creeks and pools in the southeastern USA.

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.

Species 3s. *C. tardus* Butler 1982

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.
LR_1 1.01 - 1.14; LR_2 0.56 - 0.64; LR_3 0.67 - 0.73.
Sensilla chaetica: Leg_2 21 - 46; Leg_3 15 - 34 (higher than *C. prior*; and when taken in conjunction with the lower LR, is useful for separating males of the two species)
Anal point relatively narrow; superior appendage of the D-type;
inferior volsella 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.

Larva a salinarius type. Very dark gular region, dark FA, 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 heterochromatinized. 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, major,* etc.
tarB1:		
tarC1:		
tarD1:	1 - 3, 11 - 18d, 7 - 4, 10 - 8, 18e - 24	ie. 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, major* & *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* Ryser, Scholl & Wülker

Larva of the semireductus-type.

Cytology: 4 chromosomes with the thummi arm combination: AB, CD, EF, G. Specific sequences of North American populations not described. Arm E should have a distinctive sequence, and there should be a nucleolus in arm C.
murA1:
murE1: 1-3e, 4, 10b-5, 11-10c, 3f, 12-13
murF1:

Found: ¿Alberta - Amisk Lake.

European specimens in deep sediments.

Identified by P. Michailova (Dinsmore & Prepas 1997, p. 2171). Kiknadze (pers. comm.) found none in a small sample she checked. Sæther (2012) lists this material as *C. entis.*

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.

Larva of fluviatilis-type. Length 5.4 – 15.9 mm (presumably the very small specimens are early fourth instar); no lateral projections. 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 trifid 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 contriction 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 ie. 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.

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.

Larva of fluviatilis-type, with no lateral projections. Length 5.2 – 12.5 mm (presumably the very small specimens are early fourth instar). Head capsule unusually narrow (width 0.39 – 0.49 mm), gula sometimes darkened distally, or may be pale; FA pale. From published figure, fourth laterals of mentum appear to be only slightly reduced (type I), and center trifid tooth type II. 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 contromere
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
winG1:	tterminal nucleolus, median BR

Found: Michigan - Lake Michigan (Type locality).

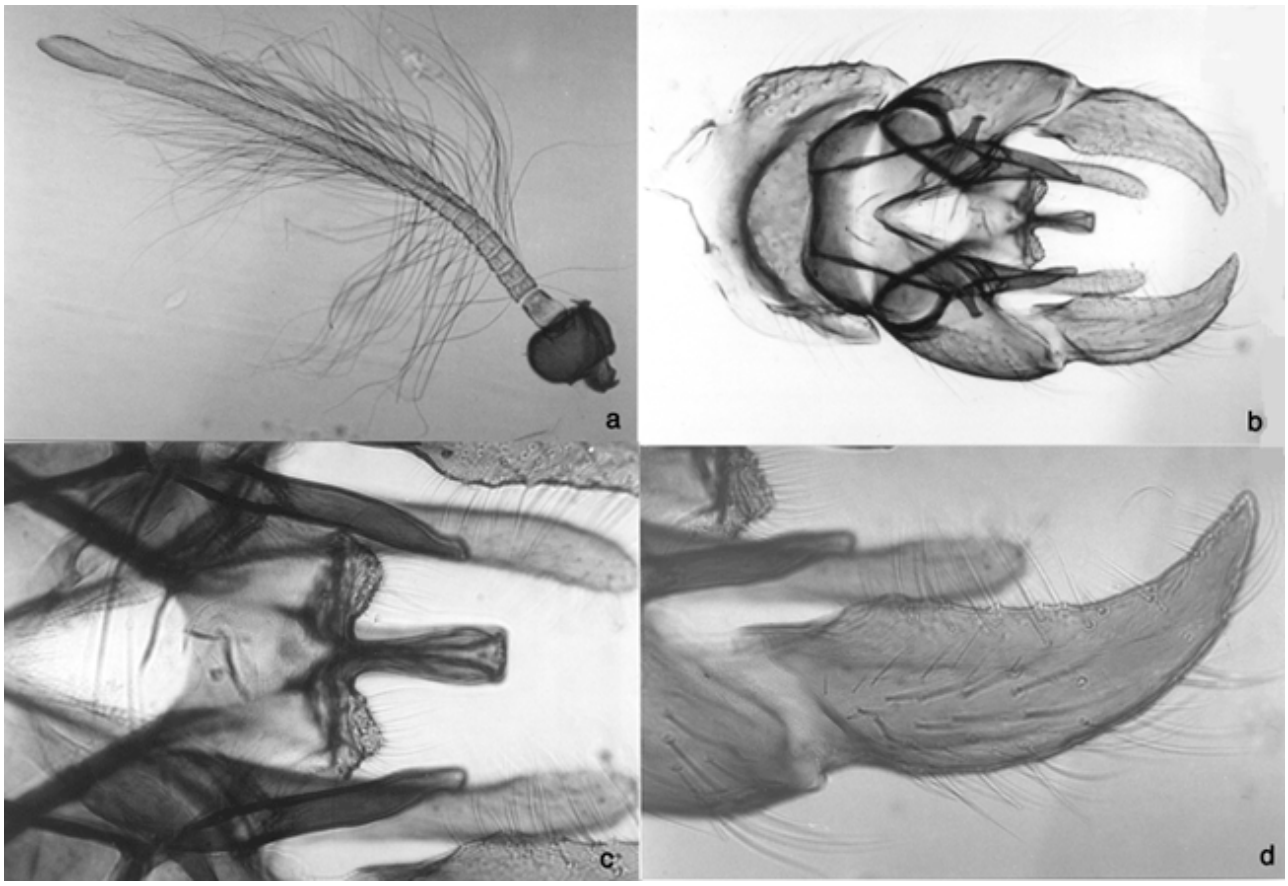
From depths of 6 - 12 m in fine sand sediments

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 B. Full description given by Wülker (2007)

Species 3w. *C. vockerothi* Rasmussen.
Was placed in the subgenus *Camptochironomus*.

Adult:
Description based on that of Rasmaussen (1984).

Male:



Paratype male of *C. vockerothi*
a. antenna; b. hypopygium; c. Superior volsella (note the length); d. gonostylus.

Wing length 3.1-3.7 mm. AR 2.0-2.35. Fore LR 0.95-1.09.
Wing squama with 19-25 marginal setae.
Head: Frontal tubercles present. Clypeus with 21-38 setae.
Thorax: Mesonotal tubercle well developed. Setae: Acrostichal 8-16; Dorsocentral 25-54, uni- to tri-serial; Prealars 7-14, uni- to bi-serial; Scutellars 29-46, uniserial laterally to multiserial medially.
Legs:

	LR	BV	SSV
Fore	0.95-1.09	2.00-2.28	2.01-2.20
Mid	0.40-0.48	2.74-3.09	4.27-4.62

Male terminalia enlarged, suggesting the species mates on the substrate. Gonostyli strongly curv

Female:
Coloration, wing length, squamal setation, and thoracic characters stated to be similar to those of the male
Legs:

	LR	BV	SSV
Fore	0.99-1.25	1.95-2.31	1.85-2.01
Mid	0.42-0.51	3.01-3.16	4.10-4.59
Hind	0.57-0.65	2.51-2.86	3.05-3.46

Genitalia: Dorsomesal lobe somewhat reducd, with inner margin distincly 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.

Larva not known.

Cytology: not known.

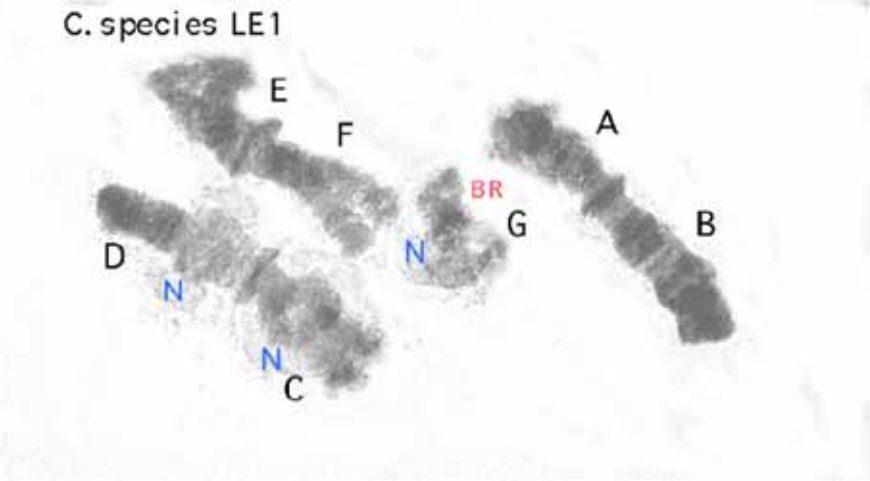
Found: Alberta - Elkwater; Hastings Lake (Type locality).

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 extented gonopophysis X.

Species 3x. *C.* sp. Le1 of Kiknadze *et al*. (1996)

Larva a salinarius-type? Dark gular (and FA?).
Mentum with rounded teeth, c1 tooth relatively broad and c2 teeth well separated, 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 N 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. Closely related to *C. riihimäkiensis.*



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

A2: 1-2c, 10, 8d-9, 2d-3, 12-11, 8c-4, 13-19
Arm B1:
Arm C1: 1-6b, 11c-8, 15-12, 11h-d, 6gh, 17a-16, 7d-a, 6f-c, 17(a)b-22 i.e. as *pilicornis*, etc.
Arm D1: 1-3, 11-17, 8-4, 10-9, 18-24
Arm E1: 1-3e, 5-10b, 4-3f, 10c-13 i.e. as *aberratus, cucini,* etc.
Arm F1: 1-10, 17-11, 18-23 i.e. as *aberratus*, *riihimäkiensis*F1, etc.
F2: 1-8c, 12-17, 10-8d, 11, 18-23 i.e. as *riihimakiensis*F2
Arm G1: 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 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.

Larva a large plumosus-type. Gular region slightly darkened with FA 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 is 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 - Potters 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.

Adult

Male: Dark species, AR 4.89 - 5.48 (mean 5.20); 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.
LR_1 1.10 - 1.22; LR_2 0.58 - 0.63; LR_3 0.65 - 0.71.
Sensilla chaetica: Leg_2 8 - 21; Leg_3 5 - 15 (lower than *C. tardus*; and when taken in conjunction with the higher LR, is useful for separating males of the two species)
Anal point relatively narrow; superior appendage of the D-type;
inferior volsella turns slightly outward over distal third; 2 - 17 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.

Larva a salinarius type. Gular region and FA 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	ie. as *tardus* A1
pri E1:	1 - 3e, 5 - 10b, 4 - 3f, 10c - 13	ie. 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).

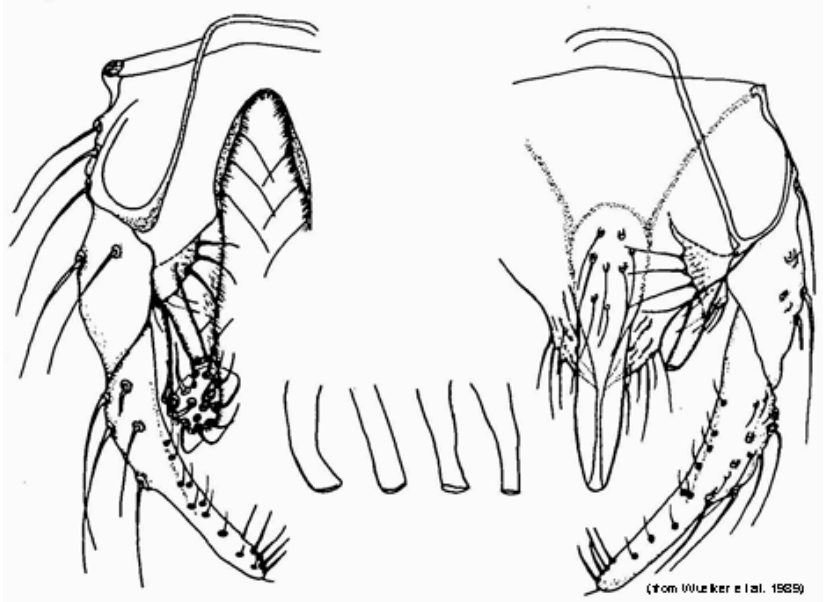
This species is the sister species to *C. tardus*.

Species 4a. *C. columbiensis* Wülker, Sublette, Morath & Martin

Adult

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 infúscate; 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 &#181m wide.
Thoracic setae dorsolateral 28.8 (24-35), acrostichal 12.8 (10-19) in double row, prealar 5, scutellar 30.8 (24-40).



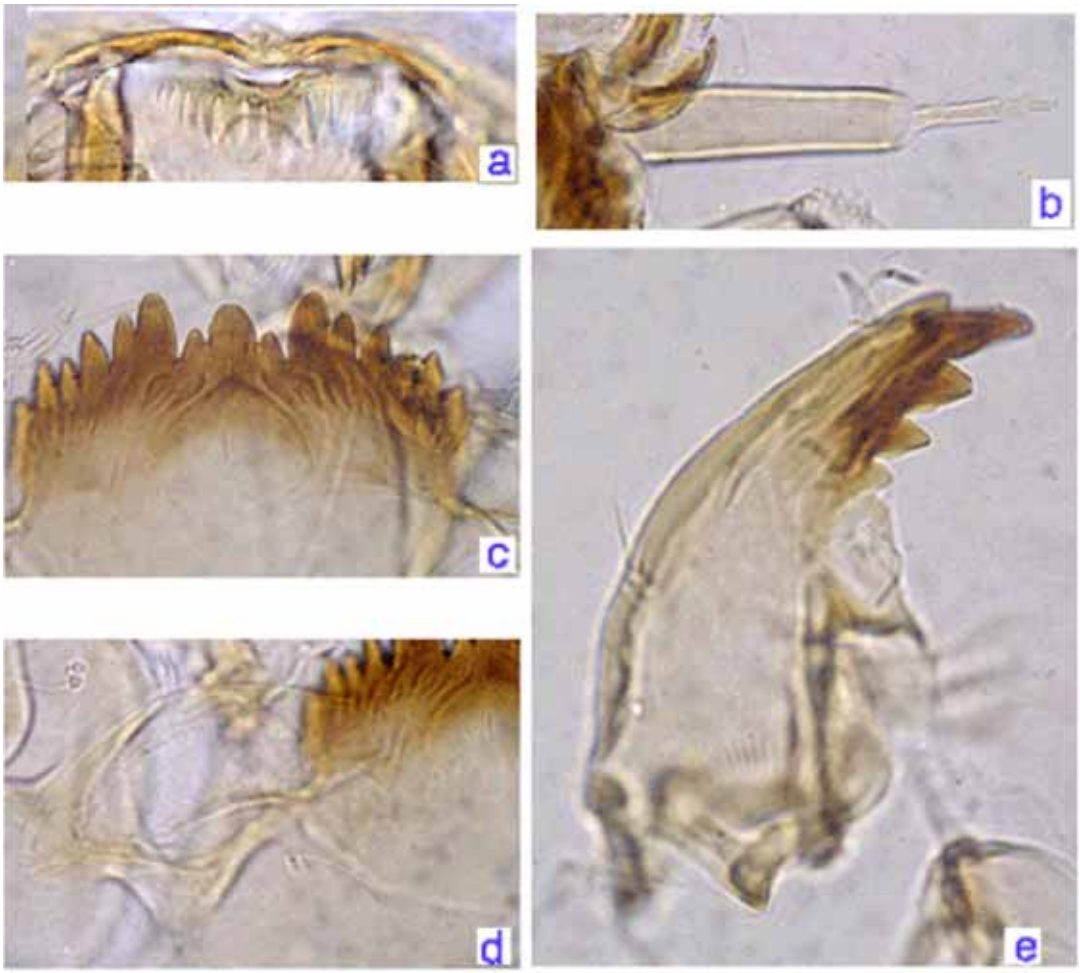
Male terminalia of C. columbiensis, with superior volsella variants (center)

Genitalia: Anal point parallel sided, in its middle slightly widened, terminally rounded; upper volsella comparatively long, straight, but dorsally curved, blunt-tipped, basal lobe with remarkably strong bristles; lower volsella parallelsided, reaching to the middle of gonostyle Setae of anal tergite 10.4 (8-13), gonostyle inner bristles 4.5 (4-5).

Similar to that of *C. anonymus* Williston. Best distinguished by the lower AR (2.1-2.4 in South America)

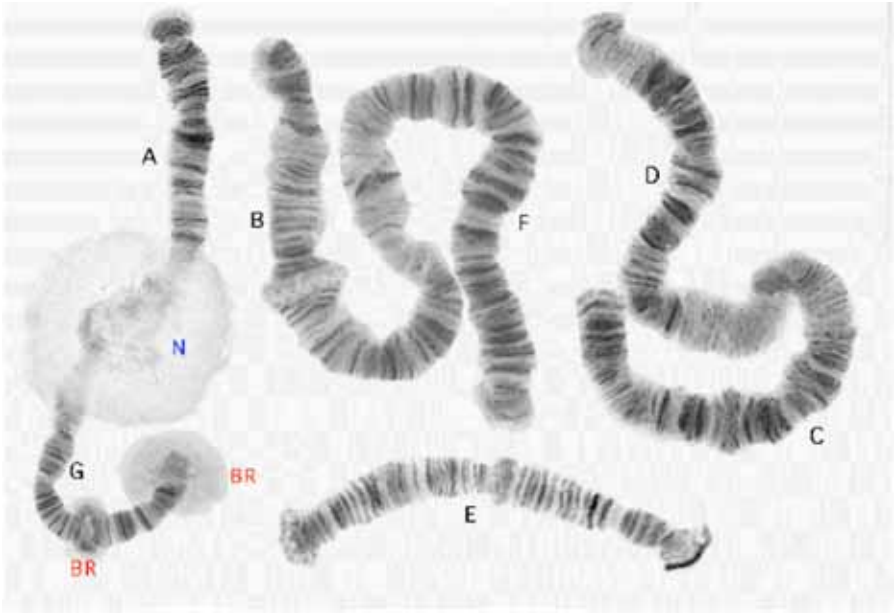
Pupa: not described.

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 pale (type II).



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



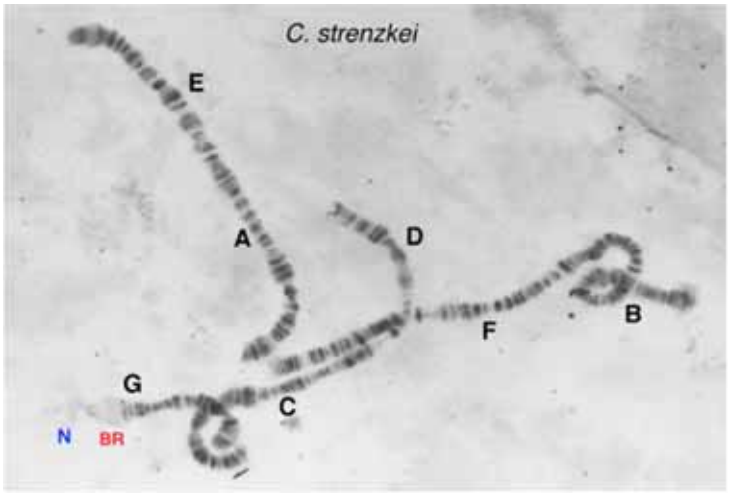
Found: Florida - Grassy Key, Munroe Co. (Hribar *et al*. 2008)
Virgin Islands (USA) - Lameshur Bay, St. John Island
This species has also been found at Cali, Colombia (Type locality) and Jocotan, Chiquimula, Guatemala.

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. strenzkei* Fittkau.

Larva (based on South American specimens) a small plumosus-type, length about 10-11mm, posterior VT usually longer. Head capsule pale, teeth of mentum with flanges, c2 teeth of the central trifid group moderately well separated, 5th laterals slightly reduced.



Cytology: 4 polytene chromosomes with the pseudothummi arm combination: AE, BF, CD, G. Arm G closely paired with a subterminal nucleolus and large BR. No nucleoli in the long chromosomes.

Found: California - El Segundo, Los Angeles Co.
Brasil - Manaus; Belém.
Peru - Pucallpa.

Shallow pools.

Morphology described by Fittkau (1968). Sublette & Mulla (2000) have identified the species in southern California.

Species 4c. *C. atritibia* Malloch.

Larva has not been seen. Shobanov *et al*. (1996) describe it as a salinarius-type larvae, quoting Malloch (1934), but Malloch did not describe it.

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*.

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 theusual sexual differences.

Larva: not known

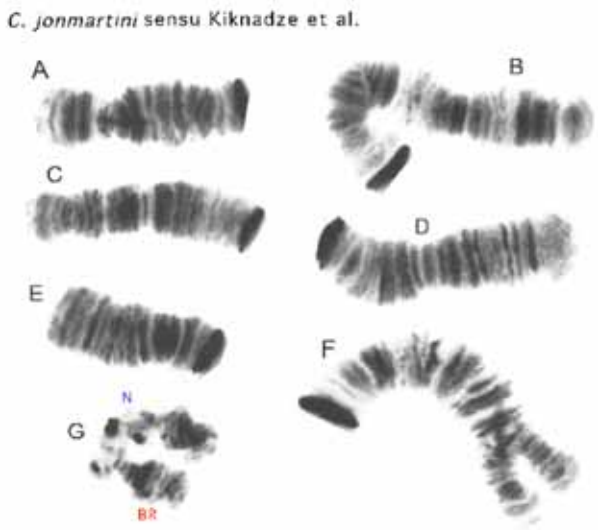
Cytology: Not known.

Found: 'Hudson Bay Territory' (Type)
Alberta - Lesser Slave Lake.
South Dakota - ¿(Oliver et al. 1990)

Species 4e. *C. jonmartini* Lindeberg & Wiederholm 1979.

Larva of thummi-type. Head with dark gular region and dark head stripe on the FA. C1 tooth of mentum moderately wide with c2 teeth well separated (type II).

Cytology: 4 polytene chromosomes with the thummi-cytocomplex 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.



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 *et al.*, 2004
h'jom D1: 1-3, 11-18d, 7-4, 10-8, 18e-24 as Kiknadze *et al.*, 2004
h'jom E1: 1-3e, 5-10b, 4-3f, 10c-13 ie. as *aberratus*, pluE1, etc.
h'jom F1: 1-10, 17-11, 18-23 ie. as *cucini, tenuistylus*, etc.
h'jom F3: 1-2, 5-3, 6-10, 17-11, 18-23 from Kiknadze *et al.*, 1996

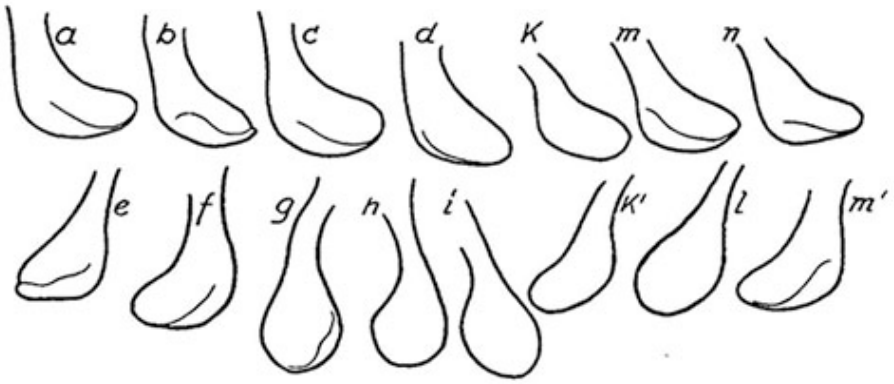
Found: Northwest Territories - tundra pond FBV, Horton River area (M.G.Butler)

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).

Species 4f. *Chironomus often depending upon positioning* Keyl 1960.

Adult:

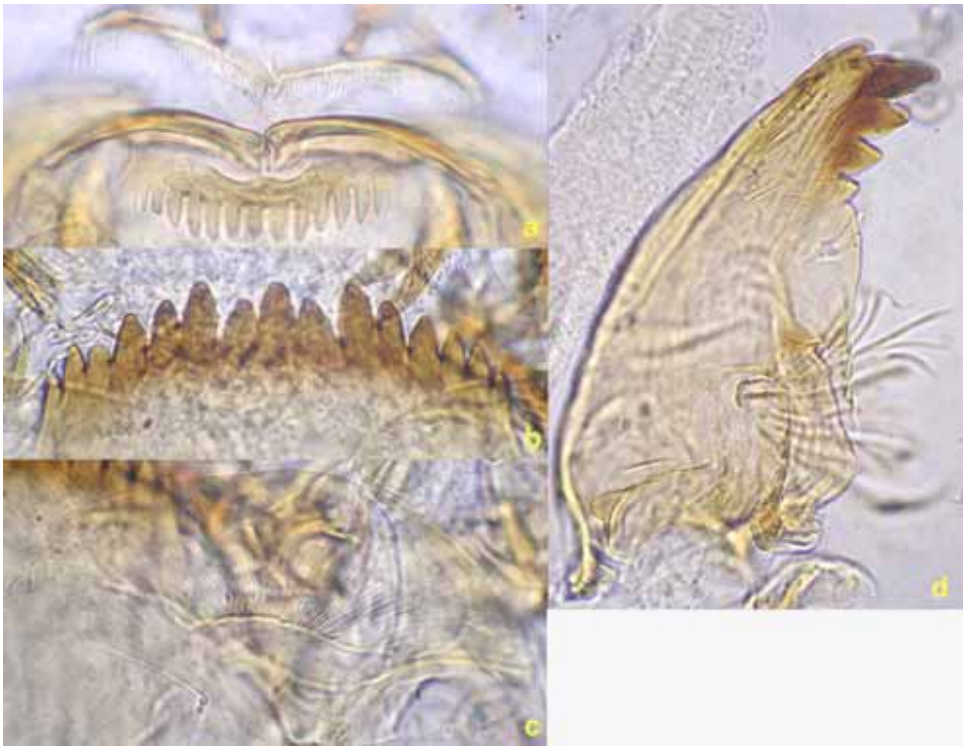
The adults have not been described, but the European material called *C. meigeni* by Thienemann and Strenzke (1951), applies to this species since the cytology of Keyl's original description comes from the same material. It is not clear why Keyl considered that it was not *C. meigeni*. Based on this European material, and the Key in Lindeberg and Wiederholm (1979), the following information can be made about the males:
Genitalia similar to that of *C. riparius*, fore tarsi without a beard (BR <3). May differ from others of the thummi-group in pattern and coloration. SV 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).



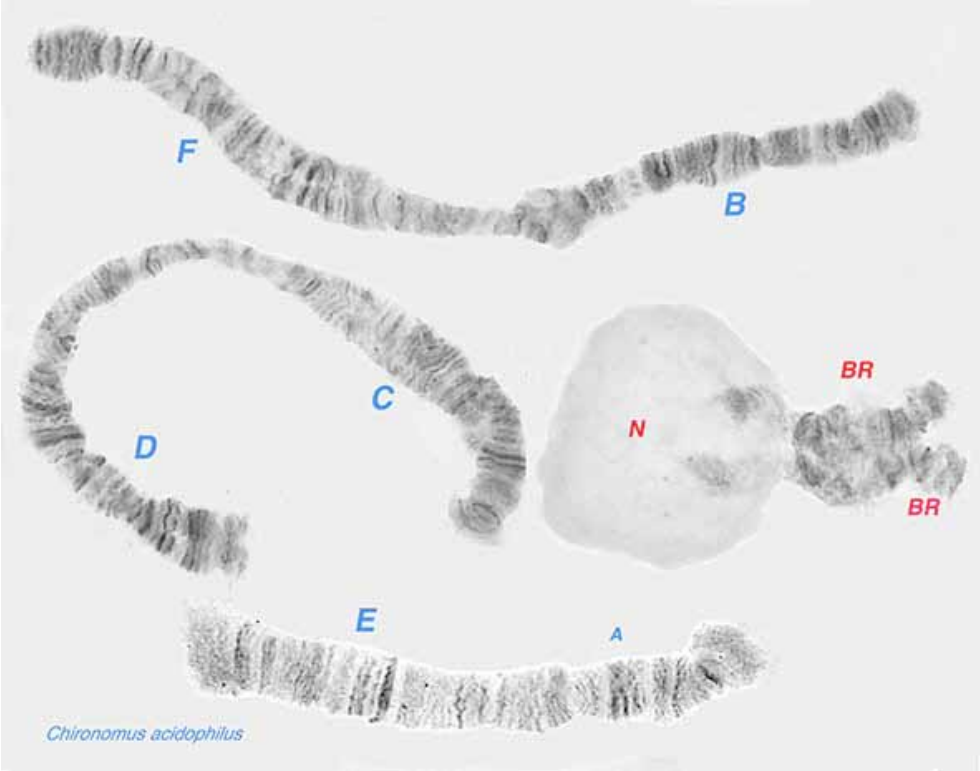
Variability of the SV of European *C. acidophilus*
From Thienemann and Strenzke (1951)

Pupa: The Palearctic pupa is included in Langton and Visser (2003).

Larva: a medium plumosus-type with well developed lateral and ventral tubules. Gular region and FA pale or slightly darkened.
Center trifid 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 darkend (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 E2 as in Europe, 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'aciE2: 1 - 3e, 10b - 3f, 10c - 13 i.e. as *luridus*, etc.
h'aciF1: 1a-i, 11 - 12, 19 - 16, 2 - 10, 15 - 13, 20 – 23



Found: Alaska - Potters Marsh, Anchorage Co.
Also described from Reinbeck, Germany (type); Yakutia, Russia; and Chlepfibeeri Moos, Switzerland.

Supposedly only occurs in acidic waters.

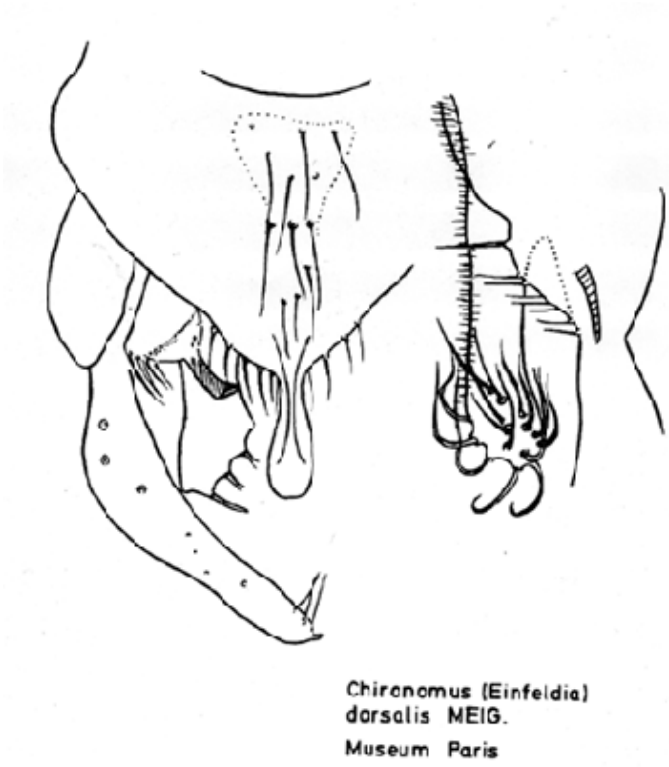
A species with a Holarctic distribution.

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) have suggested this might be a junior synonym of *C. meigeni* Kieffer.

Species 4g. *Chironomus* (*Lobochironomus*) *dorsalis* Meigen, 1818.
Syn: *Chironomus longipes* Staeger, 1839.

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 (2010) confirmed this synonymy.



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

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 FA 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 furrows 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:

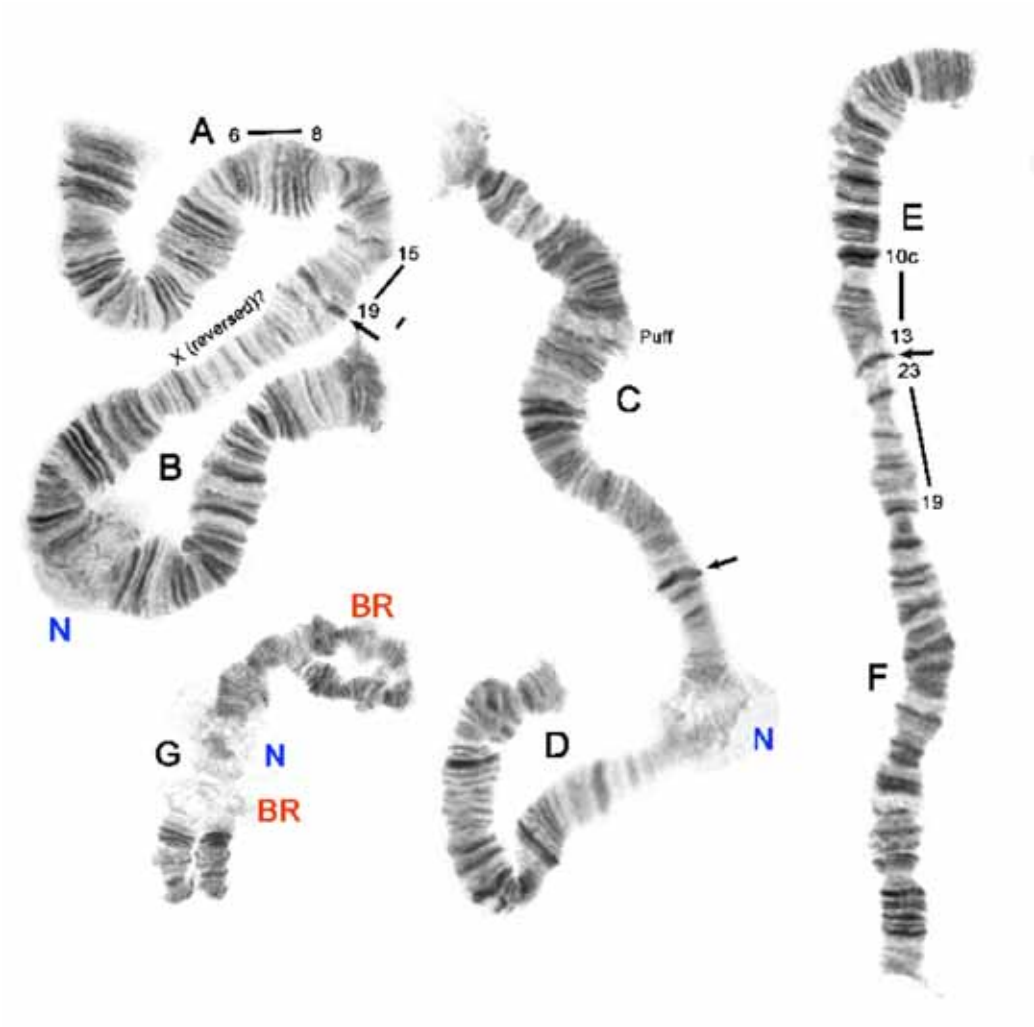
dlsB1: Nucleolus (could be the BR found in other *Lobochironomus* species) near middle of the arm, typical bands 24-28 slightly removed from the centromere (region "X" of Ryser *et al.* (1985) reversed?).

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.
Also occurs in Europe (?France (Type locality); Denmark (type locality of *C. longipes* Staiger)

DNA sequence: *cox1* 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).
Adult:

Male:

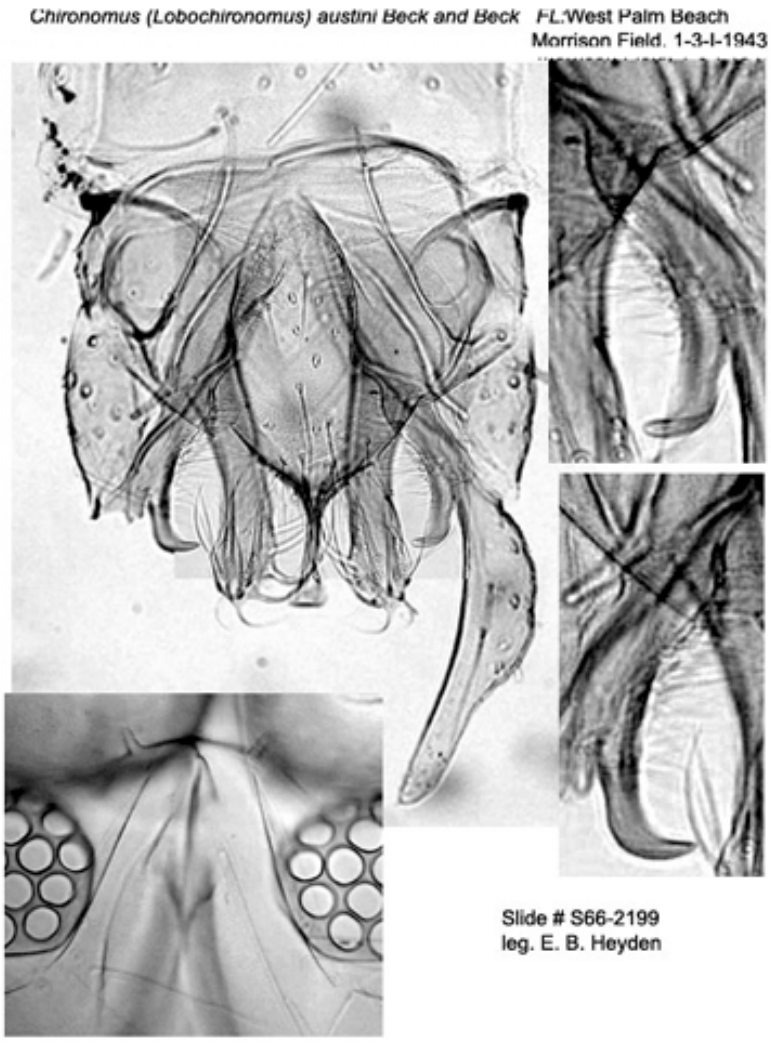
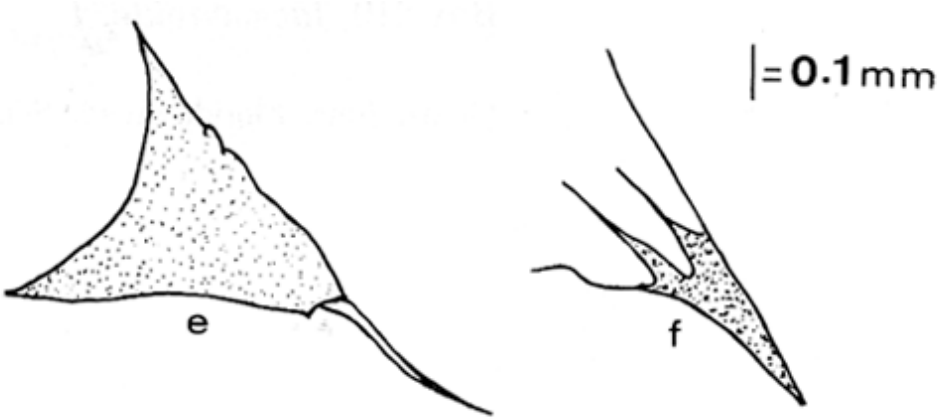


Figure courtesy of J. E. Sublette

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 tibae and of tarsal segments brown. Fore tarsus apparently without beard, fore LR 1.9 – 2.0.

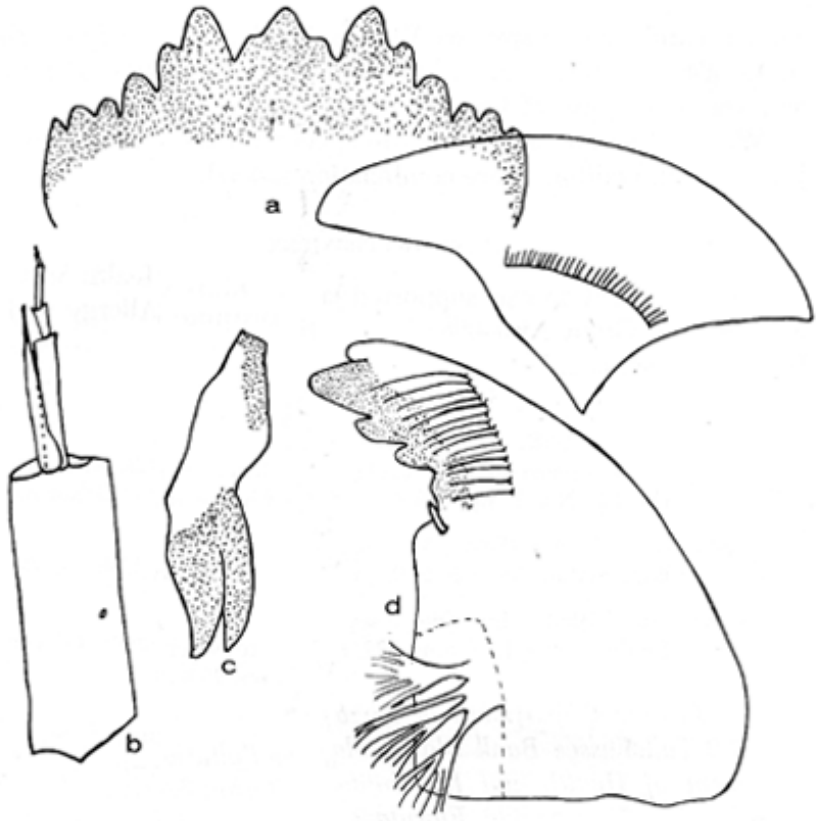
Hypopygium as in figure. Superior volsella closest to an E-type, but not really as any of Strenzke's illustrations. Anal point narrow.

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)

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; furrows 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 to what species it really belongs.

Adult:

Male

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 may be some specimens in the collection of the Kansas Biological Survey (Grodhaus and Ferrington (1989).

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 trifid 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, but if nearer *C. mendax*, it will only have 3 chromosomes (AB, CD, GEF).

Found: California - Dana Meadows, Tuolumne Co. (Grodhaus & Ferrington 1989); Yosemite National Park (Ryser *et al*. 1985).
Also found in Abisko, Sweden in Europe.

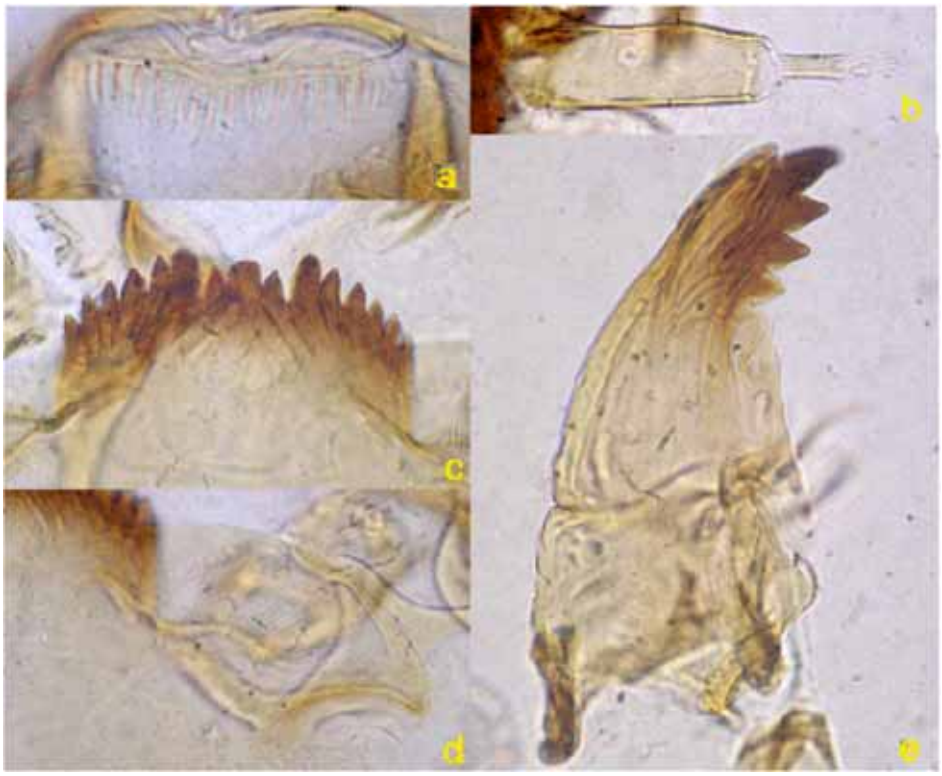
The larva is given by Ryser *et al*. (1985). Grodhaus and Ferrington (1989) give notes on the adult of North American specimens.

Species 4j. *Chironomus acerbiphilus* Tokunaga, 1939
Synonym: *C. crassimanus* Strenzke 1959.

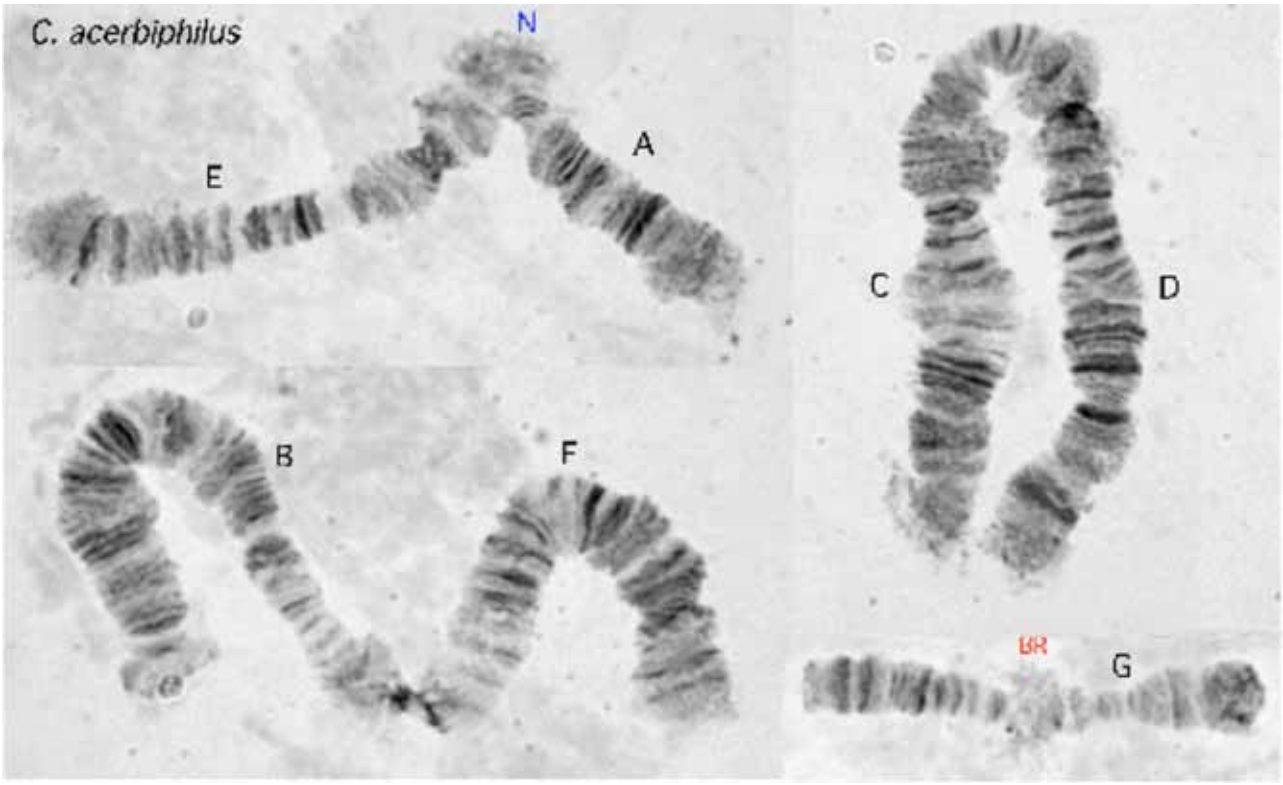
Adult and pupa
The adult and pupa of North American populations are not known.
It is therefore not known whether the adults are as dark as the Japanese specimens, or paler like the European species described as *C. crassimanus*.
The European pupa (from Rodrigues *et al*. 2009) is 8.2-10.0 mm long, cephalic 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.

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, FA 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 furrows on outer surface near the base.



Cytology: 4 polytene chromosomes with the pseudothummi-cytocomplex combination, AE, BF, CD, G. Centromeres strongly heterochromatic and constricted. Pairing may occur between 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. dorsalis* (Wülker, pers. comm.; Kiknadze *et al*. 2008). No polymorphism in studied North American, European, or Japanese populations.



aceA1: 1a-i, 7 - 9, 2d - 3, 12 - 10, 2c - 1k, 6 - 4, 13 - 19 - with large nucleolus in segment 15
aceB1: banding not clear, but probably 22-28 near centromere.
aceC1: 1 - 2, 10 - 3, 11 - 16, 22, 24 - 21,D(see below) (Jablonska-Barna *et al*. 2010)
aceD1: 1 - 3, 6 - 4, 7 - 9, 18f-a, 13 - 10, 17 - 14, 18g - 20 (Jablonska-Barna *et al*. 2010)
aceE1: 1 - 3e, 10b - 3f, 10c - 13 ie. 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.

Found: California -
Wyoming - Nymph Creek, Yellowstone National Park.
also found in Japan - Lake Katanuma, Honshu (Type locality).
and in Europe - Reinbeck, Germany (Keyl 1962)

Nymph Creek YNP, Wyoming. (Photo courtesy Kathy Sheehan)

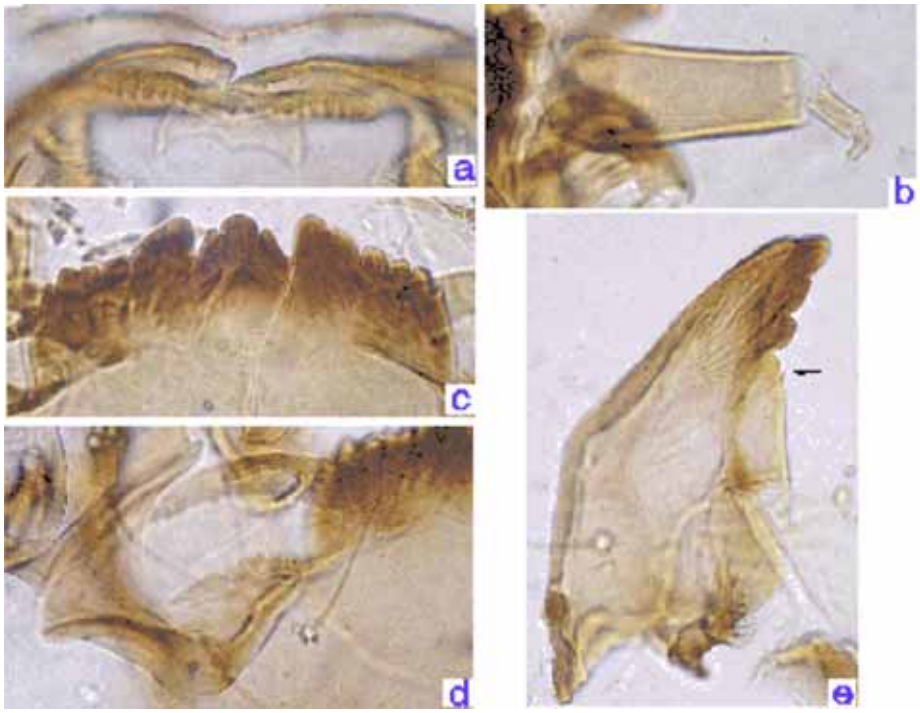
In acidic waters (pH3), and also elevated temperatures in North America.

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

Species 4k. *C.* species 'Cape Cod'.
Probably a member of the *C. decorus*-group.

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.

Larva: A small to medium sized bathophilus-type. Gula very dark almost to the base of the mentum; FA pale, but some darkening towards rear of head and at base of antenna. Mentum with 4th lateral often only slightly reduced (type I), but may be well separated (type II), 6th lateral slightly lower than 4th lateral; c2 teeth little more than notches on side of c1 tooth (type I). Ventromental plates (d, below) separated by about 30% of the width of the mentum, with about 39 - 43 striae. PE (a, below) of about 21 (19 - 24, 5) relatively even teeth. Antenna (b, below) with relatively squat basal segment, about 2.8 times as long as wide; AR about 2.1; A2/A1 about 0.2; A4/A3 about 1.5; proportions of the antennal segments (micron) 133 : 24 : 6 : 12 : 6. Mandible (e, below) with fourth inner tooth only partially developed (type I - II).



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 1/3 from distal end of arm D.

Arm A1:

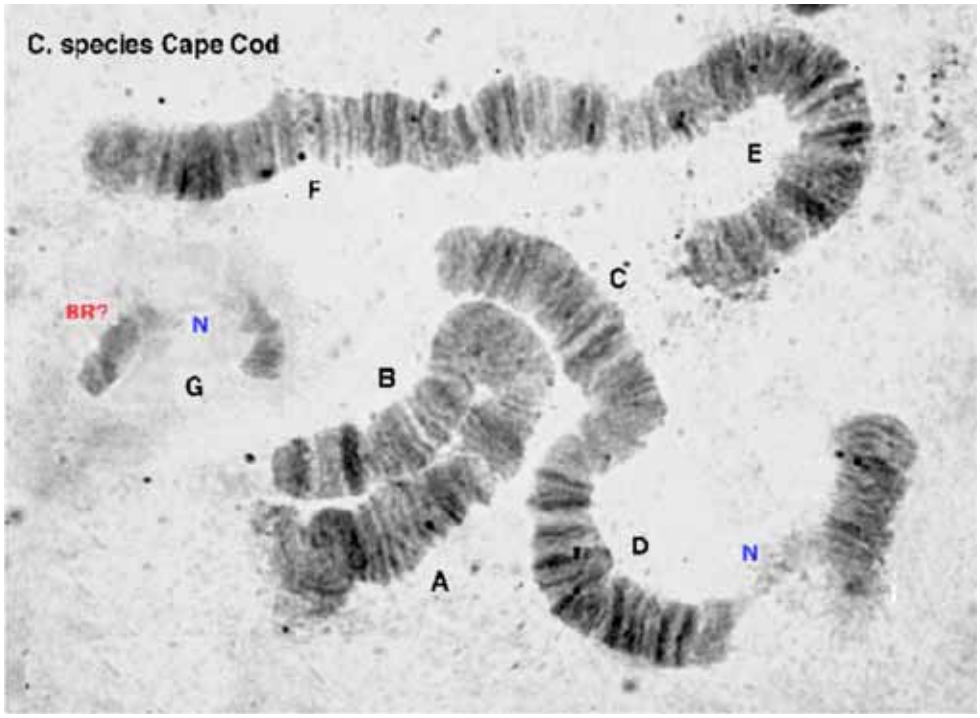
Arm B1: No obvious large puff. Bands 24-28 removed from usual position close to centromere, as in B1 of *C. quinnitukqut*.

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.*



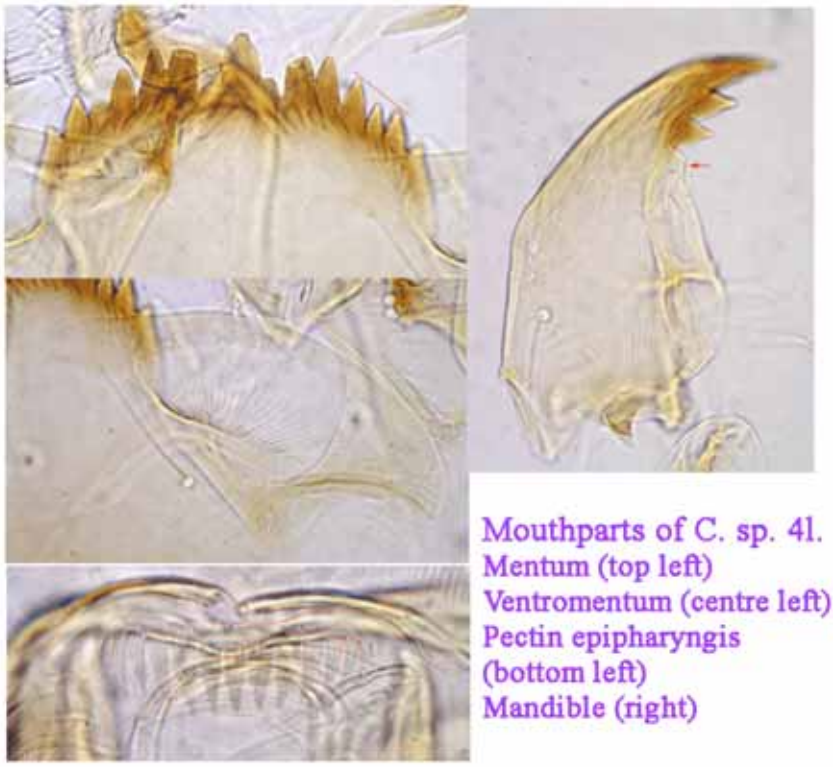
Found: Massachusetts - East Harbor (Truro), Cape Cod National Seashore, Barnstable Co.

Marine, organic sediments.

Species 4l C. species 4l (C. decorus-group?)

Adult not known.

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. Anal tubules 2-4 times as long as wide. Gular region dark, FA 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. PE with about 14 16 mostly even sized, sharp teeth, but distal teeth smaller. Mandible with 3rd inner tooth pale and almost completely fused (type I). 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.



Mouthparts of C. sp. 41.
Mentum (top left)
Ventromentum (centre left)
Pectin 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.

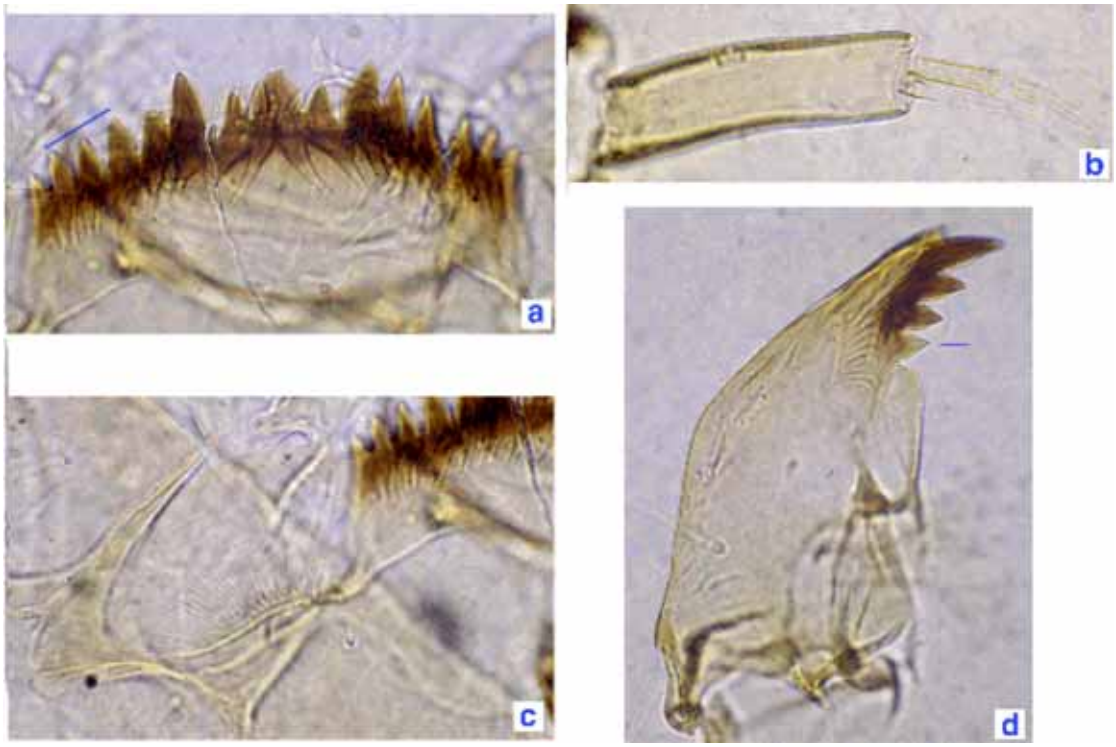
Found: Kansas - Mill Creek, nr. Craig, Johnson Co..
Louisiana - Bar ditch, Many, Sabine Parish.

Species 4m C. species 4m.

Adult not known

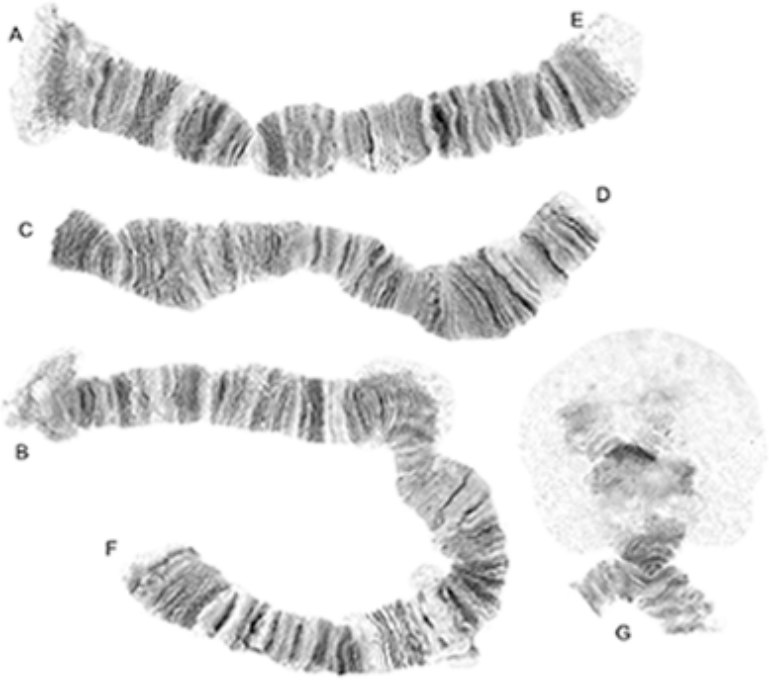
Pupa not known

Larva: A medium sized plumosus-type species. Gula slightly darkened, FA 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 straie, 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 - Potters Marsh, Anchorage.

Larva collected by Dave Wartenbee, and 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)

Adult: Described by Sublette

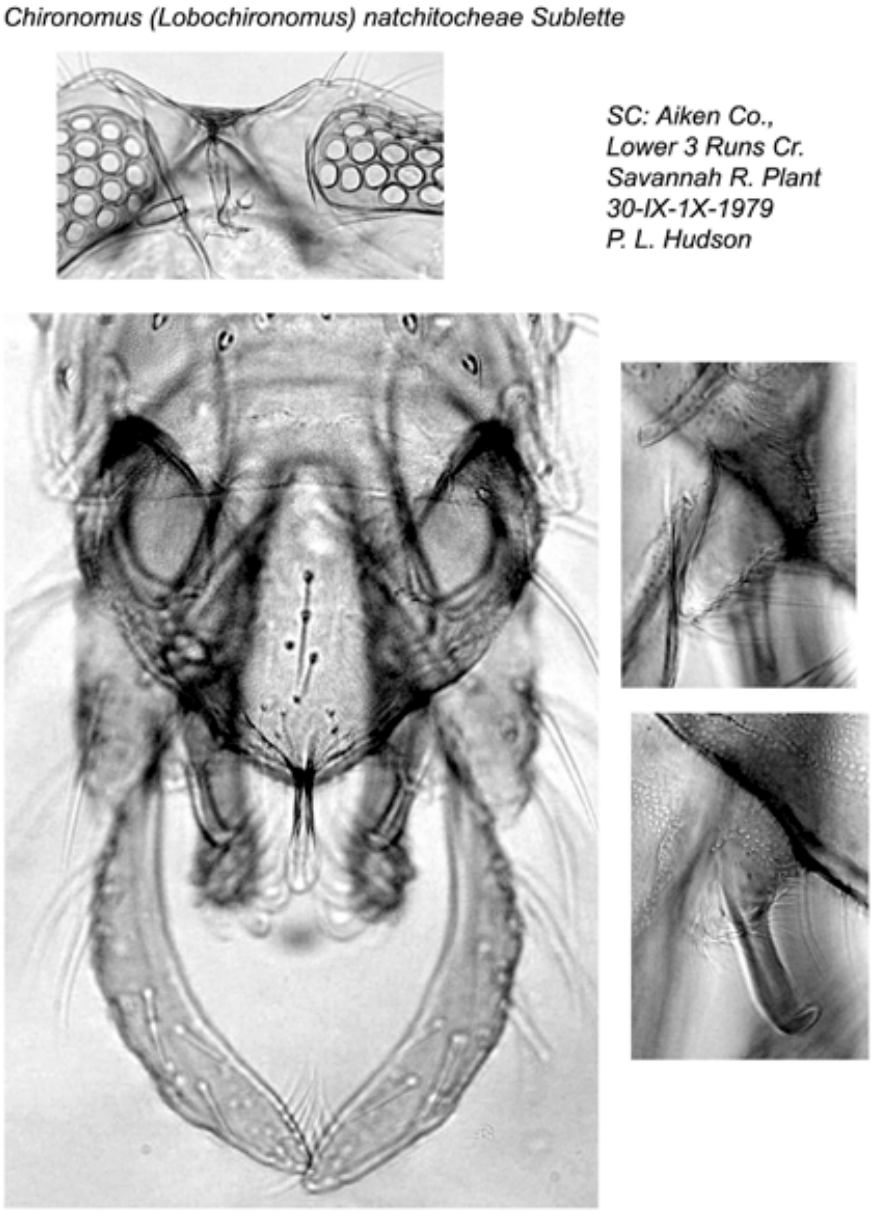


Figure courtesy of J. E. Sublette

Pupa: Length about 8 mm; almost entirely blackish. Cephalic tubercle long and pointed with a conspicuous preapical bristle. Segment II with posterior row of about 81 upturned hooks. Postero-

laterasl comb on segment VIII with about three spines; caudal fin with about 116 setae in an approximate double row.

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.

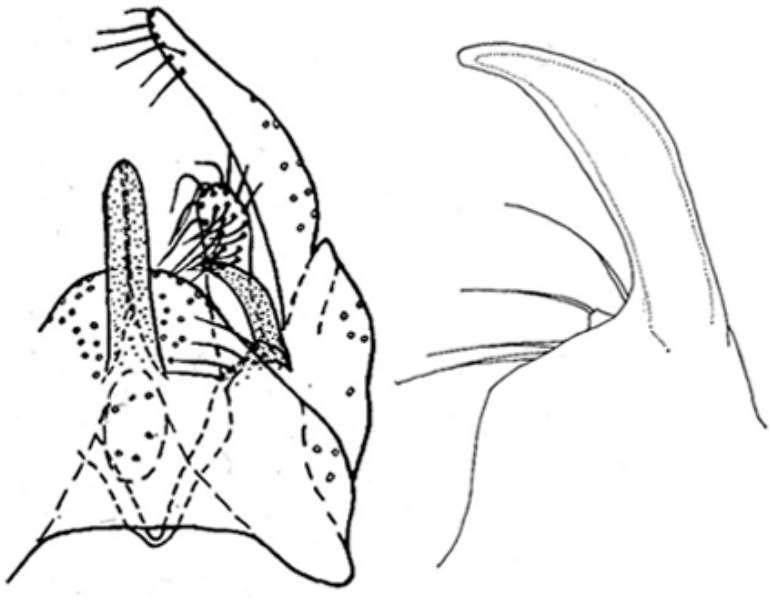
Found: Louisiana - U.S. Fish Hatchery, Natchitoches (Type locality)
South Carolina - Lower 3-runs Creek, Aiken Co.

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. All life stages described by Sublette (1964), partial description and some figures of larva in Epler (2001).

Species 4o *Chironomus tuxis* Curran

Adult



Male hypopygium of *Chironomus tuxis*
Drawn from type by Townes, 1945 (left) and Sublette 1966 (right)

Male (from Townes 1945; Sublette 1966): Wing length 3.4 mm (type 3.46 mm, VR1.02); fore LR 1.63 (type 1.67); antennal ratio 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.
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 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 superior volsella shorter and stouter.

Larva: Not known

Cytology; Not known

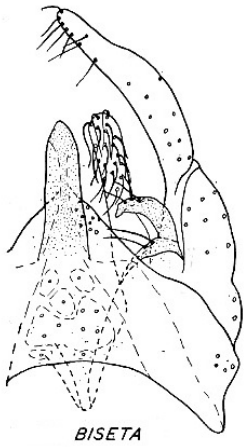
Found: Manitoba - (Oliver *et al*. 1990, Sæther 2012)
Ontario - (Oliver *et al*. 1990)
Florida - (Caldwell et al. 1997)
Georgia - (Caldwell et al. 1997)
New Jersey - Lakehurst (Townes 1945)
New York - Tuxedo (Type locality)
Minnesota - (Oliver *et al*. 1990)

Found in lakes (Hudson et al. 1990)

Adult redescribed by Townes (1945) and Sublette (1966).

Species 4p *Chironomus biseta* Townes
Confirmed as *Chironomus* by Sublette and Sublette (1965).
Known only from the adults.

Adult



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 superior volsella.

Female: Described only as similar to the male except for theusual sexual differences.

Larva: Not known

Cytology: Not known

Found: Hudson Bay Territory - (Type locality)

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 ochreus.
Femora and middle and hind tibia green, tarsi and fore tibia light brown.
Anal struts separate and extending posteriorly. Anal point broad, superior volsella very slender.

Pupa: Rows of needle-like spines on sternites I-III.

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.

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.

Adult:

Male: from Townes (1945)
Wing length 2.7 mm. LR 1.65, AR 2.4. Body slender.
Pale green with head, and thoracic vittae ochreus.
Frontal tubercles small, clypeus very small.
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.
Anal point very narrow; SV curved, narrow; style swollen, but sharply narrowing at posterior end.

Female: Similar to male except for usual sexual differences.

Pupa:

Larva:

Type locality: Belem, Para, BRAZIL
Found: Florida - St. Augustine; West Palm Beach (Townes 1945)
Maryland - Berlin (Townes 1945)
Texas - Austin, Travis Co.; Sugar Land.
Also found in Central and South America, and in Hawaii (probably by human transport).

Species 4s. *Chironomus* possibly near to *C. tenuistylus*

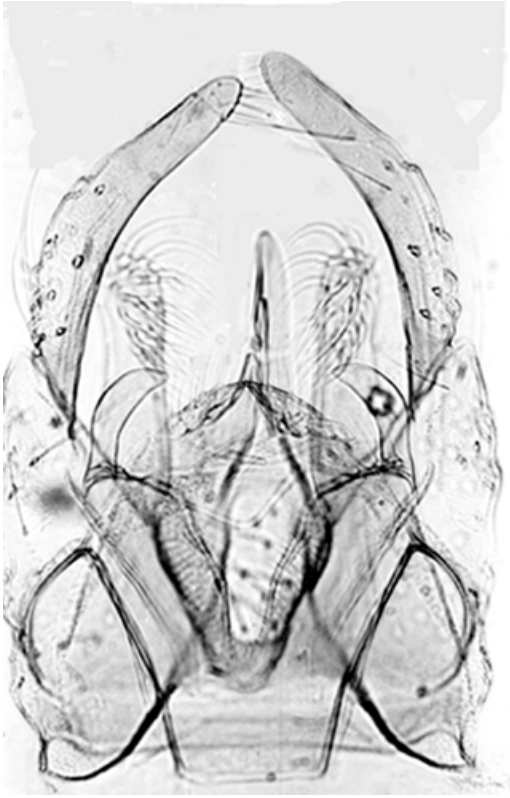
Adult:

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.



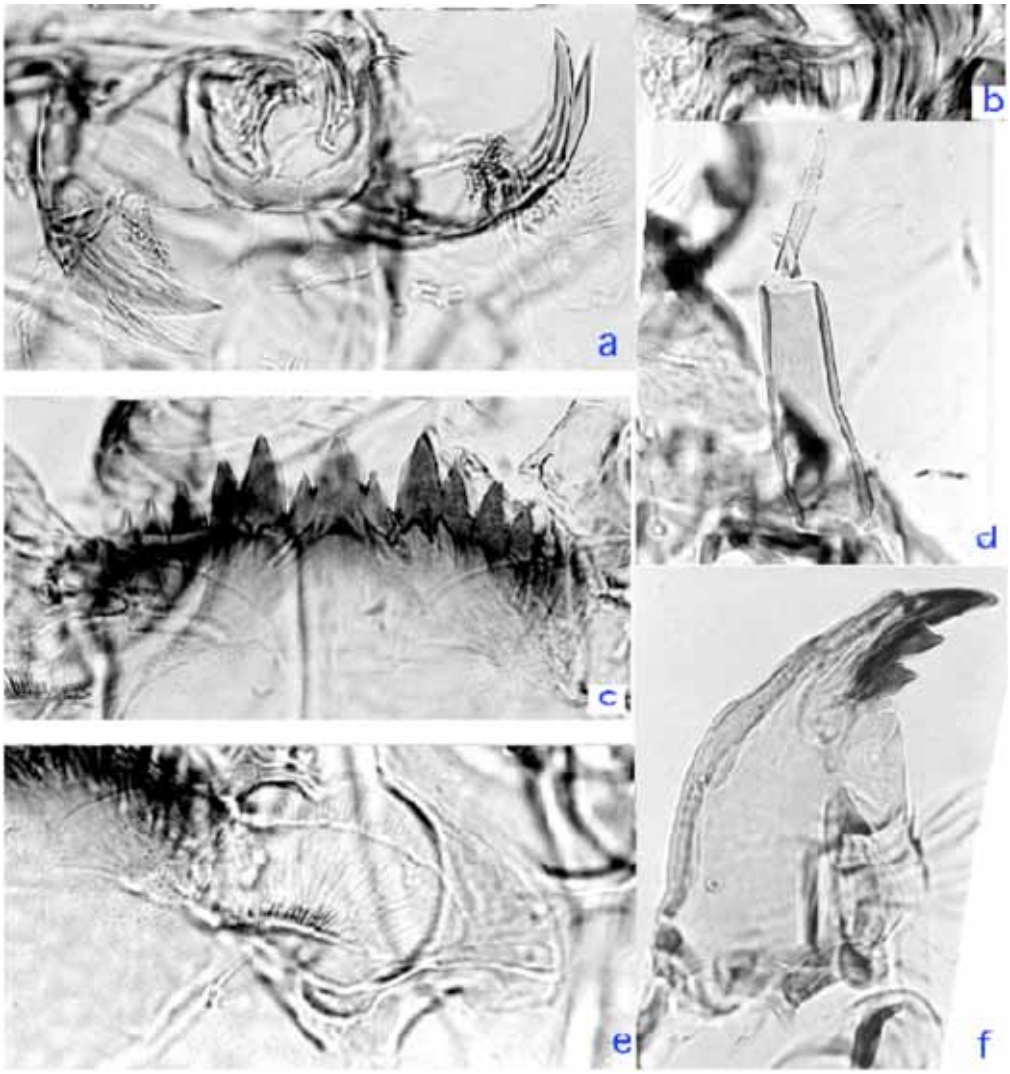
Hypopygium of C. sp. 4s.
The anal point is relatively fine, styles are slender, and the SV is a D-type, most similar to "e" of Strenke 1959

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

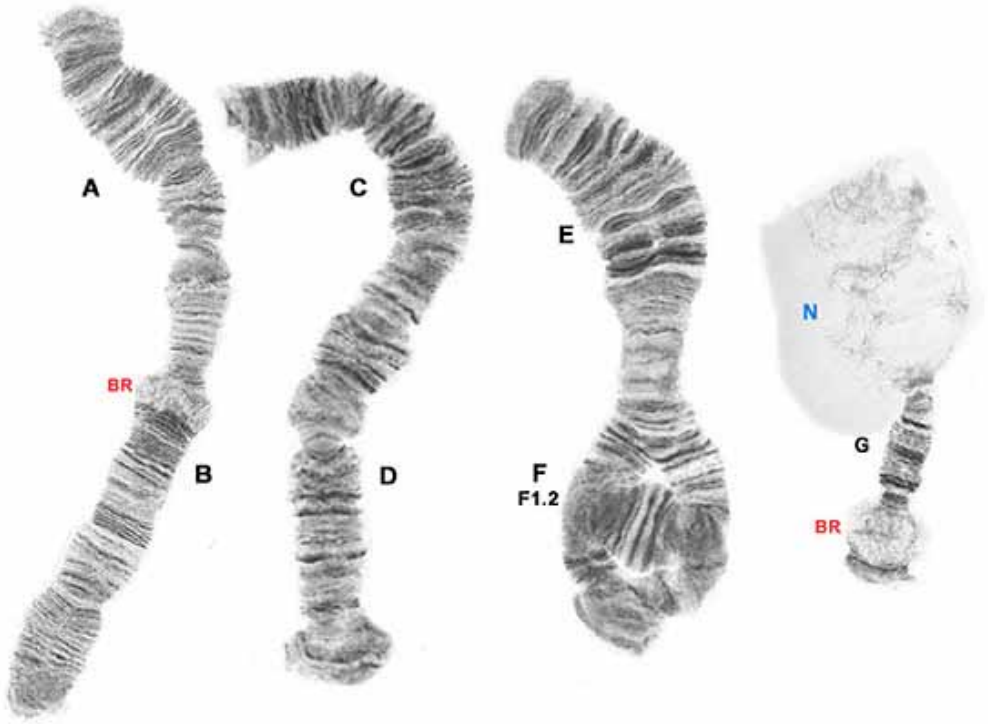
of L-setae on segments II-IV also as usual, the posterior two on segment IV arising very close to each other.
Hook row on segment II with about 78 hooks, occupying about 40% of width of segment.
Caudolateral spur of segment VIII with 1 or 2 spines.
About 72 taeniae on each side of anal lobe, in two rows posteriorly.

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 (200-280µm), 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, FA very slightly dark to dark, often with a stripe outside the margin.
Mentum with sharp teeth; 4th lateral hardly 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 separated by only about 0.2 of mentum width, with about 39-40 striae.
PE with about 11 or 12 sharp teeth. Premandible with inner tooth at least twice (2.0, 2.4 x) the width of the outer, teeth about equal in length.
Mandible with teeth relatively pale, 3rd inner tooth pale sometimes hardly developed (type I), but in others well developed (type IIIC – i.e. as dark as the other teeth).
Antenna with basal segment relatively long, and slightly curved, about 3.77 times longer than wide, and 3.7 times longer than segment A2; RO between 0.33 and 0.4 up from base of segment; AR about 1.82; segment proportions (micron): 127 : 34 : 10 : 13 : 3.



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

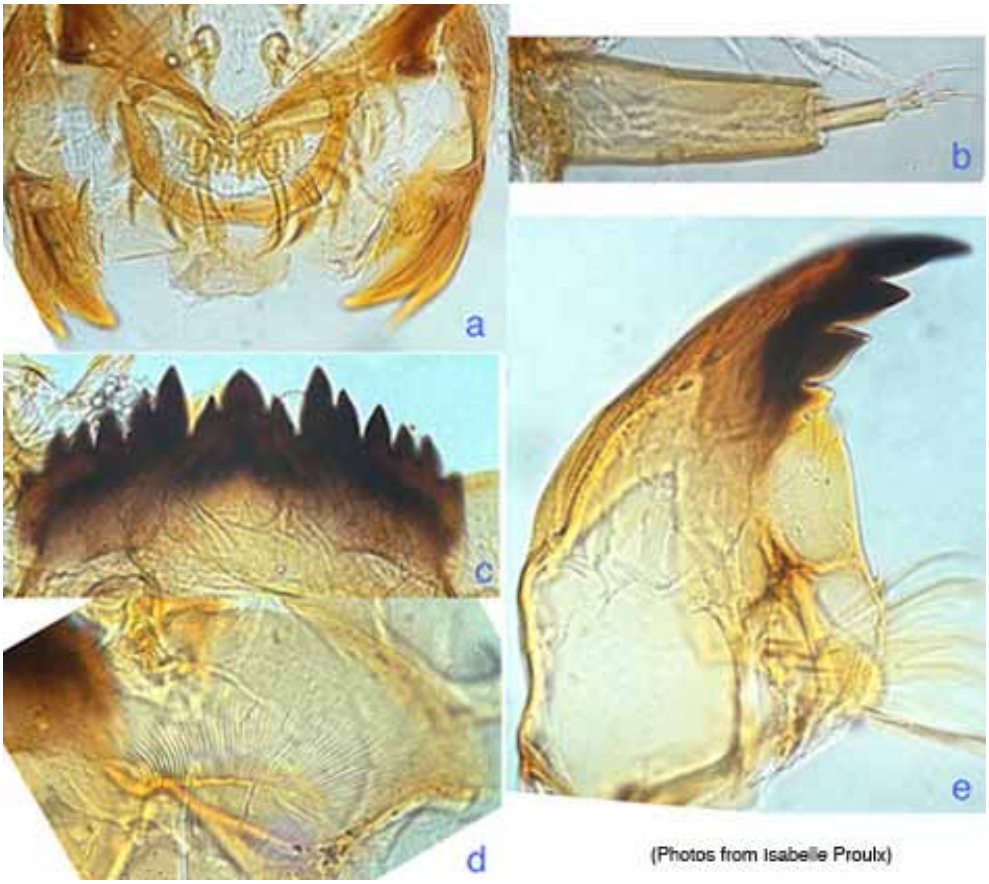
Although the adult appears similar to C. tenuistylus, the cytology makes it clear that this is a different, but probably related species. Arms A, E, and F have similar sequences, but arms B, C, D, and G show differences that cannot be explained by simple inversions.

Species 4t: *Chironomus* sp. NAII of Proulx *et al*. (2013)

Adult: Not known.

Pupa: Not known.

Larva: A medium sized salinarius-type larva; length about 11 – 13 mm.
The frontoclypeus is dark and the gular region is darkened on posterior half.
The c2teeth 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 srtriae reaching just beyond middle of the plate, and with faint striae reaching at least half the remaining distance to the anterior margin.
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 2B), at least 11 furrows 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: Ontario- Silver Lake (Proulx *et al.* 2013)

This larva does not correspond to any of the other currently known salinarius-type from North America or the Palearctic.

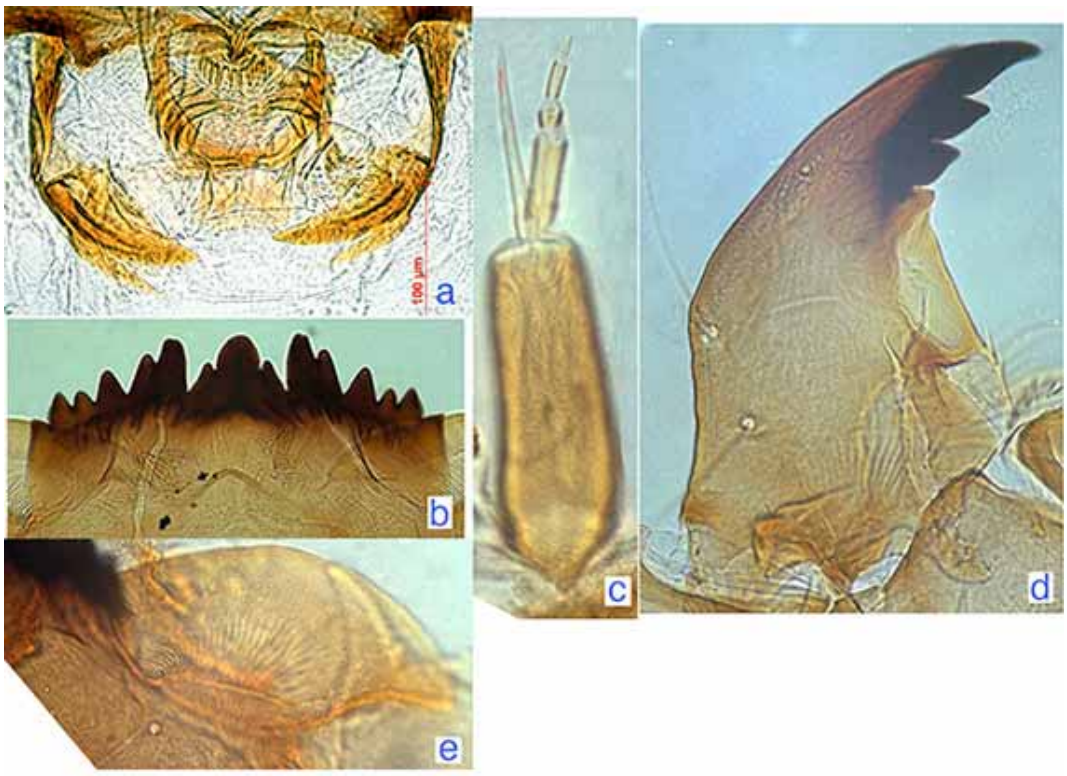
Species 4u. *Chironomus* sp. NAIII of Proulx *et al.* (2013) (could be *C. decumbens*)

Adult: Not known, unless is *C. decumbens* (see sp 2x).

Pupa: Not known.

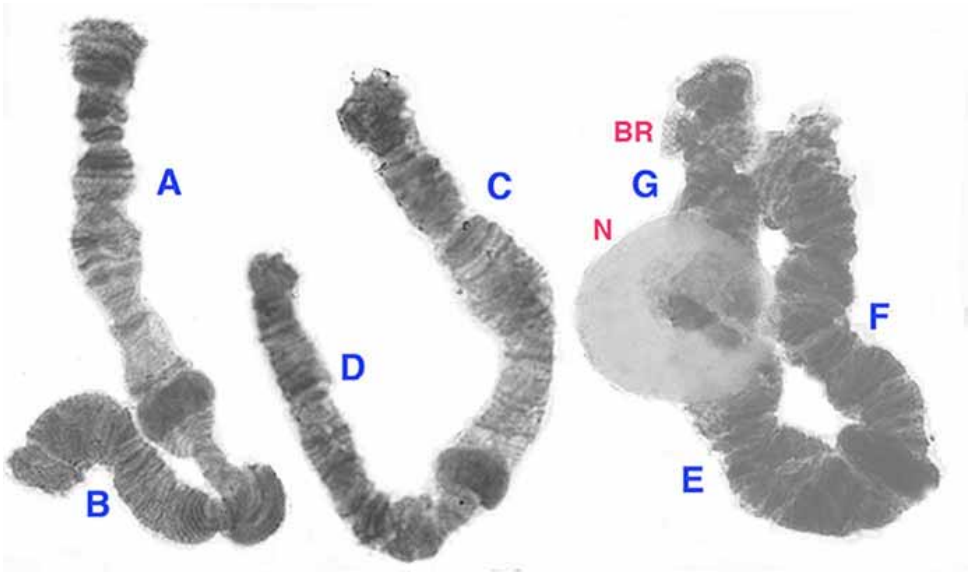
Larva: A medium sized salinarius-type larvae; length about 10 - 18 mm.. The frontoclypeus is pale and the gular region is strongly darkened on posterior half.
The c2 teeth of the mentum (Fig. b, below) trifid tooth are partially separated from the c1 tooth (type B). The mentum 4th lateral teeth are reduced (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 furrows 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, Hannah Lake, Ramsey Lake, all nr. Sudbury (Proulx *et al.* 2013).
Quebec- Lake D'Alembert, nr. Rouyn-Noranda.

Cytology of this species suggests that this species might be *C. decumbens* Morphology supports this hypothesis because *C.* sp. NAIII larval morphological description is comparable to that of *C. decumbens* (sp. 2x), although the only known larva of that species does not have heterochromatic centromeres. Such a difference could be due to intrinsic differences or may be a result of the use of different staining techniques.

Species 4v. *Lobochironomus* sp.

Adult: Not known.

Pupa: Not known.

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 µm).
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 (µm) 112 : 41 : 10 : 14 : 7.
Mandible with third inner tooth hardly separated, but somewhat darkened (type I-IIB-C), and with about 12-15 furrows 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.

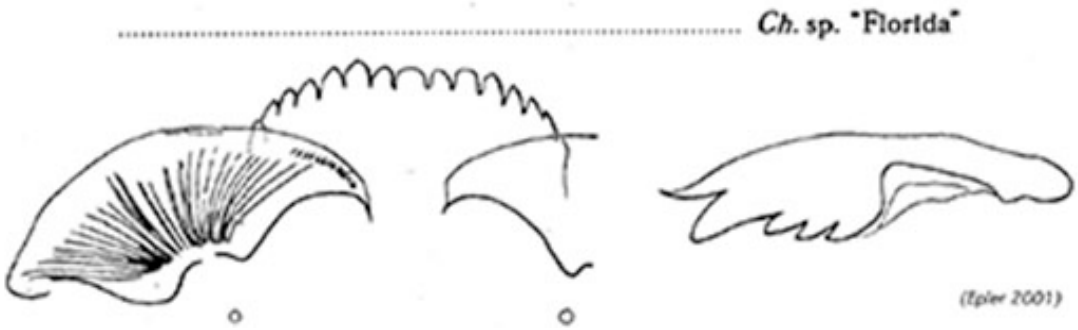
The presence of smaller interstitial teeth in the PE and of PLT suggests that this is a species of *Lobochironomus.* The larger PLT suggest it may be a previously unknown species, but it is possible that this is a polymorphism or an effect of environment. The mentum is similar to that described for *C. mendax*, but the second antennal segment is relatively longer.

Species 4w. *Chironomus* species "Florida" of Epler (2001).

Adult: Not known.

Pupa: Not known.

Larva: a plumosus- or semireductus-type.
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.

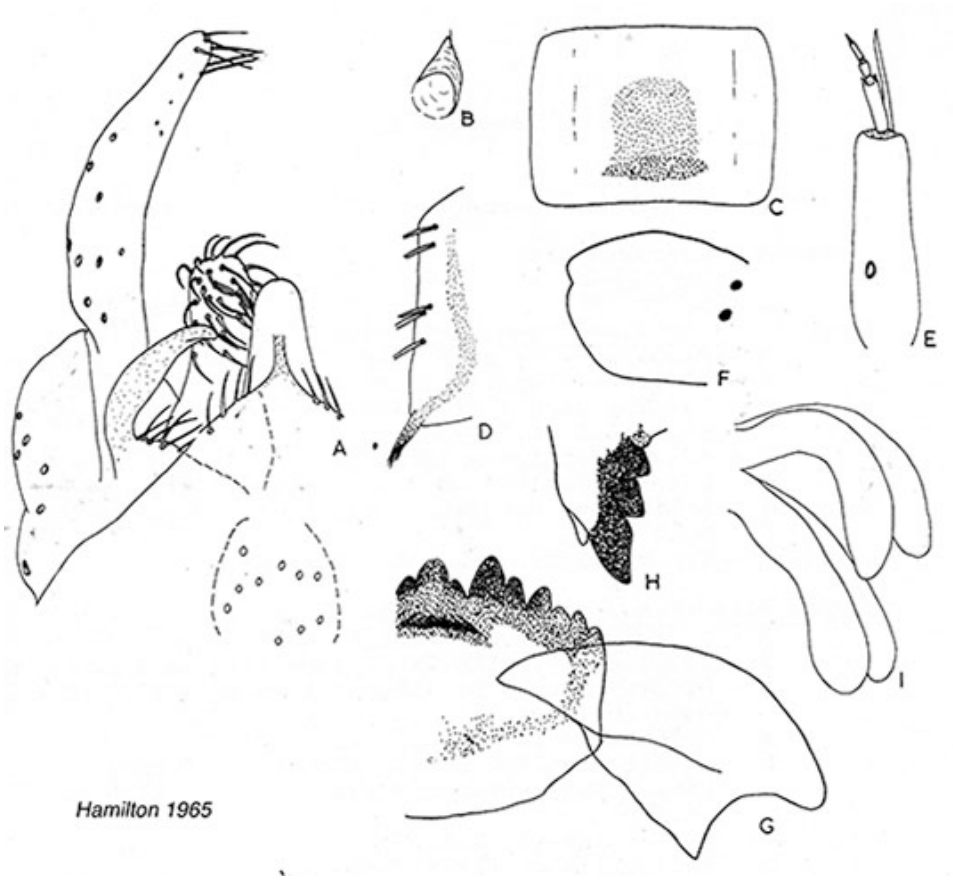
Inhabits burrows in *Nuphar* made by the aquatic moth *Bellura* (Pyralidae).

Found: Florida- peninsular Florida

Epler notes that a species in which the larva (only known stage) has a similar prementum 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)

Adult: Described as *C. rempelii* by Hamilton (1965):



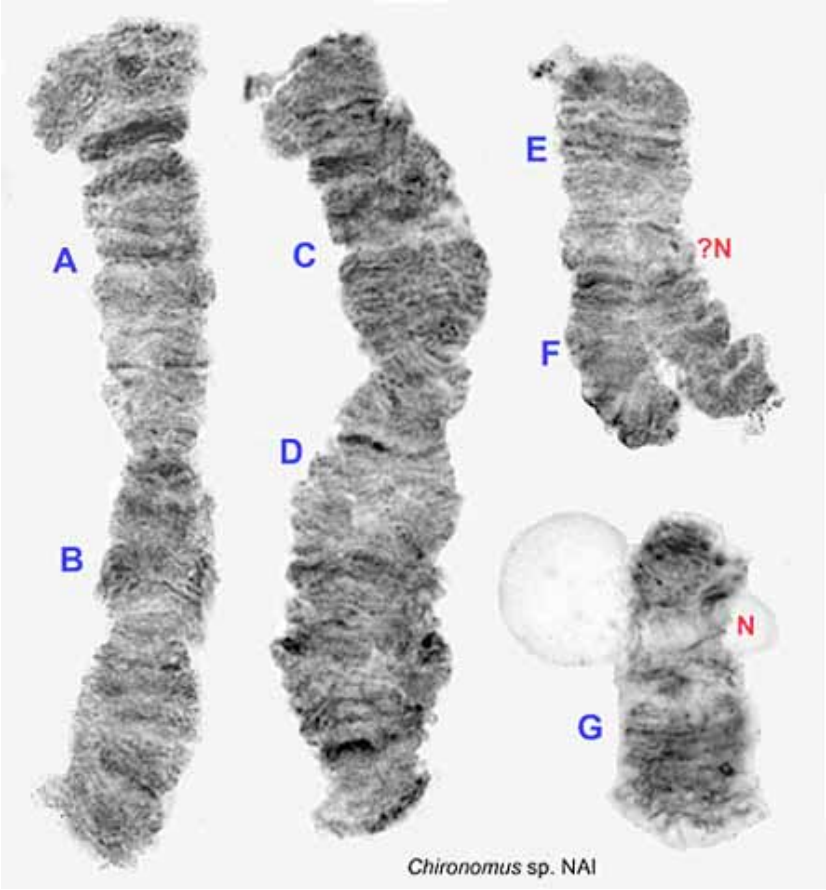
Male:
AR: 5.23 – 5.58 (5.37,4)
Wing length 4.2 – 4.9 mm, VR about 1 or slightly higher.
LR 1.23 – 1.44 (3); fore tarsus with a long sparse beard.
Black or blackish with grey bands along the caudal margins of each abdominal tergite.
Head: frontal tubercles long, about 3x longer than broad., temporal setae 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).
Length 11.1 – 12.0 mm (7). Cephalic tubercle acute with a short bristle near the apex.
Abdomen: Tergite I not shagreened, tergites II-VI with shagreen on central and caudal part of disc (fig. c above), tergite VII with a fine patch of shagreen near each antero-lateral angle, and tergite VIII with two patches of shagreen on the cental part of disc; lateral filaments on segments V-VIII usually 4-4-4-5; caudolateral spur of segment VIII with 3 – 8 spines; anal lobes each with 120 – 170+ filaments.

Larva: A medium sized thummi-type larva, length about 14.8 – 22 mm (fem. 18.8; male 14.8-20.5). Anterior VT generally longer than posterior (Ant. 0.84-1.82 mm; Post. 0.8-1.7 mm). Anal tubules

quite long (dor. 340-740 µm, vent. 340-880 µm); dorsal pair about 2.9-4.0, and ventral pair about 3.3-4.9 times longer than wide, as illustrated by Hamilton (1965).
Gular dark to very dark over at least the posterior 2/3; FA pale or very slightly darkened.
Mentum with c2 teeth only slightly to moderately separated (type I or III), 4th laterals reduced to about the level of the 5th laterals (type II), 6th laterals lower.
VM with smooth outer edge, about 40-41 striae. PE with 10-18 sharp teeth.
Antenna with A1 about 4.1 times longer than wide, RO near middle of segment; AR about 1.94 - 2.2; proportions (µm): 190 : 48 : 14 : 18 : 9.
Mandible with third inner tooth only slightly separated and pale or only slightly darkened (1A or B).

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.



Found: British Columbia - Marion Lake, Squamish.
Ontario - Kasten Lake, Sudbury area Proulx *et al.* 2013)

Oligotrophic, near-neutral lakes at depth of 4 to 7.5 m. A single generation per year.

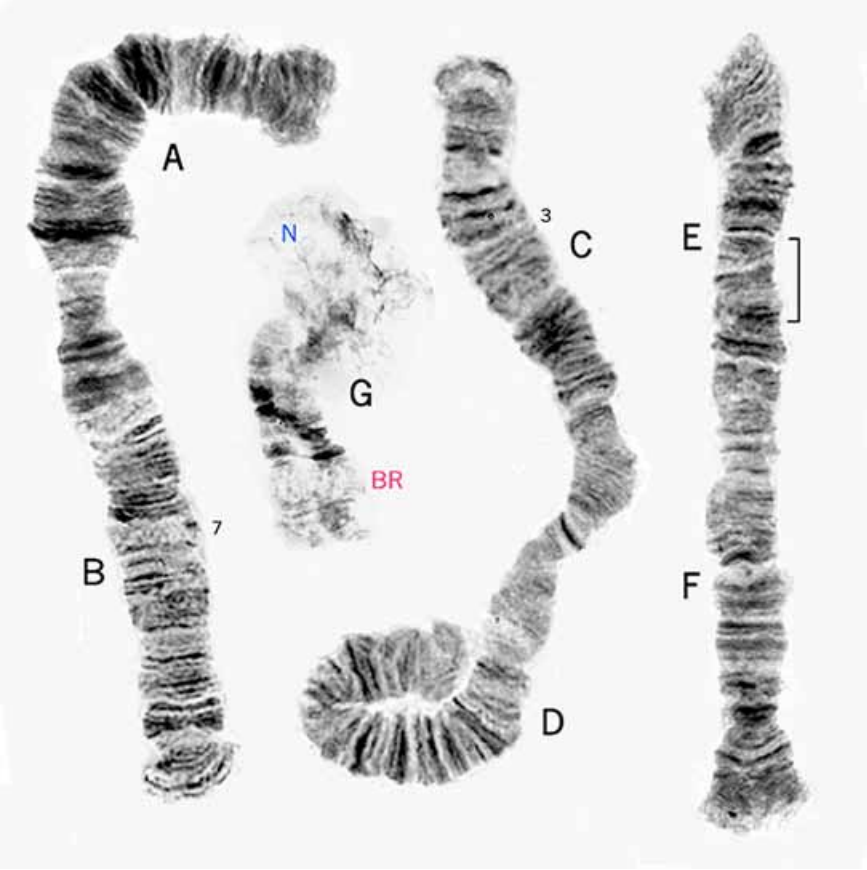
Chironomus species 4y

Adult and Pupa not known.

Larva: A moderate sized thummi type larva, length about 11.2 mm (fem); anterior VT with "elbows" (len 1.16 mm), posterior VT coiled (len 1.08 mm). AT relatively long (2.9-3.0 times longer than wide), with a slight constriction near the base (dors. 260 x 90 µm; vent. 240 x 80 µm). Gula very dark on posterior 2/3, FA pale with slight darkening outside it.

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. Mostly paired. No nucleoli in the other chromosomes. Centromere somewhat heterochromatic, including small beads at the end of the nucleolus. One specimen heterozygous for an inversion in arm E.

Arm A1:
Arm B1: Puff (group 7) about the middle of the arm, with dark bands proximal.
Arm C1: Constriction (group 4) about one third from distal end.
Arm D1:
Arm E1:
Arm E2:
Arm F1:
Arm G1: Virtually terminal N, BRabout a quarter from other end with a dark band just proximal to it.

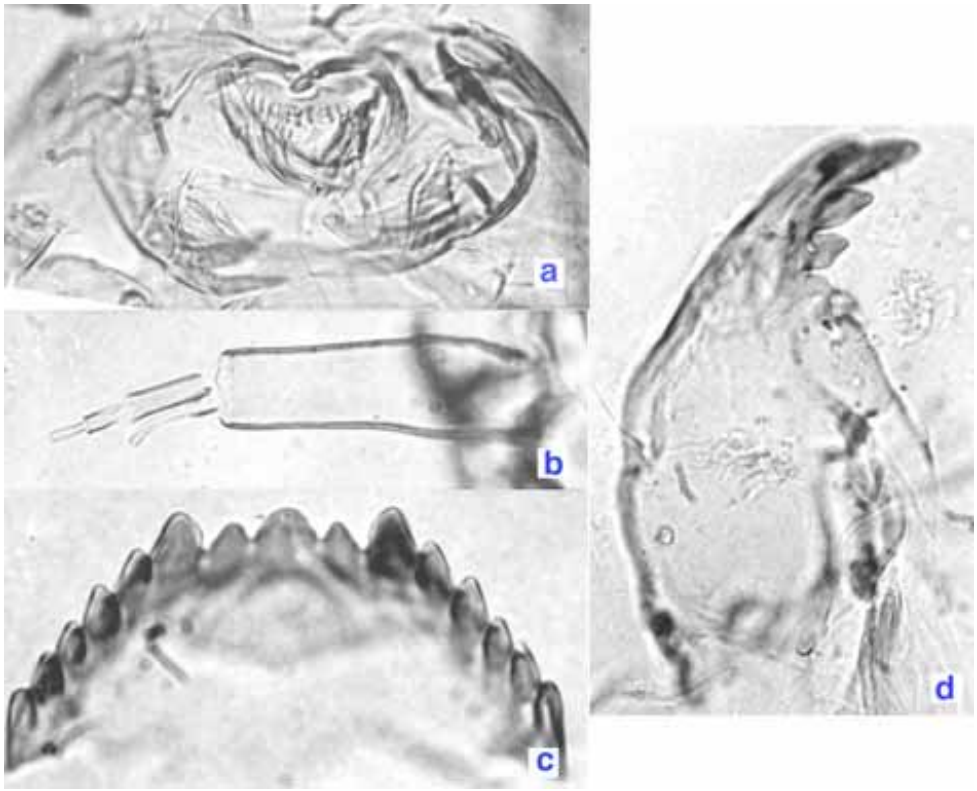


Found: California- Clear Lake (W. Wülker)
Oregon- Rolling Riffle Creek, e. Dexter, Lane Co. (43.90, -122.8).

Chironomus species 4z. *C.* species Obatanga

Adult and Pupa: Not known.

Larva: Single known larva is a small (8.1 mm) halophilus-type with posterior VT about 1.08(?) mm. AT relatively long (3.1 or 4.7) with a constriction near the base, abt. 355 µm long but ventral pair narrower. Gula and FA 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, with smooth outer margin and 35-36 striae which reach about halfway to margin, possibly separated by about 0.44 of mentum width.
PE with about 15 teeth, at least two small and fine. Premandible with outer tooth longer, and inner tooth around 2-2.2 times wider than the outer.
Antenna with segment 1 about 3.8 times longer than wide, RO about 30-35% up from base of segment; AR about 2.02; segment proportions (µm) 123 : 28 : 10 : 13 : 6.
Mandible with 3rd inner tooth pale and only partly separated, about 11 furrows on outer surface near base.



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.

Found: Ontario- – Obatanga Provincial Park, Algoma Co.

It is possible that this is a species of *Chaetolabis* or *Lobochironomus.*

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