

Octocorals as hosts to serpulid-macroids from the Cretaceous of the Potiguar Basin, Brazil

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Octocorals are very abundant in modern seas but because of their lightly calcified skeletons are relatively poorly known as fossils (Bayer 1956). Most fossil octocoral assemblages have been reported from the Cretaceous and Cenozoic (e.g. Giammona & Stanton 1980; Kocurko & Kocurko 1992) but more isolated finds date back to the Precambrian and Palaeozoic (Glaessner 1959; Bengtson *et al.* 1990). Indeed, fossil octocorals are probably more common than is apparent but are usually preserved only as spicules (e.g. Reich 2002). Such spicules are difficult to determine and therefore remain unrecognized or ignored when found (Bayer 1956). Here, we report on an unusual finding of octocoral stems that became preserved in the centre of serpulid-macroids.

Modern and fossil corals, both solitary and colonial, frequently host boring and encrusting associations (sclerobionts). Most modern and fossil examples of such associations are reported from zooantharian colonies (for a review, see Taylor & Wilson 2003). Modern octocorals are frequently encrusted by barnacles or algae (Fabricius & Alderslade 2001) and serve as a habitat for bivalves, mostly bysally attached pteriids (e.g. Zuschin & Oliver 2003). Octocoral-hosted sclerobionts have rarely been reported. The only fossil example of potentially octocoral-hosted sclerobionts known to us has been described from the Upper Cretaceous of Brazil, where bio-immuring oysters preserved the impressions of a perishable biological hard substratum (Rohr & Boucot 1989). A geometric pattern of nodes from latex replica was interpreted as a gymnosperm stem or as a gorgonacean octocoral. The xenomorphic structures (impressions) of possible gorgonaceans were found on several specimens of the oyster *Lopha ramicola* from the base of the Jandeira Formation; they were reported from a locality 5 km south of the coastal town of Upanema, about 60 km north-west of the location described here.

The Jandeira Formation of the Potiguar Basin in north-eastern Brazil covers the Coniacian to lower Campanian interval. The formation typically consists of bioclastic limestones representing high-energy levels (Araripe & Feijó 1994). Our specimens were collected from the middle to upper portion of the Jandeira Formation and are therefore probably Campanian in age. The associated macrofossil assemblage and rock facies at the Estreito Field location suggest deposition in a setting with moderate bottom currents. Abundant nerineid and aporrhaid gastropods suggest the presence of soft substrata and relatively low water energy.

All sample material was collected during a field trip to Rio Grand do Norte State in August 2003. At the right margin of the Açú River and along the Rn-118 Highway (stop 18 of de Farias *et al.* 2003), strata of the middle to upper part of the Jandeira Formation are exposed in an abandoned mine pit (Estreito Field). The weathered, yellowish calcirudites are rich in fossils, including mostly worm tubes, gastropods and bivalves (de Farias *et al.* 2003). Numerous gastropod moulds and 15 decimetre-sized cylindrical macroids densely encrusted by serpulids (serpuliths) were collected randomly from the outcrop. Some of these serpuliths were cut and polished (Fig. 1) and also studied in thin sections (Fig. 2). All materials are deposited at the palaeontological collection of Geologische Bundesanstalt (Vienna) under the collection numbers 2008/266/0001 to 0013.

The studied macroids are 3–11 cm long and have diameters ranging from 1 to 2.5 cm; they are never bifurcating. Tube-like structures, with a diameter of 5–7 mm, are present in the centre of

the aggregates and are densely encrusted by serpulid worm tubes. The tubes themselves have an internal canal with a diameter of about 1 mm and wall perforations (Figs 1, 2). These features point to the Holaxonia group within the Octocorallia. We interpret the tube as the central axis, the wall as the cortex, the perforations as openings for the polyps and the internal canal as the central chord (see Bayer *et al.* 1983, fig. 8; Fabricius & Alderslade 2001, fig. 9L).

The Holaxonia are gorgonians whose flexible, horny central axis can be calcified to various degrees. Their fossil record dates back into the Cretaceous (Bayer 1956). The serpulid tubes are recrystallized and show a distinct pattern of increasing diameters from the centre to the outer margin (Fig. 1C). This indicates colonization by a single spat that grew continuously to adult size. Indiscriminate

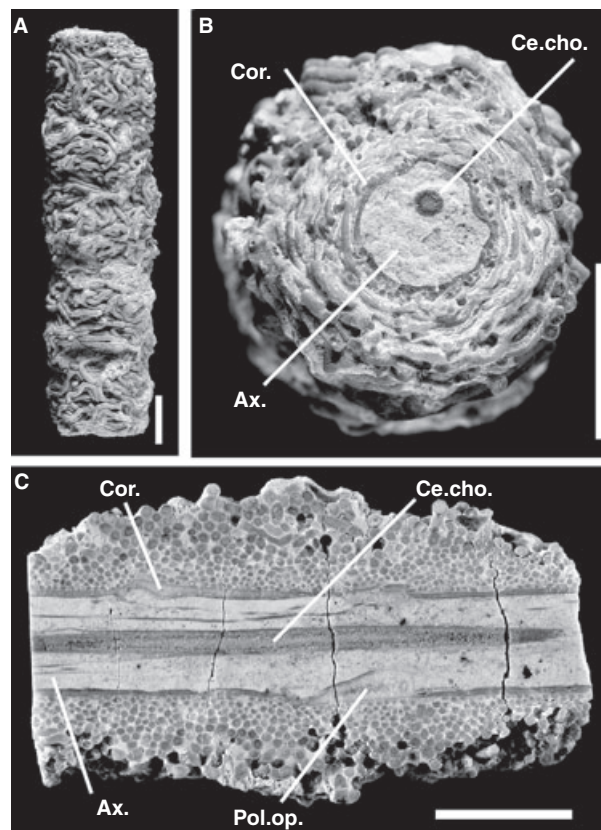


Fig. 1. Serpulid macroid on inferred Octocoral stem from the Jandeira Formation of the Potiguar Basin, NE Brazil (collection number 2008/266/0001). A, lateral view showing dense serpulid encrustations. B, top view of serpulid-encrusted central axis with cortex and central chord. C, section along length axis of serpulid-macroid. Ax., central axis; Cor., cortex; Ce.cho., central chord; Pol.op., openings for polyps. Scale bar 1 cm.

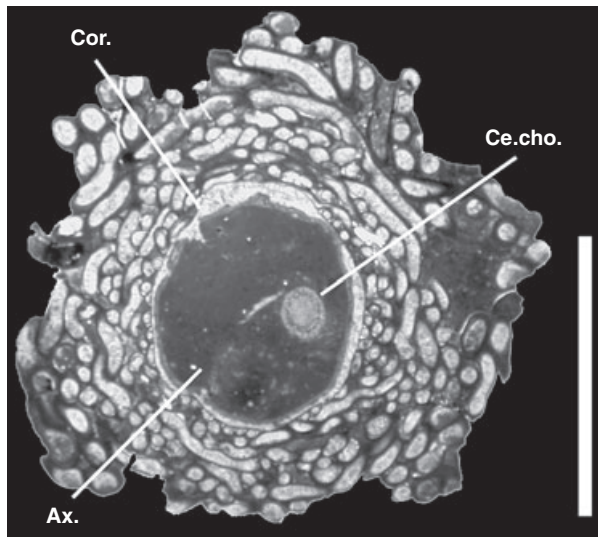


Fig. 2. Thin section across serpulid macroid (collection number 2008/266/0001). Ax., central axis; Cor., cortex, Ce.cho., central chord. The thin grey layer between the dark central axis and the clear cortex is tentatively interpreted as a ring of boundary canals. Scale bar 1 cm.

growth of serpulid tubes on the wall and across the polyp openings also indicates that the infested parts of the gorgonian colony were already dead at the time of epigrowth. Dense encrustation patterns demonstrate that octocorals provided a stable substrate for epifauna in an otherwise soft bottom-dominated environment. Modern octocorals are frequently encrusted by sclerobionts and it is therefore plausible to assume that in the fossil record they often form the unrecognized core of macroids.

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