

Taxonomic notes on
***Cricotopus levantinus* Moubayed & Hirvenoja**
and *Limnophyes gelasinus* Sæther
[Diptera, Chironomidae]

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Taxonomic notes on *Cricotopus levantinus* Moubayed & Hirvenoja, and *Limnophyes gelasinus* Sæther are given with comments on their ecology and geographical distribution. *C. levantinus occidentalis* subsp. nov. and *L. gelasinus* are described from Algeria and south-eastern France as male imagines and pupal exuviae.

Note taxonomique sur *Cricotopus levantinus* Moubayed & Hirvenoja et *Limnophyes gelasinus* Sæther [Diptera, Chironomidae]

Mots-clés : Chironomidae, *Cricotopus levantinus*, ssp. n., *Limnophyes gelasinus*, Algérie, France.

La taxinomie de *Cricotopus levantinus* Moubayed & Hirvenoja et *Limnophyes gelasinus* Sæther, est précisée, et complétée par des commentaires sur leur écologie et leur distribution géographique. L'imago mâle et l'exuvie nymphale de *C. levantinus occidentalis* ssp. n. et de *L. gelasinus* sont décrites à partir d'un matériel collecté en Algérie et dans le Sud-Est de la France.

1. Introduction

Recent extensive investigations of permanent and temporary lowland streams in Algeria and south-eastern Continental France produced a few male pharates and pupal exuviae which belong to a new subspecies of *Cricotopus levantinus* Moubayed & Hirvenoja and to *Limnophyes gelasinus* Sæther. On the basis of this material, the authors provide short descriptions of the male imago and pupal exuviae of the two taxa. Terminology for the imago and pupal exuviae follows that of SÆTHER (1980), LANGTON (1991), and LANGTON & PINDER (2007).

2. Description of *Cricotopus levantinus occidentalis* subsp. nov.

Material

Holotype. ALGERIA: Boubhir Wadi, 22.III.2001, 1 male pharate, leg. Dr. A. Lounaci.

Paratypes. ALGERIA: Boubhir Wadi, 22.III.2001, 1 male and 2 female pupal exuviae, leg. Dr. A. Lounaci. FRANCE: Var department, Réal Collobrier River basin, 24.III.1995, 1 male and 1 female pupal exuviae, leg. Dr. B. Dumont.

Holotype deposited in the National Museum of Ireland, Kildare Street, Dublin 2, Ireland. Paratypes deposited in the collection of the senior author.

Male imago (Figs 1-2)

(n = 1, pharate male)

Male adults of *C. levantinus occidentalis* subsp. nov. (Figs 1-2) can be separated from *C. levantinus levantinus* (Figs 3-4) on the basis of the following main combination of characters as in Table I:

- In general, adults of *C. levantinus occidentalis* are smaller in size;
- AR = greater than 1 (1,1);
- Inferior volsella (gonocoxite lobe) lacking notch on the basal inner margin;
- IX tergite with more than 11 setae (13-14).

Characters	<i>C. levantinus levantinus</i>	<i>C. levantinus occidentalis</i>
Total length of adult, in mm	4,0-4,1	3,0-3,1
Total length of antenna, in μm	870-880	805-815
Last flagellomere, in μm	415-425	385-395
AR	< 1, near 1	> 1, 1,1
N. of setae on tergites II-IV	37, 41, 49	37, 41, 45
Number of setae on anal tergum	about 10,7-11	13-14

Table I. Some main characters selected to separate male adults of *C. levantinus levantinus* from *C. levantinus occidentalis* subsp. nov.

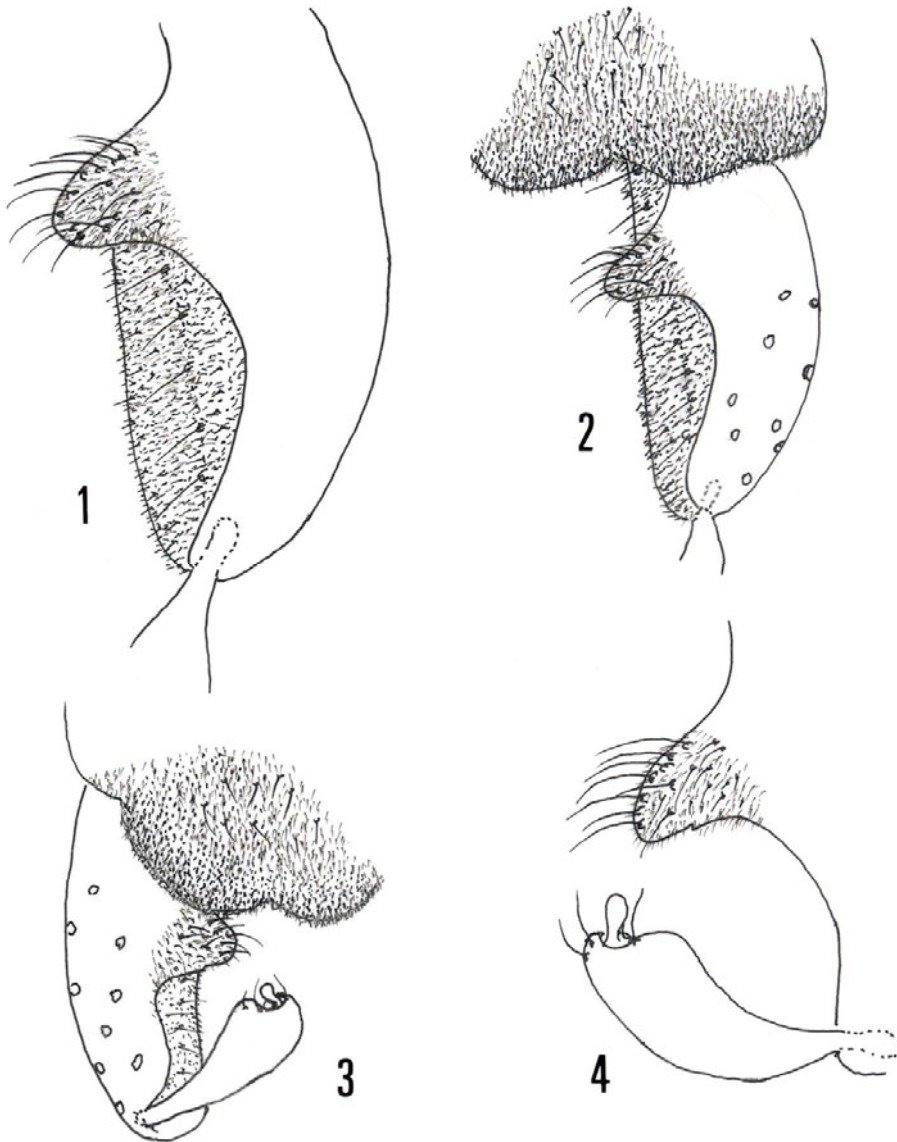
Tableau I. Quelques-uns des principaux caractères retenus pour séparer les adultes mâles de *C. levantinus levantinus* de ceux de *C. levantinus occidentalis* subsp. nov.

Male pupal exuviae

(n = 2)

Male pupal exuviae of *C. levantinus occidentalis* subsp. nov. can be separated from those of *C. levantinus levantinus* Moubayed & Hirvenoja on the basis of the following combination of characters given below and in Table II:

- In general, the pupal exuviae (like the adults) of *C. levantinus occidentalis* are considerably smaller in size than those of *C. levantinus levantinus*;
- Total length of exuviae and total length of abdomen smaller by about 1,0 mm;
- Thoracic horn smaller by about 20 to 35 μm .



Figures 1-4. Male imago of *Cricotopus levantinus* Moubayed & Hirvenoja, 1986.
 Hypopygium of *Cricotopus levantinus occidentalis* subsp. nov., with un-notched inferior volsella (1-2); hypopygium of *C. levantinus levantinus* subsp., with notched inferior volsella (3-4).

Figures 1-4. Imago mâle de *Cricotopus levantinus* Moubayed & Hirvenoja, 1986.
 Hypopyge de *C. levantinus occidentalis* ssp. n., sans encoche sur la volsella inférieure (1-2); hypopyge de *C. levantinus levantinus* ssp., avec une encoche sur la volsella inférieure (3-4).

Main characters	<i>C. levantinus levantinus</i>	<i>C. levantinus occidentalis</i>
Total length, in mm	4,0-4,1	3,0-3,1
Thoracic horn, in μm	95-105	70-75
Length of abdomen, in mm	3,2-3,3	2,80-2,85
Anterior armament of T III-VI, width in μm	III: 425	III: 300
	IV: 375	IV: 275
	V: 360	V: 260
	VI: 350	VI: 215
Posterior armament of T III-VI, width in μm	III: 575	III: 475
	IV: 525	IV: 425
	V: 475	V: 410
	VI: 310	VI: 230

Table II. Some main characters selected to separate pupal exuviae of *C. levantinus levantinus* from *C. levantinus occidentalis* subsp. nov.

Tableau II. Quelques-uns des principaux caractères retenus pour séparer les exuvies nymphales de *C. levantinus levantinus* de *C. levantinus occidentalis* subsp. nov.

Ecology and distribution

The River Orontes (local name River Assi) rises at 1700 m in Lebanon, in the northern inland Bekaa province, and flows in a northerly direction through part of Syria and into the southernmost part of Turkey (MOUBAYED 1986). *C. levantinus* was originally described from lotic habitats (springs and streams) of the River Orontes around the type locality of Hermel (600-650 m) (MOUBAYED & HIRVENOJA 1986). Further records of the species from the upper River Orontes (Zarka, Baalbek and Marj-Hena springs), between 800 and 1700 m, were published in MOUBAYED-BREIL & DIA (2007). All records of the species from Lebanon now refer to the subspecies *C. levantinus levantinus*. Typical localities for larvae and pupae of *C. levantinus levantinus* consist generally of oligotrophic to ultra-oligotrophic habitats: a moderately shady basin with water emerging from rheohelocrene springs, 8-10°C (Zarka, Baalbek and Marj-Hena springs); a high velocity, 75-100 cm/s; a sandy substrate very impoverished of organic litter; and deep water, about 50 to 150 cm. *C. levantinus levantinus* is therefore considered to be a cold stenothermous and rheophilous subspecies which is mainly collected in mountain habitats. Despite extensive investigations made throughout Lebanon, *C. levantinus levantinus* is still unknown and apparently absent from lowland coastal rivers located along the Mediterranean provinces.

C. levantinus occidentalis was collected in both Algeria and southern France and seems to be more or less thermophilous, tolerant of polluted waters and found in sites which are located mainly in the rhithral and potamal of lowland streams near the Mediterranean littoral zone (altitude about 300-400 m).

The species *C. levantinus* has not yet been recorded from rivers located in neighboring areas like Syria and Turkey despite extensive investigations in these two countries (REISS 1985, 1986; CASPERS & REISS 1989).

Remarks

C. levantinus Moubayed & Hirvenoja is separated into two subspecies on the basis of male pharates and pupal exuviae collected in both eastern and western subregions of the Mediterranean. *C. levantinus levantinus* is believed to represent the eastern element in the Mediterranean while *C. levantinus occidentalis* subsp. nov. represents the western one.

LAVILLE & LANGTON (2002) have reported *C. levantinus* from the lowland Tavignano River (altitude 200 m) in Corsica, based on one pupal exuvia. It is not possible to determine with certainty to which of the two subspecies it belongs without re-examining the specimen. However, the ecological and distribution data on both subspecies indicates that it most likely belongs to *C. levantinus occidentalis*. The description and diagnostic characters given in this paper will enable accurate identification of the two subspecies of *C. levantinus*.

3. Description of *Limnophyes gelasinus* Sæther, 1990 (Figs 5-8)

In the following text, a description of the male pupal exuviae with additional morphological features of the male imago are given.

Material

ALGERIA: BoubhirWadi, 22.III.2001, 1 male pharate, leg. Dr. A. Lounaci.

FRANCE: Var department, Réal Collobrier River, 24.V.1995, 1 male pharate, leg. Dr. B. Dumont; Mauret Stream, Réal Collobrier River basin, 23.VI.1994, 1 female pupal exuvia, leg. Dr. B. Dumont.

Male imago (Figs 5-6)

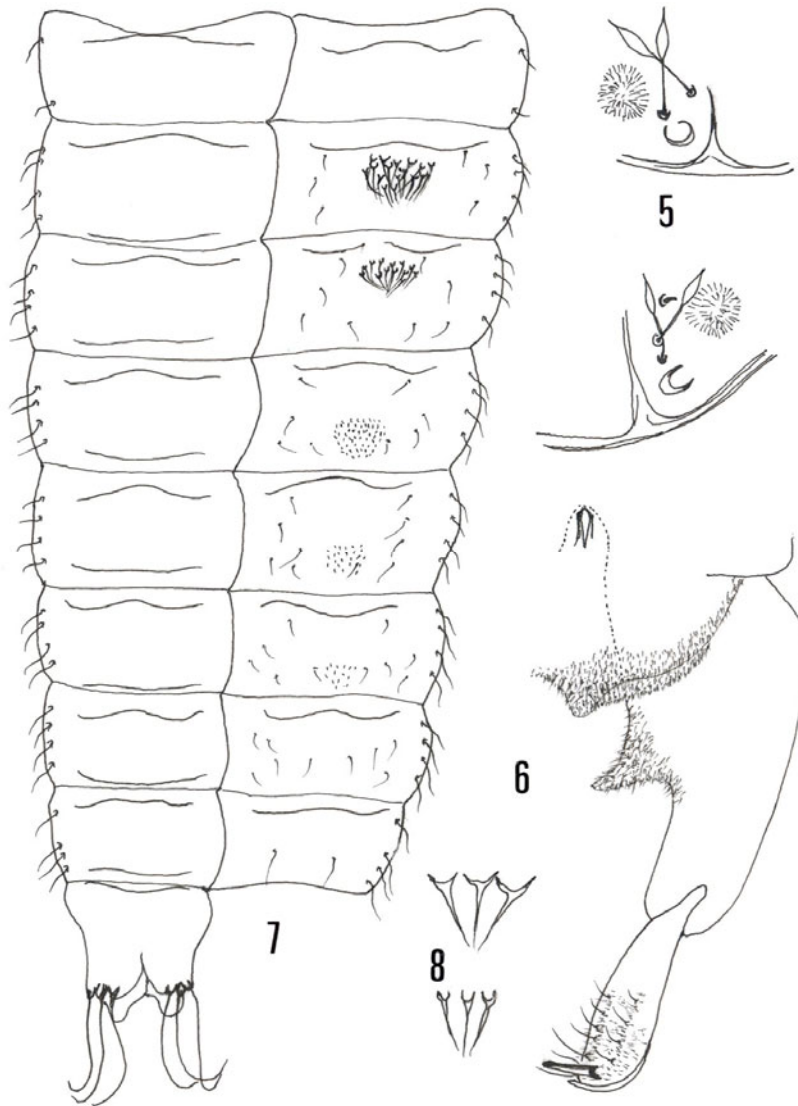
(n = 2, pharate adult males)

Diagnostic characters: the imago of *L. gelasinus* is distinguished by the following combination of characters: its smallest size; its relatively shallow humeral pit; its uniformly elongated lanceolate humeral setae; its single lanceolate prescutellar seta; its projecting and un-notched anal point. A very small species, less than 2 mm long. Total length: 1.95-1.98 mm.

Head. Antenna 11 segmented with distinct division between segments, 575 µm long; AR = 0.80-0.85; last flagellomeres 250-255 µm long. Tentorium 135 µm long, 47 µm wide. Palp segments, 26, 37, 53, 64, 84 µm long.

Thorax. With 2-3 lanceolate setae on humeral pits (Fig. 5). Humeral pit more or less shallow and rounded; lanceolate seta on humeral pit elongated, 41-43 µm long, inserted around its rim; single lanceolate prescutellar seta as long as those on humeral pit. Wing length (measured from arculus to apex), 755 µm long; squama with 3-4 setae.

Hypopygium (Fig. 6); virga, 15-17 µm long; anal point projecting, without apical notch, 12-15 µm long and 18-20 µm wide; entirely pubescent and bearing 10-11 minute setae; gonostylus 65-68 µm long, with 9-10 setae in 2 rows; megaseta, 16-17 µm long, tapered at apex.



Figures 5-8. Male imago and male pupal exuviae of *Limnophyes gelasinus* Sæther, 1990.
 Male imago. Two aspects of humeral area (5); hypopygium (6).
 Male pupal exuviae. Abdominal segments, tergites I-IX (7, left), with chaetotaxy pattern of sternites I-VIII (7, right); shape of spinules on sternites II-III (8), spinules on II (above), spinules on III (below).

Figures 5-8. Imago mâle et exuvie nymphale mâle de *Limnophyes gelasinus* Sæther, 1990.
 Imago mâle. Deux aspects de l'aire humérale (5); hypopyge (6).
 Exuvie nymphale mâle. Segments abdominaux, tergites I-IX (7, à gauche), avec la chaetotaxie des sternites I-VIII (7, à droite); détail des spinules sur les sternites II-III (8), sternite II (en haut), sternite III (en bas).

Pupal exuviae (Figs 7-8)

(n = 3)

Diagnosis: exuviae of *L. gelasinus* can be easily separated from other species on the basis of both the thinness of the lateral setae on abdominal segments and especially the unusual chaetotaxy pattern on sternites II and III which show the presence of more or less circular groups of long and thick spinules medially (Figs 7-8). However, the distribution of the median patch of long spinulae on sternites II-III is similar to those in pupal exuviae of some other orthoclad genera (e.g. *Thienemannia* Kieffer, *Heleniella* Gowin).

The description of the pupal exuviae mainly includes the shape and chaetotaxy armament pattern of the sternites. Pupal exuviae entirely transparent, only the wing sheath and anal segment are faintly brownish. Total length in mm: male exuviae, 1.95-1.98; female exuviae, 1.88. Abdomen length in mm: male exuviae, 1.65-1.68; female exuviae, 1.35. Anal segment (IX): male exuviae, 175-185 μm long, maximum width, 170-175 μm ; female exuviae 135 μm long, maximum width, 145 μm . Genital sac of male exuviae, 130-145 μm long, overreaching tip of anal segment; genital sac of female exuviae, 81 μm long, not overreaching tip of anal segment.

Cephalothorax. Frontal apotome with 2 thin setae, 70-75 μm long; median anteprenotals 67 and 46 μm long; lateral anteprenotal 52 μm long; precorneals close together, 51, 43 and 31 μm long; dorsocentrals well separated, 73, 24, 32 and 18 μm long.

Abdomen. Lateral setae on segments I-VIII noticeably thin, I-II very thin, becoming slightly thicker on segments III-VIII. In general, the armament pattern of tergites I-IX is typical for the genus *Limnophyes*. Spinules on posterior row of tergites II-VIII uniformly thin; longest spinules, 40 to 60 μm long; shortest spinules, 15-25 μm long. Distribution of lateral setae on segments I-VIII: (I)2, (II)3-4, (III-VIII)4. The unusual chaetotaxy pattern of the sternites is represented in Figs 7-8. Sternites II-III with a nearly circular median to apical patch of spinules, as given in SÆTHER (1990, Fig. 25) for the pupal exuviae of *L. minimus* (Meigen) and in LANGTON & MOUBAYED (2001) for *L. inanispatina* Langton & Moubayed. Spinules on sternites II-III stout and thick, thicker and wider at base on sternite II (Fig. 8); longest spinules, 39-43 μm long; shortest spinules, 27-30 μm long.

Ecology and distribution

L. gelasinus was previously known only from North Korea based upon one single male adult (SÆTHER 1990) and was recently included in a species checklist from Russia (Far East) (MAKARCHENKO et al. 2008). The species has been recently reported by MOUBAYED-BREIL et al. (2007) and MOUBAYED-BREIL (2008) from the Mediterranean region, North Africa (Algeria: Wadi Sebaou basin) and south-eastern France (rivers located in regions 9b and 10) base on the material described in this paper. Material from both Algeria and France consists exclusively of male pharates and pupal exuviae which were collected using drift nets and benthic Surber nets.

Rivers located in the Mediterranean region have in common some of the following main characteristics. Some of these are mentioned in GAGNEUR & CHAOUÏ-BOUDGHANE (1991), MOUBAYED et al. (2000):

- presence of temporary springs and streams at both high and low altitude;
- short travel distance of flowing waters;
- rhithral with deep, sinuous and winding gorges;
- potamal zone moderately short and often strongly polluted;

- violent flooding in Spring and Autumn;
- very long period of low water level (with drought for 3 to 6 months);
- in general, habitats of both mountain and littoral zones of rivers are deeply affected by hydrous stress.

To a large extent, Boubhir Wadi (Algeria) becomes entirely dry for about 5 months per year. The survival of aquatic or semiterrestrial organisms in such temporary habitats is related to their biological and ecological capacity to adapt to long lasting desiccation. In southern France, the sampled habitats belong to the epipotamal zone of the karstic basin.

In general, larvae of *Limnophyes* occur in eurytopic hygrophilous habitats which include aquatic, semiterrestrial and terrestrial situations. Localities where pupae of *L. gelasinus* were collected consist of more or less polluted helocrenes, rhithral and potamal including temporary bryocolous, hydropetric and madicolous micro-habitats which are believed to represent the most common and possibly favoured typical habitats for larval populations. About 20 semi-terrestrial and semi-aquatic associated species are recorded from the karstic river basins located in Algeria (Boubhir Wadi) and France (Collobrier River). Among them: *Camptocladius stercorarius* (De Geer), *Cardiocladius fuscus* Kieff., *Chaetocladius perennis* Meig., *Chaetocladius algericus* Moub., *C. melaleucus* (Meig.), *Eukiefferiella gracei* (Edw.), *Hydrobaenus conformis* Holm., *Limnophyes habilis* (Walk.), *L. ninae* Sæther, *L. pentaplastus* (Kieff.), *L. minimus* (Meig.), *L. natalensis* (Goet.), *Parametriocnemus valescurensis* Moub. & Lgt., *P. stylatus* (Kieff.), *Paraphaenocladius impensus* (Walk.), *Paratrissocladius excerptus* (Walk.), *Pseudosmittia trilobata* (Edw.), *Smittia alpicola* Goet., *S. aterrima* Meig., and *S. pratorum* Goet.

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