

## On the identity of *Isoperla curtata* (Plecoptera: Perlodidae): behavioural and molecular approaches show the existence of two separate species

JOSÉ MANUEL TIERNO DE FIGUEROA<sup>1</sup>, BRUNELLA GAETANI<sup>2</sup>, JULIO MIGUEL LUZÓN-ORTEGA<sup>3</sup>,  
MANUEL JESÚS LÓPEZ-RODRÍGUEZ<sup>1</sup> & ROMOLO FOCHETTI<sup>2</sup>

<sup>1</sup>Departamento de Biología Animal & Departamento de Ecología. Facultad de Ciencias. Universidad de Granada. 18071. Granada.  
Spain. E-mail: jmtdef@ugr.es, manujlr@ugr.es

<sup>2</sup>Dipartimento di Scienze Ambientali. Università della Tuscia, Viterbo, Italy. E-mail: fochetti@unitus.it

<sup>3</sup>Hydraena S.L.L., Granada, Spain. E-mail: hydraena@hydraena.com

### Abstract

The identity of *Isoperla curtata* Navás, 1924, an Iberian endemic, has been questioned since its description. Marked variability in pigmentation, wing length, penial armature and ecology of populations have been noted. To clarify the taxonomic status of *I. curtata* we examined variation in mating calls and cytochrome c oxidase subunit I sequences for two populations from north-central and southern Spain. Results of both approaches support the presence of two species. The north-central population corresponds to the nominal taxon, *I. curtata*, while southern populations represent a new species, *Isoperla morenica*, described herein.

**Key words:** stoneflies, drumming, DNA sequences, systematics, *Isoperla morenica* n. sp.

### Introduction

*Isoperla curtata* Navás, 1924 is a species endemic to the Iberian Peninsula, collected from a wide altitudinal range (from 50 to 1800 m) (Tierno de Figueroa *et al.* 2003). It was described from external features, mainly colour, reduction of wings, wing venation, and body size (Navás 1924). The type locality was Cercedilla, near Madrid, Spain. In 1952, Aubert published a redescription of this species with many more details and better illustrations, including figures of the male penial armature and scales (Aubert 1952). He studied specimens from Cercedilla and Navarredonda (near Ávila, Spain) and considered this species as an endemic of the mountains of central Spain (Aubert 1952). According to him, this taxon could not be included in any of the previously described *Isoperla* species-groups. Four years later, Aubert (1956), studying material from a wider geographical area including Sierra de Guadarrama (central Spain) and Cantabric Mountains (northern Spain), observed for the first time that there is a marked variability in the size and arrangement of the penial armature and scales, in pigmentation, and in wing length (with macropterous, brachypterous and micropterous individuals) in relation to the altitude. In this paper, he wrote that the polymorphism of *I. curtata* could not be easily divided geographically to form subspecies. He remarked that it would be interesting to re-examine this species on the basis of more abundant material. Later, Aubert (1963a) commented on ecological niche partitioning between populations from the Douro basin (northwest Spain) which inhabited permanent mountain streams and populations from Sierra Morena (South Spain) inhabiting temporary streams. Specimens of the latter populations were always macropterous with general body colour of light yellow, while specimens from Douro exhibited the full range of wingedness and their coloration was dark.

Biological data for this species were scarce until mating, oviposition, vibrational communication, nymphal growth, feeding habits and secondary production studies were carried out on a population from the Sierra Morena (Tierno de Figueroa *et al.* 2000, López-Rodríguez *et al.* 2009).

The aim of this study is to clarify the taxonomic relationships of two polymorphic populations, one from north-central and the other from southern Spain. To determine this relationship we used a behavioural approach that involved describing and comparing species-specific male mating calls that may act as a reproductive isolation