



Lizards at the end of the world: Two new species of *Phymaturus* of the *patagonicus* clade (Squamata, Liolaemidae) revealed in southern Patagonia of Argentina

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Abstract

The Liolaemidae radiation has resulted in three genera whose patterns of evolutionary diversification exhibit dramatic differences. Two of these lineages, *Ctenoblepharys* and *Liolaemus*, lay at the extremes, being a monotypic genus and one of the most extraordinary adaptive radiations among vertebrates, respectively. In *Phymaturus*, in contrast, 22 species are known, all characterized by similar ecological niches and life-history patterns. The *Phymaturus* genus consists of two major clades, *flagellifer* and *patagonicus*, restricted to Andean-Patagonian environments in Argentina and Chile. While the former lineage occurs primarily at the northern areas of the genus distribution, the latter mostly occupies central and southern Patagonia. In this study, we report evidence to support the existence of two new species of the genus belonging to the austral clade *patagonicus*. These new taxa, *Phymaturus castillensis* and *Phymaturus videlai*, occur close to the southernmost distributional limit known for the entire genus. At these austral latitudes, only two other species of the genus, *P. indistinctus* and *P. patagonicus*, have been found. Therefore, the two new species reported herein reveal a higher species richness at these cold and harsh South American environments, where the predominant lineage is *Liolaemus*. As in the rest of the species of the *Phymaturus* genus, *P. castillensis* and *P. videlai* are saxicolous, herbivorous, and viviparous, as revealed by our field and lab observations. A number of signals support the idea that these two *Phymaturus* populations are the result of speciation events. Essentially, both are strongly isolated by hundreds of kilometers from most species of the *patagonicus* clade, which precludes dynamic gene exchange among them, while substantial divergence in their patterns of coloration differentiate them from the two geographically closest species, *P. indistinctus* and *P. patagonicus*, and from each other. The differences in coloration are not, however, strongly accentuated between the sexes, being monochromatic in *P. castillensis* and moderately dichromatic in *P. videlai*. Interestingly, juveniles *P. videlai* exhibit also these signals of adult sexual dichromatism. Finally, the results reported in this study increase *Phymaturus* species richness up to 24 species.

Key words: *Phymaturus*, Liolaemidae, Patagonia, rock-dwelling lizards, Argentina

Introduction

The evolutionary patterns resulting from the Liolaemidae radiation provide an interesting example of the disparate diversification directions that closely related lineages can follow during the course of their phylogenetic histories. Within this South American lizard family, only three contrastingly different genera have been recognized, one being a monotypic lineage (*Ctenoblepharys*) and another (*Liolaemus*, with >200 species) one of the most extraordinary examples of evolutionary radiation known among living vertebrates (Pincheira-Donoso *et al.* 2008c). The third genus, *Phymaturus*, shows an intermediate species richness of 22 species (Pincheira-Donoso *et al.* 2008c; Corbalan *et al.* 2009). Species numbers are not, however, the only contrasting features found among these lizard lineages. Indeed, while *Liolaemus* has started to be regarded as