A PRE-COLUMBIAN CONCH MIDDEN, ST. CROIX, U. S. VIRGIN ISLANDS

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Introduction

Many punctured and weathered conch shells occur on the southeast margin of Green Cay (Fig. 1), a small island off the north shore of St. Croix. They lie at the beach behind a small fringing reef tract, on the nearby bottom, and within the steep soil bank at the foot of the colluvial slope of the island. Because they are so thoroughly weathered, buried in a soil of unknown age, and punctured crudely (by modern standards), we believe a description of the deposit and determination of the age of the shells is of interest.

Occurrence

Green Cay (Fig. 1) is an uninhabited island 19 m. high, about 500 m. long, lying 370 m. offshore midway between Punnett Point and Pull Point on the north shore of St. Croix, and nearly 4 km. airline from Christiansted. The maximum depth between the cay and the big island is 3 m. below low water. Green Cay is formed of layered hornblendite intrusives and roof pendants of steeply dipping quartzose hornfels of the Cretaceous Caledonia Formation (Ratté 1976). The intrusives are probably a part of the Southgate Diorite of Whetten (1966). The island slopes are covered locally with stony *terra rosa,* a reddish soil; the stones are angular chunks of the closely fractured bedrock. Cliffs form much of the island perimeter, but colluvial slopes have been cut back by the surf locally, perhaps as a result of the Holocene rise of sea level. Such a cut, up to 2.5 m. high, has formed for about 60 m. along the southeastern margin of the island, at the inner edge of the windward fringing reef. The cut (Fig. 2) is mostly in stony colluvium and partly in sand. A stratum in the cut is charged with numerous weathered and bleached conch shells (Fig. 3). All have been punctured near the apex to release the animal from the shell for food. Shells fallen from the stratum are scattered on the shore and inner part of the reef by slopewash and surf.

Conch shells occur in the stratum along that part of the island rimmed by colluvium, supratidal sand, and the narrow modern beach (Figure 1, A-D). The shells are particularly abundant in that part of the exposure that has been cut back by the waves to form a cutbank about 2.5 m. high (Figure 1, B-C; Figure 2). Most of the cutbank and the uncut slopes from A to B (Figure 1) are in stony colluvium and *terra rosa*; the north part of the cutbank and the unconsolidated materials from C to D (Figure 1) are sand, but not a part of the modern beach deposit.

Most of the shells are at or below 2 m. above present-day low tide, the approximate level of the inner surface of the reef flat. The conch-bearing stratum is thickest at the north end of the colluvium, becomes thinner, with fewer and more scattered shells, toward the south in colluvium and to the north in sand. Some shells lie below the stratum, probably by slump, but none occur in place above it. Some old shells are scattered on the vegetated slopes *above* the cutbank; we cannot account for them, unless they may have been tossed there by casual visitors. Along the southern 50 m. of this exposure (Fig. 2) nearly 200 shells protruded (22 January 1975) from the soil bank and as many more lay in the nearshore shallows.

The average present seaward declivity of the surface of this part of the island is estimated from maps to be about 20°. If one assumes that the conch midden was established on a similar slope, down to the shore, the surface of the conch deposit that is now 2 m. above low tide could have extended as much as 5 m. farther eastward. The area of the shell-strewn slope removed since then by the surf would be about 275 m^2.

A pit was dug laterally into the conch bed (Figs. 2, 4) to measure the abundance and the diversity of the skeletal debris. One hundred conchs (*Strombus gigas* Linné) were excavated from 0.16 m^3 of undisturbed colluvium, giving an abundance of 600 conchs/m^3 of soil. Minor amounts of other marine creatures occurred with the conchs in the pit, which contained the following estimated volumes.

Conch shells (typically filled with soil & small rock fragments)	40%
Coral fragments: *Acropora palmata* (Lamarck), *Montastrea annularis* (Ellis & Solander), *Diploria strigosa* (Dana), and trivial fragments of other species	10%
One topshell (*Cittarium* sp.) of 2.5 cm. dia.	Tr
Terra rosa soil with angular pebble-sized pieces of bedrock	50%

One shell of the Atlantic hairy triton, *Cymatium martinianum* d'Orbigny (Fig. 3), was collected 22 January 1975, from the colluvium about 1 m. above low water level near the middle of the deposit, but no others have been found. A second topshell was found on the outcrop the day the pit was dug (26 January 1976).

The colluvial slope, at the time the shells were spread there, may well have been graded to a sea level perhaps 0.5 m. lower, although the deposit itself does not demonstrate this possibility. If the average thickness of the shell-bearing stratum in the cutbank (Fig. 2) is taken to be 0.2 m., and the stratum is considered to have been graded only to present sea level, the volume of the stratum now removed was about 55 m^3 and the number of shells released to date as high as 33,000. More remain buried in the residual slope, to an unknown depth into the flank of Green Cay. The less numerous shells buried

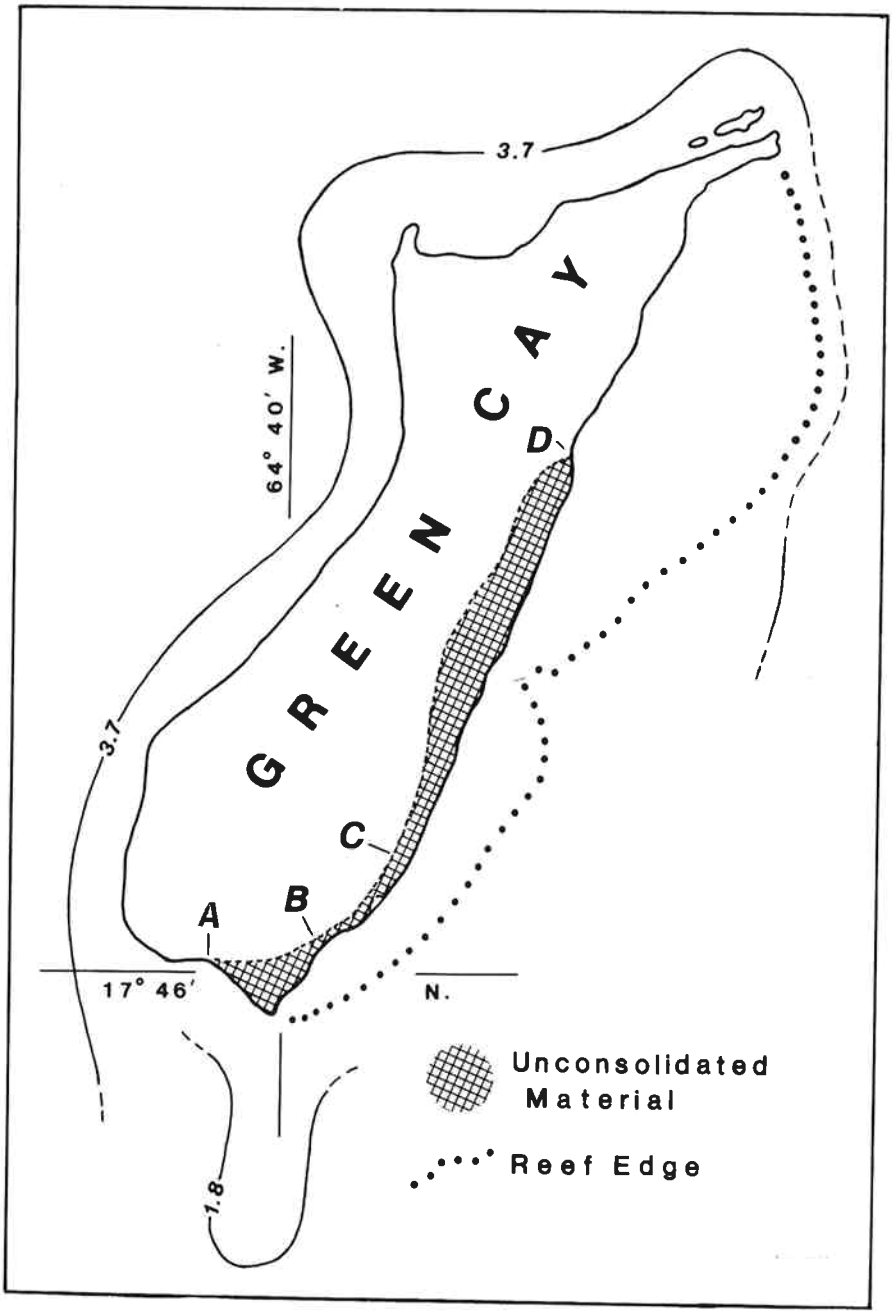
3.7
64° 40' W.
GREEN CAY
D
C
B
A
3.7
17° 46'
N.
Unconsolidated Material
Reef Edge
1.8

FIGURE 1

at about the same level between A and B and between C and D (Fig. 1) are not included in this estimate.

The Conchs

Although some of the conchs are small, they are mostly of the large size illustrated in Figure 3, and have thick, heavy shells as well. This suggests that they came from a stable population of very mature individuals. The one shown in Figure 3, for example, weighs 1600 gms. although its spire and spines are much reduced and the nacreous layers are dissolved away. In size it is representative of most of the conchs in the deposit. The modern one from Isla Mujeres (Fig. 5) is virtually the same length and span, as well as complete, but weighs 1422 gms.

A striking feature of all the conchs in the Green Cay deposit is the large ovoid or elliptical hole punctured near the spire (Figs. 3, 6). Such holes give access to the retractor muscle which, when cut, releases the whole snail from the shell. The practice is still common in the Bahamas and around the Caribbean, but modern implements such as screwdrivers make a neater job of it (Fig. 5) than was done on the shells in the Green Cay deposit. The area of the puncture shown in Figure 6 is 8.5 times larger than that shown in Figure 5. The Green Cay conchs must have been prepared with stone tools. The single triton shell found had not been punctured.

Radiocarbon Age

A conch shell taken from undisturbed colluvium near the middle of the deposit, and close to the one pictured (Figs. 3,6), was examined for possible effects of diagenesis. Three thin sections made of parts of the heavy wall of the body whorl, including one quite close to the columella, were examined before and after differential staining. The shell material is still entirely aragonite. The lamellae and bundles of fine crystals are appropriate for the several layers of *Strombus gigas,* and like those illustrated by Majewske (1969, pl. 92, fig. 2), except that the outer and inner nacreous layers (layers 1 & 5) have dissolved away. Small cavities and tubules, galleries bored by the sponge, *Cliona* sp., occur close to the exterior of the shell wall. Most of the galleries are now unroofed by solution, as seen on both specimens of Figure 3. The shell material is micritized quite close to the surface and bordering the clionid galleries, but the galleries are not filled or cemented and the shells are not otherwise altered mineralogically. There has thus been no reëquilibration in the vadose zone, and we may be confident the aragonite of the interior layers will give a radiocarbon

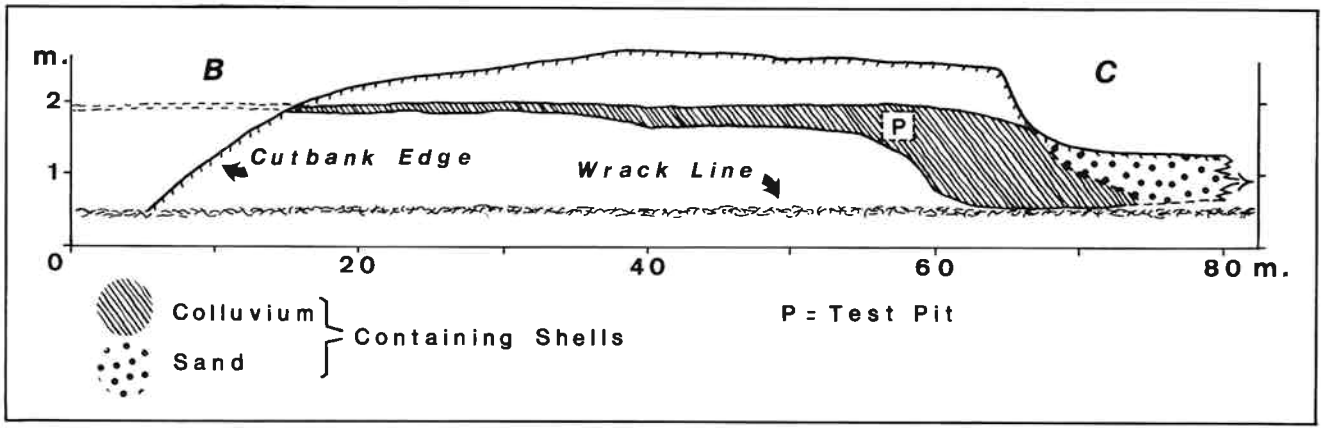

FIGURE 2
Diagram of longitudinal section of the cutbank outcrop. For location of B-C see Fig. 1. Datum is low tide.

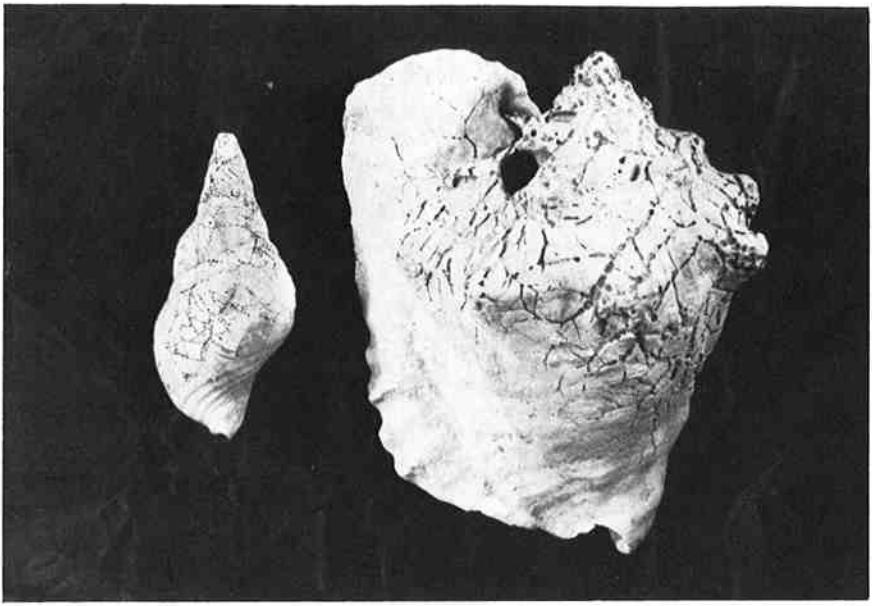

FIGURE 3

Strombus gigas Linné and *Cymatium martinianum* d'Orbigny taken from the conch bed near the middle of the exposure. The conch (R) is 22 cm on axis, but had lost 2-3 cm of the spire; the triton (L) is 14 cm on the axis, with perhaps 1-2 cm having been lost, mostly from the spire.

FIGURE 4

Photograph of exposed conch bed, taken near the sample pit (see Fig. 2).

FIGURE 5
Inclined view of apical region of a modern *Strombus gigas* killed for food on Isla Mujeres, Quintana Roo, México. The axial length of this perfect speciman is 22 cm (cf. Fig. 3). The narrow slot is 4 × 21 mm.

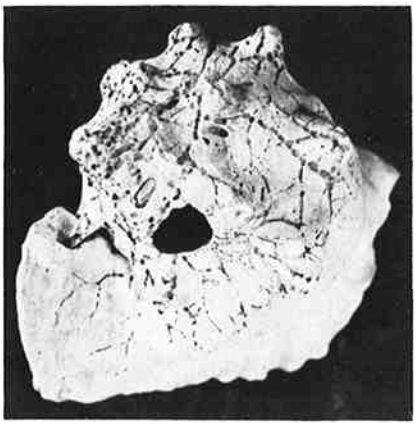

FIGURE 6
Inclined view of apical region of conch shell shown in Fig. 3. The ovoid hole is 24 × 30 mm.

date representing the age of the shell rather than the date of some diagenetic event(s) or a mixed date.

The radiocarbon age of the conch sample was determined at the Illinois State Geological Survey, and the uncorrected age is 930±75 radiocarbon years B.P. (ISGS-368). Because the ^{14}C concentration of ocean water is lower than that of the atmosphere, radiocarbon dates on marine shells must be corrected for this difference. Although no record of the ^{14}C content of ocean water in the Antillean region is known, an average correction factor of -400±100 years, based on data from other parts of the world, should be appropriate (D.D. Coleman, personal communication 1975). Plants and animals do not always incorporate all isotopes of carbon in exactly the same proportion, therefore a correction for isotope fractionation is also necessary. Isotopic analysis of three samples of the same conch (from the laminae of the shell exterior, the interior of the shell wall, and the inner surface of the shell) indicate that the necessary correction factor is +420±5 years.

The two corrections are of opposite sign and nearly of the same magnitude, so that when the age is corrected by these factors, the result is 950±130 radiocarbon years B.P. If this value is corrected for the error in the halflife of ^{14}C and natural fluctuations in the ^{14}C content of the atmosphere using the table of Damon, Long, and Wallick (1972), the corrected date is 930±140 B.P.

This makes the archaeological age 1020 A.D., nearly half a millenium before Columbus. This date places the conch fishermen at the boundary of Neo-Indian Periods III and IV (Rouse 1964). They may have been members of an early phase of the Magens Bay-Salt River culture *(op.cit.,* fig. 5), in all likelihood part of the newly-defined Elenoid Series (Rouse 1976: 37).

Summary

Evidence shows that Neo-Indians used Green Cay as a site for processing of conchs for food a millenium ago, and extracted them by methods still in use, although their tools were less convenient. If the extent and thickness of the exposed shell-bearing stratum is reconstructed to sea level of that time, the volume removed can be estimated to have held at least 33,000 discarded shells. Had sea level been slightly lower then, as is probable, the deposit would have been wider and the shells even more numerous. More remain, of course, in the still uneroded part of the midden on the southeast flank of Green Cay.

Acknowledgements

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INDIAN CONCH HEAP IN EASTERN ANEGADA

Much has been written about these aboriginal conch heaps, present in many parts of the West Indies. Here is one on our very own turf. Photograph taken in 1937 by Herbert William Krieger *(courtesy of the Smithsonian Institution).*