

CHINCHILLIDAE AND DOLICHOTINAE RODENTS (RODENTIA: HYSTRICOGNATHI: CAVIOMORPHA) FROM THE LATE PLEISTOCENE OF SOUTHERN BRAZIL

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ABSTRACT – New records of rodents from the late Pleistocene Chuí Creek, Rio Grande do Sul State, southern Brazil, are here described. A partial dentary with fragmented cheek teeth is identified as Chinchillidae, *Lagostomus* Brookes cf. *L. maximus* (Desmarest). Other two specimens are identified as cheek teeth of Dolichotinae indet. (Caviidae). Pleistocene fossils of *Lagostomus* were previously reported for Argentina and Uruguay. The material of *Lagostomus* from Chuí Creek represents the first confidently record of this taxon Brazil. Pleistocene fossil remains of Dolichotinae have been found in Argentina, Uruguay and other areas of southern Brazil, though the Brazilian find lack precise stratigraphic information. These new records widen the paleobiogeographic distribution of *Lagostomus* and confirm the presence of Dolichotinae during the late Pleistocene of southern Brazil.

Key words: *Lagostomus*, Lagostominae, Dolichotinae, Chuí Creek, Rio Grande do Sul, Quaternary.

RESUMO – Este trabalho reporta novos materiais de roedores provenientes dos depósitos fossilíferos do arroio Chuí (Rio Grande do Sul, sul do Brasil). O material de Chinchillidae é identificado como *Lagostomus* Brookes cf. *L. maximus* (Desmarest) e é representado por um dentário esquerdo faltando sua região posterior, com o incisivo preservado e a série p4-m3 fragmentada. Os outros dois espécimes são identificados como molariformes de Dolichotinae indet. (Caviidae). Os fósseis de *Lagostomus* durante o Pleistoceno estavam restritos a Argentina e Uruguai. O material aqui reportado caracteriza o primeiro registro seguro deste táxon no Brasil. Fósseis de Dolichotinae têm sido encontrados em depósitos pleistocênicos da Argentina, Uruguai e sul do Brasil, porém este último provém de uma localidade sem contexto estratigráfico preciso. Desta forma, estes novos registros ampliam a distribuição paleobiogeográfica de *Lagostomus* e confirmam a presença de Dolichotinae durante o Pleistoceno final do sul do Brasil.

Palavras-chave: *Lagostomus*, Lagostominae, Dolichotinae, arroio Chuí, Rio Grande do Sul, Quaternário.

INTRODUCTION

Chinchillidae are South American hystricognath rodents that include the extant chinchillas (*Chinchilla* Bennett, 1829),

mountain vizcachas (*Lagidium* Meyen, 1833) and pampas vizcachas (*Lagostomus* Brookes, 1828). The stratigraphic distribution of Chinchillidae extends from Eocene/early Oligocene to Recent (Vucetich *et al.*, 1999, 2010; Flynn *et al.*,

2003). Molecular studies confirmed that the extant Chinchillidae are a monophyletic group (Spotorno *et al.*, 2004) and suggest a close relationship with Dinomyidae (Huchon & Douzery, 2001). Extant chinchillids have euhypsodont cheek teeth, composed of laminar and oblique prisms, labially (upper teeth) or lingually (lower teeth) united, with a very thin interlamina cement layer, bullae well developed and locomotion partially saltatory (Wood, 1955; Bondesio *et al.*, 1975). According to Pocock (1922), Chinchillidae includes two subfamilies, Chinchillinae and Lagostominae. Chinchillines have cheek teeth with two flexi/flexids and three lophs/ids, and the lagostomines have two lophs/ids, separated by only one flexus/flexid. Lagostomines are represented in the fossil record since the Oligocene (Vucetich *et al.*, 1999, 2010). For the Pliocene and Pleistocene, two genera have been described: *Lagostomopsis* Kraglievich, 1926 from Montehermosan and Chapadmalalan ages, and *Lagostomus* from Barrancalobian to Recent (Vucetich & Verzi, 1995). However, according to Vucetich & Verzi (1995) the differences between these taxa are mainly of size. In the absence of more diagnostic characters, Vucetich & Verzi (1995) suggested that the only valid genus in the Pliocene/Pleistocene is *Lagostomus*. The same problem is present in the extinct species of *Lagostomus* because their diagnoses are also based on size (see Gervais & Ameghino, 1880), which is quite variable in the living *Lagostomus* (Llanos & Crespo, 1952). The current taxonomy of the family and extinct species of *Lagostomus* needs review (Vucetich & Verzi, 1995; Candela, 2005), as well as cladistic analyses, including fossil and extant taxa.

Caviidae are taxonomically diverse caviomorphs, often small and cursorial, with euhypsodont cheek teeth (Wood, 1955). The group originated in the middle/late Miocene (Vucetich *et al.*, 1999) and achieved its greatest diversity during the late Pliocene (Quintana, 1997). According to Paula Couto (1979), the family includes an extinct subfamily, the Cardiomyinae (but see Pérez, 2010), and two extant subfamilies, the Caviinae and the Dolichotinae. Dolichotines share the following characters: the skull with the foramen magnum displaced ventrally, diastema longer than P4-M3 series, absent nasolacrimal foramen on the maxilla, and mesopterygoid fossa reaching the M2 (Paula Couto, 1979; Quintana, 1998; Ubilla & Rinderknecht, 2003). The Quaternary dolichotines are represented by a single genus, *Dolichotis* Desmarest, 1820 (including *Pediolagus*), with two species, *D. patagonum* Zimmermann, 1780 and *D. salinicola* (Burmeister, 1876).

Until now, the Pleistocene fossil record of caviomorph rodents in southern Brazil only included Caviidae, Hydrochoeridae and Echimyidae. For the continental shelf of Rio Grande do Sul State (RS), Rodrigues & Ferigolo (2004) described several teeth and a fragment of a dentary of *Myocastor coypus* (Molina, 1782), a P4 of Dolichotinae indet., and a dentary of Eumysopinae indet. For Chuí Creek, southernmost of RS, Ubilla *et al.* (2008) reported cranial

fragments and postcranial elements of *Microcavia* Gervais & Ameghino, 1880. From Touro Passo Formation, remains of *H. hydrochaeris* (Linnaeus, 1766), Caviidae indet., and *Galea* Meyen, 1832 have been recognized (Kerber & Oliveira, 2008; Kerber & Ribeiro, 2011; Kerber *et al.*, 2011) and for Quaraí River, Oliveira (1992) referred *H. hydrochaeris*.

This paper reports new remains assigned to a Chinchillidae and a Dolichotinae from Chuí Creek (upper Pleistocene), southern Brazil and discusses the late Pleistocene fossil record of both taxa as well as the paleobiogeographic implications of these findings.

MATERIAL AND METHODS

The specimens studied herein are stored in the paleovertebrate collection of Museu Coronel Tancredo Fernandes de Melo (MCTFM in Santa Vitória do Palmar, RS) and Laboratório de Geologia e Paleontologia da Universidade Federal do Rio Grande (LGP-V in Rio Grande, RS).

The material of Chinchillidae was compared to the extant chinchillids *Lagostomus maximus* (Desmarest, 1817), *Chinchilla* and *Lagidium* (from Argentina); and the Dolichotinae were compared with the caviids *Dolichotis patagonum*, *D. salinicola*, *Microcavia*, *Galea* (from Argentina) and *Kerodon* F. Cuvier, 1825 (from northeast Brazil) (Appendix 1). Traditionally, *Kerodon* was considered a Caviinae. However, in recent papers, using molecular and paleontological evidence, it has been considered more closely related to Hydrochoeridae (Rowe & Honeycutt, 2002; Pérez, 2010). It was included in this comparison because it shares several dental features with Caviidae.

The mandibular nomenclature follows Woods & Howland (1979) and Pérez (2010), and the dental nomenclature of Caviidae follows Quintana (1996). The measurements were taken with a digital caliper accurate to 0.01 mm and stereomicroscope, and are expressed in millimeters.

Institutional abbreviations. LGP-V, Laboratório de Geologia e Paleontologia, Universidade Federal do Rio Grande (FURG), Rio Grande, RS, Brazil; MCN-M, Coleção de Mamíferos do Museu de Ciências Naturais da Fundação Zoobotânica do Rio Grande do Sul, Porto Alegre, RS, Brazil; MCPU-M, Coleção de Mastozoologia do Museu de Ciências da Pontifícia Universidade Católica do Rio Grande do Sul, Porto Alegre, RS, Brazil; MCTFM, Museu Coronel Tancredo Fernandes de Melo, Santa Vitória do Palmar, RS, Brazil; MDJ-Mr, Coleção de Mamíferos recentes do Laboratório de Paleontologia do Museu Dom José, Sobral, Ceará State, Brazil; MLP, Colección de Mastozoología, Museo de La Plata, La Plata, Buenos Aires Province, Argentina.

LOCATION AND GEOLOGICAL SETTING

Chuí Creek (53°23 S, 33°22 W) is located in southernmost Brazil, and is part of the Coastal Plain of Rio Grande do Sul State (PCRS) (Figure 1). Late Pleistocene mammal remains of

Lujanian age [*Equus* (A.) *neogaeus* Biozone, *sensu* Cione & Tonni, 1999] are found in Chuí Creek (Oliveira *et al.*, 2005), collected from a ~1.5 meter-thick muddy sandstone bed (Lopes *et al.*, 2001, 2005). The fossils are found articulated or isolated, mostly fragmented, but sometimes complete and well-preserved specimens, probably deposited and reworked in a meandering fluvial system. According to Buchmann *et al.* (2009) the presence of a fossiliferous bed, lenses of organic matter-rich sediments interpreted as abandoned meanders (oxbow lakes), a high proportion of fossils broken after burial, and occurrence of fossils at a considerable distance from the

present course of the creek, suggest that the fossils were accumulated and reworked in a wide flood plain. Lopes *et al.* (2010) dated teeth of megamammals from the fossiliferous level using Electron Spin Resonance, showing ages between 42 and 33 Ka BP. The fossiliferous bed contains fossils of large-bodied mammals, mostly herbivores, including xenarthrans and ungulates, while carnivores are very scarce in comparison (Oliveira, 1992; Oliveira *et al.*, 2005; Marcon, 2008; Oliveira & Pereira, 2009; Scherer *et al.*, 2009; Lopes & Pereira, 2010). Remains of medium- and small-sized mammals are scarcely represented.

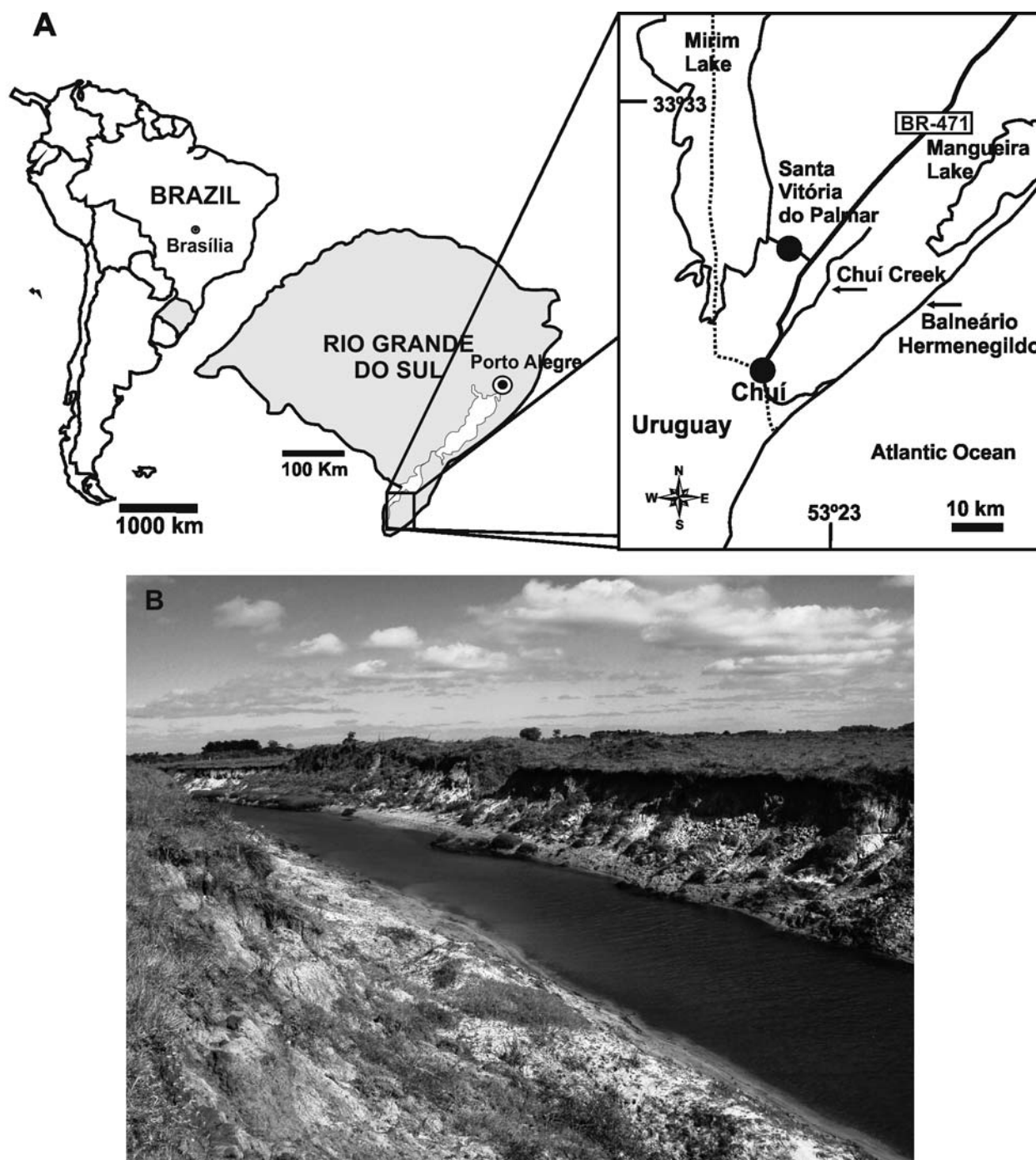


Figure 1. A, Geographical location of Chuí Creek; B, Panoramic view of Chuí Creek.

SYSTEMATIC PALEONTOLOGY

RODENTIA Bowdich, 1821

HYSTRICOGNATHI Tullberg, 1899

CAVIOMORPHA Wood & Patterson (*in* Wood, 1955)

CHINCHILLOIDEA Kraglievich, 1940

CHINCHILLIDAE Bennett, 1833

LAGOSTOMINAE Wiegman, 1832

Lagostomus Brookes, 1828

Lagostomus cf. *L. maximus* (Desmarest, 1817)
(Figure 2)

Material. MCTFM-PV 0769, left dentary lacking the posterior portion, with very fragmented cheek teeth.

Geographical and stratigraphic provenance. Chuí Creek, in the upper portion of the muddy sandstone bed. Santa Vitória do Palmar, Rio Grande do Sul State, Brazil.

Description and comparison. The dorsal area of the diastema is thin and forms a tenuous crest that extends from the mesial face of p4 alveolus up to the symphysis. The alveolus of the incisor forms a well-developed prominence on the medial surface of the dentary, which extends up to the level of m3, as in *Lagostomus maximus* and different from *Chinchilla* and *Lagidium*, in which it extends up to the m1/m2 level. The coronoid process is located at the level of the distal area of the m3 alveolus, being posteriorly oriented. This process is thin and is different from *Chinchilla* and *Lagidium*, in which it is located posteriorly to the m3 and more vertical. The lunar notch is deeper than in *Chinchilla* and *Lagidium*. The mandibular foramen is located on the dorsal surface of the dentary, posteromedially to the m3 alveolus. The notch for the

insertion of the tendon of the *masseter medialis pars infraorbitalis* muscle is located below m1 and m2, as in *L. maximus* and *Lagidium*, while in *Chinchilla* the notch is below m1. The incisor is slightly longitudinally striated on the labial face. The cheek teeth are very fragmented, but it can be seen that they are bilophodont and obliquely oriented, features that characterize Lagostominae. In size, MCTFM-PV 0769 is smaller than the adult males of *L. maximus*, but more similar to the young males and adult females analyzed (Table 1).

CAVIOIDEA Fischer de Waldheim, 1817

CAVIIDAE Fischer de Waldheim, 1817

DOLICHOTINAE Pocock, 1922

Dolichotinae indet.

(Figure 3)

Material. Isolated left m1 or m2, lacking the lingual end of Pr. II (MCTFM-PV 0736) plus another poorly preserved tooth (LGP-V 0001).

Geographic and stratigraphic provenance. Chuí Creek, MCTFM-PV 0736 was recovered from sediments dredged from the bottom of the creek, while LGP-V 0001 was found in the muddy sandstone bed. Santa Vitória do Palmar, Rio Grande do Sul State, Brazil.

Description and comparison. The description is based on MCTFM-PV 0736, which is the best preserved, but the same characters are also observed in LGP-V 0001. MCTFM-PV 0736 is euhiposodont and biprismatic (Figure 3A). It has a linguolabial curvature (Figure 3B) and is slightly mesiodistally curved, with the apex more distal than the occlusal surface (Figures 3C-D), characterizing a lower tooth.

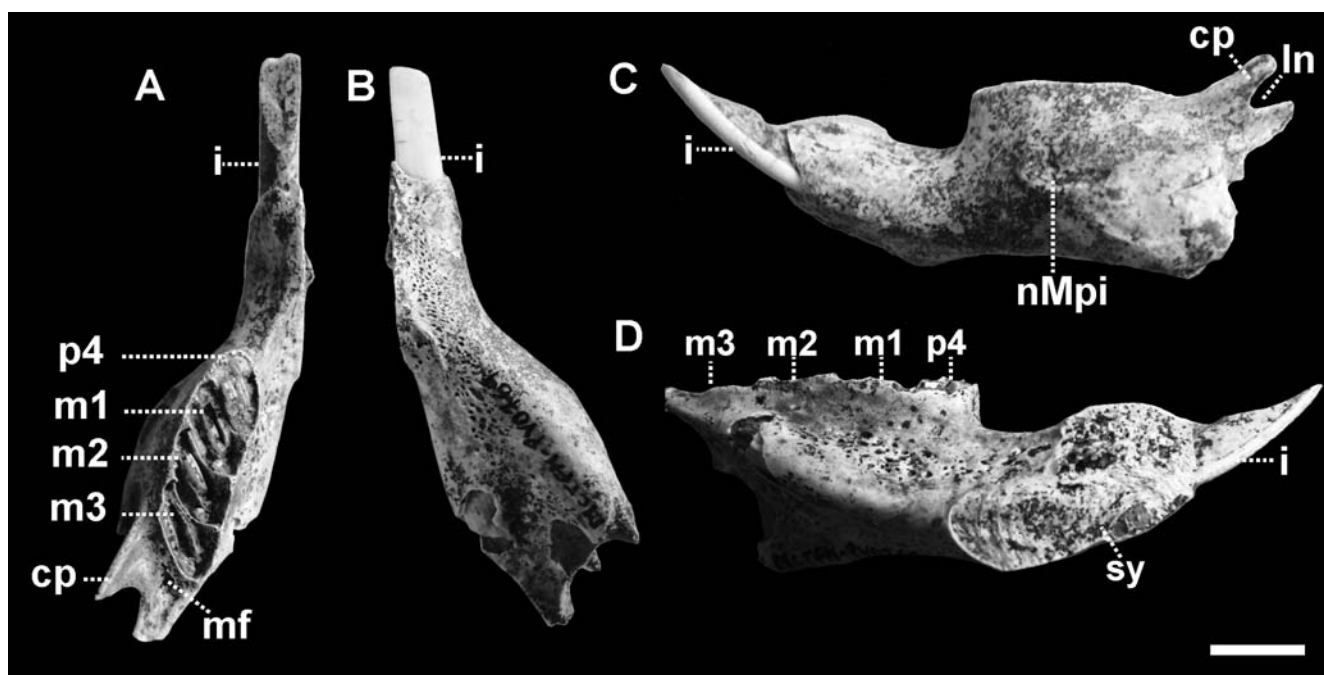


Figure 2. *Lagostomus* cf. *L. maximus* (MCTFM-PV 0769) from Chuí Creek, in occlusal (A), ventral (B), lateral (C) and medial (D) views. **Abbreviations:** cp, coronoid process; In, lunar notch; mf, mandibular foramen; nMpi, notch for insertion of the tendon of the *masseter medialis pars infraorbitalis* muscle; i, incisor; p4, fourth premolar; m1, first molar; m2, second molar; m3, third molar; sy, symphysis. Scale bar = 10 mm.



Figure 3. Left m1 or m2 of Dolichotinae (MCTFM-PV 0736) from Chuí Creek, in occlusal (A), distal (B), lingual (C) and labial (D) views. Scale bar: A = 4 mm; B, C, D = 6 mm.

Table 1. Measurements (mm) of the specimen MCTFM-PV 0769 and comparative specimens (young and adults) of *Lagostomus maximus*. Since there is sexual dimorphism in *L. maximus* (Llanos & Crespo, 1952), we separated the males (n = 7) from females (n = 10), and performed a statistic analysis with males, females and the specimens without determined sex (n = 22) to estimate variation within the species. Measurements: 1, diastema length; 2, height of the dentary body at the level of p4; 3, length of p4-m3 alveolar series; 4, mesiodistal length (MDL) of p4 alveolus; 5, linguolabial width (LLW) of p4 alveolus; 6, MDL of m1 alveolus; 7, LLW of m1 alveolus; 8, MDL of m2 alveolus; 9, LLW of m2 alveolus; 10, MDL of m3 alveolus; 11, LLW of m3 alveolus; 12, width of the incisor. **Abbreviations:** M, measurements; n, specimens; SD, standard deviation; (m) males; (f) females; * males, females plus the specimens without sex determined.

	MCTFM-PV 0769	<i>L. maximus</i> (m)				<i>L. maximus</i> (f)				<i>L. maximus</i> *			
M		n	Mean	Min/Max	SD	n	Mean	Min/Max	SD	n	Mean	Min/Max	SD
1	19.97	7	24.22	18.96/29.84	4.14	9	20.15	17.87/23.15	1.80	35	22.61	17.65/29.84	3.90
2	16.16	7	19.93	16.17/23.38	2.88	9	16.46	14.22/18.81	1.51	37	18.41	13.67/25.05	3.23
3	23.82	7	25.65	20.7/30.33	3.57	9	23.49	19.84/25.82	2.0	37	24.62	19.34/30.45	3.23
4	4.36	7	4.46	3.4/6.0	0.93	9	4.29	3.33/5.16	0.61	36	4.49	3.33/6.01	0.70
5	8.11	7	7.87	6.56/9.74	1.03	9	6.98	5.6/8.39	0.94	36	7.50	5.33/11.11	1.28
6	4.51	7	4.92	3.92/5.67	0.70	9	4.64	3.98/5.73	0.53	36	4.83	3.17/6.1	4.83
7	8.23	7	8.12	4.36/10.08	1.90	9	7.58	5.78/9.01	0.94	36	8.08	4.36/10.88	1.42
8	4.78	7	4.88	3.83/5.96	0.72	9	4.93	4.16/7.68	1.09	36	4.94	3.72/7.68	0.84
9	7.47	7	8.62	6.32/9.96	1.29	9	7.59	6.74/8.35	0.59	36	8.23	5.91/10.85	1.34
10	4.31	7	5.31	4.04/9.8	2.02	9	4.64	4.0/5.37	0.44	36	4.99	3.78/9.8	1.11
11	8.01	7	8.64	6.44/10.29	1.42	9	7.62	5.54/8.49	1.16	36	8.29	5.54/13.5	1.65
12	4.61	6	5.03	3.59/6.33	1.08	9	4.27	3.31/4.79	0.53	32	4.57	3.23/6.33	0.93

The hypoflexid is well developed, transversally oriented, and its lingual end largely surpasses the middle of the tooth. Opposite to the hypoflexid, there is a shallow furrow located between both prisms (Figure 3A). The prisms are transversally oriented, with similar size and shape, and are united by a thinner and shorter isthmus (Figure 3A) than those of the *Galea*, *Microcavia* and *Kerodon* (Figures 4A-C). The lingual area of the prisms is more convex than in *Galea*, *Microcavia* and *Kerodon*. The material is morphologically very similar to *D. salinicola* and *D. patagonum* (Figures 4D-E), but smaller than the adult specimens of *D. patagonum* (Table 2).

Dimensions (mm). Mesiodistal length, 4.28; linguolabial width, 3.5; height, 14.4.

Table 2. Measurements (mm) of *Dolichotis salinicola* and *D. patagonum*. **Abbreviations:** MDL, mesiodistal length; LLW, linguolabial width.

	m1		m2	
	MDL	LLW	MDL	LLW
<i>D. salinicola</i>				
MLP 673	4.10	3.61	4.41	3.60
MLP 672	4.76	3.99	4.56	3.57
<i>D. patagonum</i>				
MLP 371	-----	-----	-----	-----
MLP 8-XI-95-5	5.19	4.60	5.49	4.64
MLP 488	6.25	5.56	6.50	5.50
MLP 247	-----	-----	-----	-----
MLP 371	4.29	3.26	3.95	3.27
MLP 5-II-49-2	3.50	2.84	3.69	2.69
MLP 1418	5.63	5.97	5.54	4.84

DISCUSSION AND CONCLUSIONS

The specimen MCTFM-PV 0769 is assigned to the genus *Lagostomus* based on the tooth structure with two oblique laminae, coronoid process located at the level of the distal area of the m3 alveolus and posteriorly oriented and striated incisor extending up to the m3 level. The material does not differ from *L. maximus*, but given its fragmentary status, it is assigned to *Lagostomus* cf. *L. maximus*.

The specimens MCTFM-PV 0736 and LGP-V 0001 are assigned to Dolichotinae based on the characteristic tooth structure of two chordiform lobes with only one poorly-developed external furrow opposite to the hypoflexid (Kraglievich, 1930). These characteristics are similar to *Dolichotis* (Figures 4D-E); however the material is scarce and there are no characters that allow it to be confidently assigned to a genus or species.

Today, *Lagostomus maximus* inhabits plains of southern Bolivia, western Paraguay and central Argentina (Figure 5A) (Llanos & Crespo, 1952; Jackson *et al.*, 1996 and references therein). Extant Dolichotinae are also represented in these regions, but reaching higher latitudes than *Lagostomus* (Cabrera, 1961; Eisenberg & Redford, 1989; Campos *et al.*, 2001 and references therein) (Figure 5B).

Previous confirmed Pleistocene records of *Lagostomus* were from Argentina and Uruguay (Figure 5A). The Danish naturalist Peter W. Lund (1841) mentioned a Lagostominae (*Lagostomus brasiliensis*) from the karst of Lagoa Santa (Minas Gerais State, Brazil), based on a fragmented dentary and one euhypsodont and bilaminar tooth (Lund, 1841:pl.

XXV, figs. 1-3; pl. XXVI, figs 1-4). However, in the review of Lagoa Santa rodents, Winge (1888) did not recognize this taxon (Paula Couto, 1950: footnotes 36 and 318). In fact, the drawings by Lund (1841) are not clear enough to identify this material. For example, the tooth is about 50% narrower than in *Lagostomus maximus*. In addition, the occlusal design shows completely independent laminae separated by a thick layer of cement (Lund, 1841:pl. XXV, fig. 2a), even thicker than in Miocene lagostomines.

The confirmation of the presence of *Lagostomus* in the Quaternary from the Intertropical region of Brazil (*sensu* Cartelle, 1999) depends on the discovery of new remains. According to Cione *et al.* (1999), during the Quaternary of Argentina, *Lagostomus* first occurs in the Ensenadan. In Argentina, *Lagostomus* sp. is recorded for late Pleistocene in Buenos Aires Province at Punta Hermengo (Tonni & Fidalgo, 1982) and Dolores locality (Chimento, 2007), and also in Córdoba Province (Cruz *et al.*, 2009). *L. maximus* is a guide fossil for the Platan age (Holocene) (Cione & Tonni, 1999), though the species also occurs in the late Pleistocene at Paso Otero (Prado *et al.*, 1987) and Punta Hermengo, both in Buenos Aires Province (Tonni & Fidalgo, 1982), and at Córdoba Province (Sarrat, 2009); and late Pleistocene/Holocene at Arroyo Seco 2 (Gómez *et al.*, 1999) and Cueva Tixi, both in Buenos Aires Province (Tonni *et al.*, 1988). In Uruguay, *Lagostomus* sp. was reported for the late Pleistocene at El Caño locality, and Libertad and Dolores formations (Ubilla & Perea, 1999; Ubilla *et al.*, 2009).

The Quaternary fossil record of Dolichotinae is very scarce. The only genus recognized is *Dolichotis* (Figure 5B),

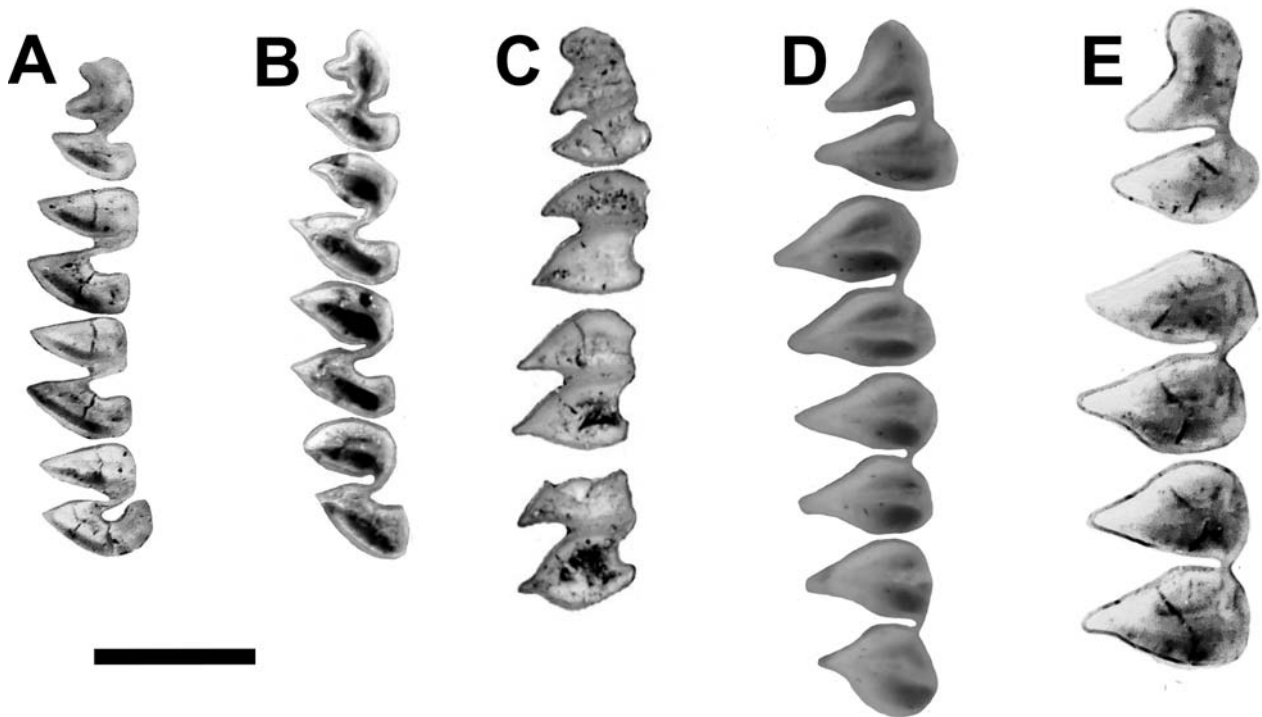


Figure 4. Lower left cheek teeth of Caviidae used for comparison with MCTFM-PV 0736 and LGP-V 0001. **A**, *Galea musteloides*, MLP 738 (4); **B**, *Microcavia australis*, MLP 683 (2); **C**, *Kerodon rupestris*, MDJ/Mr 002; **D**, *Dolichotis salinicola*, MLP 673; **E**, *Dolichotis patagonum*, MLP 8-XI-95.5 (p4-m2 series). Scale bar = 5 mm.

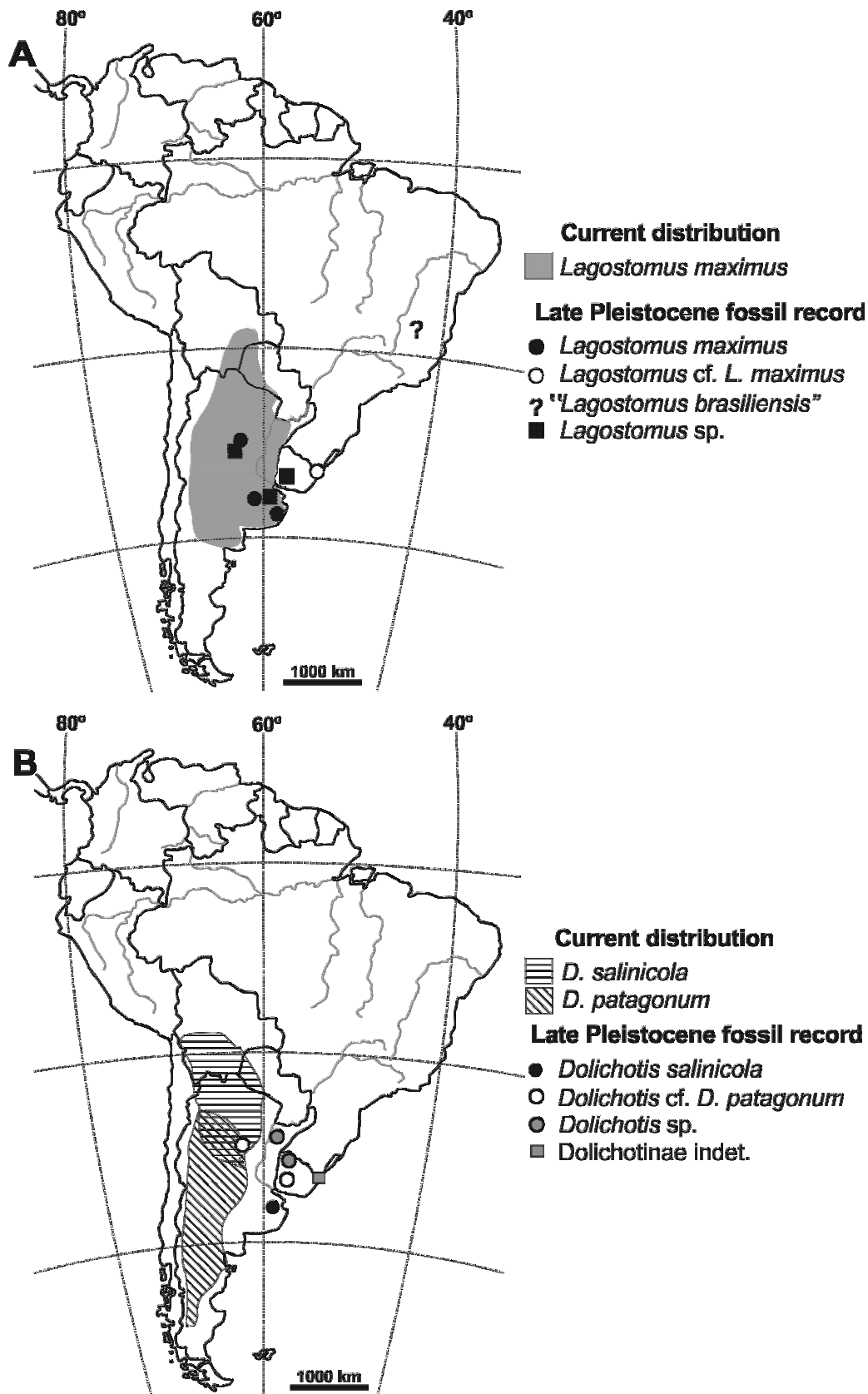


Figure 5. A, Current distribution of *Lagostomus* (Llanos & Crespo, 1952; Eisenberg & Redford, 1989; Jackson *et al.*, 1996) and its late Pleistocene fossil record. Fossil record based on: Tonni & Fidalgo (1982), Prado *et al.* (1987), Tonni *et al.* (1988), Gómez *et al.* (1999), Ubilla & Perea (1999), Sarrat (2009) and Ubilla *et al.* (2009). B, Distribution of extant Dolichotinae (Cabrera, 1961; Eisenberg & Redford, 1989; Campos *et al.*, 2001) and their late Pleistocene fossil record. Fossil record based on: Tonni (1981), Scillato-Yané *et al.* (1998), Ubilla *et al.* (2004), Sarrat (2009) and Ubilla *et al.* (2009).

which is known from the late Pliocene at least (Vucetich & Verzi, 1995; Verzi & Quintana, 2005). In the late Pleistocene, *Dolichotis* sp. was reported for Arroyo Toropí, Corrientes Province, Argentina (Scillato-Yané *et al.*, 1998); and the Sopas Formation, Uruguay (Ubilla *et al.*, 2004). *Dolichotis* cf. *D. patagonum* was mentioned for the late Pleistocene at Jesús María, Córdoba Province, Argentina (Sarrat, 2009) and Dolores Formation, Uruguay (Ubilla *et al.*, 2009). *D. salinicola* was reported for the late Pleistocene of Buenos Aires Province (Tonni, 1981). A P4 of Dolichotinae indet. was reported for the continental shelf of southern Brazil (Rodrigues & Ferigolo, 2004), but unfortunately these submarine deposits have no stratigraphic context, and the associated fossils encompass ages from Ensenadan to Lujanian (Lopes *et al.*, 2010). Thus, *Lagostomus* cf. *L. maximus* described here is the first positive record of a Chinchillidae from Brazil, and Dolichotinae confirms the presence of this subfamily in the late Pleistocene of southern Brazil.

Lagostomus maximus usually lives in open areas, with grasslands or shrubs, often characterized by little rain (Eisenberg & Redford, 1989). They are colonial diggers that live in colonial burrows systems, the “vizcachas”, which are occupied by many generations (Llanos & Crespo, 1952; Villarreal *et al.*, 2001). According to Villarreal *et al.* (2001), the vizcachas are found together with other mammals that indicate dry environments, such as the xenarthrans *Chaetophractus villosus* (Desmarest, 1804) and *Zaedyus pichiy* (Desmarest, 1804). Although predominantly associated with dry environments, *Lagostomus* seems to be more tolerant than *Chinchilla* and *Lagidium*, being found in arid to subtropical environments, with rainfall ranging from <300 mm in west central region of Argentina to > 1000 mm in the north the country (Jackson *et al.*, 1996). The dolichotines are cursorial rodents and restricted to arid and semi-arid environments (Eisenberg & Redford, 1989; Campos *et al.*, 2001).

Diverse taxa indicative of open areas and environments drier than today's have been reported for the late Pleistocene of southern Brazil, such as camelids, the tayassuid *Catagonus* and the rodent *Microcavia* (Scherer *et al.*, 2007; Ubilla *et al.*, 2008; Gasparini *et al.*, 2009). However, the presence of *Myocastor* in Chuí Creek suggests the presence of permanent water bodies. These discrepancies perhaps can be explained by the presence of mosaic environments (Bombin, 1975; 1976). The palynological data available for the late Pleistocene of Rio Grande do Sul State suggest a predominance of open areas and grasslands (Bauermann *et al.*, 2009 and references therein). Based on the ecology of the living taxa, the material reported here is consistent with this pattern. The presence of *Lagostomus* and Dolichotinae in southern Brazil, together with *Microcavia* which has a similar distribution, is probably related to the latitudinal displacements of the environmental and climatic belts during the late Pleistocene.

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Appendix 1. Comparative specimens.

Caviidae: *Dolichotis patagonum*: MLP 8-XI-9-5, MLP 488, MLP 247, MLP 371 (Juvenile), MLP 5-II-49-2 (Juvenile), MLP 1418; *D. salinicola*: MLP 672 – 673; *Kerodon rupestris*: MDJ/Mr 002; *Microcavia australis*: MLP 683 (1-10), MLP 684 (1-23). *Galea musteloides*: MLP 738 (2, 4, 6, 7). Chinchillidae: *Chinchilla laniger*: MCN-M 2805, MLP 1767; *Lagostomus maximus*: MCPU-M 013, MLP 2-VI-60-7, MLP 5-II-49-4, MLP 359, MLP 5-IX-97-01, MLP 693, MLP 1597, MLP 1598, MLP 1599, MLP 1601, MLP 1602, MLP 1617, MLP 1636, MLP 1637, MLP 1639, MLP 1642, MLP 1649, MLP 1650, MLP 1656, MLP 1657, MLP 1659, MLP 1728, MLP 1729, MLP 1773, MLP 1774, MLP 1781, MLP 26-V-99-5, MLP 30-V-97-1, MLP 30-XII-02-3, MLP 19-V-98-1, MLP 1654, MLP 19-IX-47-3, MLP 19-V-98-2, MLP 19-V-98-3, MLP 19-IX-47-4, MLP 25-X-95-2, MLP 26-V-99-6; *Lagidium viscacia*: MLP 1429, MLP 1432, MLP 20-V-96-1; *Lagidium* sp.: MLP 22-IV-47-4, MLP 343, MLP 377.