AMEGHINIANA (Rev. Asoc. Paleontol. Argent.) - 45 (3): 613-618. Buenos Aires, 30-09-2008 ISSN 0002-7014

Pleistovultur nevesi gen. *et* sp. nov. (Aves: Vulturidae) and the diversity of condors and vultures in the South American Pleistocene

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Abstract. *Pleistovultur nevesi*, a new genus and species of a large Vulturidae is described from the Upper Pleistocene or beginning of the Holocene, based on a complete and well preserved right tibiotarsus from the Cuvieri cave deposits, one of the hundreds of caves of the Lagoa Santa region in Minas Gerais state, Brazil. Also described here is a distal half of a left tibiotarsus from Gruta dos Brejões, a cave in Morro do Chapéu, Bahia state, Brazil, which probably belongs to another not-yet-known genus and species of the Vulturidae. The described material, added to prior literature, is proof of the appreciable diversity of the Vulturidae during the Pleistocene in South America.

Resumen. *PLEISTOVULTUR NEVESI* GEN. *ET* SP. NOV. (AVES: VULTURIDAE) Y LA DIVERSIDAD DE CÓNDORES Y BUITRES EN EL PLEISTOCENO DE AMÉRICA DEL SUR. Se describe un nuevo género y especie de Vulturidae de gran tamaño para el Pleistoceno Tardío o comienzos del Holoceno, en base a un completo y bien preservado tibiotarso procedente de los depósitos de la caverna Cuvieri, una de los centenares de cavernas presentes en la región de la Lagoa Santa en el estado de Minas Gerais, Brasil. Se describe asimismo la mitad distal de un tibiotarso izquierdo de otro gran Vulturidae de Gruta dos Brejoes, otra caverna en Morro do Chapéu, Estado da Bahia, Brasil, que probablemente pertenezca a otro aún desconocido género y especie. El material descrito, sumado al registro édito previo, es una prueba de la apreciable diversidad de vultúridos durante el Pleistoceno de América del Sur.

Key words. Vulturidae. Pleistocene. South America. Condor. *Pleistovultur nevesi*. Caves.

Palabras clave. Vulturidae. Pleistoceno. América del Sur. Condor. *Pleistovultur nevesi*. Cavernas.

Introduction

Condors and vultures constitute the family Vulturidae with five extant genera and seven species, restricted to the Americas.

At least one extinct genus (*Breagyps* Miller and Howard, 1938) and four extant genera (*Gymnogyps*, *Sarcoramphus*, *Cathartes*, and *Coragyps*) are recorded in the Pleistocene of North America, whereas two extinct genera (*Geronogyps* Campbell, 1979, and *Wingegyps* Alvarenga and Olson, 2004) and the five extant genera (*Vultur*, *Gymnogyps*, *Sarcoramphus*, *Cathartes*, and *Coragyps*) are recorded for the Pleistocene of South America (Miller, 1910; Howard, 1962; Brodkorb, 1964, Campbell, 1979; Tonni and Noriega, 1998; Tambussi and Noriega, 1999; Alvarenga and Olson, 2004).

Several authors claim that the fundamental difference between condors and vultures is the greater size of the former, but this division is mainly based on cranial osteology (Miller and Howard, 1938; Fisher, 1944; Emslie, 1988; Alvarenga and Olson, 2004) apparently with phylogenetic basis. The earliest records for this family are in the Middle or Upper Eocene of France (Mourer-Chauviré, 2002), whereas in South America the earliest representative is *Brasilogyps* Alvarenga, 1985, from the Upper Oligocene or Lower Miocene of southeast of Brazil. In North America, the earliest records for this family date from the Pliocene, although there are contradictory references for Eocene records (Olson, 1985; Emslie, 1988; Mourer-Chauviré, 2002). It is possible that the family originated in the Old World, to later become fixed only in the Americas, especially in South America.

It is perfectly plausible to think that the diversity of the Vulturidae could have been much greater dur-

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 AMGHB2-0002-7014/08$00.00+.50

ing the Pleistocene in South America in the context of its megafauna, as occurs in Africa currently with Old Word vultures (Accipitridae). In corroboration of this hypothesis, we herein describe a new genus and species of a large Vulturidae from the Upper Pleistocene or Lower Holocene of Brazil, based on a complete right tibiotarsus, collected in a cave of the Matozinhos region, Minas Gerais state, Brazil (figure 1). We also describe and compare another incomplete tibiotarsus from the Gruta dos Brejões, in Morro do Chapéu, Bahia state, reinforcing the diversity of these birds during the South American Pleistocene.

Material and methods

One of the studied specimen is a complete right tibiotarsus, from the Cuvieri cave, Matozinhos, Minas Gerais State, Brazil, initially broken and covered by carbonatic crust; it was previously treated with acetic acid and afterwards mechanically cleaned under a stereomicroscope, and then restored (figure 2.2). The bone is relatively well preserved, apparently from an adult individual, based on the bone surface texture when observed through the microscope, without any indication of a thick periosteum. Erosion is present on the edges of the proximal joint surfaces and on the lateral and medial edges of the condyles, which compromise a sharp precision in the measurements of the proximal and distal width. It is housed in the Museu de História Natural de Taubaté (MH-NT-VT-5238). It was compared with homologous bones of extant skeletons of all species of the South American Vulturidae (appendix 1), especially with the genera *Vultur* and *Sarcoramphus* because of their similar size. Comparisons to *Gymnogyps* were done through high resolution photographs, from several views, taken by one of the authors (H.A.) in the Los Angeles County Museum, California (specimen B 1372). Comparisons with *Breagyps* were done only from the descriptions and illustrations of Howard (1974) whereas comparisons with the genus *Geronogyps* were undertaken by means of the photographs and descriptions of Campbell (1979). We also examined and compared a slightly damaged distal half of a left tibiotarsus, that was collected by Castor Cartelle in the cave of Brejões, Municipality of Morro do Chapéu, Bahia, Brazil (figure 1), housed as MCL-1795 in the Museu de Ciências of the Pontificia Universidade Católica, Minas Gerais, Brazil; this material came from the same locality as that of the type of *Wingegyps cartellei* (Alvarenga and Olson, 2004). The terminology used herein is mainly according to Howard (1929) and, in some cases, Baumel and Witmer (1993). The measurements were done with 0.1mm/precision Mitutoyo calipers.

Figure 1. Map showing the locality of (A) Matozinhos (Gruta Cuvieri), MG, Brazil, (19°28'36''S, 44°00'41''W), the type locality of ***Pleistovultur nevesi*** and (B) Gruta dos Brejões in Morro do chapéu, BA, Brazil, (11º00'30''S, 41°26'07''W), the type locality of ***Wingegyps cartellei*** and also the left tibiotarsus MCL-A- 1795 / *mapa indicando la localidad de (A) Matozinhos (Gruta Cuvieri), MG, Brasil (19°28´36´´S, 44°00´41´W), localidad tipo de* **Pleistovultur nevesi** *y (B) Gruta dos Brejoes en Morro do Chapéu, BA, Brasil (11°00'30''S, 41°26'07''W), localidad tipo de* **Wingegyps cartellei** *y también del tibiotarso izquierdo MCL-A-1795.*

Systematic paleontology

Family VULTURIDAE

Pleistovultur gen. nov.

Type species. *Pleistovultur nevesi* sp. nov.

Diagnosis. *Tibiotarsus* with an almost oval-shaped articular surface for the head of the fibula, similar to *Sarcoramphus* (different from that of *Vultur* distally expanded); there is a crest between this joint and the fibular crest (similar in *Breagyps*, absent in *Vultur*, and tenuous in *Sarcoramphus*). The distal part of the outer cnemial crest is sharp (similar in *Vultur*, *Gymnogyps*, and *Breagyps*) and reaches the level of the fibular crest whereas in *Sarcoramphus* it is thick, rounded, and shorter. The distal opening of the tendinal groove is rounded (similar in *Vultur*, *Gymnogyps*, and *Breagyps*; oval in *Sarcoramphus* and *Geronogyps*). The lateral condyle in anterior view is very high and its axis is parallel to the diaphysis (it is much shorter in *Sarcoramphus*; in *Vultur*, *Gymnogyps*, and *Breagyps* the lateral condyle is wider and oblique to the lateral side of the diaphysis). There is no fora-

Figure 2. The right tibiotarsus of ***Vultur gryphus*** MHNT 591; ***Pleistovultur nevesi*** gen. *et* sp. nov. holotype MHNT-VT-5238; *Sarcoramphus papa* MHNT 1787 respectively, in anterior view (1, 2 and 3); the proximal end in medial view (4, 5 and 6); the distal end in anterior view (7, 8 y 9) / *tibiotarso derecho de* **Vultur gryphus** *MHNT 591;* **Pleistovultur nevesi** *gen.* et *sp. nov. holotipo MHNT-VT-5238; y* Sarcoramphus papa *MHNT 1787 respectivamente en vista anterior (1, 2 y 3); extremidad proximal en vista lateral (4, 5 y 6); y extremidad distal en vista anterior (7, 8 y 9).* Scale bar / *escala* 2 cm.

Table 1. Measurements of the tibiotarsus of ***Pleistovultur nevesi*** gen. *et* sp. nov. compared to Pleistocene and extant large vultures (mm) / *medidas del tibiotarso de* **Pleistovultur nevesi** *gen.* et *sp. nov. comparado con otros grandes buitres del Pleistoceno y reciente (mm).*

	Vultur gryphus (MHNT-591 and AZ 579)	*Gymnogyps californianus* (after Campbell, 1979)	*Gymnogyps howardae* (after Campbell, 1979)	*Breagyps clarki* (after Howard, 1974 – 4 bones)	*Geronogyps reliquus* (after Campbell, 1979)	*Pleistovultur nevesi* (Holotype – MHNT-VT-5238)	*Sarcoramphus papa* (MHNT 1787 and 775)
Length	235 -233	214	-	214 - 233	-	211	166 - 176
Proximal width	30.0 – 29.9	28.7	-	-	-	about 23.6	20.6 – 20.6
Least width of shaft	14.3 –14.1	14.7	-	-	-	13.1	10.3 - 10.1
Distal width	24.0 –24.7	25.1	24.8	23.7 – 25.7	24.1	20.5	18.6 – 18.0
Depth of internal condyle	24.8 –24.8	22.5	22.8	-	22.5	about 19.2	17.2 – 17.3

men proximal to the lateral condyle (in anterior view, and at the same level of the tendinal bridge); all Vulturidae show a foramen at this place, but it is more conspicuous in *Vultur*. In lateral view, the lateral condyle of *Pleistovultur* appears to be more rounded than in *Vultur* and *Sarcoramphus*, however important erosion at its edges may give a false impression.
Etymology. Pleisto from Pleistocene + vultur .

Pleistovultur nevesi sp. nov.
Figures 2.2, 5, 8

Holotype. A complete right tibiotarsus; MHNT-VT-5238 (figure 2.2).

Type locality. Brazil, Minas Gerais State, Municipality of Matozinhos, Gruta Cuvieri (19º28'36''S, 44º00'41''W), elevation ca. 812m (figure 1).
Horizon and age. The holotype of *Pleistovultur* was discovered inside the Gruta Cuvieri, Municipality of Matozinhos, Minas Gerais, Brazil, one of the hundreds of caves in the region north/northeast of the city of Belo Horizonte, many of which were explored and studied in the first half of the 19th Century by the Dane Peter Wilhelm Lund. Unfortunately, due to previous work done in this cave, the taphonomic conditions of the tibiotarsus holotype of *Pleistovultur nevesi* could not be duly defined, thus making it difficult to precisely determine its age. Nevertheless, the knowledge of the associated fauna, present in several adjacent caves and previously dated (Laming-Emperaire *et al*., 1975; Cartelle, 1999), permits attributing an Upper Pleistocene or Early Holocene age for this entire fauna, including *Pleistovultur*. In the same *Cuvieri cave*, Neves and Pilo (2003) dated a ground sloth *Scelidodon cuvieri*, and obtained a radiocarbon age of 9.990 + 40ybp; also, from the same cave, a second specimen of *Scelidodon* was dated of 12.510 (70ybp (Neves, pers. com.).
Etymology. *Nevesi* is in honor to Walter Neves, anthropologist from Laboratório de Estudos Evolutivos Humanos of the Departamento de Genética e Biologia Evolutiva, Instituto de Biociências, Universidade de São Paulo, responsible for collecting and forwarding the material for our study.
Diagnosis. The same for the genus.
Description. A large Vulturidae with a tibiotarsus about 25% larger than that of *Sarcoramphus papa* and about 11% smaller than that of *Vultur gryphus* (figure 2.1, 2.2 and 2.3). Measurements of the holotype in table 1.

Vulturidae gen. *et* sp. indet.
Figure 3

A distal half of a left tibiotarsus (MCL-A-1795), from the Gruta dos Brejões, Bahia, Brazil (figure 3) (11°00'30''S, 41°26'07''W), the same locality of the type specimen of *Wingegyps cartellei* (Alvarenga and Olson, 2004), also was studied and compared; unfortunately the condyles are quite damaged, thus prejudicing a better diagnosis. The very wide supratendinal bridge, the oval distal opening of the tendinal groove, and the very straight line of the medial border of the linea ex-

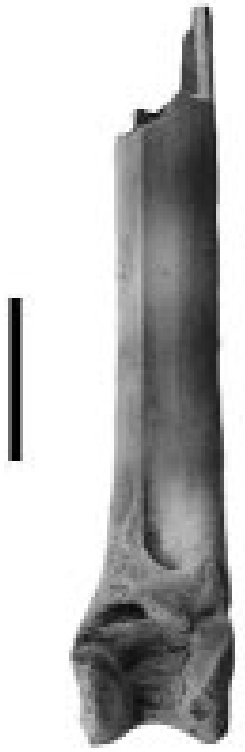

Figure 3. The distal half of a left tibiotarsus of a Vulturidae gen *et* sp. indet (MCL-A-1795), coated with ammonium chloride, from Morro do Chapéu, BA, Brazil, in anterior view / *mitad distal de tibiotarso izquierdo Vulturidae gen* et *sp. indet (MCL-A-1795), cubierto con cloruro de amonio, proveniente de Morro do Chapéu, BA, Brasil, en vista anterior*. Scale bar / *Escala* 2 cm.

tensoria, exclude this specimen from *Pleistovultur, Vultur, Gymnogyps, Breagyps,* and *Sarcoramphus*, even though by size it is very near to *Pleistovultur*. When compared with the illustration of *Geronogyps* (in Campbell, 1979), the supratendinal bridge and the proximal and distal openings are very different. So, we believe that this vulture cannot be assigned to any known genus of *Vulturidae*; however, better material is needed in order to merit a new name.

Discussion

During the Pleistocene, South America possessed a rich mammalian megafauna, comparable to that living in Africa today. Carrion-eating birds, represented by the family Vulturidae, analogous in the food pyramid to the Old World vultures (Accipitridae), almost certainly needed to feed on large carcasses. Thus, the disappearance of the megafauna certainly leads to extinction for many of the Vulturidae. We believe it to be absolutely foreseeable that there were an appreciable number of genera and species of the Vulturidae in the South American Pleistocene, which appears to be confirmed by recent reports. Campbell (1979) described the presence of the genera *Gymnogyps* and *Geronogyps* on the coast of Peru, and also reported another possible of the genus *Sarcoramphus* (*Sarcoramphus*? *fisheri*). Tonni y Noriega (1998) and Tambussi and Noriega (1999) described the presence of *Geronogyps* and *Vultur gryphus* from the Pleistocene of the south of Buenos Aires Province. Alvarenga (1998) identified the presence of *Vultur gryphus* in the Pleistocene/Holocene from the caves of Minas Gerais, Brazil. Alvarenga and Olson (2004) described *Wingegyps*, a small condor of the Pleistocene/Holocene from caves in Bahia and Minas Gerais, Brazil. The tibiotarsus MCL-A-1795 certainly represents an additional genus, which awaits better material in order to be described. Winge (1888), who studied numerous birds from caves of the same region as *Pleistovultur*, described (from Lapa Escrivania) fragments of humerus, ulna and coracoid of "a much bigger Vulturidae than *Gypargus papa* (= *Sarcoramphus papa*)" besides other bones attributed to the extant *Sarcoramphus papa* from the Lapa do Bau. These bones belonging to a Vulturidae larger than Sarcoramphus, have been recently cleaned and re-prepared by Olson and Emslie (pers. com.); unfortunately they do not present structures for a good taxonomic diagnosis; it is possible that this material can be attributed to *Pleistovultur*. Oluf Winge also perceived the distinction of the fossil specimens that Alvarenga and Olson (2004) subsequently described as *Wingegyps cartellei*. The general panorama of vultures from the South American Pleistocene now seems to begin to be understood.

Acknowledgements

We are grateful to W. Neves (IB-USP) for making the fossil tibiotarsus used in this work available for our study; to C. Cartelle (PUC de Belo Horizonte) for letting us compare the specimen MCL-A 1795; to Felipe Curcio (IB-USP) for his help on Fig. 1; to Storrs L. Olson (Smithsonian Institution, Washington DC) and Steven Emslie (UNC) for important personal communications; to J.I. Noriega (CICyTTP-CONICET, Diamante) and C. Tambussi (D.P.V. Museo de La Plata, Argentina) for some important criticism and corrections in the manuscript. Our special gratitude to Walter Hartwig from Touro University, Ca, for revision of the manuscript and English corrections. We are also grateful to the Conselho Nacional de Pesquisas e Desenvolvimento (CNPq) for the scholarships of R.M. (130053/2006-6) and G.R.B. (140359/2004-4) and the grant of E.H. (303926/85-6-RV), and also to the Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP) for the scholarship of A.H. (06/51406-1) and for the research grant to Walter Neves (04/013216).

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Recibido: 30 de abril de 2007.
Aceptado: 30 de julio de 2008.

Appendix 1. List of skeletons of extant Vulturidae used to compare with ***Pleistovultur nevesi*** gen. *et* sp. nov.: MHNT= Museu de História Natural de Taubaté; AZ= Collection of birds of the Departamento de Zoologia, Instituto de Biociências, Universidade de São Paulo / *lista de los esqueletos de buitres vivientes que se usaron para comparar con* **Pleistovultur nevesi** *gen. et sp. nov.: MHNT= Museu de História Natural de Taubaté; AZ= Collection of birds of the Departamento de Zoologia, Instituto de Biociências, Universidade de São Paulo.*

Vultur gryphus: two skeletons: MHNT- 591 and AZ-579.
Sarcoramphus papa: four skeletons: MHNT-775, 804, 903 and 1787.
Cathartes melambrotus: one skeleton: MHNT-1213
Cathartes aura: three skeletons: MHNT-97, 790 and 794
Cathartes burrovianus: one skeleton: MHNT-714
Coragyps atratus: seven skeletons: MHNT- 46, 285, 625, 750, 786, 985 and 1264.