



NEW BRACHIOPOD OCCURRENCES IN THE MIDDLE DEVONIAN OF THE PIMENTEIRA FORMATION, PARNAÍBA BASIN, PIAUÍ STATE, NE, BRAZIL

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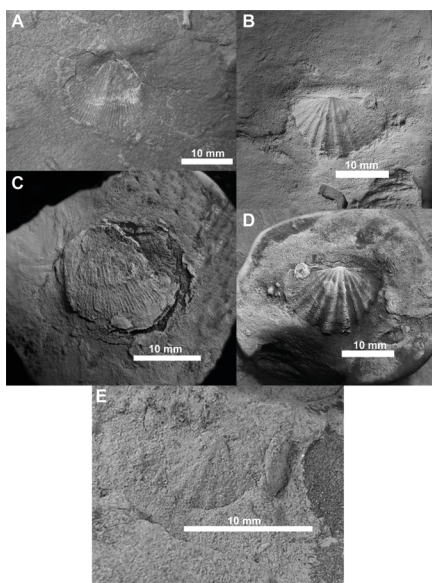
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Rezende et al., 2024. *Paleontologia em Destaque*, v. 39, n. 81, p. 83, Figura 2.

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The first record of *Australocoelia* was tentatively made for the Pimenteira Formation by Suárez-Riglos (1967) based on samples collected by K. E. Caster on the eastern margin of the basin on the Piauí state. However, the first official confirmation of *Australocoelia palmata* occurrence was by Gama Jr. (2008) for the western margin of the Parnaíba Basin, Tocantins state. New collecting sites in the Piauí state were again explored by Ponciano *et al.* (2012a) who tentatively provided new records of *Australocoelia* to the Parnaíba Basin. From the collecting sites described in Ponciano *et al.* (2012a), Rezende *et al.* (2019a) confirmed and described the specimens from the Riachão outcrop as *Australocoelia palmata*. The ones from Mucambo and Morro Branco de Kegel outcrops are confirmed and described herein for the first time.

The presence of Orthotetide brachiopods is well known in Brazil at the Paraná (Clarke, 1913) and Amazonas (Rathbun, 1874, 1879) basins, southern and northern Brazil respectively. Taxonomic studies regarding this brachiopod order in the Devonian of Brazil have only recently been resumed (Rezende & Isaacson, 2021; Corrêa *et al.*, 2023). Regarding the Parnaíba Basin, its occurrence was limited to a single tentative report made by Ponciano *et al.* (2012a) for the Pimenteira Formation, Mucambo outcrop, as *Schuchertella?* sp. and other “*Schuchertella*” occurrences made by Kegel (1953) and Melo (1988) for the Longá Formation (Upper Devonian, Parnaíba Basin). The latter was reviewed by Rezende *et al.* (2019b), who provided an extensive revision of the Longá Formation “*Schuchertella*”, classifying it as *Schellwienella* in a new species called *Schellwienella justinianoi*, while the one from the Pimenteira Formation remains to be studied.

The analyzed specimens are housed at the “Fósseis Fanerozoicos” scientific collection (CFF acronym) from the Universidade Federal do Estado do Rio de Janeiro (UNIRIO). The specimens were coated with magnesium oxide prior to photographing, measured with a caliper and described according to the terms applied by Williams & Brunton (2000, in Williams *et al.*, 2000), and Savage *et al.* (2000, in Williams *et al.*, 2000).

The fossiliferous outcrops analyzed herein are from the Picos Member, eastern margin of the Pimenteira Formation (divided in Picos and Passagem members after Ponciano *et al.*, 2012b; Ponciano, 2013; Rezende *et al.*, 2019a; Rezende, 2022) of late Eifelian-early Givetian age (Melo, 1988), and were described according to Ponciano *et al.*, (2012a).

Mucambo (PI-466/Km 12): fine to median conglomerates and conglomeratic sandstones, with hummocky cross stratification and asymmetrical ripple marks. Outskirts of Mucambo village, PI-466 road, 12 km after the junction of BR-020 towards João da Costa Municipality. Coordinates: 08°28'17.6"S; 42°22'41.2"W.

Morro Branco de Kegel (Pimenteiras 1): Fine to medium, whitish to yellowish, micaceous sandstones with hummocky cross stratification, and grayish to yellowish siltstones. Pimenteiras-Picos road (PI-407), 11 km south from Pimenteiras Municipality. Coordinates: 06°17'41.4"S; 041°22'44.9"W (Figure 1).

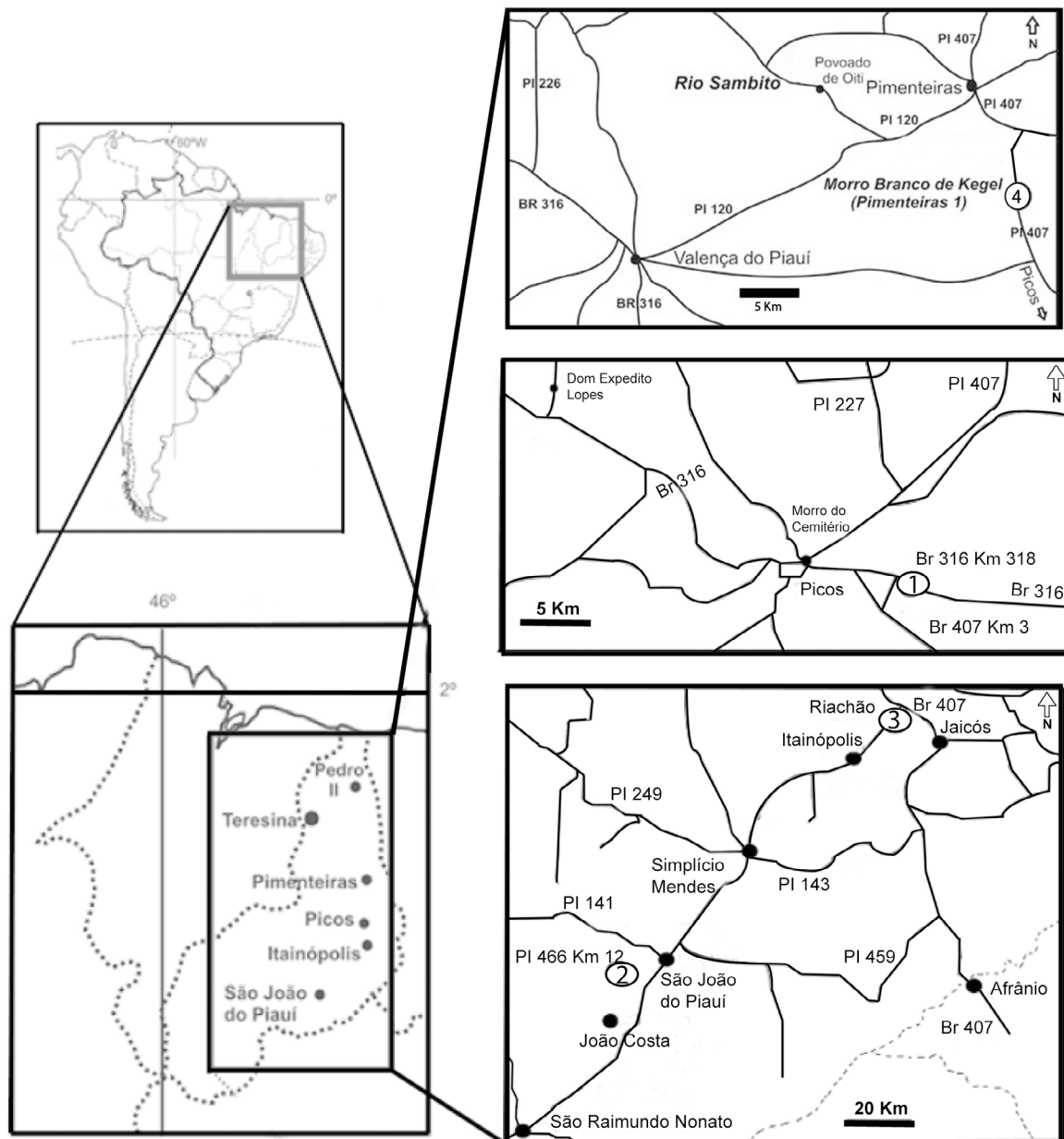


Figure 1. Map of the studied localities: 1 - Mucambo outcrop, 2 - Picos 2 outcrop, 3 - Riachão outcrop. 4 - Morro Branco de Kegel outcrop. Modified from Ponciano *et al.* (2012a).

Figura 1. Mapa das localidades estudadas: 1 - Afloramento Mucambo, 2 - Afloramento Picos 2, 3 - Afloramento Riachão, 4 - Afloramento Morro Branco de Kegel. Modificado de Ponciano *et al.* (2012a).

Class RHYNCHONELLATA Williams *et al.*, 1996

Order RHYNCHONELLIDA Kuhn, 1949

Superfamily RHYNCHOTREMATOIDEA Schuchert, 1913

Family LEPTOCOELIIDAE Boucot & Gill, 1956

Genus *Australocoelia* Boucot & Gill, 1956

Australocoelia palmata (Morris & Sharpe, 1846)

(Figure 2B, D, E)

1913 *Leptocoelia flabellites* [non Conrad] Clarke, plate 22, figs. 13-24.

2019 *Australocoelia palmata* (Morris & Sharpe) Rezende *et al.*, fig. 3.

Material. Exterior mold: CFF 0411b; CFF 0412.

Description. Exterior ventral valve of subcircular outline. Posteriorly narrow costae, widening as it approaches the anterior commissure, acquiring a subrounded aspect, slightly curved. Concentric growth lines, and crenulate anterior margin. Mold of 12 mm in length and 18 mm in width. This specimen possesses 12 plications, 5 in each flank in addition to those in the ventral fold.

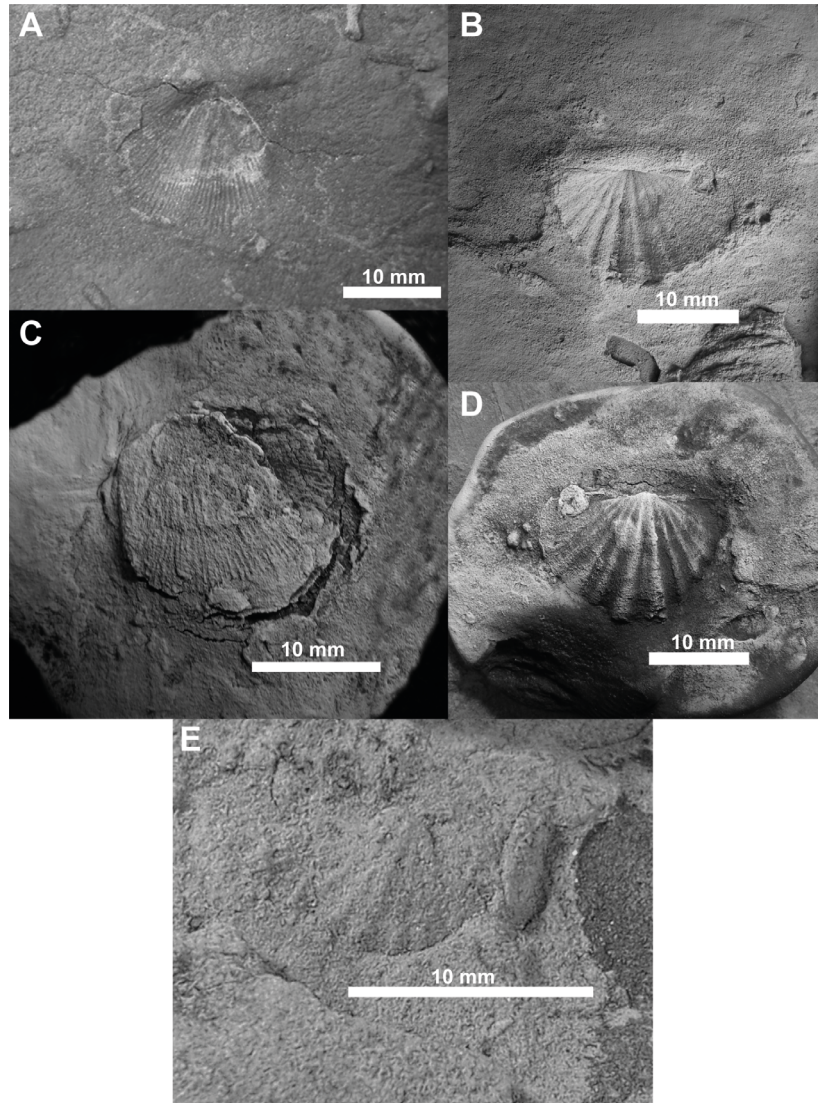


Figure 2. A, *Schellwienella?* sp. (Mucambo outcrop) - CFF 0411a; B, *Australocoelia palmata* (Mucambo outcrop) - CFF 0411b; C, *Schellwienella?* sp. (cast in modeling clay) - CFF 0411a; D, *Australocoelia palmata* (Cast in modeling clay) - CFF 0411b; E, *Australocoelia palmata* (Morro Branco outcrop) - CFF 0412.

Figura 2. A, *Schellwienella?* sp. (Afloramento Mucambo) - CFF 0411a; B, *Australocoelia palmata* (Afloramento Mucambo) - CFF 0411b; C, *Schellwienella?* sp. (molde em massa de modelar) - CFF 0411a; D, *Australocoelia palmata* (molde em massa de modelar) - CFF 0411b; E, *Australocoelia palmata* (Afloramento Morro Branco) - CFF 0412.

Discussion. The presence of this species in the state of the Piauí, eastern margin of the Pimenteiras Formation was tentatively made by Ponciano *et al.* (2012a) after samples collected in three different outcrops: Riachão (Picos-Itainópolis road BR-020), Picos 2 (BR-316/Km 318) and Mucambo (PI-466/Km 12). However, only the specimens from the Riachão outcrop have actually been confirmed and figured as *Australocoelia palmata* by Rezende *et al.*, (2019a), who provided an extensive revision of *Australocoelia* in Brazil, keeping the occurrences of the other two outcrops as uncertain.

Regarding the occurrence made for the Mucambo outcrop, Ponciano *et al.* (2012a) assigned the specimen at genus level as *Australocoelia?* sp., while the specimen from Morro Branco de Kegel (Pimenteiras 1) locality was only later identified and recognized in Rezende (2022) as a possible *Australocoelia* specimen, in spite of its poor preser-

vation state. Herein, we confirm the genus occurrence, and assign it to the species *Australocoelia palmata*. The studied specimens consist of exterior ventral molds with subcircular outline and subrounded costae, that gradually increases in size from the beak towards anterior commissure, and an average of 12 costae, 5 in each flank, in addition to the pair related to the ventral fold, as the ones already described from Riachão outcrop, and the ones from the Paraná Basin. Meanwhile, the samples from Picos 2 could not yet be studied, and therefore remain unconfirmed.

The taphonomic signatures (abrasion) and rock compaction observed in the studied specimens lead to similarities with the genera *Pustulatia* and *Plicoplasia*. However, according to the Boucot *et al.* (1965, in Williams *et al.*, 1965), the presence of pustules on the valves is decisive for the former's identification, which differs from the latter by the number of lateral ribs. Despite an exterior difference between these genera and *Australocoelia*, the number of lateral costae, the size of interspace, as well as the general outline of the valve, as figured in Boucot *et al.* (1965, in Williams *et al.*, 1965) and in Bolivian specimens by Isaacson (1977; 1993) lead the authors to classify the specimens from the Pimenteiras Formation within the genus *Australocoelia*, until new and better specimens can be studied.

The paleobiogeographic importance of the mentioned species has already been debated by Rezende *et al.* (2019a), supporting that the global marine transgression during the Eifelian/Givetian boundary that allowed the faunal distribution observed in southwest Gondwana (Videira-Santos & Scheffler, 2023). The connection between the Paraná and Parnaíba Basins (Grahns *et al.*, 2016) allowed this Malvinohosan genus to arrive in the Parnaíba Basin. Even though expanding the *Australocoelia* register to new localities, its abundance is notably smaller, when compared to the early Devonian Paraná Basin, which also suggests this taxon to be a relictual element from the former Malvinohosan Realm, collapsed during the Givetian (Melo, 1988). Its absence in overlying formations also supports the genus extinction during the Givetian, along with several invertebrate taxa, who could not bear the sea level rise that marked the transition between the Givetian/Frasnian boundary (Ribeiro & Ghilardi, 2023).

Occurrence. Mucambo (PI-466/Km 12) outcrop; Morro Branco de Kegel (Pimenteiras 1) outcrop. Pimenteiras Formation, Middle Devonian.

Class STROPHOMENATA Williams *et al.*, 1996
 Order ORTHOTETIDA Waagen, 1884
 Suborder ORTHOTETIDINA Waagen, 1884
 Superfamily ORTHOTETOIDEA Waagen, 1884
 Family PULSIIDAE Cooper & Grant, 1974
 ?*Schellwienella* Thomas, 1910
 (Figure 2A, C)

2012a *Schuchertella*? sp. Ponciano *et al.*, p. 18-19, fig. 14C.

Material. Interior mold: CFF 0411a.

Description. Interior ventral valve of an apparent subcircular to circular outline. Small size, single specimen with 16 mm in length and 18 mm in width. Costellae thin, without a distinguishable pattern. Hinge line fragmented, stout hinge teeth and dental plate diverging in an angle of approximately 100°. Triangular muscle field, split by weakly median septa.

Discussion. Herein, we propose the first description along with a taxonomic reevaluation of the specimen from the Pimenteiras Formation figured by Ponciano *et al.* (2012a). Even though poorly preserved, the studied specimen provides important diagnostic features that support its relocation from *Schuchertella* to *Schellwienella*. Rezende & Isaacson (2021) established the main diagnostic features for *Schellwienella* as the presence of pseudopunctae, bilobed cardinal process, triangular muscle field, dental plates and median septum, while the main features of *Schuchertella* are the absence of dental plates and median septum, flabellate muscle ventral muscle scar and extropunctae.

Based on the description obtained from the sample, the presence of dental plates and of the triangular muscle field does not support the classification previously held by Ponciano *et al.* (2012a), justifying the need for a new taxonomic classification. Since the studied specimen does not possess all the diagnostic characters to place it with certainty within *Schellwienella* the taxonomic positioning will remain tentative at this point, until more fossils are analyzed, and a more detailed description can be retrieved. To this point, we can be certain that it does not belong to *Schuchertella*, with close resemblance to *Schellwienella*. Even though it is not possible to determine its species, the presence of this genus in the Parnaíba Basin, Pimenteiras Formation (Middle Devonian), similarly to *Australocoelia*, also supports the previously mentioned connection with the Paraná Basin, caused by the marine transgression that occurred in the Eifelian/Givetian

border, positioning this taxon right after the transgressive moment, that reached its maximum at the Picos Member of the Pimenteiras Formation (Grahm *et al.*, 2016; Videira-Santos & Scheffler, 2023).

Schellwienella is most representative in the Lower Devonian of the Paraná Basin, like *Australocoelia*, and scarcely represented in the Pimenteiras Formation, however regaining space at the Upper Devonian Longá Formation (Famennian) (Rezende *et al.*, 2019b). Therefore, occupying an intermediate position between both stratigraphic intervals, justifying the genus arrival to the Parnaíba Basin.

Occurrence. Mucambo (PI-466/Km 12) outcrop. Pimenteiras Formation, Middle Devonian.

It has been confirmed the presence of the species *Australocoelia palmata* in two other sites of the eastern side of the Pimenteiras Formation (Mucambo and Pimenteiras 1 localities), enlarging the taxon distribution within the Parnaíba Basin, and reinforcing previously known paleobiogeographic affinities between coeval paleozoic basins. It has also been confirmed the presence of orthotetide brachiopods tentatively classified as *Schuchertella*? sp. in previous work, herein relocated to *Schellwienella*? sp. This specimen is, to date, the single specimen of orthotetida known for the Pimenteiras Formation.

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