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Report of a field meeting to the Guinea Corn Formation, northern Clarendon, Jamaica, October 25th, 1997

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INTRODUCTION

THE PURPOSE of this field meeting was to examine the Upper Cretaceous limestones and associated sediments of the Guinea Corn Formation (Upper Cretaceous, Central Inlier, Jamaica), to consider the use of 'way-up' indicators, and to determine the depositional environment of the succession. The Guinea Corn Formation has received extensive palaeontological study (e.g., Chubb, 1971; Donovan, 1993; Hazel & Kamiya, 1993; Jiang & Robinson, 1987; Kauffman & Sohl, 1974; Krijnen *et al*., 1993; Sandy *et al*., 1997), but relatively little study of the sedimentology and palaeoenvironment (other than concerning the rudists by Kauffman & Sohl, 1974) have been published. Recent work by the leader on the stratigraphy of the Guinea Corn Formation is also included in the present volume (Mitchell, 1999), and further detailed studies on the sedimentology and palaeoecology are in preparation.

The leader together with 16 members of the Geological Society of Jamaica (G.S.J.) and the first year geology class of the University of the West Indies left the Department of Geology, University of the West Indies in two coaches and assembled with 3 further members of the G.S.J. at Frankfield in northern Clarendon. From there, the party proceeded to the first locality (Section 3 of Mitchell, 1999, this volume) situated about 3.5 km outside Frankfield.

STOP 1. THE CONFLUENCE OF THE WHITE ROCK RIVER AND THE RIO MINHO

The succession immediately downstream from the confluence between the White Rock (or Rondons) River and the Rio Minho exposes the lower 41 m of the Guinea Corn Formation and the junction with the underlying Slippery Rock Formation (Mitchell, 1999, this volume). The party walked to the highest exposed part of the section and examined the upper 15 m of the section (See Mitchell, 1999, Fig. 3, this volume). The beds strike ESE and dip 48˚ towards the NNE. The party examined upper cycle B2 (nomenclature from Mitchell, 1999, this volume), cycle B3 and lower cycle C1. Each cycle consists of three distinct sedimentary units, a lower siltstone unit rich in volcaniclastic grains (lower B3 and lower C1), a siltstone or calcareous siltstone unit rich in either corals (middle B3) or with scattered rudists including *Antillocaprina stellata* Chubb (mid C1), and an upper bedded limestone with abundant rudists (upper B3). The limestone division of B3 contains a relatively soft carbonate matrix rich in volcaniclastic silt, and the rudists are beautifully weathered out (Participants were requested not to hammer this unit).

The party spent some 1½ hours studying these exposures and made copious discoveries. The siltstone of C1 yielded abundant fossils including examples of the small rudist '*Distefanella*' sp., the button coral *Paracycloseris elizabethae* Wells, and a variety of gastropods including *Turritella* sp. The leader explained that this was a soft sediment fauna with the small rudist "*Distefanella*" sp..

Numerous corals were observed in the mid portion of B3 including abundant *Ovalastrea trechmanni* (Wells), *Actinacis* sp., *Vaughanoseris catadupensis* Wells, *Trochoseris catadupensis* (Vaughan), *Leptoria (Dictuophyllia) conferticostata* (Vaughan) and *Dichocoenia* sp. Rudists were rare in this unit, but a few *Biradiolites jamaicensis* Trechmann and *Plagioptychus* sp. were discovered in the upper part.

The overlying limestone (upper B3) contained abundant rudists occurring in well defined beds. The way up of the beds was determined from mud geopetal structures developed in the body cavities of rudists. Many different rudists were identified including *B. jamaicensis*, *Bournonia cancellata* (Whitfield), *Antillocaprina suboccidentalis* Chubb, *Thyrastylon adhaerens* (Whitfield) and *Plagioptychus zansi* Chubb. Great joy was expressed at finding small clusters of *B. cancellata* in life position at one level. Of particular interest was the bed of reworked fragments of *B. jamaicensis* clusters; specimens were observed in various orientations, including some, which were upside down.

The party also noticed that down-river from this point the attitude of the beds changed, becoming first horizontal and finally dipping at 30˚ towards the WSW. Hence a small syncline was developed in the sediments at this point with a fold axis gently plunging towards the NW.

STOP 2. CABBAGE HILL

After taking lunch, the party divided into five and examined different aspects of the Guinea Corn Formation exposed in the Rio Minho at Cabbage Hill (Section 7 of Mitchell, 1999, this volume). This stop shows a good section through the upper part of the Guinea Corn Formation (See Mitchell, 1999, Figs 5-7, this volume). The leader demonstrated a bed containing abundant oncolites (basal cycle D5). The oncolites, up to 5 cm in diameter, each had a nucleus representing a reworked fragment of coral. The nuclei were mantled by irregular wrinkled algal layers. This is the thickest oncolite-bearing unit in the Guinea Corn Formation. General discussion pursued, and it was decided that the algae must have grown in shallow water within the photic zone, and, therefore, at a water depth of somewhat less than 50 m. The succeeding unit (unit E of Mitchell, 1999, this volume) of the Guinea Corn Formation consisted of volcaniclastic sediments. A particularly prominent sandstone was studied and found to be graded from very coarse sand at the base to very fine sand at the top. This normally graded bed was interpreted as a storm bed and indicated that the beds younged towards the NE.

Miss Anestoria Shalkowski demonstrated sedimentary structures in the lower part of unit E of the Guinea Corn Formation. Well-developed unidirectional ripple form sets and truncated cross-bedding were recognised. As used as way up indicators, these agreed with the way up determined from the normally graded sandstone.

Miss Deborah-Ann Rowe demonstrated a bed containing abundant examples of the large rudist *Macgillavryia nicholasi* (Whitfield) (formerly known as *Durania nicholasi*). It was agreed that no examples of *Macgillavryia* were in life position and that they must have either toppled over after death, or have been reworked by storms. Careful observations revealed that the exposed upper surfaces of the toppled *Macgillavryia* had been bored by lithophagid bivalves (forming the trace fossil *Gastrochaenolites* isp.), and since the borings were restricted to the upper surfaces it was concluded that such boring occurred post-mortem. A few other rudists were recorded as occurring with the *Macgillavryia*, these included *Chiapasella radiolitiformis* (Trechmann) and *P. zansi*. Diligent searching by members of the party also revealed beds with *Titanosarcolites giganteus* (Whitfield) and *B. jamaicensis* about 1 m higher in the succession.

Dr. David Miller demonstrated the details of a cycle in the upper part of the Guinea Corn Formation, which is jointly being studied by himself and the leader (Mitchell and Miller, manuscript in prep.). A well developed gutter on the far bank of the river had a well developed 30 cm thick lignite bed resting on a very irregular surface. The party observed that the irregular surface bore small pock-marks up to a few centimetres across and larger pot holes with diameters of 20 cm and depths of 30 cm. It was generally agreed that these features were orientated normal to bedding, and were unrelated to the present orientation of the beds. Dr. Miller explained that this surface was a palaeokarst and related to a short period of subaerial exposure of these limestones. The overlying lignite bed was devoid of marine microfossils and might represent a fresh-water deposit formed upon the palaeokarstic surface. The associated limestones contained relatively few rudists, but abundant larger benthic foraminifera possibly indicating shallow marine conditions.

Prof. Edward Robinson demonstrated the abundance of foraminifera in the upper part of the Guinea Corn Formation. The abundant small white spots up to 1 mm in diameter, were examples of the larger benthic foraminifera *Kathina* and *Chubbina*, *Chubbina* being a guide fossil for the Guinea Corn Formation. Close by, was a good example of a further guide fossil for the Guinea Corn Formation, the rudist *T. giganteus*. Previously, the limestones containing *T. giganteus* in Jamaica had been called the *Titanosarcolites* Series. Professor Robinson also demonstrated the contact of the Guinea Corn Formation with the normally graded sandstones of the overlying Summerfield Formation. He demonstrated that when there is a normal sedimentary contact between formations and we know which is the younger and which the older, then this can be used as a way up indicator.

The party then reassembled and the leader summarised what we had seen during the day. We had encountered numerous way up indicators including: geopetal structures, rudists in life position, normally graded beds, truncated cross-bedding, ripple form sets, a palaeokarstic surface, and a known sedimentary contact between an older and a younger formation.

The depositional environment of the Guinea Corn Formation was considered with relation to the sediments seen. The association of a paleokarstic surface with the foraminifera-rich limestone and rarer rudists suggested the shallowest marine environments of the Guinea Corn Formation. The deeper water facies were considered to be the silty shales and coral-rich deposits of stop 1.

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