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NOTE ON NEW LATE CRETACEOUS TITANOSAURIA RECORDS FROM THE BAURU GROUP (PARANÁ BASIN) OF SOUTHERN GOIÁS STATE, BRAZIL

NOTA SOBRE NOVOS REGISTROS DE TITANOSAURIA DO NEOCRETÁCEO DO GRUPO BAURU (BACIA DO PARANÁ) NO SUL DO ESTADO DE GOIÁS, BRASIL

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ABSTRACT

Titanosaurs were the most diverse herbivorous dinosaurs during the Late Cretaceous of Brazil. Although new titanosaur fossils have been found in recent decades, most of these records are from a few areas in the southeast region of Brazil, while other sites from the midwest of the country have been little explored and few specimens from this region have been described, which has created significant knowledge gaps. The present study describes new Upper Cretaceous materials from the state of Goiás. Despite their fragmentary nature, the specimens have anatomical information that supports their taxonomic identification as Titanosauria. These new records represent an important addition to the Late Cretaceous faunal diversity of this region, which will stimulate new research that may increase knowledge on Brazilian dinosaurs, and more generally on some of the last dinosaur faunas of South America before the end-Cretaceous asteroid impact and extinction.

Keywords: central Brazil; Titanosauria; upper Cretaceous; South America**.**

RESUMO

Os titanossauros foram os dinossauros herbívoros mais diversos durante o Neocretáceo do Brasil. Embora novos fósseis de titanossauros tenham sido encontrados nas últimas décadas, a maioria desses registros provém de algumas áreas da região sudeste do Brasil, enquanto outros sítios do Centro-Oeste do país foram pouco explorados e poucos espécimes dessa região foram descritos, o que cria grandes lacunas de conhecimento. O presente estudo descreve novos materiais do Cretáceo Superior do estado de Goiás. Apesar de sua natureza fragmentária, os espécimes possuem informações anatômicas que corroboram sua identificação taxonômica como Titanosauria. Esses novos registros representam uma importante contribuição para a diversidade faunística do Neocretáceo dessa região, o que estimulará novas pesquisas que poderão ampliar o conhecimento sobre os dinossauros brasileiros e, de forma mais geral, sobre algumas das últimas faunas de dinossauros da América do Sul antes do impacto do asteroide e da extinção do final do Cretáceo.

Palavras-chave: Brasil central; Titanosauria; Cretáceo superior; América do Sul.

1. INTRODUÇÃO

Titanosaurs are one of the most diverse and abundant clades among the herbivorous dinosaurs (e.g., McIntosh, 1990; González Riga & Ortiz, 2014) that lived during the Early to Late Cretaceous (Curry Rogers, 2009). These animals were widely distributed in South America (e.g., Bonaparte, 1978; Powell, 1986; Bonaparte & Coria, 1993; Wilson, 2002; Powell, 2003; Curry Rogers, 2005). They are among the most common faunal elements found in the Upper Cretaceous rocks of Brazil, and most of these species come from the Bauru Group strata (Bandeira et al., 2016; Silva Jr et al., 2017; Nascimento et al., 2025).

Over the last few decades, many new fossils of titanosaurs have been discovered in Brazil, concentrated in a few regions: Triângulo Mineiro (Minas Gerais State), Western São Paulo State, and Mato Grosso State (Candeiro et al., 2018; Nascimento et al., 2025). Another region that potentially contains fossil-bearing Upper Cretaceous outcrops is Midwestern Brazil (Goiás and Mato Grosso do Sul states), but it has been little explored. One of the regions with the least amount of information on titanosaurs is southern Goiás State, where rocks from the Bauru Group outcrop. The first record from this area is possibly an indeterminate isolated vertebra described by Simbras et al. (2013). Other known fossil occurrences are: one right radius, a fragmented tooth, and a rib fragment, all described by Candeiro et al. (2018) and assigned to indeterminate titanosaurs.

The research potential of southern Goiás State led the team of the Laboratório de Paleontologia e Evolução (Labpaleoevo) of the Geology course of the Universidade Federal de Goiás to perform exploratory fieldwork between the years of 2016 and 2022. Some new materials were collected at the region between the municipalities of Quirinópolis and Rio Verde (Marília Formation, Bauru Group). Here, we describe five bone fragments of sauropod dinosaurs found by the team of Labpaleoevo, which provide additional information about the dinosaur fauna of this region. On a broader scale, these fossils add to a growing understanding of some of the last dinosaur faunas in South America, before the Cretaceous ended with an asteroid impact and mass extinction (Brusatte et al., 2017).

2. GEOLOGICAL SETTING AND AGES

In Southern Goiás State are outcrops of the Bauru Group, one of the four supersequences in which the Paraná Basin is divided (Milani & Zalan, 1999; Milani et al., 2007). The Bauru Group is a continental unit dated from the Aptian to the Maastrichtian, and

outcrops across a vast area of approximately 370,000 Km2 (sensu Soares et al., 1980), including the Brazilian states of Goiás, Mato Grosso, Mato Grosso do Sul, São Paulo, and Paraná, as well part of Paraguay (Pinheiro et al., 2018).

The outcropping areas of the Bauru Group in southern Goiás, the Triângulo Mineiro, western São Paulo State, and Mato Grosso do Sul comprise the Araçatuba, Adamantina (including the Vale do Rio do Peixe, Presidente Prudente, and São José do Rio Preto units), Uberaba, and Marília formations, following the stratigraphic framework proposed by Batezelli (2017) and discussed by Langer et al. (2022).

The Araçatuba Formation outcrops exclusively in the state of São Paulo and this unit was formed in an ancient swampy environment (sensu Zaher et al., 2006). The Uberaba Formation outcrops exclusively in Minas Gerais in the municipalities of Romaria and Uberaba, and its sandstones present collaborations of rich fragments of volcanic rocks from Alto Paranaíba. These rocks are associated with a braided fluvial depositional environment (Hasui, 1968; Fúlfaro & Barcelos, 1991; Ferreira Jr., 1996; Fernandes & Coimbra, 2000) and are considered chronocorrelated with the Adamantina Formation (Fernandes & Coimbra, 1996; Goldberg & Garcia, 2000). The Adamantina Formation is the unit with the largest exposed cover, outcropping in the states of Goiás, Mato Grosso do Sul, Minas Gerais and São Paulo and is made up of fine sandstones and pelites of fluvio-lacustrine origin (Barcelos, 1984; Dias-Brito et al., 2001b). Batezelli (2017) proposed a stratigraphic arrangement whereby this unit corresponds to the Vale do Rio do Peixe, Presidente Prudente and São José do Rio Preto formations.

The strata of the Marília Formation emerge irregularly in the states of Goiás, Mato Grosso do Sul, Minas Gerais and São Paulo, and constitute the second geological unit with exposed areas in the Bauru Group (Dal´Bó & Basilici, 2010). Soares et al. (1980) subdivided the unit into the Serra da Galga, Echaporã and Ponte Alta members. Recently, Soares et al. (2020) proposed that the Serra da Galga Formation outcrops in Uberaba, Minas Gerais in what would previously have been the Serra da Galga Member.

The Bauru Group has provided one of the richest and most diverse assemblages of continental vertebrates from the Late Cretaceous of South America. The ages of the geological units in this group have been controversial, with their deposits being largely post-Coniacian based on stratigraphic, radiometric, and paleontological data (e.g., Gobbo-Rodrigues et al., 1999a,b: Campanian-Maastrichtian/Fm. Adamantina-Araçatuba, Campanian/Fm. Uberaba and Maastrichtian/Fm. Marília; Dias-Brito et al., 2001: Turonian-Santonian /Fm. Adamantina, Coniacian-Santonian/Fm. Uberaba and Late Maastrichtian/Fm. Fm. Marília). Langer et al. (2022) carried out the most detailed work compiling, integrating and suggesting ages for tetrapod faunas such as Coniacian-Santonian for the Araçatuba Formation, Campanian-earliest early Maastrichtian for the Adamantina and Uberaba formations, and Maastrichtian for the Marília Formation. The stratigraphic and chronostratigraphic arrangement proposed by Batezelli (2017) and Langer et al. (2022) are used here.

In southern Goiás State, the Bauru Group outcrops irregularly and preserves a significant sedimentary record of the Upper Cretaceous (sensu Fernandes & Coimbra, 1996). The most representative outcrops in this geological unit are in the municipalities of Caçu, Quirinópolis, and Rio Verde, where the rocks are superimposed over the Lower Cretaceous basalts of the Serra Geral Formation (Serra Geral Group, Paraná Basin) (Soares et al., 1980). The materials described here were collected from rocks of the Maastrichtian Marília Formation (Figure 2), in the regions of Quirinópolis and Rio Verde (Figure 1). This geological unit is dominated by sandstones and conglomerates that often have carbonate cement (calcite) that may contain carbonate concretions.

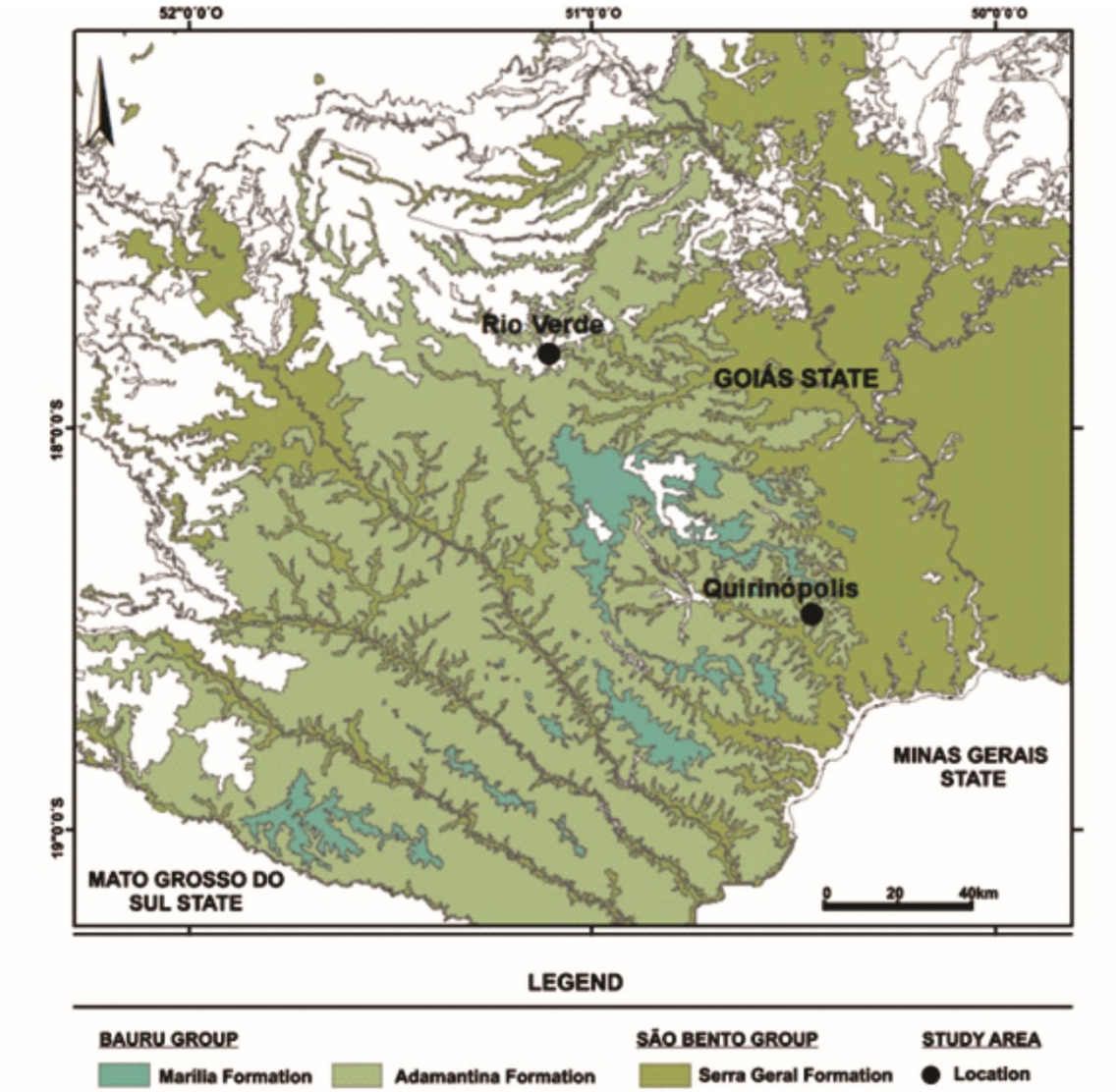


Figure 1. Geological map of the Quirinópolis and Rio Verde municipalities, highlighting the formations that outcrop in the region. Geographic coordinate system: SIRGAS 2000. Data source: IBGE (2019).

3. MATERIAL AND METHODS

The fossils described herein were collected in southern Goiás State, in the municipalities of Rio Verde and Quirinópolis (Figure 2), and are housed under the catalog numbers Paleo-UFG/V-0032–0036 in the collection of the Laboratório de Paleontologia e Evolução, part of the Geology course at the Aparecida de Goiânia campus, Federal University of Goiás (UFG).

Stratigraphic attribution follows the scheme proposed by Soares et al. (1980), and age interpretations are based on Dias-Brito et al. (2001).

All specimens were subjected to standard laboratory preparation procedures commonly employed for vertebrate fossils from the Bauru Group. Initially, the collected material was triaged, and exposed fossil surfaces were stabilized using a 3% solution of Paraloid B-72 diluted in acetone. The fossil-bearing blocks were separated into boxes and carefully prepared using manual tools.

Smaller and more fragile disaggregated elements were prepared using finer tools to allow controlled abrasion without damaging the fossil material, including fine-tipped instruments and dental equipment. Limited amounts of organic solvent were cautiously

applied only in areas without visible fossil remains, in combination with fine brushes, to assist sediment removal and fossil exposure.

After mechanical preparation, the fossils were further stabilized using Paraloid B-72 at different concentrations (3%, 5%, and 20%), according to specific preparation needs. Following consolidation, fossil surfaces were gently cleaned using soft-bristle brushes and dental tools.

At the time of this study, the preparation of specimen Paleo-UFG/V-0036 is still in progress; however, the same preparation and stabilization procedures described above have been applied. All specimens were documented through high-resolution digital photography.

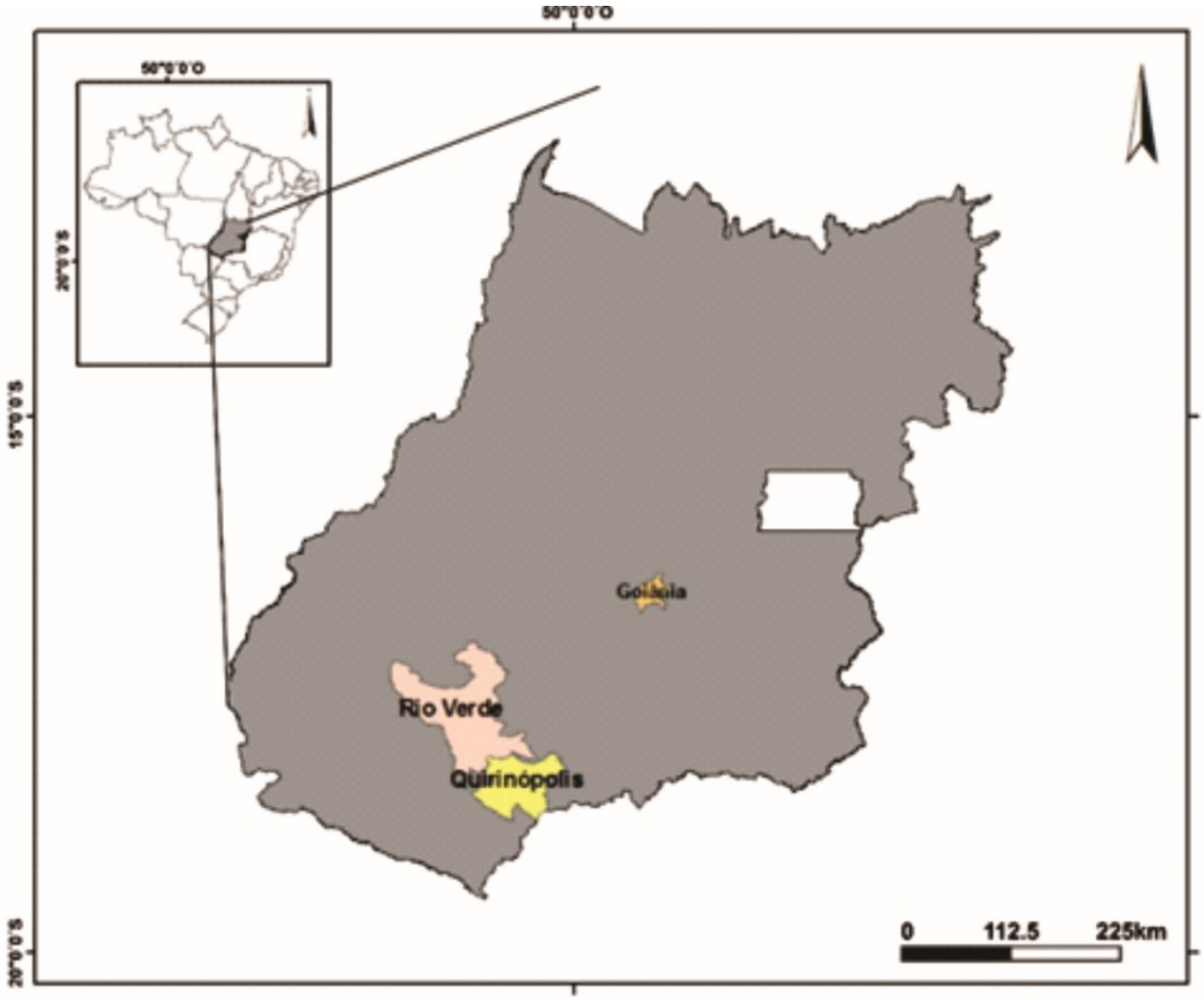


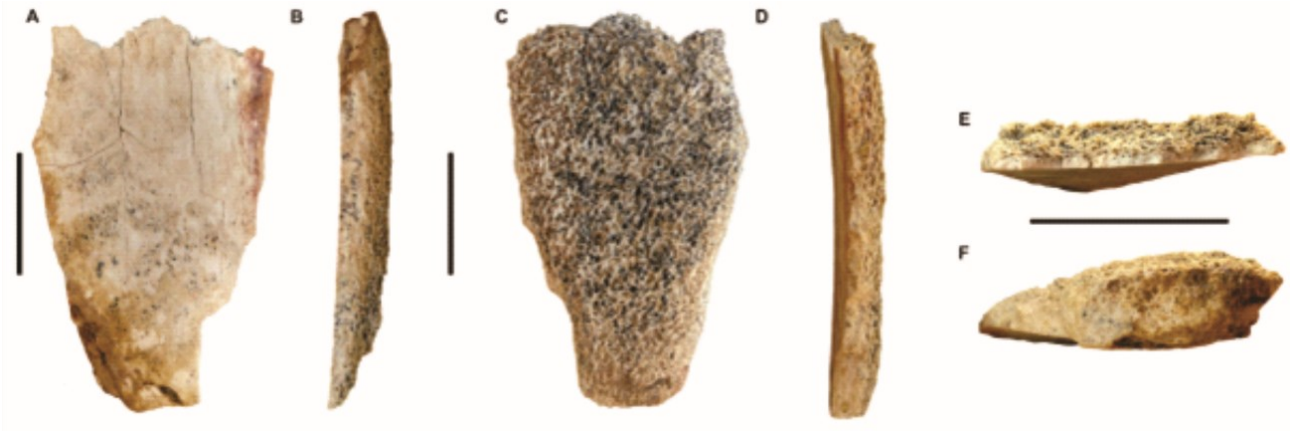
Figure 2. Location map of the areas of study in the Rio Verde and Quirinópolis municipalities. Geographic coordinate system: SIRGAS 2000. Data source: Authors (2026).

4. RESULTS

Paleontology and Systematics
Dinosauria Owen, 1842
Saurischia Seeley, 1888
Sauropoda Marsh, 1878
Titanosauriformes Salgado et al., 1997
Somphospondyli Wilson & Sereno, 1998

Titanosauria Bonaparte & Coria, 1993
Titanosauria indet.

Material. Paleo-UFG/V-0032 – fragment of an ilium.
Locality. Rio Verde municipality.
Geological unit and age. Marília Formation, Late Maastrichtian.
Observations. Paleo-UFG/V-0032 (Figure 3) was identified as a fragment of an ilium. The bone is 151.13 mm in length and 98.36 mm in width.



Figurr 3. Titanosauria indet. Paleo-UFG/V-0032 is a fragment of an ilium. A: lateral view, B: ventral view, C: medial view, D: dorsal view, E: proximal view, F: distal view. Scale: 50 mm. Data source: Authors (2026).

Paleo-UFG/V-0032 partially exposes on its surface the internal pneumatic bone with its numerous porous chambers (Figure 4). The external features (processes, bone shape, and thickness of the preserved portion) are also observed in this specimen. These structures are present in the ilium of titanosaurs like *Alamosaurus sanjuanensis* Gilmore, 1922, *Epachthosaurus sciuttoi* Martínez et al., 2004, *Lirainosaurus* Díaz et al., 2013, *Saltasaurus* Xu et al., 2006, and in the basal somphospondylian Euhel*opus zdanskyi* Wilson & Upchurch, 2009.

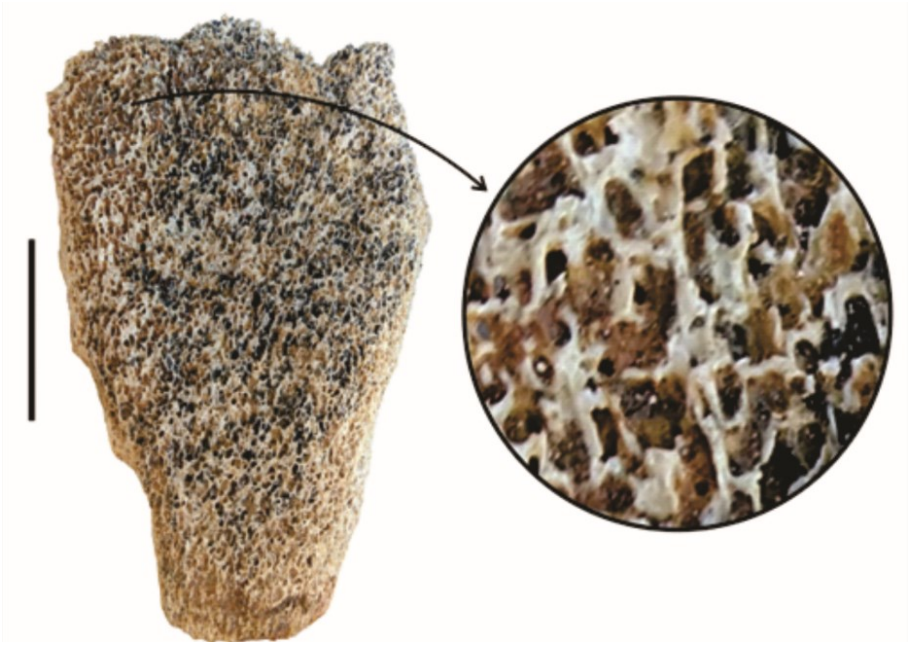


Figure 4. In detail, the pneumatic internal structure of the ilium (Paleo-UFG/V-0032). Scale: 50 mm. Data source: Authors (2026).

Material. Paleo-UFG/V-0033 – possibly a pubic bone fragment.
Locality. Rio Verde municipality.
Geological unit and age. Marília Formation, Late Maastrichtian.
Observations. Paleo-UFG/V-0033 (Figure 5) was identified as a possible fragment of a pubic bone, which is 187.11 mm in length and 78.66 mm in width. Its border is enlarged and flattened, yet diagnostic structures such as the acetabular surface and the ischiatic articulation are not present. Despite being a compact bone, the specimen does not seem to show any crushing or torsion related to taphonomic processes (Figure 5E, 5F). The proximal region is apparently more enlarged than the distal end, as expected for this bone in other titanosaurs. Unlike *Dreadnoughtus schrani* Lacovara et al., 2014 and *Saltasaurus loricatus* Powell, 1992, the distal portion does not seem to show any torsion (Bonaparte, 1980; Ullmann & Lacovara, 2016). Paleo-UFG / V-0033 does not show any longitudinal crest along the pubic axis, unlike *Saltasaurus*, *Uberabatitan riberoi* Salgado & Carvalho, 2008, and *Dreadnoughtus* (Powell, 2003; Ullmann & Lacovara, 2016).

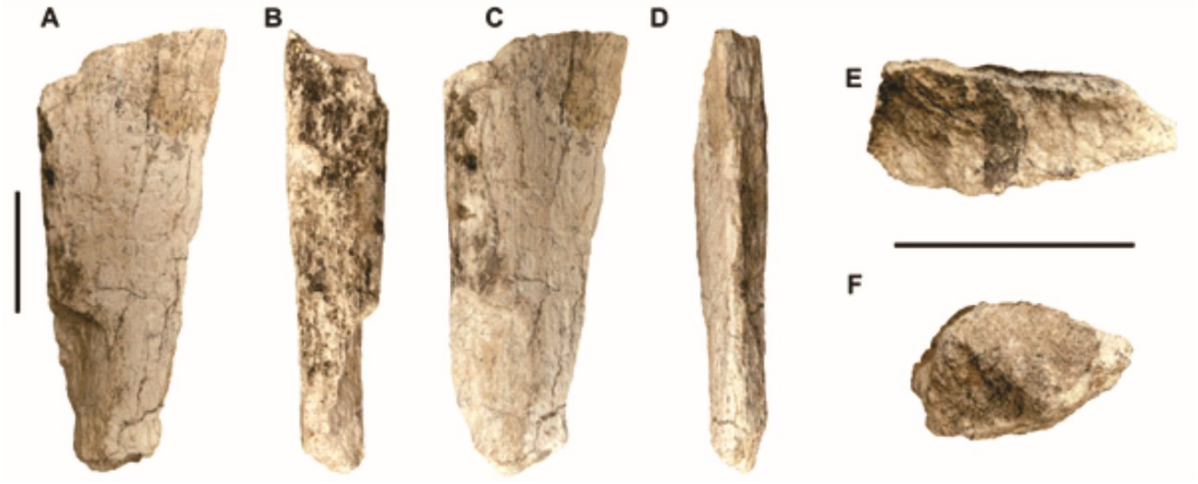


Figure 5. Titanosauria indet. Paleo-UFG/V-0033 possibly corresponds to a pubic bone fragment. A: anterior view, B: lateral view, C: posterior view, D: medial view, E: dorsal view, F: ventral view. Scale: 50 mm. Data source: Authors (2026).

Material. Paleo-UFG/V-0034 – a possible scapula fragment.
Locality. Rio Verde municipality.
Geological unit and age. Marília Formation, Late Maastrichtian.
Observations. Paleo-UFG/V-0034 (Figure 6) is 112.61 mm in length and 45.21 mm in width, and was identified as a scapula fragment. The specimen is anteroposteriorly concave, but as with the materials previously described here, with almost no diagnostic structures are preserved. As in other titanosaurids, the scapula blade is D-shaped in transverse section, with a convex lateral facet and a concave medial facet, and its most distal portion flattens to a rectangular transverse section. Paleo-UFG/V-0034 also shows no evidence of a cranioventral tubercle on the scapular blade, unlike the more derived titanosaurids such as *Neuquensaurus australis* Lydekker, 1893 and *Alamosaurus* (D'Emic & Wilson, 2011; D'Emic, 2012).

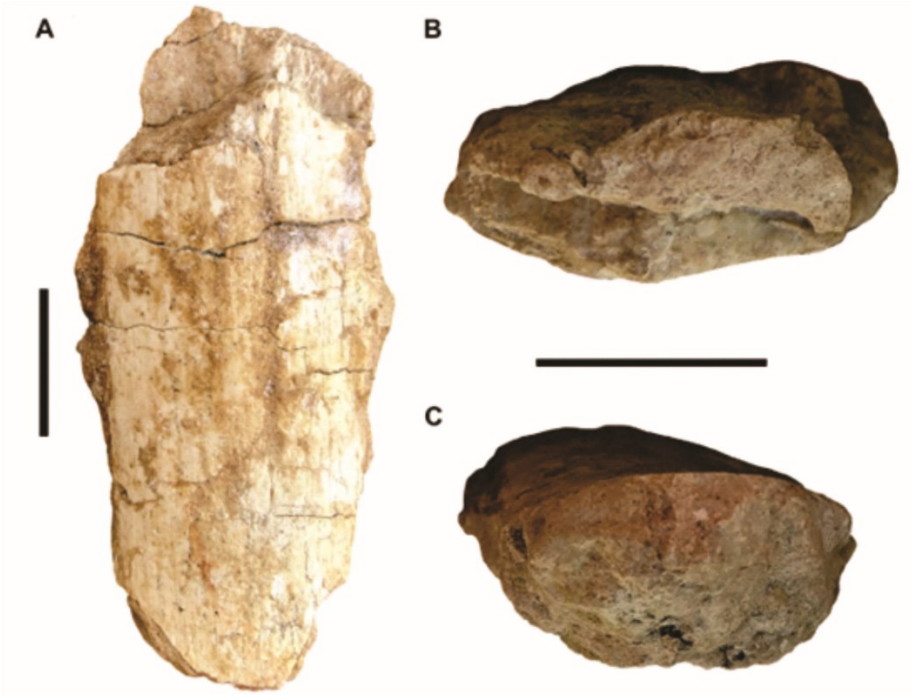


Figure 6. Titanosauria indet., Paleo-UFG/V-0034. Scapula fragment. A: lateral view, B: proximal view, C: distal view. Scale: 20 mm. Data source: Authors (2026).

Material. Paleo-UFG/V-0035 - proximal portion of a haemal arch.
Locality. Quirinópolis municipality.
Geological unit and age. Marília Formation, Late Maastrichtian.
Observations. Paleo-UFG/V-0035 (Figure 7) is 112.61 mm in length and 45.21 mm in width. This haemal arch has a proximal portion that is slightly laterally compressed, and the articular facet is preserved. Unlike *Uberabatitan riberoi*, this specimen has a single facet (Salgado & Carvalho 2008). Paleo-UFG/V-0035 resembles the morphotype seen in *Aeolosaurus maximus* Santucci & Arruda-Campos, 2011 as it presents medially developed articular facets. This proximal portion in Paleo-UFG/V-0035 is more slender and laminar, similar to *Maxakalisaurus topai* Kellner et al., 2006.

Figure 7. Titanosauria indet., Paleo-UFG/V-0035. Proximal portion of a haemal arch. A) anterior view, B) right lateral view, C) posterior view, D) left lateral view, E) dorsal view. Scale: 50 mm. Data source: Authors (2026).

Paleo-UFG/V-0035 was the first osteological fossil record of a vertebrate found in southern Goiás, in 2013. Although incomplete, it is possible to observe a compact trabecular bone structure (Figure 8) along the entire preserved area, which is typical of saurischian dinosaur bones.

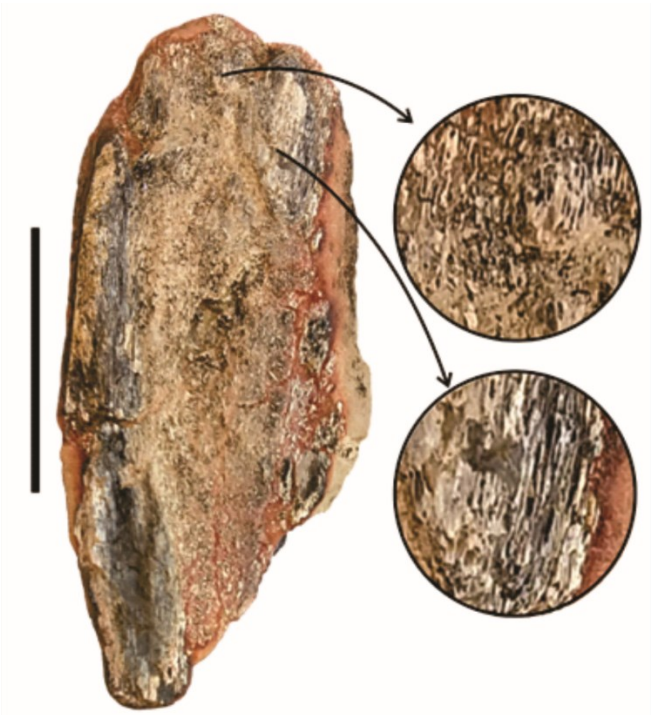


Figure 8. In detail, the compact trabecular bone structure of Paleo-UFG/V-0035. Scale: 50 mm. Data source: Authors (2026).

Material. Paleo-UFG/V-0036 – distal portion of a dorsal rib.
Locality. Quirinópolis municipality.
Geological unit and age. Marília Formation, Late Maastrichtian.
Observations. The preparation of Paleo-UFG/V-0036 (Figure 9) is still in progress, and the material is partially associated with sediments that are difficult to remove. It is possible to identify from the exposed portion that the specimen is to a fragmented dorsal rib, possibly the distal portion. The specimen does not seem to be curved as usually seen in dorsal ribs; however, as the material preparation is not completed, this appearance might be misleading. As in *Gondwanatitan faustoi* Kellner & Azevedo, 1999 and *Maxakalisaurus*, Paleo-UFG/V-0036 is more anteroposteriorly than mediolaterally developed (Kellner & Azevedo, 1999; Kellner *et al*., 2006). In transverse view, Paleo-UFG/V-0036 is subtriangular, as are the ribs of *Austrosaurus mckillopi* Longman, 1933. The medial view of this fragment presents an elevation formed by the longitudinal groove, present in many titanosauriform ribs. The broken surfaces indicate that it is a pneumatic rib that contained an internal trabecular tissue structure (Hocknull et al., 2009) as in other titanosauriforms (Wilson & Sereno, 1998).

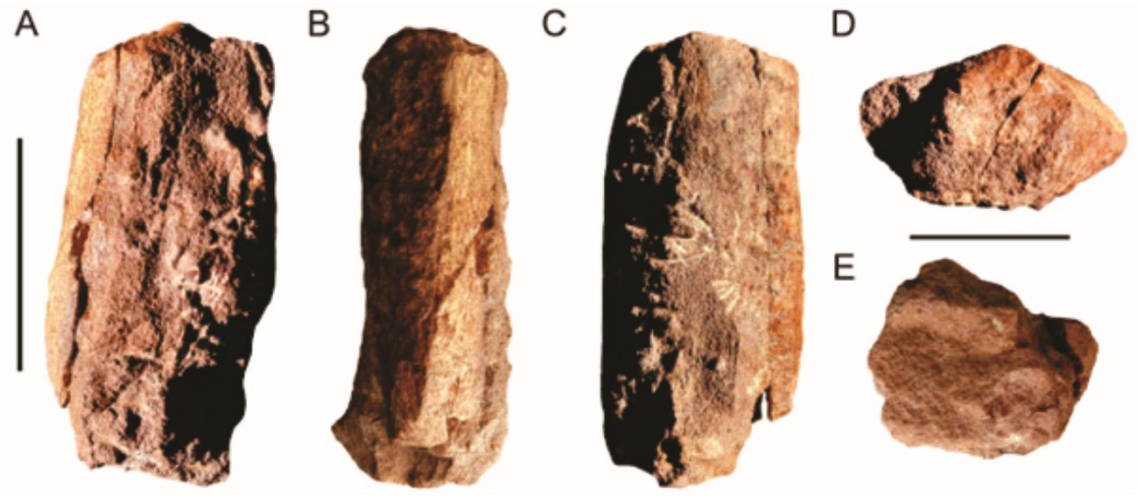


Figure 9. Titanosauria indet., Paleo-UFG/V-0036. Fragment of the distal portion of a dorsal rib. A: anterior view, B: lateral view, C: posterior view, D: proximal view, E: distal view. Scale = 50 mm. Data source: Authors (2026).

5. DISCUSSION AND CONCLUSIONS

Although fragmentary, the specimens described here preserve anatomical features that allows their taxonomic identification as Titanosauria. Paleo-UFG/V-0032 has a flattened and enlarged morphology, and is a quite porous bone, a characteristic often observed in the ilium of titanosaurids. The specimen Paleo-UFG/V-0033 shows anatomical features similar to the pubic bone of titanosaurs, and despite its fragmentary condition and the absence of diagnostic structures, the proximal portion of the specimen is seemingly more enlarged than the distal end, which is common in this clade.

Paleo-UFG/V-0034 is preliminarily interpreted as a scapular fragment. Although the material is poorly preserved, it is possible to observe that the blade is D-shaped in transversal view, with a convex lateral facet and a concave medial facet. Despite the very fragmentary condition of Paleo-UFG / V-0035, the specimen was identified as a haemal arch, which exhibits a single articular facet, similar to *Aelosaurus*. It is also possible to observe the compact trabecular bone structure (Figure 6), very common in bones of saurischian dinosaurs, particularly in titanosaurids.

The so far prepared area of the distal portion fragment of a dorsal rib (Paleo-UFG/V-0036) show fragmented areas with pneumatic structures that are common in titanosauriforms, allowing us to identify it as a dorsal rib.

The known records of the titanosaur fauna from the regions near southern Goiás State (Triângulo Mineiro, in the far west of Minas Gerais State, and western São Paulo State) are represented by specimens and species that are usually isolated and fragmented (see Candeiro et al., 2004; Gil & Candeiro, 2014; Faria et al., 2015; Martinelli & Teixeira, 2015; Candeiro et al., 2018). In Goiás State, there are few reported records, even in the same areas where the material described here was collected. These previous sauropod specimens were also assigned to Titanosauria (Candeiro et al., 2018, 2020; Maia & Candeiro, 2020). The anatomical characteristics of the materials studied here, our analysis, and the evidence that many records from Goiás State and its bordering regions are of titanosaurs indicate that the specimens in our study also belong to this clade.

Although long neglected and little explored, southern Goiás State has been showing its fossiliferous potential during the last several years (see Simbras et al., 2013; Resende et al., 2014; Candeiro et al., 2018, 2020, 2022; Maia & Candeiro, 2020). The field works conducted by the team of the Laboratório de Paleontologia e Evolução/Geology course/UFG have been recovering several specimens that, despite their fragmentary nature, have

provided information on the regional fauna from the Bauru Group. New findings, even those without diagnostic characters that allow assigning the material to more inclusive groups (e.g., clades inside Titanosauria), represent an important sample of the regional faunal diversity of the Late Cretaceous, in the final episode of dinosaur evolution before the end-Cretaceous asteroid impact and extinction (Brusatte et al., 2017). These new materials also support and encourage new expeditions to discover new fossil sites in southern Goiás State, which may contribute in the future to the discovery of other vertebrate fossil types and the financing of studies on regional paleontology.

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REFERENCES

Bandeira, K. L. N., Simbras, F. M., Machado, E. B., Campos, D. A., Oliveira, G. R. & Kellner, A.W.A. 2016. A new giant Titanosauria (Dinosauria: Sauropoda) from the Late Cretaceous Bauru Group, Brazil. Plos One, 11(10), 35-47. https://doi.org/10.1371/journal.pone.0163373

Barcelos, J. H. 1984. Reconstrução paleogeográfica da sedimentação do Grupo Bauru baseada na sua redefinição estratigráfica parcial em território paulista e no estudo preliminar fora do estado de São Paulo. Unpublished PhD. thesis, Universidade Estadual Paulista, Rio Claro, Brasil.

Batezelli, A. 2017. Continental systems tracts of the Upper Cretaceous Bauru Basin, southeastern Brazil, and their relationship with tectonics and climate. Journal of South American Earth Sciences, 75, 1–20.

Bonaparte, J. F. & Coria, R. A. 1993. Un nuevo y gigantesco sauropodo titanosaurio de la Formación Rio Lymai (Albiano-Cenomaniano) de la Provincia del Neuquen, Argentina. Ameghiniana, 30(3), 271-282.

Bonaparte, J. F. 1978. El Mesozóico de America del Sur y sus tetrapodos. Opera Lilloana, 26, 1-596.

Bonaparte, J. F. 1980. El primer ictidosaurio (Reptilia–Therapsida) de America del Sur, Chaliminia musteloides, del Triásico Superior de La Rioja, República Argentina. Actas II Congreso Argentino de Paleontologia y Bioestratigrafia, Buenos Aires, 1978, pp. 123–133.

Brusatte, S. L., Candeiro, C. R.A. & Simbras, F. M. 2017. The last dinosaurs of Brazil: The Bauru Group and its implications for the end-Cretaceous mass extinction. Anais da Academia Brasileira de Ciências, 89, 1465-1485. https://doi.org/10.1590/0001-3765201720160918

Candeiro, C. R. A., Marinho, T. S. & Oliveira, E. C. 2004. Distribuição geográfica dos dinossauros da Bacia Baurú (Cretácio Superior). Sociedade & Natureza, 16, 33-55.

Candeiro, C.R.A., Brusatte, S.L., Queiroz, G.K., Carvalho, A.A., Maia, D.S., Dias, T.C., Vidal, L.S. & Nogueira-Gomes, M.M. 2020. Late Cretaceous Bauru Group biota from

Southern Goiás state, Brazil: history and fossil content. Earth Sciences Research Journal, 24, 387-396. https://doi.org/10.15446/esrj.v24n4.82831

Candeiro, C. R. A., Martinelli, A. G., Avilla, L. S. & Rich, T. H. 2018. Tetrapods from the Upper Cretaceous (Bauru Group) of Brazil: diversity and paleobiogeography. Journal of South American Earth Sciences, 80, 487–499.

Candeiro, C.R.A., Lima, C.V., Canile, F.M., Brusatte, S.L., Dias, T.C., Martins-Ferreira, B., Frota-Lopes, R. & Campelo-Rodigues, J. 2022. Late Paleozoic, Late Cretaceous and Pleistocene-Holocene reptiles and mammals fauna: a review from Goiás State, Brazil. Boletín Geológico Y Minero, 133(4), 37-53. https://doi.org/10.21701/bolgeomin/133.4/002

Curry Rogers, K. 2005. Titanosauria: a phylogenetic overview. In: Curry Rogers, K. A.; Wilson, J. A (Ed). The Sauropods: Evolution and Paleobiology. Berkeley, University of California: 50- 103.

Curry Rogers, K. 2009. The postcranial osteology of Rapetosaurus krausei (Sauropoda: Titanosauria) from the Late Cretaceous of Madagascar. Journal of vertebrate Paleontology, 29, 1046–1086. https://doi.org/10.1671/039.029.0432

Dal´Bó, P. F. F. & Basilici, G. 2010. Facies associations and palaeoenvironmental evolution of the Marília Formation (Upper Cretaceous, Bauru Basin), southeastern Brazil. Sedimentary Geology, 230(3–4), 131–148.

D'Emic, M. D. & Wilson, J. A. 2011. New remains attributable to the holotype of the sauropod dinosaur Neuquensaurus australis, with implications for saltasaurine systematics. Acta Palaeontologica Polonica, 56, 61–73. http://dx.doi.org/10.4202/app.2009.0149

D'Emic, M. D. 2012. The early evolution of titanosauriform sauropod dinosaurs. Zoological Journal of the Linnean Society, 166, 624–671. https://doi.org/10.1111/j.1096-3642.2012.00853.x

Dias-Brito, D., Musacchio, E. A., Castro, J. C., Maranhão, M. S. A. S., Suarez, J. M. & Rodrigues, R. 2001. Grupo Bauru: uma unidade continental do Cretáceo no Brasil – concepções baseadas em dados micropaleontológicos, isotópicos e estratigráficos. Revue de Paléobiologie, 20, 245-304.

Díaz, V. D., Suberbiola, X. P., Sanz, J. L. 2013. The axial skeleton of the titanosaur Lirainosaurus astibiae (Dinosauria: Sauropoda) from the latest Cretaceous of Spain. Cretaceous Research, 43:145-160. https://doi.org/10.1016/j.cretres.2013.03.002

Faria, C. C. J., Gonzalez-Riga, B., Candeiro, C. R. A., Marinho, T. S., David, L. O., Simbras, F. M., Castanho, R. B., Muniz, F. P. & Pereira, P. V. L. G. C. 2015. Cretaceous sauropod diversity and taxonomic succession in South America. Journal of South American Earth Sciences, 61, 154-163. https://doi.org/10.1016/j.jsames.2014.11.008

Fernandes, L. A. & Coimbra, A. M. 1996. A Bacia Bauru (Cretáceo Superior, Brasil). Anais da Academia Brasileira de Ciências, 8(2), 195 – 205.

Fernandes, L. A. & Coimbra, A. M. 2000. Revisão estratigráfica da parte oriental da Bacia Bauru (Neocretáceo). Revista Brasileira de Geociências, 30(4), 717–728.

Ferreira Junior, P. D. 1996. Estratigrafia e sedimentologia da Formação Uberaba (Grupo Bauru) na região de Uberaba (MG). Dissertação de Mestrado, Universidade de São Paulo, São Paulo, 120 p.

Fúlfaro, V. J. & Barcelos, J. H. 1991. Formação Uberaba: uma revisão estratigráfica. Revista Brasileira de Geociências, 21(1), 59–66.

Gil, L. M. & Candeiro, C. R. A. 2014. Os titanosssaurídeos (Dinosauria, Sauropoda, Titanosauria) do Cretáceo Superior do Triângulo Mineiro: registro fóssil, distribuição e história natural. Biota Amazônia, 4(4), 80–90.

Gilmore, C. W. 1922. Discovery of a sauropod dinosaur from the Ojo Alamo formation of New Mexico. Smithsonian Miscellaneous Collections, 81, 1–9.

Gobbo-Rodrigues, S. R., Petri, S. & Bertini, R. J. 1999a. Ocorrência de ostracodes na Formação Adamantina (Grupo Bauru, Cretáceo Superior) no Estado de São Paulo. Revista Brasileira de Geociências, 29(2), 215–224.

Gobbo-Rodrigues, S. R., Petri, S. & Bertini, R. J. 1999b. Bioestratigrafia baseada em ostracodes da Formação Adamantina (Grupo Bauru, Cretáceo Superior). Revista Brasileira de Geociências, 29(4), 491–500.

Goldberg, K. & Garcia, A. J. V. 2000. Palaeoenvironmental changes recorded in the Upper Cretaceous Bauru Basin, southeastern Brazil. Cretaceous Research, 21(2–3), 241–254.

González Riga, B. J. & Ortiz David, L. 2014. A new titanosaur (Dinosauria, Sauropoda) from the Upper Cretaceous (Cerro Lisandro Formation) of Mendoza Province, Argentina. Ameghiniana, 51(1), 3-25. https://doi.org/10.5710/AMEGH.26.12.1013.1889

Hasui, Y. 1968. A Formação Uberaba. Boletim da Sociedade Brasileira de Geologia, 17(2), 3–20.

Hocknull, S. A., White, M. A., Tischler, T. R., Cook, A. G., Calleja, N. D., Sloan, T. & Elliott, D. A. 2009. New mid-Cretaceous (latest Albian) dinosaurs from Winton, Queensland, Australia. PloS One, 4, e6190. https://doi.org/10.1371/journal.pone.0006190

Instituto Brasileiro de Geografia e Estatística. Cartas e mapas. Disponível em: ftp://ftp.ibge.gov.br/Cartas_e_Mapas/Mapas_Tematicos/. Acesso em: Setembro/2022.

Kellner, A. W. A. & Azevedo, S. A. K. 1999. A new sauropod dinosaur (Titanosauria) from the Late Cretaceous of Brazil. In: Tomida, Y., Rich, T.H., Vickers-Rich, P. (Eds). Proceedings of the Second Gondwana Dinosaur Symposium. National Science Museum Monographs, 111– 142.

Kellner, A. W. A., Campos, D., Azevedo, S. A. K., Trotta, M. N. F., Henriques, D. D. R., Craik, M. N. T., Silva, H. 2006. On a new titanosaur sauropod from the Bauru Group, Late Cretaceous of Brazil. Boletim do Museu Nacional (Nova Serie), 74, 1–31.

Lacovara, K. J., Lamanna, M. C., Ibiricu, L. M., Poole, J. C., Schroeter, E. R., Ullmann, P. V., Voegele, K. K., Boles, Z. M., Carter, A. M., Fowler, E. K., Egerton, V. M., Moyer, A. E., Coughenour, C. L., Schein, J. P., Harris, J. D., Martínez, R. D. & Novas, F. E. 2014. A gigantic, exceptionally complete titanosaurian sauropod dinosaur from southern Patagonia, Argentina. Nature Scientific Reports, 4, 6196. https://doi.org/10.1038/srep06196

Langer, M. C., Martinelli, A. G., Bitencourt, J. S., Montefeltro, F. C., Ribeiro, L. C. B., Bittencourt, J. S., Schultz, C. L., Soares, M. B., Godoy, P. L., Wilner, E., Novas, F. E. & Ramezani, J. 2022. The age of dinosaur-bearing strata in the Bauru Group (Upper Cretaceous, Brazil): integrating tetrapod biostratigraphy, magnetostratigraphy, and geochronology. Gondwana Research, 103, 167–189.

Lydekker, R. 1893. The dinosaurs of Patagonia. Anales del Museo La Plata 2, 1-14.

Longman, H. A. 1933. A new dinosaur from the Queensland Cretaceous. Memoirs of the Queensland Museum, 10, 131-144.

Maia, D.S., Gil, L.M. & Candeiro, C.R.A. 2020. Preparação de restos de vertebrados do Neocretáceo da Formação Marília (Grupo Bauru) do município de Rio Verde, Goiás. Revista Sapiência: Sociedade, Saberes e Práticas Educacionais, 9, 189-200.

Marsh, O. C. 1878. Principal characters of American Jurassic dinosaurs. Part I. American Journal of Science, 16, 411–416.

Martinelli, A.G. & Teixeira, V. P. A. 2015. The Late Cretaceous vertebrate record from the Bauru Group in the Triângulo Mineiro, southern Brazil. Boletín Geológico y Minero, 126, 129–158. https://doi.org/10.21701/bolgeomin.126.1.006

Martínez, R. D., Giménez, O., Rodriguez, J., Luna, M. & Lamanna, M. C. 2004. Anarticulated specimen of the basal titanosaurian (Dinosauria: Sauropoda) Epachthosaurus sciuttoi from the early Late Cretaceous Bajo Barreal Formation of Chubut Province, Argentina. Journal of Vertebrate Paleontology, 24, 107–120.

McIntosh, J. S. 1990. Sauropoda. In D. B. Weishampel, P. Dodson, and H. Osmo Íska (eds.), The Dinosauria. University of California Press, Berkeley, California, pp. 345–401.

Milani, E. J. & Zalán, P. V. 1999. An outline of the geology and petroleum systems of the Paleozoic interior basins of South America. Episodes, 22, 199-205. https://doi.org/10.18814/epiiugs/1999/v22i3/007

Milani, E. J., Melo, J. H. G., Souza, P. A., Fernandes, L. A. & França, A. B. 2007. Bacia do Paraná. Boletim de Geociências Petrobras, 15, 65–287.

Nascimento, E. G., Candeiro, C. R. A., Vidal, L. S., Oliveira, G. R., Dias, E. V. & Brusatte, S. L. 2025. Titanosauria of the Bauru Group: a summary of records and their importance for understanding the diversity of the clade in Brazil. Andean Geology, 52(3), 343–366.

Owen, R. 1842. Report on British fossil reptiles, part II. Report of the British Association for the Advancement of Science, 11, 60–204.

Pinheiro, A. E. P., Pereira, P. V. L. G. C., de Souza, R. G., Brum, A. S., Lopes, R. T., Machado, A. S., Bergqvist, L. P. & Simbras, F. M. 2018. Reassessment of the enigmatic crocodyliform “Goniopholis” paulistanus Roxo, 1936: historical approach, systematic, and description by new materials. Plos One, 13(8), e0199984. https://doi.org/10.1371/journal.pone.0199984

Powell, J. E. 1986. Revision de los titanosduridos de América del Sur. Universidad Nacional de Tucumán, Tucumán, Tese de Doutorado, 340.

Powell, J. E. 1992. Osteologia de Saltasaurus loricatus (Sauropoda—Titanosauridae) del Cretácico Superior del Noroeste argentino. In Los Dinosaurios y su Entorno Biotico Edited by: Sanz, J. L. and Buscalioni, Instituto “Juan de Valdes”, Cuenca, 165–230.

Powell, J. E. 2003. Revision of South American titanosaurid dinosaurs: palaeobiological, palaeobiogeographical and phylogenetic aspects. Records of the Queen Victoria Museum, 111, 1–173.

Resende, I. L. M., Souza, E. A., Candeiro, C. R. A. & Carvalho, S. R. 2014. Microrregião da Confusão do Rio Preto, Quirinópolis, Goiás. In: 1. ed. Maria Felicidade Alves Urzedo. (Org.). Qurinópolis: Cultura e desenvolvimento regional - Mãos e olhares diferentes III, vol. 1. Kelps, Goiânia, pp. 303–321 2014.

Salgado, L. & Carvalho, I. 2008. Uberabatitan riberoi, a new titanosaur from the Marília Formation (Bauru Group, Upper Creaceous), Minas Gerais, Brazil. Paleontology,51, 881-901. https://doi.org/10.1111/j.1475-4983.2008.00781.x

Salgado, L., Coria, R. A., Calvo, J. O., 1997. Evolution of titanosaurid sauropods. I: Phylogenetic analysis based on the postcranial evidence. Ameghiniana, 34, 3-32.

Santucci, R. M. & Arruda-Campos, A. C. 2011. A new sauropod (Macronaria, Titanosauria) from the Adamantina Formation, Bauru Group, Upper Cretaceous of Brazil and the phylogenetic relationships of Aeolosaurini. Zootaxa, 3085, 1-33. https://doi.org/10.11646/zootaxa.3085.1.1

Seeley, H. G. 1888. The classification of the Dinosauria. Report of the British Association for the Advancement of Science, 1887, 698–699.

Silva Junior, J. C. G., Martinelli, A. G., Ribeiro, L. C. B. & Marinho, T. S. 2017. Description of a juvenile titanosaurian dinosaur from the Upper Cretaceous of Brazil. Cretaceous Research, 76, 19–27. https://doi.org/10.1016/j.cretres.2017.03.029

Simbras, F. M., Souza, L. C. A., Machado, R., Alves, M. C., Lopes, W. H., Santos, J. C. V. & Muniz, F. P. 2013. Bones out the Cerrado: new dinosaur exploratory frontier in Goiás State. In: 1º Simpósio Brasileiro de Dinossauros, Ituiutaba, Abstract Book.

Soares, M. V. T., Basilici, G., Lorenzoni, P., Colombera, L., Mountney, N. P., Martinelli, A. G., Marconato, A. 2020. Landscape and depositional controls on palaeosols of a distributive fluvial system (Upper Cretaceous, Brazil). Sedimentary Geology, 410, 105774. https://doi.org/10.1016/j.sedgeo.2020.105774

Soares, P. C., Landim, P. M. B., Fulfaro, V. J. & Sobreiro Neto, A. F. 1980. Ensaio de caracterização do Cretáceo no Estado de São Paulo. Revista Brasileira de Geociências, 10, 177-185.

Ullmann, P. V. & Lacovara, K. J. 2016. Appendicular osteology of Dreadnoughtus schrani, a giant titanosaurian (Sauropoda, Titanosauria) from the Upper Cretaceous of Patagonia, Argentina. Journal of Vertebrate Paleontology, 36, e1225303. https://doi.org/10.1080/02724634.2016.1225303

Wilson, J. A. & Sereno, P. C. 1998. Early evolution and higher-level phylogeny of sauropod dinosaurs. Society of Vertebrate Paleontology Memory, 5, 1–68 (supplement to Journal of Vertebrate Paleontology 18). https://doi.org/10.1080/02724634.1998.10011115

Wilson, J. A. & Upchurch, P. 2009. Redescription and reassessment of the phylogenetic affinities of Euhelopus zdanskyi (Dinosauria: Sauropoda) from the Early Cretaceous of China. Journal of Systematic Palaeontology, 7, 199–239. https://doi.org/10.1017/S1477201908002691

Wilson, J. A. 2002. Sauropod dinosaur phylogeny: critique and cladistic Geologia analysis. Zoological Journal of the Linnaean Society, 136, 217-276. https://doi.org/10.1046/j.1096-3642.2002.00029.x

Xu, X., Zhang, X., Tan, Q., Zhao, X. & Tan, L. 2006. A new titanosaurian sauropod from Late Cretaceous of Nei Mongol, China. Acta Geologica Sinica, 80, 20–26. https://doi.org/10.1111/j.1755-6724.2006.tb00790.x

Zaher, H., Pol, D., Carvalho, A. B., Riccomini, C., Campos, D. A. & Nava, W. R. 2006. Redescription of Mariliasuchus amarali, and its phylogenetic affinities (Crocodyliformes, Mesoeucrocodylia). American Museum Novitates, 3512, 1–40.