Lauterbornia 55: 1-22, D-86424 Dinkelscherben, 2005-08-19

Cryptochironomus. An identification key to the larvae and pupal exuviae in Europe

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With 35 figures and 5 tables

Keywords: Cryptochironomus, Diptera, Insecta, The Netherlands, Volga, Russia, Europe morphology, identification, distribution, larva, pupa, exuvia
Schlagwörter: Cryptochironomus, Diptera, Insecta, Niederlande, Wolga, Russland, Europa, Morphologie, Bestimmung, Verbreitung, Larve, Puppe, Exuvie

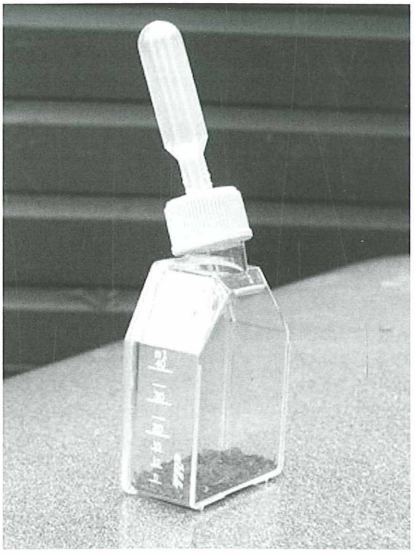
The genus *Cryptochironomus* Kieffer is represented in Europe by about ten species. An illustrated key to the pupal exuviae and larvae is given to the known and suggested species. The autecology unfortunately is little known.

1 Introduction

For the assessment of species specific characters it is necessary to have larvae for which the specific identification is certain. Only by rearing larvae to adults can this be achieved. Some years ago we began collecting larvae and rearing them to adult. When successful, this provides the adult and the pupal and larval exuviae. The pupal exuviae enable accurate identifications using the keys of Langton (1991) and Langton & Visser (2003). (The pupal exuviae of *Cryptochironomus defectus* (Kieffer) was not included in the earlier key, but as a result of our rearing program, has been included in the 2003 one.) The adults of *Cryptochironomus* are very difficult to separate. Morozova has also investigated the larvae cytologically. When all instars of all species have been obtained, it will be possible to make a full revision of the genus; Morozova has embarked on this. In the meantime, the interpretation of the species is that of Langton & Visser (2003).

2 Method used for rearing larvae

For rearing larvae, Vallenduuk used small polystyrene culture boxes with a ventilation cap. If placed the right way up as shown in the photograph, the measurements are: bottom 47x27mm, height 65mm. In the cap there is a hole made for putting in a Pasteur pipette, which is cut off. If the adult flies to the light, it will be captured in the top of the pipette. Now it is easy to collect the adult by pinching the "neck" and pouring some alcohol into the pipette.



If the adult does not fly into the pipette, some tissue soaked in ethyl acetate is put in the pipette. In this case the cap has to be closed tightly.

In a single culture box only one larva is placed. On the bottom was put some material from the collection site, and the box filled with water also from the site. Prepupae are best, for they do not eat and the adult emerges in a few days. The larvae were not fed.

Every day the cultures were checked. *Cryptochironomus* adults usually fly to the tops of the pipettes. The larvae build cases from small grains of sand. Pupation occurs in the bottom of the box. The pupal exuviae always float on the water surface. Usually it was possible to find the larval exuviae in the water or still in the pupal case.

3 Taxonomy

The family Chironomidae is usually divided into eight subfamilies. The genus *Cryptochironomus* belongs to the subfamily Chironominae and to the tribe Chironomini.

The first descriptions of species that are now in the genus *Cryptochironomus* are from Kieffer, Walker, Harnisch and Pagast. The descriptions are very incomplete and are virtually unusable: the few characters used differ from description to description. Despite some later authors (e.g. Shilova 1966, Reiss 1968) providing additional characters, it is important to produce new descriptions. The adults obtained from the rearing program will be used for comparison with type species.

Based on the interpretation of Langton in Langton (1991) and Langton & Visser (2003) we think the following species exist (Tab. 1). We primarily used in the list the taxonomy of Ashe & Cranston (1990).

The larvae as well as the pupal exuviae of the *Cryptochironomus ussouriensis* differ greatly from all other species of the genus. It appears justifiable to place this species in another genus or a separate subgenus. For the time being it is retained in the genus *Cryptochironomus*.

Tab. 1: The species of the genus *Cryptochironomus* Kieffer, 1918. * = exuviae, obtained by rearing larva(e)

Species	Ashe & Cranston (1990)	Langton (1991) Pe	Vallenduuk rearing larva	Literature
albofasciatus (Staeger, 1839)	+	+ *		
crassiforceps Goetghebuer, 1931				Shilova (1966) Pankratova (1983)
defectus (Kieffer, 1913)				
denticulatus (Goetghebuer, 1921)				
obreptans (Walker, 1856)				
psittacinus (Meigen, 1830)				
redekei (Kruseman, 1933)				
rostratus Kieffer, 1921				
supplicans (Meigen, 1830)				
ussouriensis (Goetghebuer, 1933)				Shilova (1959), Pankratova (1983), Kiknadze et al. (1991)

4 European distribution of *Cryptochironomus* (Tab. 2)

There is little known about the distribution of the species in The Netherlands and other European countries, because it has not been possible to identify the larvae and information is only slowly accruing using pupal exuviae. For the purpose of this paper we can use only the data from pupal exuviae. Because the species *defectus* and *supplicans* both run to *supplicans* in Langton's 1991 key; prior to the publication of Langton & Visser's 2003 key these two species were recorded under the one name, *supplicans*.

Tab. 2: Distribution of *Cryptochironomus*

Species	Ashe & Cranston (1990)	Klink & Moller-Pillot Netherlands	Number of localities Netherlands
albofasciatus	Europe	+	?1
crassiforceps	Caspian Sea		
defectus	Europe		20
denticulatus	Europe		
obreptans	Europe		71
psittacinus	Europe, Nearctic		23
redekei	Europe, Asia		14
rostratus	Europe, Asia		13
supplicans	Europe, Asia		16
supplicans/defectus*			77
ussouriensis	Eastern-Europe		

*Identifications of *supplicans* pupal exuviae and pupae can belong to both species.

5 Ecology of European *Cryptochironomus*

The genus *Cryptochironomus* is widespread over a great part of the world. The larvae occur in various water types. All species dwell in the upper part of the water body, seldom being found on hard substrata near the bottom. They prefer sandy substrata with some detritus and fine organic material. They do not occur between dense vegetation. When the depth of detritus increases, the larvae move out. When the depth becomes too great, eggs are no longer laid there. The presence of their food, Oligochaeta and Chironomidae, seems to be the most important factor. Lenz thinks they are partly predators (based on Luferov 1958), because the presence of detritus in the gut. It appears that all species require a good oxygen level and clear water. Regularly more than one species is found at the same site. These are vague generalisations: clearly, further investigation is needed to determine the ecology of each species.

The larvae occur in many different water types. They seldom occur in waters with the pH lower than 5,0. They probably need an oxygenpercentage of at least 40 %. For The Netherlands, in the rivers Rhine, Lek, IJssel and Waal, the common species is *C. rostratus*, though *C. defectus* does occur. In the faster flowing river Meuse *Cryptochironomus* species have not yet been found. In the delta region, close to the North Sea, and in sites with sand bottoms, lakes, watercourses and canals, mostly *C. defectus*, *C. obreptans* and *C. supplicans* occur. In pools, smaller lakes, ponds and "wiels" the species *C. psittacinus* and *C. redekei* may occur. We have found that they do not occur in waters with dense vegetation and seldom in waters with a peat bottom. They seldom occur in narrow ditches (less than 3 meters) nor in temporary waters. Crypochironomus species are rare in brackish or humic waters; they are found in oligo-/mesotroph as well as in eutrophic or oligo- and mesosaprobic waters.

6 Key to the larvae of the genus *Cryptochironomus*

In contrast with many chironomids the larvae of *Cryptochironomus* are easy to recognise when collecting: the body blood red in colour, with a comparatively small, posteriorly swollen, orange-coloured head. The larvae often move by strong wiggling. They lose their red colour in alcohol; the head is usually held backwards; the body stretched and rather stiff.

Methods and terminology

The length and the width of the head can best be measured by placing the larvae dorsoventrally on a slide. In this position the width can be measured (ensure that the head is fully submerged in the alcohol). For making the head transparent lactic acid is recommended: a solution of one part lactic acid with three parts of 70 % alcohol works well. For making detailed measurements, the larva is best placed on a slide with coverslips placed alongside to the height of the head before a coverslip is placed on top. More alcohol may be added with a pipette to keep the animal submerged.

The distance between the two S3 setae is best taken with the head dorsal side uppermost.

Terms, which are used in the key

The terminology is based on Sæther (1980) and Cranston & Reiss (1983). Some new terms are here proposed.

A1 = first antennal segment

Antenna, first segment length = from base to end of sclerotized ring

IC index = head width divided by its length

LMP = total length from tip of midmental tooth to the ventral edge of the postoccipital margin (Fig. 1)

Mandible length must be made with the mandible dissected from the head.

S3-S3 = distance between the two S3 setae (Fig. 2)

S3/A1 index = S3-S3 divided by the length of the first antennal segment (Fig. 2)

VmP length = length of the ventromental plate from the anterior to the posterior border (Fig. 4)

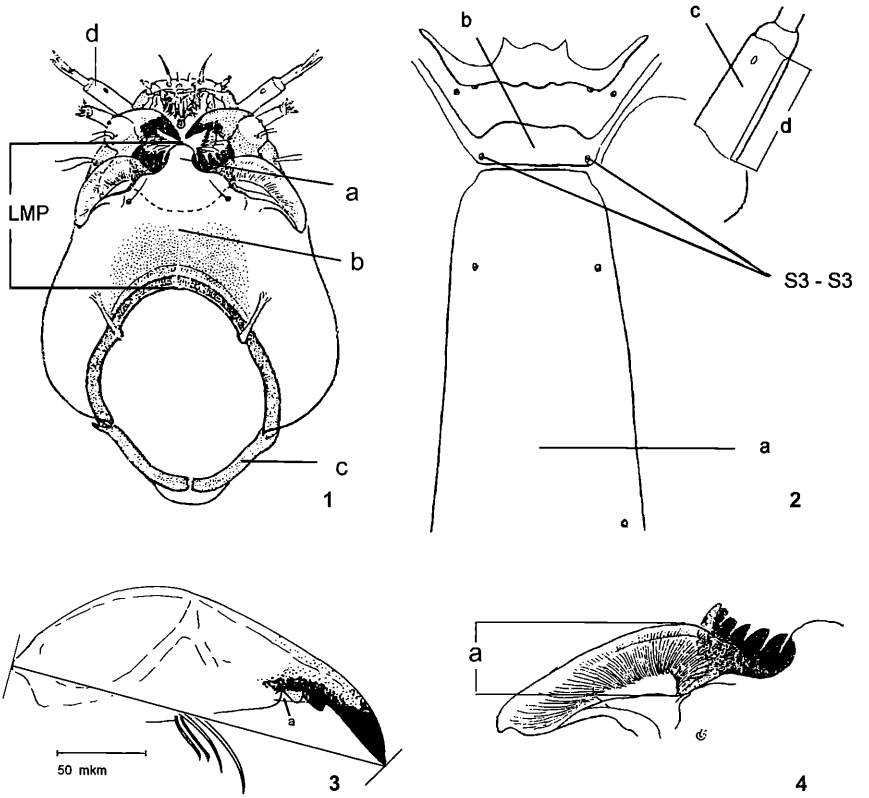


Fig. 1: ***Cryptochironomus obreptans.*** **Head ventral. a = mentum, b = gula, c = postoccipital margin, d = antenna (from Kiknadze et al. (1991)**
Fig. 2: ***Cryptochironomus*** **spec. Head dorsal, frontal apotome and labral sclerites. a = frontal apotome, b = labral sclerite 1, c = antenna, first segment (A1), d = measuring A1 length (Morozova)**
Fig. 3: ***Cryptochironomus psittacinus.*** **Mandible with SSd (a) and mandible length (Vallenduuk)**
Fig. 4: ***Cryptochironomus obreptans.*** **a = ventromental plate (VmP) length (after Kiknadze et al. 1991)**

Key to the instar III or IV (Tab. 3)

The key is based on characters observed in instar IV larvae. Only larvae in this instar are identifiable with certainty; prepupal larvae, with obviously swollen thorax, are reliably instar IV. If instar III is not recognised, the identification will be wrong in many cases.

1 Gula with obvious pigmentation **2**
Gula with at most indistinct pigmentation **3**

2 Body length 6,5 mm or more. Head width (380)410-504 µm
C. *obreptans* and C. *supplicans*, instar IV
Body length less than 6,5 mm. Head width 280-340 µm
C. *obreptans* and C. *supplicans*, instar III

3 Body length 7,5 mm or more **instar IV**
Body length less than 7,5 mm **4**

4 Head length 520 µm or more **instar IV**
Head length less than 520 µm **C. *rostratus*, C. *denticulatus* instar IV**
sometimes C. *defectus*, instar IV
all other species instar III (see key to the instar IV)

Tab. 3: *Cryptochironomus*. Pigmentation of gula and measurements of larvae with a body length less than 7,5 mm and a head length less than 520 µm

species	instar	pigmentation gula	Total length (mm)	Head length (µm)	Head width (µm)
psittacinus	III		6,0	500	400
defectus	IV		7,0	496	355
redekei	III		6,5	480	320
redekei	III		6,5	480	320
rostratus	IV		?	460	320
rostratus	IV			450	320
redekei	III		7,1	450	310
redekei	III		7,1	450	310
psittacinus	III		5,5	440	360
obreptans	?IV		6,2	418	308
obreptans	?III		6,5	352	286
obreptans	III		5,8	340	260
obreptans	III		6,1	330	?
defectus	III		5,0	320	240
obreptans	III		6,0	310	?
obreptans	III		4,7	280	240
defectus	III		4,1	240	320

Key to the instar IV-larvae

With this key it is not possible to identify *C. albofasciatus* or *C. crassiforceps*: no larvae were available and no data were found in the literature. The measurements of larvae from The Netherlands often differ from those from Russia. In the key these are amalgamated, in table 5 they are kept separate.

Ensure that the larva is instar IV – see the preceding key to instar III and IV.

1 Midmental tooth not pigmented (Fig. 5). Last lateral tooth of mentum ending much higher than first lateral tooth. Midmental tooth without incisions 2

Midmental tooth completely pigmented (Fig. 7). Lateral teeth of mentum horizontally placed. Midmental tooth with incisions (known only from Russia) *ussouriensis*

2 Gula with pigmentation (Fig. 9). The pigmentation often reaches to about half the length of the gula, but can also be a small spot in front of the postoccipital margin (Fig. 1c). Postoccipital margin ventrally as pigmented as the teeth of the mandible. Head length 530-680 μm 3

Gula without any sign of pigmentation (Fig. 10). Postoccipital margin in most of the cases completely pale or dark-yellow; if with dark ventral pigmentation than the head length nearly always 800 μm or more. (Once larvae of *C. psittacinus* were collected with a head length of 600 and 620 μm. In such cases use the table with measurements -see Tab. 5, p. 17) 4

3 *obreptans* **and** *supplicans*

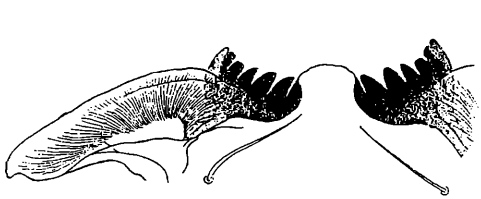
Both species are very difficult to separate. We found the following differences: however the values overlap greatly

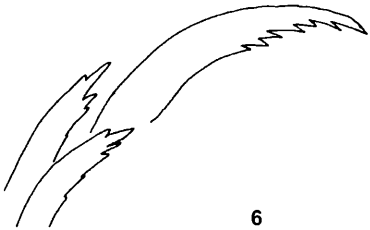
a S3-S3 (Fig. 2) 45-75 μm. S3/A1-index (Fig. 2); mean: 0,66 (see table below). Moderately long claws of anterior parapods with relatively blunt teeth (Fig. 8) *obreptans*

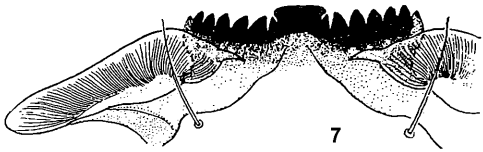
b S3-S3 (Fig. 2) 60-86 μm. S3/A1-index (Fig. 2); mean: 0,92 (see table below). Moderately long claws of anterior parapods with relatively sharp teeth (Fig. 6) *supplicans*

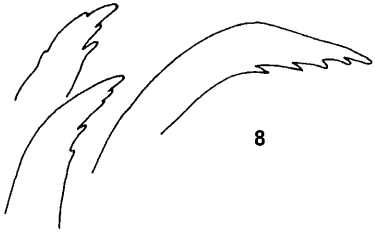
Tab. 4: Measurements of *C. obreptans* and *C. supplicans*

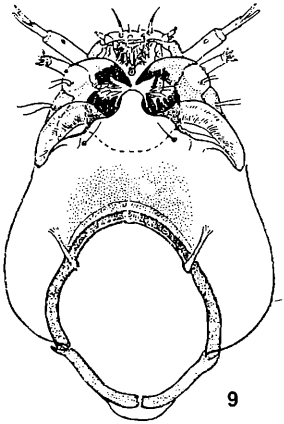
		Antenna 1 (μm)	S3-S3 (μm)	S3/A1 Index	n	LMP (μm)	n
obreptans	range	78-105	45-75	0,53-0,79	25	210-260	15
	mean	94	62	0,66		235	
	stdev	9	7	0,10		9	
supplicans	range	70-90	60-80	0,76-1,04	28	200-238	13
	mean	80	74	0,92		223	
	stdev	8	8	0,08		9	











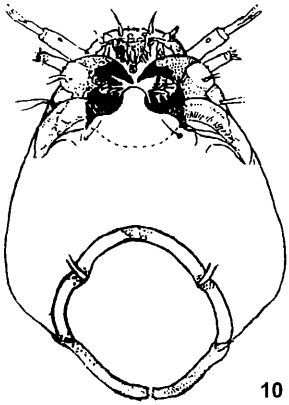


Fig. 5: ***Cryptochironomus obreptans.*** **Mentum (from Kiknadze et al. 1991)**
Fig. 6: ***C. supplicans.*** **Moderately long claws of anterior parapods (Morozova)**
Fig. 7: ***C. ussouriensis.*** **Mentum (from Kiknadze et al. 1991)**
Fig. 8: ***C. obreptans.*** **Moderately long claws of anterior parapods (Morozova)**
Fig. 9: ***C. obreptans.*** **Head ventral with pigmentation (from Kiknadze et al. 1991)**
Fig. 10: ***C. defectus.*** **Head ventral without pigmentation (Morozova)**

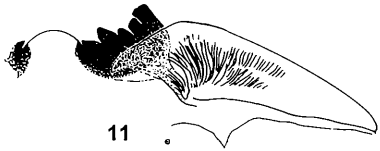
4 Head length 395-635 μm. Head width 265-435 μm **5**
Head length (600) 800-925 μm. Head width 530-720 μm *7*

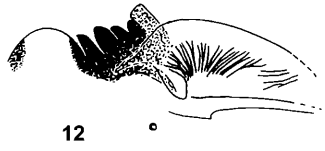
5 LMP (Fig. 1) 180-240 μm. VmP length (Fig. 4) 45-63 μm (larvae from The Netherlands: 53-63). Head length 475-635 μm. VmP striae reaching the anterior border of the ventromental plate (Fig. 11) (species occurs in stagnant, sometimes slow flowing, waters) ***defectus***
LMP (Fig. 1) 135-170 μm. VmP length (Fig. 4) 35-50 μm (larvae from The Netherlands: 48-50). Head length 395-460(?) μm. VmP striae at most reaching ¾ the length of the ventromental plate (Fig. 12); species occur in running waters **6**

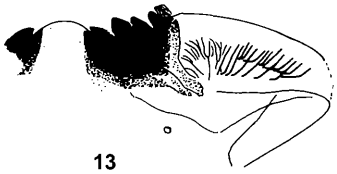
6 Fourth lateral tooth of mentum lower than the fifth tooth (Fig. 12). LMP 135-170 μm. VmP striae rather close along each other (Fig. 12). Head length 395-460 μm. Head width 265-325 μm. Antennal segment 2 and 3 about equally long. SSd (Fig. 3) reaches till the top of the first lateral tooth (species occur only in rivers) ***rostratus***
Fourth lateral tooth of mentum equally high as the fifth tooth (Fig. 13). LMP 150 μm. VmP striae relatively coarse and widely separated; some lines converge to one line (Fig. 13). Head length unknown. Head width ?380 μm. Antennal segment 2 shorter than segment 3. SSd (Fig. 3) reaches to ¾ of the second lateral tooth (species occurs in brooks, very rare) ***denticulatus***

7 Postoccipital margin ventrally pale or darkish yellow. Head length (680)800-900 μm. LMP (Fig. 1) 330-360 μm. VmP length 70-75 μm. Mandible length 225-270 μm (Fig. 15) ***redekei***
Postoccipital margin ventrally pigmented, as dark as the mandible teeth. Head length 600-820 μm. LMP (Fig. 1) 238-250 μm. VmP length 55-65 μm. Mandible length ± 215 μm (Fig. 14) ***psittacinus***

Tab. 5: *Cryptochironomus* larvae. Important characters and measurements: look p. 17







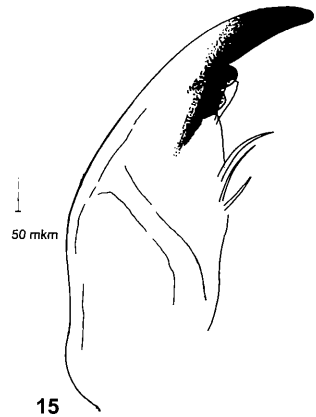


Fig. 11: ***Cryptochironomus defectus.*** **Mentum with ventromental plate (Vallenduuk)**
Fig. 12: ***C. rostratus.*** **Mentum with ventromental plate (Vallenduuk)**
Fig. 13: ***C. denticulatus.*** **Mentum with ventromental plate (Vallenduuk)**
Fig. 14: ***C. pslttacinus.*** **Mandible (Vallenduuk)**
Fig. 15: ***C. redekei.*** **Mandible (Vallenduuk)**

7 Key for pupal exuviae of *Cryptochironomus*

Introduction

The pupal exuviae of the genus are easily distinguished from other genera. The key is based mainly on Langton (1991). In most cases we were able to use our own material through collection from the water surface or by rearing larvae to adults. The terminology is based on Sæther (1980) and Langton (1991).

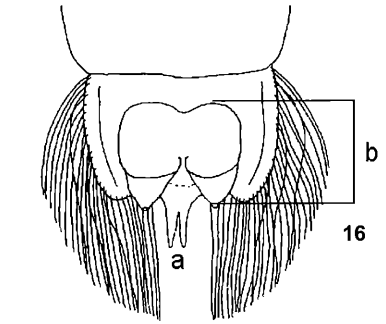
Methods

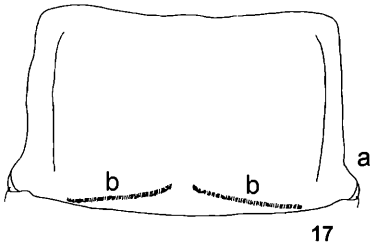
The exuviae are put into a small Petri dish with 70 % alcohol. Identification is possible with magnifications of 40-100x. If higher magnification is required, one can mount the exuviae in alcohol on a slide.

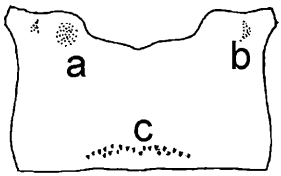
A distinct character for *Cryptochironomus*, except for *C. ussouriensis*, is the forked anal processus between the anal lobes. In most species the cephalic tubercles are hooked, making accurate measurements of them difficult. The segments have a dorsal plate, the tergite, and a ventral plate, the sternite.

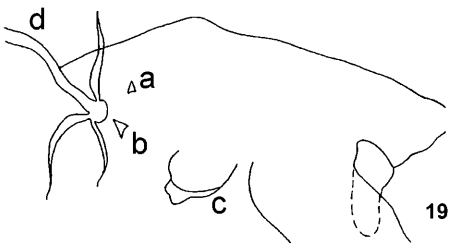
Terminolgy

Anal lobe (Fig. 16)
Anal process (Fig. 16a)
Cephalic tubercle (Fig. 20)
Dorsal anterior thoracic mound (Fig. 19a)
Dorsal posterior thoracic mound (Fig. 19c)
Genital sac (Fig. 16b)
Hook row on tergite II (Fig. 17b)
Pedes spurii B (Fig. 17a)
Thoracic horn (Fig. 19d)
Thorax (Fig. 19)
Ventral anterior thoracic mound (Fig. 19b)
Morozova found larvae in Russia (Saratov) which look very like *Cryptochironomus redekei* in all instars, but might belong to a new species. More about this in the revision of the genus *Cryptochironomus* by Morozova (in preparation).









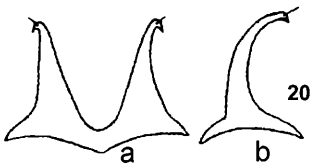


Fig. 16: ***Cryptochironomus defectus.*** **Anal lobe (female). a = forked anal process, b = genital sac (length) (Morozova)**
Fig. 17: ***C. defectus.*** **Tergite II. a = pedes spurii B (PSB), B = hook row (Morozova)**
Fig. 18: ***C. obreptans.*** **Sternite I. a = anterior hump, b = antero-lateral hump, c = posterior point row (Morozova**
Fig. 19: ***C. obreptans.*** **Thorax. a = dorsal anterior mound, b = ventral anterior mound, c = posterior mound, d = thoracic horn without setae (Morozova)**
Fig. 20: ***C. obreptans.*** **Cephalic tubercles. a = dorsal view, b = lateral view (Morozova)**

Key to the exuviae

1 Hook row on tergite II with a gap (Fig. 23). The anal process is forked (Fig. 16). Thoracic horn has a main stem and 3-4 additional bundles of branched filaments **2**

Hook row on tergite II is complete (Fig. 21). The anal process is triangular (Fig. 22). Thoracic horn comprises a main stem and a single bundle of branched filaments ***ussouriensis***

2 Tergites generally without reticulation (Fig. 23) **3**

Tergites with a fine (Fig. 24) or thick (Fig. 25) reticulation **6**

3 Thorax with only a ventral anterior mound (Fig. 26) **4**

Thorax with a dorsal and ventral anterior mound (Fig. 27) ***obreptans***

4 Pedes spurii B present (Fig. 23). Exuviae brownish-yellow. Granulation on the anterior cephalothorax relatively small, at most 8 μm*d* ***defectus***

Note: This species is very similar to *albofasciatus* and *supplicans*

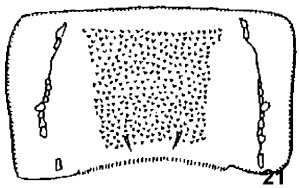
Pedes spurii B absent. Exuviae yellow or golden-yellow. Granulation on the anterior cephalothorax relatively large, 10 μm or more **5**

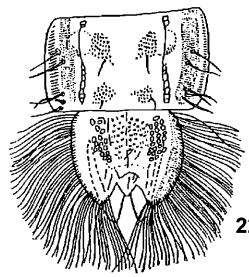
5 ***albofasciatus* and *supplicans***

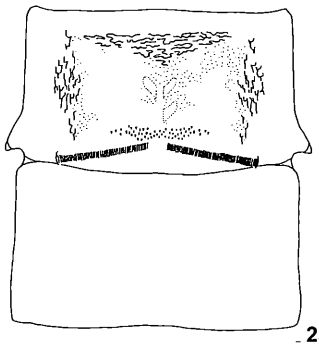
Both species are difficult to identify because they vary so much. Further characters are needed

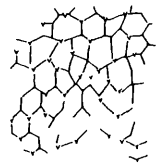
a Cephalic tubercle at the apex mostly straight, its length 180-255 mm (Fig. 28). Gap of the hook row 55-135 μm (Fig. 30). Gap in hook row half the length of hook row at one side or more. Granulation on the anterior cephalothorax crowded and forming ridges on the antepronotum ***albofasciatus***

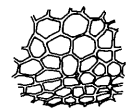
b Cephalic tubercle mostly hooked (sometimes straight) at the apex, its length 275-515 μm (Fig. 29). Gap of the hook row 20-90 mm (Fig. 31). Gap in hook row much less than half the length of hook row at one side. Granulation on the anterior cephalothorax widely separated ***supplicans***

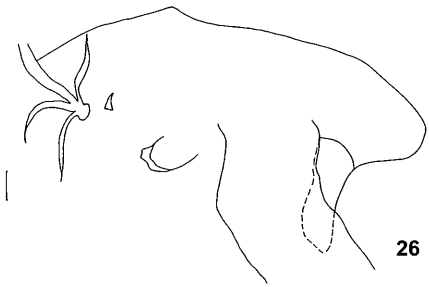












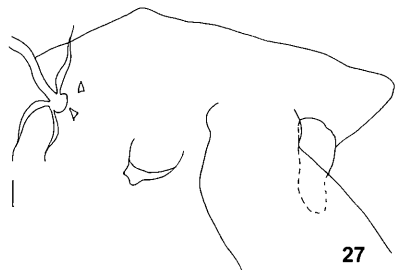


Fig. 21: ***Cryptochironomus ussouriensis.*** **Tergite II (Shilova 1959, Pankratova 1983)**
Fig. 22: ***C. ussouriensis.*** **Tergite VIII and anal lobe (Shilova 1959, Pankratova 1983)**
Fig. 23: ***C. defectus.*** **Tergites II, III (Morozova)**
Fig. 24: ***C.*** **Pe1. Reticulation on tergite IV (Langton 1991)**
Fig. 25: ***C. psittacinus.*** **Reticulation on tergite IV (Langton 1991)**
Fig. 26: ***C. supplicans.*** **Thorax (Morozova)**
Fig. 27: ***C. obreptans.*** **Thorax (Morozova)**
Fig. 28: ***C. albofasciatus.*** **Cephalic tubercles (Morozova)**
Fig. 29: ***C. supplicans.*** **Cephalic tubercules (Langton 1991)**

6 Reticulation thick (Fig. 25). Pedes spurii B without groups of small points. (Fig. 33) 7
Reticulation very fine (Fig. 24). Pedes spurii B with groups of small points (Fig. 32). (Gap in the hook row about the same length as the length of a single half row. Reticulation on tergites I-VI, less clear on VII and VIII, with small points) *denticulatus*

7 Pedes spurii B present. Gap in the hook row is equal in length or even longer than the length of a single half row (Fig. 33) 8
Pedes spurii B absent. Gap in the hook row does not exceed the length of a single half row (Fig. 34) 9

8 Points of posterior tansverse row on tergites I-VII are yellowish-brown. Walls of the reticulation without points (as in Fig. 25) *rostratus*
Points of posterior tansverse row on tergites I-VII are dark brown to black. Walls of the reticulation with small points (Fig. 35) *crassiforceps*

9 Reticulation complete on tergites I-VI, partial on VII and VIII. Posterior thoracic mound mostly with two swellings *redekei*
Reticulation complete on tergites I-V, partial on VI. Posterior thoracic mound always with one swelling *psittacinus*

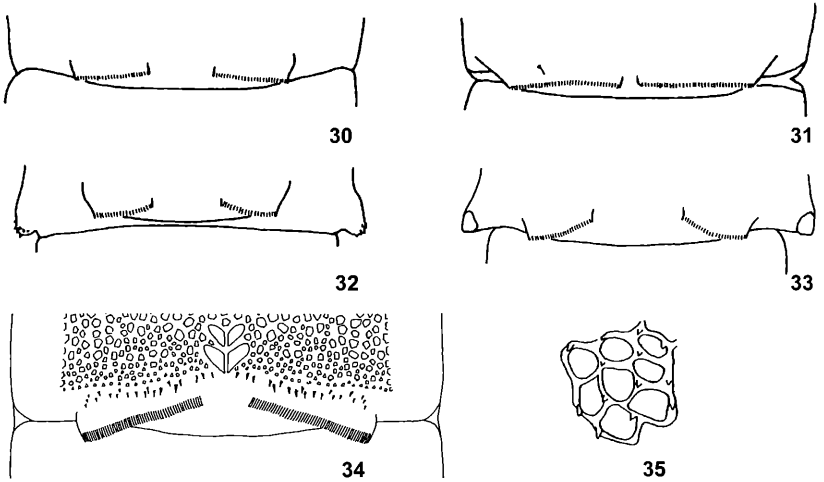


Fig. 30: *Cryptochironomus albofasciatus*. Hook row of tergite II (Langton 1991)
Fig. 31: *C. supplicans*. Hook row of tergite II (Langton 1991)
Fig. 32: *C. denticulatus*. Tergite II, PSB with points (Langton 1991)
Fig. 33: *C. rostratus*. Hook row on tergite II (Langton 1991)
Fig. 34: *C. redekei*. Hook row on tergite II (Morozova)
Fig. 35: *C. crassiforceps*. Reticulation on tergite III (Shilova 1966, Pankratova 1983)

Tab. 5: *Cryptochironomus* larvae. Important characters and measurements from species in The Netherlands (NL), Russia (RUS) and Great Britain (GB).
Gula pigm. = pigmentation of gula absent/present; Po.ma.pigm. = pigmentation of the postoccipital margin ventrally: + as dark as mandible teeth; - unpigmented . IC = index of head (headwidth divided by its length); VmPL = length of ventromental plate (Fig. 4); LMP = length total mentum from top of midmental tooth to end of postoccipital margin (Fig. 1); A1 = length of first antennal segment; S3-S3 = distance between both S3 (Fig. 2); S3/A1 = index: S3-S3 divided by the length of first antennal segment; Mand.L = length of mandible. n = number of specimens measured; empty cell = unknown

Species	country	Gula pigm.	Po.ma. pigm.	Body length mm	n	Head length µm	n	Head width µm	n	IC index	n	continued below
albofasciatus	NL											
	RUS											
obreptans	NL			8,0-13,0	9	570-680	14	410-480	14	0,68-0,78	9	
	RUS			8,0-10,5	10	560-650	10	390-475	10	0,68-0,76	10	
supplicans	NL			11,5-12,4	2	530-650	10	350-460	27	0,66-0,76	10	
	RUS			8,0-10,5	10	560-625	10	410-450	10	0,70-0,77	10	
defectus	NL			6,5-12,5	18	480-635	28	310-435	27	0,62-0,75	25	
	RUS			7,0-9,2	10	475-550	10	315-370	10	0,62-0,70	10	
rostratus	NL					430-460	6	290-320	6	0,68-0,71	6	
	RUS			6,4-8,3	8	395-455	8	265-325	8	0,64-0,72	8	
denticulatus	GB			?		?		? 380	1	?		
psittacinus	NL					(620)-820	2	530 (? 720)	2	0,85-0,87	2	
	RUS			10,0-11,7	5	600-685	5	460-510	5	0,74-0,76	5	
redekei	NL			11-15,1	10	(680) 750-900	13	530-630	13	0,68-0,80	11	
	RUS			12,2-14	2	850	2	575-600	2	0,68-0,71	2	
crassiforceps	RUS											
ussouriensis	RUS		+	13-15	4							

continued		VmPL µm	n	LMP µm	n	A1 µm	n	S3-S3 µm	n	S3/A1 index	n	Mand.L µm	n
albofasciatus	NL												
	RUS												
obreptans	NL	60-65	5	230-250	6	78-90	5	60-65	4	0,72-0,78	4	185-200	5
	RUS	55-65	10	210-260	10	70-105	20	45-75	20	0,53-0,79	20		
supplicans	NL	63	3	215-238	7	(60)70-85	24	70-86	5	0,90-1,06	5	190-200	3
	RUS	55-60	10	200-235	10	75-90	19	60-80	19	0,76-0,99	19		
defectus	NL	53-63	20	180-240	16	73-88	19	45-50	8	0,53-0,59	8	150-190	12
	RUS	45-55	10	180-200	10	70-75	10	35-40	10	0,47-0,53	10		
rostratus	NL	48-50	4	163-170	6	53-58	6					135-150	4
	RUS	35-45	8	135-160	8	55-60	8	35-40	8	0,58-0,66	8		
denticulatus	GB	45	1	150	1	60	1	42	1	0,70	1	145	1
psittacinus	NL	55-60	2	238-240	2	75	2	? 65	1	0,86	1	215	1
	RUS	55-65	5	240-250	5	80-85	5	60-65	5	0,71-0,76	5		
redekei	NL	70-75	9	330-360	9	75-90	10	95-97	5	1,05-1,18	5	225-270	5
	RUS	75	2	330-345	2	85-90	2	95	2	1,05-1,12	2	225	2
crassiforceps	RUS												
ussouriensis	RUS	75-80	4	350-370	4	90-100	4	100-105	2	1,0-1,11	2	250-260	4

8 Supplementary notes to the European species of *Cryptochironomus* with particular reference to The Netherlands and the Volga region of Russia

Cryptochironomus albofasciatus (Staeger, 1839)

Langton reports that this species corresponds to *albofasciatus* of Edwards (1929), Reiss (1968) and Pinder (1978) and *defectus* of Shilova (1966)

Shilova (1966) gives characters for the adult, but not for the pupal exuviae; Pankratova (1983) gives a description of the exuviae. There are some doubts as to whether their identification is correct. Here, the characters given by Langton & Visser (2003) have been adopted. So far the authors have not reared larvae which gave such pupal exuviae.

Cryptochironomus crassiforceps Goetghebuer, 1931

Distribution: Caspian Sea region. The species is unlikely to occur in Western Europe. The larvae are unknown.

Cryptochironomus defectus (Kieffer, 1913)

The pupal exuviae are nearly identical to those of *C. supplicans*. However, the larvae more resemble those of *C. rostratus*.

In The Netherlands the larvae occur in many water types, such as waters in cities, watercourses and pools. The substratum is always sandy mixed with some detritus and fine organic material. *C. defectus* is often found with *C. obreptans* and *C. supplicans*. Together with *C. rostratus*, *C. defectus* also occurs in slow flowing parts of rivers. Within the genus a common species.

Cryptochironomus denticulatus (Goetghebuer, 1921)

This species has until now been known only from England (information Dr. P. Langton). However, Ashe & Cranston (1990) mention Belgium (Virton) and England. Klink (pers. comm.) reports this species from the Meuse at Hastière (Belgium).

Cryptochironomus obreptans (Walker, 1856)

The pupal exuviae are easily distinguished from those of the other species. Recognizing the larvae, on the other hand, is rather difficult. They are very like those of *C. supplicans*. Regularly both species are found at the same sites, often with *C. defectus*.

In The Netherlands they occur in many water types, such as waters in cities, watercourses, borders of canals and pools. The habitats always have sandy sub-

strata mixed with some detritus and fine organic material. Pupal exuviae have also occurred in large rivers. Within the genus a common species.

Cryptochironomus psittacinus **Meigen (1830)**

Within the genus a large species. The pupal exuviae are easy to distinguish from *C. redekei*, but that is not so with the larvae. Shilova (1966) and Langton (1991) give characters for this species, but the descriptions differ. Langton's interpretation is followed here.

This species is known from deep infiltration waters as well as from shallow pools. Within the genus an uncommon species.

Cryptochironomus redekei **(Kruseman, 1933)**

Within the genus a large species. The pupal exuviae are easily distinguished from those of *C. psittacinus*, but that is not so with the larvae. Shilova (1966) and Langton (1991) give characters for this species, but the descriptions differ. Langton's interpretation is followed here.

Although this species has been found once by the authors together with *C. psittacinus*, that would appear to be a rare exception.

Adults and pupal exuviae are known from larger shallow pools. Vallenduuk collected also larvae in shallow pools. However there are larvae collected in a deep infiltration water. Within the genus a rare species.

Cryptochironomus rostratus **Kieffer, 1921**

For identification of this species we used the characters of Langton (1991). Shilova mentioned pupae from Uzbekistan (Russia) and gave a drawing with differing reticulation. That material is unfortunately lost.

In The Netherlands this species is found at several locations on the river Waal. Pupal exuviae are regularly found in the rivers Rhine and IJssel; once from the river Meuse. The larvae are always found in slow flowing parts, the substratum containing detritus and some fine organic material. Within the genus a rather common species.

Cryptochironomus supplicans **(Meigen, 1830)**

The pupal exuviae of this species are easily confused with those of *C. defectus*. The larvae of both species, however, are easily distinguished. Larvae of *C. supplicans* and *C. obreptans* differ very little. Shilova (1966) and Langton (1991) give characters for this species, but the descriptions differ. Langton's determination is here followed. Nevertheless the cephalic tubercles depicted (Fig.13 and 14) by Langton (1991) differ from our material.

In comparison with *C. defectus* this species is found much less frequently, though both species regularly occur at the same sites. Pupal exuviae are known also from the rivers IJssel and Meuse. In The Netherlands the species is found in many water types. Within the genus a common species, perhaps less common than *C. obreptans*.

Cryptochironomus ussouriensis (Goetghebuer, 1933)

Only known from Russia. It is not to be expected in western Europe.

Acknowledgements

We wish to thank Dr. H. M .P. Moller Pillot, Tilburg/NL for helpful comments. With pleasure we want to thank Dr. P. Langton for his co-operation.

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Received: 2004-08-25