



ELSEVIER

# Mammalian Biology

Zeitschrift für Säugetierkunde

www.elsevier.de/mambio



## Short communication

# Presence of *Dromiciops gliroides* (Microbiotheria: Microbiotheriidae) in the deciduous forests of central Chile

By G. Lobos, A. Charrier, G. Carrasco and R.E. Palma

Departamento de Ecología and Centro de Estudios Avanzados en Ecología y Biodiversidad, Facultad de Ciencias Biológicas, Pontificia Universidad Católica de Chile, Santiago, Chile.

Receipt of Ms. 1.2.2005

Acceptance of Ms. 6.6.2005

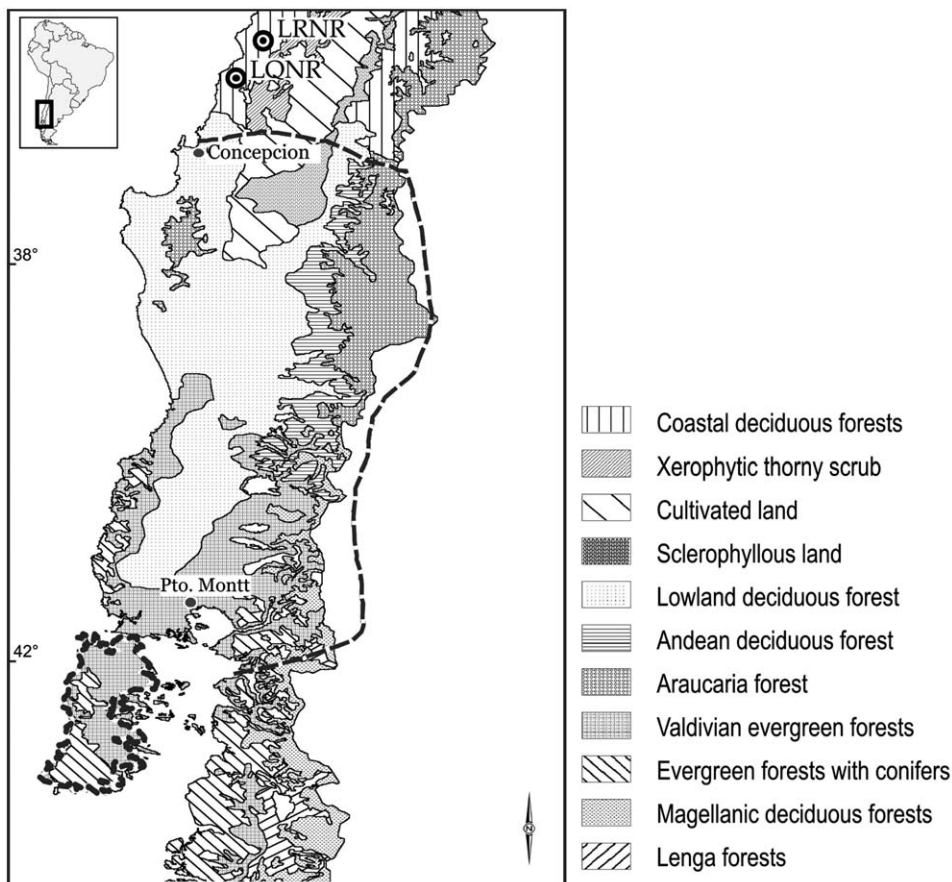
**Key words:** *Dromiciops gliroides*, range expansion, Chile

*Dromiciops gliroides* Thomas, 1894 (Microbiotheria, Microbiotheriidae) commonly known as “monito del monte” in Chile, is the sole representative of the Order Microbiotheria and considered a living fossil in the fauna of South America. The oldest fossil record for microbiotherids has been ascribed to the Early Paleocene Tiupampa fauna of Bolivia (Gayet et al. 1991). Additional fossils have been reported for the Antarctic Peninsula (Middle Eocene; Woodburne and Zinsmeister 1982, 1984) and from the Late Oligocene and Early Miocene deposits in the Argentinean Patagonia (Marshall 1982). Recent fossil findings have been reported for south – central Chile with two genera and seven species, with a single living species. Evolutionary studies at morphological and molecular levels concluded that this species is more phylogenetically related to Australian than to South American marsupials (Szalay 1982; Palma and Spotorno 1999; Palma 2003).

*Dromiciops gliroides* is a tree climber species with nocturnal habits associated to the presence of southern beech forests of the genus *Nothofagus* (Fagaceae) and to the bamboo of the genus *Chusquea* (Bambusaceae, Gramineae, Pearson 1995). Its northern-

most distributional limit has been traditionally reported for Concepción (Region VIII; 37°00', 72°30'; Fig. 1), while to the south it has been found into the Chiloé island (Region X; ca. 44°00', 72°00'). To the east, the distribution of the species encompasses the provinces of Neuquen and Rio Negro in Argentina (Hershkovitz 1999). Recently, Saavedra and Simonetti (2001) extended the distributional range of *Dromiciops* to the north, in the central coast of Chile, by trapping a specimen at Reserva Nacional Los Queules (LQNR 35°59'S–72°41'W). From a biogeographic perspective the latter has been an outstanding finding because coastal areas in Chile have been considered a refuge zone for the biota during the last glacial cycles of the Pleistocene (Armesto et al. 1995; Villagrán and Hinojosa 1997). Here, we report an additional finding for the northern range of *D. gliroides* in the forests of central Chile, thus supporting its occurrence in the deciduous Maulean forests of that area.

During a small mammal survey in the winter of June 2003 in Reserva Nacional Los Ruiles (LRNR, 35°50'–72°30'W, 224m), we trapped a female sub-adult specimen of *D. gliroides* (Fig. 2). The standard measurements (in mm)



**Fig. 1.** Current distribution (shaded area) of *Dromiciops gliroides* in Chile and adjacent Argentina. The map includes the Reserva Nacional Los Riuiles (LRNR) site where this living fossil taxon was found. Vegetational zones according to Gajardo (1995).

of the sub-adult female *D. gliroides* were: 190 (head and body), 100 (tail), 15 (hind foot) and 17 (ear), with a total weight of 20 g. Other small mammals collected in the area were the sigmodontine mice *Oligoryzomys longicaudatus* (Bennett, 1832) ( $N = 16$ ), *Abrothrix longipilis* (Waterhouse, 1837) ( $N = 4$ ) and the murine rat *Rattus norvegicus* (Berkenhout, 1769) ( $N = 5$ ). The voucher specimen of *Dromiciops* is deposited in the Division of Mammals, Colección de Flora y Fauna Profesor Patricio Sánchez Reyes (SSUC-MA), Departamento de Ecología, Pontificia Universidad Católica de Chile under the number SSUC-MA 00223.

The LRNR is subdivided in two portions focused to protect an endemic tree species, *Nothofagus alessandrii* (Fagaceae: *Nothofagus*) a tree commonly known as “ruil”. This species is a deciduous form and is distributed in two major fragments in the Reserve, separated 40 km apart approximately. Both fragments are localized in the coastal mountain range of the Maule region in Chile (VII Region), and one of them is known as the “Empedrado” with an area of 16 ha, while the other is called “Los Riuiles” with an area of 29 ha in the Chanco county (CONAF 2001). Both fragments are separated by secondary roads and pine crops. The



**Fig. 2.** Female *Dromiciops gliroides* from Reserva Nacional Los RUILes (LRNR), Chile. Photo by A. Charrier.

fieldwork was conducted in Los RUILes (the second fragment). Trapping sampling was conducted during three nights in the LRNR using Sherman traps of standard size, and a mixture of oat, vanilla and tuna fish as bait. The traps were set up in three lines of 20 × 2 m, separated by 10 m from each other (capture effort 120/per night). The predominant understory where line traps were installed was the bamboo of the genus *Chusquea*.

The capture of *D. gliroides* in Los RUILes enlarges its northern distribution by 30 km with respect to the last reported for LQNR (Saavedra and Simonetti 2001), and represents the first record for the species in that coastal area currently protected by the Chilean government. The finding is interesting since *D. gliroides* is a typical inhabitant of the Valdivian Rainforests in southern Chile and adjacent forests of Argentina, while in Los RUILes several specific elements of southern forests are missing (Osgood 1943). In fact, the LRNR is characterized by having

poorly represented forms of evergreen elements, being the area mainly constituted by sclerophyll forms such as *Lithrea caustica*, *Cryptocarya alba* and *Azara integrifolia* (San Martín et al. 1984; Gajardo 1995). The range expansion of this mouse opossum marsupial in central Chile confirms the occurrence of *Dromiciops* in the Maulean deciduous forests, that although phylogenetically related to those of the south, have a patchy distribution in central Chile surrounded by coniferous introduced elements. Other native vegetation in the Reserve was deciduous and evergreen forest such as *N. glauca*, *N. alessandri*, *N. dombeyi*, *C. alba* and *Gevuina avellana* (San Martín and Donoso 1995). The study area is characterized by the occurrence of *N. alessandrii*, which is considered an endemic and endangered form, and the most primitive species in the genus (Hill 1992; Ramírez et al. 1997). The restricted and fragmented distribution of this vegetational form has led to consider this taxon close to extinction (Benoit 1989).

Currently, the dominant vegetation of the coast of Maule region is constituted by exotic forests of the introduced species *Pinus radiata*. Natural areas at Reserva Los RUILes and Los Queules are completely compacted by this exotic coniferous trees. Between both Reserves (separated 30–40 km apart) there are no natural connections (“bridges”), thus increasing the fragmentation and the threat to those ecosystems (Simonetti and Armesto 1991). A similar situation occurs at LRNR where both major fragments are also isolated, with a high degree of disturbance between them, and without natural areas that connect them. Thus, the increasing matrix of *P. radiata* is threatening the natural biota of the reserve. Even in some areas the advance of invasive seedlings in native forests it can be seen adding a high risk of fire due to the camping zones available within the reserve. The low trapping abundance of “monitos del monte” could be associated to the kind of traps used since most of them were placed on the ground due to the major goal of the sampling was the capture of sigmodontine mice. The use of “museum special snap traps” (Patterson et al. 1989), or the location of traps up on the trees could have increased

the success of capture, not only for *Dromiciops*, but probably for other marsupial inhabitants of central Chile, such as the didelphimorph “mouse opossum” *Thylamys elegans*. In contrast to the report of Saavedra and Simonetti (2001) the specimen of *Dromiciops* was found in areas of *Chusquea* patches. Other than the patchy distribution of forests and the occurrence of introduced vegetational forms in LRNR, the presence of the murine rodent *R. norvegicus* is worrying, being the second most abundant small mammal captured during the study (19.2%). In fact, close to the area where *Dromiciops* was captured, two adult *R. norvegicus* were collected, as well as several other examples of invader species have been also collected within the forests. The negative pressure of *R. norvegicus* over the fragile community of small mammals is unsuspected and distressing (Jaksic 1998). Currently, *D. gliroides* has been catalogued as a rare species in Chile,

due to its reduced population size (Glade 1983; SAG 1998). Furthermore, the high degree of fragmentation in the Maulino forest, allows to suppose that the local population of *Dromiciops* as well as that of the Reserva Los Riles and Los Queules could be in danger of extinction.

## Acknowledgements

The authors would like to thank Fernando Torres-Pérez for reviewing the manuscript and to Ivan Barria by his technical support with the map. The present work has been part of the following grants: Hantavirus Ecology and Disease in Chile (ICIDR Grant NIAID, NIH # AI 45452) to Pontificia Universidad Católica de Chile and The University of New Mexico, USA, FON-DAP-CASEB 1501-0001, Program 2, and FONDECYT 1030488.

## References

- Armesto, J. J.; Aravena, J. C.; Villagrán, C.; Pérez, C.; Parker, G. G. (1995): Bosques templados de la Cordillera de la Costa. In: Ecología de los Bosques Nativos de Chile. Ed. by J. J. Armesto, C. Villagrán and M. Kalin-Arroyo. Santiago de Chile: Editorial Universitaria. Pp. 199–213.
- Benoit, I., (1989): Libro Rojo de la Flora Terrestres de Chile. Santiago de Chile: Corporación Nacional Forestal.
- CONAF. (2001): Guía de Parques Nacionales y Areas Silvestres Protegidas de Chile. Santiago de Chile: Corporación Nacional Forestal.
- Gajardo, R. (1995): La Vegetación Natural de Chile: Clasificación y Distribución Geográfica. Santiago de Chile: editorial Universitaria.
- Gayet, M.; Marshall, L. G.; Sempere, T. (1991): The Mesozoic and Paleocene vertebrates of Bolivia and their stratigraphic context: a review. *Rev. Técnica YFPB Santa Cruz, Bolivia* **12**, 393–433.
- Glade, A., (1983): Libro Rojo de los Vertebrados Terrestres de Chile. Santiago de Chile: Corporación Nacional Forestal.
- Hershkovitz, P. (1999): *Dromiciops gliroides* Thomas, 1894, last of the Microbiotheria (Marsupialia), with a review of the family Microbiotheriidae. *Fieldiana, Zoology* **93**, 1–60.
- Hill, R. S. (1992): *Nothofagus*: evolution from a southern perspective. *Tree* **7**, 190–194.
- Jaksic, F. M. (1998): Vertebrate invaders and their ecological impacts in Chile. *Biodiversity Conserv.* **7**, 1427–1445.
- Marshall, L. (1982): Systematics of the South American marsupial family Microbiotheriidae. *Fieldiana Geol.* **10**, 1–75.
- Osgood, W. H. (1943): The mammals of Chile. *Field Mus. Nat. Hist.: Zool. Ser.* **30**, 1–268.
- Palma, R. E.; Spotorno, A. E. (1999): Molecular systematics of marsupials based on the rRNA 12S mitochondrial gene: the phylogeny of Didelphimorphia and of the living fossil microbiotheriid *Dromiciops gliroides* Thomas. *Mol. Phylogenet. Evol.* **13**, 525–535.
- Palma, R. E. (2003): Evolution of American marsupials and their phylogenetic relationships with Australian metatherians. In: *Predators with Pouches: The Biology of Carnivorous Marsupials*. Ed. by M. Jones, C. Dickman and M. Archer. Victoria, Australia. Csiro Publishing. Pp. 21–29.
- Patterson, B. D.; Meserve, P. L.; Lang, B. K. (1989): Distribution and abundance of small mammals along an elevational transect in temperate rainforest of Chile. *J. Mammalogy* **70**, 67–78.

- Ramírez, C.; San Martín, C.; Oyarzún, A.; Figueroa, H. (1997): Morpho-ecological study on the South American species of the genus *Nothofagus*. *Plant Ecol.* **130**, 101–109.
- Saavedra, B.; Simonetti, J. A. (2001): New record of *Dromiciops gliroides* (Microbiotheria: Microbiotheriidae) and *Geoxus valdivianus* (Rodentia: Muridae) in central Chile: their implications for biogeography and conservation. *Mammalia* **65**, 96–100.
- SAG (1998). Cartilla de Caza. Departamento de Protección de los Recursos Naturales. Renovables. Santiago, Chile: Servicio Agrícola y Ganadero.
- San Martín, J.; Donoso, C. (1995): Estructura florística e impacto antrópico en el bosque maulino de Chile. In: *Ecología de los Bosques Nativos de Chile*. Ed. by J. J. Armesto, C. Villagrán and M. Kalin-Arroyo. Santiago, Chile: Editorial Universitaria. Pp. 153–168.
- San Martín, J.; Figueroa, H.; Ramírez, C. (1984): Fitosociología de los bosques de ruil (*Nothofagus alessandri* Espinosa) en Chile central. *Rev. Chil. Hist. Nat.* **57**, 171–200.
- Simonetti, J. A.; Armesto, J. J. (1991): Conservation of temperate ecosystems in Chile. *Rev. Chil. Hist. Nat.* **64**, 615–626.
- Szalay, F. S. (1982): A new appraisal of marsupial phylogeny and classification. In: *Carnivorous Marsupials*. Ed. by M. Archer. Sydney, Australia: Royal Zoological Society. Pp. 621–640.
- Villagrán, C.; Hinojosa, L. F. (1997): Historia de los bosques del sur de Sudamérica, II: Análisis fitogeográfico. *Rev. Chil. Hist. Nat.* **70**, 241–267.
- Woodburne, M. O.; Zinsmeister, W. J. (1982): Fossil land mammal from Antarctica. *Science* **218**, 284–286.
- Woodburne, M. O.; Zinsmeister, W. J. (1984): The first land mammal from Antarctica and its biogeographic implications. *J. Paleontol.* **58**, 913–948.

**Authors' address:**

G. Lobos, A. Charrier, G. Carrasco and R. Eduardo Palma, Departamento de Ecología and Centro de Estudios Avanzados en Ecología y Biodiversidad, Facultad de Ciencias Biológicas, Pontificia Universidad Católica de Chile, Alameda 340, Santiago 6513677, Chile  
(e-mail: epalma@bio.puc.cl.)