Hibernal Emergence of Chironomidae in Crimea (Ukraine)

Viktor Baranov[1,2] and Leonard C. Ferrington Jr.[3]
[1]*I.I. Schmalhausen Institute of Zoology , National Academy of Science of Ukraine; Department of General and Applied Entomology; Bohdana Khmelnitskogo st. 15, Kiev, 01601, Ukraine.*
[2]*Department of Zoology and Animal Ecology, V.N. Karazin Kharkiv National University, Svobody sq., 2, 61002, Kharkiv, Ukraine.*
E-mail: baranowiktor@gmail.com

[3]*Department of Entomology, 306 Hodson Hall, University of Minnesota, Saint Paul, MN 55108-6125, USA.*
E-mail: ferri016@umn.edu

Abstract

Twenty-seven species of Chironomidae were detected emerging in the Crimea peninsula during the period from December 2010 to March 2013. Twenty-three are Orthocladiinae and 4 are Chironominae (one Chironomini and three Tanytarsini species). Nine species are recorded for the first time in Crimea. At the genus-level the hibernal emergence in Crimea shows resemblance to the patterns reported for streams in Kansas.

Introduction

Hibernal emergence of Chironomidae in the southern part of Ukraine is nearly unstudied (Baranov 2011a). The only research published on hibernal emergence of Chironomidae was done on a single spring-brook in the Kharkiv city (Sarzhinka tract), where 15 winter-emerging species were recorded (Baranov 2011b). Chironomids from Crimea were also almost unstudied until recently, but new records increased the number of Crimean Chironomidae species to 135 (Baranov 2013).

Because of the climate of the peninsula, with annual average temperatures at the Southern coast ranging from 10.8-13.9 C, and average temperature in January of about 0°C (Pozhachenuk 2009), some of the Crimean aquatic insects possess interesting patterns of emergence in winter (Prokopov 2010). For example, early spring species of Plecoptera occasionally emerge during winter after short periods of warm air temperatures (e.g., *Capnia nigra* (Pictet, 1833) or *Leuctra crimeana* Zhiltzova, 1967). Prokopov (2010) suggested that some species are capable of emerging earlier in winter if air temperatures are higher than average and occur before the spring floods. However, there is no comprehensive data on Chironomidae phenology during winter months across a variety of habitats for Crimea. In this paper we report species, substrate conditions and river zones where species have been collected in winter.

Material and methods

Adults were collected mainly with sweep net. Pupal exuviae were collected with a hand net and drift nets. In total, 17 samples were collected from 12 sites (e.g. Figs 1A, B). In addition, some larvae and pupal exuviae were kindly provided by Mr. Grigoriy Prokopov.

Specimens were preserved in 70% ethanol and then slide-mounted in Euparal using the technique described by Pinder and Langton (2007). Morphological terminology follows Sæther (1980). Specimens were identified using MBS-1 dissecting microscope and American Optics Microstar Series 10A biological microscope. Slide preparations were made according to the method described by Langton and Pinder (2007). All material has been deposited in the collection of the Department of General and Applied Entomology of I. I. Schmalhausen Institute of Zoology, NAS. Species were determined using keys of Langton and Pinder (2007), Giłka (2011), Makarchenko and Makarchenko (2006a, b) and Sæther (1990).

Results

Twenty-seven species of Chironomidae were detected emerging in the Crimea during the period from November 2012 to March 2013 (Table 1). Twenty-three are Orthocladiinae and four are Chironominae (one Chironomini and three Tanytarsini species). The following species are recorded for the first time in Ukraine: *Chaetocladius insolitus* Caspers, 1987*, Eukiefferiella ilkleyensis* (Edwards, 1929)*, Limnophyes pentaplastus* (Kieffer, 1921)*, Limnophyes spinigus* Sæther, 1990*, Orthocladius glabripennis* (Goetghebeuer, 1921)*, Thienemanniella clavicornis* (Kieffer, 1911), *Thienemanniella vittata* (Edwards, 1924) and *Micropsectra apposita* (Walker, 1856).

Table 1. Chironomidae species collected during winter months in the Crimea peninsula. Air temperature on day of collection given as range over 24 hours. Abbreviations used in table: Substrate types, s = sand; m = mud; gr = gravel. River zones, ep-rtr = epyrithral; hyp = hyporythral; rtr = rythral; kren = krenal; mtr = metarythral.

Species	Air temp, C° (range)	Substrate type	River zone
Orthocladiinae			
Acricotopus lucens	6	s-m	mtr
Brillia bifida	-5 – 6	s-m; gr-m	mtr
Bryophaenocladius akiensis	6	s-m	mtr
Bryophaenocladius sp.2	6	s-m	mtr
Chaetocladius insolitus	-5 – 9	s-m; gr-m	kren; mtr
Corynoneura lacustris	6	s-m	mtr
Eukiefferiella claripennis	9	gr-m	kren
Eukiefferiella ilkleyensis	6	s-m	mtr
Heterotrissocladius subpilosus	14	s-m	mtr
Limnophyes minimus	6 – 15	gr-m	mtr; ep-rtr
Limnophyes pentaplastus	9	gr-m	kren
Limnophyes spinigus	5 – 6	gr-m; s-m	mtr
Metriocnemus eurynotus	6 – 15	s-m; gr-m	kren; mtr
Orthocladius sp. 1	5	s-m	mtr
Orthocladius glabripennis	14	s-m	mtr
Orthocladius s.str. sp. 2	6	s-m	mtr
Paracladius conversus	5 – 6	gr-m; s-m	mtr
Parametriocnemus stylatus	6	s-m	mtr
Paraphaenocladius impensus contractus	15	gr-m	mtr
Parorthocladius korneyevi	5 – 9	gr-m; s-m	kren; mtr
Pseudorthocladius sp.1	14	s-m	mtr
Thienemaniella clavicornis	6	s-m	mtr
Thienemaniella vittata	5	s-m	mtr
Chironominae			
Chironomini			
Dicrotendipes nervosus	6	s-m	mtr
Tanytarsini			
Cladotanytarsus atridorsum	14	s-m	mtr
Micropsectra apposita	6 – 12	Gr	kren; ep-rtr
Micropsectra atrofasciata	5 –15	s-m; gr;gr-m	kren; ep-rtr; mtr; hyp-rtr

Species accounts

Acricotopus lucens (Zetterstedt, 1850)

Material: 1♂, Ukraine, Crimea, Bachchisarajskij district near Novopavlivka, Alma River, N44°49.86' E33°58.41', 19.iii.2011, Prokopov, G.

Common Holarctic species. Widespread in Ukraine, recorded for the first time from the Crimea peninsula (Ashe & O'Connor 2012, Baranov 2011b). Ubiquitous species with no special references in literature to hibernal emergence. However, Lindegaard (1995) listed *A. lucens* as possible inhabitant of European springs, and spring species often possess hibernal activity of adults.

Brillia bifida (Kieffer, 1909)

Material: 2♂, 1♀, Ukraine, Crimea, Simferopol, Salgir River, near Tavrida National University, N44°56.41' E34°8.21', 20.ii.2011, Prokopov, G.; 5♂, 2♀, Ukraine, Crimea, Simferopol, Salgir River, near Tavrida National University, N44°56.41' E34°8.21' , 18.i.2013, Baranov, V.; 3♂, Ukraine, Crimea, Simferopolskij district, Western Bulganak River, near Pozharske village, N44°55.92' E33°52.22', 20.i.2013, Baranov, V.

Widespread Palearctic species, previously not re-

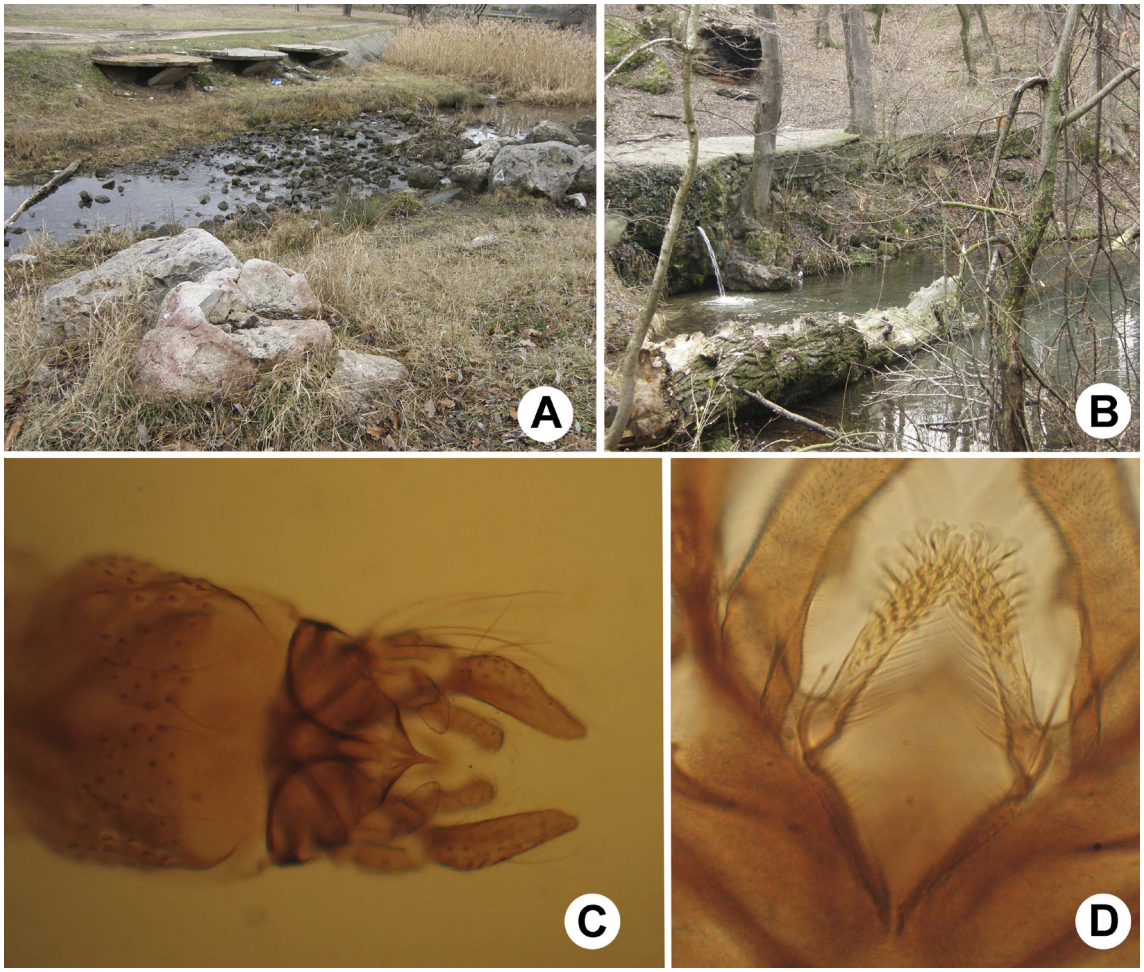

Figure 1. A, B: Sampling localities. A, Salgir river, Simferopil city, 18.01.2013; B, Plachushaja skala tract, Pozharskoe village, 21.01.2013. C, D: *Micropsectra apposita;* C, hypopigium; D, median volsella.

corded from Ukraine (Ashe and O'Connor, 2012, Baranov 2011b). No records of hibernal emergence of this species have been found.

Bryophaenocladius akiensis (Sasa, Shimomura & Matsuo, 1991)

Material: 2♂, Ukraine, Crimea, Bachchisarajskij district, Alma River, near Novopavlivka, N 44°49.86' E 33°58.41', 19.iii.2011, Prokopov, G.

Eastern Palearctic species, recorded from Japan, the Russian Far East and, probably, Madeira. In Ukraine it was recorded in 2010 and 2011 in the mountainous areas of Crimea (Ashe & O'Connor 2012; Baranov 2013 Makarchenko and Makarchenko (2006a, b). In Ukraine this species is characteristically associated with small, cold springs and rivers, occurring in the winter or spring (Baranov 2011c).

Bryophaenocladius sp.2

Material: 1♂, 2♀ Ukraine, Crimea, Bachchisarajskij district, Alma River, near Novopavlivka, N44°49.86' E33°58.41', 19.03.2011, Prokopov, G.

Two females and one male of undetermined *Bryophaenocladius*, collected from dead previous-year vegetation along the river bank.

Chaetocladius insolitus Caspers, 1987

Material: 15♂, 2♀, Ukraine, Crimea, Bachchisarajskij district, Alma River, near Novopavlivka village, N44°49.86' E33°58.41', 19.i.2013, Baranov, V.; 3♂, 5♀, pupa, pupal exuviae, Ukraine, Crimea, Simferopol, Salgir river, near Taurida National University, Simferopol, N44°56.41' E34°8.21', 21.ii.2012; 19.i.2013, Baranov, V.; 10♂ Ukraine, Crimea, Simferopolskij district, Western Bulganak River, near Pozharske village, N44°55.92' E33°52.22', 20.i.2013, Baranov, V.

This is a rare species of west Palearctic non-biting midge (Diptera, Chironomidae), with very strange and distinct male hypopygium (Figs 2A, B), with tergite IX bearing a lamelliform structure, derived from a structure similar to anal tergite bands, and covering the anal point base (Caspers 1987). The

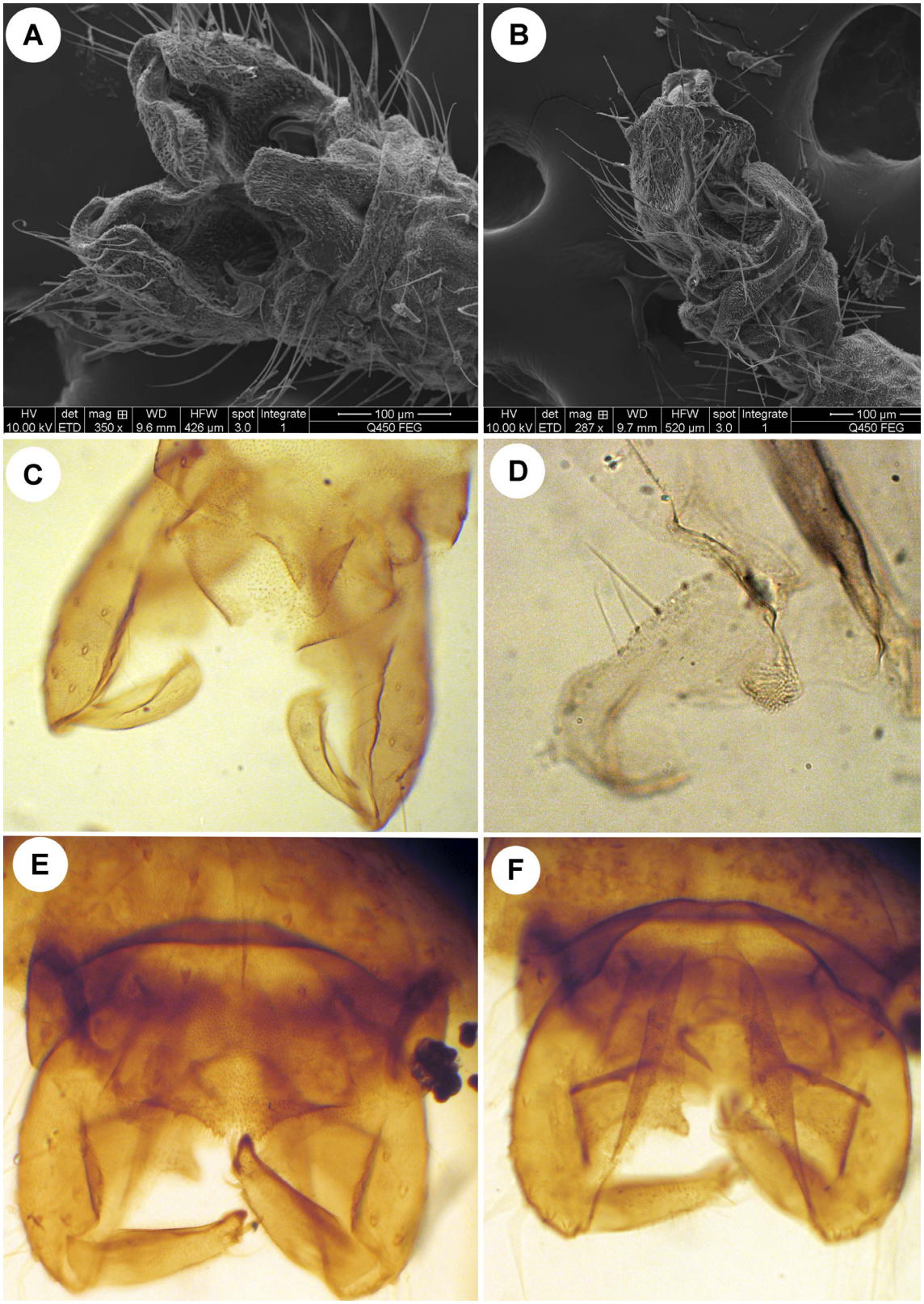

Figure 2. A, B: Scanning electron micrograph of *Chaetocladius insolitus* male hypopygium. C, D: *Paraphenocladius impensus contractus*; C, male hypopygium; D, squama. E, F: *Limnophyes spinigus* hypopygium; E, details of tergite 9; F, details of virga.

species was described from a small stream, near Lunz biological station, Austria, and was previously recorded also from Germany (Bavaria), Ireland and Switzerland (Ashe & O'Connor 2012). However, the record from Switzerland is based on an unknown source, cited in Fauna Europe ver. 2004 (Sæther and Spies 2004, Martin Spies and Patrick Ashe pers. comm.) and is therefore doubtful. Caspers (1987) stated that the autecology of *C. insolitus* is unknown. Michiels (1999) has found *C. insolitus* in the Salzach, a mainly alpine river in Southern Bavaria, running primarily in natural conditions. We have found large populations of this species in the subalpine zones of Alma and Salgir rivers, and in the lowland part of the Bulganak River basin. All records of *C. insolitus* in Crimea are during winter months, when swarms were detected on days with the air temperature from 6° to 9°C. Pupal exuviae were found in rivers with water temperature from 5° up to 9° and pH from 7.0 to 7.8.

Corynoneura lacustris Edwards, 1924

Material: 2♂, Ukraine, Crimea, Bachchisarajskij district, Alma River, Partyzans'ke reservoir, N44°49.25' E34°2.98', 26.iii.2011, Prokopov, G.

Widespread Holarctic species, in Ukraine is known only from the Crimea (Ashe & O'Connor 2012; Baranov 2011c). Species is common in the winter at the Alma River, at the sites with sandy substrates.

Eukiefferiella claripennis (Lundbeck, 1898)

Material: 1♂, Ukraine, Crimea, Simferopil city, Salgir River, near Tavrida National University, N44°56.41' E34°8.21', 18.iii.2013, Baranov, V.

Species distributed throughout the Holarctic, Oriental regions and Oceania (Hawaiian islands), widespread in Ukrainian Carpathians (Ashe & O'Connor 2012; Baranov 2011b). The present record is the first for Crimea. Several specimens where caught only in the winter.

Eukiefferiella ilkleyensis (Edwards, 1929)

Material: 1♂, Ukraine, Crimea, Simferopolskij district, Western Bulganak River, near Pozharske village, N44°56.41' E34°8.21', 20.i.2013, Baranov, V.

Species is widespread in the Holarctic Region. The present record is the first in Ukraine (Ashe & O'Connor 2012; Baranov 2011). Drake (1982) documented emergence in February in southern England.

Limnophyes minimus (Meigen, 1818)

Material: 3♂, Ukraine, Crimea, Simferopil city, Salgir River, near Tavrida National University, N44°56.41' E34°8.21', 18.i.2013, Baranov, V; 11♂, Ukraine, Crimea, Bachchisrajskij district, Kacha River, near Sinapnoe village, N44°56.41' E34°8.21', 19.i.2013, Baranov, V.

This is a common, subcosmopolitan species that is widespread in Ukraine (Ashe & O'Connor 2012; Baranov 2011b).

Limnophyes pentaplastus (Kieffer, 1921)

Material: 1♂ Ukraine, Crimea, Simferopil city, Salgir River, near Tavrida National University, N44°56.41' E34°8.21', 18.i.2013, Baranov, V.

Limnophyes spinigus Sæther, 1990

Material: 1♂ Ukraine, Crimea, Simferopil city, Salgir River, Gagarin Park, N 44°56.41' E 34°8.21', 29.XII.2010, Baranov, V.; 1♂ Ukraine, Crimea, Simferopolskij district, Western Bulganak River, near Pozharske village, N44°55.92' E33°52.22', 20.i.2013, Baranov, V.

Species is recorded from Ukraine for the first time (Baranov 2011a). Crimean specimens differs from the specimens described by Sæther (1990), by lower number of scallpellate scutelars (2), however, the shape of gonostylus, conspicuously long virga and megasetae, and general appearance of the hypopigium closely resembles *L. sphingius* (Figs 2E, F).

Metriocnemus eurynotus (Holmgren, 1833)

Material: 3♂, Ukraine, Crimea, Simferopil city, near Tavrida National University, N44°56.41' E34°8.21', 18.i.2013, Baranov, V.; 4♂, Ukraine, Crimea, Simferopil city, Salgir River, Botanical Garden, N 4°56.41' E34°8.21', 21.i.2013, Baranov, V.; 2♂, Ukraine, Crimea, Bachchisarajskij district, Alma River, near Novopavlivka, N44°49.86' E33°58.41', 19.iii.2011, Prokopov, G.

Species was previously recorded from Crimea (Baranov 2011c).

Orthocladius sp.1

Material: 1 pupal exuviae, Ukraine, Crimea, Bachchisarajskij district, Alma River, near Novopavlivka, N44°49.86' E33°58.41', 19.i.2013, Baranov, V.

Orthocladius glabripennis (Goetghebeuer, 1921)

Material: 1♂, Ukraine, Crimea, Bachchisara-

jskij district Alma River, Partiznske Reservoir, N44°49.86' E33°58.41', 19.iii.2013, Prokopov, G.

This species is recorded for the first time from Ukraine (Baranov 2011a)

Paracladius conversus (Walker, 1856)

Material: 1♂ (pharate adult) Ukraine, Crimea, Bachchisarajskij district Alma River, near Novopavlivka, 19.i.2013, N44°49.86' E33°58.41', Baranov, V.; 3♂, Ukraine, Crimea, Western Bulganak River, near Pozharske village, N44°55.92' E33°52.22', 20.i.2013, Baranov, V.

Widespread Holarctic species, common in Ukraine (Ashe and O'Connor 2012).

Parametriocnemus stylatus (Kieffer, 1924)

Material: 2♂, Ukraine, Crimea, Simferopolskij district, Western Bulganak River, near Pozharske village, N44°55.92' E33°52.22', 20.i.2013, Baranov, V.

Widespread in the Holarctic Region, and common in Ukraine (Ashe and O'Connor 2012).

Paraphaenocladius impensus contractus Sæther & Wang, 1995

Material: 2♂, Ukraine, Crimea, Simferopil city, Salgir River, Botanical Garden, N44°56.41' E34°8.21', 21.i.2013, Baranov, V.

This subspecies of *P. impensus* was previously recorded only from the China, Japan, Turkey, Austria and Algeria, Romania (?) and Germany (Ashe and O'Connor 2012), and was considered as Southeren Palaearctic and Oriental subspecies. Subspecies is clearly differs from the *P. impensus impensus* in having squama with 3-6 setae, AR 0,44-0,69 (about 0,67 for our specimen), LR_1 – 0,70-0,74; LR_2 – 0,48-0,54; LR_3-0,67-0,71 (Sæther & Wang 1995). Details of the hypopygium in Figs 2C, D.

Parorthocladius korneyevi Baranov, 2011

Material: 24♂, Ukraine, Crimea, Simferopil city, Salgir River, Gagarin Park, N44°57.75' E34°5.51',29.XII.2010, Baranov, V.; 3♂, Ukraine, Crimea, Simferopolskij district, Western Bulganak River, near Pozharske village, N 44°55.92' E 33°52.22', 20.i.2013, Baranov, V.

This species is endemic to the Crimea peninsula, where it is recorded only for these two rivers (Baranov 2011c).

Thienemanniella clavicornis (Kieffer, 1911)

Material: 3♂ Ukraine, Crimea, Simferopolskij district, Western Bulganak River, near Pozharske village, N44°55.92' E33°52.22', 20.i.2013, Baranov, V.

Although widespread in the Palearctic and Oriental regions, this species is recorded for the first time from Ukraine (Ashe & O'Connor 2012, Baranov 2011b).

Thienemanniella vittata (Edwards, 1924)

Material: 5♂, Ukraine, Crimea, Bachchisarajskij district, Alma River, near Novopavlivka, N44°49.86' E33°58.41', 19.i.2013, Baranov, V.

Widespread European species. This species is recorded for the first time from Ukraine (Ashe & O'Connor 2012, Baranov 2011b).

Chironominae: Chironomini

Dicrotendipes nervosus (Staeger, 1839)

Material: 5♂, Ukraine, Crimea, Bachchisarajskij district, Alma River, near Novopavlivka, N44°49.86' E33°58.41', 19.iii.2011, Prokopov, G.

Widespread in the Holarctic Region and common in Ukraine and Crimea (Baranov 2011b).

Chironominae: Tanytarsini

Cladotanytarsus atridorsum Kieffer, 1924

Material: 10♂, Ukraine, Crimea, Bachchisarajskij district, Alma River, Partiznske Reservoir, N 44°49.25' E 34°2.98', 19.iii.2013, Prokopov, G.

Widespread in western Palaearctic and Oriental regions, and common in Ukraine and Crimea (Baranov 2011b, Giłka 2011).

Micropsectra apposita (Walker, 1856)

Material: 45♂, 10♀, 21 pupal exuviae, Ukraine, Crimea, Simferopolskij district, Plachushaja skala tract, N44°56.07' E33°50.73', 20.i.2013, Baranov, V.; 20♂, Ukraine, Crimea, Bachchisrajskij district Kacha River, near Sinapnoe village, N44°40.2' E34°0.41', 19.i.2013, Baranov, V.

Western European species, recorded for the first time from Ukraine (Giłka 2011, Baranov 2011b). Details of the hypopygium in Figs 1C, D.

Micropsectra atrofasciata (Kieffer, 1911)

Material: numerous specimens of all stages, at all collection sites mentioned above.

Widespread in the Palaearctic Region (may possibly be the most abundant species of Tanytarsini in Europe, (W. Giłka, pers. comm. 2012, Baranov 2011b).

Discussion

At the genus-level the hibernal emergence in the Crimea shows resemblance to the patterns reported for streams in Kansas (Ferrington 2000; 2007; Anderson *et al*. 2011) with composition consisting of primarily Orthocladiinae, and to lesser extent Tanytarsini. Several of the orthoclad genera reported both here and for Kansas are known to have species that emerge in winter or have phenologies that include late winter emergence through spring season. These genera also include species that are common to smaller stream habitats, often with alternating pools-riffle habitats, and some in areas with very extensive groundwater inputs. Collections of adults, although rare, tend to be more productive after periods when air temperatures have exceeded 0°C. continuously for several days preceding sample collection in the Crimea, as was also reported for species emerging in winter in Kansas (Ferrington 2000).

Emergence of Tanytarsini in Crimea is primarily dominated by two species of *Micropsectra*, which also is the pattern in Kansas. Here we also report one collection of *Cladotanytarsus atridorsum*. This genus was not encountered during winter in Kansas, but two species of *Paratanytarsus* and three species of *Tanytarsus* emerged from ground water dominated or intermittent stretches of stream (Anderson *et al*. 2011). We did not make extensive collections at sites with similar hydrologic characteristics in Ukraine, but future efforts will be directed to streams with similar hydrologies to determine if the winter patterns are similar at the generic level.

Only one species of Chironomini, *Dicrotendipes nervosus*, has been encountered emerging during winter in Crimea, and only on one date. However, this species is widespread in Ukraine and Crimea, and appears to be multivoltine, with emergences through spring, summer and fall periods. By contrast, five species of Chironomini have been recorded during winter months, including *Dicrotendipes fumidus* (Johannsen, 1905), which likely is bivoltine in Kansas (Ferrington unpublished data). The other species of Chironomini reported in winter in Kansas, however, also appear to be common, widespread and multivoltine with emergence spread through spring summer and fall seasons. In both Crimea and Kansas it appears that life histories of Chironomini are not adapted for substantial emergences at lower water and air temperatures.

The patterns of collections of genera as a function of air and water temperatures also show some general similarity in Crimea and Kansas. In both regions, species of *Chaetocladius* can emerge at air temperatures below freezing. Orthocladiinae genera are more commonly encountered as adults at cooler air temperatures in winter than Chironomini. Water temperatures were not continuously quantified as part of this study, but future efforts to document environmental conditions prevailing during winter emergences will attempt to include repeated water temperature determinations before and at time of collection.

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