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NOTE

THE SOUTHERNMOST BEAR: *PARARCTOTHERIUM* (CARNIVORA, URSIDAE, TREMARCTINAE) IN THE LATEST PLEISTOCENE OF SOUTHERN PATAGONIA, CHILE

FRANCISCO J. PREVOSTI[1], LEOPOLDO H. SOIBELZON[2], ALFREDO PRIETO[3], MANUEL SAN ROMAN[4], and FLAVIA MORELLO[3], [1]Facultad de Ciencias Naturales y Museo (U.N.L.P.), cc 223, 1900 La Plata, Buenos Aires, Argentina, protocyon@hotmail.com; [2]CONICET, Departamento Científico Paleontología de Vertebrados, Museo de La Plata, Paseo del Bosque, 1900 La Plata, Buenos Aires, Argentina; [3]Centro de Estudios del Hombre Austral, Instituto de la Patagonia, UMAG Casilla 113-D, Punta Arenas, Chile; [4]Centro de Estudios del Cuaternario de Fuego-Patagonia y Antártica Chilena, Casilla 113-D, Punta Arenas, Chile

A second upper incisor belonging to the tremarctine bear *Pararctotherium* was recovered from latest Pleistocene deposits in Cueva de los Chingues, Magallanes, Chile (San Roman et al., 2000; Fig. 1). This is the southernmost record of an ursid in the world and one of the youngest records of *Pararctotherium*. The paleoenvironment of southern Patagonia in the latest Pleistocene (ca. 11,000 yBP) was a cold grassland.

The Ursidae originated during the late Eocene in the Holarctic region and throughout its history has primarily been restricted to the Northern Hemisphere. Ursids twice dispersed into Africa (Hunt, 1996): the Hemicyoninae in the early Miocene and Agriotherium in the late Miocene, with the latter reaching the southern tip of Africa (ca. 33° 43′ S). The Tremarctinae is comprised of five genera: *Plionarctos*, late Miocene–early Pliocene, North America (Tedford and Martin, 2001); *Arctodus*, late Pliocene–Pleistocene, North America (Kurtén, 1967; Emslie, 1995); *Arctotherium* and *Pararctotherium*, Pleistocene, South America; and *Tremarctos*, late Pliocene–Pleistocene, North America and Recent, South America (Kurtén, 1966). Trajano and Ferrarezzi (1994) considered *Pararctotherium* to be a subgenus of *Arctotherium*. We regard both *Arctotherium* and *Pararctotherium* as valid, distinct genera based on the systematic and phylogenetic revision of South American fossil bears by LHS (e.g., Soibelzon, 2000, 2002; Soibelzon et al., 2000).

Tremarctines dispersed into South America from North America at least twice. The oldest records of *Arctotherium* are early Pleistocene (Ensenadan age; Kraglievich and Ameghino, 1940; Berman, 1994; Soibelzon and Bond, 1998; Soibelzon et al., 2001; Soibelzon, 2002). *Tremarctos*, which lacks a fossil record in South America, probably crossed the Panamanian Isthmus in the latest Pleistocene or Holocene (Soibelzon, 2002). South American fossil bears are primarily recovered from the Pampean Region (ca. 33° S), with isolated finds in Brazil, Bolivia, Chile, Venezuela, and Uruguay. *Arctotherium latidens* is the lone Ensenadan tremarctine in South America. Following its extinction, tremarctines were represented by several species of *Pararctotherium* during the middle to late Pleistocene (Bonaerian and Lujanian ages; Cione and Tonni, 1999). It was distributed widely across southern South America (Bolivia, Brazil, Argentina, Uruguay, and Chile) and persisted until the end of the Lujanian (Soibelzon and Bond, 1998; Soibelzon, 2002).

Abbreviations—**MLP**, Museo de La Plata, Argentina; **MMP**, Museo Municipal de Mar del Plata ‘‘Lorenzo Scaglia’’, Argentina; **MACN**, Museo Argentino de Ciencias Naturales ‘‘Bernardino Rivadavia’’, Argentina; **UMAG**, Universidad de Magallanes, Chile; **W**, maximum transversal width; **L**, maximum anteroposterior length.

SYSTEMATIC PALEONTOLOGY

Class MAMMALIA Linnaeus, 1758
Order CARNIVORA Bowdich, 1821
Family URSIDAE Gray, 1825
Subfamily TREMARCTINAE Merriam and Stock, 1925
PARARCTOTHERIUM Ameghino, 1904
PARARCTOTHERIUM sp.

Referred Specimen—UMAG 53643 (Fig. 2A–C, Table 1), left I2.

Locality and Age—Cueva de los Chingues, Pali Aike National Park, Magallanes, Chile (52° 05′ 37″ S; 69° 44′ 31″ W; Fig. 1). The tooth was found in the 3D grid at the 90–95 cm level, and is latest Pleistocene. San Roman et al. (2000) reported that collagen taken from a bone of *Hippidion* sp. from this level had a date of 11,210 ± 50 ^{14}C yBP (=13,410–13,010 cal. yBP).

Description—The crown is proportionally high, and laterally narrow, especially in its middle and lower portions. In occlusal view (Fig. 2B), it is subtriangular in outline, more elongated anteroposteriorly, with the apex oriented lingually. The principal cusp is anteroposteriorly compressed and laterally expanded, with a small cuspule on the lateral side. The enamel of the anterior face is wrinkled and has a shallow longitudinal groove. The medial border is slightly convex (mainly at the base of the crown), but the lateral border is concave. The lingual shelf is subhorizontal, slightly inclined lingually, with two rounded ridges at the medial and lateral border. The lateral ridge is shorter and narrower than the medial ridge. A very small enamel bulge is located between these ridges and the principal cusp.

Comparisons—UMAG 53643 displays the morphology of a tremarctine I1 or I2. It is not shovel–shaped, as are the lower incisors, and has a triangular occlusal edge (Emslie, 1995). We identify UMAG 53643 as an I2 because in most tremarctines the I2 is larger than I1, more triangular in occlusal view, and has a longer inner shelf. The I3 is caniniform in all Ursidae.

Tremarctines are the only ursids known from South America, with two extinct genera, *Arctotherium* and *Pararctotherium*, and the extant *Tremarctos ornatus* from northwestern South America. The I2 of *Pararctotherium* is very different from that of *Arctotherium* (Fig. 2D–G). The I2 of *Pararctotherium* is smaller than that of *Arctotherium* (Table 1) and the lingual ridges are rounded and flat without cusps on their anterior boundary. *Pararctotherium* has a small enamel bulge absent in *Arctotherium*. The longitudinal groove between the two ridges is deeper in *Arctotherium*. In addition, *Arctotherium* has a well developed cusp on the lateral margin of the principal cusp, which is reduced or absent in *Pararctotherium* (Fig. 2D–G). Upper incisors of *Tremarctos ornatus* are much smaller than those of *Arctotherium* or *Pararctotherium*.

The I2 from Cueva de los Chingues has the same morphology and size as those of *Pararctotherium* (Table 1). It is nearly indistinguishable from MACN 971, the holotype of *Pararctotherium pamparum* (Fig. 2F, G) and very similar to *Pararctotherium brasiliense* (Paula Couto, 1960: fig. 4; Cartelle, 1994:90). Unfortunately, the third species of *Pararctotherium, P. enectum*, is know only from mandibles. Because of this and the rarity of incisors of *Pararctotherium,* we could not make a definitive specific determination.

The only other large carnivores in southern Patagonia during the latest Pleistocene were the lion-sized Patagonian panther (*Panthera onca mesembryna*) and *Smilodon* (Borrero, 1997). The I1 and I2 of the Patagonian panther are smaller than those of *Pararctotherium*, and their crowns are shorter and more expanded laterally. The lingual faces are less compressed and more squared in cross-section than those of *Pararctotherium*. The inner cingula run along the lingual border of the teeth, reaching their maximum height at the midline and are separated from the principal cusp by a transverse groove. The morphology of the upper incisors of *Smilodon* is significantly different: the principal cusp

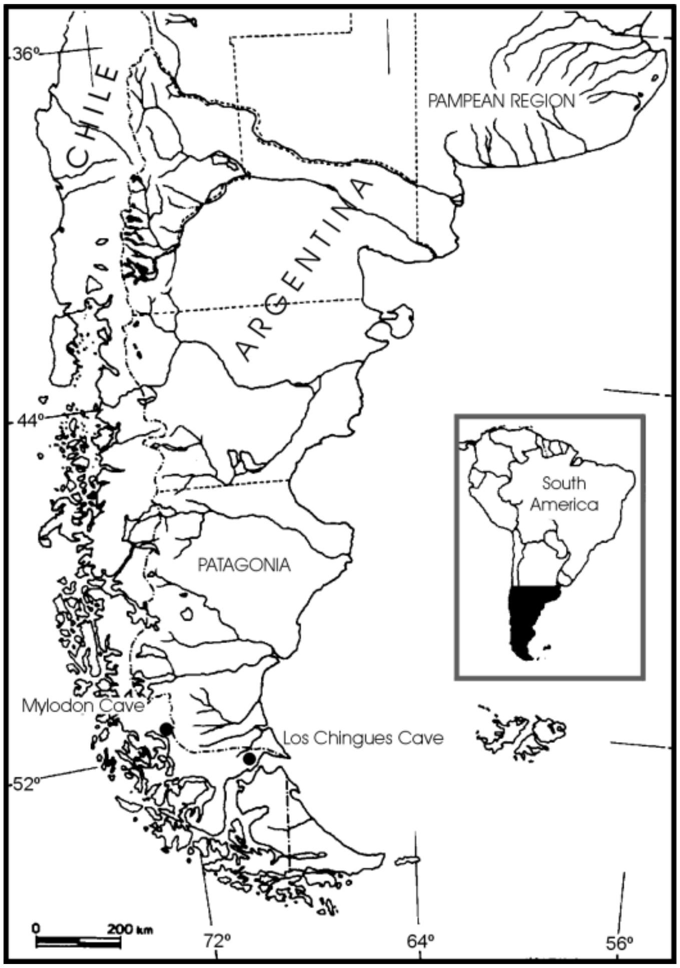

FIGURE 1. Map showing the position of Cueva de los Chingues and Cueva del Mylodon in southern Chile.

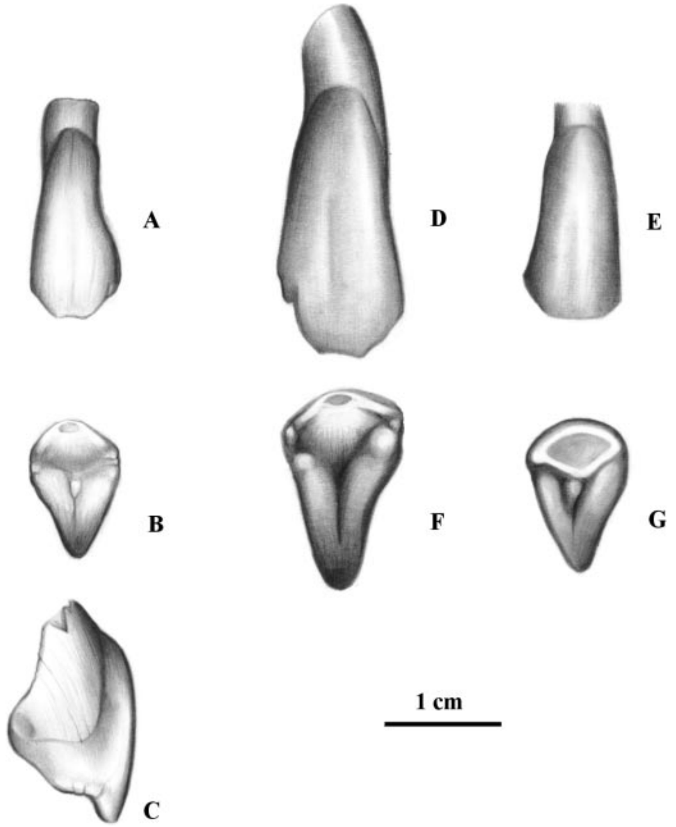

FIGURE 2. Comparison of I2 of *Arctotherium* and *Pararctotherium*. Labial (**A**), occlusal (**B**), and lateral (**C**) views of UMAG 53643, left I2 of *Pararctotherium* sp. Labial (**D**) and occlusal (**E**) views of MLP 00-VII-15-1, right I2 of *Arctotherium latidens*. Labial (**F**) and occlusal (**G**) views of MACN 971, right I2 of the holotype of *Pararctotherium pamparum*.

is large, conical in shape, recurved, and elliptical in occlusal view, with ridges at its medial and lateral faces (Merriam and Stock, 1932).

PALEOBIOGEOGRAPHIC SIGNIFICANCE

Pararctotherium is known from Brazil (*P. brasiliense*; Paula Couto, 1960; Trajano and Ferrarezzi, 1994), Uruguay (*P. pamparum*; Perea and Ubilla, 1983), and Argentina (*P. enectum* and *P. pamparum*; Ameghino, 1904; Berman, 1994; Soibelzon and Bond, 1998). The most southern record, outside Patagonia, is a mandible of *P. pamparum* from the late Pleistocene (Bonaerian or Lujanian age) of the southern Pampean Region (38° 38′ S; 60° 36′ W). The latest records of fossils tremarctinaes come from Young, Uruguay (ca. 11,600 ± 130 yBP; Ubilla and Perea, 1999) and Santa Clara del Mar, Argentina (24,450 ± 150 ^{14}C yBP, at 37° 49′ S; 57° 29′ W; Pardiñas et al., 1998). Some records of *P. brasiliense* have been considered latest Pleistocene to Holocene (Paula Couto, 1960; Trajano and Ferrarezzi, 1994; Cartelle, 1998), but as the fossils were collected out of stratigraphic context, their age cannot be determined accurately.

In 1900, a portion of femur found in the Cueva del Mylodon (Ultima Esperanza, Chile; 52° 05′ 37″ S; 69° 44′ 31″ W; Fig. 1) was referred to *Arctotherium* sp. (Smith Woodward, 1900). Later, Oliver (1935) assigned it to *Pararctotherium pamparum*. Although the specimen is now lost, the size and morphology of are those of the femur of *Pararctotherium*, but it cannot be assigned to any particular species. Curiously, this record was ignored in revisions of South American fossil Tremarctinae (e.g., Kraglievich, 1926, 1934; Kraglievich and Ameghino, 1940; Kurtén, 1967; Berman, 1994; Trajano and Ferrarezi, 1994). The discovery of an I2 of *Pararctotherium* at Cueva de los Chingues confirms the presence of the genus during the latest Pleistocene of southern Patagonia. This is one of the youngest records of the genus, and the southernmost record of Ursidae in the world.

PALEOENVIRONMENT AND PALEOECOLOGY

The colonization of southwestern Patagonia by *Pararctotherium* must have occurred after the last Glacial Maximum (20,000–18,000 yBP), because glacial ice covered this part of Patagonia (Clapperton et al., 1995; Cione and Barla, 2000). Deglaciation in southwestern Patagonia began between 16,000 and 14,000 yBP (Clapperton et al., 1995; Heusser, 1995; Rabassa et al., 2000). To the east of the Andes, xeric scrub-steppe (dominated by *Empetrum*) was replaced by grassland about 12,000 yBP (Markgraf, 1985, 1991, 1993). Between 12,700 and 10,300 ^{14}C yBP, ice readvanced up the Strait of Magellan, reaching as much as

TABLE 1. Measurements on the I2 of *Pararctotherium* sp. from Cueva de los Chingues, Chile (UMAG 53643), other *Pararctotherium* specimens, and *Arctotherium latidens*. L, greatest anteroposterior length; W, greatest transverse width.

	L	W
Pararctotherium sp. (UMAG 53643)	11.3	8.25
P. pamparum (MACN 971)	14.1	9.2
Pararctotherium sp. (MMP 1233M)	11.7	8.2
A. latidens (MACN 12529)	17.6	11.1
A. latidens (MMP48S)	15.8	10.9
A. latidens (MLP 97-I-5-1)	15.5	10.5
A. latidens (MLP 82-X-22-1)	15.4	10.8
A. latidens (MLP 00-VII-15-1)	17.4	11.9
A. latidens (MMP1232M)	16.9	12.5

80 km beyond its current margins (McCulloch et al., 2000). Between 12,300 and 10,300 ^{14}C yBP, frequent changes of short duration (ca. 100–200 yr) between grassland and heathland occurred, but they do not provide an unambiguous signal of climatic cooling, and the pollen evidence of increased heathland vegetation reflects an increase in effective moisture when compared with the previous 2,000 years (McCulloch et al., 2000).

The latest Pleistocene mammalian fauna of southern Patagonia (Borrero, 1997) included grazers such as equids (*Hippidion*), camelids (*Lama gracilis*), and mylodont ground sloth (*Mylodon*), a mixed-feeding camelid (*Lama guanicoe*), and carnivores (*Panthera onca mesembryna*, *Puma concolor*, *Smilodon* sp., *Dusicyon avus*) (Markgraf, 1985; Alberdi et al., 1987; Menegaz et al., 1989; Canto, 1991; Borrero, 1997), but was less diverse than that of lower latitudes (e.g., Pampean region). The first record of humans in southern Patagonia is accurately dated around 11,000 yBP (Borrero, 1999). The *Paractotherium* I2 at the Cueva de los Chingues was found together with fossils of *Hippidion*, *Mylodon*, *Lama guanicoe*, large felids (*Puma concolor* and possibly *Panthera onca mesembryna*), canids, and rodents (San Roman et al., 2000).

The record of *Pararctotherium* at Cueva de los Chingues is synchronic with the cold grassland event (see above), thus some species of *Pararctotherium* were adapted to live in open, arid, and/or cold environments. This agrees with previous hypotheses on *Pararctotherium* paleoecology (Berman, 1994; Trajano and Ferrarezzi, 1994; Cartelle, 1998; Soibelzon and Bond, 1998).

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