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No. 12, Thiruvannamalai Nagar, Saravanampatti - Kalapatti Road, Saravanampatti,
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Ph: +91 9385339863 | www.threatenedtaxa.org
Email: sanjay@threatenedtaxa.org

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Caption: Malabar Slender Loris *Loris lydekkerianus malabaricus* © Dileep Anthikkad.



Austroborus cordillerae (Mollusca: Gastropoda) from central Argentina: a rare, little-known land snail

Sandra Gordillo

¹ Universidad Nacional de Córdoba, Facultad de Filosofía y Humanidades, Museo de Antropología, Córdoba, Argentina.

¹ Consejo Nacional de Investigaciones Científicas y Tecnológicas (CONICET), Instituto de Antropología de Córdoba (IDACOR), Avda. Hipólito Yrigoyen 174, X5000JHO, Córdoba, Argentina.
sandra.gordillo@unc.edu.ar

To the north-west of Córdoba, in the central region of Argentina, there is an evolutionarily diverse land snail fauna dominated by endemic species. Such is the case of the two most abundant and diverse genera *Plagiodontes* and *Clessinia* (Pizá et al. 2006; Pizá & Cazzaniga 2010; Cuezco et al. 2013, 2018).

This article concerns another land snail from the region, *Austroborus cordillerae*, which is a little-known species found infrequently (Klappenbach & Olazarri 1989; Gordillo et al. 2015). The lack of information on this species means that its state of conservation has not yet been categorized and it could be on the verge of extinction. This work therefore provides updated information on the records of this species by incorporating data collected in museums and new field findings.

Austroborus is recognized through three species with disjunct distribution: *Austroborus lutescens* (King), which lives in Uruguay (Scarabino 2004), *Austroborus dorbignyi* (Doering) from the south of Buenos Aires, Argentina (Delhey et al. 2005) and *Austroborus cordillerae* (Doering), from the north-west of Córdoba, Argentina

(Gordillo et al. 2015). This genus is reduced in size (35 mm high) compared to other representatives of the Strophocheilidae family (i.e., *Megalobulimus*, 85 mm high). The species *A. cordillerae* is somewhat larger than the other two, and is characterized by the coloration of the peristome (intense orange) and the sculpture of the proto-shell with intersecting radial and axial ribs (like a lattice), with small globular thickenings standing out in the intersection areas (Image 1). Unfortunately, these structures are not always well-preserved due to natural erosion or wear. Our diagnostic references only use the shell, since very little is known about the soft parts, except for a short description of a section of the radula (maxilla) given by Klappenbach & Olazarri (1989). The paratype of *A. cordillerae* is housed in the Senckenberg Natural History Museum in Frankfurt (Zilch 1971).

The new records are 10 fossil (late Quaternary) shells from the Olaen pampa (Image 2; 1,100 m) and one modern specimen (shell) from Ongamira (Image 2; 1,160 m). In addition, 14 specimens that are part of museum collections or institutions were included (most of them

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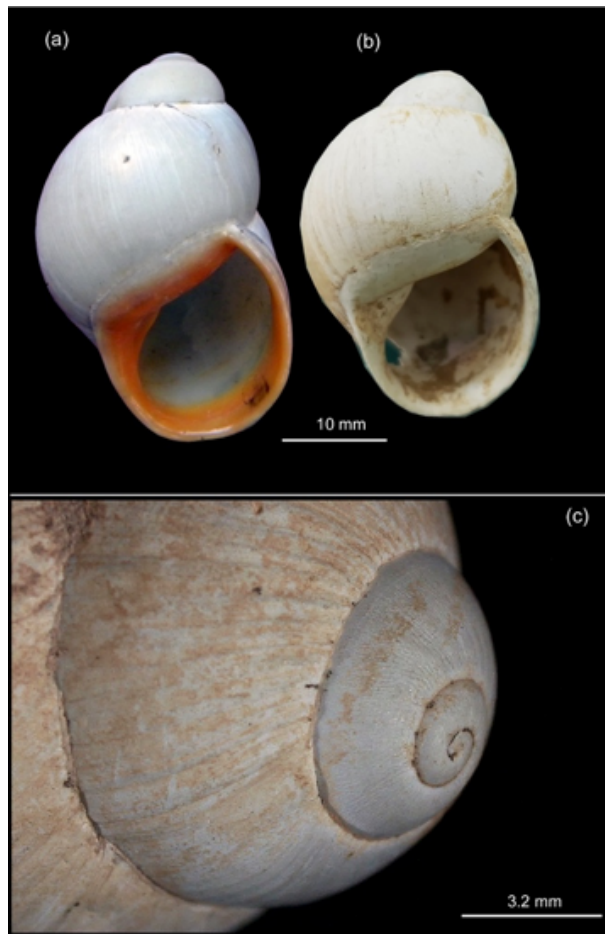


Image 1. Apertural views of adult shells of *Austroborus cordillerae*: a—modern | b—recent specimen | c—details of the spire of specimen. © Sandra Gordillo.

are from archaeological sites), together with nine more modern specimens from different sources (specimens offered for sale via internet). When added to the previous 13 records summarized by Gordillo et al. (2015), these 34 new records considerably increase the number of specimens documented so far.

Based on all the information collected, it is interpreted that the development of the species would have reached its peak in the Olaen pampa, where it was recorded in late Quaternary sediments, probably of Pleistocene age. After that, *Austroborus* drastically decreased in number. This assumption is sustained through field observations in the provenance locations of the shells and previous studies carried out in the province of Córdoba to address climatic changes along the late Quaternary using different geological and biological proxies (Carignano 1999; Andreazzini et al. 2013; Córdoba et al. 2005; Giorgis et al. 2015; Gordillo & Boretto 2020).

However, despite its retraction in the Olaen pampa,

we know that the species continued to live during the late Holocene, since it was found alive in the Achala pampa around 1885 and in the Ongamira valley in 1928 (Klappenbach & Olazarri 1989).

Thus, other factors would also have affected its retraction in the last millennium. In this sense, towards the end of the Holocene, the colder and drier climate, and practices associated with exotic livestock such as the burning of pastures, could have been the causes of their extinction in both the Achala and Olaen pampas. For the mountainous sector of Córdoba, including the high pampas, there is a history of four centuries of domestic grazing and man-made fires as a management practice, which have caused erosion, reduction of vegetation cover and shrinkage of forests (Díaz et al. 1994; Renison et al. 2006; Cingolani et al. 2008, 2013). Although there is no precise information on the effect of fire on mollusk species in the region, field observations in the Olaen pampa made it possible to verify the presence of a large number of burnt shells from different gastropod species (e.g., *Plagiodontes*, *Clessinia*, *Epiphragmophora*) as a result of the fires that raged in the region during the spring of 2020. Studies under controlled conditions by other authors with other species have also shown that, in addition to the death caused by forest fires, the altered habitat after a fire also affects the survival of snails (Ray & Berger 2015). Thus, bush burning over the years as an animal breeding practice must also be considered as a factor or threat to these and other species living today.

Finally, for Ongamira, a recent finding (March 2020) of a modern *Austroborus* shell, together with scattered data on specimens collected in the last 10 years (by collectors or for sale), suggests that there could be a relict population of this species. However, this information on ‘collecting’ should also lead us to reflect on the effects of these very practices and to consider them as an additional threat; one that could also severely affect some relict populations in this locality.

To conclude, it appears that a set of factors (climatic and anthropic) acting over time caused the retraction of this endemic snail.

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Image 2. Distribution area of *Austroborus cordillerae* (orange area) in central Argentina, South America.

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ravi@threatenedtaxa.org



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