

NEW SOUTHERN MOST RECORDS OF *ELIGMODONTIA PUERULUS* (RODENTIA: CRICETIDAE) IN NORTHERN CHILE: IMPLICATIONS FOR ITS BIOGEOGRAPHY AND CONSERVATION

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ABSTRACT

Eligmodontia puerulus is well-adapted to desert ecosystems. It is restricted to the puna or “altiplano” region, which comprised southern Peru, northeastern Chile, west-central Bolivia and northwestern Argentina. In Chile its known distribution reaches its southern limit at the north of Atacama Salt. Between September 2006 and March 2010 we captured 100 individuals using Sherman traps and determined 37 individuals based on dental remains of *E. puerulus* inside *Lycalopex culpaeus* faeces, in seven different localities between the Salar de Atacama, in the Antofagasta Region, and Quebrada Villalobos, in the Atacama Region. These records increase the species distribution in 490 km at the south of its known distribution range, and also support the potential distribution for Chile proposed by Lanzone and Ojeda (2005), whose postulate a continuous distribution in all the puna region.

Keywords: *Eligmodontia puerulus*, Chile, puna, distribution.

RESUMEN

Registros sureños de *Eligmodontia puerulus* (Rodentia: Cricetidae) en el norte de Chile: implicancias para su biogeografía y conservación. *Eligmodontia puerulus* es un roedor adaptado para la vida en ecosistemas desérticos. Su distribución de encuentra restringida al altiplano, la cual se encuentra comprendida en el sur de Perú, noreste de Chile, área centro-oriental de Bolivia y noroeste de Argentina. En Chile, su distribución conocida alcanza su límite sur al norte del Salar de Atacama. Entre Septiembre de 2006 y Marzo de 2010 se realizaron 100 capturas de individuos mediante trampas Sherman y se determinaron 37 individuos a través de piezas dentales de *E. puerulus* en heces de *Lycalopex culpaeus*, en siete localidades distintas entre el Salar de Atacama, en la Región de Antofagasta, y la Quebrada Villalobos, en la Región de Atacama. Estos registros amplían la distribución de la especie en 490 km al sur de su rango de distribución conocido, apoyando también la distribución potencial de la especie propuesta por Lanzone y Ojeda (2005), quienes postulan una distribución continua en todo el altiplano.

Palabras Clave: *Eligmodontia puerulus*, Chile, altiplano, distribución.

Although mammalian Chilean fauna is relatively well known (e.g., Muñoz-Pedreros and Yañez 2009; Iriarte 2008, new taxa distributions are frequently added to South American diversity knowledge (e.g. Spoto et al. 1998; Saavedra and Simonetti 2001; Ulyses et al. 2010).

Northern and southern regions have been less studied than more temperate locations, and are thus the main potential sources of new records of species occurrence (Simonetti et al. 1995).

Herein, we report eight new localities for the specie *Eligmodontia puerulus* in northern Chile.

Distribution of *Eligmodontia* genus includes a wide territory (Lanzone and Ojeda 2005; Lanzone et al. 2007; Mares et al. 2008). It spans high desert habitats within the Puna region in the north, through drylands and lowlands near the Atlantic coast to the Patagonian steppe in the south, and from the sea level to the 5,000 masl.

This actual heterogeneous distribution range would be the result of an important diversification process in the cricetines group, influenced by environment changes happened during the Miocene period (Hershkovitz 1962; Lanzone and Ojeda 2005) and an adaptation process which has not completely finished as well.

Eligmodontia puerulus, the silky-foot mouse or “ratón de pie sedoso” is regarded as typical species in the desert ecosystem. This species inhabits in the Puna region of extreme southern Peru, northeastern Chile, west-central Bolivia and northwestern Argentina (region known as “altiplano”) and in steppe habitats between the 500 and 4,800 meters above sea level (Redford and Eisenberg 1992; Muñoz-Pedrerros and Yáñez 2009; Iriarte 2008; Mares *et al.* 2008) being part of the Puna fauna district (Osgood 1943).

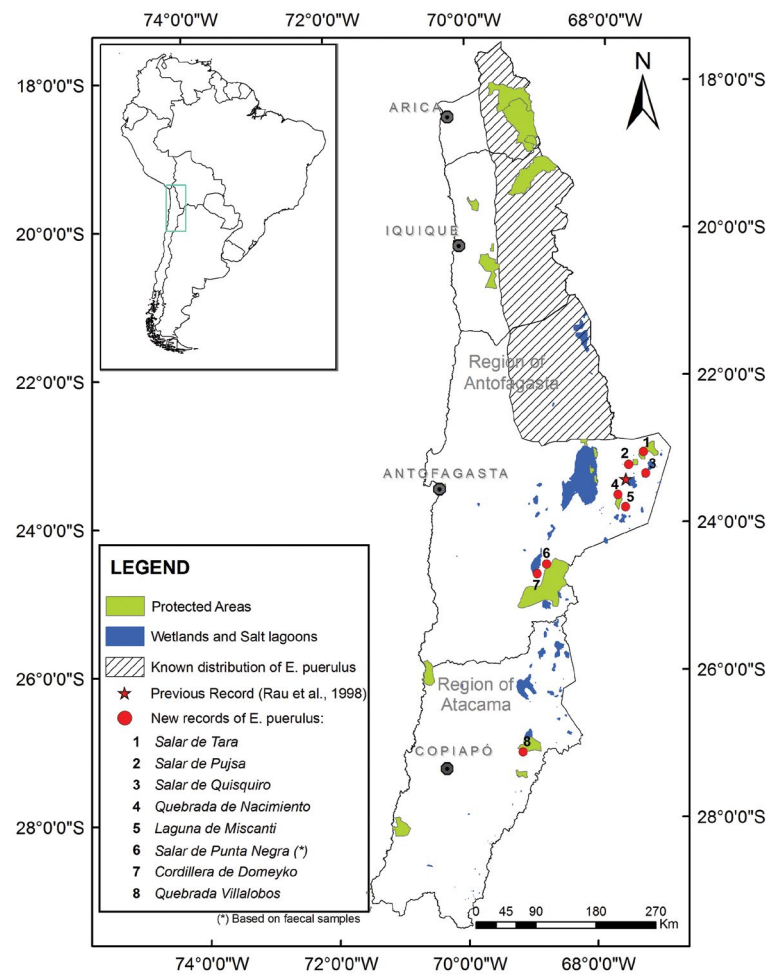
Morphological and physiological adaptations have allowed this species to live in extreme environmental conditions (*e.g.* hydric stress, strong wind, high solar radiation; Hershkovitz 1962). The previously known distribution of *E. puerulus* reached and area 15 km north of the Salar de Atacama, see Figure 1 (Muñoz-Pedrerros and Yáñez 2000; Iriarte 2008).

Subsequently, Rau *et al.* 1998, found a single individual in the locality of Talabre Viejo, 43 km to the South of the previously known distribution.

This new discovery was not included in the literature as a distribution extension. Here we report the findings of new records of *E. puerulus* in different locations at the southern range of their recorded distribution.

Between September 2006 and March 2010 we captured 100 live individuals of *E. puerulus* in seven different localities within its known southern range (Table 1, Figure 1).

FIGURE 1. Known distribution and new records of *E. puerulus*.



Area	N	Region	Date	Latitude (S)	Longitude (W)	H (masl)	Distance to known distribution (km)
Salar de Tara	13	Antofagasta	January 2007	22° 59' 59"	67° 18' 38"	4318	23
Salar de Pujsa	1	Antofagasta	January 2007	23° 14' 06"	67° 31' 09"	4511	37
Salar de Quisquiró	5	Antofagasta	January 2007	23° 12' 25"	67° 14' 50"	4204	41
Quebrada de Nacimiento	14	Antofagasta	September 2006	23° 36' 49"	67° 50' 11"	3580	85
Laguna de Miscanti	65	Antofagasta	January 2007	23° 43' 38"	67° 47' 05"	4170	96
	37		January -				200
Salar de Punta Negra	(¹)	Antofagasta	December 2009	24° 39' 57"	68° 55' 10"	3210	
Cordillera de Domeyko	1	Antofagasta	May 2009	24° 45' 26"	69° 05' 47"	3525	213
Quebrada Villalobos	1	Atacama	March 2010	27° 12' 20"	69° 01' 23"	4019	490

(¹) based on faecal samples

TABLE 1. New records of *E. puerulus*. Coordinates in Latitude/Longitude, Datum WGS84

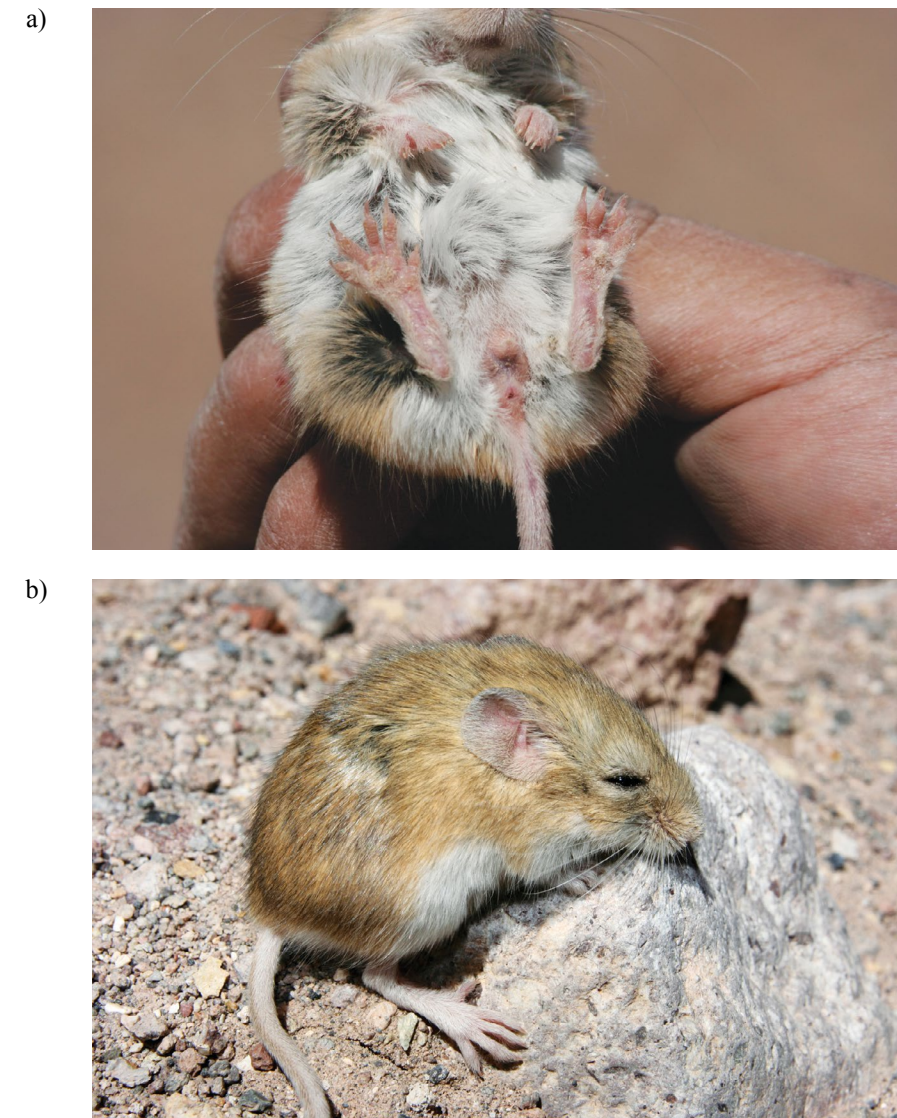


FIGURE 2. Adults of *E. puerulus* from a) Cordillera de Domeyko, b) Quebrada Villalobos (Photos: N. Lagos).

The individuals were photographed and recognized to specie level by the specialist Juan Carlos Torres-Mura, of the National Museum of National History, Santiago, Chile.

From September 2006 to January 2007, we sampled small mammals in different areas of the Region of Antofagasta.

On this sampling period we caught a total of 98 individuals of *E. puerulus* in Salar de Tara, Salar de Pujsa, Salar de Quisquiro, Quebrada de Nacimiento and Laguna Miscanti (Table 1, Figure 1).

The individuals were captured between the 3,580 and 4,511 masl, at different habitats including rocky steepes, wet areas and gramineous dominated environments.

In 2009 we captured single female of *E. puerulus* (Figure 2) during sampling of small mammals carried out in the cordillera de Domeyko (Table 1, Figure 1) in Region of Antofagasta.

Cordillera de Domeyko is a ravine placed near the Salar de Punta Negra.

It is composed by native Andean vegetation dominated by *Festuca* sp. - *Ephedra* sp. - *Adesmia* sp. associations where *Ephedra andina* and *Adesmia spinosa* are dominant species.

Sampling consisted of daily trapping sessions of at least four nights during May 2009.

We used medium-sized Sherman traps baited with rolled oats arranged in 6 x 8 grids and with traps located five metres apart from each other.

Grids were placed in areas with vegetation and also with rocky cover. In the same study we collected several *Lycalopex culpaeus* (Culpeo fox) faeces samples, finding a total of 37 different individuals of *E. puerulus*.

These were identified by cranial and dental remains in the faeces.

A sample of those dental remains found in six faeces samples were deposited at the National Museum of National History, Santiago, Chile (MNHNCL/MAM 1548).

For the identification of molars we used Reise (1973). In the same trapping grids we captured individuals of *Phyllotis xanthopygus* and *Abrothrix andinus*.

The last new record of *Eligmodontia puerulus* was a male captured in Quebrada Villalobos in the Region of Atacama (Table 1, Figures 1 and 2).

Quebrada Villalobos is a ravine located into the Nevado Tres Cruces Priority Conservation Site which includes two major lakes: the Laguna Negro Francisco and Laguna Santa Rosa (Figure 1). Quebrada Villalobos is composed by native Andean vegetation dominated by species such as *Deyeuxia eminens*, *Puccinellia frigida*, *Scirpus atacamensis*.

Sampling consisted of daily trapping sessions of at least three nights during March 2010.

We used medium-sized Sherman traps baited with rolled oats arranged in transect and with traps located 10 m apart each other.

Traps were placed upon vegetation patches (wet area) and in lands next to vegetation patches (dry area).

In the same trapping transect no other species were captured.

The Table 2 shows the body measurements of the individuals captured at the seven new localities.

All these records not only update the previous distribution for Chile proposed by Muñoz-Pedrerros and Yáñez (2009), increasing the southern limit distribution of *E. puerulus* about 490 km, but also support the potential distribution for Chile proposed by Lazon and Ojeda (2005) (Table 1).

The importance of these new records is that it provides further evidence of continuous distribution of previously known areas in the north Region of Antofagasta and the southernmost capture at the Region of Atacama.

This suggests that the northern and southern populations are not isolated, and the distribution of this specie reaches the entire puna region of Chile (connecting the Region of Arica y Parinacota and the Region of Atacama) increasing its distribution area in 490 km.

The distribution change would become an important factor since it has been incorporated in a conservation status proposal (Cofré and Marquet 1999).

Apparently this specie is well adapted to live in different habitats of the high Andes, considering all the environments where this specie was found: wet areas, fertile plains, rocky areas and shrub dominant habitats, which is coherent with the habitat generalist classification suggested by Cofré and Marquet (1999).

Area	Sample size	Body length	Tail length	Ear	Weight (g)
Salar de Tara	13	7,3 ± 1,2	6,2 ± 0,8	1,4 ± 0,2	16 ± 6,1
Salar de Pujsa	1	6,5	6,5	1,5	17,8
Salar de Quisquiro	5	9,3 ± 0,4	7,5 ± 0,9	2	26,3 ± 3,8
Quebrada de Nacimiento	14	8,2 ± 0,4	5,7 ± 0,4	1,3 ± 0,2	21,1 ± 2,7
Laguna de Miscanti	65	7,7 ± 0,8	7,1 ± 0,7	1,4 ± 0,2	20 ± 6,6
Cordillera de Domeyko	1	6,5	7,6	1,1	20
Quebrada Villalobos	1	10,1	5,9	1,2	15

Table 2. Morphometric measures of captured *E. puerulus*. Measures are in centimeters.

Despite its phylogeographic relevance, these southern populations might be threatened by human activities in the zone derived of mining activities increasing in both regions during the last century. Fortunately, five of the seven new records were near or inside protected areas: The Miscanti, Tara and Pujsa individuals were found inside Los Flamencos National Park, the Punta Negra individual was found near the Lullailaco National Park, and the individual captured at Quebrada Villalobos was found inside the Nevado Tres Cruces Priority Conservation Site (recently designated as RAMSAR site) that would help to ensure the long term conservation of this elusive species.

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