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A beachcomber's field guide to The Palisadoes, Jamaica

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Abstract

The south side of the Palisadoes near Norman Manley International Airport in Kingston, Jamaica, is a fertile collecting ground for beachcombers. Specimens from this area have informed our knowledge of Jamaican and Antillean geology and palaeontology. The beachrock of the Palisadoes is, unusually, a polymict conglomerate with clasts identifiable from the 20th Century. A cobble of pumice likely floated from Montserrat and supported pseudoplanktonic *Lepas anatifera* Linné, a goose barnacle. Echinoderms are common including mummified brittle stars. Fragile tests of the heart urchin *Brissus unicolor* (Leske) represent a genus widely dispersed in the fossil record of the Antilles. A specimen of the cidaroid *Eucidaris tribuloides* (Lamarck) had an aberrant apical system, composed of eleven plates with eleven genital pores.

Key words: tombolo, beachrock, pseudoplankton, pumice, mummification, growth aberration

1. Introduction

In early 1998 I received a job offer that I could not refuse, and prepared to leave Jamaica for the UK after over 12 years teaching and researching at the University of the West Indies (UWI). My time in Jamaica was fondly remembered, a formative influence on the career as a geologist. Before leaving, I resolved to be co-leader on two fieldtrips for the Geological Society of Jamaica as a mark of my respect and debt to the geologists of the island (Donovan and Miller, 1999; Dixon and Donovan, 1999). If only there had been more time, there was a third field meeting that I would gladly have led. The following field guide describes the trip that, over 25 years later, I would still like to make.

I have been an active beachcomber in the British Isles and the Netherlands for specimens of interest to me as a palaeontologist and geologist for over 20 years (see, for example, Donovan, 2007, 2021, 2023). But the Palisadoes is my favourite collecting site anywhere. It is close to Norman Manley International Airport in Kingston and the beach has yielded an exciting array of recently-dead marine invertebrates. I must assume that the currents offshore the south coast of Jamaica have some sort of convergence at this spot; I know beaches to the east and west, and have never seen anything approaching its diverse nekrofauna anywhere else. It was a favourite spot to visit before I set practical examinations when I taught at UWI. I would visit needing, say, 25 left valves of a burrowing bivalve or a similar number of regular echinoids and would see what was available. Or I might need four or five unusual specimens for a spot test. Those who took the course GL21A 'Palaeontology' under me will recognise the source of certain specimens in their practical examinations.

I was rarely disappointed by the Palisadoes. Like all beaches, the variety and number of dead

invertebrates varied during the year, and from year to year, but there were always large samples of some species and unusual specimens of exotic taxa to tempt the collector. If you get there, you will not be disappointed.

2. How to get there

I write this assuming that you are travelling to the site directly from the airport – jump off the flight and straight into the field – but it is easily adapted if you are coming from Kingston. The airport is developed on the harbour side of the Palisadoes, a tombolo that reaches to Port Royal, which was devasted by the great earthquake of 1692 (Hendry, 1978). A tombolo is a spit linking an island to the mainland or another island. The access road to the airport ends at a roundabout, with Kingston to the left and Port Royal to the right (Fig. 1). Turn towards Port Royal. About one and a half kilometres further on, pull off the road on the left (south) side. Walk across the sand and scrub to the beach, which is extensive, extending for several kilometres east and west. However, follow these directions and you are in the best area for collecting (Fig. 1, Locality 2).

3. Locality details

The Palisadoes, parish of St. Andrew, Jamaica (Fig. 1), is a tombolo which forms the southern boundary of Kingston Harbour and occurs to the north-west of the Yallahs Basin (Burke, 1967). The harbour side is notable for well-developed mangroves. The Palisadoes are dry, with cacti up to 3 m high and no standing bodies of freshwater in the well-drained sediment cover. The main road extends the length of the tombolo, connecting Port Royal to Kingston. Port Royal is well-known for its locally caught seafood, and is a fine place to relax and celebrate after a successful day in the field.

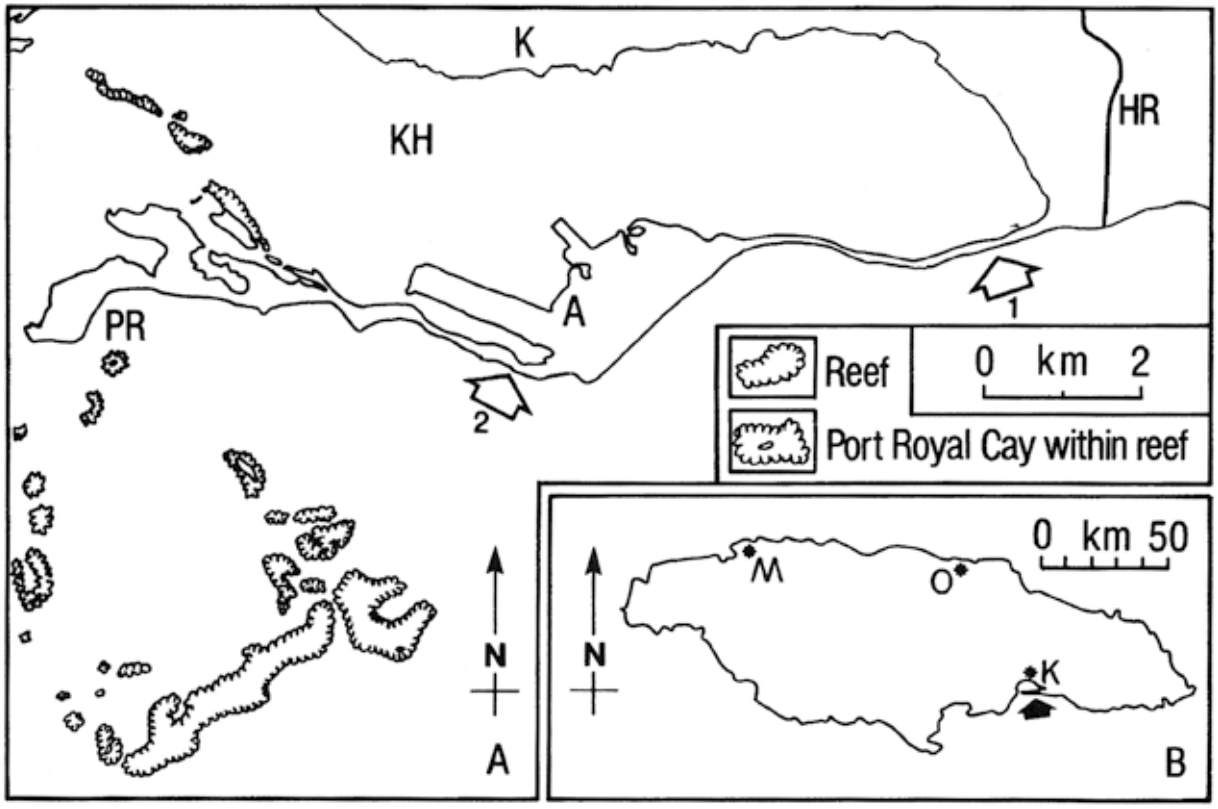

Fig. 1. After Donovan et al., 1993, fig. 1. **A,** locality map of The Palisadoes and adjacent area, southern Jamaica. Key: A = Norman Manley International Airport; HR = Hope River; K = Kingston; KH = Kingston Harbour; PR = Port Royal. Localities 1 and 2 are arrowed. Locality 1 (old NGR 786435) is the site where *Clypeaster rosaceus* (Linné) was collected as a reworked cobble of beachrock. Locality 2 (old NGR 725420) is the main site discussed herein. **B,** Outline map of Jamaica showing position of study area (arrowed). Key: K = Kingston; O = Ocho Rios; M = Montego Bay.

4. What to look for

The southern (seaward) beach of the Palisadoes is a mecca for shell collectors. Shelly invertebrates are diverse, but are dominantly benthic molluscs, colonial scleractinian corals, crustaceans and echinoderms. Common molluscs are gastropods, bivalves and valves of chitons; although I have not found them here, shells of the deeper-water cephalopod *Spirula* would not be unexpected. There are many identification guides to Antillean molluscs, of which I use Warmke and Abbott (1961), Morris (1973) and Humfrey (1975). Identification of colonial scleractinians (Humann and Deloach, 2013) and crabs and barnacles (Gosner, 1978) are similarly well served, while echinoderms are easily recognised with the excellent Hendler et al. (1995).

Specimens discussed below are from Locality 1 ('Beachrock') or Locality 2 (others). These are presented not as typical of either site – all are rarities – but to demonstrate something of the sorts of clasts that can be found and which provide unique data of relevance to the rock record.

4.1. Beachrock

(Adapted from Donovan et al., 1993). Beachrock is produced predominantly in tropical, carbonate-rich, intertidal environments by penecontemporaneous – "formed during or shortly after the deposition of the containing rock stratum" (Lapidus, 1990, p. 397) – cementation in the zone between high and low tides (Scoffin, 1987). Beachrock is commonly composed of mainly carbonate grains with a carbonate (aragonite and/or high-magnesium calcite) cement, but non-carbonate beaches, such as on the Palisadoes, can similarly be lithified. The Palisadoes has *in situ* beachrock that occurs almost everywhere on the seaward shoreline. Beaches and beachrock sediments in The Palisadoes are polymict, varying from sands to boulders in diverse lithologies derived from the catchment of the Hope and Yallahs rivers to the east. Individual beds within the beachrock are up to 0.5 m thick (Donovan et al., 1993, fig. 2A), with a seaward dip of 2° to 6° and a micritic cement of magnesian calcite. In contrast, the beachrock formed in the limestone environment of the nearby Port Royal Cays (Fig. 1) is cemented by aragonite (Hendry, 1979). The most abundant invertebrate skeletons in the beachrock were those of more massive scleractinian corals, large gastropods (Donovan et al., 1993, fig. 2B-D), oysters and other benthic molluscs.

A test of the extant sand dollar *Clypeaster rosaceus* (Linné) was collected as a cobble from the beach at Locality 1 (Fig. 1) and is obviously derived from the beachrock (Fig. 2). This species is locally common in the Pleistocene of Jamaica (Donovan, 1993) and has been reported from a number of localities. This species also lives at least close to the study area, around the Port Royal Cays. The lithology of the sediments infilling the test show it to have been derived locally. The test is abraded, so that details of the apical surface are indistinct, but the five petals, the apical system and some primary tubercles are preserved. The ambitus has been abraded away, exposing the internal infill of a terrigenous, polymict sedimentary rock with gravel-sized clasts in a matrix/cement of mainly carbonate. This rock also obscures the oral surface. Internal supports of the test are visible (Fig. 2). No other echinoids were observed in the beachrock, despite a modest abundance of other benthic taxa.

Fig. 2. After Donovan et al., 1993, fig. 3. Sand dollar *Clypeaster rosaceus* (Linné), Natural History Museum, London, EE3000, from Holocene (20th Century?) beachrock, the Palisadoes (Locality 1 in Fig. 1). Lateral view (anterior to left) to show abraded ambital region and infill of lithic fragments with a carbonate cement. Arrow indicates internal support of test. Length 95 mm.

4.2. Goose barnacles, pseudoplankton and pumice

(Adapted from Donovan, 1999). An unusual specimen of pumice supports its involvement in pseudoplanktonic transport of invertebrates in the Caribbean. Pseudoplankton is the attachment of a benthic organism to a floating structure (Wignall and Simms, 1990), such as a log, empty cephalopod shell (Donovan, 1989) or plastic bag. The specimen was collected from of the Palisadoes, slightly west of Locality 2 (Fig. 1).

The specimen is a cobble-sized clast of pale grey pumice with a maximum dimension of about 69 mm (Fig. 3). The rock is obviously vesicular and still floats. Uncommon, well-shaped, mafic phenocrysts (hornblende) attain a maximum dimension of 8 mm. Attached to this clast are at least twelve specimens, from minute juveniles to mature adults, of the lepadomorph (goose) barnacle *Lepas anatifera* Linné, associated with the attachments of at least 13 further, mature individuals.

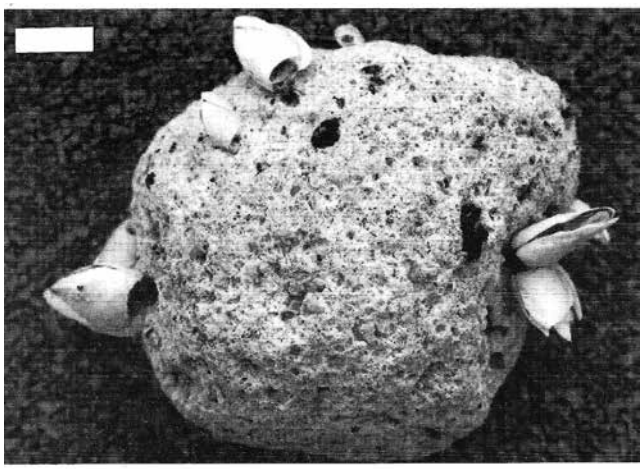

Fig. 3. After Donovan, 1999, fig. 1. A cobble of pumice encrusted by the lepadomorph barnacle *Lepas anatifera* Linné, collected near Locality 2 on the Palisadoes. Larger, more mature individuals occur towards the circumference, while a few, minute juveniles are discernible more centrally. The specimen is deposited in the University of the West Indies Geology Museum (UWIGM), Mona, Jamaica, with registration number 1998.5. Scale bar represents 10 mm.

Lepas anatifera commonly occurs as pseudoplankton on biological and man-made drift within the Caribbean region (Bacon, 1976, p. 7; Donovan, 1989). An igneous rock such as pumice is an unusual substrate for *L. anatifera* or any pseudoplanktonic invertebrate. However, Jokiel (1990) reported the transport of modern colonial scleractinians on pumice within the Pacific region, so goose barnacles are not so unusual in such a situation. When this specimen was found, the only major volcanic activity in the Antillean region was that of the Soufriere Hills in Montserrat, about 1,500 km from the Palisadoes. This volcano had been active since July 1995 (Druitt and Kokelaar, 2002).

4.3. Echinoids

Locality 2 is a favourite site for the tests of Recent echinoderms. Ophiuroids (brittle stars) and echinoids are common. Ophiuroids disarticulate soon after death, but may be found dried and ‘mummified’ at this site. They live in large numbers under scleractinian debris in just a few cm of water at Lime Cay in the Port Royal cays (Fig. 1) and are presumably washed up on the beach during storms.

Echinoid taxa with robust tests are common at Locality 2. Dead tests include *Echinometra lucunter* (Linné) and *Echinometra viridis* A. Agassiz, regular echinoids with particularly robust tests (Hendler et al., 1995) and with a good fossil record in the region (Donovan, 1993). What is surprising is the occurrence of echinoids with thin and/or fragile tests. A personal favourite is the spatangoid (heart urchin) *Brissus unicolor* (Leske) (Donovan and Veale, 1996; Fig. 4 herein). The figured specimens are part of a collection of 45 tests from Locality 2, now deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D.C. (USNM). *Brissus unicolor* has a particularly thin test and these were the only multiple specimens of this species collected from a Jamaican beach during the 12½ years that I lived on the island. I was obviously collecting at Locality 2 on just the right day. *Brissus unicolor* is known from the Pleistocene of Jamaica (Simpson, 2001) and *Brissus* spp. occur elsewhere in the fossil record of the Antilles (e.g. Donovan et al., 2016).

The strangest echinoid that I have found from the Palisadoes is shown in Figure 5A, B (Donovan and

Lewis, 2009). The cidaroid *Eucidaris tribuloides* (Lamarck) is a typical regular echinoid with an apical system composed of five (larger) genital plates, each with one genital pore, and five (smaller) ocular plates (Fig. 5C). These plates are rarely preserved in fossil specimens (Fig. 5D). The specimen in Figures 5A, B, has a truly aberrant apical system with eleven plates in the circlet, not ten, and there are eleven genital pores, not all restricted to genital plates. *Eucidaris tribuloides* is an easily recognisable species in the Jamaican Pleistocene (Gordon and Donovan, 1992), but is commonly fragmentary. Even 'complete' specimens lack the apical system, so aberrations like the specimen described herein would not be discernible. *Eucidaris* spp. is common in the Plio-Pleistocene of the region.

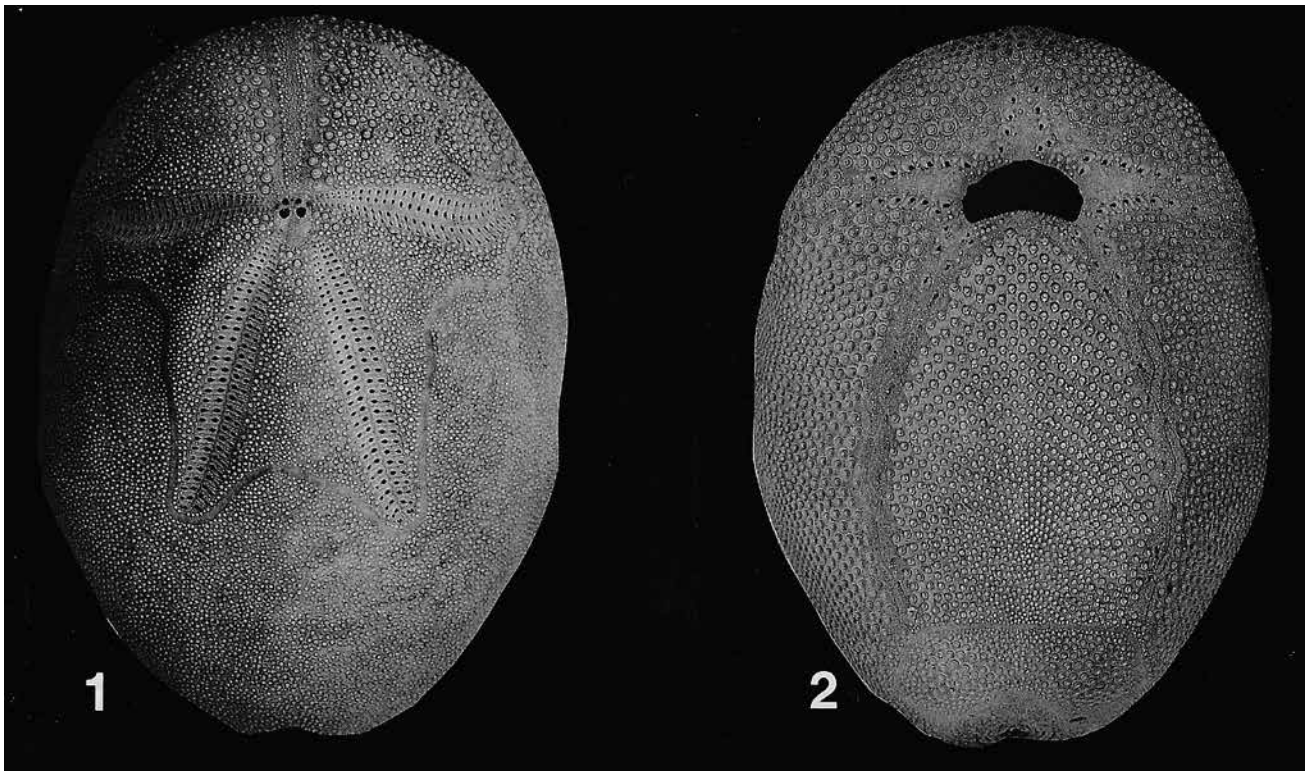

Fig. 4. A Recent irregular echinoid, *Brissus unicolor* (Leske) (after Donovan and Veale, 1996, fig. 4.1, 4.2). The Palisadoes, parish of St Andrew, Jamaica. Two specimens, each about 43 mm in length, registered at the National Museum of Natural History, Smithsonian Institution, Washington D.C., registration USNM E44054. **1,** apical view. Apex towards anterior; ambulacra petaloid apart from that in the anterior; the periproct is posterior, but not apparent in this view. **2,** oral view. Peristome kidney-shaped and towards anterior with the pores of the ambulacra easily distinguished; the posterior periproct is just apparent. Contrast the size and density of tubercles with *E. tribuloides* (Fig. 5); each tubercle would bear a spine in life. *Eucidaris tribuloides* is epifaunal and the spines are defensive; *B. unicolor* is infaunal and the spines are short, protecting the test from sediment and facilitating digging. Specimens painted with food colouring and whitened with ammonium chloride sublimate.

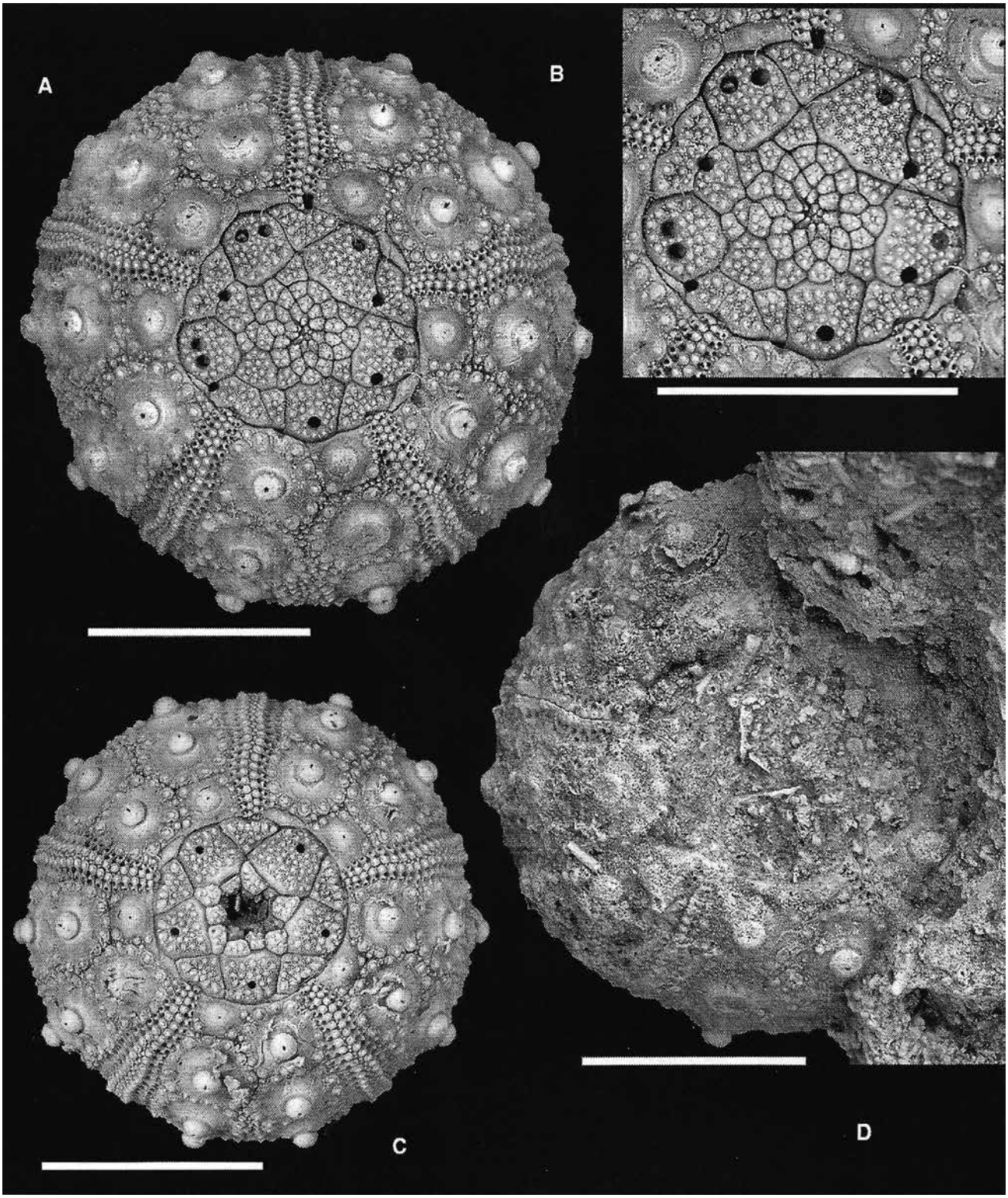

Fig. 5. After Donovan and Lewis, 2009, fig. 1. *Eucidaris tribuloides* (Lamarck), specimens in Naturalis Biodiversity Center, Leiden (prefix RGM). **A–C,** Recent, the Palisadoes, Locality 2 (Fig. 1). A, B, RGM 554 912. *A*, apical view; *B*, detail of apical system and aberrant plating. C, RGM 554 911, apical view; compare with (**A, B**). **D,** RGM 554 913, Pleistocene, Port Morant Formation, parish of St. Thomas, south-east Jamaica, apical view; apical system not preserved. Specimens whitened with ammonium chloride for photography. Scale bars represent 10 mm.

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