



## Endemic epigean Tenebrionids (Coleoptera: Tenebrionidae) from the Andean Region: exploring the patagonian-diversification hypothesis

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### Abstract

Tenebrionidae is a diverse insect family of Coleoptera that shows high levels of endemism in epigean species. For the Andean region, which is divided into three subregions: Central Chilean, Subantarctic and Patagonian, it has been hypothesized that epigean tenebrionids have diversified in the Patagonian subregion and subsequently, they dispersed to Subantarctic and Central Chilean subregions. In this work, based on information obtained from museum collections and scientific studies, we presented the first list of endemic epigean tenebrionids from the Andean region with their taxonomic arrangement and geographic distribution. Moreover, we used these data to explore the veracity of the Patagonian-diversification hypothesis. A total of 416 species grouped into six subfamilies, 17 tribes and 41 genera were identified as endemic to the Andean region. Considering the spatial distribution it was observed that subfamilies, tribes, genera and species were unequally distributed across subregions. Results did not support the Patagonian-diversification hypothesis; to the contrary, they were more concordant with processes of isolation among subregions that have promoted speciation by interrupting gene flow among populations, resulting in endemism because species can not expand their range sizes. Finally, we discuss the implications of our findings to be considered in biodiversity conservation, because endemic species, by their high extinction risk, are primary targets in conservation strategies.

**Key words:** Evolution, taxonomy, spatial distribution, Argentina, Chile, vicariance

### Introduction

Tenebrionidae, one of the most diverse families of Coleoptera with about 20,000 described species (Matthews *et al.* 2010), has a cosmopolitan distribution with a great diversity in tropical and subtropical areas and in hot and cold deserts (Watt 1974; Matthews *et al.* 2010). According to the habitat preferences it is possible to recognize two main groups of tenebrionid beetles: 1) species associated with trees, and 2) species associated with soil or sand (Aalbu *et al.* 2002). Among the latter group several studies have reported the existence of a high level of endemism in different areas of the World (Watt 1974; Matthews *et al.* 2010; Carrara & Flores 2013; Cifuentes-Ruiz & Zaragoza-Caballero 2014). This high endemism has strong implications in tenebrionid subsistence, because species with restricted geographic distribution have a greater extinction risk than species with broad geographic distribution (Gaston & Fuller 2009). Indeed, because of this characteristic several endemic epigean species were considered as conservation targets in studies oriented to protect species diversity (see Carrara *et al.* 2011).

At a global level, the Andean region is one of the areas that particularly attract the attention of biogeographers and conservationists (Olson & Dinerstein 2002; Mittermeier *et al.* 2011). Geographically, it covers the south of Argentina and central and south of Chile (Fig. 1). According to available biogeographical classifications the Andean region is divided into three subregions: Central Chilean, Subantarctic and Patagonian (Morrone 2006, 2014, 2015). The Central Chilean subregion extends from 26° (Lowenberg-Neto 2014) to 37° south latitude in Chile (Morrone 2006, 2015). The Subantarctic subregion covers the southern Andes from 37° south latitude to Cape Horn in Argentina and Chile, and includes the Islands: Malvinas, Georgias del Sur, and Juan Fernandez (Morrone 2006, 2014, 2015). Finally, the Patagonian subregion extends at the east of the Andes from 35° south