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# Allozyme differentiation among populations of the Pyrenean newt *Calotriton asper* (Amphibia: Caudata) does not mirror their morphological diversification

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## Abstract

The Pyrenean newt (*Calotriton asper*) is a morphologically diversified species endemic to the Pyrenean mountains (Western Europe) that inhabits fast running streams and mountain lakes. Given its high morphological diversity, the species has been subdivided into at least ten different taxa, subsequently treated by most authors as local forms. Herein, we examined the electrophoretic patterns produced by 20 presumptive allozyme loci in specimens of seven populations distributed over the entire geographic range of the species. Sixteen loci were monomorphic across the sampling area and only four loci were polymorphic. No diagnostic alleles of any population or population set were detected. The average number of alleles per locus was found to be extremely low, between 1.1 and 1.2 ± 0.1. Genetic divergence among populations was minimal, with a maximum divergence of $Nei_{78}$ = 0.031. No correlation was shown between genetic and geographic distances (Mantel test: r = -0.29, t = -1.1, p = 0.13). Fst values were low, as would be expected for a non-fragmented population. Estimated gene flow among populations was high, with a Nm = 1.01. Cytochrome b mtDNA sequences from the two populations furthest apart only differed in a single position. According to these genetic/morphological discrepancies, we interpret the observed morphological diversification of *C. asper* as a product of rapid morphological change under local selection pressure, in response to population specific ecological conditions. The implication of our findings for conservation efforts is that we need to preserve the unique evolutionary processes occurring in single populations or small groups of populations, even if the populations involved cannot be taxonomically differentiated.

**Key words:** Systematics, Taxonomy, Protein electrophoresis, Genetic differentiation, mtDNA, Morphology, Spain

## Introduction

The recently resurrected genus *Calotriton* (Caudata: Salamandridae) includes two especies of newts geogaphically restricted to the Pyrenean and Pre-Pyrenean mountains in southwestern Europe (Carranza & Amat 2005). *Calotriton arnoldi* Carranza & Amat 2005 is an endemic taxon of the Montseny Mountains of Catalonia (Spain), while *Calotriton asper* (Dugès 1852) is distributed over most of the Pyrenean Range (García-París *et al.* 2004).

The Pyrenean newt, *Calotriton asper*, is present over most of the Pyrenees, a mountain range that forms the boundary between Spain and France and includes the small country of Andorra. The Pyrenees are formed by a main central backbone, that runs west-eastwards from the Cantabrian to the Mediterranean seas and whose highest peaks rise to 3404 m. There is also a series of smaller chains, the Pre-Pyrenean mountains, which run mostly parallel to the main range on its southern side, forming deep valleys that drain into the Ebro River towards the Mediterranean Sea. *Calotriton asper* occupies most of the streams of the central axis from altitudes of 360 m to 3300 m, and also inhabits sites that are isolated to a lesser or greater extent all along the

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