

Distribution extension of a rare *Phymaturus* lizard (Squamata: Liolaemidae) reaching Nahuel Huapi National Park (Argentina)

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The *Phymaturus* genus is a saxicolous clade of liolaemid lizards endemic to arid north Patagonia and the southern Andes (located in Argentina and Chile). All known species are viviparous, and mainly herbivorous (Lobo et al., 2012; Lobo et al., 2016). In the last decade, new studies have revisited the phylogenetic relationships within this genus, followed by descriptions of several new species belonging to two species groups: *palluma* and *patagonicus* (e.g., Núñez et al., 2010; Lobo et al., 2012; Morando et al., 2013; Ávila et al., 2014).

Phymaturus tenebrosus Lobo and Quinteros, 2005 is a medium-sized lizard endemic to north-western arid Patagonia, that was recently split as a separate species from the *patagonicus* clade (Lobo and Quinteros, 2005). At present, *P. tenebrosus* is only known from a very restricted area in the Pilcaniyeu Department, western Río Negro Province, Argentina (around CA in Fig. 1), not covered by the Federal Protected Areas System of this country (SIFAP, after the Spanish initials). *Phymaturus tenebrosus* has not yet been categorized by the IUCN, but it is considered to have a Vulnerable Conservation Status in Argentina (Abdala et al., 2012), due to various factors such as presenting a limited and fragmented distribution, specialization in the saxicolous and herbivorous lifestyle, viviparous reproductive mode, low annual reproductive output (Ibargüengoytia,

2004), and acquisition of sexual maturity at 7-9 years, with a maximum life span of 16 years (Piantoni et al., 2006). Additionally, a physiological model of extinction worldwide predicts a high extinction risk for this lizard due to climate change (Sinervo et al., 2010). Other factors affecting its conservation are the high frequency of fires and sheep farming (Boretto, 2012), which intensify the natural fragmentation of its habitat.

Here, we present new records of this species in Río Negro and Neuquén Argentine provinces, extending its distribution westwards, reaching Nahuel Huapi National Park (NHNP) (Fig. 1). During October 2013, specimens of this lizard were opportunistically observed very close (5 km) to the eastern border of NHNP at Cerro Villegas (CV in Fig. 1), one of which was photographed (Fig. 2A). After this first record, other specimens were observed sporadically at 1200-1400 m asl around the same site (Cerro Villegas) during subsequent austral summer seasons (i.e., October-March). In order to verify if the species was also present west of the upper Limay River, which constitutes an important natural barrier to animal movement in north Patagonia, on February 2016 we examined several rocky outcrops located east of Cuyín Manzano River (CM in Fig. 1) with suitable conditions to harbour *Phymaturus* populations. Our survey covered an altitudinal range from 870 to 1300 m asl, and was conducted by two observers under good weather conditions (i.e., on a sunny day with no wind). During this survey, we found a single young male specimen of *P. tenebrosus* on a rocky outcrop located at 1266 m asl. The specimen was located in a horizontal and deep crack in the rock, which offered good shelter. Faeces were also observed nearby. The individual was photographed (Fig. 2B) and released at the same refuge. A complementary, exhaustive survey conducted on March 2016 by three observers at Fortín Chacabuco Ranch (location F Ch in Fig. 1), a second suitable area for this species within NHNP, was unsuccessful.

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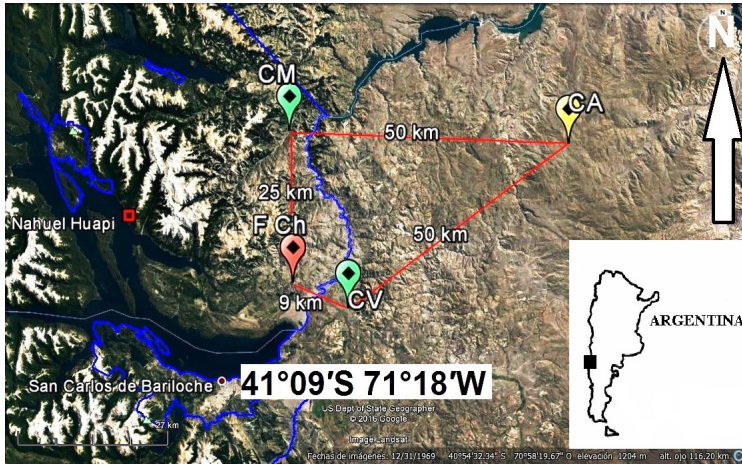


Figure 1. Map showing surveyed locations for *Phymaturus tenebrosus* contributed herein, and its *terra typica* (Lobo & Quinteros 2005). CA (yellow balloon): Cerro Alto, the species' *terra typica*. CM and CV (green balloons): Cuyín Manzano and Cerro Villegas, locations with positive records. F Ch (red balloon): Fortín Chacabuco Ranch, location with negative output. The blue lines represent the boundaries of Nahuel Huapi National Park (file SIB-APN 2012, v. 01 beta); the eastern boundary follows the upper Limay River (i.e., blue irregular layout within the red polygon). The geographic coordinates correspond to Bariloche city. As shown by the change in background colouration (from green to sand), our records lay near the transition between the Andean forests and the Patagonian arid steppe. Google Earth™ desktop 7.1.5.1557 free version was used.

Our record of *P. tenebrosus* in Cuyín Manzano falls about 50 km west from the species' *terra typica* (CA in Fig. 1), and brings about some interesting implications as related to the ecology and conservation of this little

known lizard, starting by its inclusion in the SIFAP: the upper Limay River roughly defines the eastern border of the NHNP, hence, the record at Cuyín Manzano lays within the boundaries of this protected area.



Figure 2. A). Adult *Phymaturus tenebrosus* recorded at Cerro Villegas, Río Negro Province (location CV in Fig. 1), and B) juvenile *P. tenebrosus* recorded at Cuyín Manzano area, Neuquén Province (location CM in Fig. 1), Argentina. Photos: A by J. Karlanian, B by S. Ippi.

Second, the Cuyín Manzano area belongs to the Andes foothills, in the transition zone between the Andean forests and the Patagonian arid steppe (see background colouration in Fig. 1), an uncommon biozone for *Phymaturus* spp. Third, the Limay River barrier may be of biogeographical relevance for this species, due to which population divergence between populations located east and west of this river is expectable. Last, this record extends the distribution of the species to include a second Argentine province (Neuquén).

Currently, the network of federal and state protected areas in Patagonia is not effective in protecting most endemic lizard species (Corbalán et al., 2011). Indeed, 18 *Phymaturus* spp. (along with lizards in other genera) served as key biodiversity elements for prioritizing areas of arid Patagonia that should be protected either at regional, provincial (state) or more local levels (Chehébar et al., 2013). For the *Phymaturus* genus as a whole, the situation is slightly better: all 34 species currently recognised in Argentina are categorized as Vulnerable (Abdala et al., 2012), but only a handful are protected by national parks (SIB-APN, <https://www.sib.gov.ar/>). A similar situation takes place in Chile, where this genus is represented by fewer species, although this number will most likely raise in future years as various candidate species have recently been identified (e.g., Núñez et al., 2010; Troncoso-Palacios and Lobo, 2012). All six species that were evaluated with regard to conservation status were categorized as endangered or critically endangered; nevertheless, only three are covered by the Chilean Protected Areas System (Chile, Ministerio del Medio Ambiente, <http://www.mma.gob.cl/clasificacionespecies/>). Surprisingly, although most *Phymaturus* spp. are threatened in the countries where they are endemic, most are listed as “Least Concern” by the IUCN (Red Lists 2016-2), which may be due to difficulties in evaluating this taxonomically unstable group of reptiles, with several new species being defined at an increased rate. Due to the combination of these factors, *Phymaturus* can be considered as an insufficiently protected taxon globally.

Our record of *P. tenebrosus* west of Limay River proves occurrence of this Vulnerable lizard within the SIFAP of Argentina, while at the same time adding the first *Phymaturus* sp. to the Argentine national parks located on the Patagonian Andes (i.e., Lanín National Park southwards), which is encouraging. However, despite favourable weather conditions and an exhaustive full-morning search, we were only able to locate a single specimen at Cuyín Manzano, and

none at Fortín Chacabuco Ranch. In addition to the fragmented distribution (i.e., elevated, and generally fragmented rock outcrops) and low population densities of this lizard, the large properties (“estancias”) that contain most known populations of *P. tenebrosus* in north Patagonia are heavily modified due to livestock. Particular intrinsic characteristics of this species, as females giving birth two offspring maximum every two years (Ibargüengoytia, 2004), and an advanced age to reach reproductive maturity (Piantoni et al., 2006), may turn this species very sensitive to changes in habitat conditions. With this, studies on the status of *P. tenebrosus* populations, and on the threats they face, are needed.

Now with the confirmed presence of this species in NHNP, a long-term monitoring program should be established soon, especially considering that it is the only threatened lizard in this park. Moreover, its potential presence in protected areas adjacent to NHNP (such as Limay Protected Landscape and Lanín National Park) deserves some exploration efforts, and new protected areas should be created in the transition zone between the national parks located at the Andes foothills and the arid plains of Patagonia, as this ecotone contains key habitat for lizards and for several other biodiversity groups (e.g., Ojeda, 2007; Chehébar et al., 2013; Lambertucci and Ruggiero, 2016).

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