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Report of a field meeting to the Round Hill region of southern Clarendon, 9 April 1988

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Abstract – Round Hill, Clarendon, comprises a sequence in the Newport Formation (Miocene), White Limestone Group, overlain to the southwest by the Round Hill Beds (Plio-Pleistocene), August Town Formation, Coastal Group. Late Quaternary (Holocene?) limestone conglomerates unconformably overlie the Round Hill Beds. The limestones and siliclastics of the Round Hill Beds contain a fauna dominated by benthic molluscs, particularly scallops and oysters, but also including scleractinian corals, the foraminiferan *Sphaerogypsina globulus* (Reuss) and two species of sand dollar. The late Quaternary conglomerates thicken to the southeast and include a fauna of terrestrial gastropods. Chubb's suggestion that the source of the black sands on Farquhar's Beach was the Cretaceous inliers of central Jamaica is the most probable theory for the formation of this deposit. The mineral springs at Milk River Bath and the God's Well sink hole were also visited.

INTRODUCTION

THE PURPOSE of the field meeting was to study the sedimentary sequence and palaeontology of the Round Hill Beds and to examine the nature of the black sand deposit of Farquhar's Beach, the radioactive mineral springs at Milk River Bath and the spectacular God's Well sink hole. A party of 32 members and friends left Kingston on the morning of Saturday, 9 April, and rendezvoused in the car park shortly before Farquhar's Beach.

The positions of all localities mentioned in the text are shown in Fig. 1.

Locality 1: FARQUHAR'S BEACH

Trevor Jackson (TAJ) immediately introduced the party to the distinctive black sand deposit of Farquhar's Beach. This is one of several black sand beaches that occur along the south coast of Jamaica. The sand at Farquhar's Beach is composed primarily of titano-magnetite and titano-haematite crystals with lesser amounts of feldspar, quartz and calcite (McFarlane, 1977). Major element components in the magnetic portion of the black sands are Fe_2O_3 (85.7 to 71.9 per cent), FeO (14.2 to 2.2 per cent) and TiO_2 (16.3 to 8.9 per cent): (Chubb, 1960).

Because the black sands are concentrated at the mouth of the Rio Minho and westward along the south coast from Farquhar's Beach in Clarendon to Long Acre Point in St Elizabeth, Chubb (1960) speculated that the source of the sands was the Cretaceous inliers in the interior of central Jamaica. Erosion and transportation by rivers flowing southwards, accompanied by westerly longshore currents, accounts for the dispersion of sand along the coast. Wood (1976, p. 27) noted that sediment samples from Milk River Bay are almost totally composed of clastic material.

In 1977, McFarlane proposed that the source of the black sands was an igneous and/or metamorphic outcrop located south of the present coastline and not far from the present location of sand deposits. McFarlane suggested that these rocks had been exposed during the low sea level stands of the Pleistocene and erosion proceeded mainly by physical, rather than chemical, weathering. However, this theory must be considered, at best, speculative. Available evidence strongly supports the views of Chubb (1960).

Because insufficient time was available, the raised beach deposits in this area were not examined in detail (Robinson, 1968).

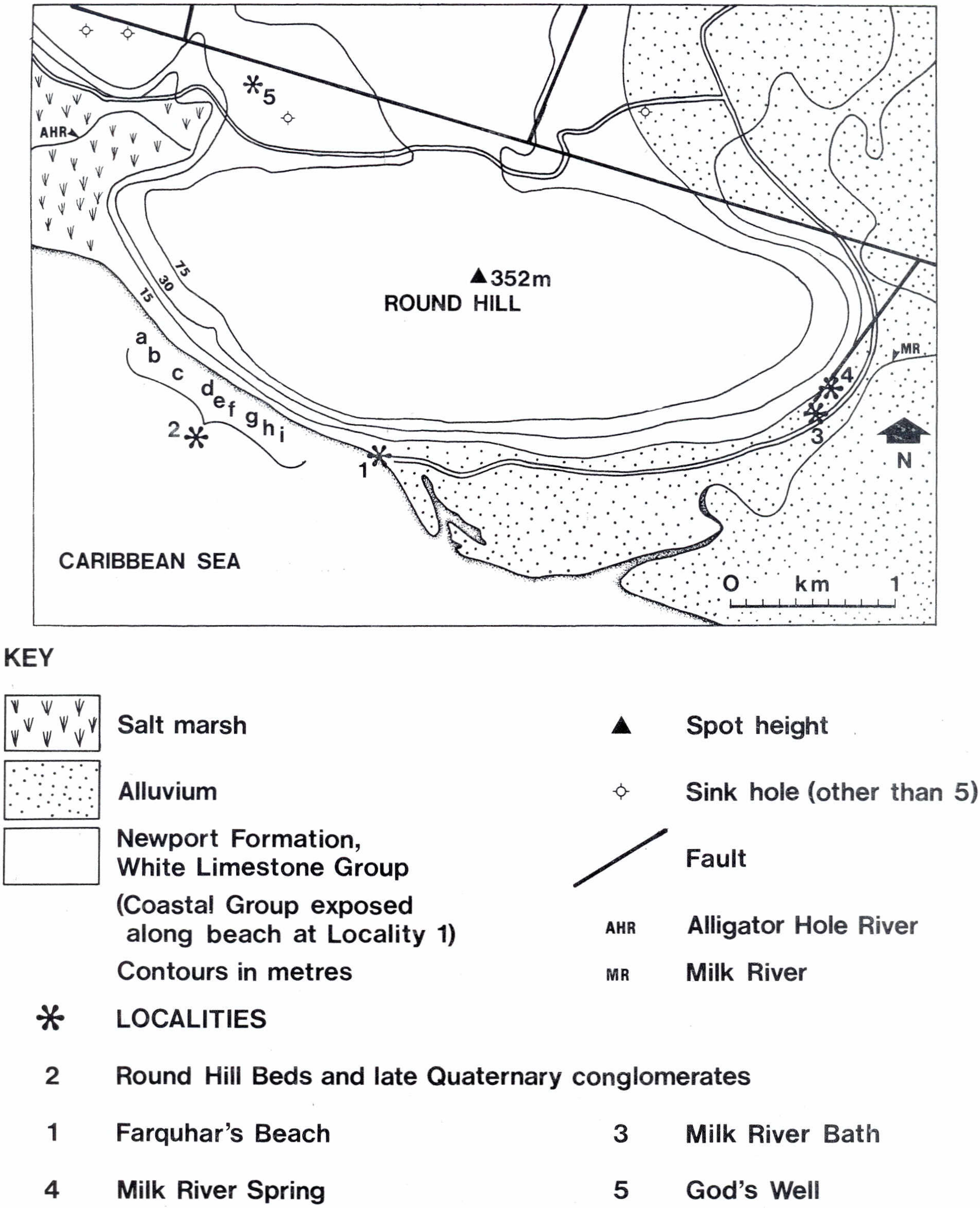

Figure 1. Simplified geological map of the Round Hill area, loosely based on Geological Survey Division provisional 1:50,000 sheet 13, 'Mandeville', April 1974. The Round Hill Beds and overlying Holocene(?) conglomerates are exposed along Farquhar's Beach.

Locality 2: ROUND HILL BEDS

The sequence of the Round Hill Beds (August Town Formation, Coastal Group) at Farquhar's Beach is probably the best exposed fossiliferous sequence in Jamaica, yet it has not so far been described in detail, although an account of part of the section appears in Littlewood and Donovan (1988). The party proceeded on foot to the far end of the exposure. Despite being informed in advance that knee-deep water was to be anticipated on some parts of the section, it soon became apparent that some members of the party had not dressed accordingly!

The following brief account of the solid geology of Round Hill is largely derived from Littlewood and Donovan (1988). The Round Hill Beds are a sequence of limestones, sandy limestones and siliclastics, with a fauna dominated by benthic molluscs, particularly pectinaceans (scallops) and oysters, and the benthic foraminiferan *Sphaerogypsina globulus* (Reuss) (Robinson, 1968, p. 46), with colonial scleractinian corals, crabs, barnacles, rare clypeasteroid echinoids (sand dollars), and occasional horizons dominated by simple and branched burrows. The whole sequence is richly fossiliferous. Dips are steep, either to the south or vertical, and the outcrop is incised by occasional faults. This coastal section was first described by Duncan and Wall (1865, p. 6, fig. 4), who considered the succession to comprise Miocene sediments overlain by a white limestone. Robinson (1968) correctly re-interpreted the sequence as a possibly conformable contact between the underlying Newport Formation (Miocene: White Limestone Group) and the younger Round Hill Beds (Plio-Pleistocene), which are in turn unconformably overlain by cemented limestone screes of late Quaternary (Holocene?) age and derived from Round Hill itself. Robinson (ibid., p. 46) noted that 'Several remarkable beds of oysters occur near the base of the sequence, with the oysters in an original position of growth, and with many individual shells reaching 15 inches or more in length'. Prescott and Versey (1958, p. 39) considered that these oysters resembled *Ostrea haitiensis* Sowerby, although they are actually *Crassostrea virginica* (Gmelin). The main oyster horizons at Localities 2c and 2h + i are probably the same, as about 1 m beneath each of them is a horizon yielding the clypeasteroid echinoid *Clypeaster* sp. cf. *C. rosaceus* (Linnaeus). Indeed, many of the fossiliferous horizons in this sequence appear to be dominated by a single species.

The party inspected these beds while proceeding back to the parked vehicles, with Stephen Donovan (SKD) and Timothy Littlewood (DTJL) identifying fossils for collectors. Two particularly interesting discoveries were made. Mrs Elizabeth Davis-Strickland found a spine from the regular echinoid *Eucidaris tribuloides* (Lamarck) at Locality 2b. Even more notable was the discovery of a near-complete test of the sand dollar *Encope* sp. aff. *E. sverdrupi* Durham by Miss Jacqueline F. Bowen (JFB) at Locality 2d. Once alerted to the presence of this distinctive species, further fragments were located by Mr Steve Geetan, Miss Lavinia Marriott, JFB, DTJL, and SKD. While both of these species are known from Jamaica (Donovan, 1988), neither has been adequately described from the island. Mrs Davis-Strickland also collected a large crab claw, although it was uncertain whether this was *in situ* or part of the float and therefore possibly Recent.

The Holocene(?) conglomerates were inspected in fallen blocks on the beach. The conglomerates thicken to the southeast and contain a terrestrial gastropod fauna.

Localities 3 and 4: MILK RIVER BATH AND SPRING

Lunch was taken at Milk River Bath, allowing the keener palaeontologists time to rejoin the party.

The Milk River Springs discharge along an east-west trending fault at the foot of the eastern end of Round Hill. The main spring provides a supply of water to bathhouses at the Milk River Hotel (Locality 3). North of the hotel another spring flows into a shallow well (Locality 4: Royall and Banham, 1981). The spring water at Milk River issues from the Newport Formation, close to the contact between the limestone and the alluvium of the Milk River (Fenton, 1981).

The temperature of the water in the bathhouse of the hotel is 33° C, whereas at the well site it is 37° C. The spring waters are known for their high level of radioactivity, caused by the presence of Rn^{222} (Vincenz, 1959), and are regarded as among the most radioactive in the world. The springs at Milk River contain up to 16 per cent more chloride than seawater (Royall and Banham, 1981). The Ca:Na ratios of the springs are also higher than for seawater, which may be due to the increased solubility of calcium carbonate in the spring water.

It is believed that much of the spring water may be derived from seawater entering the South Coast Fault at depth. This water becomes heated and modified in rising along the fault, mixing with groundwater from limestone near the surface. The source of the radon is believed to be at appreciable depth. This was deduced by Versey (1959), who observed that the rate of discharge had (a) a direct relationship to precipitation and (b) an inverse relationship to the total dissolved solids content of the water and to the intensity of radiation.

The Milk River springs are used solely for their therapeutic properties. Although members of the party did not avail themselves of the bathing facilities, the radioactivity of the baths and spring was demonstrated by Miss Joan Thomas and Mrs Andrea Johnson, of the Centre for Nuclear Sciences at the University of the West Indies, using a four-channel gamma spectrometer. Measurements taken in bathhouse number 2 (Locality 3) gave an average reading of 7,599 counts min^{-1}. Background was 902 counts min^{-1}. The mean reading at Locality 4, a small spring 100 m east of the hotel, was 1,590 counts min^{-1}, with a background of 1,407 counts min^{-1}.

Locality 5: GOD'S WELL

The party now drove to the north side of Round Hill to examine God's Well, the most spectacular sink hole in the Newport Formation. TAJ explained that this feature was first described by Sawkins, in 1869, and later, in more detail, by Zans (1960). According to Zans (ibid., p. 100), the major east-west fault, which extends along the northern side of Round Hill, plus the northwest-southeast joint systems, greatly facilitated the development of karst in this area.

The orifice of the sink hole is oval and measures 40 m along its longer axis and 25 m across. The sink hole has near-vertical walls, and the distance from the top of the depression to the water level is approximately 25 m. The water level fluctuates between wet and dry seasons by about 0.7 m. God's Well is drained underground to the west, where it issues as a spring at the head of the Alligator Hole River (ibid.).

Zans (ibid., p. 104) postulated that God's Well was produced by the collapse of a limestone roof over a major underground cavern.

The party drove the short distance westward to Manatee Pond, in order to examine this development before returning to Kingston.

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