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Systematics of the *Podarcis hispanicus* complex (Sauria, Lacertidae) III: valid nomina of the western and central Iberian forms

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Abstract

Recent genetic works have suggested that the Iberian wall lizard *Podarcis hispanicus* (Steindachner, 1870) sensu lato is a species complex. Several forms have already been elevated to species rank and linked to available nomina, but at least three still have to be formally named, including the western Iberian forms currently designated as *Podarcis hispanicus* “type 1A”, “type 1B” and “type 2”. The aim of the present work is to assign a valid nomen to these taxa. Using multivariate analyses, we first checked that the morphological differences reported in Portugal between type 1 and type 2 are maintained over their distribution range. We then investigated phenotypic differentiation between type 1A and type 1B, which were found to be so similar that identification based on phenotype is currently not advisable. We propose to treat type 1 and type 2 as distinct species because of their level of genetic and phenotypic divergence, large area of distribution and ample evidence for reduced or absent introgression in contact zones. We maintain type 1A and 1B as subspecies for the time being, pending further analyses of their contact zone. The valid nomen for “*Podarcis hispanica* type 1 (sensu lato)” is *Lacerta muralis guadarramae* Boscá, 1916 which becomes *Podarcis guadarramae* (Boscá, 1916). Lineage type 1A is here described as a new taxon: *P. guadarramae lusitanicus* ssp. nov., inhabiting northern Portugal and northwestern Spain. The type 1B lineage corresponds to the nominotypical subspecies that inhabits Spain, mostly the Central Iberian Mountains. We were unable to locate an available nomen for “*Podarcis hispanica* type 2”, which is here described as *Podarcis*

virescens sp. nov. This species is widely distributed in the plains and plateaus of central and parts of south-western Spain as well as central and southern Portugal.

Key words: reptiles, wall lizards, Spain, Portugal, morphology, systematics, nomenclature

Introduction

Recent genetic and morphological data indicate that *Podarcis hispanicus* (Steindachner, 1870) is currently composed of several genetically distinct lineages, many of which warrant specific rank (Oliverio *et al.* 2000; Sá-Sousa 2000; Harris & Sá-Sousa 2001, 2002; Harris *et al.* 2002a, 2002b; Sá-Sousa *et al.* 2002; Busack *et al.* 2005; Pinho 2007, Pinho *et al.* 2006, 2007, 2008; Renoult *et al.* 2009; Kaliontzopoulou *et al.* 2011). Few systematic changes have formally been proposed, however: *Podarcis hispanicus* (sensu stricto) has been restricted to the Spanish Levant form (Geniez *et al.* 2007); the form occurring in the Baetic mountains and adjacent areas south of the Rio Guadalquivir, which is conspecific with North-African populations, has been elevated to species rank as *Podarcis vaucheri* (Boulenger, 1905) (Oliverio *et al.* 2000; Busack *et al.* 2005); the north-eastern Iberian form that extends as far as southern France (= “*Podarcis hispanica* type 3” in e.g. Pinho *et al.* 2007) should be called *Podarcis liolepis* (Boulenger, 1905) (Speybroeck & Crochet 2007; Renoult *et al.* 2010a). Note that the insular populations from the Columbretes islands (Catalonia; Spain) were formally raised to species rank under the binomen *Podarcis atratus* (Boscá, 1916) by Castilla *et al.* (1998) (as *Podarcis atrata*, see footnote about the gender of *Podarcis*¹). They are in fact conspecific with *P. liolepis* (Harris & Sá-Sousa 2001; Busack *et al.* 2005).

In Portugal, two morphotypes first identified by Guillaume & Geniez (1986, see also Geniez 2001) have been later shown to constitute distinct evolutionary lineages with an essentially parapatric distribution (Sá-Sousa 2000; Harris & Sá-Sousa 2001; Sá-Sousa *et al.* 2002). The northern half of the country is inhabited by *Podarcis hispanicus* type 1 while *P. hispanicus* type 2 occurs in the centre of Portugal with some sparse populations known in southern Portugal. Both type 1 and type 2 lineages have deeply divergent mitochondrial DNA clades (corresponding to a divergence estimated of at least six million years: Kaliontzopoulou *et al.* 2011), highly differentiated allozymes (Pinho *et al.* 2007) and multilocus estimates of gene flow are close to zero (Pinho *et al.* 2008). Additional data established that *P. hispanicus* type 1 also occurs in central and north-western Spain while type 2 inhabits south-central Spain south of the Iberian Central Mountains (Pinho *et al.* 2007). Pinho *et al.* (2006, 2007, 2008) have further revealed two deeply divergent clades in *P. hispanicus* type 1: one, type 1A, occurs in northern Portugal and north-western Spain while type 1B is only found in the Central Iberian Mountains (Spain). Carretero (2008) provides a comprehensive summary of the distribution of the various forms of the *Podarcis hispanicus* complex (but see Renoult *et al.* 2009, 2010a for updates on the situation in eastern Spain). To sum up, Iberian populations of the *P. hispanicus* complex currently include five named species (*Podarcis bocagei*, *P. carbonelli*, *P. hispanicus*, *P. liolepis* and *P. vaucheri*) and three unnamed lineages (type 1A, type 1B and type 2) which are clearly not conspecific with any of the five named species². The main objective of the present paper is to formally name these three lineages following the rules of zoological nomenclature as detailed in the International Code of Zoological Nomenclature (the Code hereafter, International Commission on Zoological Nomenclature 1999).

While the distribution and morphology of both type 1 and type 2 lineages have been well studied in Portugal (Sá-Sousa *et al.* 2002), only scant genetic data are available for the rest of the Iberian Peninsula. The first step of this work was thus to check if the differences established in Portugal between type 1 and type 2 remain valid in the rest of the Iberian Peninsula. We also wanted to investigate the amount of morphological variation existing within type 1 and type 2, and especially between type 1A and type 1B. We thus performed several morphological analyses to support formal systematic and nomenclatural changes for “*Podarcis hispanica* type 1A”, “type 1B” and “type 2”, using published genetic evidence and new multivariate analyses of morphological variation. We also refine their distribution range and ecology based on published studies and additional unpublished data.

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1. For systematics and nomenclature we follow Speybroeck *et al.* (2010), which see for the masculine gender of *Podarcis*.
 2. See Renoult *et al.* (2009) for correspondence between these lineages and the mtDNA clades of Kaliontzopoulou *et al.* (2011). The new “Albacete/Murcia” mtDNA clade of Kaliontzopoulou *et al.* (2011) might constitute an additional evolutionary unit but has so far not been characterized morphologically and lacks support from nuclear markers.

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