Natural history of the *Chinchilla* genus (Bennett 1829). Considerations of their ecology, taxonomy and conservation status

Historia natural del género *Chinchilla* (Bennett 1829). Consideraciones de su ecología, taxonomía y estado de conservación

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ABSTRACT

Over the last years there has been new and valuable information in both wild chinchillas, however this is still insufficient for effective protection. In this paper we review some fundamental aspects of its natural history, synthesizing and delivering new information about their ecology, taxonomy and conservation status, based on the review of available literature, and field data collection. In relation to their ecology we have been identified new colonies of both species, for scientific research as well as environmental technical reports. For most of these colonies we identified vegetation to which they are associated, predators and other sympatric rodent species. The taxonomy of these species is controversial. A proposal was submitted to ICZN in 2003, and the recommendations were to describe a neotype for genus and species, but the original specimens described by Bennett (1829), Lichtenstein (1830) and Waterhouse (1844) are in museums from Europe and should be considered as syntypes. Conservation status of both species is critically endangered because most colonies are threatened by mining exploitation. Therefore, it is essential to explore new regions to identify new colonies and compare them with modern methods such as molecular markers. Finally, with this information we argue the need to develop a conservation programs for both species; it should consider critical areas of their biology, such as ecology, genetics and reproduction.

KEYWORDS: *Chinchilla*, conservation plans, critical endangered, distribution, endemism, new colonies.

RESUMEN

En los últimos años se ha generado nueva y valiosa información de las dos especies silvestres de chinchillas; sin embargo ésta sigue siendo insuficiente para una protección efectiva. En este trabajo hacemos una revisión de algunos aspectos fundamentales de su historia natural, sintetizando y entregando nuevos antecedentes de su ecología, taxonomía y estado de conservación, en base a la revisión de la literatura disponible, y toma de datos en el campo. En relación a su ecología, hemos identificado nuevas colonias de ambas especies, tanto por investigación científica como por reportes técnicos ambientales. Para la mayoría de esas colonias se ha identificado la vegetación a la que están asociadas, depredadores y otras especies de roedores simpátridos. La taxonomía de ambas especies ha sido controversial. Una propuesta fue sometida a la ICZN en el 2003 y las recomendaciones fueron describir un neotipo para el género y ambas especies; sin embargo, los especímenes originales descritos por Bennett (1829), Lichtenstein (1830) y Waterhouse (1844) existen en museos de Europa y deben ser considerados como los respectivos sintipos. Finalmente, el estado de conservación de estas especies ha sido catalogado como críticamente en peligro tanto por instituciones nacionales como internacionales, esto debido a que la mayoría de las colonias son pequeñas, fragmentadas y aisladas, sin embargo, ahora la mayor amenaza es la relación geográfica de las nuevas colonias con áreas de explotación minera. Se argumenta con esta información la necesidad de desarrollar un programa de conservación de ambas especies, que considere ámbitos fundamentales de la biología de la especie, tales como la ecología, genética y reproducción.

PALABRAS CLAVES: *Chinchilla*, conservation plans, critical endangered, distribution, endemism, new colonies.

INTRODUCTION

The *Chinchilla* genus (Bennett 1829) comprises two wild and endemic species of Chile, *Chinchilla chinchilla* (Lichtenstein 1830) commonly known as short-tail or andean chinchilla, and *C. lanigera* (Molina 1782), commonly known as the long-tail or coastal chinchilla. Both chinchillids species had a wide distributions; short tail chinchilla includes historical distribution from Chile, Argentina, Peru and Bolivia (Chacón 1892; Walle 1914; House 1953; Grau 1986; Jiménez 1996; Anderson 1997; Eisenberg & Redford 2000; Parera 2002; Woods & Kilpatrick 2005) and coastal chinchilla ranges from Choapa river (32°S) to north Potrerillos (26°S) (Grau 1986; Jiménez 1996). Actually the distribution is restricted to few, small and fragmented colonies (Valladares 2012; Valladares *et al.* 2012).

In relation to ecology, the knowledge for both species is very poor (Jimenez 1996). Studies conducted during the last few decades have been restricted to ecophysiology (Cortés *et al.* 2000; Ostojic *et al.* 2002; Cortés *et al.* 2003), diet (Cortés *et al.* 2002; Tirado *et al.* 2012) and distribution (Valladares 2012; Valladares *et al.* 2012; Valladares *et al.* 2014). There are little information about social behavior, predators, competitive species and null information about temporal abundance.

About the taxonomy, the major biological questions is the number of species of chinchillas to be recognized (Anderson 1997), one (Osgood 1941, 1943, Allen 1942); two (Cabrera & Yepes 1960; Cabrera 1961; Spotorno *et al.* 2004a), or three (Prell 1934a; Bidlingmaier 1937), but according to Miller *et al.* (1983) this taxonomic issue could never be resolved because there were no wild colonies. Other unresolved topics in taxonomy is the determination of a neotype for the *Chinchilla* genus (Bennet 1829), *lanigera* (Molina 1782) and *chinchilla* (Lichtenstein 1830) species, to contribute to the taxonomic stability suggested by the International Commission on Zoological Nomenclature (ICZN - case 3278; Valladares & Spotorno 2003).

The critical conservation status for both species is derived by the more than 20 million specimens that were killed only in Chile at the beginning of twentieth century (Albert 1900, 1901; Iriarte & Jaksic 1986). Although both species were considered extinct during 1960's, *C. chinchilla* was rediscovery by Spotorno *et al.* (1998) and Valladares *et al.* (2012); and *C. lanigera* by Mohlis (1983) and Spotorno *et al.* (2004a).

In this work we present a timely update on past reviews of information, which will be a useful tool for both planning future conservation efforts and mitigation of human-wildlife conflicts, such as the mining exploitation.

METHODS

To evaluate the ecology and conservation status of both species, we revisited scientific information (e.g. Jiménez 1987, 1989, 1994, 1995, 1996; Spotorno *et al.* 1998; Cortés *et al.* 2002; Spotorno *et al.* 2004a,b; Valladares 2012; Valladares *et al.* 2012; Tirado *et al.* 2012) and technical and public reports. In other hand, we took field data to assess the vegetation associated with the colonies of chinchillas, as well as the sympatric species of rodents and predators (Valladares *et al.* 2014).

To evaluate the taxonomy, we assessed old papers and collect specific information from curators of European and South American collections, for example the National Museum of Natural History, Leiden, Holland; Natural History Museum of London, England, and Museum für Naturkunde, Leibniz Institut for Research on Evolution and Biodiversity at the Humboldt University, Berlin, Germany, Museo Argentino de Ciencias Naturales "Bernardino Rivadavia", Argentina.

RESULTS

ECOLOGY

Colonies from Las Chinchillas National Reserve were characteristic by ranging between 0,9 to 10.7 individuals/ha. Most of the scattered colonies were located on steep and dry equatorial-facing slopes, where long-tail chinchillas eat the succulent bromeliad *Puya berteroniana*. Their refuges corresponded to rock crevices and boulder piles (Jiménez 1987, 1989, 1994, 1995, 1996). The main plant species eaten by *C. lanigera* was the perennial graminoid *Nassella chilensis*, and secondarily *Heliotropium stenophyllum*, *Lobelia polyphylla*, *Bridgesia incisifolia* and *Adiantum chilense* (Cortés *et al.* 2002). They coexisted with a diverse assemblage of rodents such as *Abrocoma bennetti*, *Abrothrix olivaceus*, *A. longipilis* and *Octodon degus* (Muñoz-Pedreros & Gil 2009). The main predators of the chinchillas in Coquimbo region were the foxes *Lycalopex culpaeus* and *L. griseus* (Muñoz-Pedreros & Gil 2009). Other biological aspects such as reproduction, growth, and dispersion are unknown. The diet as well as predators of the small and isolated colony at La Higuera are unknown. In relation to the Atacama colony, it was located 44 km from the coast, and inhabits in the middle of a very arid hill, approximately 1150 m in height, and surrounded by extensive dunes of the Atacama Desert (Valladares *et al.* 2014). Forty two points with feces, footprints and/or wallows were identified, nine of them showing recent activity. The vegetation was identified as *Heliotropium sclerocarpum*, *Tetragonia microcarpa*, *Gymnophytum flexuosum*, *Nolana sp.*, and particularly *Eriocyse aurata*, probably the main source of water and food, with 87% of its cactus gnawed by rodents. No other

sympatric species were reported, but *Phyllotis darwini* was collected near there (Valladares 2012). An owl *Bubo magallanicus* was observed as the unique predator (Table 1), although foxes were occasionally observed by mining-workers (Valladares et al. 2014).

Colonies of *C. chinchilla* from Antofagasta region are associated to *Parastrephia lepydophylla*, *P. quadrangularis*, *Baccharis incarum*, *Chuquiria gaulicina* and *Adesmia horrida* (Spotorno et al. 1998), *Baccharis tola*, *Adesmia caespitosa*, *A. erinacea*, *Fabiana byroides*, *Stipa chrysophylla* and *Cristaria andicola* (Tirado et al. 2012), with preferences in diet to *S. chrysophylla* (59,1%). Its colonies are sympatric with *Abrocoma cinerea*, *Phyllotis cf xanthopygus*, *Abrothrix andinus dolichonyx* and *Lama guanicoe* (Spotorno et al. 1998; Tirado et al. 2012). The habitat for the Atacama colonies corresponded to a stream with boulders, and medium-sized caves, with sparse scrub vegetation of *Stipa frigida* and *Senecio volckmannii* (Table 1). Other species of rodents were *Phyllotis cf xanthopygus* and *Abrothrix andinus* (Valladares et al. 2012). A second colony was detected at a northern site, in Santa Rosa lagoon (26°49'11"S and 69°05'67"W), corresponding to the northern area of the National Park, where remains of a jaw and feces were found. The principal predator identified in the three recognized colonies is *Lycalopex culpaeus* (Lagos et al. 2012).

TAXONOMY

Both actually recognized species (*C. lanigera* y *C. chinchilla*) has had a controversial taxonomy. Bennett (1829) commented the original description of *lanigera* by Molina, saying that it had “much error and few truth”. Nevertheless, the original descriptions were not in doubt, until Prell (1934a,b). He rejected Molina’s name as ambiguous, unidentifiable, or even applicable to a different animal of the genus *Abrocoma* or “chinchilla rat”, which lives in the same territory. The acceptance of this latter interpretation would alter the nomenclature of that genus, because *lanigera* of Molina would be an older name than names now used for species of *Abrocoma*. In such case, the chinchilla of the Andes and coastal mountains south to Illapel would be without specific name, and he proposed *Chinchilla velligera*. On other hand, Lichtenstein (1830) described *Eriomys chinchilla* from Perú, near Lima (Prell 1934a; Osgood 1941, 1943), or probably north of Chile (Allen 1942). Waterhouse (1848) described *Chinchilla brevicaudata* from Perú, but according with Osgood (1943), it was based on the same specimens as *Eriomys chinchilla* Lichtenstein, evidently a renaming to avoid tautonymy. The northern chinchilla has received several names, *Callomys aureus* d’Orbigny & Geoffroy (1830), *Chinchilla*

major Trouessart (1898), *Chinchilla boliviana* Brass (1911), *Chinchilla intermedia* Dennler (1939), *Chinchilla lanigera boliviana* and *Chinchilla lanigera brevicaudata* Allen (1942), *Chinchilla chinchilla* and *Chinchilla boliviana* Prell (1934b), *Chinchilla c. chinchilla* and *C. c. boliviana* Osgood (1941, 1943), *Chinchilla brevicaudata brevicaudata* and *C. brevicaudata boliviana* (Cabrera 1961) but nobody designated a type specimen. Cabrera (1960, 1961), Ipinza (1969), Tamayo & Frassinetti (1980) and Woods (1993); Redford & Eisenberg (1992) and Spotorno et al. (2004a,b) recognized *C. lanigera* Molina (1782) and *C. brevicaudata* Waterhouse (1848); but Anderson (1997) and Valladares (2002) recognized *C. chinchilla* Lichtenstein (1830) for the “short tail” chinchilla species. Valladares (2002) and Spotorno et al. (2004a) recognized two species based in molecular divergence from part of cytochrome b gene sequences. Tate (1935) recognized *Chinchilla* as the genotype and the species *lanigera* Molina, but he was not sure about the taxonomic position of *Chinchilla chinchilla* and *Chinchilla brevicaudata*.

According to Smeenk (*in litt*), Waterhouse (1848) described *C. brevicaudata* based in three specimens identified as *Eriomys chinchilla*, one at the Berlin Museum (not seen by him) and two at the Leyden Museum, which he measured himself. Both specimens were collected or obtained by D’Orbigny and Prévost and described as a new species by Waterhouse. D’Orbigny collected in Bolivia between July 1830 and June 1833. He stayed in La Paz from 19 April to 27 June 1833; he arranged and packed his collections amassed during his various expeditions in the country. La Paz may have been only the place where the specimens were acquired or shipped rather than the exact collecting locality. Specimens obtained by Prévost from Chile are not further documented; the Leiden Museum received some mammals from him in 1835 and 1839. According to Smeenk, both specimens were determined as syntypes (RMNH.MAM.39393 y RMNH.MAM.39394). On the other hand, the specimen reviewed by Lichtenstein was deposited in the Museum für Naturkunde, Leibniz Institut for Research on Evolution and Biodiversity at the Humboldt University, Berlin, Germany, with number BZN1878; on the label is determined as *Eriomys chinchilla*, collected by Salmin in Perú. Finally, the specimen reviewed by Bennett is deposited on Collection of Department of Zoology (Mammals sections) of the Natural History Museum of London (code GMCM 54a1).

In the absence of consensus on the priority of the species name, the matter was referred to the International Commission on Zoological Nomenclature (ICZN - case 3278), appealing to Article 23 of the Code of Zoological Nomenclature (4th Edition) establishing the Law of Priority over the name most commonly used. This request was answered on September 1, 2003, stating that the specific

epithet *chinchilla* is the oldest available for the species and is therefore valid. It was also suggested to determine a neotype for the *Chinchilla* genus (Bennet 1829), *lanigera* (Molina 1782) and *chinchilla* (Lichtenstein 1830) species to contribute to taxonomic stability.

CONSERVATION STATUS

In relation to the conservation status, Cofré & Marquet (1999), based on a Priority Conservation Index, cataloged *C. chinchilla* in an 'Endangered' category. According to these authors, *C. chinchilla* had features such as geographical distribution of 85.000 km², with a local abundance of 63.1 ind/km², inhabit two countries and is mentioned in another list of conservation as "rare", "undetermined or inadequately known." In light of the background found in the literature, there are still doubts about its range, as it can be restricted just to three colonies (Valladares *et al.* 2012). The short tail chinchilla was considered extinct in Peru and Bolivia (Honaki *et al.* 1982; Bernal & Silva 2003), but today in Bolivia this species is considered "Critically Endangered", since it is still possible to find wild populations. This position is supported by information from residents of the southern department of Potosi (Tarifa 2009). In Perú, it was recently listed as "Critically Endangered" by Supreme Decree N° 034-2004-AG, although there is no data supporting the presence of this species in this country. Meanwhile in Argentina, the species has been listed as "Critically Endangered" (Díaz & Ojeda 2000; Chébez & Olivera 2008). In Chile, *C. chinchilla* has been evaluated as "Endangered" by the Regulation of the Law of Hunting (Servicio Agrícola y Ganadero 2012). CONAF published in 1988 the Red Book of Vertebrates in Chile, cataloging this species as "Endangered". The species is "Extinguished" in the Tarapacá region, and "Endangered" in the Antofagasta and Atacama regions (Muñoz-Pederos & Gil 2009). In any case, the short tail chinchilla has been classified as "Critically Endangered" by CITES (<http://cites.org/eng/resources/species.html>), by IUCN (D'Elia & Ojeda 2008a), and by the Evolutionary Distinct & Globally Endangered program (EDGE, www.edgeofexistence.org/mammals/top_100.php) (Table 2), without conservation attentions and further surveys to establish the location of wild populations of this species as well as urgent conservation actions. *C. chinchilla* is currently classified as "Endangered" or "Critically Endangered", but not Extinct by Perú, Bolivia and Argentina. Interestingly, the absence of wild living specimen's collection has not been documented along this extensive area.

C. lanigera has been classified as "Endangered" by CONAF (1988), but they specify that it is considered "Extinct" in the Antofagasta and Atacama regions, and as "Endangered" in the Coquimbo region. By the Regulation of the Law of Hunting (Servicio Agrícola y Ganadero 2012), it has been evaluated as "Endangered" for north and central Chile, and "Critically Endangered" by IUCN (D'Elia & Ojeda 2008b), due to "a drastic past and an ongoing declination of the population, estimated to be more than 90% over the past three generations (15 years). This species has been reduced to a fraction of the original distribution and is under continuing pressures due to illegal hunting and reduction of habitat quality". *C. lanigera* was evaluated as "Critically Endangered" by the Evolutionary Distinct & Globally Endangered program (EDGE, www.edgeofexistence.org/mammals/top_100.php), without conservation attentions and further surveys to establish the location of wild populations of this species with urgent conservation actions (Table 2). Both species were evaluated by Ministerio del Medio Ambiente of Chile as Critically Endangered for *C. chinchilla* and Endangered for *C. lanigera*.

Currently, the greatest threat to these species is the proximity of their colonies to mining exploitation areas. In the case of *C. lanigera*, colonies of "Las Chinchillas" National Reserve and other external colonies of the reserve, are near to the mineral project "El Espino" in the Coquimbo region (see <http://seia.sea.gob.cl>), but the base line of this project did not recognized the presence of chinchillids in the influence area, although the National Reserve "Las Chinchillas" is only to 8 kms south. A colony reported by a mining company "Cerro Blanco" from White Mountain Titanium Corporation, near to Vallenar, Atacama region, where in their line base mentioned a record of *C. lanigera* in winter, 2012 (see <http://seia.sea.gob.cl>). On the other hand, colonies of *C. chinchilla* from Atacama region were reported nearly to a mineral project (Valladares *et al.* 2012; Lagos *et al.* 2012), but other new colonies were recently identified by others companies, for example the prospection and exploration of the "Salares 7" from Salares Lithium Company (see <http://seia.sea.gob.cl>), where in their line base of vertebrates show a photography of footprints of *C. brevicaudata* [sic], and "Salares Norte Mining" from Gold Fields Salares Norte Company (see <http://seia.sea.gob.cl>), where in their base line show photograph's of short tail chinchilla.

TABLE 1. Ecological characteristics of *C. chinchilla* and *C. lanigera*, cited by Jiménez 1987, 1989, 1995, 1996, Spotorno et al. 1998, Spotorno et al. 2004a,b, Mohlis 1983, Valladares 2012, Valladares et al. 2012, Cortés et al. 2002, Lagos et al. 2012, Tirado et al. 2012, * this work. WPA: Wild Protected Areas.

TABLA 1. Características ecológicas de *C. chinchilla* y *C. lanigera*, citado por Jiménez 1987, 1989, 1995, 1996, Spotorno et al. 1998, Spotorno et al. 2004a,b, Mohlis 1983, Valladares 2012, Valladares et al. 2012, Cortés et al. 2002, Lagos et al. 2012, Tirado et al. 2012, * este trabajo. **pruebas indirectas. WPA: Áreas Silvestres Protegidas.

LOCALITY	COORDINATES	HIGH	VEGETATION	DIET	OTHER RODENTS	PREDATORS	THREATENED	WPA
<i>Chinchilla chinchilla</i>								
Morro Negro, Antofagasta region	25°00'S, 68°45'W	over 4000	<i>Baccharis tola</i> <i>Adesmia caespitosa</i> <i>Adesmia erinacea</i> <i>Fabiana byroides</i> <i>Stipa chrysophylla</i> <i>Cristaria andicola</i>	<i>A. erinacea</i> <i>S. chrysophylla</i>	<i>Abrocoma cinerea</i> <i>Abrothrix andinus dolichonyx</i> <i>Phyllotis rupestris</i> <i>Eligmodontia puerulus</i>	no identified	no identified	Lullaillaco National Park
El Lago, Antofagasta region	23°44'S, 67°28'W	3500	<i>Parastrephia lepidophylla</i> <i>P. quadrangularis</i> <i>Baccharis incarum</i> <i>Chusqueira ulicina</i> <i>Adesmia horrida</i>	unknown	<i>Abrothrix andinus dolichonyx</i> <i>Phyllotis rupestris</i> <i>Eligmodontia puerulus</i> <i>Abrocoma cinerea</i>	<i>Galictis cuja</i> <i>Puma concolor</i>	mining exploitation	-
Quebrada Piedras Lindas, Atacama region	27°28'S, 69°00'W	over 4000	<i>Stipa frigida</i> <i>Senecio volkmanii</i>	unknown	<i>Phyllotis cf xanthopygus</i> <i>Abrothrix andinus</i> <i>Lagidium viscacia</i>	<i>Puma concolor</i> <i>Lycalopex culpaeus</i>	mining exploitation	Nevado Tres Cruces National Park
<i>Chinchilla lanigera</i>								
Aucó, Coquimbo region	31°30'S, 71°06'W	400 - 1900	<i>Nassella chilensis</i> <i>Heliotropium stenophyllum</i> <i>Lobelia polyphylla</i> <i>Bridgesia incisifolia</i> <i>Adiantum chilense</i> <i>Puya berteroniana</i> <i>Portieria chilensis</i>	<i>N. chilensis</i> <i>B. incisifolia</i> <i>P. chilensis</i> <i>L. polyphylla</i> <i>H. stenophyllum</i>	<i>Octodon degus</i> <i>Abrocoma bennetti</i> <i>Abrothrix longipilis</i> <i>Abrothrix olivaceus</i> <i>Oligoryzomys longicaudatus</i> <i>Phyllotis darwini</i>	<i>Lycalopex culpaeus</i> <i>Lycalopex griseus</i> <i>Galictis cuja</i> <i>Bubo magallanicus</i> <i>Buteo melanoleucus</i>	road and mining exploitation	Las Chinchillas National Reserve
Corral de Piedras, La Higuera, Coquimbo region*	29°53'S, 70°52'W	800	<i>Balsamorhiza brevifolium</i>	unknown	<i>Abrothrix olivaceus</i>	<i>Buteo polyosoma</i>	no identified	-

LOCALITY	COORDINATES	HIGH	VEGETATION	DIET	OTHER RODENTS	PREDATORS	THREATENED	WPA
Fundo El Durazno Coquimbo región**	29°16'S, 65°39'W	706	<i>Bridgesia incisiifolia</i>	unknow	<i>Octodon degus</i>	<i>Conepatus chinga</i>	mining exploitation	Private Protected Area
			<i>Cordia decandra</i>		<i>Phyllotis darwini</i>	<i>Galictis cuja</i>		
			<i>Echinopsis chiloensis</i>		<i>Spalacopus cyanus</i>	<i>Buteo melanoleucus</i>		
			<i>Ephedra chilensis</i>			<i>Lycalopex culpaeus</i>		
			<i>Eulachnia acida</i>			<i>Lycalopex griseus</i>		
			<i>Flourensia thurifera</i>					
			<i>Krameria cistoidea</i>					
Quebrada Curico Coquimbo región*	29°88'S, 65°07'W	700	<i>Adesmia confusa</i>	unknow	<i>Abrocoma bennetti</i>	<i>Galictis cuja</i>	mining exploitation	-
			<i>Bridgesia incisiifolia</i>		<i>Abrothrix longipilis</i>	<i>Buteo melanoleucus</i>		
			<i>Echinopsis chiloensis</i>		<i>Abrothrix olivaceus</i>	<i>Leopardus colocolo</i>		
			<i>Eulachnia acida</i>		<i>Lagidium viscacia</i>	<i>Lycalopex culpaeus</i>		
			<i>Puya berteroniana</i>		<i>Octodon degus</i>	<i>Lycalopex griseus</i>		
			<i>Senna cumingii</i>		<i>Olgoryzomys longicaudatus</i>			
					<i>Phyllotis darwini</i>			
			<i>Acacia caven</i>		<i>Abrocoma bennetti</i>	<i>Bubo magellanicus</i>		
			<i>Adesmia argentea</i>		<i>Octodon degus</i>	<i>Buteo melanoleucus</i>		
			<i>Adesmia confusa</i>		<i>Phyllotis darwini</i>	<i>Lycalopex culpaeus</i>		
new locality, Atacama región*	26°55'S, 70°21'W	1135	<i>Bridgesia incisiifolia</i>	unknow	<i>Spalacopus cyanus</i>	<i>Lycalopex griseus</i>	mining exploitation	-
			<i>Colliguaja odorifera</i>					
			<i>Echinopsis chiloensis</i>					
			<i>Ephedra chilensis</i>					
			<i>Eulachnia acida</i>					
			<i>Flourensia thurifera</i>					
			<i>Maytenus boaria</i>					
			<i>Senna cumingii</i>					
			<i>Heliotropium sclerocarpum</i>		<i>Phyllotis darwini</i>	<i>Bubo virginianus</i>		
			<i>Tetragonia microcarpa</i>			<i>Lycalopex sp</i>		
			<i>Gymnophytum flexuosum</i>					
			<i>Nolana sp.</i>					
			<i>Eriocyse aurata</i>					

Table 2. Conservation status of both *C. lanigera* and *C. chinchilla* species by national and international institutions.

Tabla 2. Estado de conservación de ambas especies, *C. lanigera* y *C. chinchilla* tanto por instituciones nacionales como internacionales.

	CONAF (1988)	ICP***	IUCN (2010)	SAG (2012)	CITES	EDGE
<i>C. chinchilla</i>	Endangered	Endangered	Critically Endangered	Endangered	Appendix I**	Critically Endangered
<i>C. lanigera</i>	Endangered*	Critical	Critically Endangered	Endangered	Appendix I**	Critically Endangered

* Extinct in Antofagasta and Atacama regions, Chile

** Lists species that are the most endangered among CITES-listed animals and plants

*** Cofre and Marquet (1999)

DISCUSSION

The past distributions of both wild species were indeed extensive. In the case of *C. chinchilla*, it was distributed from southern Perú, Bolivia, to northern Argentina and Chile (Grau 1986); however, it has not been recorded in these countries in the last 50 years and should be determinate as extinct (Valladares *et al.* 2014). The actual identified colonies are smaller and restricted to highland of Antofagasta and Atacama regions, Chile. In the case of *C. lanigera*, it is an endemic species of Chile living in coastal Atacama and Coquimbo regions (Grau 1986). However, after their main extermination, the distribution was restricted to Las Chinchillas National Reserve (Mohlis 1983), and a little colony northern of Coquimbo region (Spotorno *et al.* 2004a); but recently it was determinate a new colony for Atacama region. Both species has been reduced to more than 95% of their original distribution, and the actual colonies haven't been evaluated in fundamental biological variables for their conservation.

In relation to their ecology, the colony of *C. lanigera* from Atacama (Valladares *et al.* 2014) was found in the Priority Conservation Site "Desierto Florido" (Squeo *et al.* 2008), where the effects of ENSO are very strong, with a significant increase in rainfall and consequent increase vegetation, generating strong population fluctuations (Gutiérrez *et al.* 2008). Given that both chinchillas have medium body sizes, relatively long life cycles, and long gestation periods among the rodent species of the region (Meserve *et al.* 1995), it is most probable that all colonies of chinchillids respond to such environmental fluctuations in a delayed multiyear form, but we don't have enough scientific information about their actual abundance and temporal fluctuations.

About the number of species to be recognized, in this moment we accept two species of chinchillids, *C. chinchilla* and *C. lanigera*, but the new colonies should be analyzed with modern techniques as molecular markers, particularly the new colonies that represent extremes of distribution, for example the most southern colonies of *C. chinchilla* and the northern of *C. lanigera*, both from Atacama region, which

corresponds to the oldest geographic range of sympatry. On the other hand, it is still pending identification of wild colonies of *Chinchilla* in bordering countries, particularly in Bolivia where in the past were described as different species from those recognized here.

We accept the existence of syntype specimens in museums from Europe, particularly the specimen reviewed by Bennett (code GMCM 54a1) because it represents a syntype of the Genus and *lanigera* species.

Colonies near to mining exploitation areas is a threat never discussed in the bibliography before. It has a great importance on the conservation topics because mining is associated to toxicity for heavy metals and very large territorial interventions. It will be important to develop a conservation plan for these species in the north of Chile, with goals and objectives clearly defined, seeking funds for scientific research on diverse topics such as distribution, abundance, ecology, reproduction, behavior, and genetic diversity. We consider that under this background, effectively both *C. lanigera* and *C. chinchilla* are in critical condition.

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