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A faunistic review of the chironomids of Neusiedler See (Austria) with the description of a new pupal exuviae

(Insecta: Diptera: Chironomidae)

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Abstract

This paper presents a review on the faunistics of the Chironomidae of Neusiedler See, a shallow, alkaline and turbid lake. It sums up all relevant information on this family provided by several benthological studies since the 1930s. In total at least 72 species have been recorded from Neusiedler See. *Glyptotendipes salinus* MICHAILOVA is newly recorded from Austria. Most species live in the reed belt or within the periphyton of submerged macrophytes. The number of sediment dwelling species is rather low, which is probably due to the extreme chemical and physical conditions of Neusiedler See. Many species reported from Neusiedler See are known to be euryecious, especially as regards eutrophy or salinity.

One pupal exuvia could not be assigned to any known species. It is described and briefly discussed as *Cricotopus* (*Isocladius*) sp. 2.

Key words: Chironomidae, Neusiedler See, Austria, fauna, ecology, *Cricotopus*, pupal exuvia, description.

Zusammenfassung

Diese Arbeit bietet einen Überblick über die Faunistik der Chironomiden des Neusiedler Sees, eines durch hohe Alkalinität und Trübe gekennzeichneten Flachsees. Sie faßt eine Reihe von Arbeiten über die benthische Lebensgemeinschaft des Neusiedler Sees seit den 30er Jahren zusammen. Es sind insgesamt 72 Chironomidenarten vom Neusiedler See bekannt. Eine von ihnen, *Glyptotendipes salinus* MICHAILOVA, ist zum ersten Mal für Österreich nachgewiesen. Die meisten Arten leben im Schilfgürtel des Sees oder im Aufwuchs submerser Makrophyten. Die Anzahl der sedimentbewohnenden Arten ist relativ gering, was wahrscheinlich auf die extremen chemischen und physikalischen Bedingungen im Neusiedler See zurückzuführen ist. Viele Arten des Neusiedler Sees sind aus der Literatur als euryök hinsichtlich Trophie und Salinität bekannt.

Eine Puppenexuvie konnte keiner bekannten Art zugeordnet werden. Sie wird als *Cricotopus* (*Isocladius*) sp. 2 beschrieben und ihre taxonomische Stellung diskutiert.

Introduction

Neusiedler See is the largest lake in Austria and is situated at the border with Hungary. It is one of the greatest wetlands in Central Europe and has been a topic of limnological research for many decades. On 24 April 1994 the southern part of Neusiedler See was declared a national park by the Austrian government.

The first record on chironomids from Neusiedler See was that of GEYER & MANN (1939), who found five species (determined by Lenz at genus-level only): *Tanypus* (sub *Pelopia*),

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Procladius, *Chironomus* gr. *plumosus*, *Glyptotendipes* (sub *Phytochironomus*), *Paratanytarsus* gr. *lauterborni*. FINDENEGG (1959, cit. in SCHIEMER 1979) confirms three species: *Chironomus plumosus* L., *Tanypus punctipennis* MEIGEN, and *Procladius* sp.

The first detailed investigation on chironomids was carried out by SCHIEMER & al. (1969) and SCHIEMER (1978, 1979) during the International Biological Programme. It dealt with faunistics, phenology, spatial distribution and production of chironomids and other benthic groups. Since then, only records from light traps from 1986 (det. Contreras-Lichtenberg) have provided some new information.

From 1990 to 1993 the fish community of Neusiedler See was studied in great detail with special respect to trophic relationships (WAIS 1993, HERZIG 1994, HERZIG & al. 1994, MIKSCHI & al. 1996). The benthological study carried out in the framework of this investigation concentrated on chironomids and provided the most recent data on this family (WOLFRAM 1993).

The aim of the present paper is to summarize faunistic informations on Chironomidae of Neusiedler See.

Limnological data on Neusiedler See

Neusiedler See is a large (312 km^2), shallow (Z_{mean} = 1.1 m, Z_{max} = ca. 2 m), meso- to eutrophic lake in Central Europe (Fig. 1). It is surrounded by a broad reed belt, which makes up more than half of the lake area. The extreme shallowness of the lake in combination with strong and frequent wind events leads to erosion of the lake bottom and a high concentration of suspended solids (up to 800 mg dwt l^{-1}). Continuous mixing is also responsible for a highly variable temperature regime. In summer the temperature rises to up to 30 °C, whereas in winter low temperatures around 1 °C prevail over several weeks. Moreover, due to wind action rapid changes in temperature can occur within a few hours. Chemically the lake is characterized by a high alkalinity (7.5 – 14.6 meq l^{-1}) and conductivity (1150 – 2800 µS, 18 °C), which also vary greatly throughout the year. Further information on the hydrology and limnology of Neusiedler See can be found in LÖFFLER (1979).

Sources for the faunistic review

Ten sources contribute to the species list in Tab. 1:

1 The first well-founded data on chironomids are those by SCHIEMER (1978, 1979) from 1967 – 1973. He sampled adult chironomids in emergence traps over sediment and submerged macrophytes (Fig. 1: A, B, C) and larvae with a Gilson corer. The adults were determined by Fittkau and Reiss.

2 A number of species was collected by F. Reiss, who caught swarming males in August 1966 near Neusiedl.

3 During his study on the feeding ecology of adult chironomids, SCHLEE (1977) caught some species near Podersdorf, one of the villages east of Neusiedler See.

4 An appendix in LÖFFLER (1979) lists a number of species that are not mentioned in SCHIEMER (1979). No sampling sites or dates are given.

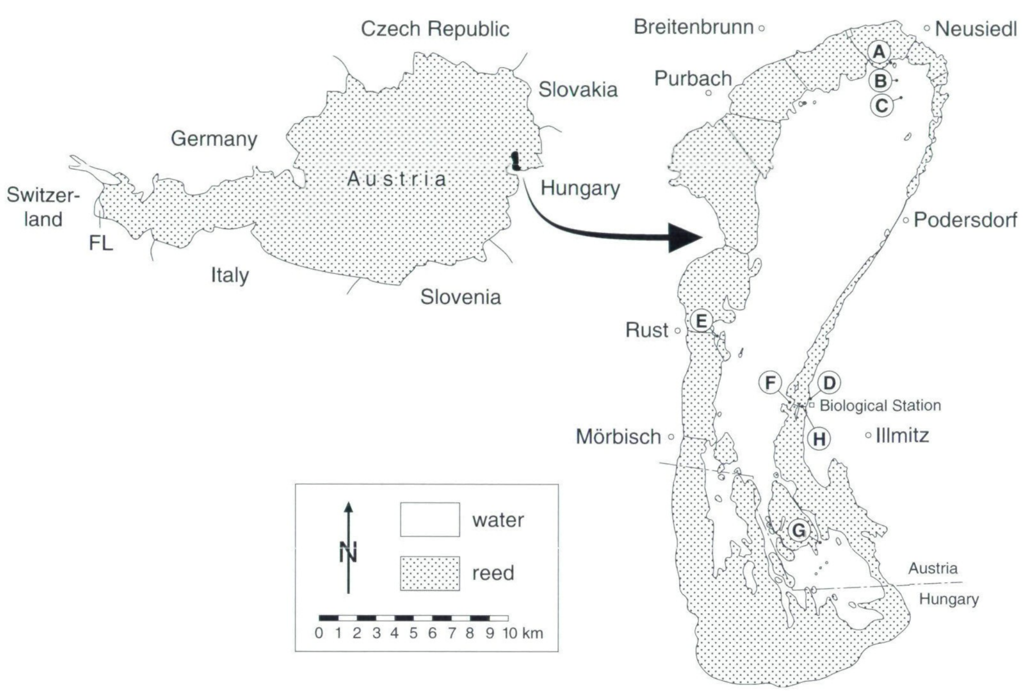


Fig. 1: Map of Neusiedler See. A - H … sampling stations.

5 In 1986 H. Metz used a light trap to catch chironomids which were subsequently identified by R. Contreras-Lichtenberg. The light trap was situated near the biological station in Illmitz (Fig. 1: D). It must be born in mind that the species caught by the light trap may have originated from one of the surrounding ditches or salt pans, and not from the lake itself.

6 - 9 Several sites were sampled during 1990 – 1995 by WOLFRAM (1993, unpubl. data). Chironomids from the sediment (column 6) (Fig. 1: A, B, C, E, F, G) and from periphyton on *Phragmites australis* and *Utricularia* spp. (7) (Fig. 1: H) were identified as larvae. Some of them were reared to pupae or adults. A large number of pupal exuviae (8) was sampled from the surface of a channel within the reed belt (Fig. 1: H), which was partly covered by macrophytes (*Utricularia* spp., *Myriophyllum spicatum*, *Potamogeton pectinatus*, *Najas marina*). A few swarming males (9) were caught near the Biological Station (Fig. 1: D). Some of the pupal exuviae were determined by P. Langton; *Glyptotendipes* species were identified by R. Contreras-Lichtenberg.

10 Anita Wais analyzed the gut contents of several benthivorous fishes from Neusiedler See (WAIS 1993, HERZIG & al. 1994, unpubl. data). The fish were caught in the Bay of Illmitz and in channels within the reed belt near Illmitz as well as in the National Park (Fig. 1: F, H).

An investigation by METZ (1990) dealing with the macrobenthos in the delta of the river Wulka, the main inflow into the lake, is not considered in this study.

Tab. 1: Species list of Chironomidae of Neusiedler See. 1 – 10: sources from literature (see in text).

	1	2	3	4	5	6	7	8	9	10
T a n y p o d i n a e										
Ablabesmyia longistyla FITTKAU, 1962			+	+		+	+	+		+
Ablabesmyia phatta (EGGER, 1863)					+		+	+		+
Ablabesmyia sp.					+					
Guttipelopia guttipennis (VAN DER WULP, 1861)			+	+						
Monopelopia tenuicalcar (KIEFFER, 1918)				+			+	+	+	+
Procladius (*Holotanypus*) *choreus* (MEIGEN, 1804)								+		
Procladius (*Holotanypus*) cf. *crassinervis* (ZETTERSTEDT, 1838)					+					
Procladius sp.	+			+	+	+				+
Procladius zernyi GOETGHEBUER, 1936 nom. dub.					+					
Tanypus kraatzi (KIEFFER, 1912)				+		+		+		+
Tanypus punctipennis (MEIGEN, 1818)	+			+	+	+		+	+	+
Tanypus vilipennis (KIEFFER, 1918)			+							
Xenopelopia falcigera (KIEFFER, 1911)				+						
Xenopelopia cf. *falcigera* (KIEFFER, 1911)								+		
Xenopelopia nigricans (GOETGHEBUER, 1927)				+						
Xenopelopia sp.							+			+
O r t h o c l a d i i n a e										
Acricotopus lucens (ZETTERSTEDT, 1850)				+			+	+		+
Corynoneura lacustris EDWWARDS, 1924								+		
Corynoneura scutellata WINNERTZ, 1846				+						
Corynoneura sp.							+			+
Cricotopus (s. str.) *bicinctus* (MEIGEN, 1818)							+			
Cricotopus (s. str.) *flavocinctus* (KIEFFER, 1924)							+	+		+
Cricotopus (s. str.) sp. 1										+
Cricotopus (*Isocladius*) *intersectus* (STAEGER, 1839)								+		
Cricotopus (*Isocladius*) gr. *intersectus* / *reversus*							+			+
Cricotopus (*Isocladius*) *obnixus* (WALKER, 1856)							+			
Cricotopus (*Isocladius*) *pilitarsis* (ZETTERSTEDT, 1850)			+							
Cricotopus (*Isocladius*) *sylvestris* (FABRICIUS, 1794)				+			+	+	+	+
Cricotopus (*Isocladius*) sp. 2								+		
Hydrobaenus lugubris FRIES, 1830								+		
Hydrobaenus sp.										+
Limnophyes pumilio (HOLMGREN, 1869)								+		
Limnophyes asquamatus ANDERSEN, 1937								+		
Limnophyes sp.								+		+
Nanocladius bicolor (ZETTERSTEDT, 1838)								+		+
Psectrocladius (*Allopsectrocladius*) *platypus* (EDWARDS, 1929)							+			
Psectrocladius (s. str.) *barbimanus* (EDWARDS, 1929)							+	+	+	
Psectrocladius (s. str.) *limbatellus* (HOLMGREN, 1869)								+		
Psectrocladius (s. str.) gr. *limbatellus* / *sordidellus*							+			+
Psectrocladius (s. str.) *psilopterus* KIEFFER, 1906				+						
Psectrocladius (s. str.) *sordidellus* / *ventricosus*								+		
Psectrocladius (s. str.) sp.	+			+	+					
Psectrocladius (s. str.) *ventricosus* KIEFFER, 1925				+						
Pseudosmittia Pe 2 LANGTON, 1991								+		
Pseudosmittia ruttneri STRENZKE & THIENEMANN, 1942			+							
C h i r o n o m i n a e - C h i r o n o m i n i										
Chironomus (*Camptochironomus*) *tentans* (FABRICIUS, 1805)				+	+					
Chironomus (s. str.) *annularius* auct., non DE GEER, 1776					+					
Chironomus (s. str.) *anthracinus* ZETTERSTEDT, 1860					+					

	1	2	3	4	5	6	7	8	9	10
Chironomus (s. str.) *aprilinus* MEIGEN, 1830					+					
Chironomus (s. str.) cf. *inermifrons* GOETGHEBUER, 1921					+					
Chironomus (s. str.) cf. *plumosus* (LINNAEUS, 1758)					+	+				
Chironomus (s. str.) *plumosus* (LINNAEUS, 1758)				+						
Chironomus (s. str.) *riparius* MEIGEN, 1804					+					
Chironomus sp. 1					+					
Chironomus sp. 2					+					
Chironomus sp.			+		+	+		+	+	+
Cladopelma gr. *laccophila*						+				+
Cladopelma virescens (MEIGEN, 1818)	+			+				+		
Cryptochironomus obreptans (WALKER, 1856)								+		
Cryptochironomus redekei (KRUSEMAN, 1933)					+			+		
Cryptochironomus sp.			+			+				+
Cryptochironomus tricolor KIEFFER, 1924 nom. dub.					+					
Cryptotendipes sp.						+				+
Cryptotendipes usmaensis (PAGAST, 1931)	+			+				+		
Dicrotendipes lobiger (KIEFFER, 1921)				+						
Dicrotendipes nervosus (STAEGER, 1839)	+			+	+	+	+	+		+
Einfeldia pectoralis KIEFFER, 1924 nom. dub.					+					
Einfeldia wiedemanni (GOETGHEBUER, 1931) nom. dub.					+					
Endochironomus albipennis (MEIGEN, 1830)								+		
Glyptotendipes barbipes (STAEGER, 1839)				+	+			+		
Glyptotendipes glaucus (MEIGEN, 1818)							+	+		
Glyptotendipes gripekoveni (KIEFFER, 1913)				+			+	+		
Glyptotendipes imbecillis (WALKER, 1856)								+		
Glyptotendipes pallens (MEIGEN, 1804)					+		+	+		
Glyptotendipes salinus MICHAILOVA, 1987								+		
Glyptotendipes sp.				+			+			+
Harnischia curtilamellata (MALLOCH, 1915)	+			+				+		
Harnischia sp.						+				+
Microchironomus tener (KIEFFER, 1918)	+			+		+		+		+
Parachironomus arcuatus (GOETGHEBUER, 1919)	+			+	+			+		
Parachironomus gr. *arcuatus*						+	+			+
Polypedilum (s. str.) *nubeculosum* (MEIGEN, 1804)	+			+	+			+	+	
Polypedilum (s. str.) gr. *nubeculosum*						+				+
Polypedilum (*Pentapedilum*) *sordens* (van DER WULP, 1874)					+		+	+		
Synendotendipes impar (WALKER, 1856)				+						
Xenochironomus xenolabis KIEFFER, 1916					+		+	+		+
Chironominae - Tanytarsini										
Cladotanytarsus atridorsum KIEFFER, 1924								+		
Cladotanytarsus lepidocalcar KRÜGER, 1938								+		+
Cladotanytarsus mancus (WALKER, 1856)			+							
Cladotanytarsus gr. *mancus*						+				+
Paratanytarsus inopertus (WALKER, 1856)	+			+		+	+	+	+	+
Paratanytarsus intricatus GOETGHEBUER, 1921			+	+						
Paratanytarsus cf. *intricatus* GOETGHEBUER, 1921							+			+
Paratanytarsus ex gr. *lauterborni*				+						
Paratanytarsus sp. 2										+
Stempellina almi BRUNDIN, 1947			+					+		
Stempellina gr. *bausei*						+				+
Tanytarsus mendax KIEFFER, 1925								+		
Tanytarsus sp.							+			+
Tanytarsus usmaensis PAGAST, 1931								+		
Tanytarsus verralli GOETGHEBUER, 1928								+		

Results and Discussion

Taxonomy

All chironomid species known from Neusiedler See are listed in Tab. 1. Four species found by Dr. Contreras-Lichtenberg in light traps, viz. *Procladius zernyi* GOETGHEBUER, *Cryptochironomus tricolor* KIEFFER, *Einfeldia pectoralis* KIEFFER, and *Einfeldia wiedemanni* (GOETGHEBUER), are considered as nomina dubia by ASHE & CRANSTON (1990). It is interesting to note that the type locality of *P. zernyi* is cited as "Burgenland (Austria)". No detailed specification is given, but it may be assumed that the exact type locality of this species is Neusiedler See.

Cricotopus (s. str.) sp. 1 was found in the gut of bream. As the head capsules of the species were severely worn, the determination at species level was impossible. However, *C.* sp. 1 was clearly distinguishable from *Cricotopus* (s. str.) *flavocinctus* (KIEFFER) and *C.* (s. str.) *bicinctus* (MEIGEN). *Cricotopus* (*Isocladius*) sp. 2 is represented by a small number of pupal exuviae. It is a true *Isocladius* species, but lacks a thoracic horn. A description of the pupal exuviae is given below.

The genus *Glyptotendipes* is respresented by at least five species (det. R. Contreras-Lichtenberg, P. Langton). The occurrence of a sixth one, *G. salinus* MICHAILOVA, is unsure as only a single pupal exuviae has been found (det. P. Langton). Future findings must be confirmed by cytological analyses.

Paratanytarsus sp. 2 was found in the gut of some eels. It is characterized by a high number of teeth on the pecten labralis and resembles in this respect *P.* spec. 1 in KLINK (1983).

Faunistics

A total number of 101 chironomid taxa with at least 72 species has been recorded from Neusiedler See (Those species that are considered as nomina dubia by ASHE & CRANSTON (1990) are ignored). Compared to other thoroughly investigated standing waters in Austria such as Bodensee (REISS 1968) or Gebhartsteich (JANECEK 1985) the number of chironomids recorded from Neusiedler See is not very high. This is partly due to the extreme chemical and physical conditions. However, it is likely that more species will be found if more habitats, especially within the reed belt, are sampled.

The Chironomidae are represented by three subfamilies. The Chironominae dominate with 56 taxa (at least 39 species, 55.4 %), followed by the Orthocladiinae with 29 taxa (22 species, 28.7 %). The latter subfamily is restricted to the periphyton of reed and submerged macrophytes. Tanypodinae contribute with 16 taxa (11 species) or 15.8 % only, but dominate in terms of abundance and biomass in the open lake area (WOLFRAM 1996).

According to ASHE & CRANSTON (1990) more than 30 species from Neusiedler See are not known from Austria. This must be corrected on the basis of increased faunistic work in Austria in recent years (e.g. JANECEK 1985, SCHMID 1987). In fact, only one species can be truly considered to be new for Austria: *Glyptotendipes salinus*. This species was described from Bulgaria (MICHAILOVA 1987). Up to now, it is known only from the type locality and from a brackish lake near Odessa/Russia (Michailova, pers. comm.). However, recently *G. salinus* has turned up also in The Netherlands (Langton, pers. comm.). The finding of *G. salinus* in Neusiedler See is the first record from Central Europe. However, as mentioned above, only one single pupal exuviae has been found. Thus, the determination remains unsure.

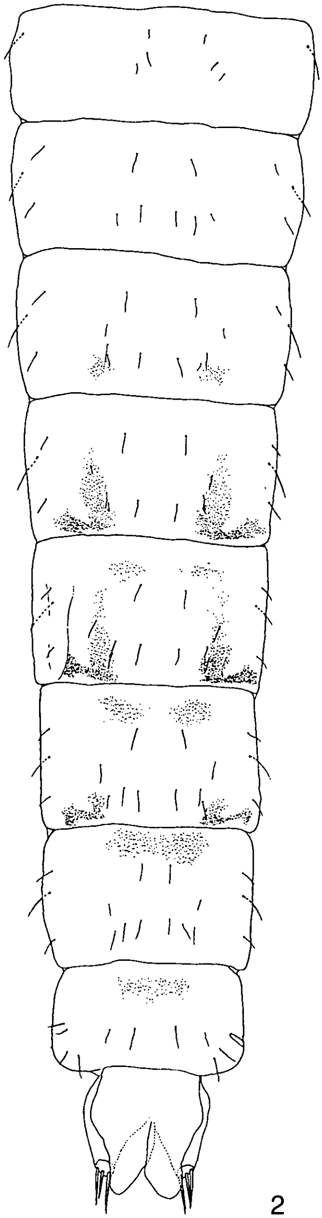
Stempellina almi BRUNDIN is one of five species of the genus occurring in the Palaearctic (ASHE & CRANSTON 1990). Since its description by BRUNDIN (1947) it has been found rather rarely. According to ASHE & CRANSTON (1990) it is known from Sweden, Finland, Russia, and Algeria. Several records came from flowing waters, viz. the River Sok in Russia (Moller Pillot, pers. comm.), the River Thames (LANGTON 1991, sub *Stempellina* Pe 1), and the River Rhine (Reiss, pers. comm.). Some further records came from an artificial pond and the Pelhamer See, respectively, in Bavaria (Reiss, pers. comm.). The only records from Austria I am aware of are those of Reiss (pers. comm.) and SCHLEE (1977), who both caught a large number of swarming males from Neusiedler See in summer 1966 and 1969, respectively.

Ecology

The number of species inhabiting the open lake area is rather low (16), whereas a greater number can be found on periphyton of reed and submerged macrophytes. Obviously only a minority can tolerate the unfavourable conditions in the open lake. It is characterized by an unstable sediment, high turbidity due to continuous mixing (WOLFRAM 1993), and a high predator pressure by benthivorous fish (WAIS 1993, HERZIG & al. 1994).

Most chironomid species from Neusiedler See can be considered to be tolerant of eutrophy and organic pollution. SÆTHER (1979) and BAYERISCHES LANDESAMT FÜR WASSERWIRTSCHAFT (1992) list a number of littoral chironomid species and their occurrence in lakes of different trophic state. According to their results most species from Neusiedler See occur in a wide range of trophically different waters, but dominate in or prefer eutrophic conditions. Thus, based on the benthic fauna, Neusiedler See must be considered eutrophic.

A high proportion of species from Neusiedler See is known also from brackish waters. *Tanypus punctipennis*, the most frequent species in the open water zone, can tolerate oligo- to mesohaline conditions (MOLLER PILLOT & BUSKENS 1990). In only two further lakes it was found as dominant as in Neusiedler See (WOLFRAM 1996), viz. Soap Lake and Lenore Lake, both of which are characterized by a high salinity (LAUER 1963, 1969, cit. in HAMMER 1986). Maybe high conductivity in Neusiedler See compensates for the lack of salt (Langton, pers. comm.). However, neither *T. punctipennis* nor any other chironomid species found in Neusiedler See can be considered truly halobiont or at least halophil. One exception could be *Glyptotendipes salinus*, a species that up to now has been recorded from brackish habitats only (MICHAILOVA 1987, pers. comm.). However, it must be born in mind that the single pupal exuviae of *G. salinus* could also have been introduced from one of the salt pans east of Neusiedler See. The conductivity in these small pools reaches values up to 10000 µS, which would suit much more *G. salinus*. Several other species typical for saline waters have been found in these salt pans, such as *Berosus* sp. (Coleoptera) and *Microchironomus deribae* (FREEM.).



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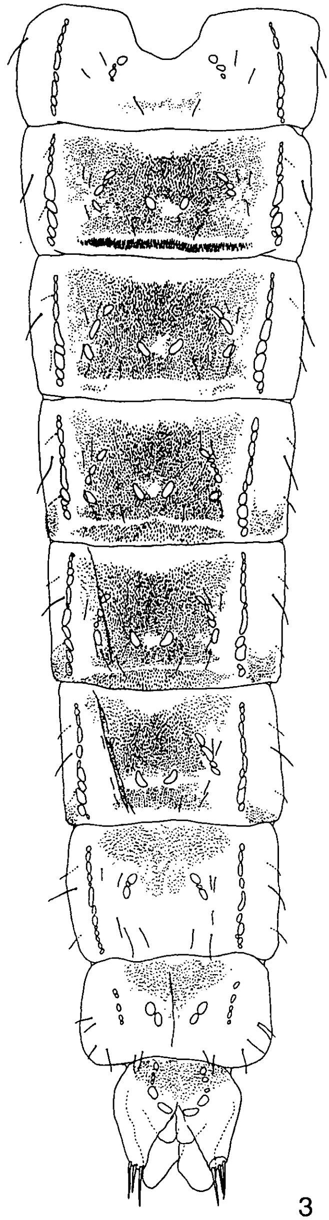

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Figs. 2 - 3: *Cricotopus* (*Isocladius*) sp. 2, male pupal exuviae, (2) tergites, (3) sternites.

Description of *Cricotopus* (*Isocladius*) sp. 2

Length: ca. 5 mm.

Colour: Thorax and abdominal segments colourless.

Cephalothorax: Median antepronotals 2, lateral antepronotal 1, precorneals 3, dorsocentrals 4 in two pairs, prealar 1; frontal setae between antennal bases. Thoracic horn lacking. Thorax smooth, suture margin slightly wrinkled.

Abdomen: Tergites (Fig. 2). Tergite I with or without a few scattered points on posterior margin; anterior and median transverse bands of points present on tergites II – VI, completely fused on tergites II – V, more or less separated on tergite VI; anterior shagreen present on tergites VII – IX; two rows of hooks posteriorly on tergite II, number of hooks: 87 – 206 (mean = 148, n = 5); apical spinule bands present on tergites III – VI, on tergite III the spinules may be partly reduced to small, faint blotches, number of spines of apical band on tergite III: 42 – 170 (mean = 87, n = 5).

Sternites (Fig. 3). Paired posterior patches of points present on sternites III – VI, partly spreading anteriorly; sternites V – VIII with anterior area of fine shagreen.

Pedes spurii B lacking.

Abdominal setation:

	I	II	III	IV	V	VI	VII	VIII
D	3	4	5	5	5	5	5	2
V	3	4	5	5	5	5	5	2
L	1	3	3	3	3	3	3	4

D_4-setae of tergite VIII well separated from L-setae, L_4 of segment VIII equal to the other L-setae.

Anal macrosetae straight, colourless, Ø 1 – 1.5 µm, length 87 – 149 µm (mean = 121 µm, n = 5), less than ½ of anal lobe length.

Comments of the taxonomic status of this pupal exuviae

The pupal exuviae characterized above has not previously been described by HIRVENOJA (1973) or LANGTON (1991). It can be identified as *Isocladius* by the combination of the following characters: frontal setae between antennal bases, anal macrosetae equally strong, shagreen of tergites III – V uniform, not separated in two patches, D1 of segment VIII clearly separated from lateral setae, all lateral setae of segment VIII equally thick.

Cricotopus (*Isocladius*) sp. 2 can be distinguished from other species within the subgenus *Isocladius* by the lack of the thoracic horn and the reduction of the apical spinule band of segment III to narrow, faint blotches. Up to now, there is not known any other *Isocladius* species that lacks a thoracic horn.

At the moment it is uncertain whether the described exuviae represents a new taxon or an unknown pupal stage of a known species. Furthermore, it is difficult to assign it with certainty to any of the known species groups. Due to the arrangement of the dorsal setae it is likely not to represent a member of the *C. sylvestris*-group. The lack of pedes spurii B on segments II or III could suggest that it belongs to the *C. laricomalis*- or *C. obnixus*-group. In one respect this species resembles *Cricotopus* (*Isocladius*) Pe 5 described by LANGTON (1991): in both species the apical band of tergite III is reduced to blotches on the cuticle. However, it is uncertain whether this character represents an extreme reduction in a species usually with fully developed apical point band (Langton, pers. comm.). Despite this similarity the two species cannot be the same, because, in addition to the lack of a thoracic horn, the armament of tergite II is much stronger in sp. 2 than in Pe 5.

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