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The Devonian trilobites of Brazil: A summary

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ABSTRACT

Devonian trilobites are found in three major Paleozoic intracratonic basins of Brazil (Amazonas, Parnaíba, and Paraná). The trilobites represent the families Homalonotidae, Dalmanitidae, and Calmoniidae. The distribution of these taxa in the Brazilian territory is summarized here because of their remarkable scientific and historical importance, and a revised taxonomy and lithostratigraphy of the Devonian (Pragian – Famennian) trilobites from Brazil is presented, based on new research and recent literature. Homalonotids and dalmanitids are relatively cosmopolitan, whereas calmoniids are more endemic and seem to have been restricted to marine cold-waters of the southern hemisphere (Malvinokaffric Realm). Although the trilobites within the Brazilian intracratonic basins are approximately contemporaneous, they show various patterns of endemism and biogeographical affinities with other Malvinokaffric areas such as Bolivia, South Africa, and the Falkland (Malvinas) Islands. At family level, therefore, trilobite diversity from Brazil is comparatively low, which may indicate biogeographical filtering related to the distance and/or remoteness of the Brazilian basins from more open oceanic waters.

1. Introduction

Three large Brazilian intracratonic basins are discussed in this paper: the Amazonas Basin, located in the North; the Parnaíba Basin of the North/Northeast; and the Paraná Basin in the Southeast/South (Fig. 1). A fourth major Paleozoic basin (Solimões, in northwestern Brazil) is still poorly studied in terms of its macrofossils and therefore not included in the scope of this paper. Each of the basins contains a considerable thickness of Middle Paleozoic clastic sediments, partly exposed in extensive outcrop belts along their margins. Marine Devonian sequences are well represented in these basins and provide evidence of widespread marine transgressions across Brazil, especially during the Pragian – Frasnian. The marine invertebrate fossils discovered in these sequences include trilobites, which are restricted to the families Homalonotidae, Dalmanitidae, and Calmoniidae. The Calmoniidae is considered to be endemic to the marine cold-water, southern hemisphere Malvinokaffric Realm. The other two families are more cosmopolitan, whereas their Brazilian representatives seem to be somewhat endemic at genus or species level. The distribution of these trilobites among the Brazilian intracratonic basins is shown in Tables 1–4.

The first evidence about Devonian marine invertebrate fossils from Brazil was found during the pioneering Morgan expeditions in 1870-71, led by Charles Frederick Hartt, in the Amazonas Basin, and during the Imperial Geological Commission expeditions of 1876-77, directed by Orville Adelbert Derby. A series of publications dealing mainly with the shelly fossils collected on these expeditions were published between 1871 and 1913 (see Melo, 1988 for references). Besides Katzer (1903, 1933) and Melo (1988), only a few additional papers have been published on the Devonian invertebrate fossils from this area during the last years (see Ponciano, 2011 for references).

Devonian strata of the Parnaíba Basin were first discovered by Small (1914) near to the Pimenteira village (nowadays the city of Pimenteiras), in the State of Piauí, but were recognized as Devonian only by Caster (1948). Wilhelm Kegel subsequently collected many marine invertebrate fossils from this basin in the mid-C20th (Kegel, 1953). Subsequently, Castro (1968), Melo (1988), Carvalho et al. (1997), Fonseca (2004), Ponciano and Della Favera (2009), Fonseca and Ponciano (2011), Fernandes et al. (2012), Ponciano et al. (2010, 2012a, b), and other few papers have accorded attention to Devonian macrofossil assemblages from the Parnaíba Basin.

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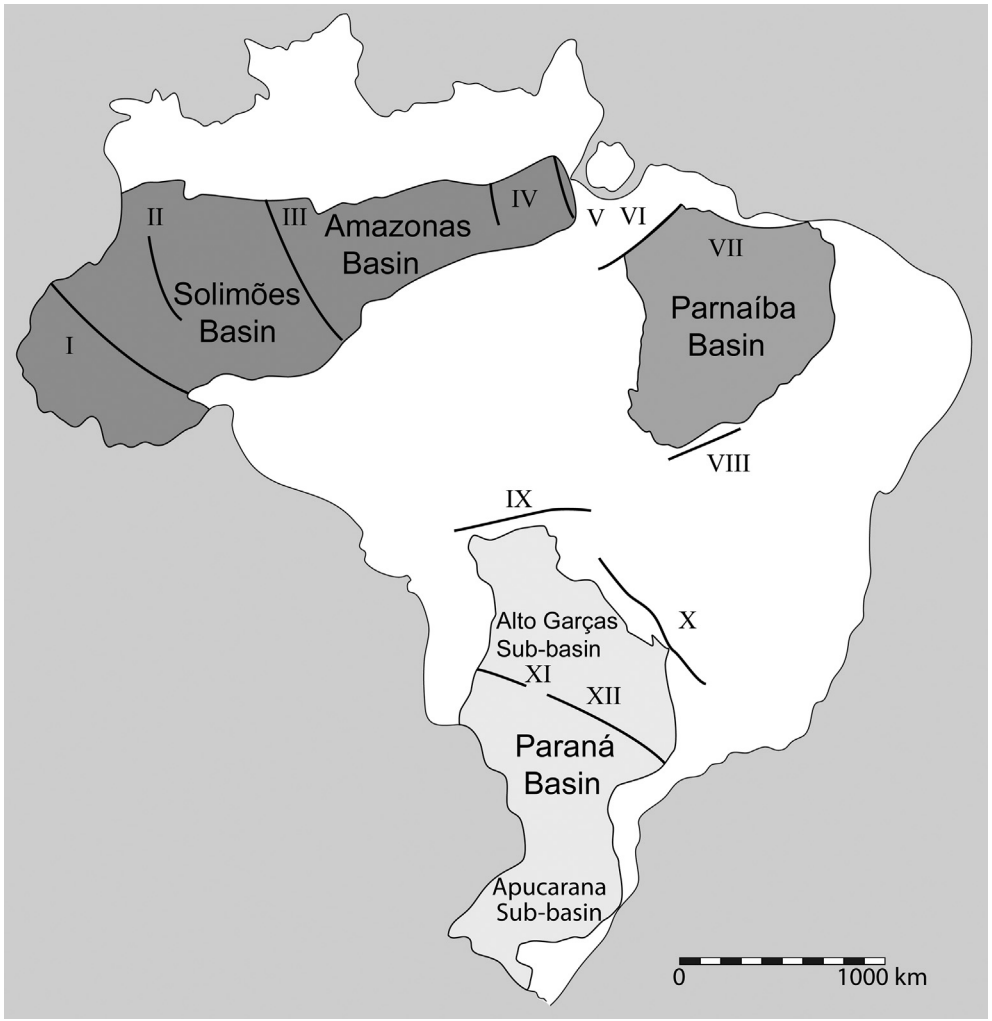

Fig. 1. Map of Brazil showing the Paleozoic basins and the tectonic structures (I-XII) that delimit them (Modified from Grahn, 1992). I. Iquitos High; II. Caruari High; III. Purus High; IV. Monte Alegre High; V. Gurupá High; VI. Tocantins High; VII. Ferres/Urbano Santos High; VIII. São Francisco High; IX. Upper Xingu High; X. Goiânia High; XI. Campo Grande High; XII. Três Lagoas High.

Table 1
Trilobites from the Amazonas Basin.

Species	Maecuru Fm.	Ererê Fm.
Homalonotidae		
Digonus derbyi	X	
Burmeisteria oiara		X
Dalmanitidae		
Amazonaspis maecurua	X	
?*Dalmanites infractus*	X	
Dalmanitidae gen. and sp. indet.	X	
Calmoniidae		
?*Acastoides menurus*	X	
Eldredgeia paituna		X
Malvinella australis	X	
?Malvinella tumiloba	X	
"Palpebrops" goeldi	X	
Phacopina braziliensis	X	
Gen. indet. *acanthurus*	X	
Vogesina gemellus	X	
Gen. indet. *galea*	X	
Gen. indet. *scirpeus*	X	
Gen. indet. *macropyge*	X	
Uncertain Family		
"*Phacops*" *pullinus*	X	

The Devonian of the Paraná Basin has been investigated in several stratigraphic, sedimentological, and paleontological studies. Derby (1878b) first recognized Devonian fossils in this basin. Clarke's (1913) monograph is a classic publication and still represents one of the most important contributions on the Devonian marine invertebrates of the Paraná Basin. Clarke (1913) recognized the distinction between austral and boreal faunas, and also associated the Brazilian fauna with the Falkland (Malvinas) Islands and South Africa, uniting them as an "Austral Fauna". Later, Richter and Richter (1942) erected the terminology "Malvinokaffric Province" for the endemic Devonian trilobites recovered from various localities in the Southern Hemisphere (Falkland/Malvinas Islands, South Africa, Brazil – State of Paraná, Ponta Grossa Region). This later became known as the "Malvinokaffric Realm" (Eldredge and Ormiston, 1979). Lieberman (1993) presented an important review of the calmoniid "*Metacryphaeus*group", which includes several Brazilian taxa. More recent studies have found evidence for an early to early late Emsian decline of the Malvinokaffric fauna in the Paraná Basin (Bosetti et al., 2012), as well as an early Givetian "Lilliput Effect" associated with the collapse of the Malvinokaffric shelly fauna (Bosetti et al., 2010) supposedly with up to 90% size reduction of surviving species, although the extent to which the trilobites were affected is unclear.