



Presence of *Arctotherium* (Carnivora, Ursidae, Tremarctinae) in a pre-cultural level of Baño Nuevo-1 cave (Central Patagonia, Chile)

Presencia de Arctotherium (Carnivora, Ursidae, Tremarctinae) en un nivel pre-cultural de cueva Baño Nuevo-1 (Patagonia Central, Chile)

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ABSTRACT

The description of an I₃ assigned to *Arctotherium* sp. obtained from the Baño Nuevo-1 site (Central Patagonia, Chile) is presented. The finding was recovered from Layer 5 and it is associated to *Macrauchenia* sp., *Lama guanicoe*, Felidae, Camelidae, Equidae and Mylodontidae, within a sterile deposit of cultural material, dated between ca. 13.500 and 11.200 BP. Despite the fact that it is only a single specimen, such finding extends the known distribution for the genus in Chile.

Keywords: Ursidae; *Arctotherium*; Late Pleistocene; Central Patagonia.

RESUMEN

Se presenta la descripción de un I₃ asignado a *Arctotherium* sp. proveniente del sitio Baño Nuevo-1 (Patagonia Central, Chile). El hallazgo fue realizado en la Capa 5 y está asociado a restos de *Macrauchenia* sp., *Lama guanicoe*, Felidae, Camelidae, Equidae y Mylodontidae dentro de un depósito estéril de material cultural, datado entre los ca. 13.500 y 11.200 años AP. Aunque se trata de un único espécimen, amplía el rango de distribución conocido para este género en Chile.

Palabras clave: Ursidae; *Arctotherium*; Pleistoceno final; Patagonia Central.

Recibido el 7 de enero de 2015 / Aceptado el 23 de septiembre de 2015 / Publicado online el 20 de noviembre de 2015

Citation / Cómo citar este artículo: P. López Mendoza, et al. (2015). Presence of *Arctotherium* (Carnivora, Ursidae, Tremarctinae) in a pre-cultural level of Baño Nuevo-1 cave (Central Patagonia, Chile). *Estudios Geológicos* 71(2): e041. <http://dx.doi.org/10.3989/egeol.42011.357>.

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Introduction

Recent evaluations of the Baño Nuevo-1 collections have led to the identification of an *Arctotherium* sp. (Carnivora, Ursidae, Tremarctinae) tooth fragment from the upper sections of Layer 5 (Late Pleistocene), associated to *Macrauchenia* sp., Equidae, Felidae, *Lama guanicoe*, Camelidae and Mylodontidae remains (mainly dermal bones). On the immediately overlaying Layer 4B, *Diabolotheerium* cf. *nordenskioldi*, *Lama guanicoe*, *Macrauchenia* sp., Equidae, Camelidae, Felidae and Mylodontidae remains have also been recorded (López, 2009; Bostelmann, *et al.*, 2011; López & Mena, 2011).

This sample (one specimen) opens new issues for the osseous record of the final Pleistocene at the site, as another possible taphonomic agent has to be considered, while discussing the faunal remains founded on rockselters from this time period at the Chilean central Patagonia in general. Beyond description and taxonomic identification, it also opens new grounds for paleoecological studies, such as those already developed in southern Patagonia (Martín, 2008; 2013; Martín & San Román, 2010).

The finding of an *Arctotherium* remain at Baño Nuevo-1 has been barely mentioned in previous studies (see López & Mena, 2011). Given its importance, however, this brief note aims to provide valuable information on its stratigraphical setting and chronological context and a detailed description as well as a preliminary discussion on the origins of the fossil.

The finding in context

Baño Nuevo-1 is located *ca.* 80 km, NE of Coyhaique (45° 17' S-71° 32' W) (Fig. 1). The cave is located on an Aptian volcanic complex, locally known as “Cerro Grande del Campo Seis” (Large Hill on Section 6). With a depth of 20 m and an average width of 4 m, the cave nowadays has a relatively restricted access due to the entry of coluvial debris fallen through a lateral shaft (Velásquez & Mena, 2006). The stratigraphic record has been previously presented in several articles (see Mena *et al.*, 2000, 2003; Núñez *et al.*, 2005; Mena & Stafford, 2006; Velásquez & Mena, 2006; Mena, 2009; López & Mena, 2011; Trejo & Jackson 1998).

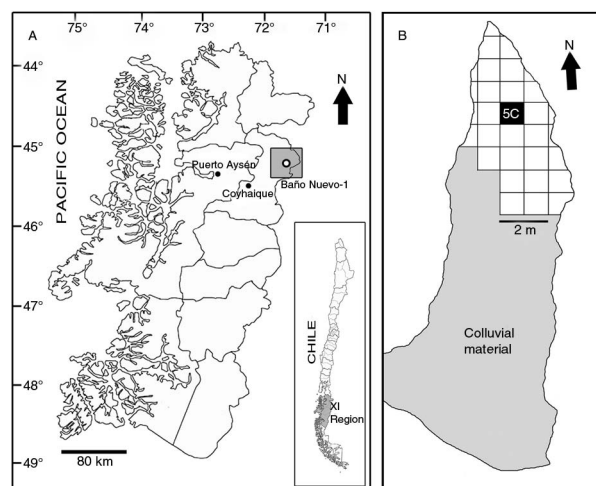


Figure 1.—A. Location of the Baño Nuevo-1 site; B. Plan drawing showing recovery location of the *Arctotherium* sp. sample.

The tooth specimen presented, was recovered from Layer 5, characterized by clay and organic sand, dated between *ca.* 13.500 and 11.200 cal ¹⁴C B.P. (see Fig. 2). Just like Layer 4A, this layer presents abundant fossil remains and organic sediments that could be assigned to Mylodontidae dung (Mena & Stafford, 2006; Núñez *et al.*, 2005). This layer overlies Layer 6, composed by fine microlaminated sands deposited by a large Pleistocene proglacial lake devoid of any faunal remains (Mena & Stafford, 2006; Núñez *et al.*, 2005).

Material and methods

The material corresponds to a left I₃. Currently, it is stored at the Facultad de Ciencias Sociales, Universidad de Chile, under the code Baño Nuevo-1/ Unidad 5C/Capa 5/N°F171. The specimen was compared with collections of *Arctotherium vetustum* at the Museo Argentino de Ciencias Naturales Bernardino Rivadavia, *Lycalopex culpaeus*, *Otaria* sp. and *Puma concolor* from the Laboratorio de Zooarqueología of the Universidad de Chile, and *Panthera onca* from a private collection. Since part of the cusp is broken, mesio-distal and lingual-labial measurements had to be taken only at the crown base. The occlusal surface was observed through Scanning Electron Microscopy (SEM) (Zeiss, model EVO MA10) at the Departamento de Antropología of the Universidad de Chile.

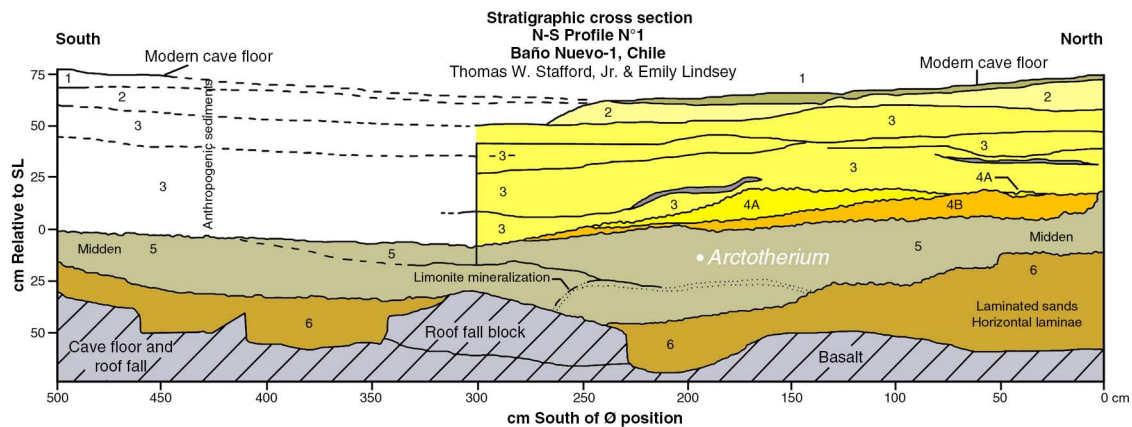


Figure 2.—Stratigraphic cross section of the Baño Nuevo-1 site.

Institutional abbreviations: MACN, Museo Argentino de Ciencias Naturales Bernardino Rivadavia.

Systematic Paleontology

Carnivora Bowdich, 1821

Ursidae Gray, 1825

Tremarctinae Merriam and Stock, 1925

Arctotherium Burmeister, 1879

Arctotherium sp.

Material: Baño Nuevo-1/Unidad 5C/Capa 5/Nº F171, an isolated I₃ (Fig. 3A, B, C and D).

Geographical occurrence: Baño Nuevo-1 cave, Coyhaique, Central Patagonia, Chile. UTM: 0301821 E-4981638 N (Fig. 1A-B).

Stratigraphical occurrence: Layer 5, Late Pleistocene dated between *ca.* 13.500 and 11.200 cal ¹⁴C B.P. (Fig. 2).

Description and comparisons

The small and fragmentary nature of the sample precludes a clear-cut, absolute identification, yet both its size and shape allows us to assign it to Ursidae and, moreover, to *Arctotherium* Burmeister, 1879. The finding was done on unit 5C and it corresponds to a left I₃ from an adult. The incisor presents a fracture on its occlusal surface allowing us to see the pulp cavity of the tooth. This surface exhibits a subtriangular

shape, while on the lingual facies we can see an enamel layer crossing the surface. The root also presents a subtriangular section being compressed on its mesio-distal direction with two grooves reaching the dental crown and parallel edges. At the basis of the crown in the mesial level, the root rises to form an inverted V, while on the distal surface we observe a well developed marginal lobe at the point where the crown meets the root, that is fractured on its occlusal surface (Fig. 3A, B, C and D).

The incisor from Baño Nuevo-1 was found to be much larger than those from canids, felids and otarids used as comparative references. It also presents a marked development of the marginal distal lobe and grooves on the root. None of these traits were observed on canids, felids or otarids. The specimen also presents a thick enamel layer on its labial face, being much thinner on the lingual one. Morphologically the Baño Nuevo-1 incisor is similar to *Arctotherium vetustum* (MACN 1201), although larger, with 8.5 mm mesio-distal measurement in the base and 12.6 mm labial-lingual measurement in the base.

Biogeographic panorama

Nowadays the Tremarctinae Subfamily can be found exclusively on the Americas (Soibelzon, 2004). Four genera are recognized: *Plionarctos* Frick, 1926 and *Arctodus* Leidy, 1854 in North America, *Arctotherium* Burmeister, 1879 in South America

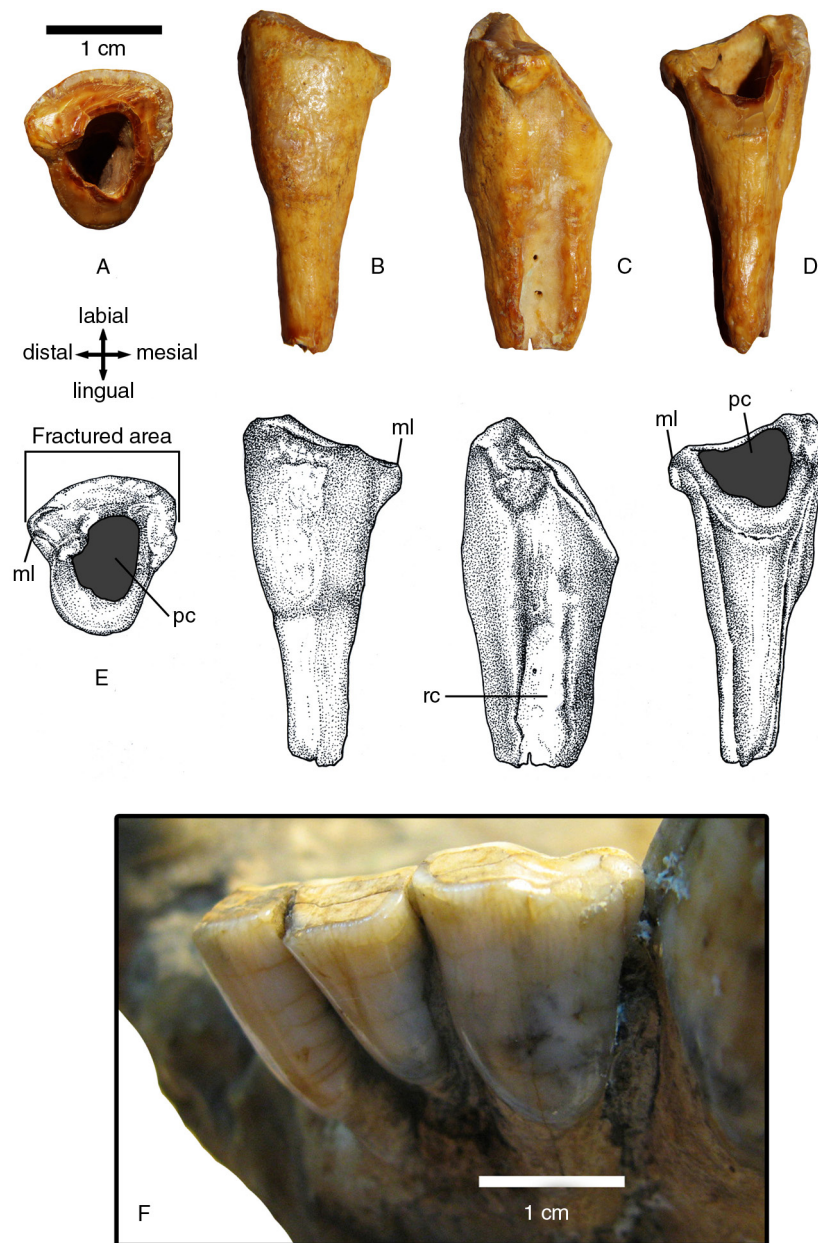


Figure 3.—Views from the de *Arctotherium* sp. I_3 from Baño Nuevo-1: A. Occlusal; B. Labial; C. Lateral; D. Lingual; E. Drawings of I_3 of *Arctotherium* sp. of the Baño Nuevo-1 site indicating the principal features mentioned in the text; F. *Arctotherium vetustum* (MACN 1201) mandible with left I_3 *in situ*. Abbreviations: ml. marginal lobe; pc. pulp cavity; rc. root canal.

and *Tremarctos* Gervais, 1855 with an extinct species from North America and a living one in South America (Soibelzon, 2004).

According to the latest reviews (Soibelzon, 2004; Soibelzon *et al.*, 2005) the South American extinct bears have been assigned to the genera *Arctotherium*, being recorded in Venezuela, Brazil, Bolivia, Uruguay,

Argentina and Chile from the Ensenadan (Upper Pliocene to Middle Pleistocene) to the Lujanian (Upper Pleistocene-Early Holocene). Five species are recognized within this genera: *Arctotherium vetustum* Ameghino, 1885 from Bonaerian levels (Middle Pleistocene) at the Argentine provinces of Buenos Aires and Entre Ríos and one possible finding

from Brazil; *Arctotherium wingei* Ameghino, 1902 from Brazilian and Venezuelan Lujanian levels and Pleistocene deposits in Bolivia; *Arctotherium bonariense* (Gervais 1848–1852) from Bonaerian and Lujanian levels of the Buenos Aires province (Argentina); *Arctotherium angustidens* Gervais & Ameghino, 1880 from Ensenadan levels at the same province and at Tarija, Bolivia; and finally *Arctotherium tarijense* Ameghino, 1902 from Bonaerian and Lujanian levels at this Bolivian locality, Argentine provinces of Santa Fe and Buenos Aires, Uruguay and at the XII Region of Magallanes, Chile (Soibelzon, 2004).

In Chile, the record of Ursidae is restricted to central and southern Patagonia. It is composed by a molar from the Pilauco site (40° S) assigned to Ursidae (Pino *et al.*, 2013). Another finding corresponds to a femur from Cueva del Milodón (51°S), originally assigned to *Arctotherium* sp. and later on reassigned to *Pararctotherium pamparun* by Oliver-Schneider (1935). At Cueva de Los Chingues (52° S) an I² was recorded. Originally assigned to *Pararctotherium* sp. by Prevosti *et al.* (2003), it was later identified as *Arctotherium tarijense* by Soibelzon (2004) and has recently been reassigned to *Arctotherium* sp. by Prevosti & Martín (2013). Finally, there must be mentioned another femur fragment collected from the surface of Cueva del Puma (52° S) and identified as *Arctotherium tarijense* with a date of 10.345±75 B.P. (Martín *et al.*, 2004, Martín, 2013). Thus, the evidence now reported from Baño Nuevo-1 fills the intermediate gap between the areas from where it was known before.

The *Arctotherium* sp. remain from Layer 5 at Baño Nuevo-1 cave is associated to Mylodontinae, Felidae (aff. *Panthera onca mesembrina*), Equidae, *Lama guanicoe* and *Macrauchenia* sp. remains with no traces of human presence (López & Mena, 2011). Paleoenvironmental studies based on pollen records from neighboring areas (High Cisnes River, De Porras *et al.*, 2012; High Simpson river, Markgraf *et al.*, 2007; Middle Chacabuco river, Villa-Martínez *et al.*, 2011) reveal an open steppe environment.

Discussion and conclusions

One of the questions triggered by the finding of *Arctotherium* at Baño Nuevo-1 is related to the taphonomy of the fossil assemblage at the cave.

Studies about the role of *Arctotherium* as a potential agent on the formation and transformation of bone assemblages are almost nonexistent, unlike the Old World Ursidae situation, whose taphonomic effects have been subject of intensive research (Gargett, 1996; D'Errico *et al.*, 1998; Stiner *et al.*, 1998; Wolverton, 2001; Quilès *et al.*, 2006; Rabal-Garcés & Cuenca-Bescós, 2009; Arilla *et al.*, 2014). One of the few American studies, specifically geared to the case of *Arctotherium angustidens*, reveals a high proportion of broken teeth, as likely result of chewing on hard materials such as bones (Figueirido & Soibelzon, 2010). On the other hand, studies by Haynes (1983) have revealed that bears (*Ursus arctos* and *Ursus americanus* in particular) leave traces like those made by rodents, that is short and parallel with punctures related to parallel grooves on the crest of long bones. Andrews and Fernández-Jalvo (1997) found punctures of up to 10.4 mm in diameter, attributed to the action of bears. These marks were recorded both on the shaft and articular surfaces, just like those findings done by D'Errico and collaborators (1998). The only puncture recorded on remains from Layer 5 at Baño Nuevo-1 was found on a *Lama* sp. patella and both its shape and size are consistent with those produced by canids.

However, with this finding, *Arctotherium* joins the Felidae (aff. *Panthera onca mesembrina*) and *Dusicyon avus* previously known from the site as potential agents in the formation of the bone assemblages from the layers of the Final Pleistocene at the site (Trejo & Jackson, 1998). As said before, the wear patterns and dental pathologies observed in different samples indicate an omnivorous diet with non-negligible meat consumption, including bones (Prevosti & Vizcaíno, 2006; Figueirido & Soibelzon, 2010; Martín, 2013). In fact, most of the known *Arctotherium angustidens* remains have broken teeth's, most likely due to chewing on hard bones (Soibelzon *et al.*, 2009; Figueirido & Soibelzon, 2010).

In the occlusal surface of the I₃ of Baño Nuevo-1, part of the cusp is fragmented and it presents a caries that could be interpreted as a result of eating carbohydrate-rich foods, such as fruit or honey (Ferigolo, 1992; Soibelzon & Prevosti, 2007; Soibelzon *et al.*, 2014). Though a microwear analysis is not applicable to South American giant short-faced bear, because in species with omnivore diet the interpretation of hard plant

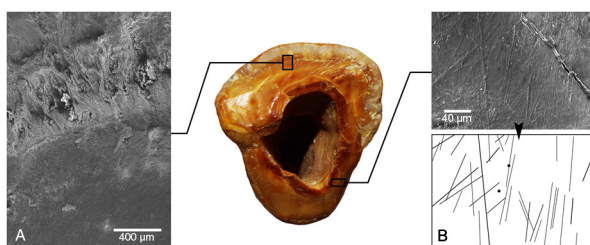


Figure 4.—Occlusal view of the I_3 of Baño Nuevo-1 showing: A. SEM photography of the area of fracture; B. SEM photography and schematic drawing indicating tracks of strias and pits product of the use as masticatory surface.

versus bone consumption is problematic (Soibelzon *et al.*, 2014:1241), we performed a SEM observation to see microwear that could reveal chewing use after cusp breakage. We looked the labial and lingual faces of the occlusal surface, finding striations and pits that point to a chewing action on the lingual face, while no such traits were observed on the labial face (Fig. 4A–B). Such evidences points to a postdepositional fracture of a portion of the cusp, or an immediate loss of it together with the complete incisive from its alveolar cavity.

Given the lack of direct evidence of damage due to bear action, the origin of *Arctotherium* at Baño Nuevo-1 has to be questioned. Soibelzon and collaborators (2009) point to two possible scenarios for the presence of bears in caves: the use for hibernating, and the sporadic search of carrion inside the caves. Hibernation has been mentioned in other works (Martín, 2013:28), but it is not clear if it can be applied to Tremarctinae. Accordingly, the sporadic use of Baño Nuevo-1 cave for both food and shelter purposes, is the most plausible scenario, taking into account the number and sort of evidence recovered, along with no presence of taphonomic traces attributable to *Arctotherium*. In any case, this very low density of *Arctotherium* material is consistent with the record from other sites in Patagonia, such as Milodón, Los Chinges or El Puma caves, as it is the almost null evidence of taphonomic traces left by this taxon (Martín, 2008:364).

The record of *Arctotherium* at Baño Nuevo-1 raises several questions that must be dealt with in the future, such as the competition with other animals to occupy the cave or its role in the formation and transformation of the deposits.

ACKNOWLEDGMENTS

To Dr. Francisco Prevosti for his help identifying the sample, and his valuable comments to an earlier version of the manuscript. Thanks to the Museo Argentino de Ciencias Naturales Bernardino Rivadavia for granting the access to their collections. We also want to thank the anonymous reviewers and Elvira Latorre B. for her drawings.

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