

# The Geology of the Clerc Site, Guadeloupe and its Implications

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## INTRODUCTION

The controversy surrounding the fossilised woman from Guadeloupe (Cooper,<sup>1</sup> Bowden,<sup>2</sup> Wise,<sup>3</sup> Stringer<sup>4</sup>) brought to light one serious deficiency in the information many of the claims and counter-claims were being based upon. The description of the discovery by the original discoverers via Duchassaing<sup>5</sup> and later Clerc<sup>6</sup> and Saint-Michel<sup>7</sup> were all either insufficient or ambiguous enough to

prevent any conclusive argument about the skeleton. It was for this reason that I visited Guadeloupe in December of 1985. It was my aim to firmly establish the geology of the Clerc site in particular and its surrounds in order to answer two questions. Firstly, could the specimen in the British Museum have come from the Clerc site, and secondly, if it did not come from the Clerc site then where could it have come from?

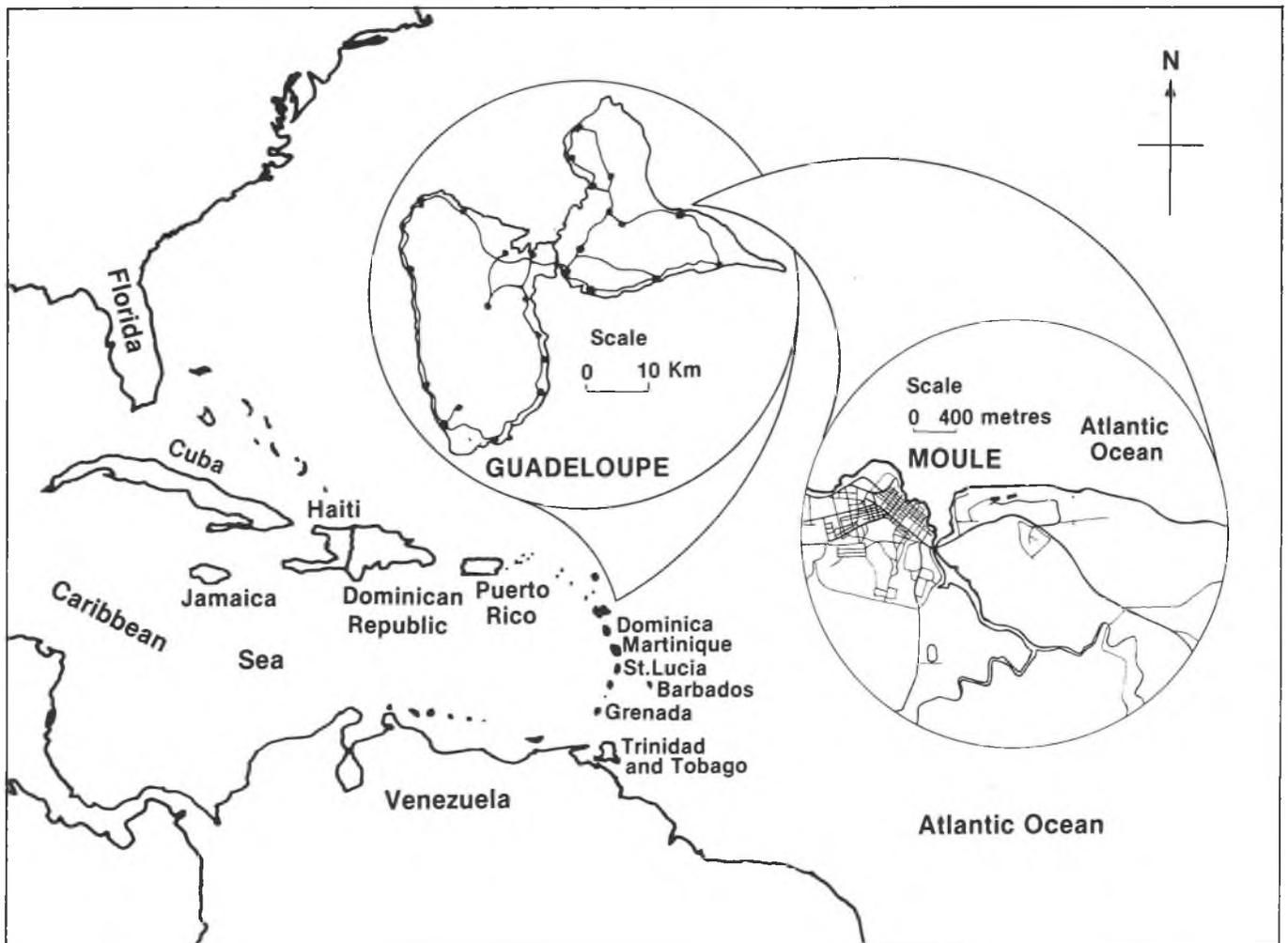


Figure 1. Map showing the location of the islands of Guadeloupe, and the township of Moule on Grande-Terre, the easternmost of the two islands making up Guadeloupe.

In order to answer those two questions it was necessary to:

1. Locate the Clerc site.
2. Investigate its geology.
3. Map its stratigraphy in order to,
4. Establish whether it was feasible that a specimen encased in beach rock(?) could have come from such a site, and if not,
5. To locate possible sites where the skeleton may have originally come from, and
6. Collect specimens from such sites to be compared with the rock in the British Museum.

### ESTABLISHING THE CLERC SITE LOCATION

After consultation with the director of the Clerc Museum on Guadeloupe and accompanied by a local guide, it was not too difficult to locate the pits where Clerc did his excavations from 1960 to 1970 (see Fig. 1). Despite the fact that the area outside of the township of Moule, particularly along the cliff faces to the east, is rather jungle-covered, the location is not too hard to find. Since specific directions have never been in print before, to the best of my knowledge, the site is located by moving along the highway east of Moule, turning left at the entrance to the Hotel Les Alizes and proceeding to the beach-front. At the beach-front a dirt track moves off to the east which can be followed for about three quarters of a kilometre until a set of tyre tracks proceeds down to the rear of the dunes. The Clerc site is located at the end of those tyre tracks (see Fig. 2) and

is approximately 200–300 metres from the old Morel windmill. Currently the site is apparently used on the odd occasion by sand robbers. The site is not easy to see because of the rapidly growing shrubbery around it. It cannot be seen from the beach-front. The precise location is shown on Figure 3.

Although Saint-Michel's map, which was used as the basis for Figure 3, was published in 1963, the foreshore area shown by Saint-Michel is rather inaccurate in places owing to up to 20 metres of foreshore having been eroded in various locations since 1959 (when Saint-Michel finished his mapping). This is particularly true of the beach in front of the Clerc site. Clerc's site is definitively located on the landward side of the stabilised coastal dune which runs along the foreshores east of Moule and has otherwise been referred to as the Galibis Sands.

### GEOLOGY OF THE CLERC SITE

Extensive investigations were made along the entire length of the stabilised dune from the eastern side of Moule Harbour to the point east of Moule where they can no longer be found. Excavations were made into and through this sand to find what it was comprised of, what lay underneath it, and to collect specimens from through it. The pattern of structure was consistent throughout the length of the dune. This procedure was made easier since in several places the dune had been previously breached during storms either by waves or accumulated wash from behind, so complete cross-sections of the dune were available for investigation (see Figs. 4 and 5).



Figure 2. (a) A view showing the area in which the Clerc pit is found. The pit can be seen at the end of the tyre tracks and to the right of the car.



Figure 2. (b) Close-up of the Clerc site showing the excavations. Note the steep hill in the background.

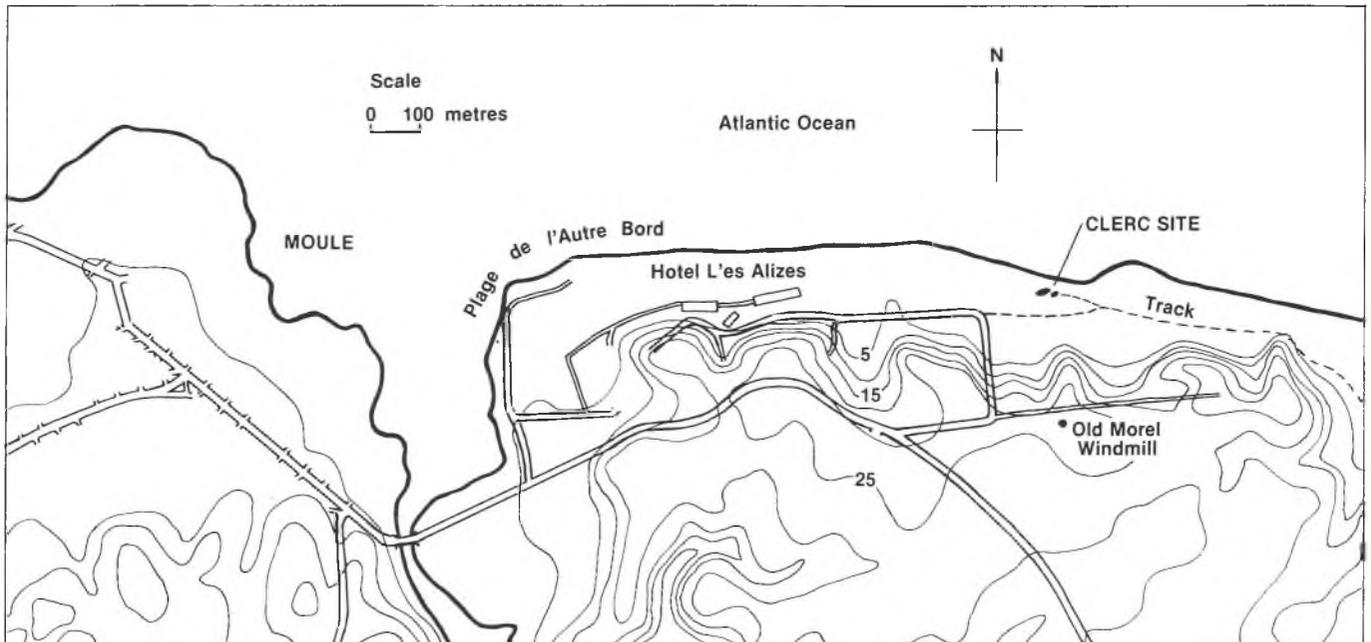


Figure 3. Map showing the location of the Clerc site, east of Moule.

In size the dune was rarely greater than 2 metres in height and often much less. The vegetated section of the dune, which went effectively from high water or splash zone mark back until the underlying strata were exposed on the opposite side of the dune, was rarely wider than six to seven metres. The dune consisted of an upper layer of vegetation that had

produced a carbon-rich layer up to one third of a metre in thickness, which I suspect indicates it has been stable for a fair length of time. Proceeding downward through the dune, the sand became increasingly white and lacking in carbon content. It was very obviously beach sand and primarily consisted of shelly fragments, including some whole

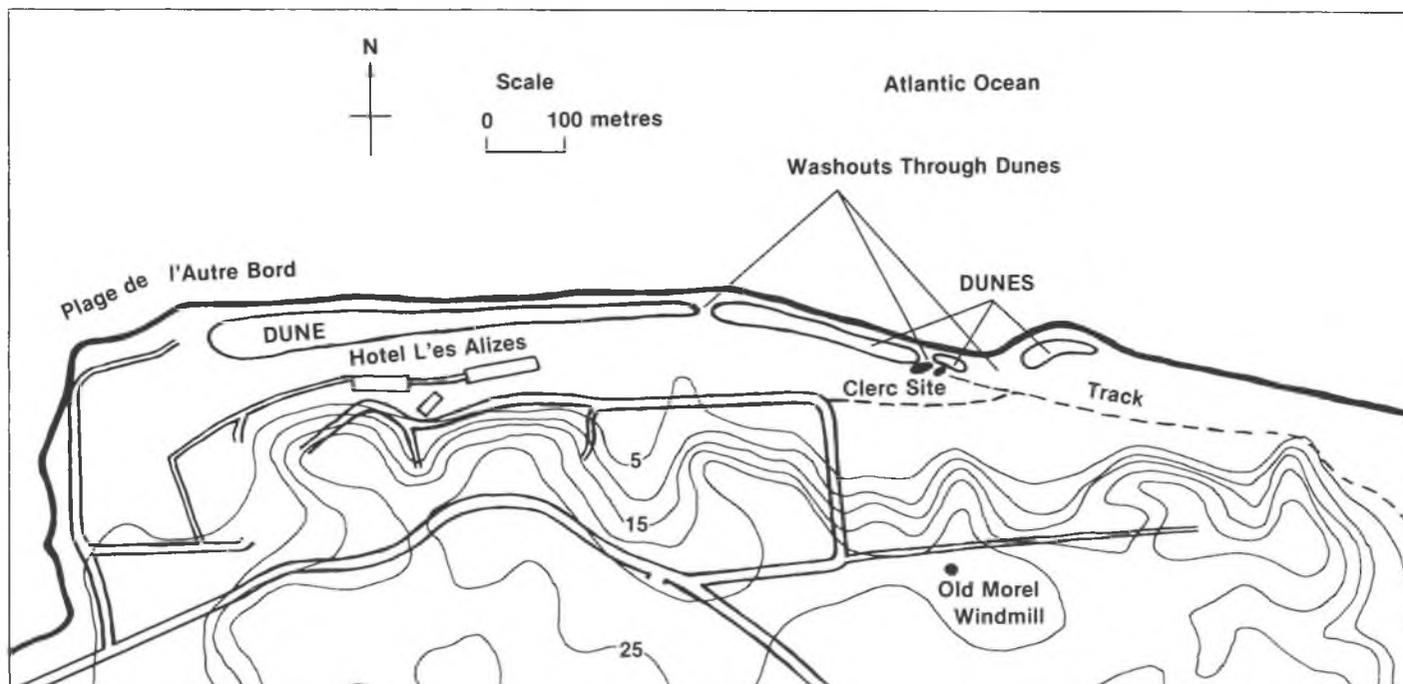


Figure 4. Map showing the locations where washouts in the coastal dune allowed stratigraphic cross-sections through the dune to be investigated.



Figure 5. View of one of the washouts in the coastal dune.

shells. Stratification was not very evident in the dune.

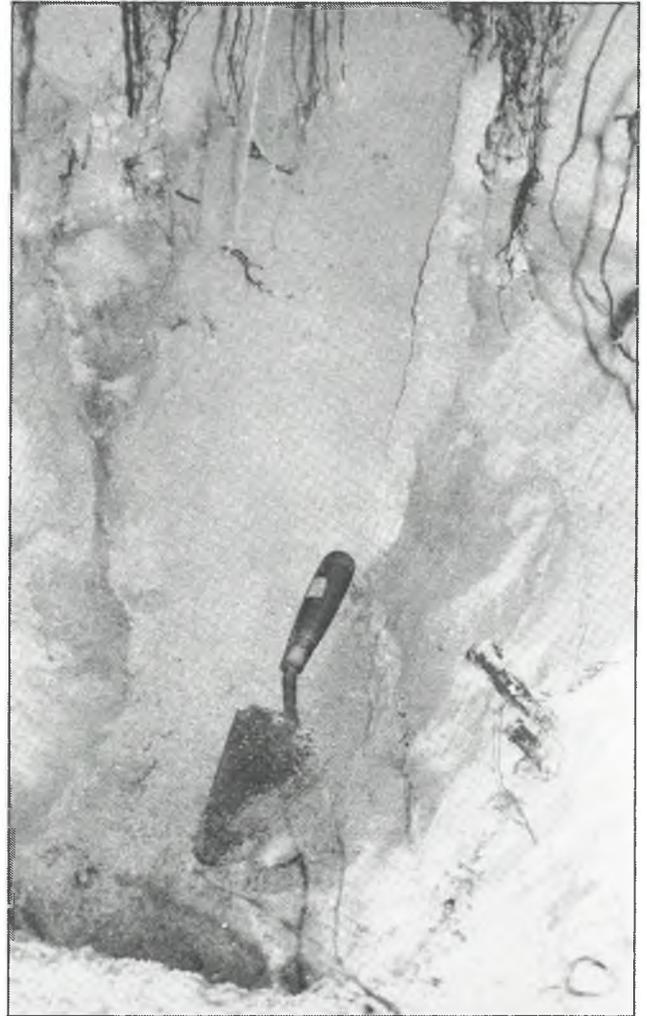
The diagrams used by previous authors showing the Galibis Sands as up to 200 metres thick are either overly generous or out of date due to erosion. Even if one includes the entire width of the current beach,

there is rarely more than 50 metres of sand from the water's edge to the rear of the dune.

A further cross-section was made from the top to the bottom of the dune behind which the actual Clerc pit(s) was located (see Fig. 6). The pattern was similar to all other locations along the dune.



**Figure 6. (a)** General view inside the Clerc pit showing the location of the dog discovery (guide's left hand pointing) and its relationship to the yellow clay layer at the base of the excavation (guide's right hand pointing).



**Figure 6. (b)** Excavation through the dune to the clay layer at the bottom of the Clerc pit. The clay layer can be seen below the trowel. Note the sand shows no stratification and shell fragments are obvious (upper left hand corner).



**Figure 6. (c)** The same clay layer under the beach sand at Moule Harbour some two kilometres from the Clerc site. This illustrates the extensiveness of this clay layer.

Additional confirmation of it being the Clerc site was provided by my discovery of several buried Indian dogs and Indian pottery at the site. Three dogs in all were discovered (see Fig. 7). They were located roughly a metre from the top of the dune. They had been buried whole, indicated by the fact that the skeletons were intact, while a carbon-rich zone around the skeletons indicative of their body remains outlined the dogs' shapes. The pottery was found lower down in the excavation but no significant stratification was visually evident as I excavated through the dune. The texture of the sand towards the bottom of the dune became increasingly clayey, until it rested firmly on a layer of yellowish clay. In this location, as in all other locations investigated along the dune, this yellowish clay was non-fossiliferous(?) and rested on the top of an in situ uplifted reef (see Fig. 8).



Figure 7. Closer views of the dog skeleton discovery. (a) The guide points to the newly discovered dog skeleton just below the vegetation roots in the wall of the Clerc pit. (b) An even closer view of the dog skeleton.

Throughout all my excavations of the coastal dune, including the Clerc site, no calcification of the sand was evident within the dune. This was particularly tested for at the Clerc site, and no calcification of the sand was found. If the British Museum skeleton, which is encased in limestone as hard as "statuary marble", had come from the Clerc site, as claimed by Wise,<sup>3</sup> then some calcification of the dune sand and/or a layer of beach rock within the dune should have been found.

Thus available evidence from the dune, and particularly at the Clerc site, rules out any possibility that the skeleton in the British Museum could have come from the Clerc site.

### ORIGINAL SKELETON SITE?

With the elimination of the landward side of the dune as a possible source of the British Museum's fossilised woman, my attention shifted to trying to recognise any possible area which could have matched the rather vague site descriptions which have come down to us from the time of Duchassaing, Mantell and others. Mantell's diagram (1839)<sup>6</sup> as provided by Kurt Wise<sup>3</sup> and the general references to the skeletons being east of Moule narrowed down the possibilities. Nevertheless, a brief investigation was made of the coastline west of Moule and for

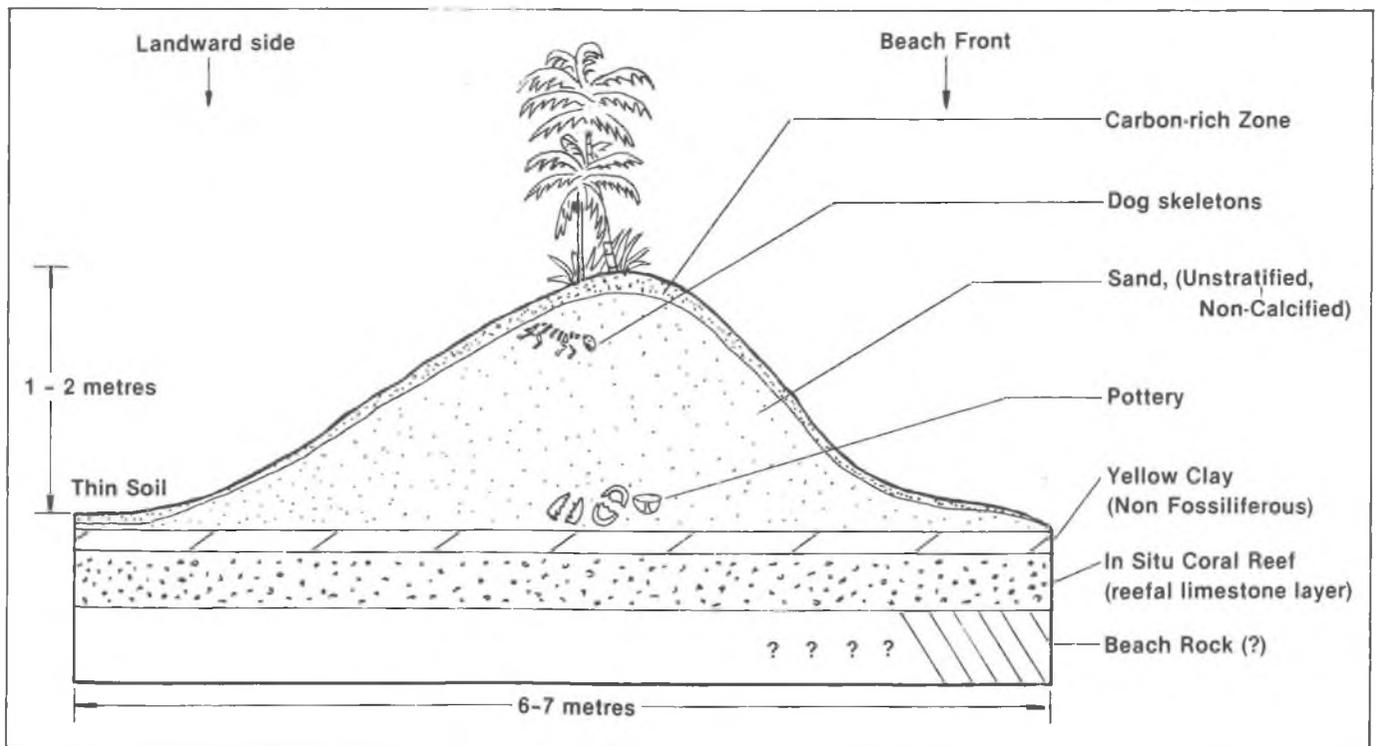


Figure 8. Idealised section through the coastal dune, including that portion of the dune at the Clerc site.

quite a considerable portion away from the location of Morel to the east, just in case the original references were incorrect. It did not take much investigation to the west of Moule to rule out any possibility that the skeletons could have been discovered in such a location as listed by the early researchers. There are almost no sites to the west of Moule which bear even vague resemblance to the one being searched for. It is not far along the coastline west of Moule until almost vertical cliffs predominate at the water's edge. Investigation of the coastline near Moule indicates that the only possible contenders for the original site adjacent to Morel fall within five kilometres east of the township of Moule. After that the same difficulty is reached — vertical cliffs rising from sea level at the shoreline.

Therefore, the potential coastal sites east of Moule were thoroughly investigated, the stratigraphy analysed, and specimens collected. If one assumes that Mantell's diagram (1839)<sup>8</sup> is reasonably accurate, even though it was based on second-hand information given to Mantell,<sup>3</sup> then the most likely locations for the skeleton are shown on Figure 9.

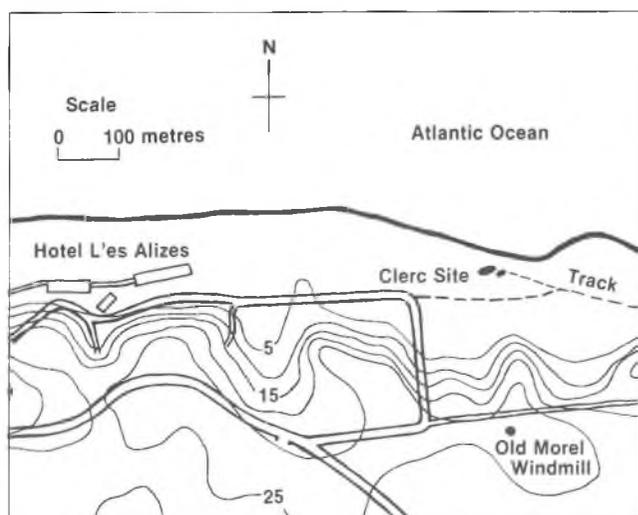


Figure 9. Map showing the coastline just east of L'Autre Bord. From all the descriptions we have today, this stretch of coastline is the most likely area in which the original skeleton was discovered.

My reason for choosing these locations which, as you will see, are relatively close to Morel, is that the cross-section shown by Mantell (1839) and the cross-section from the cliffs in this portion of the coast down to the sea have a great degree of similarity (see Fig. 10).

The most intriguing aspect of this area is the consistency of the cross-section. At all places shown the cross-section brings to light one fact — the entire Galibis Sands along this portion of the coastline are underlain by uplifted reef (see Figs. 5 and 11). This

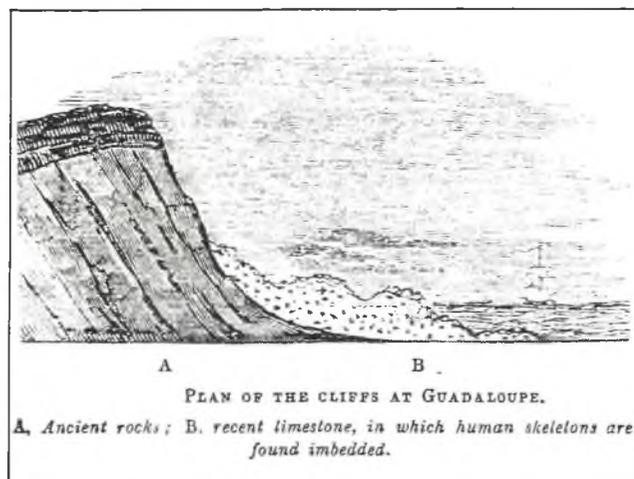


Figure 10. (a) Mantell's 1839 diagram of the beach-front and cliff where the skeleton was supposed to have been discovered.

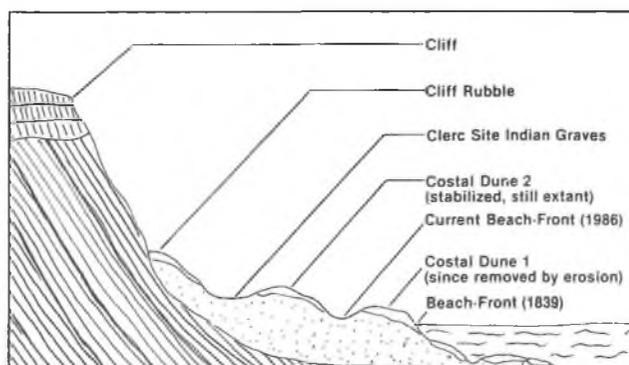


Figure 10. (b) Interpretation of Mantell's diagram. That diagram is reproduced with annotations to show the most likely changes to have occurred since Mantell drew it in 1839.

observation, which I well and truly documented photographically and with a collection of specimens, raises one question. Why has this fact not been shown before on previous maps of the area? It is not shown on Saint-Michel's map of 1963 and neither it is shown on Hinnewinkel and Petit's 1979 map<sup>9</sup> or Seurin's 1982 map.<sup>10</sup> I find it difficult to believe that geologists could have failed to have discovered this uplifted reef had they walked through the area as I did. They have accurately mapped the uplifted reef at the entrance of Moule Harbour. But since this same uplifted reef continues for many kilometres to the east of Moule both along the beach and underneath the Galibis Sands all the way up the cliffs at the rear of the Galibis Sands, why have they not observed it? On the landward side of the dune it is exposed (outcrops) in quite a large number of areas and even when not outcropping is usually only covered by a very thin layer of soil no more than two to three centimetres thick (see Fig. 12). This reef is also exposed in many places along the beach front.



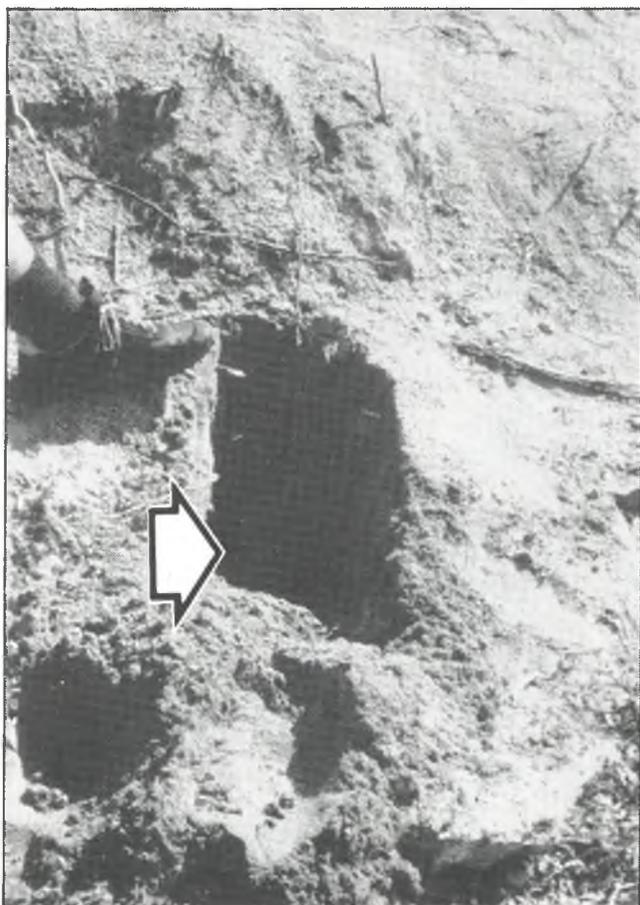
**Figure 11. (a)** The right-hand-side wall of the washout shown in Figure 5. This view exposed coral reef on the floor of the washout in the bottom left-hand corner of the field of view.

The uplifted reef is slightly above the high tide level at the beach-front and slopes gently upwards towards the cliffs until it is anywhere between one and three metres above sea level. The most surprising things about this reef are that it is rarely more than a half a metre thick, and it rests consistently on a strata which is best described as beach rock(?). This underlying beach rock(?) is thinly laminated in many places and forms flagstone-size layers, sometimes as thick as 15–20 centimetres. Because of the possibility that this was only a localised infilling of a wave excavated zone below the coral reef and might not continue under the coral reef, a thorough search was made for a section through the coral reef where this question could be studied. At one location west of Moule the uplifted reef was sufficiently eroded to establish quite clearly that the beach rock(?) underlay it for several hundred metres inland at varying thicknesses and



**Figure 11. (b)** A closer view of the uplifted in situ coral reef (reefal limestone layer) exposed in the floor of the washout.

varying angles. This was confirmed at a second site (see Fig. 13). In the area of the Clerc site the coastline itself provided a similar sort of evidence. Because the coast has been quite significantly eroded, and since all exposed points indicate the uplifted coral reef originally grew in situ on top of this beach rock(?), it is reasonable to conclude that if two such exposure points are 20–30 metres apart, one being further out to sea, then one could clearly establish that the beachrock material is laterally consistent under the reef for 20–30 metres. At the Clerc site itself the beach has been eroded landwards some 20 metres. However, the extension of the beach rock(?) inland behind the dune could not be confirmed at this site due to the lack of drilling equipment and suitable natural excavations. The significance of this observation is that the matrix of the British Museum skeleton and the beach rock under the coral reef are exceedingly similar and lends support to Cooper's thesis that the skeleton came from below the reef. It is my conclusion therefore that at all points along the coast from three kilometres west of Moule to four kilometres east of Moule a thin band of uplifted reef is situated on top of beach rock(?).



**Figure 11.** (c) Excavation of the side wall of the washout showing again the yellow clay layer below the sand dune but above the coral reef limestone layer.

Based on these observations, I therefore propose that the stratigraphic cross-section of the area east of Moule for some three to four kilometres is as shown in Figure 14. It is of interest to note that this reef appears to correlate stratigraphically with the uplifted reef labelled by Saint-Michel as Miocene at Point de la Couronne. A fuller account of the geology will however be discussed in a future paper.

You will notice that the cross-section again has remarkable similarities to Mantell's diagram. The most significant difference, however, is the absence of sand behind the coastal dune contrary to the diagrams of earlier investigators. This observation may be explainable on the basis that since Mantell's diagram was drawn, this area, which includes both the coastline and the zone behind the dunes, has been continually subject to removal of sand by wind and wave erosion (see Fig.10 again). The other observation which needs to be made is that the descriptions of the material surrounding the skeleton in the British Museum most closely resemble the material found underneath the uplifted coral reef, that is, the beach rock(?). Further research to test



**Figure 12.** (a) A view behind the coastal dune showing outcrop of the coral reef limestone layer landward of the dune (below the guide's feet). In the background the coastal cliffs behind the Clerc site can be seen.



**Figure 12.** (b) A closer view of the fossilised coral in the outcrop of the reefal limestone layer, confirming formation of the limestone from an *in situ* coral reef. (The pen is for scale).



**Figure 13.** (a) An outcrop west of Moule showing the exposed contact between the *in situ* coral reef limestone layer and the beach rock(?) beneath (guide is pointing to it).



**Figure 13.** (b) A closer view of this same contact. Note the fossilised coral above the contact and the stratification (lamination) in the beach rock(?) below.

this possibility needs to be carried out, particularly a thin section petrographic study to compare this beach rock(?) with material from the Museum.

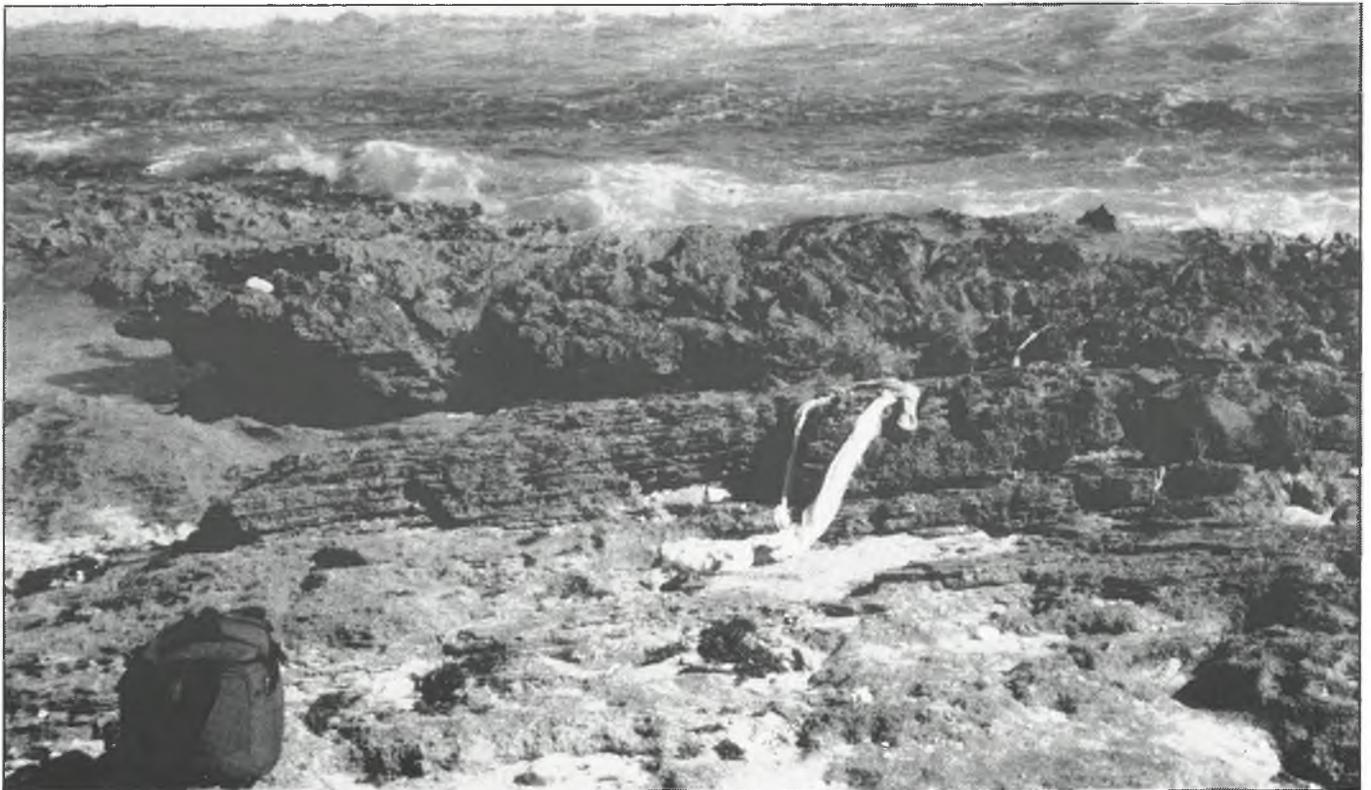
### SEAWARD SOLUTION?

Following a recent personal communication from Guadeloupe (May 1986) that new skeletons have been discovered (March 31, 1986) on the seaward side of the dune at the Hotel Les Alizes, which is just east of the harbour at Moule, the following possibilities arise which might solve the mystery of the origin of the skeleton in the British Museum. The newly discovered skeletons were found in a horizontal position laid out very similarly to the

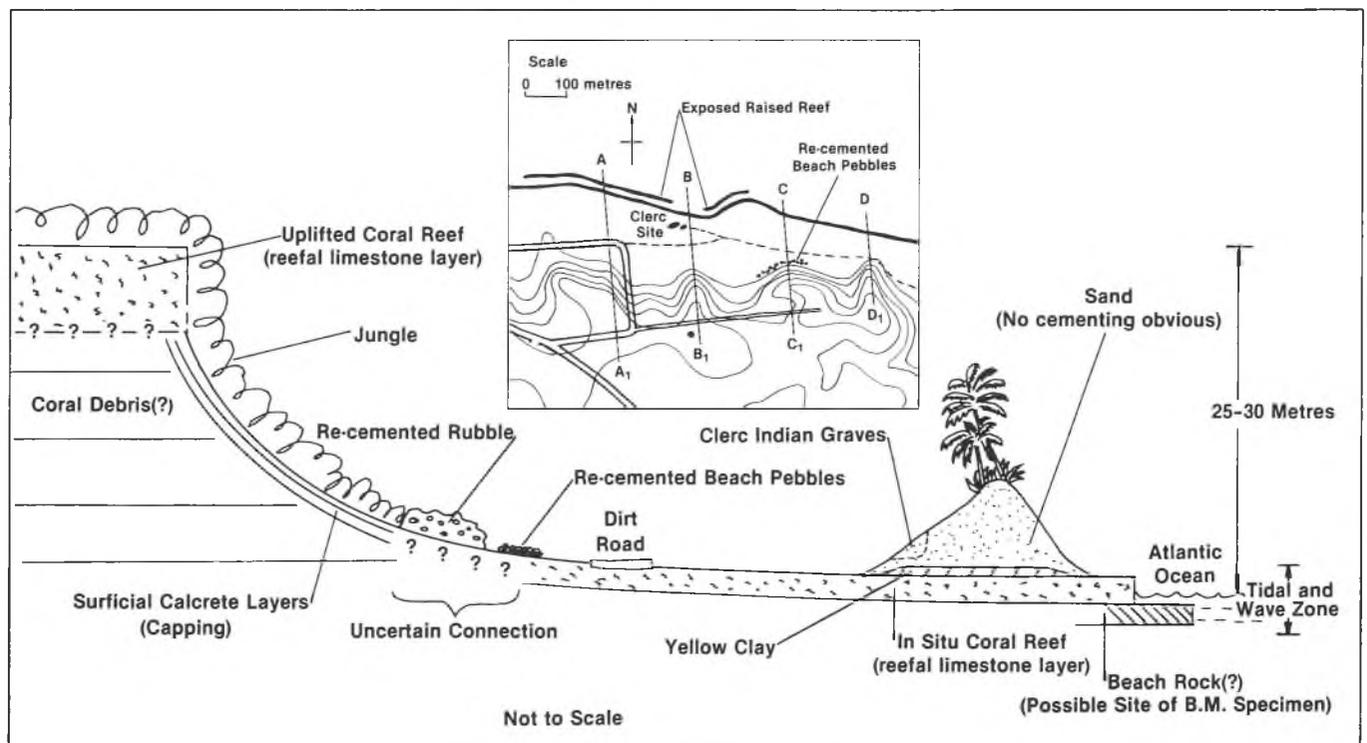
British Museum specimen. There were three all told and they were inclined with their feet higher than their heads. No artifacts were found with them and they were found in unconsolidated sand. The discoverers, who were merely sightseeing on the beach, dug them out with their hands. The bones came apart quite easily and sadly no onsite professional investigation was made, since the local Gendarmerie simply appropriated the skeletons and removed them. However, it raises the following interesting possibility since the bodies buried on seaward sides of the dune are certainly in a position in which they could be far more easily calcified. So how long have these skeletons been in the sand and what are the implications of the find to the origin of the skeleton in the Museum?

Throughout the Caribbean there is much evidence of beach rock being formed under the right conditions at the present time. Even on Guadeloupe, on the section east of Point de la Couronne (further east of the Clerc site), there was obvious active beachrock formation.

Whilst I personally could find no proof that any beach rock was forming on the current beaches east of Moule Harbour through to the Clerc site, I did find much evidence that many layers of such beach rock had been built up in the past. This was particularly evident in the portions of the coastline where 20-30 metres of sand have been removed, in some cases by excavation to fill up the tourist beaches, and in other cases by natural erosion. This process of active erosion since the 1960s was confirmed by the locals



**Figure 13.** (c) A view of an adjacent outcrop of the uplifted coral reefal limestone layer underlain by the laminated beach rock(?) The contact is just above the socks. Note that the beach rock(?) stratum lies at an angle of between 15 and 20 degrees. It is also finely laminated and parallel to the present beach-front.



**Figure 14.** The idealized stratigraphic cross-section from the cliffs to the coast at and near the Clerc site east of Moule. The insert map shows the locations where the cross-section was investigated, and hence the area where the cross-section is applicable.

along the coastline both east and west of Moule. In many cases it has left multiple strata of beach rock eroded to wave level but inclined at between 5 and 15 degrees, which indicate the old shore-front positions.

All of which makes the following scenario possible. Originally the skeleton in the British Museum was buried on the seaward side of the dune. During a period of active beachrock formation, the skeletons were incorporated into the beach rock. Following this period of beachrock formation, there was a period of active erosion that forced back the beach (shoreline retreat) exposing the strata of beach rock, which then gradually broke up into flagstones, one of which contained the skeleton which is now in the British Museum. This would explain why the skeleton was found in beach rock below high tide level, and why no such specimens are being found today. This explanation would also imply that if we wished to find such specimens today, then we would have to look up to 20–30 metres offshore where the beach-front used to be.

Opposing this thesis is the fact that the newly-discovered skeletons were simply in unconsolidated sand. Further personal communication (September 16, 1986) indicates that these skeletons are those from an old burial site used around the turn of the century. Which means they have been there for 80–90 years without the sand surrounding them having been consolidated at all. This is on a beach which has been built up through sand having been dumped there deliberately to promote it as a tourist attraction. Yet this same beach is having difficulty maintaining its own against the onslaught of wave erosion. In all situations where beach rock is exposed, it is parallel to the current beach and therefore has been formed in association with the current beach, yet the strata extend further out to sea than the current beach-front. This again indicates that these strata belong to previous beaches which were further out to sea. Exploration of the beaches near the Clerc site particularly, and around the entrance to the harbour at Moule, by prodding through the sand did not indicate any hard surfaces parallel to the current surface of the beach. The only hard surface encountered was the laterally consistent semi-horizontal surface of the uplifted coral reef underneath.

## CONCLUSIONS

1. It can be stated emphatically that the fossilised woman's skeleton in the British Museum did not come from the Clerc site excavation.
2. It can also be stated at the present time that the matrix which contains the skeleton in the British

Museum is very similar to the material underneath the uplifted coral reef east of Moule, a reef which is able to be correlated stratigraphically with material labelled by Saint-Michel as Miocene.

3. It can be stated equally emphatically that the beachrock deposits seaward of the coast at Morel are also possible contenders for having provided the matrix of the skeleton in the British Museum.

Therefore it is imperative that further research be undertaken, particularly petrographic analyses of both the beach rock under the coral reef and the beach rock seaward of the Morel coastline. If this procedure confirms that the skeleton came from below the uplifted reef we then need to establish the age of the reef.

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## APPENDIX I

### Beachrock Formation

The most interesting observation I made on active sites of beachrock formation on Guadeloupe is that the beach rocks which seem to be forming at the present time were to be found in the violent wave action zones east of Pointe de la Couronne where it was incredibly windy at all times I was there. This is contrary to the traditional ideas of a tropical sandy beach-front being an ideal site. The beachrock strata which were forming at these sites were also very steeply inclined by comparison with traditional beliefs about beach rock. Neither were they forming underneath a beach surface but on top of a thin layer of sand covering a reef erosion face. My reason for claiming them as current sites of beachrock formation is that obvious broken shells which still retained their colour were glued to the surface of a thick layer of rock-hard sand and shells. In one location a shell which had been broken into two pieces that obviously belonged to each other, was stuck to the surface with the two pieces no more than 30 centimetres apart. Yet the surface of the beach rock was at an angle between 20 and 30 degrees, was the site of active wave bombardment, and was not under any sand at all. I suspect the reason for such rapid beachrock formation is that during low tide, any sediments deposited during high tide are subject to such high evaporation rates from the wind that cementation of the surface is complete before the next onslaught of wave activity.

## APPENDIX II

### Washouts

Since the Clerc site is located near two large washouts in the coastal dune, the possibility that the skeleton could have been washed out from the Clerc site, deposited on the beach-front, and calcified into beach rock. To the immediate east of the Clerc site there is a washout in the coastal dune, approximately 50 metres wide, while to the immediate west of the Clerc site there is a washout of some several metres width. However, the likelihood that an Indian skeleton could have been removed by sufficient wave energy to take it out to sea, and yet have stayed intact to be preserved as the British Museum specimen, is almost unimaginable. Having seen the storm activity on the island, I would rule out this possibility completely.

## APPENDIX III

### Probabilities

It must be emphasised that the originally recorded excavation site for the British Museum specimen and the currently known sites of Arawak Indian graves east of Moule roughly correspond. If we assume the specimen in the British Museum came from under the reef then that means the Indian sand graves are much younger than the British Museum specimen. The question then is how much older is the British Museum specimen? Since this uplifted reef appears to correlate stratigraphically with the Miocene of Saint-Michel, or alternately with the Quaternary / Recent classification of Hinnewinkel and Petit, the possibility exists that such a skeleton is from a completely different pre-Arawak culture.