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HIGH ALTITUDE CHIRONOMIDAE (DIPTERA) OF SERRA DA ESTRELA (PORTUGAL): ADDITIONS TO THE PORTUGUESE AND IBERIAN PENINSULA FAUNA

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ABSTRACT

A Chironomidae (Diptera) fauna list for headwater streams of high altitude areas in Serra da Estrela (Portugal) is presented, doubling the previously established species richness for the region. The findings include 17 new records for Portugal, which represent an increase to 219 species for the Continental Portugal Chironomidae fauna. Two new records were detected for the Iberian Peninsula: one species (*Tvetenia duodenaria),* and one subgenus –*Psectrocladius (Mesopsectrocladius*)–; and the presence of the genus *Natarsia* is confirmed. The last two occurrences correspond to monoespecific taxa of the Palearctic region. However, as taxonomic identification has been based on larval material, instead of pupae, pupal exuviae or imagoes, species level assignment is still uncertain.

Key words: Diptera, Chironomidae, high mountain streams, Serra da Estrela, Portugal, Iberian Peninsula.

RESUMEN

Quironómidos (Diptera, Chironomidae) de alta montaña de la Sierra de Estrela (Portugal) y adiciones a la fauna de Portugal y la Península Ibérica

Se presenta una lista de especies de Chironomidae (Diptera) recolectados en los ríos de cabecera de zonas de alta montaña en la Serra da Estrela (Portugal). Con esta aportación se duplica la riqueza de especies regional conocida hasta el momento y se eleva la fauna de quironómidos del Portugal continental a 219 especies. Se incluyen dos nuevas citas para la Península Ibérica, una especie (*Tvetenia duodenaria)* y un subgénero –*Psectrocladius (Mesopsectrocladius*)–, y se confirma la presencia del género *Natarsia.* En los dos últimos casos se trata de larvas de taxones hasta el momento monoespecíficos en la región paleárctica, pero al no haberse recolectado pupas o adultos no se puede asegurar la identificación específica.

Palabras clave: Diptera, Chironomidae, ríos de alta montaña, Serra da Estrela, Portugal, Península Ibérica.

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Introduction

Chironomids are one of the most abundant and diverse group of aquatic insects inhabiting freshwater systems, particularly in alpine headwater streams (Castella *et al.,* 2001; Lods-Crozet *et al.,* 2001a; 2001b; Maiolini & Lencioni, 2001) and lakes (Rieradevall *et al.,* 1998, Rieradevall & Prat, 1999, 2000; Füreder *et al.,* 2006). These areas have great biogeographical interest due to the presence of both euryoecious and cold-stenothermal species, which cannot cross geographical barriers formed by warmer lowland waters. The westernmost high-mountain system in continental Europe is Serra da Estrela in Portugal (1993 m a.s.l.), although it is not as high as other alpine ranges such as the Pyrenees or the Alps. Knowledge of macroinvertebrate fauna and especially of chironomids in Serra da Estrela is still limited to rivers and streams below 1400 m a.s.l. (Reiss, 1989; Cobo *et al*., 2001) and high mountain lakes above 1615 m a.s.l. (Rieradevall & Prat, 1999). Five intermittent headwater streams located above 1400 m a.s.l. were studied in the present work, which is part of a larger study on the benthic macroinvertebrate community of these high altitude streams (see Chaves *et al.*, in press). The main objective of the present paper is to improve the knowledge of Serra da Estrela freshwater biodiversity, namely with respect to the Chironomidae fauna.

Material and methods

Biological data was collected in five different intermittent headstreams located within the Mondego River basin, in Serra da Estrela Natural Park (Table 1). Distance between sites ranged from 16 km to 0.5 km. Therefore, all sites presented very similar climatic and geological conditions and fit within a single stream type (>800 m a.s.l., siliceous geology, with less than 10 km^2 of catchment area).

The five intermittent stream sites were sampled on six occasions, at approximately four to six-weekly intervals, from late April 2004 to early November 2004. All five streams dried up to form pools in summer. Streams 1 and 2 were totally dry during one sampling occasion (July) and streams 4 and 5 during three sampling occasions (from July to mid October). More information about ecological functioning and benthos structure at these localities can be found in Chaves *et al*. (in press).

Pupae and pupal exuviae of Chironomidae were collected by applying the methodology indicated by Langton & Casas (1998), using a hand-net of 250 μm mesh size. Care was taken to include all possible habitats over representative sections of the stream (10 m samples). Samples were preserved *in situ* in 96% ethanol, rinsed using a 250 μm mesh sized sieve, sorted under magnification and preserved in 70% ethanol.

Pupal exuviae (Pe), pupae and pharate imagoes (Pm for male pupae, and Pf for female pupae), and larvae were prepared for taxonomical identification following current methods, which included, when necessary, bathing in a warm 10% potassium hydroxide solution for clearing the specimen, rinsing with distilled water, dehydrating in 70% and 90% ethanol and mounting in

Table 1.— Location and physiographic characteristics of each of the five stream sites studied. All sites are within the Mondego River basin in Serra da Estrela (Portugal).

Tabla 1.— Localización y características fisiográficas de los cinco ríos de cabecera estudiados en la cuenca del río Mondego en Serra da Estrela (Portugal).

	Streams				
Variables	**1**	**2**	**3**	**4**	**5**
Latitude (North)	40º21.840	40º21.775	40º21.445	40º25.700	40º24.244
Longitude (West)	7º37.847	7º37.713	7º37.630	7º35.653	7º35.172
Distance from source (km)	0.38	0.40	2.00	0.73	0.50
Altitude (m a.s.l.)	1673	1664	1629	1400	1470
Drainage basin (km^2)	0.08	0.15	2.16	0.20	0.13
Tributary of	Ribeira da Lagoa (Alva)	Ribeira da Lagoa (Alva)	Ribeira da Lagoa (Alva)	Ribeira do Cabaço (Alva)	Ribeira da Fervença (Alva)

Table 2.— Species of Chironomidae found in Serra da Estrela (SE). For each species and site the date of capture is indicated as well as if the identification was made using only the pupal exuviae (Pe) or the pharate pupa, male (Pm) or female (Pf). Additional information for each species includes the previous citations in Serra da Estrela (SE) or Portugal. 1- Rieradevall *et al.* (1998); 2- Rieradevall & Prat (1999); 3- Malo *et al.* (1998); 4- Cobo *et al*. (2001); 5- Reiss (1989); 6- Freeman (1959); 7- Cobo *et al.* (2002). # The previous citations in Serra da Estrela of *Ablabesmyia longistyla* and *Heterotrissocladius marcidus* were omitted in Cobo *et al.* (2001). ## This confirms the presence of *Psectrocladius (P.) oligosetus* in Serra da Estrela, already cited by Rieradevall & Prat (1999), although Cobo *et al.* (2002) considered its presence not confirmed. ### *Tanytarsus buchonius* was already cited for Portugal (Cobo *et al.,* 2001), although surprisingly it was not included in the Iberian chironomid fauna catalogue by Cobo *et al.* (2002).

Tabla 2.— Especies de quironómidos encontradas en la Serra da Estrela. Para cada especie y cada punto de muestreo se indica la fecha en que fue capturada, el número de especímenes, si la identificación se hizo por la exuvia pupal (Pe) o una pupa madura, macho (Pm) o hembra (Pf). Se incluye información sobre si la especie había estado citada anteriormente en Serra da Estrela o en Portugal. Para algunas especies se incluyen algunas notas taxonómicas de interés. 1- Rieradevall *et al.* (1998); 2- Rieradevall & Prat (1999); 3- Malo *et al.* (1998); 4- Cobo *et al*. (2001); 5- Reiss (1989); 6- Freeman (1959); 7- Cobo *et al*. (2002). # Las citas previas en Serra da Estrela de *Ablabesmyia longistyla* y *Heterotrissocladius marcidus* no fueron incluidas en Cobo *et al.* (2001). ## Se confirma la presencia de *Psectrocladius (P.) oligosetus* en Serra da Estrela, ya citado por Rieradevall & Prat (1999), aunque Cobo *et al.* (2002) consideró su presencia como no confirmada. ### *Tanytarsus buchonius* ya fue citado por Cobo *et al.* (2001) en Portugal, sin embargo sorprendentemente no fue incluido en el catálogo de los quironómidos ibéricos compilado por Cobo *et al.* (2002).

	Species	Stream 1	Stream 2	Stream 3	Stream 5	SE	Portugal
	Procladius (Holotanypus) choreus (Meigen, 1804)	(22-09-2004): Pf 1.				1, 2	3, 4
	Macropelopia sp.	(05-06-2004): Pf 1				4	
	Ablabesmyia longistyla Fittkau, 1962			(05-06-2004): Pf 2		4 #	3, 5
**	*Paramerina cingulata* (Walker, 1856)	(22-09-2004): Pf 1		(22-09-2004): Pf 5			6
*	*Zavrelimyia barbatipes* (Kieffer, 1911)	(22-09-2004): Pf 1	(05-06-2004): Pm 1	(15-07-2004): Pf 1, (22-09-2004): Pm 1 + Pf 4	(04-06-2004): Pm 1		4, 7
	Diamesa Pe 2, Langton, 1991				(21-04-2004): Pf 1		
**	*Bryophaenocladius muscicola* (Kieffer, 1906)			(22-09-2004): Pe 1			
*	*Chaetocladius melaleucus* (Meigen, 1818)	(22-09-2004): Pm 2 + Pf 6					4, 7
	Cricotopus (Cricotopus) bicinctus (Meigen, 1818)			(05-06-2004): Pm 2 + Pe 2 (22-09-2004): Pm 1		4	3, 5
**	*Cricotopus (Cricotopus) fuscus* (Kieffer, 1909)			(22-09-2004): Pf 1			
**	*Eukieferiella brehmi* Gouin, 1943	(28-08-2004): Pe 7 + Pm 1 + Pf 5 (22-09-2004): Pe 1 (11-11-2004): Pe 1 + Pf 4	(20-04-2004): Pf 1 (05-06-2004): Pf 1 (28-08-2004): Pm 1	(28-08-2004): Pf 3 (22-09-2004): Pf 2			
	Heterotrissocladius marcidus (Walker, 1856)	(20-04-2004): Pm 1 (22-09-2004): Pe 1		(20-04-2004): Pm 1	(21-04-2004): Pf 1 (04-06-2004): Pf 2	2, 4#	
*	*Orthocladius (Eudactylocladius) fuscimanus* (Kieffer in Kieffer & Thienemann, 1908)	(22-09-2004): Pe 2 + Pm 1					4
*	*Parametriocnemus stylatus* (Kieffer, 1924)		(22-09-2004): Pe 2				4
	Psectrocladius (Psectrocladius) oligosetus Wülker, 1956	(22-09-2004): Pe 1				1, 2,	7 ##
***	*Tvetenia duodenaria* Kieffer, 1922	(28-08-2004): Pm 2 + Pe 2					
**	*Zalutschia humphresiae* Dowling & Murray, 1980	(20-04-2004): Pe 2 + Pf 2		(22-09-2004): Pm 1			
	Micropsectra apposita (Walker, 1856)	(05-06-2004): Pe 2				4	4
*	*Tanytarsus buchonius* (Reiss & Fittkau, 1971)	(20-04-2004): Pm 1 (22-09-2004): Pm 2					7###

Table 3.— Chironomidae taxa found in the 5 headwater streams sampled in Serra da Estrela (Portugal) identified using larvae. When the genus is monotypic in the Western Palearctic region, as for *Natarsia, Pseudokiefferiella* or *Stilocladius*, we have assigned the corresponding species name in brackets.

Tabla 3.— Taxones de quironómidos identificados en los 5 ríos de cabecera muestreados en la Serra da Estrela (Portugal) de acuerdo a las larvas encontradas. Cuando el género es monotípico en la región Paleárctica Occidental, como es el caso de *Natarsia, Pseudokiefferiella* o *Stilocladius*, se ha asignado el nombre específico correspondiente entre corchetes.

	Sf. Tanypodinae
	Krenopelopia Fittkau, 1962 (*K. nigropunctata* in Serra da Estrela (Cobo *et al.,* 2001)).
*	*Larsia* Fittkau, 1962
***	*Natarsia* [*N. punctata* (Fabricius, 1805)]
	Trissopelopia Kieffer, 1923 (*T. longimana* in Serra da Estrela (Cobo *et al.,* 2001)).
	Sf. Diamesinae
*	*Diamesa* Meigen, 1835 (two different larval forms)
*	*Pseudokiefferiella* [*P. parva* (Edwards, 1932)]
	Sf. Prodiamesinae
*	*Prodiamesa olivacea* (Meigen 1818)
	Sf. Orthocladiinae
	Brillia bifida (Kieffer, 1909) (= *B. modesta* (Meigen, 1830))
**	*Hydrobaenus* Fries, 1830
*	*Limnophyes* Eaton, 1875
*	*Orthocladius (O.) gr. rubicundus*
*	*Paratrichocladius* Santos Abreu, 1918
*	*Pseudorthocladius* Goetghebuer, 1932
**	*Smittia* Holmgreen, 1869
*	*Cricotopus (Isocladius) tricinctus* (Meigen, 1818)
	Chaetocladius Kieffer, 1911
**	*Corynoneura lacustris* Edwards, 1924
	Corynoneura lobata Edwards, 1924
	Corynoneura gr. scutellata (C. arctica/scutellata)
**	*Heleniella serratosioi* Ringe, 1976
	Krenosmittia Thienemann & Krüger, 1939
**	*Orthocladius (Euorthocladius) luteipes* Goetghebuer, 1938
*	*Paraphaenocladius pseudirritus* Strenzke, 1950
*	*Psectrocladius (Allopsectrocladius) obvius* (Walker, 1856)
*	*Psectrocladius (Allopsectrocladius) platypus* (Edwards, 1929)
***	*Psectrocladius (Mesopsectrocladius)* [*P. (M.) barbatipes* Kieffer, 1923]
*	*Psectrocladius (Psectrocladius) octomaculatus* Wülker, 1956
	Rheocricotopus (Rheocricotopus) effusus (Walker, 1856)
*	*Rheocricotopus (Rheocricotopus) fuscipes* (Kieffer, 1909)
**	*Stilocladius* [*S. montanus* Rossaro, 1979]
*	*Thienemanniella clavicornis* (Kieffer, 1911)
**	*Thienemanniella vittata* (Edwards, 1924)
**	*Tvetenia bavarica* (Goetghebuer, 1936)
*	*Tvetenia calvescens* (Edwards, 1929)
	Sf. Chironominae
	Tribe Chironomini
	Chironomus Meigen, 1803
*	*Microtendipes* Kieffer, 1913
**	*Paratendipes* Kieffer, 1911
	Polypedilum Kieffer, 1912
	Tribe Tanytarsini
*	*Micropsectra aristata* Pinder, 1976
	Micropsectra ?lindrothi Goetghebuer, 1931
	Micropsectra ?junci (Meigen, 1818)
*	*Stempellinella* Brundin, 1947
*	*?Paratanytarsus* Thienemann & Bause, 1913

Euparal media. Pupal skins were identified following Langton's (1991) key. These microscope slides are deposited in Dr. Rieradevall's collection at the University of Barcelona. For larvae identification we used mainly Wiederholm (1983) and Schmid (1993) together with miscellaneous bibliography, and Dr. Rieradevall's reference collection from Iberian mountain lakes and streams. This collection material allowed the correlation between several larvae specimens and their pharate adults and consequently the development of *Corynoneura and Micropsectra* unpublished identification keys that helped in the present identifications.

Results and Discussion

Species identified using pupaes and pupal exuviae during the present study are presented in Table 2, with indication of stream and collection date and type and quantity of examined material. For completeness and due to the relevance of some findings, we also present a check list of chironomid taxa (genus and/or species) that were identified using larval material exclusively (Table 3). In this table, when the genus is monotypic in the Western Palearctic region, as for *Natarsia, Pseudokiefferiella* or *Stilocladius*, we have assigned the corresponding species name in brackets.

New records for the Iberian Peninsula, Portugal and Serra da Estrela are indicated by ***, ** and *,

respectively in both tables. Chironomid species assemblages in the five headwater streams studied accounted for 62 taxa, including representatives of subfamily Tanypodinae (9 taxa), Diamesinae (3), Prodiamesinae (1), Orthocladiinae (38), and Tribes Chironominii (4) and Tanytarsinii (7).

Forty-two taxa are new for Serra da Estrela, updating the Chironomidae fauna richness of this area to a total of 85 taxa, from the 43 reported up to now (Cobo *et al.*, 2001). These findings include 17 new records for Portugal, which represent an upgrade from the 202 previously detected taxa (Cobo *et al.,* 2002) to 219 species for the Continental Portugal Chironomidae fauna. One of these taxa is a new species record for the Iberian Peninsula (*Tvetenia duodenaria* Kieffer, 1922) and two are new monotypic genus and subgenus records for the same region (*Natarsia* (presumably *N. punctata* (Fabricius, 1805)), and *Psectrocladius (Mesopsectrocladius)* presumably *(P.* (*M.*) *barbatipes* Kieffer, 1923) respectively). In the case of *Natarsia* this is the confirmation of its presence in the Iberian Peninsula, as although already cited by Czerny & Strobl (1909), the posterior references (Arias, 1912; Cobo *et al*., 1987 and Soriano *et al*., 1997) are just citations of the same old and only source of information. Maybe because of that Cobo *et al*. (2002) omitted the inclusion of *Natarsia* in their Iberian Chironomidae catalogue. Three new genera records for continental Portugal are included: *Hydrobaenus, Smittia,* and *Paratendipes.* The remaining identifications represent an expansion of their known altitudinal range in Portugal. Since different material types (pupal exuviae, pupae, pharate imagoes and larvae) were used for taxonomic identification, only six taxa (those identified with pupal exuviae) can be considered as consistent new species cites, while the remaining taxa (11) need further confirmation with supplementary pupal or imagoes specimens.

As *Tvetenia duodenaria* is recorded for the first time in the Iberian Peninsula, and because we found some morphological differences with the data provided from other regions, we include some taxonomic remarks about this species from the material examined in Serra da Estrela. Thus, the observed male genitalia and pupal skins agreed with Lehman's (1972) descriptions, although the relative length of the thoracic horn filament with respect to the base was not as long in the Portuguese material as in the previously described material: 2.54 times vs. 6, respectively. Langton (com. pers., 2006) found great variability in this species character, similarly to other Orthocladiinae species. Thoracic horn base length is 0.34 of the thoracic horn total length instead of the expected 0.16-0.19 ratio originally indicated by Langton (1991). This ratio fitted better the description of *Dratnalia potamophylaxi* (Fittkau & Lellak, 1971) in Langton's key (op. cit.), although the tergite I morphology did not agree.

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