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# Septarian nodules from Jamaica: Comment

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WOOD AND DONOVAN (1996) described a septarian nodule from the geological record of Jamaica as an example of poor curation of a museum specimen. They commented that this was the first record of a septarian nodule from Jamaica, but that its provenance was only recorded as "Parish of Clarendon" and that this was poor documentation. Porter (1997) in a comment on the paper by Wood and Donovan (1996) remarked on a septarian nodule that he had figured in the Gleaner in 1984. Porter (1984, 1997) recorded septarian nodules in the bed of Hectors River, downstream from Craig Head in Manchester, and suggested that they might be derived from the Yellow Limestone Group.

Septarian concretions (we prefer concretions to nodules, since the term concretion is generally used for regular and nodule for irregular diagenetic bodies: Pettijohn, 1975) are characterised by two sets of fractures, a concentric set and a radial set (Austin, 1986; Fig. 1). Fractures of the radial set are thickest near the centre of the concretion and thin towards the edges (Fig. 1). In concretions collected *in situ* from sediment, neither set of fractures reaches the margin of the concretion. Both Porter's (1997, Fig. 1) and Wood and Donovan's (1996, Fig. 1) septarian concretions are specimens in which the septarian cracks have been exposed by the removal of the outer layers of the concretion by weathering. Such specimens are commonly called "Turtle Stones" because of their resemblance to the shell of a turtle. The identification of septarian concretions *in situ* within rock succession requires that specimens are either broken or cut to reveal their inner secrets. Hounslow (1997) has recently considered the genesis of cracks in septarian concretions.

Carbonate concretions, such as septarian concretions, occur in a variety of fine-grained (clay and silt grade) clastic and impure carbonate sediments. They may also develop within coarse-grained clastic sedimentary rocks such as sands. The dominance of relatively pure limestones in the Jamaican succession limits the levels at which septarian concretions might be found. Despite this, we have found five levels within the Jamaican succession that yield *in situ* septarian concretions and these are listed in age order below.

1. Upper Cretaceous, Slippery Rock Formation, Clarendon. The upper part of the Slippery Rock Formation (Robinson and Lewis *in* Robinson *et al*., 1972, p. 13) consists of muds with variable proportions of ripple cross-laminated fine-grained sands. Septarian concretions are fairly common within the upper part of the Slippery Rock Formation. They occur in the Slippery Rock River near Smithville and in the Rio Minho near Grantham. Specimens in the Slippery Rock River are elongate ellipsoids with diameters typically 15 cm maximum by 8 cm minimum, and up to 4 cm thick. The body of the concretion has a micrite cement and appears fairly homogeneous. Radial septarian cracks are developed and these are filled with calcite (Fig. 1A). Larger, more irregular concretions occur within wavy bedded heterolithics (i.e., cross-laminated fine grained sands interbedded with muds) in the Rio Minho. These have a set of irregular radial cracks filled with two generations of calcite.

2. Upper Cretaceous, Guinea Corn Formation, Clarendon. The lower part of the Guinea Corn Formation consists of interbedded limestones and siltstones (Mitchell, 1999, this volume). A single layer with septarian concretions was found in a siltstone bed in the Rio Minho near Grantham. These concretions are up to 15 cm in diameter and 7 cm thick. The body of the concretion has a micrite cement and has concentric rings defined by slight variations in colour, which we interpret as due to changes in chemical composition of the cement during the growth of the concretion (Fig. 1B). These concretions also contain finely disseminated pyrite. Two sets of septarian cracks are present, a radial set and a concentric set; both are filled with calcite (Fig. 1B).

3. Lower Eocene, basal Chapelton Formation, Freemans Hall Beds. The Freemans Hall Beds consist of conglomerates, sandstones and siltstones that occur beneath the blue-hearted limestones of the Stettin

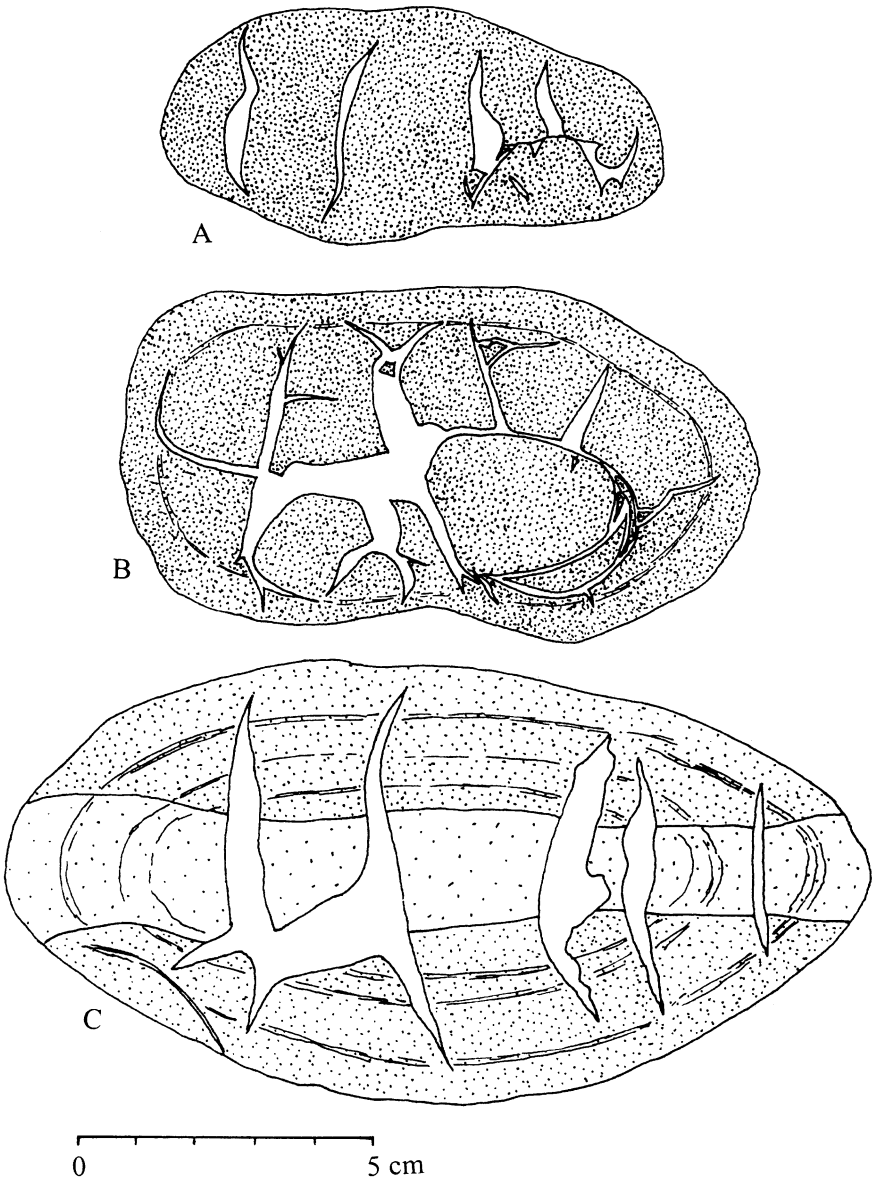


**Figure 1.** Line drawings of vertically sectioned septarian concretions from Jamaica: A, Concretion with vertical cracks filled with calcite, Slippery Rock Formation, Slippery Rock River; B, Septarian with combination of radial and concentric cracks and compositional banding near edge of concretion, Guinea Corn Formation, Rio Minho; C, Concretion with vertical radial cracks, a central micritic band (lightly stippled) and compositional banding in the body of the concretion, Freemans Hall Beds, Lichfield. Body of concretion stippled, calcite filled septarian cracks white.

Member (Robinson, 1996). Small septarian concretions occur in the siltstones on the road between Freemans Hall and the village of Stettin. These regularly oblate concretions are up to 14.5 cm in diameter and 7.5 cm in thickness. Internally they consist of bedded micrites containing sparse bivalve debris and abundant plant remains (Fig. 1C). The internal stratification shows some distortion indicating soft sediment deformation prior to cementation. The concretion's central band consists of a purer micrite (probably indicating a higher primary fine-grained skeletal carbonate component) than the upper or lower margins which are siliciclastic-rich, suggesting that concretion growth may have been centred on a more calcareous band. The plant remains are preserved in three-dimensional relief implying early diagenetic cementation prior to compaction. The body of the concretion has a micritic cement. The concretion contains concentric rings defined by slight variations in colour,

which we interpret as due to changes in chemical composition of the cement during the growth of the concretion. Only one set of cracks is developed in these concretions (Fig. 1C), a radial set with individual cracks having maximum widths of up to 6 mm. All the cracks become narrower towards the margin of the concretion. The cracks are filled with calcite.

4. Middle Eocene, Chapelton Formation, Guys Hill Member, near Lichfield, Parish of Trelawny. The Guys Hill Member (Robinson, 1988, p. 60) exposed in a roadcut near Lichfield consists of fine-grained quartz-rich, cross-bedded sands with sets up to 2 m in thickness, overlain by a succession of mudrocks containing lignites. The mudrocks contain sideritic bands rich in oysters and large septarian concretions up to 1 m in diameter and 15 cm thick. These septarian concretions are composed of siderite, and have cracks up to 1 cm in thickness containing calcite. Because of their large size, they have not yet been sampled.

5. Upper Pliocene, Bowden Formation, Bowden, Parish of St. Thomas. The Bowden Formation (Upper Pliocene) is exposed around the village of Bowden (Pickerill *et al*., 1998). The higher part of the Bowden Formation consists of "marls" containing thin turbidites and micritic concretionary bands. One of these micritic concretionary bands (in section 2 of Pickerill *et al*., 1998) has yielded septarian concretions. These concretions are up to 9.5 cm in diameter and up to 7 cm thick. They are composed of micritic calcite cement and have little internal structure. Mouldic bivalves and gastropods are, however, concentrated along the centre of the concretion. The concretion contains one set of radial fractures with individual cracks up to 2.5 mm in width and widest in the centre of the concretion. These fractures have remained open and contain no cement. Duck (1995) has previously figured unfilled fractures in septarian concretions.

Septarian concretions are not, therefore, that rare in the rocks of Jamaica, but are easily overlooked as the septarian cracks that they contain are only visible when the concretion is broken open or extensively weathered. We are at present involved in an isotopic study of Jamaican concretions and will report our results at a later date.

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