

FIRST OCCURRENCE OF A LINGULIDE (BRACHIOPODA: LINGULIDAE) AT PIAUÍ FORMATION (UPPER CARBONIFEROUS), PARNAÍBA BASIN, BRAZIL

CAROLINA ZABINI

Departamento de Geologia e Recursos Naturais, Instituto de Geociências, UNICAMP. Rua João Pandiá Calógeras, 51, Cd. Universitária, Barão Geraldo, 13083-870, Campinas, SP, Brazil. Tel. +55 19 35214576. carolinaz@ige.unicamp.br

LUIZ EDUARDO ANELLI & JULIANA DE MORAES LEME

Departamento de Geologia Sedimentar e Ambiental, Instituto de Geociências, USP. Rua do Lago, 562, Cd. Universitária, 05508-080, São Paulo, SP, Brazil. anelli@usp.br, leme@usp.br

ABSTRACT – This paper presents the first possible occurrence of *Lingularia* in the Carboniferous of the Parnaíba Basin, Brazil. In addition, an attempt to clarify the classification of lingulids of Brazil and to demonstrate that the diversity of the group can still be better known and explored in the Brazilian basins is made.

Key words: *Lingularia?*, Esperança Member, taxonomy, Lingulida.

INTRODUCTION

Lingulids (Brachiopoda: Lingulida) have been recorded in Brazil from Ordovician to Devonian and through the Carboniferous of the Parnaíba and Paraná Basins (Rathbun, 1878; Clarke, 1913; Mendes, 1961; Bigarella *et al.*, 1965; Gray, *et al.*, 1985; Melo & Boucot, 1990; Grahn & Caputo, 1992; Zabini *et al.*, 2007, 2010; Ponciano *et al.*, 2012; Zabini *et al.*, 2012, 2013; Queiroz *et al.*, 2013). The Mesozoic has only one lingulid known from the Sergipe-Alagoas Basin: *Lingularia? notialis* (Holmer & Bengtson, 2009). With the exception of the Discinoidea from the Devonian of the Paraná Basin, which have been recently redescribed (Comniskey, 2011; Zabini *et al.*, 2013), lingulids from other periods remain to be correctly diagnosed; some of these fossils are referred as “*Lingula*” or “*Orbiculoidea*” when found in Brazilian Paleozoic strata and worldwide (Holmer & Bengtson, 2009).

Fossils from Piauí Formation, Parnaíba Basin, are known since the early 1940’s and have only recently been studied in more detail (Campanha & Rocha-Campos, 1979; Anelli *et al.*, 2002, 2006, 2009, 2012). Among the microfossils described by Campanha & Rocha-Campos (1979) are foraminifers, conodonts, bryozoans, ostracods, microgastropods and microbivalves. Among the macroinvertebrates, the bivalve fauna is one of the most diverse of South American upper Paleozoic rocks (Anelli *et al.*, 2009). Gastropods, cephalopods, brachiopods, bryozoans, and trilobites are also present, but in small number (Anelli, 1999; Anelli *et al.*, 2009). Although Campanha & Rocha-Campos (1979) and Anelli *et al.* (2009) mention the occurrence of brachiopods, there is

no description or illustration of them. Therefore, we aim to describe the first occurrence of a Lingulidae in these beds.

The lingulide specimen was found at the Esperança facies, which is interpreted as deep marine (deposited in transgressive conditions), based on the taphonomic signatures of the invertebrates found (Anelli, 1999). Although the specimen was found in life position, only the ventral valve is preserved.

The fossils were collected from dolostone quarries of the Piauí Formation near the José de Freitas village, State of Piauí (Figure 1). Among 1,200 fossils collected, only one lingulide specimen was found, in beds of the Esperança Member. It is housed in the scientific collection of the Instituto de Geociências, Universidade de São Paulo (USP), under the code GP/IT 2304.

Subphylum LINGULIFORMEA Williams, Carlson,
Brunton, Holmer & Popov, 1996
Class LINGULATA Gorjanski & Popov, 1985
Order LINGULIDA Waagen, 1885
Superfamily LINGULOIDEA Menke, 1828
Family LINGULIDAE Menke, 1828

?*Lingularia* Biernat & Emig, 1993
(Figure 2)

Type-species. *Lingularia similis* Biernat & Emig, 1993.

Material. One ventral valve (GP/IT 2304).

Locality. Esperança Member, Piauí Formation, Parnaíba Basin.

Description. Ventral valve preserved as internal mold. Linguliform outline, parallel lateral sides, elongated, slightly convex. Anterior margin rounded. Maximum width at about mid-length. No external ornamentation is visible. No propareas distinguished. 1.8 cm long and 1.0 cm wide with a W/L ratio of 0.55. Visceral field of about 60% of the valve length. One pair of subtle pedicular nerve impressions observed, extending until the middle of the visceral field; apparently,

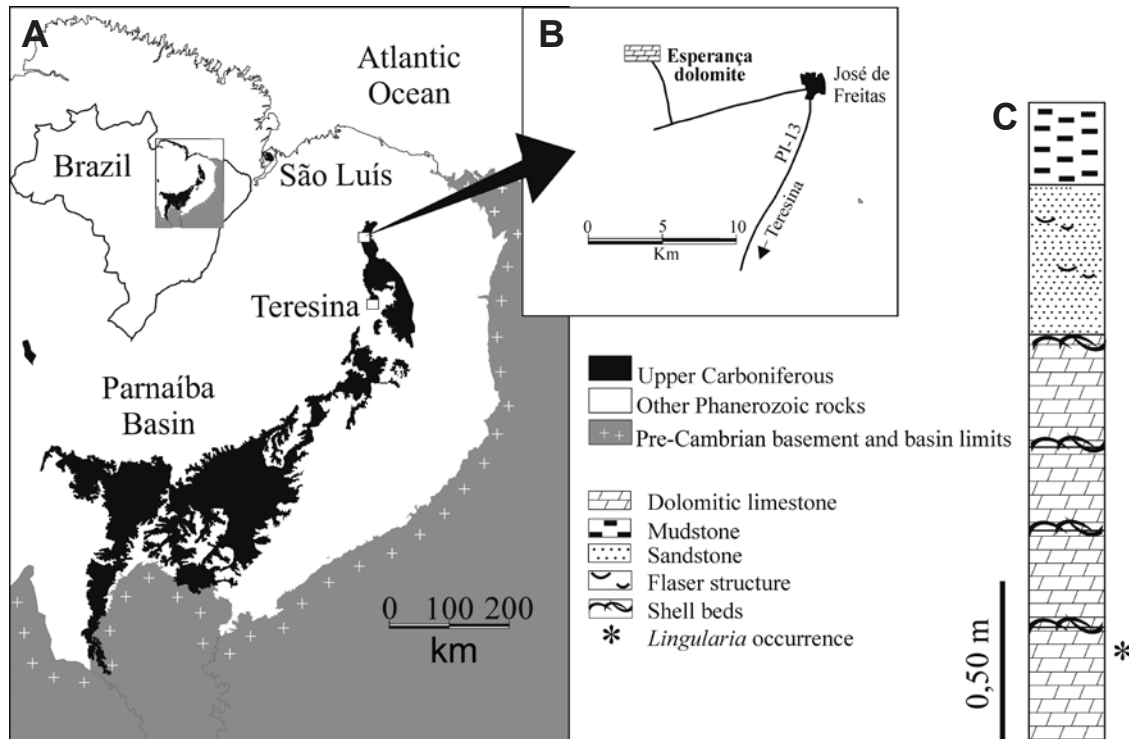


Figure 1. **A**, structural map showing the Piauí Formation (dark grey) in the Parnaíba Basin, northeastern Brazil; **B**, detail of the Esperança outcrop location; **C**, Esperança dolomite outcrop and the stratigraphical position of the *Lingularia?* sp. occurrence. Modified from Anelli *et al.* (2009).

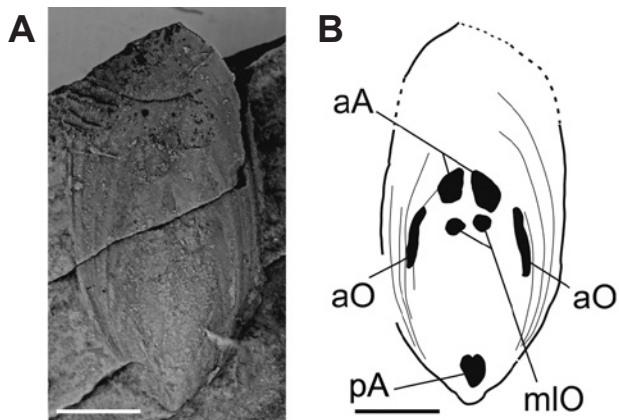


Figure 2. Specimen described in this paper and its muscle scars. **A**, ventral valve, internal mold. **B**, muscle scars based on the specimen, mirrored. **Abbreviations:** aA, anterior adductor; aO, anterior oblique; mLO, median lateral oblique; pA, posterior adductor. Scale bars = 50 mm.

they do not converge near the posterior abductor (pA). A pair of V-shaped ridges opened in low angle extend postero-laterally until the first third of the visceral area. Anterior adductor (aA) are clearly visible and placed above the mid-length of the shell (Figure 2B). Median lateral oblique (mLO) muscle scars rounded, at the center of the valve, above aA. Anterior oblique (aO) assymmetric, long and teardrop shaped. Anterior internal oblique poorly visible. Posterior internal oblique not observed. Posterior adductor (pA) scar heart-like in outline (Figure 2B).

Comparisons. The specimen is assigned to *Lingularia?* on the basis of the following attributes: linguliform shape of the

shell; W/L ratio of 0.55; pA heart-like; aO long and teardrop-shaped.. (Figure 2B). In spite of this, it cannot be assigned to *Lingularia* with certainty since only one ventral valve was recovered. Therefore, the authors choose to maintain the open nomenclature *Lingularia?* sp. Biernat & Emig, 1993 (Bengtson, 1988). More data (*i.e.* more better-preserved valves) is necessary to secure a diagnosis avoiding within-population variations and other biases (Biernat & Emig, 1993). *Apsilingula* Williams, 1977 is described as having valves thickened posteriorly and deep muscular impressions. Although our specimen shows thickened muscular impressions (aA), the posterior part of the valve is not thickened. In *Apsilingula*, the ventral visceral area extends only to midvalve. *Argentiella* Archbold, Cisterna & Sterren, 2005 differs from our specimen in having small distinct propareas and a broad median-ridge in ventral valve that is absent in our specimen. *?Barroisella* Cooper, 1942 present small but prominent propareas, also absent in this specimen. *?Barroisella* possess ventral visceral field extending only to mid-valve and the pedicle nerve possibly passing lateral to the umbonal muscle scar (pA). *Credolingula* Smirnova & Ushinskaya, 2001 differs from the valve described here in several aspects, such as the presence of plications, absent in our specimen; size of the visceral field area similar of about two-thirds of the valve length in *Credolingula* and in our specimen. Although *Credolingula* has a similar shaped pA, it is joined with external and internal oblique muscle scars. In addition, at each valve *Credolingula* has two weak plications, which are absent in our specimen. *Dignomia* Emig & Herrera, 2006 differs from our specimen mainly in having a median groove (septum internally) that extends

from the umbonal region to the anterior half of the ventral valve which is absent in our specimen. The extant *Glottidia* Dall, 1870 differs from our specimen especially on the presence of internal septa. *Langella* Mendes, 1961, has a more rounded outline, and the main differences between *Langella*, *Barroisella* are revealed when comparing the dorsal valve, which is missing in this case; nonetheless both these genera have short descriptions and there is doubt about their family position (Holmer & Popov, 2000). *Lingula* Bruguère, 1797 differs from our specimen by its rounded pA scar and impressions of the pedicle nerves circulating this scar. In addition, its visceral area extends to midvalve, which is smaller than in our specimen. *Semilingula* Yegorov & Popov, 1990 is described as similar to *Lingularia*, but with vestigial dorsal vascula media; nonetheless, we do not have the dorsal valve to compare. *Sinolingularia* Peng & Shi, 2008 differs only in their rounded umbo, *Sinolingularia* being reported in millimeters and our specimen being centimetric. *Sinoglottidia* Peng & Shi, 2008 differs from our specimen in having rounded umbo, ventral valve with pA scar rounded and internal septa in ventral valve.

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