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The fishing bat *Noctilio* (Mammalia, Chiroptera) in the Middle Pleistocene of central Argentina

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We report the record of a canine tooth assignable to an undetermined species of *Noctilio* from the Middle Pleistocene of the Atlantic coast in central Argentina. This is the southernmost record for the genus and the first paleontological record of *Noctilio* in southern South America. In addition, this finding supports the hypothesis of an episodic warm climatic pulse suggested by other micromammals recovered from the same fossil-bearing levels.

Key words: *Noctilio*, Pleistocene, Argentina, paleoclimates

INTRODUCTION

The family Noctilionidae comprises a single genus, *Noctilio*, distributed from the west coast of Mexico to northern Argentina. One of the two living species of the genus, *N. albiventris*, is known from the Middle Miocene (Laventan) of Colombia (Monkey Beds, Villavieja Formation — Czaplewski, 1997; Czaplewski *et al.*, 2003). Remains assignable to the other living species, *N. leporinus,* have been found in cave deposits referable to the late Pleistocene and Holocene of Cuba and Puerto Rico (Reynolds *et al.*, 1953; Choate and Birney, 1968; Silva Taboada, 1979). Additionally, a small-sized extinct species, *N. lacrimaelunaris*, is known from the late Miocene (Acre Conglomerate Member between the Solimões and Madre de Dios formations, Department of Madre de Dios, Perú — Czaplewski, 1996).

Here we report the finding of a canine tooth assignable to an undetermined species of *Noctilio* from the Middle Pleistocene of the Atlantic coast in central Argentina (Necochea County, Buenos Aires province). This is the southernmost record for the genus and the first paleontological record of *Noctilio* in Argentina. The new material comes from levels that have yielded a caviomorph rodent fauna indicative of an

important faunal turnover (Vucetich *et al*., 1997; Vucetich and Verzi, 2002). The latter phenomenon comprises species indicative of a distributional drift associated to a warm event, probably the local expression of an interglacial episode (Verzi *et al*., 2004).

In this work we describe the new *Noctilio* material and discuss the importance of its stratigraphic provenance as an additional evidence of the above mentioned faunal turnover in the eastern Pampean region during the Middle Pleistocene.

Materials and Methods

The new material was compared with specimens of the two living species of *Noctilio* (see Fig. 1), as well as with species belonging to the phylogenetically related family Phyllostomidae (see Patton and Baker, 1978; Lewis-Oritt *et al.*, 2001). The comparative materials are housed in the mammalogical collections of Museo de La Plata (MLP) and Museo Argentino de Ciencias Naturales 'Bernardino Rivadavia' (MACN): Noctilionidae: *Noctilio leporinus*: MLP 26.XII.02.20, 26.XII.02.33, MACN 14188–89, 17241, 17917, 20951, *N. albiventris*: MACN 14204, 17237, 20809, 20886, 20889–90; Phyllostomidae: *Anoura caudifer*: MACN 20691, *Artibeus lituratus*: MACN 17.47, *Carollia perspicillata*: MACN 17950, *Chrotopterus auritus*: MACN 17944, *Glossophaga soricina*: MACN 17016, *Macrophyllum macrophyllum*: MACN 17938, *Micronycteris* sp.: MACN 17030, and *Vampyressa pusilla*: MACN 28243. The following measurements were taken for the new material and the specimens of living *Noctilio* species: crown height, transverse length, alveolar length and root height.

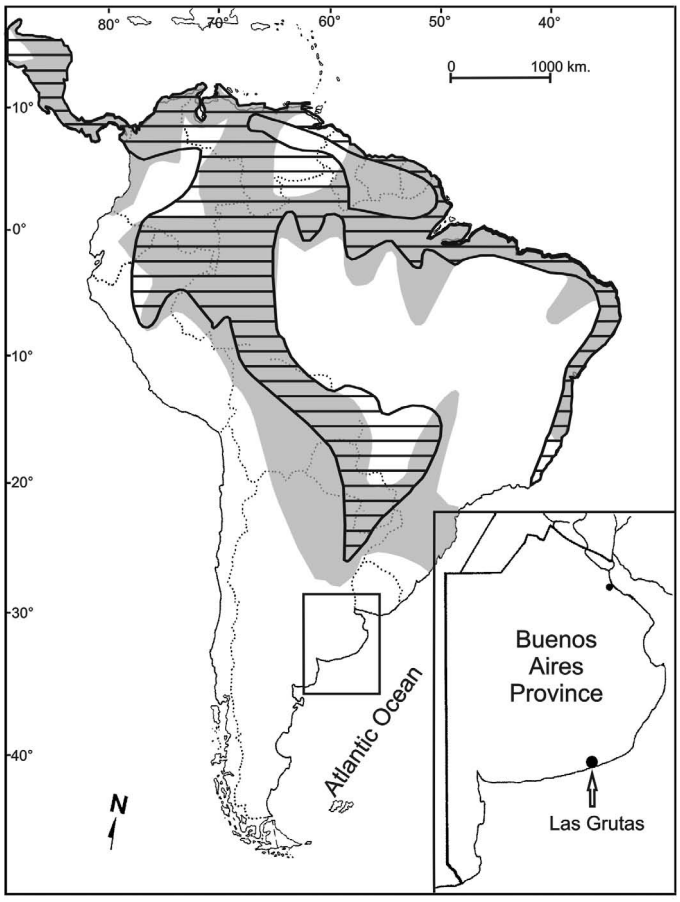

Fig. 1. Map of South America showing current distribution of *N. leporinus* (gray area) and *N. albiventris* (horizontally stripped area) and Las Grutas locality where *Noctilio* sp. was recorded

Systematic Paleontology

Order Chiroptera Blumenbach, 1779
Family Noctilionidae Gray, 1821
Genus *Noctilio* Linnaeus, 1766
Noctilio sp.

Material

MLP 07-V-1-1; right upper canine with deteriorated crown apex and posterolabial ridge.

Geographic and Stratigraphic Provenance

Las Grutas (38°37'S, 58°49'W), Necochea county, Buenos Aires province, Argentina (Fig. 1). Lithostratigraphic unit LG4 (Bidegain *et al*., 2005); *Ctenomys kraglievichi* Biozone, Early Bonaerian, Middle Pleistocene (Fig. 2 — Verzi *et al.*, 2004; Cione and Tonni, 2005).

The stratigraphic profile consists of five units separated by lithological uncorformities (Fig. 2). The upper units, LG2 and LG1, are dominated by the clay fraction. The lower units, LG3 to LG5, comprise sediments with dominant sand fraction, with rounded quartz clasts and mid-sized to coarse sand. Calcium carbonate deposits (calcretes), occasionally associated to pedogenetic events, occur throughout the entire profile (Bidegain *et al*., 2005).

Description

The new material consists of a right upper canine (Fig. 3). It is tall and anteroposteriorly short, with no secondary cusps. It bears a conspicuous strongly oblique cingulum with a slight posterolabial projection; the latter is damaged. The lingual surface of the canine is concave and has a medial ridge that extends anterolabially from the apex almost to the cingulum; this ridge is partially eroded and has for the most part lost its enamel cover. The labial surface is smoothly convex. The overall morphology of this canine – particularly the features of the cingulum and posterolabial ridge – clearly

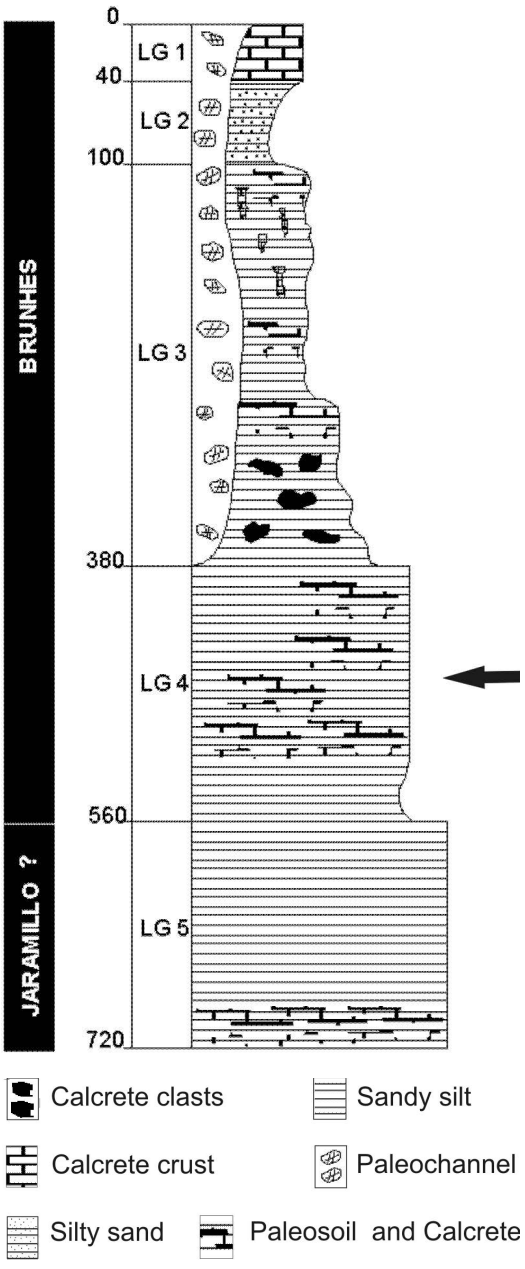

Fig. 2. Stratigraphic profile of Las Grutas (modified from Bidegain *et al*., 2005). The arrow indicates provenance level of the new material

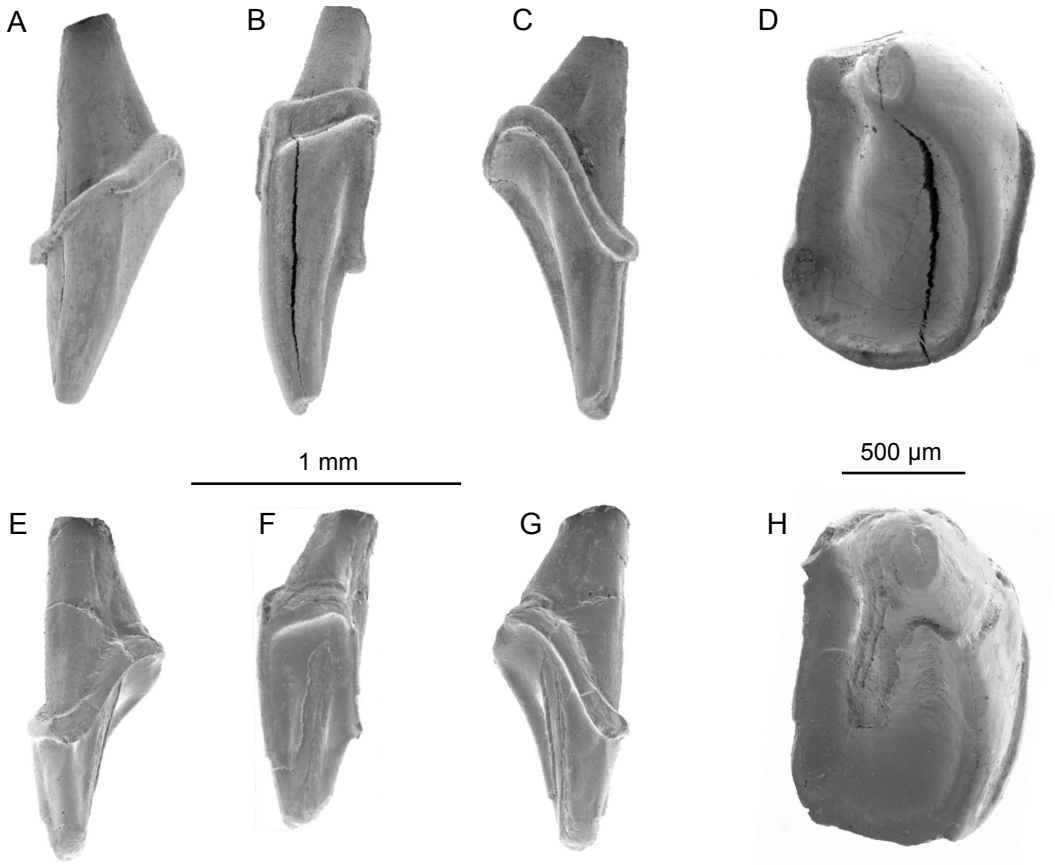

FIG. 3. Morphology of the right upper canine of *N. leporinus* (A–D) and *Noctilio* sp. (E–H) from Las Grutas locality (Necochea, Buenos Aires, Argentina). Labial view (A–E), posterior view (B–F), lingual view (C–G) and occlusal view (D–H)

suggests its assignation to genus *Noctilio*. Its measurements are intermediate between those of the two living species, *N. albiventris* and *N. leporinus* (Table 1). However, no characters allow assignation of the new material to any of the described species of this genus.

DISCUSSION

The species of *Noctilio* are associated with aquatic environments due to their feeding habits. *Noctilio leporinus* is an aerial insectivore and piscivore that inhabits vicinity of bodies of water through tropical

TABLE 1. Canine measurements (mean, range and SD, in mm) of *Noctilio* sp. from Las Grutas (Necochea, Argentina) compared with *N. leporinus* and *N. albiventris*

Measurement	*N. leporinus* (n = 8)			*N. albiventris* (n = 6)			*Noctilio* sp.
	$\bar{x}$	Min–Max	SD	$\bar{x}$	Min–Max	SD	MLP 07-V-1-1
Anteroposterior length	1.96	1.78–2.20	0.16	1.48	1.31–1.63	0.10	1.79
Transverse width	1.96	1.40–2.76	0.57	1.32	0.98–1.77	0.35	1.46
Crown height	5.31	4.48–5.81	0.53	3.50	2.27–4.56	0.73	3.70
Root height	4.91*	–	–	–	–	–	4.82

* — n = 1

and subtropical parts of the New World from western Mexico (southern Vera Cruz) to the Yucatan Peninsula, and southward to northern Argentina (Fig. 3 — see also Hood and Jones, 1984; Bárquez *et al.*, 1999). Its southernmost distributional limit is the locality of Sauce Viejo (31°50'S, 60°52'W) in Santa Fe Province, northeastern Argentina. The species occurs in 'Paranense' and 'Yunga' forests, as well as in humid and dry 'Chaco' (see Cabrera and Willink, 1980). *Noctilio albiventris* is primarily an insectivorous (Brooke, 1994) ranging from northern Honduras southwards throughout South America, to northeastern Argentina (Hood and Pitocchelli, 1983). The locality of San Javier (29°30'S, 59°46'W) in Santa Fe Province, northeastern Argentina, represents the southernmost record for this species (Bárquez *et al.*, 1999). *Noctilio albiventris* inhabits a variety of vegetation types throughout the humid 'Chaco' and the 'Paranense' forest, but always occurs near streams, bodies of water or other moist places.

The record of *Noctilio* sp. at the LG4 unit of Las Grutas is associated with a sudden record of caviomorph rodents, which are linked to environmental conditions such as those currently occurring in the 'Chaco' (Cabrera and Willink, 1980). The caviomorph rodents recorded are the ctenomyid *Ctenomys kraglievichi*, an echimyid closely related to the living *Clyomys* (reported as *Clyomys* in Vucetich *et al.*, 1997), and the dasyproctid *Plesiaguti totoi* (Vucetich and Verzi, 2002). Aff. *Clyomys* is the only post-Pliocene record of an echimyid at this latitude, whereas *Plesiaguti* is the only dasyproctid recorded in the Pleistocene of Argentina. Both these species and *C. kraglievichi* are clearly immigrants to the area of southern-southeastern Buenos Aires Province. The Brazilian affinities (sensu Hershkovitz, 1958) of aff. *Clyomys* and *Plesiaguti* (Vucetich *et al*., 1997; Vucetich and Verzi, 1999, 2002) suggest that they were associated with an important warm pulse that took place within the lapse represented by the *C. kraglievichi* Biozone (Verzi *et al*., 2004). However, although the caviomorph species recorded in this biozone suggest warmer environments, they do not clearly indicate more humid conditions than those currently to be found at this latitude.

Although the findings of fossil chiropterans are always strongly biased due to taphonomic reasons, we propose that the occurrence of *Noctilio* at Las Grutas would be part of the same episodic record suggested for the other micromammals found in these levels. The presence of *Noctilio* in east-central Argentina, about six degrees south from its present distribution, supports the hypothesis of a distributional drift of micromammals associated with a warm climatic pulse (Verzi *et al*., 2004). According to the paleomagnetic and biochronological evidence (see Verzi *et al*., 2004; Bidegain *et al.*, 2005), the *Ctenomys kraglievichi* Biozone could correspond to OIS 11 (Shackleton, 1995) verified at ca 0.4 Ma. This interglacial episode was very intense, and the longest one in the last 0.5 Ma (Droxler *et al*., 1996; Tzedakis *et al.*, 1997; Droxler *et al.*, 2003). It lasted for approximately 30 ky, almost twice as long as the more recent interglacials (Droxler *et al.*, 2003).

In addition, the habitat requirements of extant species of *Noctilio* suggest that the new fossil fishing bat would have been associated to forested habitats with both permanent and temporary freshwater bodies, like those occurring in some current Chacoan environments.

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