

# The karyotype and morphology of all stages of *Chironomus (Chaetolabis) macani* Freeman, 1948 and *Chironomus (Chaetolabis) bitumineus* nom. nov. for *C. (C.) macani* Wiederholm, 1997 nec Freeman

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With 5 figures and 5 tables

**Keywords:** Chironomus, Chaetolabis, Chironomidae, Diptera, Insecta, morphology, nomenclature, identification, larva, pupal exuviae, male, female

**Schlagwörter:** Chironomus, Chaetolabis, Chironomidae, Diptera, Insecta, Morphologie, Nomenklatur, Bestimmung, Larve, Puppe, Männchen, Weibchen

The male and female imago, pupal exuviae, larva and karyotype are described for *Chironomus (Chaetolabis) macani* Freeman, reared from single larvae by Henk J. Vallenduuk. The holotype has been studied by Peter Langton. A black *C. (C.) macani* described by Wiederholm (1997) is shown to be distinct and given the name *bitumineus*. Its pupal exuviae is described by Peter Langton and its larva by Henk Vallenduuk.

## 1 Imago and pupal exuviae of *Chironomus (Chaetolabis) macani* and *bitumineus* by Peter Langton

Terminology of adults follows Saether (1980), of pupal exuviae Langton (1991, 1994).

### 1.1 *Chironomus (Chaetolabis) macani* Freeman

*Chironomus (Chaetocladius) macani* Freeman, 1948, adult description.

Holotype in NHM: 2.vii.1947, Hawkshead, Three Dubs Tam, Lancashire, England.

Single reared larvae by H. Vallenduuk

#### 1.1.1 Pupa (n = 2 reared exuviae)

Length 11.9, 13.4 mm. Exuviae brown, thorax with a darker longitudinal band passing through dcs insertions, tergites with a dark brown streak along the lateral adhesion marks, faint on I, VI-VIII. Spur of segment VIII dark brown. Anal lobes darker posteriad to black along the fringe insertion line.

Cephalothorax. Cephalic tubercles broadly conical, 148, 180  $\mu\text{m}$  long, ending in frontal setae 80  $\mu\text{m}$  long (Fig. 1b). Thoracic horn richly branched, plumose. Basal ring of thoracic horn 228 x 112, 240 x 100  $\mu\text{m}$ , tracheal patch 140 x 68, 180 x 68  $\mu\text{m}$  about 19 tracheoles across, 2-4  $\mu\text{m}$  diameter. Thorax very small granulate anteriorly, smaller and sparse mid laterally with a few stronger granules by suture towards the oblique hinge line, by mid scutum somewhat reticulate (Fig. 1a), the granules larger and shallower and squashed in on themselves in mounts.

Abdomen. Tergite I with a few small points anteromedially, II-V with median undivided patches of dense imbricating points (Fig. 1d, larger posteriorly). On tergite VI the point patch narrows posteriad to between setae D5 to join the posterior transverse band of large points. Tergite VII with a transverse band of minute points anterior to setae D1, widely broken medially. VIII with 2 lateral patches of small points, not arranged in rows. Anal segment without shagreen. Paratergites V, VI and VII with a small patch of small spines posteriorly. Pleura of

segment IV sparsely armed with spinules 25  $\mu\text{m}$  long. Ventral shagreen: on II the lateral longitudinal bands are not connected to the median patch posteriorly, on III and IV the lateral bands are absent. Parasternite II with a narrow longitudinal band of shagreen. Hook row with about 90 hooks. Vortex distinct on segment IV; conspicuous pedes spurii B present on segment II. Segment VIII with dark brown, strong postero-lateral spurs (Fig. 1c), each with a single apical tooth. Chaetotaxy of abdominal segments see Tab. 1.

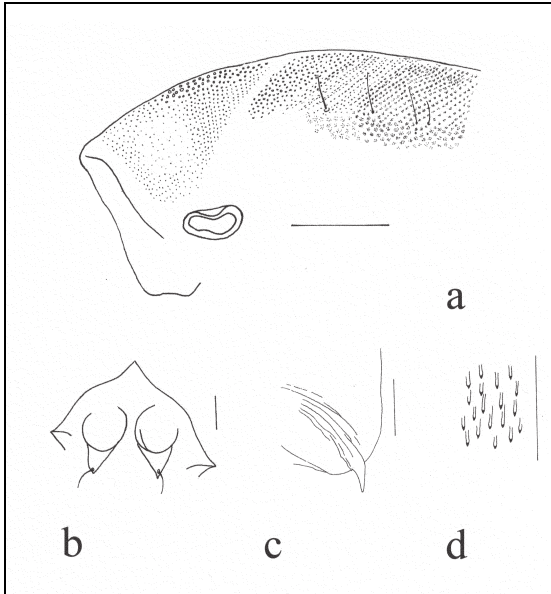


Fig. 1: *Chironomus (Chaetolabis) macani* Freeman. Pupal exuviae. a = granulation of thoracic dorsum, b = frontal apotome and cephalic tubercles, c = spur of segment VIII, d = armament of tergite IV. Scale line = 0.1mm

Tab. 1: *Chironomus (Chaetolabis) macani*. Pupa, Chaetotaxy of abdominal segments (one side). Ds = dorsal seta, Dt = dorsal taenia, Ls = lateral seta, Lt = lateral taenia

	I	II	III	IV	V	VI	VII	VIII	IX
Ds	2	4	5	5	5	5	5	1	
Dt									1
Ls	0?	3	3	3					
Lt					4	4	4	5	150

The pupal exuviae runs to couplet 71 *Chironomus commutatus* Keyl in Langton (1991), because there is only one dorsal taenia on the anal lobes and seta D3 of tergite IV lies external to seta D4, but in *C. commutatus* the thorax is small granulate for the whole dorsum ventrad to below the dorsocentral setae (fig. 6b in Michailova et al. 2013). In Langton & Visser (2003) it fails to run to *C. macani* at couplet 208, *C. macani* having sternite II lateral point bands complete and joined to the median patch posteriorly. The original specimens of *C. macani* used for these keys are those of W. Wülker's rearings of the *Chironomus (Chaetolabis) macani* of Wiederholm (1979), a different *Chaetolabis* species (see discussion following the description of the male). From *Chironomus polonicus* Michailova et al. (2013), which also runs to *C. commutatus* in the above mentioned keys, the granulation of the thorax is much less extensive (cf. fig. 6a in Michailova et al.).

### 1.1.2 Adult female (n = 1)

Colour (alcohol preserved, mounted in Euparal): Yellow, apical flagellomere black, palpi brown, tips of anterior tarsomeres brown, tarsomere of mid and posterior legs progressively

darkened towards tip, tarsomeres 4 and 5 brown (this specimen may be teneral, because it is much paler than the male). Wings with rm darkened.

**Head.** Antennae (Fig. 2d) with 5 flagellomeres (first two flagellomeres fused, with two verticils, counted here as flagellomere 1); flagellomeres 1-4 with bulbous base and long neck, 5 narrow cylindrical; flagellomeres 1-5 200, 128, 140, 120, 240  $\mu\text{m}$  long. Head setae obscured.

**Thorax.** Wing 4.0 mm long. Squama with about 30 setae. Thoracic setae uncountable. Measurements of legs see Tab. 2.

**Tab. 2: *Chironomus (Chaetolabis) macani*. Female, legs. Measurements in  $\mu\text{m}$ . Fe = femur, Ti = tibia, Ta = tarsus, LR = leg ratio, ratio of metatarsus length to tibial length**

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR
leg 1	1640	1500	2060	1080	800	640		1,4
leg 2	1800	680	1000	600	420	280	220	0,6
leg 3	2000	2000	1440	820	640	380		0,7

**Abdomen.** Tergites and sternites with dense, irregularly distributed setae.

Female genitalia (Fig. 2c). Sternite VIII with 35 setae on the right side. Gonocoxite IX with 6 setae. Seminal capsules oval, 160x124  $\mu\text{m}$  in diameter. Cerci 260  $\mu\text{m}$  long, 200  $\mu\text{m}$  wide.

The conspicuously dark apical flagellomere, the fused basal two flagellomeres and 6 setae on gonocoxite IX may be characters that serve to identify this female.

### 1.1.3 Adult male (n = 1)

Colour (alcohol preserved): Brownish yellow. Antennal pedicellus dark brown, flagellum and plume brown, palpomeres brown, eyes black. Scutal stripes dark brown, median scutal band extending posteriad as far as the scutal tubercle, median anepisternum II dark brown, posterior anepisternum II dark brown, paler medially, lower two thirds of pre-episternum dark brown, halteres yellow, postnotum dark brown. Foreleg coxae, trochanters and femora yellow, tibiae dark brown, tarsomeres 1-3 with tips darkened, 4 and 5 brown; mid and hind legs as forelegs, but tibiae yellow with darkened tips; combs of mid and posterior tibiae black. Wings with rm darkened. Abdominal tergites evenly dark brown with narrow yellow posterior margin; hypopygium brown.

**Antenna** (Fig. 2b). Antenna with a large globular pedicel and flagellum of 11 flagellomeres, 2-10 2.0 times as wide as long. Flagellum segment lengths: 60, 36, 36, 32, 36, 40, 36, 36, 36, 36, 1800  $\mu\text{m}$ . Antennal ratio (AR) 4.7.

**Head.** Eye bare, with a long dorsomedial parallel-sided extension, 328  $\mu\text{m}$  long, 112  $\mu\text{m}$  broad. Verticals 16. Clypeals 49. Frontal tubercles very small, 12  $\mu\text{m}$  long, 12  $\mu\text{m}$  broad. Palp 5-segmented, segment lengths: 76, 80, 288, 284, 460  $\mu\text{m}$ .

**Thorax.** Acrostichals? 41 dorsocentral setae. 0 prealar. Scutellum with 14 setae on the left side. Wing. Length (arculus to wingtip) 4.4 mm, R with 34 setae; R1 with 35 and R4+5 44. Squama with? setae. Measurements of legs see Tab. 3.

**Tab. 3: *Chironomus (Chaetolabis) macani*. Male, legs. Measurements in  $\mu\text{m}$ . Fe = femur, Ti = tibia, Ta = tarsus, LR = leg ratio, ratio of metatarsus length to tibial length, BR = beard ratio, ratio of length of longest seta to width of metatarsus**

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	BR
leg 1	1880	1700	2360	1200	920	900	420	1.4	1.3
leg 2	2000	1860	1060	620	480	300	220	0.57	2.7
leg 3	2140	2340	1500	900	660	400	260	0.64	3.5

Abdomen. Tergites and sternites with dense irregularly distributed setae.

Hypopygium (Fig. 2a). Central pale part of tergite IX with 9 long setae. Anal point constricted basally and expanded in distal half.

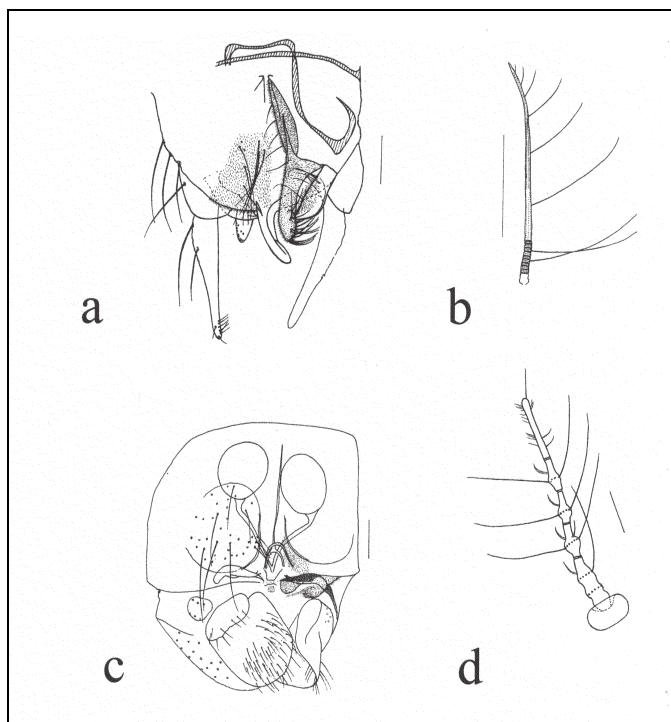


Fig. 2:-*Chironomus (Chaetolabis) macani* Free-man. Adult. a = male hypopygium, b = male antenna, c = female genitalia, d = female antenna. Scale lines: a, c, d = 0.1mm, b = 1mm

This morphotype runs to *Chironomus (Chaetolabis) macani* Freeman in Langton & Pinder (2007). In particular it should be noted that the black fore tibiae accord with Freeman's (1948) original description of the species. The holotype in Natural History Museum London has one foreleg missing and the other lacks the tarsus; the intense black colour of the remaining tibia and the colour of the other legs and body accords with the morphotype we describe here. Wiederholm (1979) describes a black form that he assigns to the same species, but W. Wülker's (1987) description of the karyotype shows that it has  $2n = 6$ , whereas the form described here has  $2n = 8$ . This reflects the situation in North America, where *C. (C.) atroviridis* Townes has  $2n = 8$  and *C. (C.) ochreatus* Townes has  $2n = 6$  (Martin, J., quoted in Wülker, W. 1987). Neither of these latter species has the colouration of the two described West Palaearctic forms. A new specific epithet is here proposed for Wiederholm's species: *bitumineus* (Latin for "like tar" referring to its black colouration).

## 1.2 *Chironomus (Chaetolabis) bitumineus* nom. nov.

*Chironomus (Chaetolabis) macani* Wiederholm, 1979; Wülker, 1987 misidentification

Holotype male + pupal exuviae: Venetjärvi, Finnland "Zucht Leg. Wülker 1985" on label.

Paratype male + pupal exuviae: Venetjärvi "Zucht" on label. Both slides coll. Zoologische Staatssammlung München.

### 1.2.1 Pupa (n = 2 reared exuviae)

Length 10.1, 10.2 mm (n = 2). Exuviae pale brown, thorax darker, smudged darker still posteriad, tergites without a brown streak along the lateral adhesion marks, paratergites progressively darker from VI-VIII. Spur of segment VIII brown. Anal lobes pale at base, darker posteriad.

**Cephalothorax.** Cephalic tubercles bulbous at base with a short conical apex, 200  $\mu$ m long overall, apex 45–75  $\mu$ m long, 30–45  $\mu$ m wide, ending in frontal setae 60  $\mu$ m long (Fig. 3b). Thoracic horn richly branched, plumose. Basal ring of thoracic horn 195 x 90, 200 x 90  $\mu$ m, tracheal patch 140 x 60, 145 x 55  $\mu$ m about 16 tracheoles across, 3  $\mu$ m diameter. Thorax very small granulate anteriorly, becoming evanescent progressively posteriad above the hinge line; distinctly small granulate again below the hinge line and posteriad below the line of dorsocentral setae, fading into reticulation about mid thorax (Fig. 3b).

**Abdomen.** Tergite I unarmed, II-V with median undivided patches of dense small non-imbricating points (Fig. 3d), larger posteriorly. On tergite VI the point patch narrows posteriad to between setae D5 to join the posterior transverse band which does not extend laterally beyond seta D4. Tergite VII with a transverse band of minute points anterior to setae D1, widely broken medially. VIII with 2 lateral patches of small points, not arranged in rows. Anal segment without shagreen. Paratergites V, VI and VII with a small patch of small spines posteriorly. Pleura of segment IV smooth. Ventral shagreen: on II the lateral longitudinal bands not connected to the median patch posteriorly, on III with a trace of lateral bands of very small points anteriorly, on IV the lateral bands are absent. Parasternite II with a narrow longitudinal band of shagreen. Hook row with about 70 hooks. Vortex distinct on segment IV; conspicuous pedes spurii B present on segment II. Segment VIII with dark brown, strong postero-lateral spurs (Fig. 3c), each with a single apical tooth. Chaetotaxy of abdominal segments see Tab. 4.

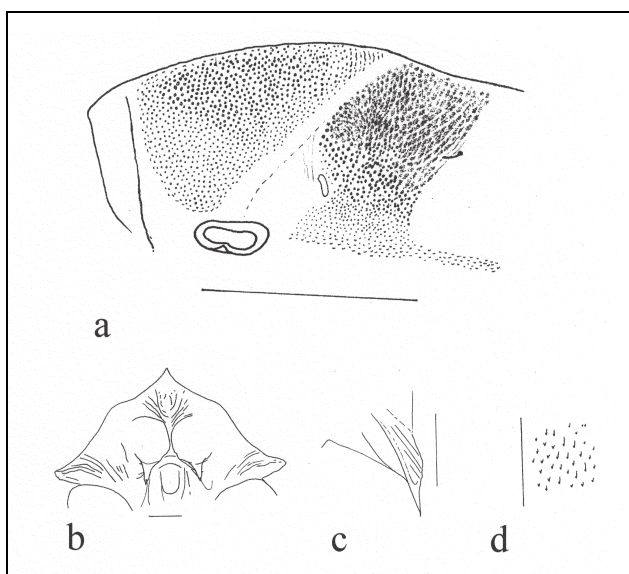


Fig. 3: *Chironomus (Chaetolabis) bitumineus* nom. nov. Pupal exuviae. a = granulation of thoracic dorsum, b = frontal apotome and cephalic tubercles, c = spur of segment VIII, d = armament of tergite IV. Scale line = 0.1mm

**Tab. 4: *Chironomus (Chaetolabis) bitumineus*. Pupa. Chaetotaxy of abdominal segments (one side). Ds = dorsal seta, Dt = dorsal taenia, Ls = lateral seta, Lt = lateral taenia**

	I	II	III	IV	V	VI	VII	VIII	IX
Ds	2	4	5	5	5	5	5	1	
Dt									1
Ls	0?	3	3	3					
Lt					4	4	4	5	100–140

The pupal exuviae runs to couplet 70 *Chironomus macani* Freeman in Langton (1991) and to couplet 210a *C. macani* in Langton & Visser (2003).

### 1.2.2 Adult male and female

Fully described by Wiederholm (1979).

## 2 The larva of *Chironomus (Chaetolabis) macani* and *bitumineus*

by Henk Vallenduuk

Material studied of *Chironomus (Chaetolabis) macani*

Helenaveen, Mariapeel, HV06187, Netherlands, 6-iv-2010, single reared larva

Helenaveen, Mariapeel, HV06225, Netherlands, 20-iv-2011

Helenaveen, Mariapeel, HV06228, Netherlands, 28-iv-2011, single reared larva

Helenaveen, Mariapeel, HV06289, Netherlands, 31-viii-2011

Material studied of *Chironomus (Chaetolabis) bitumineus*

Veittijärvi, lake D5, Sweden, leg./det. Wülker

Venetjärvi, 18-iii-1986, Finland, leg./det. Wülker

Ontario, Beverswamp, Canada, 20-ix-1966, leg./det. J. Martin (Nearctic)

During 2009-2011 Vallenduuk collected larvae in the reserve Mariapeel (2 localities) and Deurnse Peel (1 locality) Netherlands. At these localities only *C. (C.) macani* is found. Some larvae were cytologically identified and some were single reared to adult.

Larvae of *Chironomus (Chaetolabis) bitumineus*, all collected and identified (as *macani*) by Prof. W. Wülker, are held in the collection of the Zoologische Staatssammlung München. The larvae were not single reared.

The morphology of both species is very similar, however the larva of *C. macani* is somewhat larger.

Larvae of both species do not have lateral tubules on segment VII and have a weak pigmentation on the submentum. The pigmentation reaches to about half the length of the submentum and not wider than the outer ends of the ventromental plates. In the key to *Chironomus* (Vallenduuk et al. 1997) they will run to *C. anthracinus* or *riparius* agg.

Identification of the species is possible. Both species *macani* and *bitumineus* can be recognised by the construction of the central mental tooth. Its accessory teeth are almost completely fused with the central tooth shown by a very short incision (Fig. 5: MC+ac). The pecten epipharyngis has smaller interstitial teeth (Fig. 4: PE) (a high magnification is needed). It appears that only larvae belonging to the subgenera *Chaetolabis* and *Lobochironomus* have this character, whereas the larvae of *Chironomus* s. str. species have a pecten epipharyngis with equal teeth. Distinguishing characters in the morphology are given in Tab. 5. Erbaeva (1968) gives for *macani* a smaller head width but smaller larvae are known from East European areas.

Tab. 5: *Chironomus (Chaetolabis) macani* and *bitumineus*. Distinguishing morphological characters. Note that not every character could be measured. The given ranges might not show the exact sizes. HW = head width, Abas = basal antennal segment, FI = flagellum, PM = postmentum, IPD = interventromental plate distance, ng = not given, (..) = taken from slide mounted larva

Species	HW μm	Abas length μm	FI length μm	PM length μm	IPD μm
<i>bitumineus</i>	(730)	120–128	60	344–350	48–56
<i>macani</i>	680–720	120–140	75–95	360–390	55–60
<i>macani</i> sensu Erbaeva (1968)	636	ng	ng	299	ng
<i>macani</i> sensu Martin	670	108	64	336	56

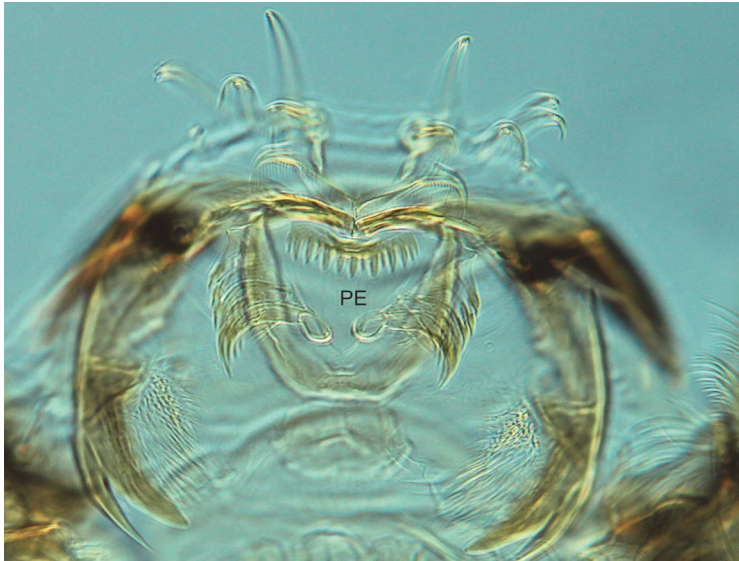


Fig. 4: *Chironomus (Chaetolabis) bitumineus*. Pecten epipharyngis

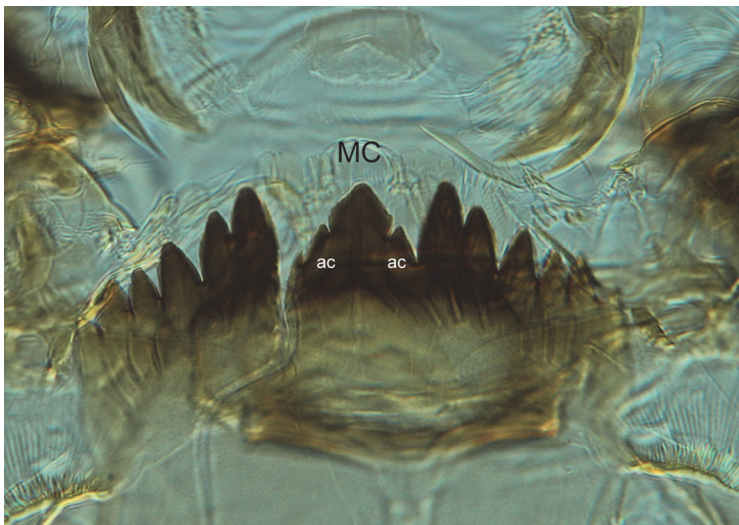


Fig. 5: *Chironomus (Chaetolabis) bitumineus*. Central mental tooth with accessory teeth

### 3 Discussion

The situation concerning the karyotype is unclear: Istomina, Kiknadze and Michailova conclude that *Chironomus macani* belongs to the subgenus *Lobochironomus* from a cytological point of view. Therefore we do not give the description of the karyotype. Rearing from an egg mass will be needed.

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