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Discussion about the occurrence of the genus *Aeolosaurus* Powell 1987 (Dinosauria, Titanosauria) in the Upper Cretaceous of Brazil

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ABSTRACT
The records of Cretaceous Brazilian titanosaurs assigned to the Patagonian genus *Aeolosaurus* Powell (Dinosauria, Sauropoda, Titanosauria) are discussed. The fragmentary and isolated nature of many of the specimens and the incomplete knowledge of the diversity and phylogenetic relationships of Brazilian titanosaurs generate uncertainty regarding the taxonomic assignments. Revision of the Brazilian specimens attributed to *Aeolosaurus* suggests that there are no characters indicating the presence of this Patagonian genus in the Late Cretaceous of Brazil. The conclusion that the relationships of these specimens were incorrectly recognized, points out that better taxonomic procedures, using consistent data, such as the presence of well-defined apomorphies, are needed for correct taxonomic designations, paleogeographic and paleobiostratigraphic inferences and the proposal of biochrons.

Key words: Titanosauria, Aeolosaurini, *Aeolosaurus*, Late Cretaceous, Bauru Group, Brazil.

RESUMO
DISCUSSÕES SOBRE A PRESENÇA DO GÊNERO *AEOLOSAURUS* POWELL 1987 (DINOSAURIA, TITANOSAURIA) NO CRETÁCEO SUPERIOR DO BRASIL. O registro de titanossauros no Cretáceo do Brasil, associado ao gênero patagônico *Aeolosaurus* Powell (Dinosauria, Sauropoda, Titanosauria), é discutido. A natureza fragmentária e isolada de muitos dos materiais estudados e o conhecimento ainda incipiente da real diversidade e das relações filogenéticas dos titanossauros brasileiros tem gerado incertezas nas afinidades taxonômicas propostas. A revisão dos espécimes brasileiros atribuídos a *Aeolosaurus* sugere que não há caracteres para sustentar a ocorrência deste gênero patagônico no Cretáceo do Brasil. A constatação de que estes materiais isolados e fragmentários foram inadequadamente reconhecidos em suas relações alerta para a necessidade de procedimentos taxonômicos mais adequados. Para tanto, identificações bem fundamentadas, por exemplo, na presença de apomorfias, é indispensável para a correta designação taxonômica, e as consequentes inferências paleobiogeográficas, paleobiostratigráficas e no estabelecimento de biócronos.

Palavras-chave: Titanosauria, Aeolosaurini, *Aeolosaurus*, Cretáceo Superior, Grupo Bauru, Brasil.

INTRODUCTION

Titanosaur sauropods are the most common dinosaur group recorded in post-Cenomanian Cretaceous continental beds of southeast Brazil (e.g., Kellner and Azevedo, 1999; Kellner and Campos, 1999, 2000; Santucci and Bertini, 2001; Kellner *et al.*, 2005, 2006; Salgado and Carvalho, 2008; Bittencourt and Langer, 2011). To date, six valid species have been recognized: *Gondwanatitan faustoi* Kellner and Azevedo, 1999; *Baurutitan britoi* Kellner *et al.*, 2005; *Trigonosaurus pricei* Campos *et al.*, 2005; *Adamantisaurus mezzalirai* Santucci and Bertini, 2006; *Maxakalisaurus topai* Kellner *et al.*, 2006; *Uberabatitan ribeiroi* Salgado and Carvalho, 2008; and *Tapuiasaurus macedoi* Zaher *et al.*, 2011. The first five taxa come from the Bauru Group and the latter from the Sanfranciscana Basin. In addition to these valid species, there are taxa that have been shown to be *nomina dubia*, such as *Antarctosaurus brasiliensis* (Arid and Vizotto, 1971; Kellner and Campos, 2000; Upchurch *et al.*, 2004), taxa whose validity remains to be demonstrated, such as the Brazilian records of the Patagonian genus *Aeolosaurus* (Bertini *et al.*, 1999, 2000; Santucci and Bertini, 2001; Candeiro *et al.*, 2006; Candeiro, 2010), and many isolated, fragmentary bones and teeth attributed to titanosaurs (e.g., Huene, 1931; Kellner and Campos, 2000; Bertini *et al.*, 2001; Santucci and Bertini, 2001; Almeida *et al.*, 2004; Lopes and Buchmann, 2008; Santucci, 2008; Bittencourt and Langer, 2011).

In this note, we analyze the records of Brazilian titanosaurs assigned to the genus *Aeolosaurus* (see Table 1) and concomitantly used in paleobiogeographic interpretations. Our conclusions suggest that at present there are no unequivocal records of the Patagonian genus *Aeolosaurus* in the Upper Cretaceous of Brazil.

Institutional abbreviations: CPP, Centro de Pesquisas Paleontológicas Llewellyn Ivor Price, Peirópolis, Uberaba, Minas Gerais; LGP-D, Laboratório de Geologia e Paleontologia, Fundação Universidade Federal do Rio Grande, Rio Grande; MACN-PV-RN, Museo Argentino de Ciencias Naturales "Bernardino Rivadavia", Paleontología de Vertebrados (Colección Río Negro), Buenos Aires; MJG-R, Museo Jorge Gerold, Ingeniero Jacobacci, Río Negro; MMR/UFU-PV, Museu de Minerais e Rochas, Universidade Federal de Uberlândia, Uberlândia, Minas Gerais; MN, Museu Nacional, Rio de Janeiro; MPCA, Museo Provincial Carlos Ameghino, Cipolletti, Río Negro; MPMA, Museu de Paleontología, Centro Cultural, Monte Alto, São Paulo; UFRG-DG, Departamento de Geologia, Universidade Federal do Rio de Janeiro (Coleção de Répteis), Rio de Janeiro; UNPSJB-PV, Universidad Nacional de la Patagonia San Juan Bosco (Paleontología de Vertebrados), Comodoro Rivadavia, Chubut.

HISTORY OF THE GENUS *AEOLOSAURUS*

Aeolosaurus rionegrinus (Type species) was described in the doctoral thesis of J. Powell (1986), but it first appeared in a published paper the following year (Powell, 1987, p. 148). Although some have referred erroneously to the formal publication of Powell's thesis in 2003 as the publication date for *Aeolosaurus* (e.g., Candeiro, 2010), Powell (1987) is the correct reference. The type material of *Aeolosaurus rionegrinus* (MJG-R 1) consists of seven anterior caudal vertebrae, right and left incomplete scapulae; right and left humeri, radius and ulna, right and left ischia, five metacarpals, right fibula and tibia, astragalus, and indeterminate fragments, which comes from the Upper Cretaceous of the Angostura Colorada Formation, from the Casa de Piedra locality, Estancia Maquinchao, Río Negro Province (Patagonia, Argentina) (Powell, 1987). Later, *A. rionegrinus*? was reported from the Los Alamitos Formation (MACN-PV-RN 147, Powell, 1987); this specimen was subsequently excluded from the genus (Salgado and Coria, 1993, p. 127). More recently, material of *Aeolosaurus* sp. was reported from the Los Alamitos (MPCA 27100; Salgado *et al.*, 1997) and Allen formations (MPCA 27174-27177; Salgado and Coria, 1993). Recently, a new species, *A. colhuehuapensis* Casal, Martínez, Luna, Sciutto and Lamanna, 2007, was described, based on a series of articulated caudal vertebrae (UNPSJB-PV 959/1-27) coming from the upper member of the Bajo Barreal Formation, from an island in Lake Colhué Huapi, Chubut Province (Casal *et al.*, 2007). It is noteworthy that the material from the Allen Formation assigned to *Aeolosaurus* sp. (Salgado and Coria, 1993) lacks the autapomorphy of the genus *Aeolosaurus sensu* Casal *et al.* (2007, p. 55): the positioning of the postzygapophyses anterior to the level of the anterior edge of the vertebral body in the middle caudal. Therefore, a revision of this material is warranted in order to corroborate the taxonomic assignation.

The first records of *Aeolosaurus* outside of Patagonia were published by Santucci and Bertini (2001, see also the abstracts of Bertini *et al.*, 1999a,b, 2000), based on material from the Bauru Group, southeastern Brazil. This, and other sparse records of the genus (Candeiro *et al.*, 2006; Lopes and Buchmann, 2008), were used as paleobiogeographic and biostratigraphic indicators (e.g., Santucci and Bertini, 2001; Candeiro, 2006, 2010; Candeiro *et al.*, 2006). In our view, the fragmentary and isolated nature of most studied materials and the still sparse knowledge of the diversity and phylogenetic relationships of Brazilian titanosaurs generate uncertainty in the taxonomy of the specimens with these characteristics. Therefore, the inferences on biostratigraphy and paleobiogeographic should be based on well-established taxonomic assignments.

DISCUSSION OF *AEOLOSAURUS* RECORDS IN BRAZIL

We discuss the Brazilian record of *Aeolosaurus* according to the publication date.

Records in Monte Alto, Álvares Machado, and Peirópolis sites (Santucci and Bertini, 2001): referring to

the first records of *Aeolosaurus* in Brazil and based on material coming from levels of the Bauru Group at three different localities. They include: (i) an unnumbered specimen at the MPMA consisting of two cervical vertebrae, six articulated antero-medial caudal vertebrae (Figure 1A), and two postero-medial caudal vertebrae, fragments of ribs, humerus, and both femora, belonging to a single individual, from Monte Alto county, São Paulo State (Bertini *et al.*, 1999a); (ii) CPP 248 (Figure 1B), consisting of a middle caudal vertebra from the Peirópolis locality, Uberaba county, Minas Gerais State (this material was erroneously published as CPP 298 by Santucci and Bertini, 2001); (iii) CPP 297, consisting of an isolated osteoderm also from Peirópolis locality; (iv) MN 4111-V, holotype specimen of *Gondwanatitan faustoi* from Álvares Machado county, São Paulo State (Kellner and Azevedo, 1999) which the authors considered to be a species of *Aeolosaurus* (see also Bertini *et al.*, 2000).

(i) MPMA/without number: the Monte Alto specimen is the most complete Brazilian specimen assigned to *Aeolosaurus*, but only the caudal elements have been described to date. This specimen shares with other aeolosaurines (*sensu* Franco-Rosas *et al.*, 2004) the following features: antero-dorsal margin of caudal centrum anteriorly tilted, the neural arch placed on the anterior half of the centrum, neural spine anteriorly inclined (but the inclination is less than in the Patagonian species), and large prezygapophyses (but the length is relatively shorter than in the Patagonia species). Casal *et al.* (2007) emended the diagnosis of the genus *Aeolosaurus* and established as an autapomorphy the position of the postzygapophyses, placed anteriorly to the level of the anterior edge of the vertebral body in the middle caudals (see Casal *et al.*, 2007, Figures 6A-C). This autapomorphy is absent on the Monte Alto specimen (Figure 1A). In all the available caudals from the Monte Alto specimen, the postzygapophyses are placed much more posteriorly with respect to the anterior vertebral body edge (Santucci and Bertini, 2001, Figure 2A). This condition is clearly different from that observed in *Aeolosaurus* species from Patagonia and closely similar to condition observed in other Brazilian titanosaurs such as *Gondwanatitan faustoi* (Kellner and Azevedo, 1999), *Trigonosaurus pricei* (Campos *et al.*, 2005) and *Uberabasuchus ribeiroi* (Salgado and Carvalho, 2008) (Figures 2E-G). In addition, the Monte Alto specimen has less inclined neural spines, and the projections of prezygapophyses are relatively smaller than in other aeolosaurines. Also, as it was stated by Santucci (2002), the Monte Alto femur is about 45% larger than that of the Patagonian *Aeolosaurus*. Based on these comparisons, at present, it is more conservative to consider the material of Monte Alto as Aeolosaurini indet. Furthermore, possible affinities with *Gondwanatitan faustoi* and *Trigonosaurus pricei* should not be dismissed. A better understanding of the phylogenetic relationships of Brazilian titanosaurs and the analysis of all available material will be necessary to establish taxonomic determinations;

(ii) CPP 248: The isolated middle caudal vertebra (Figure 1B) assigned to *Aeolosaurus* has all the diagnostic features of the clade Aeolosaurini (Franco-Rosas *et al.*, 2004), including: anterodorsal margin of centrum anteriorly tilted, neural arch placed on the anterior half of the centrum, neural spine anteriorly inclined, large prezygapophyses, and anteroposteriorly large prezygapophyseal and postzygapophyseal facets. As it was already mentioned, the anterior position of the postzygapophyses with regard to the anterior edge of the caudal body (Casal *et al.*, 2007) is absent in CPP 248. As it can be observed in CPP 248 and in *Gondwanatitan* (Kellner and Azevedo, 1999, Figure 12), the postzygapophyses are placed posterior to the anterior border of the centrum, so differing from *A. rionegrinus* and *A. colhuehuapensis* (Figures 2A-B). Also, CPP 248 differs from the Patagonian *Aeolosaurus* species in the shape, size and orientation of the postzygapophyses. The isolated vertebra CPP 248 is difficult to analyze considering that only caudal features

Figure 1. Aeolosaurini indet. from the Upper Cretaceous of Brazil. **A.** MPMA\without number, 4º- 9º caudal vertebrae from Monte Alto (São Paulo State) in right lateral view; **B.** CPP 248, isolated middle caudal vertebra from Peiropólis in right lateral view (Minas Gerais State); **C.** LGP-D003, middle caudal centrum from Veríssimo (Minas Gerais State) in right and left views. Scale equals 5 cm.

are paradigmatic to diagnose the clade. For example, the assignment of isolated material from the Cambambe Formation (Mato Grosso State) to *Gondwanatitan* was possible due to the presence of postcranial material other than caudals (e.g., tibia; see Franco-Rosas *et al.*, 2004). Consequently, and based on the absence of the autapomorphy of *Aeolosaurus* species (Casal *et al.*, 2007), CPP 248 is here considered as Aeolosaurini indet., without dismissing possible affinities with the Brazilian genus *Gondwanatitan;*

(iii) CPP 297: The isolated osteoderm assigned with doubt to *Aeolosaurus* by Santucci and Bertini (2001) was described and compared in detail by Marinho and Candeiro (2005; see also Azevedo and Kellner, 1998) who concluded that it could be considered only as Titanosauria gen. et sp. indet. Recently, Calvo and Porfiri (2010, p. 110) also concluded that assignment of this osteoderm to the Patagonian taxon is uncertain.

(iv) *Gondwanatitan*: Despite the proposed synonymy of the genus *Gondwanatitan* with *Aeolosaurus*, it has not been accepted or used subsequently (e.g., Franco-Rosas *et al.*, 2004; Santucci and Bertini, 2006; Casal *et al.*, 2007; Santucci, 2005, 2008; Salgado and Carvalho, 2008; Calvo and Porfiri, 2010) and the autapomorphies observed by Kellner and Azevedo (1999) justify its taxonomic validity.

Records in Prata County (Candeiro *et al.*, 2006): Goldberg *et al.* (1995) first mentioned fossils in the region of Boa Vista Hill, Prata County (Minas Gerais State). Subsequently, two different teams excavated the same small site: the National Museum, RJ (Henriques *et al.*, 2002; Kellner *et al.* 2006) and the UFRJ/UFU (Almeida *et al.*, 2004; Candeiro *et al.*, 2006). Among the published results, Kellner *et al.* (2006) described the titanosaur *Maxakalisaurus topai* (MN 5013-V) based on several portions of the skeleton.

On the other hand, Almeida *et al.* (2004) described as Titanosauridae indet. an isolated posterior caudal vertebra and a partial chevron (UFRJ DG 270 R) emphasizing its affinity with the genera *Aeolosaurus* and *Gondwanatitan*. Later, Candeiro *et al.* (2006) referred this specimen (UFRJ DG 270 R) to *Aeolosaurus* sp. without further details or anatomical information. This specimen (Almeida *et al.*, 2004, Figure 2; Candeiro *et al.*, 2006, Figure 5) has the same morphology of the holotypic caudal vertebra of *M. topai* (Kellner *et al.*, 2006, Figure 15A). The comparison of both materials is shown in Figure 3. Based on the fact that they come from the same stratigraphic level and small outcrop and are almost indistinguishable anatomically, it is suggested with confidence that UFRJ DG 270 R is actually part of the holotype of *M. topai*. The subtle differences between the two vertebrae are attributable to positional variation along the tail and preservation. In addition, the autapomorphies of the genus *Aeolosaurus* could not be evaluated in the isolated distal caudal UFRJ DG 270 R and heart-shaped anterior articular surface is of limited taxonomic value because it occurs in different titanosaurid taxa (e.g., Salgado and García, 2002). Thus, this record of *Aeolosaurus* in the region of Prata (Minas Gerais State) should not be considered at all.

It is also noteworthy that a partial caudal vertebra MMR/UFU-PV 0001 (Candeiro *et al.,* 2006, Figure 4G) and other isolated bones, all coming from the same site, that were considered as Titanosauria indet. could belong to *M. topai* (Kellner *et al.*, 2006), based on the considerations given above.

Record in Veríssimo County (Lopes and Buchmann, 2008): referring to a very fragmentary material described from the region of Veríssimo (Minas Gerais State), from the Serra da Galga Member, Marília Formation, as cf. *Aeolosaurus* sp. The fossiliferous level was originally interpreted as the Echaporã Member by Lopes and Buchmann (2008), but new geological observations made by one of us (RPL) suggest that the quarry where the specimen from Veríssimo was found can be correlated with the Serra da Galga Member. The authors arrived at this taxonomic assignment of the bones based on the fact that one of the caudal centra (LGP-D0003; Figure 1C) has a lateral depression similar to those of the Patagonian *Aeolosaurus* species and *Rinconsaurus caudamirus*, and differing from the conditions of the Brazilian taxa *Gowdwanatitan*, *Trigono-*

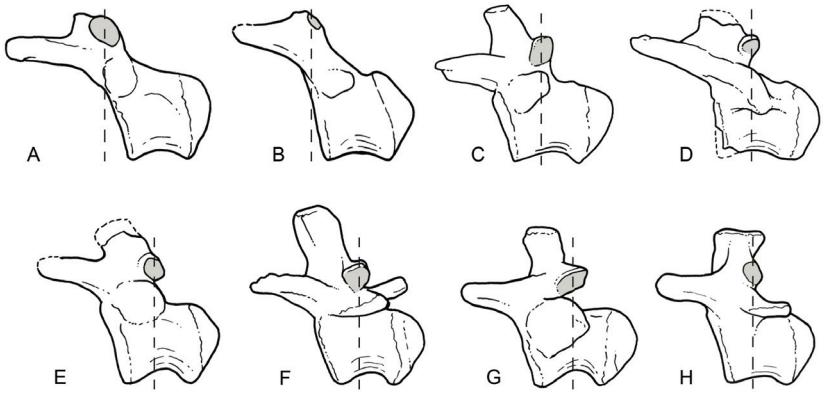

Figure 2. Comparisons of middle caudal vertebrae among some titanosaurs showing the position of the postzygapophysis with regard to the centrum in right lateral view. **A.** *Aeolosaurus rionegrinus* (modified from Powell, 2003); **B.** *A. colhuehuapensis* (modified from Casal *et al.*, 2007); **C.** Aeolosaurini CPP 248; **D.** Aeolosaurini MPMA\without number; **E.** *Gondwanatitan faustoi* (modified from Kellner and Azevedo, 1999); **F.** *Trigonosaurus pricei* (modified from Campos *et al.*, 2005); **G.** *Uberabatitan ribeiroi* (modified from Salgado and Carvalho, 2008); **H.** *Baurutitan britoi* (modified from Kellner *et al.*, 2005). Not in scale. Grey tone indicates postzygapophysis.

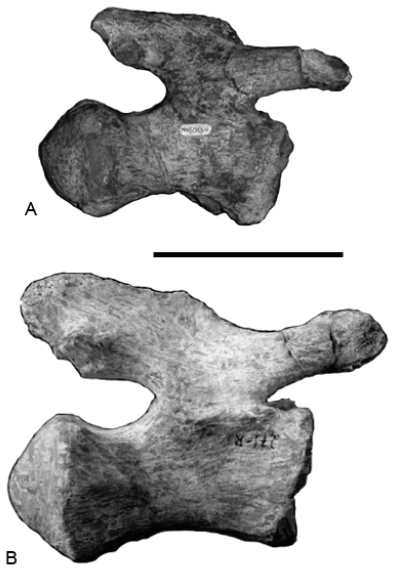

Figure 3. A. Holotype MN 5013-V *Maxakalisaurus topai*, caudal vertebra 15(?) in right lateral view (modified from Kellner *et al.*, 2006). **B.** UFRJ-DG 270-R, caudal vertebra in right lateral view (modified from Almeida *et al.*, 2004). This vertebra was originally considered to be Titanosauridae indet. (Almeida *et al.*, 2004) but later considered to be *Aeolosaurus* sp. (e.g., Candeiro *et al.*, 2006; Candeiro, 2010). Both specimens come from the same stratigraphic level and small site at Prata locality. UFRJ-DG 270-R is here considered as belonging to *M. topai*. Scales: 10 cm.

saurus, and *Baurutitan*. Other postcranial material is too poorly preserved to contribute to taxonomic identification at the generic level (Lopes and Buchmann, 2008).

Re-examination of the specimen suggests that the depth of the depression appear to be, at least in part, an artifact of preservation. On the left side, the depression is similar to the concave surface that occurs beneath the transverse process in anterior and middle caudal vertebrae of other titanosaurs (*sensu* Calvo *et al.*, 2007). In this region, the layer of periosteum is broken off and it is possible to observe the spongy internal tissue. On the right surface, the depression is deeper and the spongy tissue is not seen (Figure 1C). Thus, it may be an effect produced during its preparation. Due to the disparate conditions on both sides of LGP-D003, this feature should be used with caution. Besides, the characters mentioned by Lopes and Buchmann (2008), as in other aeolosaurins, the antero-dorsal margin of centrum is anteriorly inclined and the neural arch is placed on the anterior half of the centrum. Based on the extremely fragmentary nature of the material discovered at Veríssimo, it is more prudent to consider this record as Aeolosaurini indet.

Brazilian *Aeolosaurus* records discussed by Candeiro (2010): the last revision of *Aeolosaurus* records from South America by Candeiro (2010) omitted such relevant data such as the pioneering work of Santucci and Bertini (2001; see above), misinterpreted most Brazilian records, and several references are erroneously cited.

The author (Candeiro, 2010, p. 247) claimed that Bertini *et al.* (2000) mentioned *Aeolosaurus* sp. from Peirópolis as consisting of two caudal vertebrae under the number "CPP 374". This information is incorrect because Bertini *et al.* (2000) mentioned only one vertebra from the Serra de la Galga Member, Marília Formation (i.e., Peirópolis), that corresponds to, although not explicit in the abstract, specimen CPP 248 (this specimen is mentioned by Bertini *et al.*, 1999b; Santucci and Bertini, 2001). Instead, "CPP 374" is the specimen number of an isolated theropod tooth from the Peirópolis locality (a collection number already used in Candeiro, 2007).

The specimens described by Lopes and Buchmann (2008) herein discussed are cited erroneously by Candeiro (2010, p. 247) as coming from Peirópolis site (Uberaba County). In fact they come from the Marília Formation, at

Table 1. Specimens assigned to the Patagonian genus *Aeolosaurus* in the Upper Cretaceous of Brazil and the new taxonomic assignments proposed.

Specimen	Material	Locality	Formation (Fm.)	Age	Previous Taxonomy	Taxonomy proposed here
MPMA/without number	4th-9th caudal vertebrae and two posterior caudals	Monte Alto, São Paulo	Upper section Adamantina Fm.	Upper Cretaceous (Campanian)	*Aeolosaurus* sp. (Santucci and Bertini, 2001)	Aeolosaurini indet.
CPP 248	Middle caudal vertebra	Peirópolis, Minas Gerais	Serra da Galga Member, Marília Fm.	Upper Cretaceous (Maastrichtian)	*Aeolosaurus* sp. (Santucci and Bertini, 2001)	Aeolosaurini indet.
CPP 297	Osteoderm	Peirópolis, Minas Gerais	Serra da Galga Member, Marília Fm.	Upper Cretaceous (Maastrichtian)	Tentatively *Aeolosaurus* sp. (Santucci and Bertini, 2001)	Titanosauria indet. (Marinho and Candeiro, 2005)
MN 4111-V	Holotype *Gondwanatitan* (see Kellner and Azevedo, 1999)	Álvares Machado, São Paulo	Adamantina Fm.	Upper Cretaceous (Campanian)	*Aeolosaurus faustoi* (Santucci and Bertini, 2001)	*Gondwanatitan faustoi* (following previous authors; see text)
UFRJ DG 270 R	Posterior caudal vertebra	Boa Vista Hill, Prata, Minas Gerais	Adamantina Fm.	Upper Cretaceous (Campanian)	*Aeolosaurus* indet. (Candeiro *et al.*, 2006)	*Maxakalisaurus topai* (Kellner *et al.*, 2006)
LGP-D0001-5	Coracoid, phalanx?, two caudal centra, tibia	Veríssimo, Minas Gerais	Serra da Galga Member, Marília Fm.	Upper Cretaceous (Maastrichtian)	cf. *Aeolosaurus* sp. (Lopes and Buchmann, 2008)	Aeolosaurini indet.

Veríssimo County (see above). Therefore, the geographic locality and associated fauna provided is incorrect.

Candeiro (2010, p. 247) incorrectly cited the specimen MN 381 as *Gondwanatitan faustoi*. The holotype of *G. faustoi* is specimen MN 4111-V (Kellner and Azevedo, 1999). According to the database of the Museu Nacional (Rio de Janeiro), MN 381 corresponds to a rib of the extinct ground sloth *Eremotherium* (Mammalia, Xenarthra).

Finally, Candeiro (2010, p. 247) cited the specimens MPMA 427 and MPMA 477 from São Paulo State as studied by Santucci (2002) and referred as *Aeolosaurus* sp. In Santucci (2002), he did not mention these specimens at all. The only material assigned to *Aeolosaurus* sp. by Santucci (2002) is the same as published in Santucci and Bertini (2001). The origin of these numbers (there is no reference of them in the MPMA) is not known for us and, therefore, the associated information (material, provenance, and associated fauna) is doubtful.

CONCLUSIONS

In this note, the difficulty of carrying out taxonomic determinations to the generic and specific levels based solely on poorly preserved and isolated material is emphasized. Therefore, records of new genera or species from remote areas and their indiscriminate use for paleobiogeographic and paleobiostratigraphic inferences and the establishment of biochron should be made and treated with caution. The recognition of similarities between Brazilian and Argentinean titanosaurs is unarguable, and widely recognized in the analyses made in recent years (e.g., Kellner and Campos, 1999, 2000; Santucci and Bertini, 2001; Franco-Rosas *et al.*, 2004, Kellner *et al.,* 2006; Salgado and Carvalho, 2008; Bittencourt and Langer, 2011); however, we contend that at present there is no conclusive data to support the presence of *Aeolosaurus* in the Upper Cretaceous of Brazil. Thus, the Brazilian specimens previously assigned to *Aeolosaurus* are removed, and considered as Aeolosaurini indet. (see Table 1), with possible affinities with other Brazilian genera (e.g., *Gondwanatitan*, *Trigonosaurus*, *Uberabatitan*).

The recognized clade Aeolosaurini of Franco-Rosas *et al.* (2004) defined as the inclusive group comprising *Aeolosaurus rionegrinus* and *Gondwanatitan faustoi* but not *Saltasaurus loricatus* nor *Opisthocoelicaudia skarzynskii* (Franco-Rosas *et al.*, 2004, p. 332) brings together a series of formally named taxa (e.g., *Gondwanatitan faustoi*, *Aeolosaurus rionegrinus*, *A. colhuehuapensis*) and material assigned to this group, typical of the Upper Cretaceous of South America. Nonetheless, the composition of the clade Aeolosaurini is still controversial (see Calvo and Porfiri, 2010 regarding the inclusion of *Rinconsaurus*) and new material and detailed phylogenetic analysis are needed. Aeolosaurini is a group to date only recovered in the Upper Cretaceous of South America (Brazil and Argentina). New proposals on Brazilians titanosaur phylogenies will also be necessary to know the topology of the characters commonly used to assign the fragmentary remains to established taxa. The Brazilian and Argentine taxa included within the Aeolosaurini emphasize the similarity between the both regions during the Late Cretaceous, but there is no unambiguous evidence to support the presence of *Aeolosaurus* in the Upper Cretaceous of Brazil.

Based on this conclusion and on the analysis of the peirosaurid (Mesoeucrocodylia) remains from Argentina which were excluded from the Brazilian taxon *Peirosaurus torminni* Price (see Martinelli *et al.*, 2010; Campos *et al.*, 2011), at present there are no genera in common between Brazil and Argentina during the Late Cretaceous. New findings and new analyses may change this hypothesis.

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