

**SERPULIDS (ANNELIDA, POLYCHAETA) AT EARLY CRETACEOUS OF
SERGIPE BASIN, BRAZIL SERPULIDE (ANNELIDA, POLYCHAETA) DO
CRETÁCEO INFERIOR DA BACIA SERGIPE, BRASIL**

Fabiana Silva Vieira¹,
Mário André Trindade Dantas²,
Anderson da Conceição Santos Sobral³,
Leonardo Ferreira de Almeida¹,
Maria Helena Zucon¹

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¹ Laboratório de Paleontologia, DBI/CCBS, UFS (fabiannavieira@yahoo.com.br)

² Instituto Multidisciplinar em Saúde, Campus Anísio Teixeira, UFBA

³ Programa de Pós-Graduação em Geociências, UFPE

RESUMO

Fósseis de *Serpula sergipensis* Beurlen, 1965 (Serpulidae) foram encontrados em rochas da formação Riachuelo, Bacia de Sergipe, Brasil (10°43'389" S e 37°10'780" W). Esta espécie é descrita, e ilustrada, com base em sessenta fragmentos de tubos calcários. Os tubos de habitação de *S. sergipensis* são pequenos, solitários, em forma de gancho, com seção transversal quase circular, e com o aumento moderado do diâmetro (1.5 a 4.5 mm) do tubo. Os tubos podem ocorrer isolados, e são ornamentados com finos anéis de crescimento. Os amonóides *Eodouvilleiceras* e *Vectisites simplex* confirmam a idade desta assembleia como Aptiana superior. Uma análise preliminar da fauna associada encontrada com os fósseis de *S. sergipensis* indicam que localidade Porto dos Barcos 2 tratava-se de um ambiente de águas rasas, com baixa energia, alta taxa de oxigênio e nutrientes, habitada por uma comunidade bentônica composto por bivalves, equinóides e espécies de poliquetas.

Palavras chave: Polichaeta, Serpulidae; Cretáceo inferior, Bacia de Sergipe, Brasil.

ABSTRACT

Serpula sergipensis Beurlen, 1965 (Serpulidae) have been found in rocks of the Riachuelo Formation from Sergipe Basin, Brazil (10°43'389" S e 37°10'780" W). This species is described and drawn based on sixty fragments of calcareous tubes. The tubes-dwelling of *S. sergipensis* are small, solitary, loop-like, with an almost circular transversal section, and moderate tube diameter (1.5 to 4.5 mm). Tubes occur isolated, and are ornamented with fine growth rings. The ammonites *Eodouvilleiceras* and *Vectisites simplex* confirm the age of this assemblage as upper Aptian. A preliminary analysis of the associated fauna found with the fossils of *S. sergipensis* indicates that the Porto dos Barcos 2 locality represents a calm energy shallow water environment, with high rate of oxygen and nutrients, inhabited by a benthonic community composed by bivalves, echinoids, and polychaeta species.

Keywords: Polychaeta; Serpulidae; Lower Cretaceous, Sergipe Basin, Brazil.

INTRODUCTION

Serpulids are polychaetes that build elaborate calcareous tubes. This large and highly successful group has a cosmopolitan geographic and wide bathymetric distribution, from the intertidal to the abyssal zones (ten Hove & Kupriyanova, 2009, Kupriyanova & Nishi, 2010).

The serpulid faunas of the Mesozoic are known, mostly based on European material (Vinn *et al.*, 2012). In Brazil records of the Mesozoic faunas were made by Beurlen (1965), Muniz & Zucon (1981), Muniz *et al.*, (1981) and Cassab *et al.*, (1994).

In the Sergipe basin, the Polychaeta fauna were found in rocks, originated by marine sedimentary layers, dated as early Albian (Riachuelo Formation), Coniacian (Contiguiba Formation), and late Campanian (Calumbi Formation). The most common *taxa* were that which could build elaborate calcareous tubes, as, for example, the genus *Serpula*, *Diploconcha* and *Hamulus*, however excavators forms (*e.g.* *Terebella*) can be found as well.

Despite their occurrence as fossil in the Riachuelo Formation, literature data on serpulid fossils are limited. The main objective of this paper was to provide a record of one of the species of serpulids found in the locality of Porto dos Barcos 2, lower Cretaceous, from Sergipe Basin, Brazil.

MATERIAL AND METHODS

The Sergipe Basin comprises one of the most extensive marine middle Cretaceous carbonate successions among the northern South Atlantic basins, between latitude 9° and 11°30'S, and longitude 37° and 35°30'W (Fig. 1). The Aptian–Albian succession of the basin is represented by a mixed carbonate-siliciclastic platform system (Muribeca and Riachuelo Formations), corresponding to a transitional phase between the rift phase and the beginning of the open marine phase (Koutsoukos *et al.*, 1991, 1993). These phases reflect the progressive separation of the African–South American continent.

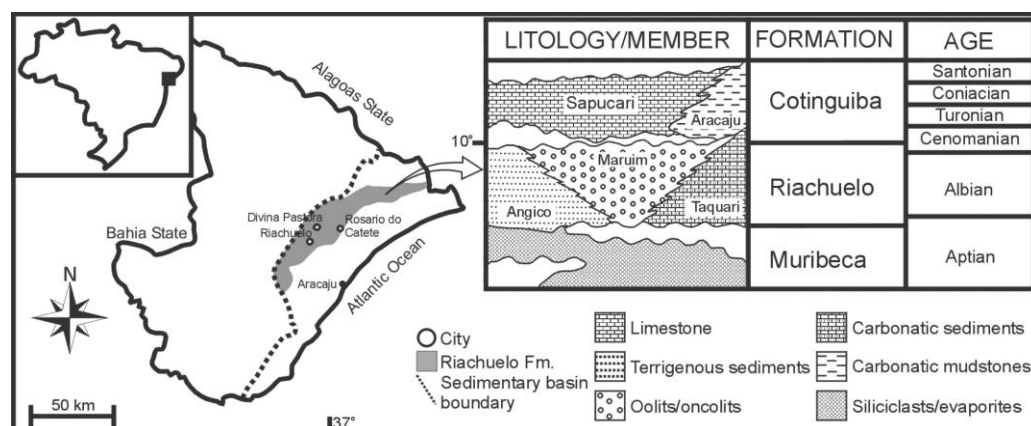


Figure 1 - Geographic position of Riachuelo Formation and its stratigraphic relationship to other marine unities of Sergipe Basin, Sergipe State, Brazil (from Mello *et al.*, 2007).

The specimens described here were collected from the most basal layers of the Riachuelo Formation, Riachuelo city, in a locality known as Porto dos Barcos 2, between 10°43'389"S - 37°10'780"W, nearby

the well RO 223 from Petrobras (Fig. 2), characterized by a thick sequence of yellow clay and silt, with concretions dipping 20° towards NE 20°NE (Zucon, 2005).

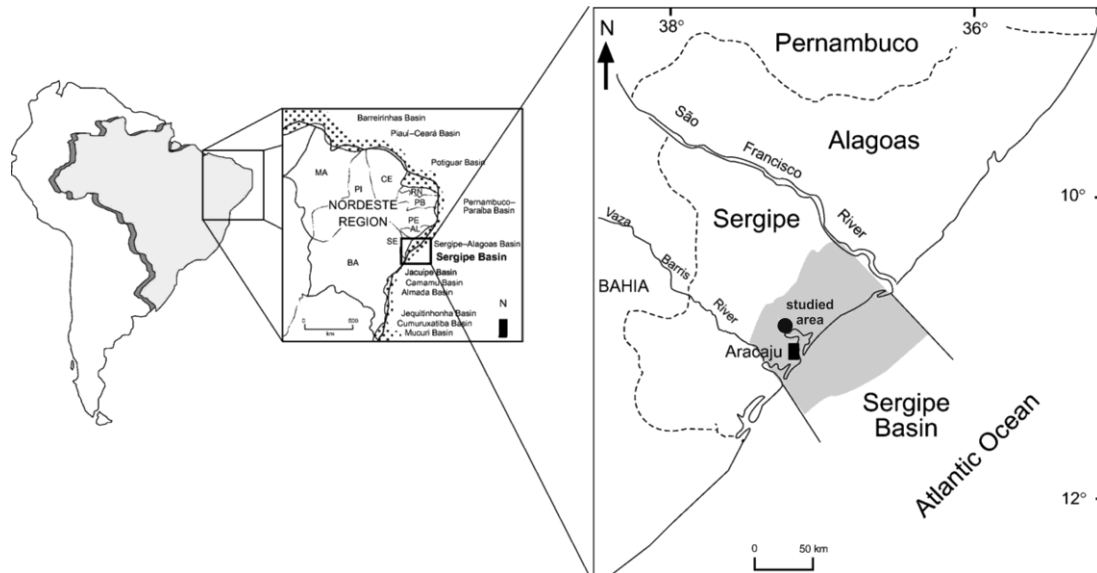


Figure 2 - Location map of the marginal basins of northeastern Brazil (modified from Carvalho *et al.*, 2003).

The classification of Polychaeta used in this work was developed by Beurlen (1965). Stratigraphic occurrences and ages of serpulid are based on the detailed ammonoid zonations (Zucon, 2005). The studied material is housed at the scientific collection of the Paleontology Laboratory of the Universidade Federal de Sergipe (LPUFS), São Cristovão, Sergipe, Brazil.

SYSTEMATIC PALEONTOLOGY
POLYCHAETA Grube, 1850
SEDENTARIA Lamarck, 1818

SERPULIDAE Burmeister, 1837
Serpula Linnaeus, 1758
Serpula sergipensis Beurlen, 1965

Material. Sixty fragments of calcareous tubes LPUFS 4695 to 4754.
Description. Isolated Calcareous tubes, attached to a hard substrate in all their length, with loop-like form and almost circular transversal section. Small tube with moderate tube with moderate tube diameter increase ranging from 1.5 to 4.5 mm. The tubes are ornamented with fine growth rings (Fig. 3).

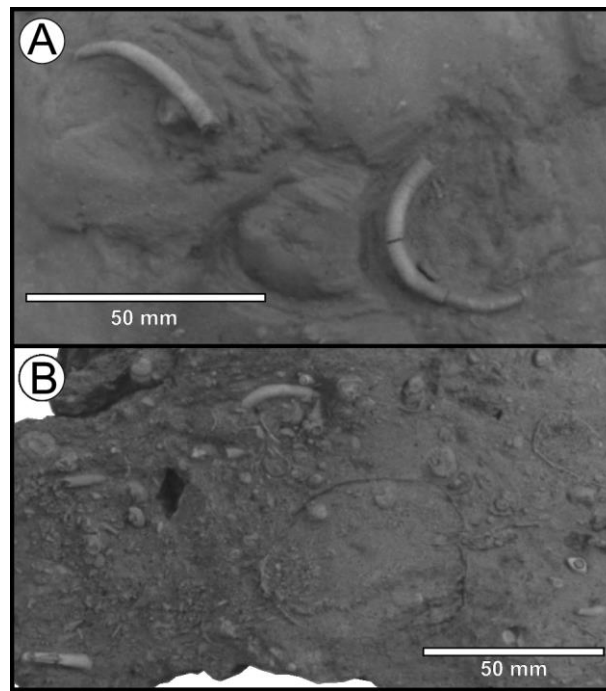


Figure 3 - (A) two isolated *Serpulids* fossils in sedimentary matrix; (B) Arrangement of the *serpulids* fossils and their associate fauna in sedimentary matrix.

FINAL REMARKS

Serpulids in the studied strata profile of the Riachuelo Formation occur in outcrops and subsurface cores and include isolated tubes growth form. The morphology of the tube-dwelling polychaetes allow us to classify these material as *Serpula sergipensis* Beurlen, 1965.

Modern polychaete annelids commonly live in marine environment, such as shallow sea. Most polychaetes prefer benthic life, including free crawling, secluded in the tube on sea floor, or dwelled on the hard objects. In modern oceans, serpulids (tubeworms) are dominant within the biomass of benthic biota. They are the major groups of fouling organisms occurring mainly in the intertidal to the subtidal zones of coastal waters, with only a few species known to grow in the estuary. The majority of serpulids species dwell in 3–65 m shallow water (Ruppert *et al.*, 2005). Statistics performed in the ecological distribution for a variety of modern

euryhaline polychaete indicate that for the biota classified as class Polychaeta and order Sedentaria. The majority of them live in salt water environment along the coast, a few survive in the brackish water environments such as estuary, river side and lagoon, and only very few can live in freshwater (Yang, 2012).

Modern polychaetes among them the commoner benthic marine invertebrates and tube-dwelling species are abundant in both modern and ancient shallow-water settings where their calcareous tubes are cemented to both hard and soft substrates (Fauchald & Jumars 1979, Ruppert *et al.*, 2005). Literature data on serpulid palaeoecology are scant although they are important in ecological systems (Sørensen & Surlyk 2010).

Annelids fossils are not usually used in biostratigraphy, however they have paleoecological importance due their capacity of ingest and modify large amounts of sediments, being one of the most influential organisms in

the fossil record (Távora & Nascimento 2011).

Serpulids were important encrusting organisms in the geological past. Members of the family Serpulidae dwell in calcium carbonate tubes formed by aragonite, calcite or a mixture of aragonite and calcite (Yang 2012).

Associated to the Serpulids were also found fossils (disarticulated shells, internal and external molds) of bivalves (e.g. *Linotrigonia*, *Neithea*, *Pleuromya*, *Pinna* and *Lopha*), gastropods (e.g. *Turritella*, *Tylostoma* and *Natica*), cephalopods (e.g. *Vectisites* and *Eodouvilleiceras*) and equinoids (e.g. *Temnocidaris*, *Douvillaster* and *Leptosalenia*).

The associated fauna found with fossils of *S. sergipensis* is in fact a mixture of specimens of different communities. The ammonites *Eodouvilleiceras* and *Vectisites simplex* belong to a nektonic community, and in this case only help us to confirm the age of this assemblage as upper Aptian (Zucon 2005). Only the bivalves (e.g. *Neithea*) and equinoids (e.g. genus *Temnocidaris* and *Leptosalenia*) lived in the same community, which indicate a calm shallow sea environment, with lower degree of abrasion and breakage (Andrade *et al.*, 2004; Manso & Lemos 2008).

Abrasion and fragmentation of other bioclasts were observed suggesting mechanic rework. The serpulids fossils were composed by tubes with different colors (white, gray and yellow), which suggests different degrees of energy, indicating variation in depth, suggesting an environment characterized by waves in shallow water.

The Porto dos Barcos 2 locality (late Aptian to early Albian) represents a calm energy shallow water environment, with high rate of oxygen

and nutrients, inhabited by a benthonic community composed by bivalves, echinoids, and polychaeta species.

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