

HISTORY AND PALEONTOLOGY OF THE PONTAL DO TRIÂNGULO MINEIRO: THE FIRST FOSSIL DISCOVERIES OF THE UPPER CRETACEOUS OF MINAS GERAIS

História e Paleontologia do Pontal do Triângulo Mineiro: as primeiras descobertas de fósseis do Cretáceo Superior de Minas Gerais

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Abstract

The Pontal do Triângulo Mineiro region has been the subject of many paleontological researches due to its great fossiliferous potential as demonstrated by numerous published studies. From this perspective, we observed the necessity of reviewing the pioneer paleontological studies in this area to analyze its data and historical facts, which could corroborate the following studies on this area. This thus elucidates the importance of knowing the local Geology and Paleontology by also accessing its historical context. This method significantly contributes to the continuation of the research on Upper Cretaceous deposits of the Pontal do Triângulo Mineiro region.

Keywords: History; Paleontology; Geology; Upper Cretaceous; Pontal do Triângulo Mineiro region.

Resumo

A região do Pontal do Triângulo Mineiro tem sido objeto de estudos e pesquisas, nesse caso em específico, da Paleontologia devido ao seu grande potencial fossilífero demonstrado por meio de inúmeros trabalhos publicados até o momento. Nessa perspectiva, e observando a necessidade de recuperar os trabalhos paleontológicos pioneiros na região, analisaram-se dados e fatos históricos que pudessem demonstrar o trabalho de profissionais da área junto às suas primeiras descobertas fósseis na região. Assim, evidenciando a necessidade em se conhecer da Geologia e Paleontologia do local, nosso trabalho propõe um constante diálogo com o contexto histórico, que muito nos auxilia para o contínuo desenvolvimento da pesquisa na região, especificamente no estudo do Cretáceo Superior.

Palavras-chave: História; Paleontologia; Geologia; Cretáceo Superior; Região do Pontal do Triângulo Mineiro

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INTRODUCTION

Paleontology has been considered a relevant science for the comprehension of paleobiotas and its geological and biological legacy. Through publications of researchers and professors in the field of Paleontology, it is possible to access the History of the first discoveries of fossils in Brazil.

Here, we will specifically address this matter in the context of the Pontal do Triângulo Mineiro region. In order to better understand the region under study, it is necessary to know its geography, geology and history associated with the history of paleontological research in Brazil (CASSAB, 2004).

The Uberaba and Triângulo Mineiro regions have been known since 1940 as one of the most important areas for prospection of Brazilian Late Cretaceous fossils. Part of its fossil contents is usually found in cuts in banks along railroads and highways, as well as in excavations made in the urban area of the municipality of Uberaba. The notion of fossiliferous outcrops in these localities comes partly from the geological understanding of the region, which was first mentioned in the scientific literature by the Austrian petrographer Eugen Hussak (1856 – 1911) when he recognized the superimposed sediments of the Uberaba Formation in 1906 (ALVES; PEYERL, 2013).

In 1930, the German paleontologist Frederich von Huene (1875 – 1969) was the first to report dinosaur remains from the lower southwest regions of the Minas Gerais State, known as Pontal do Triângulo Mineiro.

The abovementioned information briefly demonstrates the subjects that will be explored and discussed here. Throughout this study we aimed at correlating the collected data, such as maps and historical documents, from different areas of knowledge. This resulted in a chronological reconstruction of the first fossil discoveries in the Pontal do Triângulo Mineiro region, and recognition of the elements that were part of this process.

Therefore, the objective of this article is to relate and compile the history of Brazilian paleontology since the first fossil discoveries at the region known as Pontal do Triângulo Mineiro which, in the past ten years, became one of the main areas for prospection of Late Cretaceous vertebrates in Brazil.

METHODOLOGY

The methodology used here focused on bibliographical survey, data collection, and interpretation of the geological maps. The manifold information on this study is the

result of a great research on historical documentary sources, and on paleontological manuscripts/publications referred here (ALBERTI, 1996).

CHARACTERISTICS OF THE PONTAL DO TRIÂNGULO MINEIRO REGION

The region called Pontal do Triângulo Mineiro covers some municipalities in the State of Minas Gerais with rather particular characteristics, being much different from the rest of the State. Its economy is based on primary production, and more recently it has been aimed to the production of derivatives of sugar cane. The municipalities of the Pontal do Triângulo Mineiro are composed of a geographic scenario traditionally based on the agriculture due its land fertility, geomorphology, geology, climate, hydrography and other factors which favors planting.

The State of Minas Gerais is located in Southeast Brazil, and it borders other important Brazilian states such as São Paulo, Goiás, and Bahia. The geography of Minas Gerais stimulates government investment and improvements in roads, which are important links to this portion of the Cerrado Mineiro. This also results on human occupation nearby these roads, creating new cities and communities.

It is worth to note that within the Pontal do Triângulo Mineiro region the most important municipality is Ituiutaba. This city has an urban infrastructure with commercial, leisure (usually with attractions typical of the country culture), health, and educational establishments, among others, which also satisfies the basic needs of the population from the surrounding regions.

The Pontal do Triângulo Mineiro region has a marked plurality of agricultural activities and cattle raising. This is evidenced by the ongoing changes of the geographic space where is common the planting of cereals such as rice (since the middle 1970s), and the production of meat and dairy products. More recently, creating a scenario of sugar cane plantations, agro-industrial mills by governmental incentives of demand national and international. All this allowed recognition and direction of the cropland areas of the Triângulo Mineiro, providing new ways for rural exploration linked with the new dictates from the beginning of the 21st century, and coinciding with soil availability, climate, terrain and facilities of mechanization offered as a whole by the lands of the Triângulo Mineiro.

The infrastructure investments on the region led, in the last few decades, to many paleontological discoveries, such as the fossils found during the construction of the inter-municipal road between Campina Verde and Gurinhatã. Other than the fossil findings, the historical background of the regional development of the Pontal do Triângulo Mineiro also

allowed the access to historical-paleontological information of fundamental importance to the local, regional and national scientific scenario. Hence, distinct aspects of the History contribute to the importance of the Pontal do Triângulo Mineiro region's Economy and Paleontology.

GEOLOGY

Today, the Bauru Group in the Pontal do Triângulo Mineiro region is only known for the outcrop of rocks in the Marília and Adamantina Formations (sensu FULFARO; BARCELOS, 1991). The Uberaba Formation outcrops in the region of the municipalities of Uberaba and Romaria (FERREIRA JUNIOR, 1996).

According to Barcelos (1984), the Adamantina Formation outcrops irregularly in the Pontal do Triângulo Mineiro region, presenting a wide geographic distribution and having great lithological diversity, whose surface can be related to meandering fluvial deposits. This surface is characterized by the presence of lenticular sand stones with crossed, small and medium stratifications associated with siltic-argilous cycles. Dias-Brito et al. (2001) assigned a Turonian-Santinian age to the Adamantina Formation due the presence of fossil ostracods.

The Marília Formation was described by Almeida & Barbosa (1953) as located at the Western São Paulo State, and later was identified as also part of the "Triângulo Mineiro" by Suguio (1973), and Barcelos (1984). The deposits of the Marília Formation in the Pontal do Triângulo Mineiro are typically represented by large and conglomerate sand stones locally presenting nodular calcretes and limestone, whereas in other areas of the Marília Formation presents slightly stony conglomeratic sediments. The levels of pure limestone are extracted for commercial purposes especially in the region of Monte Alegre de Minas. The age of the Marília Formation is considered by Dias-Brito et al. (2001) as Maastrichtian, based on its records of ostracods.

PALEONTOLOGY

The first clear mention of the Upper Cretaceous of the Triângulo Mineiro in paleontological studies dates from 1931. The paleontologist Frederich von Huene (1931) refers to remains of titanosaurid herbivorous dinosaurs found at the region known as Monte Alegre de Minas. These are the first fossils discovered in the Triângulo Mineiro region.

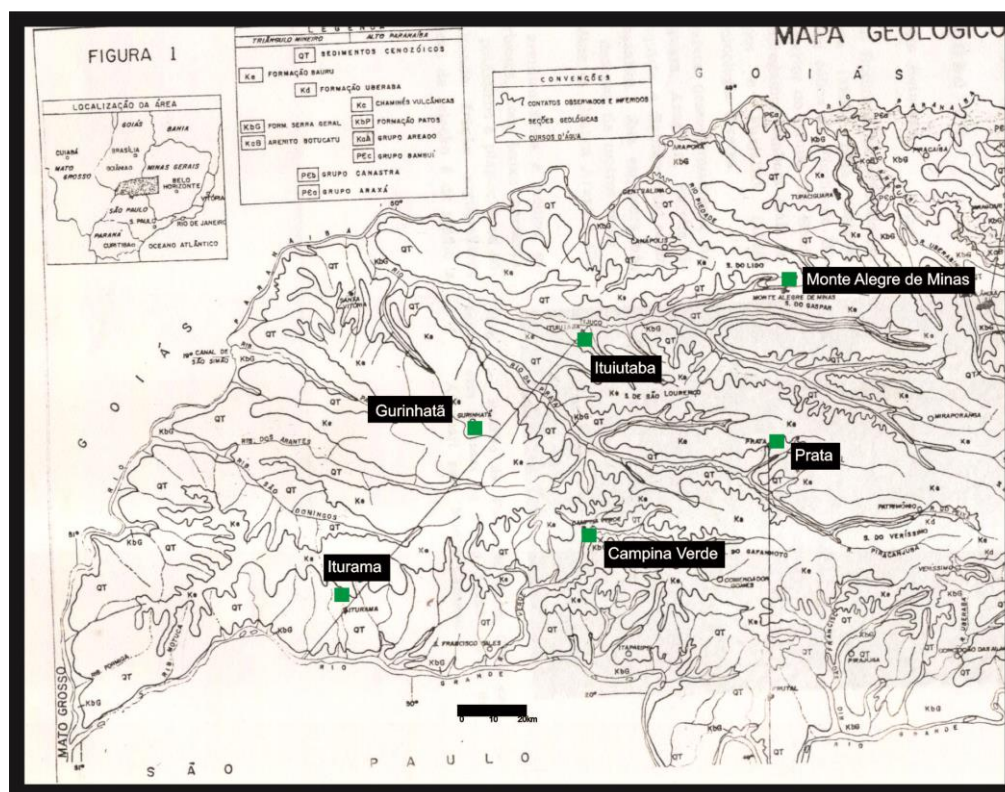
In the 17th and 18th centuries, this region used to have an Indian settlement of the Kayapo tribe by the time when the expeditions of the “bandeirantes” (explorers) arrived in the region.

These surveys evaluated geographical and geological characteristics, and according to Figueirôa (1997; p. 201), were aimed at “three lines of action, territorial demarcation, minerals for industry and supply of general services”. According to the author, during this period important studies were conducted targeting the demarcation of boundaries between the states of São Paulo and Minas Gerais. The Pontal do Triângulo Mineiro region was part of two very important areas containing mineral resources: Western São Paulo and Southwestern Goiás (known as Serra de Caldas Novas). These areas were of particular interest to the surveys conducted by the Geographic and Geological Commission of São Paulo (CGG).

From the Geological point of view, Milward (1935) was the first to refer to the great outcrop extension in the Triângulo Mineiro. By that time, these outcrops were known as the Bauru Formation even though its sediments were previously recognized as post-Uberaba, as described by Hussak (1906). Conventionally, Milward (*op cit.*) recognized the Bauru Formation as a region with characteristics of high plains and steep slopes. These rocks were eroded by fluvial regimes, thereby making possible the existence of great outcrop extensions exposed in the geographical limits of the Triângulo Mineiro, and delimited by the Rio Grande, Paranaíba and Araguari rivers.

Hasui (1969) described the occidental part of the Marília Formation – i.e. the Pontal do Triângulo Mineiro – as having rocks predominantly composed of dark brown clay, indicating short periods of erosive phases which could be interpreted as alternative floods and settling. The first geological mapping of the Bauru Group in the Pontal do Triângulo Mineiro region was made by Hasui (1969) (Figure 1). This author was the first to describe systematically the stratigraphic units outcropping in the Triângulo Mineiro region, characterizing these rocks as units of the Bauru and Uberaba Formations.

Figure 1 - First mapping of the Bauru Group in the Pontal do Triângulo Mineiro region made by Hasui (1969) (modified from Hasui *op cit.*).



From: Hasui (1969) (modified from Hasui *op cit.*).

The first fossils described by von Huene were found at the municipalities of Monte Alegre de Minas and Campina Verde, which were both emancipated from Patos in 1870 and 1938, respectively (Anuário Estatístico de Minas Gerais, 1994). This region has great potential for exploration of above-ground limestone, and limestone mining activities are still operating in the municipality of Monte Alegre de Minas.

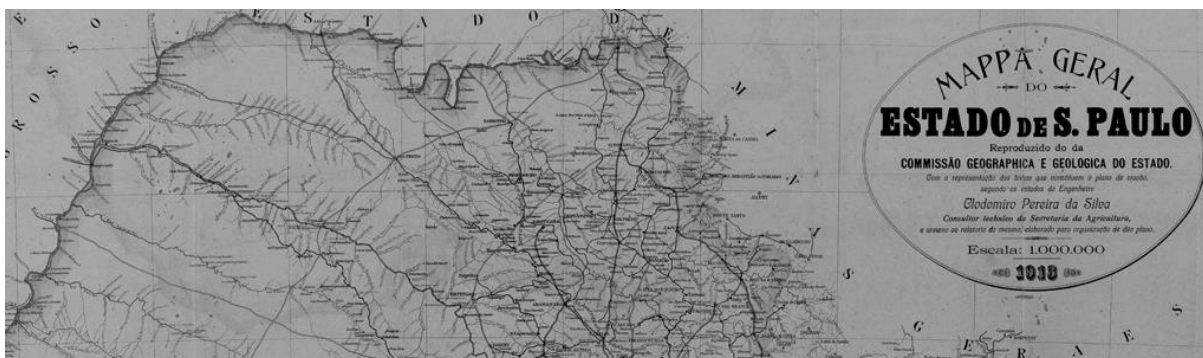
Friedrich von Huene (1931) makes a brief reference, however without making a detailed description of a femur of titanosaur dinosaur found, according to him, in São Paulo by the Geographic and Geological Commission of São Paulo. Since then, the referred material has neither been described nor photographically displayed by the following authors who cite its existence (*e.g.*, KELLNER; CAMPOS, 2000; CANDEIRO et al., 2004, 2006; CANDEIRO, 2005).

Here we wish to briefly mention the studies of the Geographic and Geological Commission of São Paulo (CGG) as important contributions for the study of the history of paleontology in Brazil.

On March 27th, 1886, the CGG was created, and “owes its appearance to the practical demands of the paulista coffee growers” (FIGUEIRÔA, 1997, p. 163). The work of the CGG “sought a line which we could classify as ‘naturalist’ with

activities covering the fields of Geology, Botany, Geography, Topography, Meteorology, Zoology and Archaeology”(FIGUEIRÔA, 1997, p.113) (Figure2), “in the attempt to produce a profile, as accurate as possible, of the paulista (São Paulo) physical resources” (FIGUEIRÔA, 1997, p. 167).

Figure 2 - General map of the São Paulo State produced by the Geographic and Geological Commission of São Paulo. São Paulo, 1913. 1 map. Scale 1.000.000.



From APESP. Fundo Instituto Histórico e Geográfico de São Paulo.

At the end of the 1920s and beginning of the 1930s, Brazil withstood numerous economical and political transformations associated with the 1929 Crisis (Collapsing of the New York Stock Market). This was followed by the coffee crisis and alteration of the political scenery with the 1930 Revolution. Therefore, many political and economic problems affected the CGG. Their recovery and organizational modifications happened in 1935 with the creation of the Department of Geography and Geology (FIGUEIRÔA, 1997, p. 122).

FINAL CONSIDERATIONS

The Pontal do Triângulo Mineiro region established itself as an important mark to the Brazilian paleontological studies of the Upper Cretaceous. Here we highlight how vicissitudes enabled the discovery of dinosaur remains in the Campina Verde and Monte Alegre de Minas regions. These findings were described by the German paleontologist Frederich von Huene during his presence at the Museu Paulista in the city of São Paulo. Once again, this emphasizes the relevant studies performed by the Geographic and Geological Commission of São Paulo, which was an active participant during the early development of natural sciences in Brazil.

The History of the Pontal do Triângulo Mineiro region can be accessed and revealed through the published studies on the Brazilian vertebrate paleontology developed during the first decades of the last century. The Brazilian paleontological researches carried

out since the “beginning of the XXI century are really products of the period of adjustments related to the emergence of a new national paleontological paradigm which requires new principles, theories, basic concepts and methodologies (...). (GHILARDI et al., 2013, p. 82).

In conclusion, the present study briefly described historical and paleontological facts which partially reveal the early paleontological studies at the Pontal do Triângulo Mineiro region, and which may contribute to future studies or to researches which are being carried out.

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