

Pleistocene Molluscan Faunas on San Salvador Island, Bahamas

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In June and July of 1987, Pleistocene age bivalves and gastropods were collected on San Salvador Island in the Bahamas. The distribution of these molluscan fossils has been examined and characterization of fossil assemblages and depositional sites has been attempted. There are 18 sampling sites from 3 general locations. Thirteen sites are at the Cockburn Town fossil reef complex, representing coral rubble, in situ corals, beach, and shallow intertidal facies. Three sites are at Quarry A: a beach/rocky shore/shallow intertidal environment (Bain, 1985), and 2 sites are at Quarry E: a tidal delta related environment (Teeter, 1985).

The sites were carefully chosen with several considerations: 1. large amount of shell material; 2. many whole shells (for more easily identifiable specimens); 3. good preservation; and 4. representative of the outcrop. Sketches and/or stratigraphic cross sections were made of each site, pictures were taken, and finally the bulk samples were taken using a hammer and chisel.

After the fossil shells were retrieved from the rocks, identified, and counted, the data was quantitatively analyzed in order to examine fossil distribution. Clustering methods were used to describe probable fossil assemblages. Similarity coefficients, both distance and cosine theta, were used for the locations. Only distance coefficients were used in the analysis of the species data. (Harbaugh and Merriam, 1968) A discussion of the results of this analysis follows. Each major division (assemblage) defined by clustering is discussed separately.

The Barbatia cancellaria assemblage contains 18 species, only 2 of which are bivalves. (Figure 1) All the species are found at location QA1A, a beach deposit. (Figure 2) All but two of the species (Littorina nebulosa and Nerita peloronta) are found at this location in their greatest numbers. L. nebulosa and N. peloronta join the cluster at the furthest point, perhaps a result of their not being most abundant at QA1A. Based on present occurrence, over two-thirds of the species are rocky shore - rocky intertidal inhabitants. Several live on or in the intertidal sand. The beach deposit is very close to the rocky shore and shallow intertidal deposits in Quarry A.

In the second assemblage consisting of 8 different species, bivalves dominate and Laevicardium laevigatum is the most abundant. All the members of this assemblage are found in their highest numbers at location CR4A, a coral rubble zone. Mollusk remains were found suggesting life position. From the states of preservation of the shells, it is apparent that this site is made up of partially in situ fossils and partially storm fill/washed in shells. The species from this assemblage are probably fill material, but as indicated by many in situ valves, may not have travelled far from their original habitat after death. Only a relatively small percentage of shells from CR4A were broken or in other ways damaged.

The third cluster group is the Cerithium litteratum assemblage, a gastropod dominant assemblage. (Figure 1) All but 4 species are found at location CR5A in their highest numbers. The Cerithium litteratum group is being clustered mainly on the basis of the species' occurrences at CR5A and CR5B, a shelly coral rubble zone containing Acropora palmata and A. cervicornis. (Figure 2) The presence of many well preserved shells and an entire urchin (CR5B) suggest that the fossils did not travel far before being deposited and were most likely subjected to rapid burial (Dodd and Stanton, 1981).

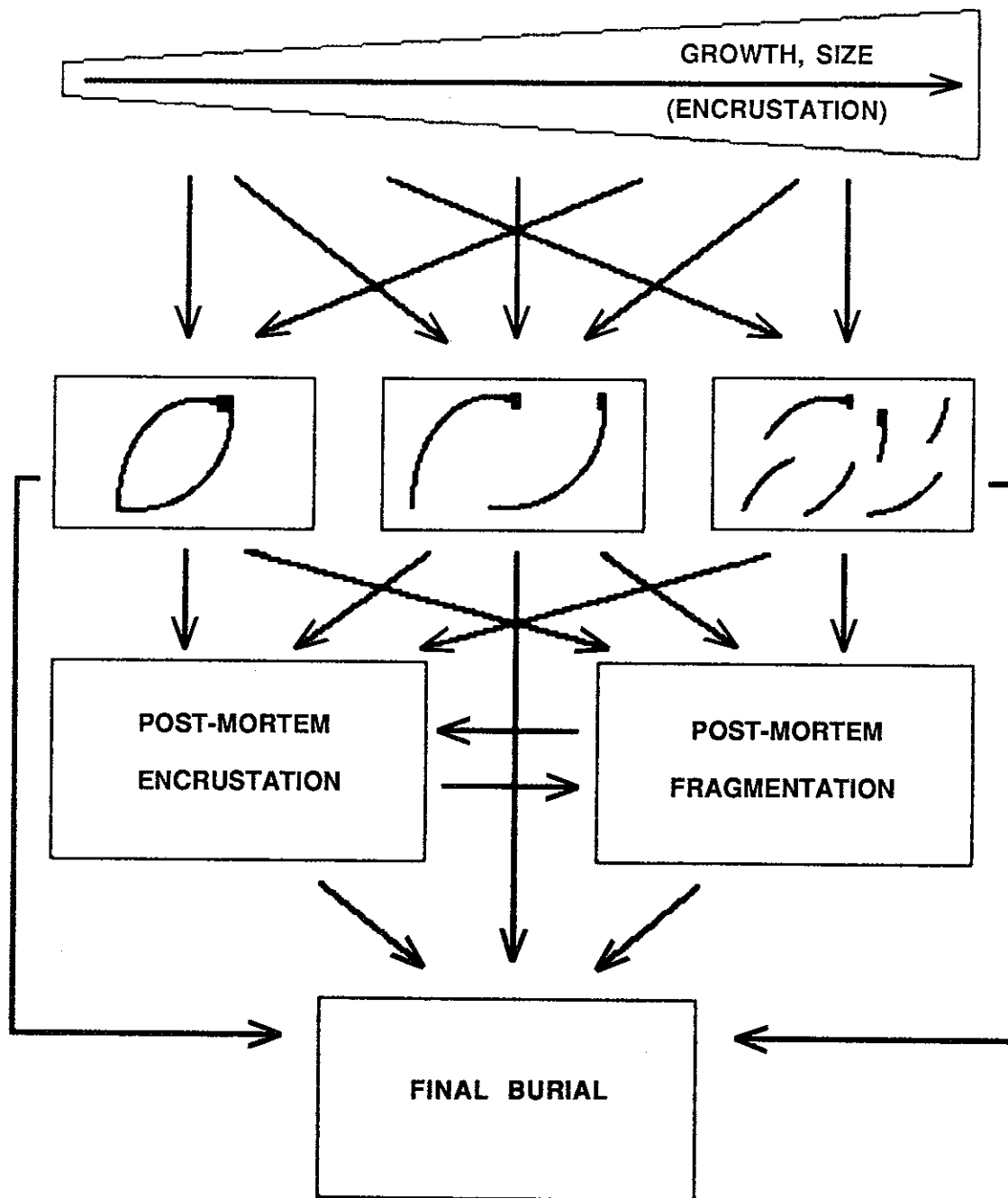


Figure 1. Multiple taphonomic pathways along which bivalve shells are modified prior to final burial.

The fourth group, Chione cancellata, is a shallow subtidal zone. (Figure 1) All but Strombus gigas are bivalves. All but Modiolus americanus occur in the sample from CR13A. (Figure 2) M. americanus and S. gigas do occur, however, together in the CR1A and CR5C samples. It seems that these 2 species join the others late in the cluster because of this, as the other 3 species are most abundant at CR13A. CR13A is a deposit consisting of beach rock clasts, shell rubble, and Ophiomorpha burrows. The burrows indicates sandy bottom and very shallow water (Multer, 1977) The presence of S. gigas, C. cancellata, and Tellina listeri also may be indicative of a grass bed environment. Taphonomic data from CR13A indicates that shells probably did not travel far before being deposited - most are not broken or worn at all. Many of the C. cancellata have been deposited convex up, suggesting normal wave or current action - not storm action.

The second to last assemblage, Linga pensylvanica, consists of only 6 species, half of which are bivalves and half of which are gastropods. (Figure 1) The species represent relatively diverse life habitats. They seem to be clustered together because of their occurrences at locations CR6, CR6', and CR11. (Figure 2) All these locations are beach deposits (shelly calcarenites) and have a high percentage of damaged shells associated with them. Of the 6 designated fossil assemblages, this one seems to be the most indicative of a "graveyard" assemblage, in which random shells were deposited together after having travelled some distance.

The last designated cluster is the Cerithium eburneum assemblage. (Figure 1) Of the nine members, 4 are bivalves and 5 are gastropods. The species are being grouped together on the basis of their occurrence at 2 locations: QEA and CR5D. (Figure 2) The first four members of the assemblage are the subgroup assigned to QEA (a tidal delta related environment). The remaining 5 species are found in relatively high numbers in the sample from CR5D (coral rubble). The 2 subgroups seem to have been joined together because of the common occurrence of Americardia media and Cerithium eburneum in both locations.

In clustering the locations, 2 different methods were used. (Figure 2) The first dendrogram clusters the locations using a cosine theta coefficient. Here, 4 groups were defined, each one a combination of different depositional facies. In the second method a distance coefficient was used to group the sample sites. Seven separate clusters were determined, based probably on the number of species present and the total number of individuals present at a given location. Distance coefficient appears to be superior in grouping the sampling locations.

The assemblages which have been defined by cluster analysis are only numerically determined groups of fossils. Although they may represent Pleistocene mollusk communities, they may also simply be death assemblages. The main focus of this study was to look at fossil distribution of molluscan faunas and to try to form assemblages from the data. It was not attempted to make paleo-reconstructions of biological communities in this project.

References

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DISTANCE COEFFICIENT

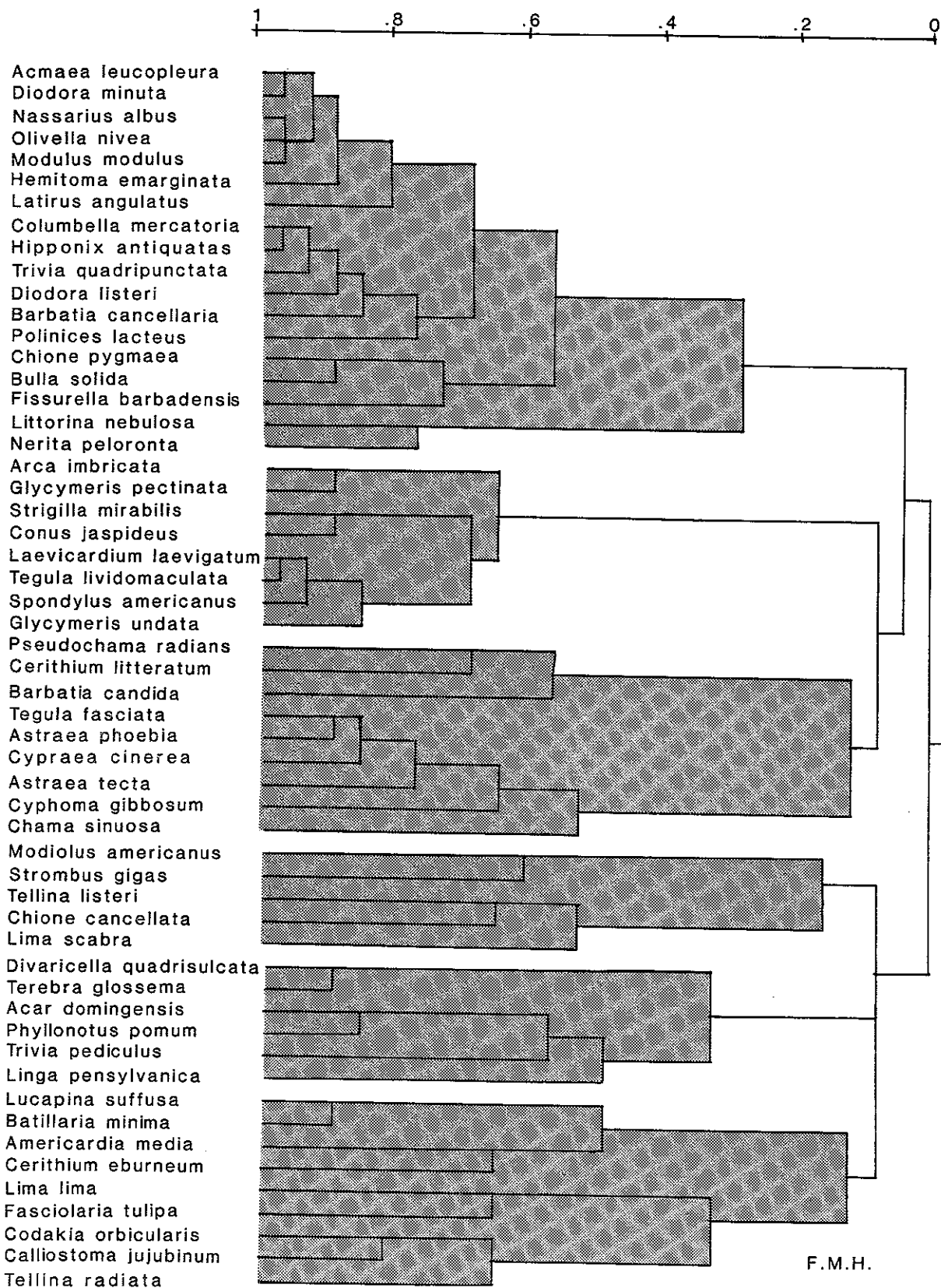


Figure 1. Dendrogram of fossil species on San Salvador Island, Bahamas.

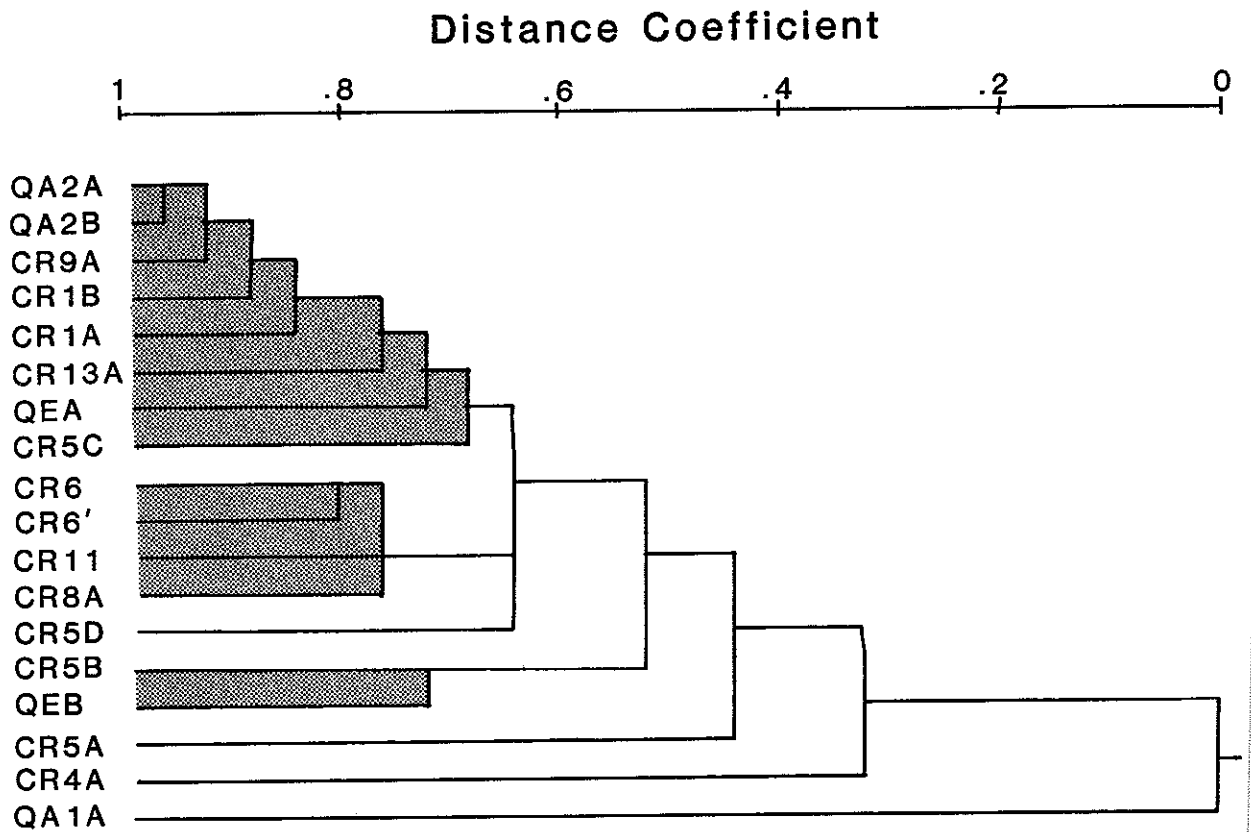
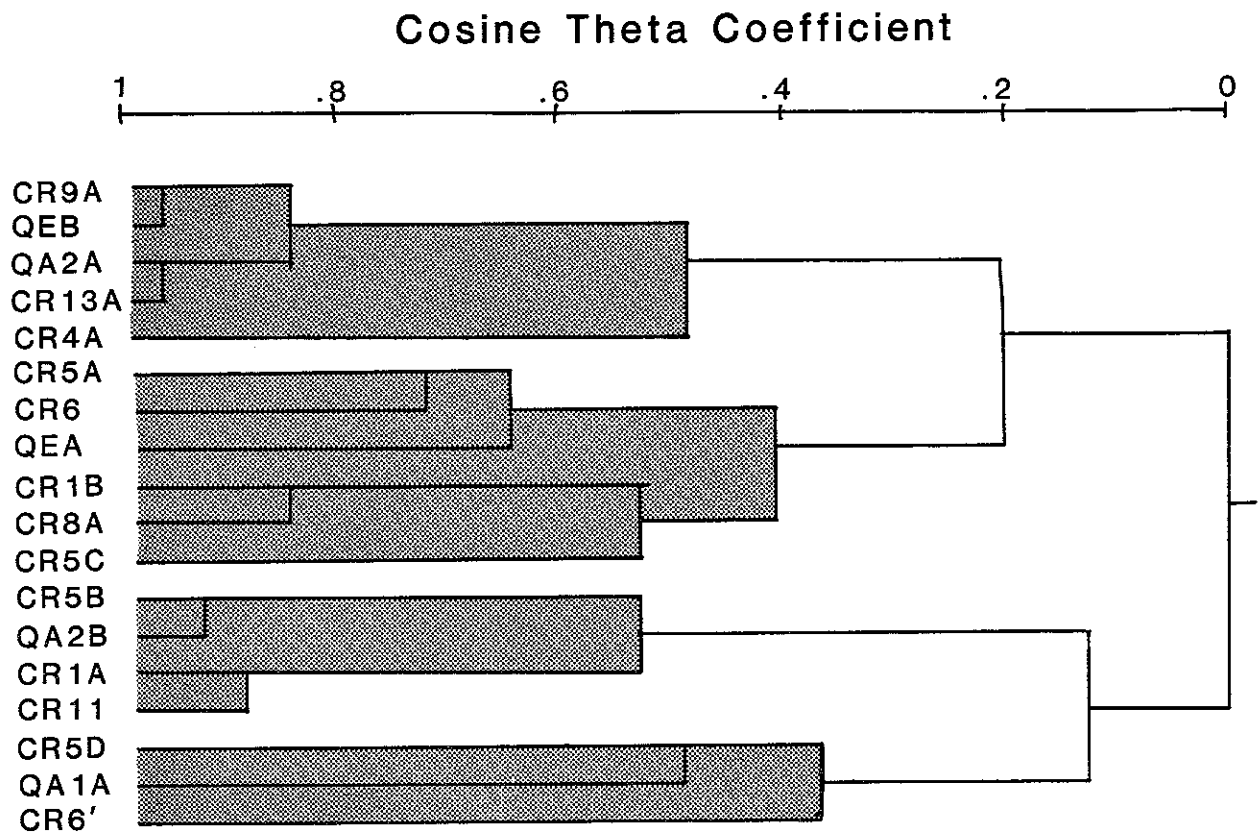


Figure 2. Dendrograms of locations on San Salvador Island, Bahamas.

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