



Contents lists available at SciVerse ScienceDirect

Journal of South American Earth Sciences

journal homepage: www.elsevier.com/locate/jsames

First record of *Eremotherium laurillardii* (Lund, 1842) (Mammalia, Xenarthra, Megatheriidae) in the Quaternary of Uberaba, Triângulo Mineiro (Minas Gerais State), Brazil

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ARTICLE INFO

Article history:

Received 2 January 2012

Accepted 30 March 2012

Keywords:

Megatheriidae

Eremotherium

Uberaba

Minas Gerais

Quaternary

ABSTRACT

Although the occurrence of Pleistocene mammals is abundant in many localities of Minas Gerais State (e.g., Lagoa Santa, Janaúba, Bambuí, Cordisburgo, Patos de Minas, Araxá), there are no references at present of Quaternary megafauna in Uberaba, Triângulo Mineiro, southeastern Brazil. This region is traditionally recognized for its taxonomically diverse fauna of the Late Cretaceous Bauru Group. In 2006, fossil material attributed to giant ground sloth *Eremotherium laurillardii* (Xenarthra, Megatheriidae), a typical taxon of the Brazilian Pleistocene, was discovered in the Uberaba City (Minas Gerais State). The specimen (CPP 1122) which is here described consists of several cranial and postcranial bones of a single individual. The material was confined to a small alluvial deposit, yielding in the Córrego da Saudade stream, which due its restricted area distribution it is not represented in geological maps.

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1. Introduction

Although findings of Pleistocene mammals are abundant and frequently found in several regions of the Minas Gerais State, southeastern Brazil, such as Lagoa Santa, Janaúba, Bambuí, Pains, Cordisburgo, Montes Claros, Francisco Sá, Patos de Minas, Araxá (Price, 1944; Lund, 1950; Paula Couto, 1953, 1954; Simpson and Paula Couto, 1957; Cartelle and Lessa, 1988; Cartelle, 1989, 1994, 1999; Monteiro, 1998), there are to date no records of Quaternary fauna in the Triângulo Mineiro region. The Quaternary discoveries in Minas Gerais State were extremely important for the paleontological history of Brazil as a whole, because since the beginning of the 19th Century these findings had worldwide repercussion for paleontologists and archaeologists (e.g., Hoch and Prous, 1985; Cartelle, 2002). The works started with the pioneering contributions of Peter W. Lund and Herluf Winge (e.g., Lund, 1950), who studied thousand of specimens recovered from natural karstic caves filled with Pleistocene–Holocene sediments (see Cartelle,

1994, 2002), from different localities from the center and north of Minas Gerais. Later on, especially since the second half of 20th Century, several contributions enlarged considerably the Quaternary studies of Minas Gerais State (e.g., Price, 1944; Simpson and Paula Couto, 1957; Paula Couto, 1979; Cartelle and Lessa, 1988; Cartelle, 1989, 1994, 1999; Monteiro, 1998; Neves et al., 1999; Hadler et al., 2009; Mothé et al., 2010).

In 2006, the staff of the Centro de Pesquisas Paleontológicas Lewellyn Ivor Price (CPP), now owned by the Complexo Cultural e Científico de Peirópolis of the Universidade Federal do Triângulo Mineiro (CCCP/UFTM) excavated several cranial and postcranial bones from a sand-clay deposit overlaying Late Cretaceous rocks from the Bauru Group, in the Uberaba City (Minas Gerais State, Brazil). The material was found due to the information provided by Mr. Marleno de Jesus Alcântara who unearthed the first fossil bones from the new site. The small alluvial deposit is apparently confined to the Córrego da Saudade stream and the outcrop is not represented in the geological maps of the region.

The rescued material, presented in here, corresponds to a single specimen referred to the giant ground sloth *Eremotherium laurillardii* (Xenarthra, Megatheriidae), which constitutes the first record of Pleistocene fauna in the Uberaba County and in the

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Triângulo Mineiro region, as well. Although this taxon is widely distributed in Brazil during the Quaternary (e.g., Paula Couto, 1953, 1954, 1978; Cartelle and De Iuliis, 1995; Cartelle, 2000; Bergqvist and Almeida, 2004; Dantas and Zucon, 2005), this record suggests the presence of a Pleistocene fauna still not yet properly documented in this region. Furthermore, this finding is important because the entire Triângulo Mineiro region is traditionally known by geo-paleontological works focused on Late Cretaceous discoveries from the Bauru Group (Adamantina, Uberaba and Marília formations; e.g., Huene, 1931; Price, 1955; Carvalho et al., 2004; Novas et al., 2005, 2008; Kellner et al., 2006; Salgado and Carvalho, 2008). Therefore, the Pleistocene deposit here reported is significant to the development of a new line of study in the Triângulo Mineiro region, Minas Gerais State.

1.1. Abbreviations

CPP, Centro de Pesquisas Paleontológicas Lewellyn Ivor Price, Complexo Cultural e Científico de Peirópolis, Universidade Federal do Triângulo Mineiro (UFTM, Peirópolis, Uberaba, Minas Gerais State, Brazil). **M/m** refers to upper and lower molariforms, respectively. Number of upper (1–5) and lower (1–4) molariforms refer to tooth position (see Grassé, 1955; Gaudin, 2004 for nomenclature on tooth homologies in sloth).

2. Geographical location and stratigraphy

The material (CPP 1122) studied here was found in Uberaba City (Minas Gerais State, Brazil; Fig. 1), in the Córrego da Saudade stream. The site is located in the conjunction of the Novo Horizonte, Villaggio di Fiori, and Distrito Industrial neighborhoods, approximately 4.5 km downtown. The stream runs northward to its mouth in the Uberaba river. Some of the fossils were found *in situ* (GPS Coordinates: 19° 44' 22.04"S/47° 58' 15.44" W) in the left slope of the stream and other nearby, on the course of the stream (Figs. 2 and 3). According to the size, lack of repeated homologous bones, and proximity among the elements, all the material belongs to a single individual.

The main fossiliferous outcrops in the region of Uberaba are confined to rocks of Late Cretaceous age, corresponding to the Bauru Group (Fernandes and Coimbra, 1996). These Cretaceous outcrops have produced a large number of specimens taxonomically varied, which include fishes, anurans, turtles, lizards, crocodyliforms, and

dinosaurs, among others (e.g., Price, 1955; Estes and Price, 1973; Campos and Kellner, 1999; Carvalho et al., 2004; França and Langer, 2005; Kellner et al., 2005; Novas et al., 2005, 2008; Salgado and Carvalho, 2008; Gaffney et al., 2011). On the other hand, outcrops of Cenozoic age include commonly Tertiary-Pleistocene detritus-lateritic coverage and Holocene undifferentiated alluviums (RADAMBRASIL, 1983), without fossiliferous occurrences until now.

In the Córrego da Saudade stream in Uberaba City, the remains of *E. laurillardii* were found in gray sandy sediments, poorly consolidated, with numerous rounded quartz clasts and angular clasts of sandstone coming from the Uberaba Formation (Bauru Group) (Figs. 2 and 3). The fossiliferous level (Unit I) has a thickness ranging from 0.60 to 1.70 m, filling discordantly the paleo-relief of the Cretaceous rocks. The lower level corresponds to the consolidated green sandstones attributed to the Uberaba Formation, which form the floor of the stream at the site where *E. laurillardii* bones were found (Figs. 2 and 3). In direction to the stream mouth, the Quaternary sediments overlap discordantly the basalts of the Serra Geral Formation. Above the fossiliferous Unit I, there is a layer of reddish to blackish clays (Unit II) that contains the current soil (Fig. 2). This layer has a thickness ranging from 3 to 4 m (Fig. 2) and a high content of organic matter (peat). Preliminary pollen analysis of sediment from Unit II indicated plants typical of the current Cerrado Biome.

The sedimentary package that overlaps the Uberaba Formation or Serra Geral Formation (depending on the locations) is dated as Pleistocene (Unit I) to Holocene (Unit II) age. The chronological inference of the Unit I is based upon the presence of the genus *Eremotherium* which is typically found in Pleistocene sediments of Brazil (e.g., Cartelle, 1994, 1999; Cartelle and De Iuliis, 1995). AMS radiocarbon dating of *Eremotherium* material was impossible due to the lack of collagen in the samples. New fossil occurrences may refine the chronology of this new site. Prospections and detailed geological mapping of this sort of sediments will also provide hitherto undescribed geological and paleontological contexts of Quaternary age for this region.

3. Systematic paleontology

Order XENARTHRA Cope, 1889 (*sensu* Gaudin, 2004)

Suborder TARDIGRADA Latham and Davies, in Forster 1785 (*sensu* Gaudin, 2004)

Family MEGATHERIIDAE Gray, 1821

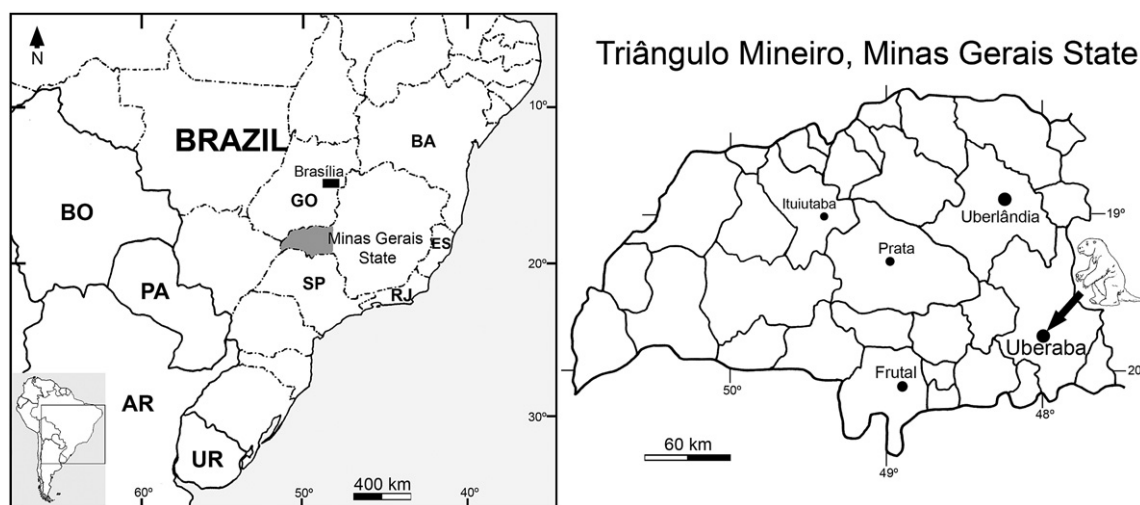


Fig. 1. A, Location map of the Uberaba City, in the Triângulo Mineiro region, Minas Gerais State, southeastern Brazil. References: AR, Argentina; BO, Bolívia; BA, Bahia State; ES, Espírito Santo State; GO, Goiás; PA, Paraguay; RJ, Rio de Janeiro State; SP, São Paulo State; UR, Uruguay. Drawing of ground sloth made by J. Blanco.



Fig. 2. Stratigraphic profile in the Córrego da Saudade stream, urban area of the Uberaba City, Minas Gerais State, Brazil. The material of *Eremotherium laurillardii* (CPP 1122) was found into the Unit I.

Subfamily MEGATHERIINAE Gray, 1821
Genus *Eremotherium* Spillmann, 1948
Eremotherium laurillardii (Lund, 1842)

3.1. Referred material

CPP 1122 (Figs. 4 and 5) includes: right zygomatic arch with portion of orbital region and portion of the M1–M2 alveoli; fragment of right maxilla with portion of M1 alveolus; almost complete right dentary with partial dentition; fragment of horizontal ramus of the left dentary with alveolus of m2 and portion of alveoli of m1 and m3; two indeterminate fragments with inter-alveolar walls; nine fragments of molariforms; distal epiphysis of right humerus; complete right radius; proximal portion of right ulna and fragment of distal epiphysis (without connection between them); first phalanx (fused proximal + middle phalanges) of right manual digit III; proximal half of left femur; right astragalus; complete thoracic

vertebra; fragment of thoracic vertebral centrum; four fragments of thoracic neural arches; almost complete left rib; fragment of rib; and indeterminate fragments.

3.2. Locality and age

Site located in the stream Córrego da Saudade, in the intersection of the Novo Horizonte, Recanto das Torres, and Distrito Industrial neighborhoods (GPS Coordinates: 19°44'22.04"S/47°58'15.44"W), Uberaba City, Minas Gerais State, Brazil (Fig. 1). It is preliminary considered as Late Pleistocene, based on the typical distribution of *E. laurillardii* in Brazil (e.g., Cartelle and De Iuliis, 1995; Cartelle, 1999).

3.3. Remarks and taxonomic assignment

The anatomy of Megatheriinae is well known, being *Megatherium* and *Eremotherium* the best represented genera (e.g., Owen, 1855, 1856, 1858, 1860; Hoffstetter, 1949; De Iuliis and Cartelle, 1993, 1999; Cartelle and De Iuliis, 1995, 2006; Cartelle, 1999; Gaudin, 2004; Pujos, 2006; Brandoni et al., 2008). Therefore, the descriptions are mainly based on relevant features for taxonomic proposals.

The best-preserved skull remains of the specimen CPP 1122 are the right dentary and the fragment of the right zygomatic arch with the portion of the orbit (Fig. 4). Based on the alveolar level of the right M1–M2 alveoli, the zygomatic arch and the orbit are more ventrally positioned than in *Megatherium americanum*, according to Owen (1856). The zygomatic arch is complete, with the jugal and squamosal tightly in contact. The jugal descending process is stout, elongated, and ventroposteriorly projected. Above the orbit, the lacrimal foramen is large, rounded with prominent lateral walls. The foramen opens into a canal that runs ventrally, until the upper level of the orbital rim. Only portion of the labial alveolar wall of the two first upper molariforms is preserved in this fragment of skull. The first alveolus is located at the level of the lacrimal foramen.

The right dentary is well preserved missing the tip of coronoid process, the posterodorsal corner of the angular process, and the symphyseal spout. The condyle is high positioned, ovate, slightly wider than long. The ventral process (i.e., ventral bulge) of the jaw is smaller than in *M. americanum* (see Owen, 1856), with similar

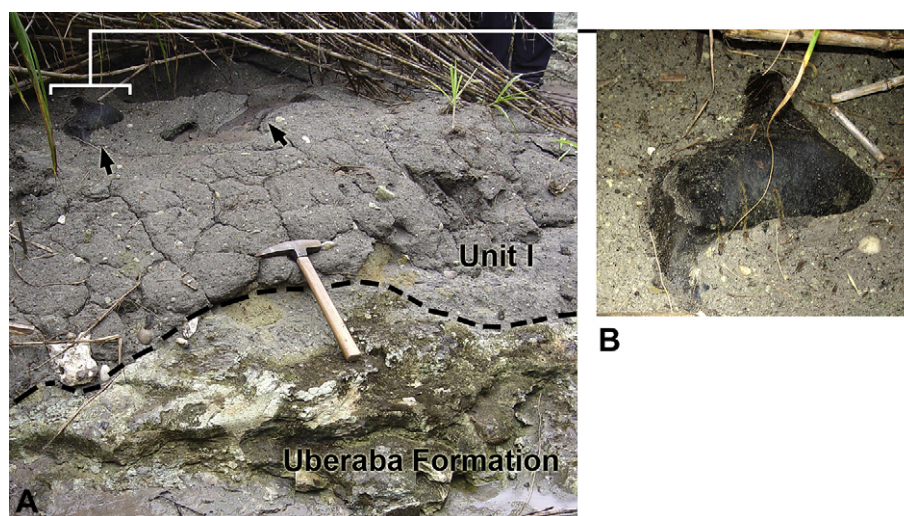


Fig. 3. A, Detail of Unit I that overlays the Uberaba Formation (Bauru Group, Late Cretaceous), yielding bones *in situ* of *Eremotherium laurillardii* (CPP 1122); B, detail of the astragalus *in situ* of *Eremotherium laurillardii* (CPP 1122). The arrows indicate osseous remains.

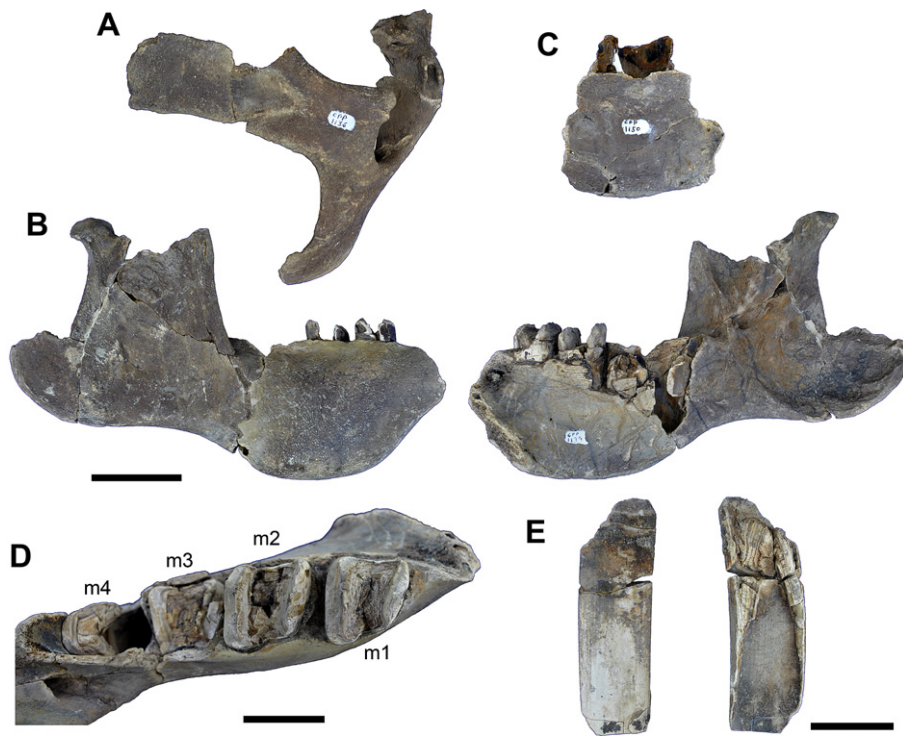


Fig. 4. Cranial remains of *Eremotherium laurillardi* (CPP 1122), coming from the Uberaba City, Minas Gerais State, Brazil. A, fragment of right zygomatic arch in lateral view; B, right dentary in lateral and medial views; C, portion of horizontal ramus of the left dentary in medial view; D, occlusal detail of right lower molariforms (m1–m4); E, fragment of isolated molariform in mesial and distal (internal) views. Scale equals 10 cm in A–C and 5 cm in D and E.

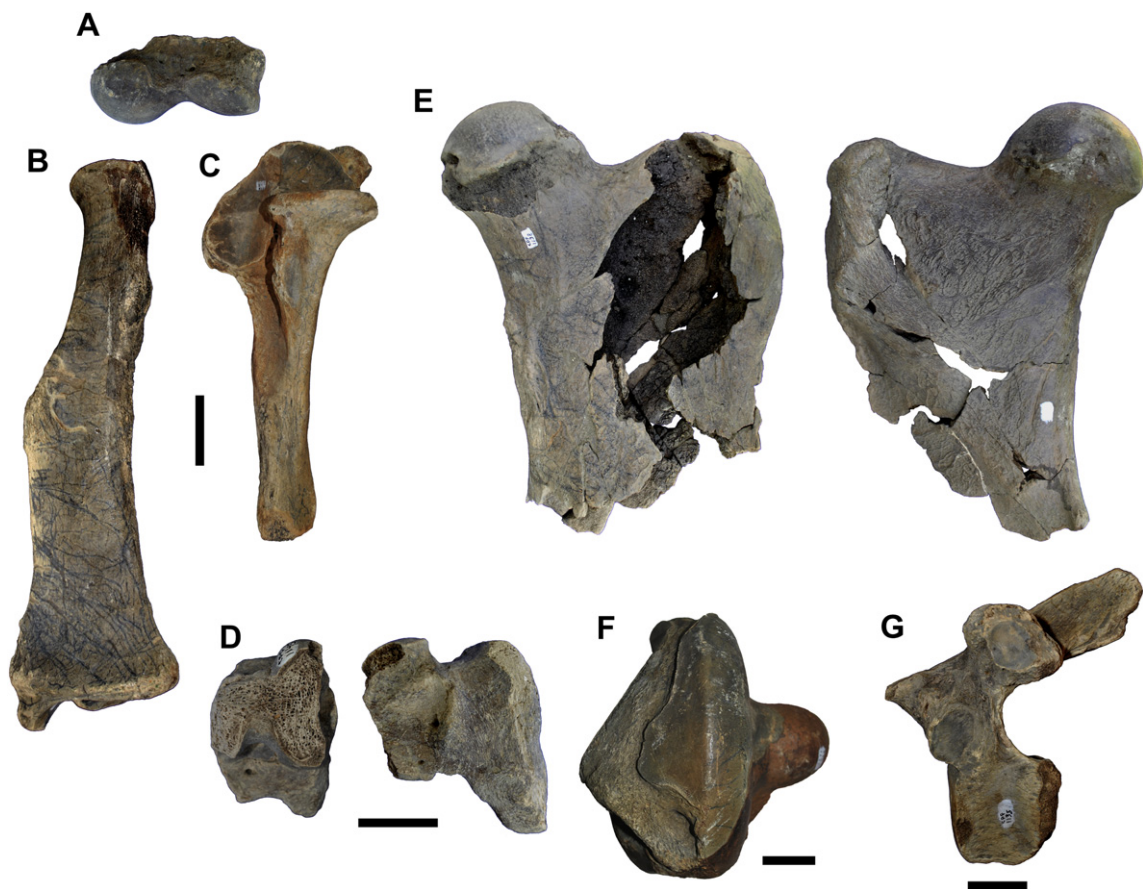


Fig. 5. Postcranial remains of *Eremotherium laurillardi* (CPP 1122), coming from the Uberaba City, Minas Gerais State, Brazil. A, portion of distal epiphysis of right humerus in anterior view; B, right radius in anterior view; C, proximal portion of right ulna in anterior view; D, first phalanx of right manual digit III in distal and medial views; E, proximal half of left femur in anterior and posterior views; F, right astragalus in dorsolateral (fibular) view; G, thoracic vertebra in left lateral view. Scale equals 10 cm in A–C, E and 5 cm in D, F and G.

proportions to *E. laurillardii* (see Gaudin, 2004). As in *E. laurillardii*, the ventral portion of the mandibular symphysis of CPP 1122 extends posteriorly until the level of the first lower molariform. In *M. americanum*, the mandibular symphysis extends much further posteriorly (Gaudin, 2004). As in *E. laurillardii*, the ventral edge of the angular process of 1122 (Fig. 4) is positioned in a more ventral position in comparison to the condition of *M. americanum*.

The dentition of CPP 1122 is only partially preserved because the four lower molariforms are fractured and the isolated portions of teeth are strongly weathered and eroded. There is no diastema among lower molariforms and the tooth row is horizontal in lateral view. As in others megatheriines, each tooth has two strong, almost transverse crests (one mesial and one distal), separated by a deep valley. Similar to *E. laurillardii*, the mesial crest of the first and second molariforms is slightly obliquely oriented whereas in *M. americanum* they are almost perpendicular to the mesio-distal mandibular axis. The shape and size of the lower molariforms varies considerably. The m1 and m2 are sub-square, the m3 is trapezoidal, and the m4 is sub-rectangular (Fig. 4). The m3 is the mesio-distally smallest tooth of the row (see Table 1 for measurements). The pulp cavity can be observed clearly in the fragments of the isolated teeth. The development of this cavity is similar to that of *E. laurillardii* (Cartelle and De Iuliis, 2006), being dorsoventrally shorter than in *M. americanum*. The pulp cavity occupies about two-thirds of the height of the molariforms.

The distal fragment of humerus, the radius, the portions of ulna, the vertebral elements (Fig. 5), and the ribs do not provide significant data for systematic proposes within Megatheriinae. The preserved vertebral remains are considered to belong to the thoracic region by the sub-triangular shape of the vertebral bodies which is more oval and rounded in the cervical and lumbar regions, and also by the posterior inclination of the neural spine and the relative position of articulation surfaces for the ribs. Of the hand only one element was recovered. It includes the first phalanx of right digit III (proximal + middle phalanges; De Iuliis and Cartelle, 1993, Fig. 5D).

The left femur, although not complete, is transversely broad and anteroposteriorly compressed (Fig. 5). The inclusion of the measurements of the femur CPP 1122 (maximum proximal width = 40.5 cm; minimum width of the diaphysis (preserved) = 29.3 cm) in the data analyzed by Tito (2008: Fig. 9), positioned the specimen from Uberaba close to the regression equation obtained for *E. laurillardii* ($y = 0.4769x + 63.168$ and $R^2 = 0.8995$; Tito, 2008) than that for *M. americanum*.

The right astragalus CPP 1122 is similar to that of *E. laurillardii*, with the dorsolateral trochanter semicircular in shape as in other megatheriines (De Iuliis, 1994). Furthermore, the odontoid process for the tibia is well developed as in other ground sloths. The separation between the ectal facet for the calcaneus and the tibial facet is similar to the condition observed in *E. laurillardii*, with a separation slightly larger than in *Megatherium* (De Iuliis, 1994).

The comparison of the maximum proximal width of the femur CPP 1122 (40.5 cm) with data on *E. laurillardii* and *M. americanum* (see Tito, 2008) suggests that CPP 1122 correspond to an adult individual of

large size. Similarly, the absence of clear sutures in the skull bones and fusion of the neural arch with the vertebral body in the complete thoracic vertebra indicate that CPP 1122 is an adult individual.

4. Discussions and conclusions

Throughout the 20th Century the knowledge about the taxonomy of the ground sloth *Eremotherium* and close related taxa have changed considerably. The review works made by Cartelle and De Iuliis (1995, 2006), based upon numerous specimens from the Pleistocene of Bahia (Brazil) and Florida (USA) states, have provided a plenty of evidence to recognize the presence of a single, large species of *Eremotherium*: *E. laurillardii*, with a Pan-American distribution during the Pleistocene. The high quantity of recovered remains of *E. laurillardii* from a single locality allowed these authors to recognize the presence of a large intra-specific variation (ontogenetic and sexual dimorphism) of the morphological traits traditionally used as characteristics of each species (Cartelle and Bohórquez, 1982; Cartelle and De Iuliis, 1995). One species of small size was recognized in Ecuador, *Eremotherium elenense* (Hoffstetter, 1949), but the validity of this taxon remains still uncertain (see Cartelle and De Iuliis, 1995: 830). De Iuliis and Saint-André (1997) described the species *Eremotherium sefvei* from Bolivia, based on an isolated femur of small size, possibly confined to the Late Pliocene/Early Pleistocene. Given the age and features of the femur, the Bolivian species is considered valid today. Posteriorly, De Iuliis and Cartelle (1999) described a new species, *Eremotherium eomigrans*, coming from the Late Pliocene of Florida State (USA). According to the authors, *E. eomigrans* is indistinguishable from *E. laurillardii* based solely on cranio-mandibular and dental features. Nonetheless, there are anatomical differences between both taxa in the postcranial skeleton. Differing from *E. laurillardii*, all postcranial elements of *E. eomigrans* are more slender, and there are several apomorphies in the humerus, tibia, fibula, and hand (see De Iuliis and Cartelle, 1999: 501).

The specimen CPP 1122 from Uberaba differs from the Bolivian species *E. sefvei* by its larger size and from the North American species *E. eomigrans* by the presence of robust skeletal bones, similar to the condition of the Pleistocene species *E. laurillardii*. Unfortunately, the synapomorphies of *E. eomigrans* (De Iuliis and Cartelle, 1999) cannot be evaluated in the available material from Uberaba. Based on the wide distribution of *E. laurillardii* in the Pleistocene of Brazil (e.g., Cartelle, 1999) and the presence of typical characters of this species (see Section 3.3), the specimen CPP 1122 found at Uberaba town is definitely related to terrestrial ground sloth *E. laurillardii*. Subtle differences among *Eremotherium* specimens are within the range of variability already known for the species (Cartelle and De Iuliis, 1995, 2006). Moreover, as was pointed out by Tito (2008), regional differences of each population could not be discarded; however, this hypothesis has not yet been studied in detail.

The findings of Quaternary remains in the Uberaba County (Triângulo Mineiro region) open a new line of research in the CCCP/UFTM, since until now the studies were mainly focused on vertebrate faunas from the Upper Cretaceous Bauru Group (e.g., Carvalho et al., 2004; Novas et al., 2005, 2008; Salgado and Carvalho, 2008). Future systematic research in Quaternary outcrops in this region may contribute to the understanding of the Cenozoic biota and for refining the distribution and age of post-Cretaceous fossiliferous rocks in geological maps.

Acknowledgments

We thank the financial support for this research provided by Fundação de Amparo à Pesquisa do Estado de Minas Gerais

Table 1

Selected measurements of the lower tooth row of *Eremotherium laurillardii* (CPP 1122) in millimeters.

Right mandible	m1	m2	m3	m4
Mesial maximum wide	36.1	39.3	36.8 ^a	34.5 ^a
Distal maximum wide	43.4	45.2	37.6 ^a	21.0 ^a
Maximum mesio-distal length	40.7	42.2	41.9 ^a	42.8 ^a
Length of m1–m4 dental row	193.0 ^a			

^a Indicates estimated measurements.

(FAPEMIG), Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq), Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES), and Fundação de Ensino e Pesquisa de Uberaba (FUNEP). Special thanks are due to Mr. Marleno de Jesus Alcântara and Mr. Jose Bezerra Campos, from Uberaba City, for the discovery of the material here studied and field work assistance, and to Carolina S. Scherer (Universidade Federal do Recôncavo da Bahia) for suggestions and comments that improve the manuscript. Two anonymous reviewers and the editor J.N. Kellogg made suggestions that greatly improved the Ms.

References

- Bergqvist, L.P., Almeida, E.B., 2004. Biodiversidade de mamíferos fósseis brasileiros. Revista da Universidade de Guarulhos, Geociências 9, 54–68.
- Brandoni, D., Soibelzon, E., Scarano, A., 2008. On *Megatherium gallardoi* (Mammalia, Xenarthra, Megatheriidae) and the Megatheriinae from the Ensenadan (lower to middle Pleistocene) of the Pampean region, Argentina. Geodiversitas 30 (4), 793–804.
- Campos, D.A., Kellner, A.W.A., 1999. On some sauropod (Titanosauridae) pelvis from the continental Cretaceous of Brazil. Natural Science Museum Monographs 15, 143–166.
- Cartelle, C., 1989. Sobre uma pequena coleção de restos fósseis de mamíferos do Pleistoceno final – Holoceno de Janaúba (MG). In: Congresso Brasileiro de Paleontologia, 11, Curitiba-PR, Anais, pp. 635–649.
- Cartelle, C., 1994. Tempo Passado. Mamíferos do Pleistoceno em Minas Gerais. Editorial Palco, Belo Horizonte, MG, 131 pp.
- Cartelle, C., 1999. Pleistocene mammals of the Cerrado and Caatinga of Brazil. In: Eisenberg, J.F., Redford, K.H. (Eds.), Mammals of the Neotropics. The Central Tropics, vol. 3. The University of Chicago Press, pp. 27–46.
- Cartelle, C., 2000. Preguiças terrícolas, essas desconhecidas. Ciência Hoje 27 (161), 18–25.
- Cartelle, C., 2002. Peter W. Lund, a naturalist of several sciences. Lundiana 3 (2), 83–85.
- Cartelle, C., Bohórquez, G.A., 1982. *Eremotherium laurillardii* Lund, 1842. Parte I. Determinação específica e dimorfismo sexual. Iheringia, Séries Geológica 7, 45–63.
- Cartelle, C., De Iuliis, G., 1995. *Eremotherium laurillardii*: the Panamerican Late Pleistocene megatheriid sloth. Journal of Vertebrate Paleontology 15 (4), 830–841.
- Cartelle, C., De Iuliis, G., 2006. *Eremotherium laurillardii* (Lund) (Xenarthra, Megatheriidae), the Panamerican giant ground sloth: taxonomic aspects of the ontogeny of skull and dentition. Journal of Systematic Palaeontology 4 (2), 199–209.
- Cartelle, C., Lessa, G., 1988. Descrição de um novo gênero e espécie de Macraucheniididae (Mammalia, Litopterna) do Pleistoceno do Brasil. Paulacoutiana 3, 3–26.
- Carvalho, I.S., Ribeiro, L.C.B., Avilla, L.S., 2004. *Uberabasuchus terrificus* sp. nov., a new Crocodylomorpha from the Bauru Basin (Upper Cretaceous), Brazil. Gondwana Research 7, 975–1002.
- Dantas, M.A.T., Zuccon, M.H., 2005. Sobre a ocorrência de dois taxa pleistocênicos na Fazenda Tytoya, Poço Redondo, Sergipe. Scientia Plena 1 (4), 92–97.
- De Iuliis, G., 1994. Relationships of the Megatheriinae, Nothrotheriinae, and Planiopsinae: some skeletal characteristics and their importance for phylogeny. Journal of Vertebrate Paleontology 14 (4), 577–591.
- De Iuliis, G., Cartelle, C., 1993. The medial carpal and metacarpal elements of *Eremotherium* and *Megatherium* (Xenarthra: Mammalia). Journal of Vertebrate Paleontology 13, 525–533.
- De Iuliis, G., Cartelle, C., 1999. A new giant megatheriine ground sloth (Mammalia: Xenarthra: Megatheriidae) from the late Blancan to early Irvingtonian of Florida. Zoological Journal of the Linnean Society 127, 495–515.
- De Iuliis, G., Saint-André, P.-A., 1997. *Eremotherium sefvei* nov. sp. (Mammalia: Xenarthra: Megatheriidae) from the Pleistocene of Ulloma, Bolivia. Geobios 30, 453–461.
- Estes, R., Price, L.I., 1973. Iguanid lizard from the Late Cretaceous of Brazil. Science 180, 748–751.
- Fernandes, L.A., Coimbra, A.M., 1996. A Bacia Bauru (Cretáceo Superior, Brasil). Anais da Academia Brasileira de Ciências 68 (2), 195–205.
- França, M.A.G., Langer, M.C., 2005. A new freshwater turtle (Reptilia, Pleurodira, Podocnemidae) from the Upper Cretaceous (Maastrichtian) of Minas Gerais, Brazil. Geodiversitas 27, 391–411.
- Gaffney, E.S., Meylan, P.A., Wood, R.C., Simons, E.L., Campos, D.A., 2011. Evolution of size-necked turtles: the family Podocnemidae. Bulletin of the American Museum of Natural History 350, 1–237.
- Gaudin, T.J., 2004. Phylogenetic relationships among sloths (Mammalia, Xenarthra, Tardigrada): the craniodental evidence. Zoological Journal of the Linnean Society 140, 255–305.
- Grassé, P.-P., 1955. Ordre des Édentés. In: Grassé, P.-P. (Ed.), Traité de Zoologie, Vol. 17 Mammifères. Masson et Cie, Paris, pp. 1182–1266.
- Hadler, P., Ferigolo, J., Goin, F.J., 2009. Mamíferos de pequeno porte (Didelphimorphia, Chiroptera e Rodentia) do Pleistoceno Final/Holoceno do Brasil, com ênfase no Rio Grande do Sul. In: Ribeiro, A.M., Bauermann, S.G., Scherer, C.S. (Eds.), Quaternário do Rio Grande do Sul, Integrando conhecimentos. Monografias da Sociedade Brasileira de Paleontologia, pp. 155–170. Porto Alegre.
- Hoch, E., Prous, A., 1985. A contribuição de P. W. Lund à arqueologia européia e brasileira. Arquivos do Museu de História Natural 10, 170–176.
- Hoffstetter, R., 1949. Sobre los Megatheriidae del Pleistoceno del Ecuador, *Schaubia*, gen. nov. Boletín de Informaciones Científicas Nacionales 3 (Suppl. 25), 1–45.
- Huene, F.v., 1931. Verschiedene mesozoische Wirbeltierreste aus Südamerika. Neus Jahrbuch für Mineralogie, Geologie und Paläontologie, Beilagen 66, 181–198.
- Kellner, A.W.A., Campos, D.A., Trotta, M.N.F., 2005. Description of a titanosaurid caudal series from the Bauru Group, Late Cretaceous of Brazil. Arquivos do Museu Nacional, Rio de Janeiro 63, 529–564.
- Kellner, A.W.A., Campos, D.A., Azevedo, S.A.K., Trotta, M.N.F., Henriques, D.D.R., Craik, M.M.T., Silva, H.P., 2006. On a new titanosaurid sauropod from the Bauru Group, Late Cretaceous of Brazil. Boletim do Museu Nacional, Nova Série Geologia 74, 1–32.
- Lund, P.W., 1950. Memórias sobre a Paleontologia Brasileira. Ministério da Educação e Saude, Instituto Nacional do Livro, Rio de Janeiro, RJ, p. 589. LVI pr.
- Monteiro, C.A., 1998. Novas ocorrências de mamíferos Pleistocênicos no Norte de Minas Gerais (Brasil). Acta Geológica Leopoldensia 21, 137–147.
- Mothé, D., Avilla, L.S., Wihck, G.R., 2010. Population structure of the gomphothere *Stegomastodon waringi* (Mammalia: Proboscidea: Gomphotheriidae) from the Pleistocene of Brazil. Anais da Academia Brasileira de Ciências 82 (4), 983–996.
- Neves, W.A., Powell, J.F., Prous, A., Ozolins, E.G., Blum, M., 1999. Lapa Vermelha IV Hominid 1: morphological affinities of the earliest known American. Genetics and Molecular Biology 22 (4), 461–469.
- Novas, F.E., Ribeiro, L.C.R., Carvalho, I.S., 2005. Maniraptoran theropod ungual from the Marília Formation (Upper Cretaceous), Brazil. Revista del Museo Argentino de Ciencias Naturales “Bernardino Rivadavia”, n.s. 7, 31–36.
- Novas, F.E., Carvalho, I.S., Ribeiro, L.C.B., Méndez, A.H., 2008. First abelisaurid bone remains from the Maastrichtian Marília Formation, Bauru Group, Brazil. Cretaceous Research 29, 625–635.
- Owen, R., 1855. On the *Megatherium*. Part II. Vertebrae of the trunk. Philosophical Transactions of the Royal Society of London 145, 359–388.
- Owen, R., 1856. On the *Megatherium*. Part III. The skull. Philosophical Transactions of the Royal Society of London 146, 571–589.
- Owen, R., 1858. On the *Megatherium* (*Megatherium americanum*, Cuvier and Blumenbach). IV. Bones of the anterior extremities. Philosophical Transactions of the Royal Society of London 148, 261–278.
- Owen, R., 1860. On the *Megatherium* (*Megatherium americanum*, Cuvier and Blumenbach). V. Bones of the posterior extremities. Philosophical Transactions of the Royal Society of London 149, 802–829.
- Paula Couto, C., 1953. Paleontologia Brasileira. Mamíferos. In: Ministério de Educação e Saúde. Instituto Nacional do Livro. Biblioteca Científica Brasileira. Serie A, vol. I, 516 pp.
- Paula Couto, C., 1954. Megaterios intertropicais do Pleistoceno. Anais da Academia Brasileira de Ciências 26, 447–461.
- Paula Couto, C., 1978. Mamíferos fósseis do Pleistoceno do Espírito Santo. Anais da Academia Brasileira de Ciências 50 (3), 365–379.
- Paula Couto, C., 1979. Tratado de Paleomastozoologia, first ed. Academia Brasileira de Ciências, Rio de Janeiro, RJ, p. 590.
- Price, L.I., 1944. Vertebrados Pleistocênicos de Águas do Araxá. Anais da Academia Brasileira de Ciências 16 (3), 193–195.
- Price, L.I., 1955. Novos crocodilídeos dos arenitos da Série Bauru, Cretáceo do Estado de Minas Gerais. Anais da Academia Brasileira de Ciências 27, 487–498.
- Pujos, F., 2006. *Megatherium celendinense* sp. nov. from the Pleistocene of Peruvian Andes and the megatheriine phylogenetic relationship. Palaeontology 49 (1), 285–306.
- RADAMBRASIL, 1983. Ministério de Minas e Energia. Levantamento de Recursos Naturais. Folha 31. Rio de Janeiro.
- Salgado, L., Carvalho, I.S., 2008. *Uberabatitan ribeiroi*, a new titanosaur from the Marília Formation (Bauru Group, Upper Cretaceous), Minas Gerais, Brazil. Palaeontology 51, 881–901.
- Simpson, G.G., Paula Couto, C., 1957. The mastodonts of Brazil. Bulletin of the American Museum of Natural History 112 (2), 131–145.
- Tito, G., 2008. New remains of *Eremotherium laurillardii* (Lund, 1842) (Megatheriidae, Xenarthra) from the coastal region of Ecuador. Journal of South American Earth Sciences 26, 424–434.