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The caviomorph rodents from the San Andrés Formation, east-central Argentina, and global Late Pliocene climatic change

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Abstract

The caviomorph rodents from the San Andrés Formation are revisited. The fossiliferous stratigraphic unit outcrops in the coastal cliffs of the Chapadmalal area (east-central Argentina), and represents the Late Pliocene (Upper Marplatan Stage, Sanandresian Substage). A new species of *Cavia* (Caviidae) and unpublished materials of *Dolichotis salinicola* (Caviidae) and *Abrocoma* (Abrocomidae) are described, and the taxonomic status of the previously described taxa is briefly discussed. The living taxa *Cavia*, *D. salinicola* and *Abrocoma* are first recorded in the San Andrés Formation, and the extinct *Abalosia* (Octodontidae) is exclusive of this formation. The specimens of *Abrocoma* represent the single undoubted record of the living genus. The record of *D. salinicola*, *Abalosia*, *Abrocoma* and the octodontid *Ctenomys* represents an immigration event to east-central Argentina. This fauna from San Andrés is the extinct caviomorph assemblage most clearly indicative of arid environments so far recorded. Its episodic character and composition, and the available palaeomagnetic data, reinforce the hypothesis that it is probably coeval with the profound Late Pliocene cooling and drying pulse detected worldwide around 2.5 Ma. The Sanandresian immigrant taxa would have inhabited the emergent semi-deserts of western Argentina, and may have reached the more eastern Chapadmalal area during an expansion of such arid environments triggered by this Late Pliocene cooling and drying pulse.

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1. Introduction

Coastal cliffs of the Chapadmalal area, in east-central Argentina, are among the best Plio-Pleistocene exposures in South America. These exposures were

subject of numerous seminal geologic and paleontologic studies focused to the knowledge of fossil vertebrates and stratigraphy of the Late Cenozoic, and the palaeoclimatic and palaeogeographic context (e.g. Ameghino, 1908; L. Kraglievich, 1934; J. Kraglievich, 1952; Reig, 1952, 1958a,b, 1978; Pascual et al., 1965; Marshall et al., 1983, 1984; Zárate and Fasano, 1989; Orgeira, 1987, 1990, 1991; Alberdi et al., 1995; Cione and Tonni, 1995a, 1996). Their rich

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fossil record yielded valuable information to the knowledge of the diversity and evolution of the Late Cenozoic South American mammals, including the dramatic faunistic turnover known as Great American Faunistic Interchange, extensively recorded in these cliffs (e.g. Webb, 1976; Reig, 1981; Tonni et al., 1992; Marshall and Sempere, 1993; Cione and Tonni, 1996).

However, despite the large efforts, single taxa throughout complete faunas of different units require new collections and deep systematic, biostratigraphic and biochronologic review (e.g. Alberdi et al., 1995). Systematics and biostratigraphy of caviomorph rodents from the cliffs of Chapadmalal area have been partially revisited (Vucetich and Verzi, 1999 and references therein). In this context, limited data from the Late Pliocene caviomorphs of the San Andrés Formation show the record of peculiar taxa, members of a significant faunal change probably related to climatic fluctuations (Vucetich and Verzi, 1995, 1999; Verzi, 2001). In this paper, the systematics of caviomorphs from the San Andrés Formation is revisited, and new taxa, only mentioned in previous lists (Quintana, 1994) are described for the first time. The palaeoclimatic and palaeogeographic meaning of this caviomorph fauna, and its probable relationship with global climatic events, is discussed.

2. Material and methods

The material of extinct and living caviomorphs analyzed belong to the collections of: Museo de Ciencias Naturales de Mar del Plata “L. Scaglia”, Argentina (MMP); Museo de La Plata, Argentina (MLP); Museo Argentino de Ciencias Naturales “Bernardino Rivadavia”, Buenos Aires, Argentina (MACN); Museo de Biología, Universidad Central de Venezuela, Caracas, Venezuela (MBUCV). In addition, materials of extant species of Abrocomidae (including holotypes) were studied through illustrations (Glanz and Anderson, 1990; Emmons, 1999; unpublished illustrations of materials belonging to the Natural History Museum, London, BMNH). The taxa described are based on materials collected by the authors, as well as on previous collections. The provenance of most taxa could be refined through samplings made especially by one of the authors

(CAQ). Previously collected materials assigned to the ‘Formación San Andrés’ (*in schedis*) but found in localities where this unit is not exposed (see Reig and Quintana, 1991; Quintana, 1994; Cione and Tonni, 1995a), were excluded from the analysis. Skulls and mandibles were measured with a dial caliper nearest 0.01 mm. Tooth measurements were taken through the reticule eyepiece of a Wild M5 stereomicroscope. The following cranial, mandibular and dental measurements were taken: BLI, breadth of lower incisor; BUI, breadth of upper incisor; DLI, depth of lower incisor; DM, mandibular height below dp4 or p4; DUI, depth of upper incisor; LLD, length of lower diastema; LM1, anteroposterior length of M1; Lm1, anteroposterior length of m1; LM2, anteroposterior length of M2; Lm2, anteroposterior length of m2; LM3, anteroposterior length of M3; LP4, length of P4 (or DP4); Lp4, length of p4 (or dp4); LP4-M3, length of P4-M3; LUD, length of upper diastema; TM1: maximum transverse diameter of M1; Tm1, maximum transverse diameter of m1; TM2, maximum transverse diameter of M2; Tm2, maximum transverse diameter of m2; TM3, maximum transverse diameter of M3; TP4, maximum transverse diameter of P4 (or DP4); Tp4, maximum transverse diameter of p4 (or Dp4).

3. Geological and stratigraphic setting

Coastal cliffs of the Chapadmalal area, south of Mar del Plata City (Buenos Aires Province, east-central Argentina) enclose near 30 km of almost continuous exposures, ranging from 12 to 25 m in thickness (Zárate and Fasano, 1989). Along these cliffs the following lithostratigraphic units, from bottom to top, can be recognized: Chapadmalal, Barranca de los Lobos, Vorohué, San Andrés, Miramar, Arroyo Seco, Santa Isabel and Lobería formations (Fig. 1). For a description of the geology and stratigraphy of these units see Kraglievich (1952), Teruggi et al. (1974) and Zárate and Fasano (1989).

The San Andrés Formation is composed of massive clayey siltstones, and some sandy lenses. These sediments would have been deposited mainly in shallow water ponds (Kraglievich, 1952; Zárate and Fasano, 1989). Pedogenetic processes and calcareous accumulations partially modified the primary depositional features (Zárate and Fasano, 1989). Teruggi et

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