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SCIENTIFIC SURVEY
OF
PORTO RICO and the VIRGIN ISLANDS

VOLUME XVIII—Part 1

Porto Rican Archaeology

Froelich G. Rainey



NEW YORK
PUBLISHED BY THE ACADEMY
FEBRUARY 13, 1940

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This natural history survey of Porto Rico and the Virgin Islands, conducted by The New York Academy of Sciences, was established in 1913. Continuous publication of the results of this survey is made possible through contributions from the Department of Agriculture and Commerce of Porto Rico, and the University of Porto Rico.

PORTO RICAN ARCHAEOLOGY

By FROELICH G. RAINEY

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INTRODUCTION

The present study is based primarily upon archaeological excavations in Porto Rico carried out in the summer of 1934 under the direction of Peabody Museum, Yale University, and of the American Museum of Natural History in New York with the cooperation of the University of Porto Rico. These excavations were part of the scientific survey of the island organized by the New York Academy of Sciences. Investigation was continued in the summer of 1935 under the same arrangement for a period of six weeks, and some additional information obtained at that time has been included. During the winter and spring of 1934 a general survey of archaeological sites and collections was made in the Bahamas, Haiti, and Santo Domingo, and some reference is made in this paper to the work on those islands.

In 1934 with the assistance of the University of Porto Rico a rapid survey of archaeological sites in Porto Rico was made. Chancellor Carlos E. Chardon assigned Mr. Gustavo Rodriguez to assist me in the location of sites suitable for excavation, and with the cooperation of the extension agents of the University of Porto Rico we were able to cover a large area in a relatively short time. During the months of April and May many promising sites were located both in the mountainous interior region and along the coast. Since the primary object was the excavation of sites with sufficient depth of deposit to show

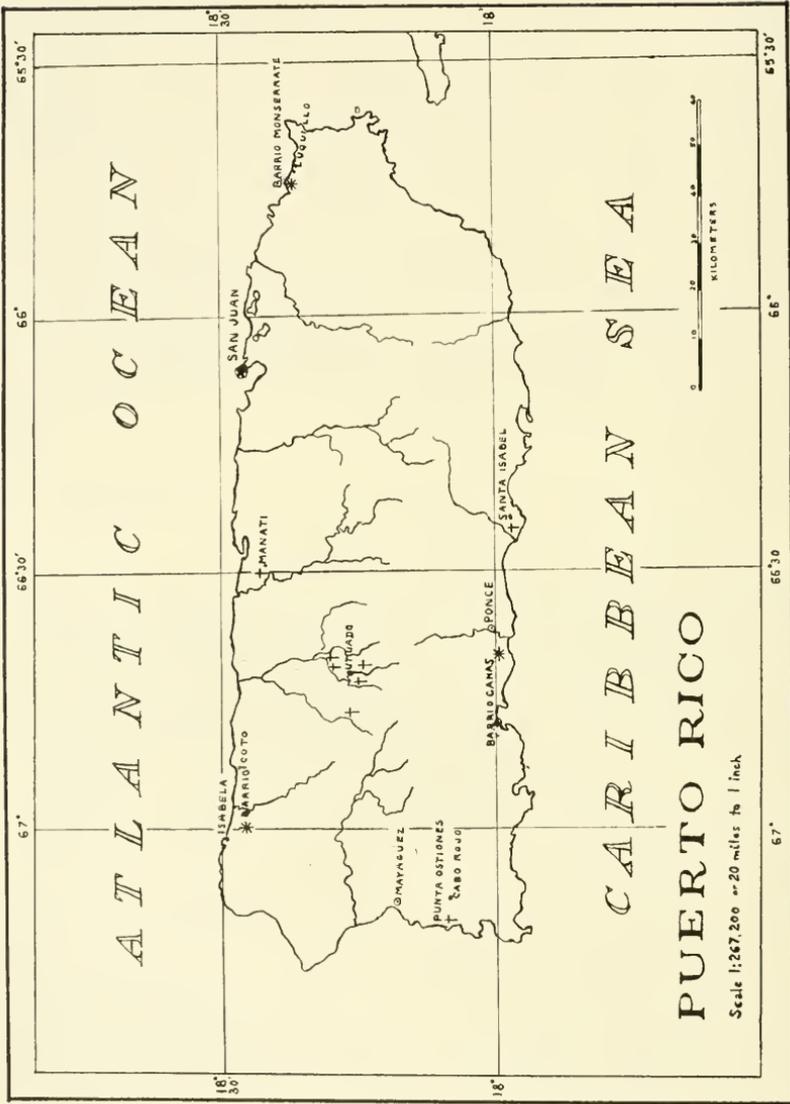


Figure 1. Map of Porto Rico. * Sites excavated in 1934. † Sites excavated previous to 1934.

stratification if such existed, and since the most extensive sites were found along the coast, excavations for the most part were limited to the coastal region.

Three major sites were excavated during the months of June, July, and August, 1934 (FIGURE 1). A large crew of laborers supplied by the Porto Rican Emergency Relief Administration made it possible to extend cuts through a large part of each site and in this manner to determine the general composition. It was found that a single unit of deposit in any site was of little significance in relation to the whole, due to the nature of the deposition, and for this reason extensive excavation was of cardinal importance.

In July 1935 it was possible to carry out limited excavations in the mountainous interior near Orocovis. Assisted by Arturo Morales Carrión of the University of Porto Rico and again with the aid of Federal Relief Administration funds, I conducted the excavation of four different sites near Orocovis attempting to correlate the interior deposits with those on the coast. In August, 1935, we continued excavation for a period of two weeks at the Monserrate site which had been partially excavated during the preceding summer.

Two periods of prehistoric occupation on the island were distinguishable in clearly stratified deposits of culture refuse found on the north and on the south coasts. The artifacts removed from these stratified deposits indicate that two distinct cultures are represented. The first part of this paper is a description of the excavations and collections which illustrate these cultures, while the second part is concerned with the distribution throughout the West Indies of the complex of traits characterizing each of them.

An extended archaeological monograph of Porto Rico will not be included here. No attempt has been made to correlate the artifacts removed from the excavations with the artifacts in the large and numerous Porto Rican collections in museums and in the possession of private collectors. Furthermore, a description of the numerous sites known throughout the island is omitted as not pertinent to the object of this paper. Descriptions and illustrations of individual objects have been limited more than might seem advisable, but emphasis has been placed on the description of common and characteristic types of the material excavated. Obviously, a considerable range of variation appears within a group of objects classified as a type and this variation is indicated to some extent in the descriptions, but a general classification of material is necessary in presenting a concise description of several thousand specimens. Furthermore, the

generalized type becomes more significant than the individual object when correlating the artifacts excavated with those found throughout the West Indies.

The unpublished manuscript of Dr. S. K. Lothrop which locates one hundred thirty-eight archaeological sites on the island, and the work of many collectors who have amassed material from numerous sites, open the way to research in Porto Rico which should extend over a period of years. The objective of the work in 1934 was a stratigraphic study of large deposits which might make it possible to interpret the relation of various sites and the significance of the thousands of specimens in the collections. It is hoped that the tentative cultural chronology indicated by these excavations and described in this paper may give direction and assistance in further and more comprehensive research throughout the island.

I wish to express my gratitude to the many individuals and institutions who have contributed to this research. Mr. Allison V. Armour of New York made possible with his research yacht, the "Utowana," the general survey of the Bahamas and Haiti preceding the work in Porto Rico, and has at all times given support and advice. To Dr. Clark Wissler I am deeply indebted for the opportunity of undertaking research in Porto Rico and for his advice throughout the course of the work. To Dr. Cornelius Osgood I am also indebted for this opportunity and for his criticism of this report. Dr. Carlos E. Chardon, Chancellor of the University of Porto Rico, and the men of the Agricultural Extension Service of the University, supplying transportation and knowledge of the country, made possible a survey which might otherwise have taken months. General Blanton Winship, Governor of Porto Rico, and Colonel Francis Riggs, Insular Chief of Police, evidenced a real interest in the work and solved many difficult problems for me. Major Adolfo de Hostos, who has studied Porto Rican prehistory for many years, contributed his knowledge of the field and also proof-read this account. Dr. Montalvo Guenard of Ponce, Porto Rico, located numerous sites and cooperated in the excavation of one which proved most productive. To such men as Francisco Parra-Toro, Luis de Celis, Gustavo Rodriguez, Arturo Morales Carrión, Dean J. J. Osuna, acting Chancellor of the University, and the men of the Fajardo Sugar Company, I am deeply grateful for the many and varied ways in which they gave their assistance.

Finally, the accompanying pages were submitted to Yale University in partial fulfillment of the requirements for the Degree of Doctor of Philosophy, 1935.

SEQUENCE OF CULTURES IN PORTO RICO

Excavations in Barrio Canas

Canas is a barrio of the municipality of Ponce. It lies in a fertile plain between the mountains and the sea, on the southwest Porto Rican coast which is now one of the most productive sugar cane regions of the island. The southern coast is semi-arid, and the cane fields are irrigated. The climate is always moderate and a tropical xerophytic vegetation grows in areas which are not under constant cultivation.

Colonia Miramar is a section of Barrio Canas within which lies a field called "sitio de caracoles" or "place of shells." For many years collectors of Porto Rican antiquities have taken objects of prehistoric manufacture from this field as each year of cultivation uncovered more of the refuse deposit. At the present time marine shells are scattered over an area of several acres. In sections where the shells are thickest low mounds can be seen, suggesting that the refuse was originally deposited in mounds of considerable size which have been reduced and leveled off during the last four centuries of constant cultivation.

Adjoining this field and extending along the banks of the Rio Canas, is a small plot of land which is at present overgrown with brush and trees. It is probable that no great amount of cultivation has ever taken place in this section as several mounds of considerable elevation still remain. Four of these appear to form a unit since they are connected by low grades or ramps. The largest mound has an elevation of 2 meters and extends in a roughly oval shape over an area approximately 65 by 30 meters. The western end has been partially cut away by the river and falls sharply from the crest to the river bed. Joining this at the opposite end is a roughly round mound 20 meters in diameter which rises abruptly to an elevation of 2.5 meters. On the east side of the latter is a still smaller mound with an altitude slightly over one meter. The fourth mound lies on the river bank south of the largest mound and connected with it by a low ridge. This last mound approaches 25 meters in diameter and is 2 meters high.

Culture refuse made up essentially of marine shells and potsherds extends over the whole area which includes the group of four mounds, others in the wooded plot and the shell-strewn area in the cultivated fields. No attempt was made to map the whole area of occupation since this would require the removal of most of the trees and brush in the wooded section, for which permission could not be obtained.

Excavation was confined primarily to the largest mound but test pits were made in two of the others.

The extent of the largest mound, designated as A on the chart, was such that its complete removal was impossible in the time allowed. In order to obtain as much information as possible concerning its composition as a whole, trenches were cut across both ends and these were connected by a longitudinal trench running the full length of the mound. A second longitudinal trench was begun but was not entirely completed. A crew of twelve men was set to work at the eastern end in what has been termed excavation No. 1, and at the same time twelve more were started at the western end in the excavation referred to as No. 2. Five weeks were spent in working the Canas site.

EXCAVATION NUMBER 1

All excavation in the Canas midden was carried out by working down from the surface in the series of trenches shown on the chart (FIGURE 2). These trenches were marked off in sections 2 meters square and a team of two men worked in each section, one shoveling while the other examined the soil thrown out of the cut. All refuse was removed in levels 25 centimeters in thickness and the specimens from each 25 centimeter level in each square were sorted, labeled with the section and depth (*i.e.* A-1, 0-25 centimeters), and packed in a bag as a separate unit.

Excavation No. 1 comprised two parallel trenches 28 meters in length which cut across the northeastern end of the midden, and two trenches extending 30 meters through the long axis of the midden in the highest central section. An undug ramp 2 meters in width remained between these longitudinal trenches and thus provided four parallel faces or cross-sections which could be examined and charted in order to determine any stratification of refuse should such exist.

The composition of refuse was largely the same throughout all sections removed in excavation No. 1. Although primarily made up of marine shells (*Strombus*, *Tellina*, *Chama*, *Neritina*, *Cardium* and *Donax*), it contained a large quantity of sand, blackened earth, ash, charcoal, and bone refuse. Near the surface, usually to a depth of approximately 25 centimeters there was a greater amount of humus, and shells were broken in small pieces, but below this most shells were intact and the soil intermixed was loose and powdery. In trenches No. 1 and No. 2 cut across the midden, no consistent stratification of refuse appeared. In limited sections there were concentrations of one or two types of marine shells, earth, or ash and charcoal,

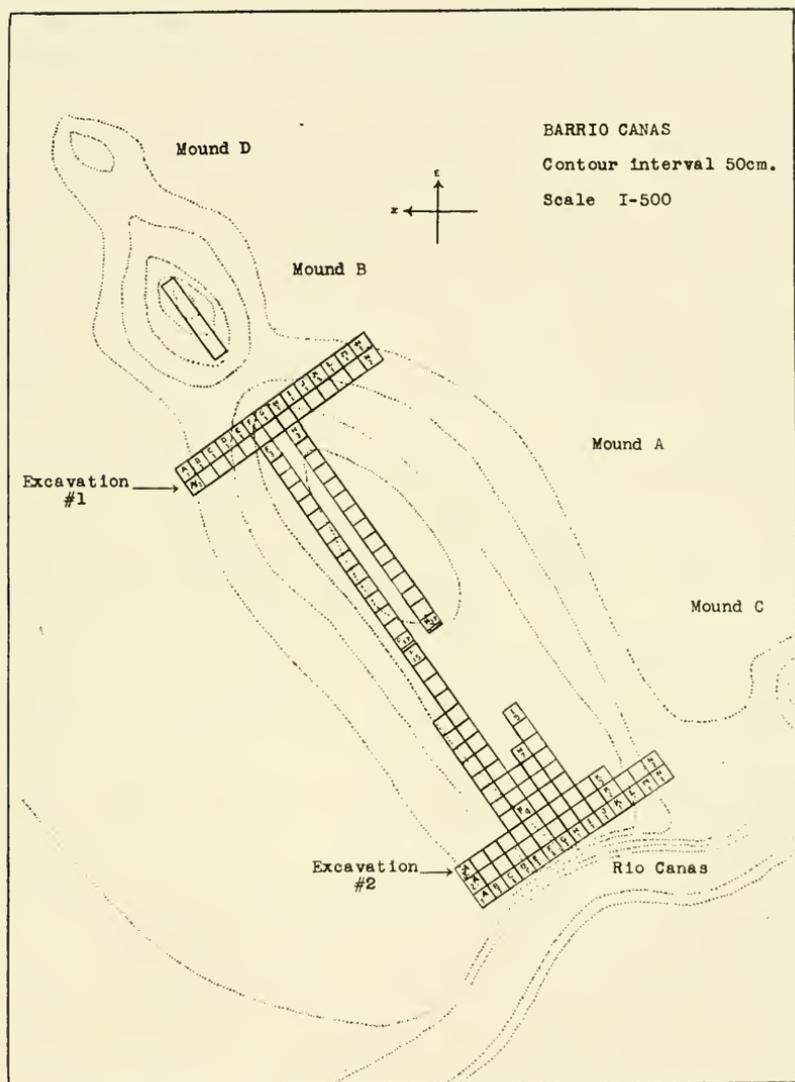


FIGURE 2. Chart of Barrio Canas site.

but no well-defined strata and no distinct fire pits or hearths. In longitudinal trenches F and H, however, the upper levels of the deposit contained primarily large marine shells (*Strombus*, *Tellina*, and *Chama*) while the lower levels contained small marine shells (*Neritina*, *Cardium*, and *Donax*). This lower level of small marine shells is

shown on FIGURE 3 (page 13). No sharp line dividing the deposit could be seen, and the distinction is made simply on the preponderance of large or small marine shells.

The only indications of house structures found in the deposit were cylindrical cavities approximately the size of fence post holes which may mark the location of disintegrated house posts. No alignment of such cavities was found which might have indicated the size and shape of house structures. One of the cavities, globular in shape and 75 centimeters in depth, may indicate a disintegrated storage basket.

Potsherds make up the bulk of the artifacts found in the excavation and these were so numerous that several thousand were removed in a single day. The great majority were fragments of coarse, undecorated pottery, but a small percentage bore incised designs, modeled ornamentation, or a red slip. Only large rim fragments and ornamented sherds were retained during the excavation. A few vessels were found intact. Implements made from shell, stone, and bone were found also but these were relatively rare compared to the number of pottery fragments. Collections of bone refuse from this deposit are made up largely of fish, bird, hutia and manati bones. They have not been studied and identified in detail.

The fifteen burials found in the four trenches of excavation No. 1 appeared at depths varying from 75 centimeters to 1.75 meters in several different sections. All skeletons were found lying in culture refuse but none was associated with mortuary artifacts. The bones were so badly disintegrated that few of them were removed intact and no skull could be preserved for study. In several cases, however, the original position of interment could be determined. The description of each burial is given in the appendix (page 190). Some of the bones probably represent secondary burial of skeletons after the flesh had been removed, while others are certainly primary burials of the entire body. In most of these primary burials the bodies were interred in a flexed position either on the left side, the right side, or upon the back. At least one, however, was placed on the back in an extended position, and some may have been deposited in a sitting posture.

The four trenches of excavation No. 1 exposed an undisturbed refuse deposit composed primarily of marine shells in which no significant stratification could be seen. The composition of this refuse and the artifacts which it contained are characteristic of numerous shell heaps found along the southern coast of Porto Rico. Large quantities of coarse, undecorated pottery and certain types of shell and polished stone implements are typical. This northeastern part of the midden

at Canas is unusual only in its extent, depth, and undisturbed condition. The great majority of Porto Rican middens have been leveled, to a large extent, by centuries of cultivation.

EXCAVATION NUMBER 2

The southwestern end of mound A at Canas has been partially cut away by the river Canas which is now simply a dry stream bed, and there is a sharp decline from the crest of the mound to the bed of the river. Excavation No. 2 was begun with a trench 28 meters long and 2 meters wide which cut directly across the midden at the edge of this abrupt decline. Subsequently, two parallel trenches 2 and 3 (FIGURE 2) were also excavated but an undug ramp connecting with that in excavation No. 1 was left intact until the last so that a longitudinal cross-section extending the full length of the mound could be charted. A single trench F running with the long axis of the midden connected with excavation No. 1 while three more trenches, E, H, and I, parallel to F, remain unfinished. As in excavation No. 1, all trenches were divided in sections 2 meters square and all specimens were segregated according to section and level.

In the first cut (trench A) in excavation No. 2 the deposit of large marine shells, dry sandy soil, ash, and coarse pottery, like that found throughout excavation No. 1, extended to a depth of only 40 to 90 centimeters. Below this we found a hard-packed yellow material which appeared to be sterile sub-soil. As the excavation was continued, however, this sub-stratum proved to contain numerous potsherds as well as occasional stone implements. Many of these potsherds were decorated with brilliant red and white painted designs, and practically all sherds found were hard, fine-grained, well-fired ware representing what appeared to be an unusually advanced technique of pottery manufacture. The great majority of the sherds as well as the occasional stone implements stood in sharp contrast to anything found in the northeastern part of the midden and to the sherds in numerous Porto Rican collections found in shell middens throughout the island. Dr. Montalvo-Guenard, of Ponce, however, had found a few sherds of this kind in a field near the Canas midden.

As excavation in the southwestern end of the midden continued toward the center, the upper level of marine shells and coarse pottery increased in depth and the yellow, hard-packed sub-stratum remained, sharply segregated from the upper, loose, shifting, marine shell deposit. The composition of this sub-stratum, which varied in thickness from 40 to 60 centimeters was eventually recognized as a

mass of disintegrated land crab shells (*Cardisoma guanhumii* Latreille) mixed with a yellow sandy loam. Ash and charcoal were also present but in smaller quantities than in the marine shell level above. Bone refuse was also common and like that in the upper level represented principally the manati, hutia, turtle, fishes, and birds. As represented on the chart (FIGURE 3) this sub-stratum of land crab shells and painted sherds extended from the bank of the river approximately 30 meters toward the center of the midden and then disappeared at a point where the upper level of marine shell deposit reached a depth of 2 meters.

Of the nine burials found in excavation No. 2 (see appendix for detailed description), seven appeared in the sub-stratum of land crab shells. All of these were so far disintegrated that no skeleton could be preserved for study. In only three cases was it possible to determine the position of interment, but in these cases it was clear that the bodies had been placed in an extended position, two lying on the face and one lying on the back. Although a comparison of burial types in the marine shell level and the land crab level is hardly possible with so few examples, it may be significant that all three identifiable in the sub-stratum were in the extended or prone position while the great majority of those in the upper marine shell level were in a flexed position. Furthermore, no secondary burial of bones alone, quite certainly a type of burial associated with the upper marine shell level, was observed in the sub-stratum of land crab shells.

SUMMARY

When excavation No. 2 was terminated after five weeks of excavation at the Canas site, it was clear that two periods of occupation were represented in the large midden by the two distinctly separate strata of culture refuse. There was no sterile layer of soil between these two strata which might represent a lapse of time between the two periods of deposition, but this absence does not necessarily indicate a continuous occupation of the site as illustrated by the fact that the accumulation of a sterile layer of soil has not yet taken place on the most recent deposit, now at least four hundred years old. The lower stratum of yellow soil and disintegrated land crab shells appeared as a relatively hard-packed mass always sharply separated from the loose and shifting upper stratum of sand, ash, and marine shells. Approximately the same types of bone refuse (manati, hutia, turtle, fishes and birds) occurred in both strata and indicate that the people occupying the site during the two periods had certain foods in common, but

BARRIO CANAS

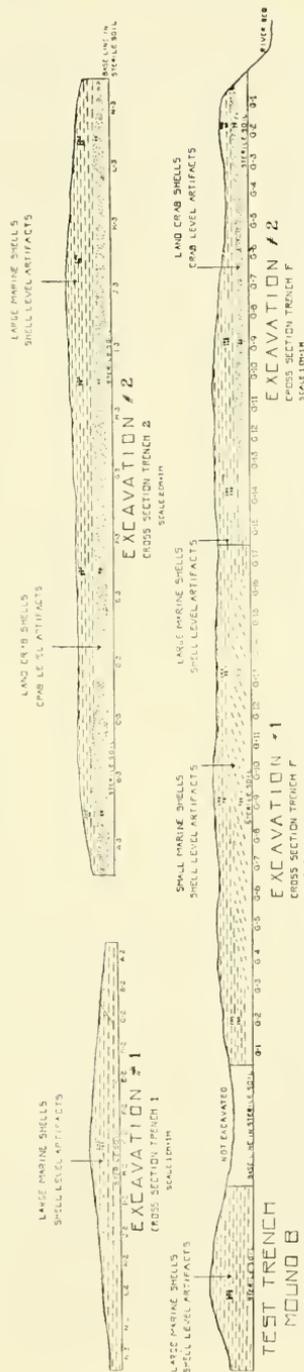


FIGURE 3. Cross-sections of Barrio Canas excavations. A, trench F, excavation No. 2. Showing upper marine shell deposit and lower land crab shell deposit, at Canas. B, trench H, excavation No. 2. Showing two levels of deposition, at Canas. C, flexed burial lying on back. In the last of the marine shell deposit in trench H, excavation No. 1, Canas.

the staple of the early inhabitants was certainly land crabs while that of the later inhabitants was largely marine shellfish.

It would appear from the excavation completed that the late occupation extended over a longer period and a wider area than the earlier. No refuse of the early period was found below mounds B and C in the test pits made, and in mound A it was confined to an area 30 meters in diameter along the river bank. The maximum depth of refuse from the early period was 60 centimeters while the late period refuse in many sections reached a depth of 2 meters. Red and white painted sherds, however, have been found along an irrigation ditch in a field about .5 kilometer from mound A, and it is probable that they indicate another site occupied during the early period.

Collections from Barrio Canas

Since the site in Canas was essentially a deposit of refuse, the artifacts found were for the most part fragmentary. The great majority were potsherds which appeared in large numbers scattered through the food refuse. Complete vessels were very rare, although large fragments were common. Implements made of shell and of stone were comparatively numerous, but the majority of these also were broken. Ornaments of shell and stone were very rare and were never found with the burials encountered in the deposit. Implements and carved figures of bone were limited to a few unique specimens.

When the collections were arranged in the laboratory according to their depth in the refuse deposit, it was clear that there was a sharp distinction between the artifacts found in the early deposit of land crab shells and those found in the late deposit of marine shells. During the excavation of the site the two levels of occupation were recognized when they were first encountered, and the material from each level was segregated when packed and labeled, so that it has been possible to treat the artifacts from each level as a unit. In the following descriptions a classification of the material from each level is presented. The classifications of pottery are made on the same general basis of vessel shapes, types of ware, and aspects of ornamentation, but the distinctions between the pottery of each level are such that the systems of classification do not conform in many details. The term Shell Level is used in the following sections to designate the upper or recent deposit of marine shells, and the term Crab Level is used to designate the lower or older deposit of land crab shells.

The summary which follows the descriptions of Shell Level and

Crab Level artifacts will serve to point out the differences and the similarities where such exist.

POTTERY OF THE SHELL LEVEL

The 2915 sherds which make up the collection of pottery fragments from the shell heap proper at Canas are actually a small proportion of the total number removed during the excavation, since all small and undecorated fragments were discarded. The great bulk of the pottery found was a crude unpainted ware, homogeneous in color and composition. Only large rim sherds, lugs, handles, and the relatively rare fragments of this crude ware which were ornamented with incised or modeled decorations, were retained for analysis. A small number of the sherds in the deposit were of a red slipped ware and because of their rarity the majority of such sherds were also retained. Thus on the basis of color the sherds in the collection fall into two major groups which have been termed Crude Ware and Red Ware.

CRUDE WARE.—Fragments of cooking pots or service wares indicate that the bulk of the pottery used was neither slipped nor painted, and was as a whole crude and poorly made. The large part, or 2662 of the 2915 sherds in the collection, are of this type. The ware is dominantly brown but varies in shade from a reddish to a dark fire-blackened brown. It is sand-tempered but thick, coarse, and poorly fired. Surfaces are generally rubbed smooth but are never polished. Vessels of crude ware are as a whole irregularly formed and have the appearance of being hastily or carelessly made. The majority of the sherds are fire-blackened in part and suggest that crude ware vessels were used for cooking. Pottery of this type was occasionally ornamented with incised patterns, or with modeled figures, either in relief on vessel walls or in the round on rims and handles.

RED WARE.—Only 253 fragments of Red Ware were taken from the deposit and these represent practically all that were found. The discards during the excavation were Crude Ware fragments, so that no exact percentages of Red and Crude Wares can be given. However, it is certain that Red Ware made up less than 5% of the pottery deposit.

Red Ware is distinguished by a clay slip which varies from a pink to a light red. The slip is present either on the inside or the outside, or on both sides. Surfaces of Red Ware fragments are generally rubbed to a dull smoothness but never to a bright polish. Fragments of Red Ware vessels indicate that pottery of this kind was more carefully made than Crude Ware. This is shown in the regularity of

outline, and the finish of surfaces and modeled ornamentation. The same types of incised and modeled ornamentation, however, appear on both Crude and Red Ware. As far as can be determined vessel shapes are also the same. Red Ware vessels were used as cooking pots since many fragments show the fire-blackening, but this is less common than on Crude Ware fragments.

The only real distinctions between Red Ware and Crude Ware pottery are the red slip and the more careful finish. Therefore, the color of ware and the presence or absence of slip have been omitted from the following classification of Shell Level pottery.

THE BASIS FOR CLASSIFICATION.—Elements of ornamentation are as a whole comparatively rare on pottery of the Shell Level. Painted decoration is found on only six sherds. Incised decoration is present on only 35 sherds out of the 2915 retained, which is in turn only a small part of the total number in the deposit. Relief decoration on the walls of vessels is likewise very rare since there are only 31 examples. Modeled figures on rims and handles are more common but still rare, with only 158 examples. Such small percentages of ornamented sherds are obviously not adequate for a classification of sherds on the basis of ornamentation alone. A classification of rim types is of little significance since the great majority are simple vertical or incurving rims.

Complete vessels are very rare. Only 10 vessels were found complete, or nearly so. However, the majority of sherds retained are large fragments of the characteristic boat-shaped bowls which are easily identified by the handles and lugs. Round bowls and dish forms can in turn be distinguished from the boat shapes. Thus a classification of the pottery on the basis of shapes is possible, although subject to some degree of error. This classification on the basis of shapes is supplemented by another classification of the elements of ornamentation, confined to incised designs and modeled forms.

CLASSIFICATION OF POTTERY SHAPES BASED UPON IDENTIFIABLE FRAGMENTS (FIGURE 4).—*Shape A*: The most common type of vessel found in the Shell Level is a deep boat-shaped cooking pot with broad vertical loop handles. These pots are generally about twice as long as they are wide. They have the form of a boat with a high bow and stern. The handles are formed at each end of the vessel, and have the appearance of an extension of the rim which has been folded back down the wall of the vessel to form a flat loop. All pots of this type have a small, flat, round base. The rims are vertical and form a line or ridge in joining the rounded body about the circumference.

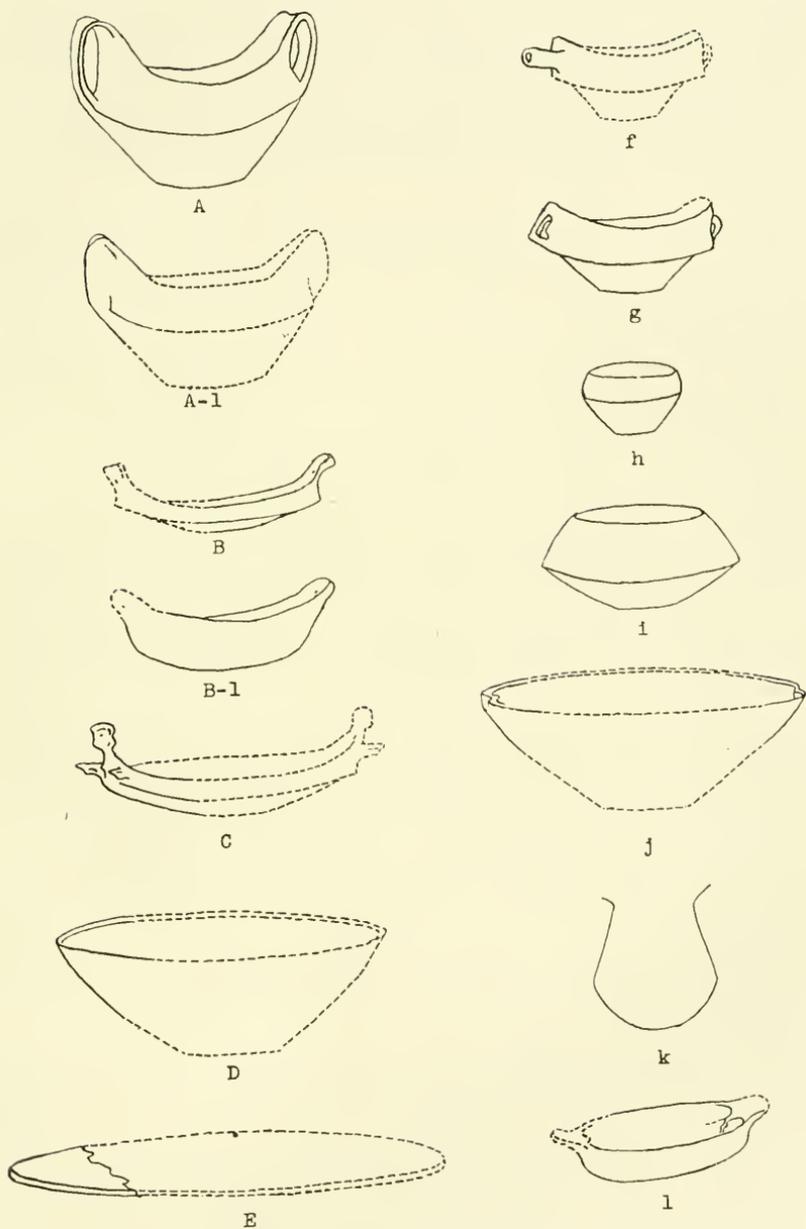


FIGURE 4. Shell Level vessel shapes.

Three pots of this type are practically complete. The smallest is 16 centimeters in longest diameter and 7 centimeters high. The largest is 34 centimeters in longest diameter and 19 centimeters high. The 424 handles taken from the Shell Level can definitely be identified as fragments of shape A, and 892 large rim sherds can be associated with this type of deep boat-shaped pot due to the characteristic curvature of the rim.

The majority of fragments of this type are crude undecorated ware, but there are a few examples of Red Ware, and also some fragments ornamented with rude modeled forms which will be described in a following section.

Shape A-1: A variant of shape A is a pot of the same general shape and size which is distinguished by vertical ridge lugs in place of broad loop handles. Fragments of shape A-1 are much less common than those of shape A, with only 42 identifiable sherds. The vertical lugs of shape A-1 are formed in the same position as the loop handles of shape A at each end of the pot. The lugs rise gradually from the walls of the vessels to form a ridge 1 to 3 centimeters high. Ordinarily the lug extends over the lip of the vessel, and in rare cases terminates in a round flat knob. In a few examples the lug is perforated to form a true handle. Vessels of this shape have no modeled ornamentation.

Shape B: There are 47 fragments which can be identified as shallow boat-shaped bowls or dishes with rectangular lugs. Two nearly complete vessels of this type make it possible to determine the shape quite definitely. The bowls are elongate, and may be described as boat-shaped although the ends do not rise sharply as they do on the pots of shape A. As a whole the vessels are much smaller and generally not over 22 centimeters in greatest diameter. As far as can be determined, the bases are round, rims are curved, and no ridge appears about the circumference. The lugs as a rule rise from the lip at the same angle as the vessel wall. Generally the corners of the lug are slightly drawn up, producing a somewhat concave upper edge.

Shape B-1: Seven fragments indicate a shape which may best be termed a variant of shape B. It is determined by roughly semi-lunar lugs on shallow oval, or boat-shaped, bowls of the same form as shape B. The semi-lunar lugs take the place of rectangular lugs on vessels of the same general shape and size. The semi-lunar lugs are rarely perforated to form a handle for suspension. Shallow bowls or dishes of shapes B and B-1 are apparently not ornamented in any way. They are as a rule made of Crude Ware, but there are a few examples of Red Ware.

Shape C: Boat-shaped bowls with modeled head lugs are represented by 47 fragments. Many of these fragments are large enough to indicate the prevalent form, which is that of a shallow oval or boat-shaped vessel of the general form and size of shape B. Modeled heads are evidently formed at each end of the vessel as an extension of the rim. Vessels of this type may be either Red Ware or Crude Ware. As a whole, they appear to be more carefully made than shape A, and less often show use as cooking bowls, being probably too small and shallow to be of use on the fire. The various types of modeled heads will be described under the heading, "Modeled head lugs on rims."

Shape D: Round bowls and dishes are suggested by a number of rim sherds which are not large enough to indicate the complete vessel shape. Some 543 sherds have been grouped in this general classification as representing vessels with a round rim in contrast to the customary oval rim of the boat-shaped vessels.

A large number of these sherds grouped as shape D probably are fragments of a wide-mouthed shallow bowl or dish. Rim sherds of this type often show an enlarged lip or edge which turns sharply in toward the interior of the vessel. Obviously such a loose classification as round bowls and dishes is very inadequate, but it does have some meaning in that it sets off a group of vessels which are round as opposed to the great majority which are of the characteristic boat-shape.

Shape E: Thick clay platters or griddles, so common in the West Indies as a whole, are abundant in the Shell Level deposit. No complete griddles were found, but fragments indicate circular, disc-shaped platters of a great variety of sizes. These are composed of a very coarse, poorly-fired clay, and are as a rule very fragile. In thickness they vary from 1 to 4 centimeters at the rim and are always much thicker at the rim than at the center. A noticeable characteristic of the majority of these griddles is that the upper side is rubbed or smoothed while the lower side is very coarse and rough. Samples of griddle rims were taken from each level of each section during the excavation, but no attempt was made to retain all fragments.

There are a very few examples of griddles which are ornamented with deep, rough parallel line incisions about the rim. A simple design or pattern is formed, and the incisions are restricted in all cases to a border around the edge of the griddle.

Miscellaneous rare shapes.—There are a few sherds which can be recognized as fragments of bowls representing either unique or comparatively rare shapes.

Shape f: Vessels with spouts are indicated by 3 rim fragments with tubular spouts about 4 centimeters long. In all three cases it can be determined that the spouts were attached approximately 1 centimeter below the lip and at right angles to the wall of the vessel. The rim fragments suggest shallow round bowls but the complete shape cannot be determined.

Shape g: One complete bowl is a unique specimen as no fragments of similar vessels were found. It is a shallow bowl somewhat more round than boat-shaped. It has a flat base and a semi-spherical body terminating in a vertical rim. On one side, at the rim, is a loop handle and at the opposite side is a hole 2 centimeters in diameter which was apparently used for pouring. The pot is unusually crude and irregularly made.

Shape h: One complete and one partially complete bowl represent a rare shape. They are small round bowls which round out from a flat base to the equator and then rise vertically to the lip, thus combining a vertical rim with a semi-spherical body and a flat base.

Shape i: A single vessel which is practically complete rests on a flat round base and rises gradually to the equator, at which point the walls turn sharply in to form a restricted mouth. No fragments suggesting this shape were found.

Shape j: Bowls of a shape characterized by a peculiar indentation of the rim can be recognized from 8 sherds. A complete bowl of this kind was found in Barrio Monserrate. It appears as if, when still soft, the vessel had been picked up with a pair of tongs which left a small groove, indentation, or fold at the lip on each side.

Shape k: Vessels with restricted necks are represented by 4 sherds. Very little concerning the complete shape of the vessels can be determined beyond the fact that jar forms with collars or necks are present but rare.

Shape l: Bowls partitioned off into two compartments can be determined from 3 examples. One was found practically complete and is a shallow boat-shaped bowl with rectangular lugs. A partition is modeled through the center extending from one end to the other. Much of the partition has been broken out and it is not possible to tell whether it extended the full depth of the bowl.

CLASSIFICATION OF THE ASPECTS OF ORNAMENTATION BASED UPON SHERDS (PLATE 1).—*Modeled head lugs on rims*: Modeled heads, or "adornos," are the most outstanding aspect of ornamentation in all the Shell Level material. There are 68 examples of this type of ornament applied to rims. They appear most commonly on sherds

which can be identified as belonging to shallow boat-shaped bowls, but there are a few sherds which are fragments of round bowl forms. Invariably they are applied to the peaks, or raised ends, of the boat-shaped vessel. No complete pots with modeled head lugs were found, but it is presumed that in most cases lugs were applied at each end. On the basis of the figure represented, these rim adornos have been divided into 6 classes. All represent some kind of zoomorphic figure.

Class a. The so-called bat-heads are the most common identifiable type. They are characterized by bulging eyes shaped like doughnuts, protruding snouts with nasal perforations, and crests or head-dresses formed by deep grooves. Often a modeled form below or around the chin is present, which may represent folded arms or wings. The crest and head-dress are at times modified to forms which may represent ears. The features as a whole are made up of knobs and deep grooves. Adornos of this class are found in most of Porto Rico and have become known as one of the most typical forms of ornamentation on Porto Rican pottery. There were 21 examples of this class found in the Shell Level. Of these, 16 face the inside of the vessel and 5 are placed so that they face along the rim, 2 toward the left and 3 toward the right. They are found on Crude Ware as well as Red Ware vessels.

Class b. A group of 10 of these modeled figures can be identified as human representations. Human-heads are smaller and much more simple than the bat-heads. They are characterized by a prominent and well-formed nose, and by eyes and mouth formed by a slit or perforation. No other features are represented. In simplicity and crudeness they contrast sharply with the bat-heads. All of the 10 examples face the interior of the vessel. In most cases these human-head lugs are flatter than the bat-heads which are always in complete round.

Class c. Three heads look remarkably cat-like. They have been set aside as a separate class because they are identical and markedly distinct from other heads. The eyes are sunk deep in the face and outlined by rings of clay. The nose protrudes in a snout. Sharp-pointed ears stand straight up on the head. It is possible that these heads are a variant of the bat-head class, but the appearance as a whole is quite distinct. The three face the interior of the vessel.

Class d. Four heads can be recognized as bird figures. Each one is to some degree distinct, but a common trait is a well-formed beak. One example represents the whole body, while the other 3 are forms of the head alone. All face the interior of the vessel.

Class e. Pelican-heads are clearly represented by 2 specimens. Both examples are applied to Red Ware shallow boat-shaped bowls, and are identical except for size. In each case, two pelican-heads are joined facing in opposite directions along the rim of the vessel. The long thick bills are brought down against the neck in the position which the pelican so commonly assumes. Eyes are well formed on each side of the head.

There are 27 modeled heads of zoomorphic beings which have been left unclassified. Each one is unique and cannot readily be associated with any known creature. Three of these may represent the turtle, but have no distinct traits in common. Two others are probably meant to represent humans, but are distinct from the usual human-heads. Bulging, doughnut-shaped eyes, and eyes formed by slits and punctures, are present on many examples of the unclassified group. There are 13 which face the inside of the vessel, 12 which face the outside, and 2 which look along the rim.

Modeled forms on loop handles: A distinct aspect of ornamentation is found on 76 broad loop handles which are clearly fragments of the deep boat-shaped bowls, shape A. This ornamentation is carried out by the addition of modeled forms on the top of the handles. Apparently the figures were formed by drawing up the clay while the handles were being made, or in many cases by applying strips or knobs on the finished handle and modeling them as desired. Such ornamentation is regularly found on the Crude Ware cooking pots, but also in rare cases on Red Ware. Decoration of this kind can most conveniently be divided into two classes on the basis of the type of figure.

Class a. Geometric figures are the most common, numbering 57 examples. Spirals, scrolls, ridges, loops and ear-like appendages predominate. The ear-like motives were evidently formed by drawing up the edges of the handle. In many cases the ears are impressed with lateral or transverse grooves, or pinched together to form a groove. Knobs of clay applied to the handle are impressed with crosses and grooves, or drawn out to form a straight or curved ridge. Rarely an S-shaped figure appears in high relief lying over the top of the handle. No single type of geometric figure predominates and the majority of examples are unique. Scrolls, ridges, and loops in the center of the top of the handle may be combined with ear-like elements at the edges.

Class b. Zoomorphic heads modeled on loop handles are less common than geometric figures. There are only 19 examples present. All such heads are of the same type, and are unusually small, crude, and simple. They were applied at the middle of the top of the handle,

and formed by simply impressing a small knob with grooves and punctures to form the eyes and mouth of the head. In some cases a prominent nose has been pinched out between the punctures representing the eyes. The majority of these heads are not over one centimeter in height. Most of them probably represent bat-heads and human-heads.

Geometric figures are at times combined with the zoomorphic heads. Of these, ear-like appendages at the edges of the handle are the most common, but curved ridges also appear on the same handle.

Modeled figures in relief on vessel walls: Ornamentation of vessels by the application of figures in low relief was not common, since only 31 sherds carrying such ornamentation were found in all the Shell Level. Nevertheless, on pottery which is rarely decorated in any way, this limited number of sherds forms a distinct class. So far as can be determined, relief decoration was generally applied to round bowls, and always near the rim. All figures of this type were crudely executed. They appear on both Crude Ware and Red Ware sherds, but no complete vessel ornamented by relief figures was found. Figures which commonly appear in relief can be grouped in four classes:

Class a. Figures which can best be described as sigmoid scrolls. These appear in low relief, roughly parallel to the rim and near the lip. They are composed of a series of joined curves, a section of which resembles a capital S lying on its back. The number of curves is not determined since all examples of this motive are found on sherds, but it is clear that the scroll did not extend in all cases entirely around the bowl.

Class b. Figures which are closed spiral scrolls. In no case does the spiral make more than two turns about the inside end. The whole figure is rarely more than 4 centimeters in diameter. Spiral scrolls are in low relief, and also on the outside wall of vessels near the rim.

Class c. Figures which may be described as worm-like. They form a half circle near the rim of the vessels, with one end of the half circle always beginning at the lip. The worm-like appearance is emphasized by a series of transverse grooves impressed over the length of each figure. In many cases two such figures are found together with the convex sides facing.

Class d. More elaborate relief decorations are indicated by several sherds which carry portions of a zoomorphic figure in low relief. Heads and arms or feet and legs appear together. There are no cases of a complete body. It is very probable that the feet and legs were applied on the wall of the vessel at one side and the head and arms on

the other side, which is not unusual in the so-called Arawak pottery of the Greater Antilles. Examples of this class are so rare and fragmentary that no conclusion can be reached as to the prevalent type of figure represented, but one specimen is the familiar bat-head so common to Porto Rican pottery. Bat-heads have been described among the modeled head lugs on rims.

Incised decoration: Sherds ornamented with incised lines are surprisingly rare in the Canas site. Decoration of this kind has long been associated with West Indian ceramics, but only 35 sherds were found bearing incisions. As far as can be determined from the sherds, incised ornamentation was generally applied to round bowls and not to boat-shaped vessels, but the fragments are small and the complete forms remain uncertain. Designs may be grouped in three classes.

Class a. Horizontal parallel lines in a panel near the rim, often terminating in a pit or puncture, form the most common design pattern. Incisions are rude and often irregular, and were applied before the firing. In some cases the parallel lines curve in to connect, thus forming a long rectangular figure with rounded ends. The puncture or pit, which appears to have been applied with a sharp awl, is a characteristic element of this design. A series of parallel lines were often used in this type of pattern, but apparently they were confined to a space within 3 or 4 centimeters of the lip of the vessel. Class a designs are generally found on the outside of the rim, but a few examples are present which indicate that the incisions were applied within the rim of what must have been an open bowl.

Class b. Parallel lines in curvilinear patterns on the outside of the body are less common than the horizontal rim incisions. Sherds bearing patterns of this kind are so rare and fragmentary that no adequate characterizing description can be given.

Class c. A series of vertical parallel lines forming a band about the rim of vessels is a distinct pattern. This type of incised design is even more crude than those mentioned above. It generally appears on bowl forms of Crude Ware. Apparently the band of incised lines does not extend around the rim of the vessel. This pattern is often associated with the worm-like relief figures.

Painted decoration: Ornamentation with paint is limited to 6 sherds which are all fragments of shallow bowls or dishes. A red paint, which appears to be the same as the slip applied to Red Ware vessels, has been added to the lip of these bowls to form a border, and simple curvilinear designs have been applied to the interior. None of the fragments are large enough to give an idea of the complete design but

all the sherds of this group bear simple red lines which are segments of curvilinear elements. These painted designs are applied to the usual Crude Ware vessels. The 6 sherds of shallow bowls or dishes ornamented with a simple red line pattern are significant in the Canas site since a large number of the sherds removed from the middens at Monserrate are of vessels of the same shape ornamented in the same manner.

ASSOCIATED ARTIFACTS OF THE SHELL LEVEL

Artifacts of shell and stone were numerous in the Shell Level deposit though much more rare than potsherds (PLATE 2). Tools of shell and stone make up the bulk of associated artifacts, and of these, shell tools predominate. Of a small group of ornaments, about half are shell and half stone. Bone artifacts are limited to a few awls or needles, carved figures, spatulas and problematic objects.

SHELL IMPLEMENTS.—*Chisels*: The most prevalent shell tool resembles a chisel. The tool is in every case made from the lip of a *Cassis tuberosa*, and the row of knobs or ridges which are present on the shell remain on the body of the chisel, as if intended to aid in gripping the implement. It is dagger-shaped, and slightly curved with the natural curve of the shell. The length varies from 10 to 15 centimeters, and the width from 2 to 4 centimeters. The thickness depends largely on how well the tool has been ground down. Many of them are very rough, and a flange which is a remnant of the body of the shell remains on the side. Many of the chisels are only roughly pointed and have a comparatively blunt end. Others have been rubbed down to a sharp curved bit or to a polished point. The poll is usually left rough but in some cases is smoothed off to form a blunt or rounded butt. Only 1 specimen has been ground until all traces of the shell surface have disappeared. There were 32 examples of this type of tool found.

Hoes: Tools roughly shaped like the sole of a shoe can probably best be classed as hoes. Cut from the *Strombus goliath*, they have a slight curve of the shell. They are cut only around the edges and the flat surfaces retain the undulations of the natural shell. They are never polished or rubbed, and the edges remain jagged or rough. The working end is rounded like the end of the sole of a shoe and is never ground down to form a sharp bit, but remains the thickness of the shell. No evidence of hafting is present. In size they vary from 15 to 18 centimeters in length, and 6 to 8 centimeters in width. The thickness is generally about $\frac{1}{2}$ to 1 centimeter.

Celts or axes: Celts are very similar in form to the hoes, except that the working end has in all cases been ground down to a fairly sharp curved bit. Many of them have the shoe-sole shape, and they are invariably made from the *Strombus goliath* shell as are the hoes. The surfaces are unworked but the edges are occasionally ground smooth. A few examples have a roughly pointed poll while others are to some extent rectangular. All have a curved bit. Lengths are 11 to 14 centimeters, widths from 4 to 8 centimeters; the thickness of the body is generally from $\frac{1}{2}$ to 1 centimeter. The celts are less common than hoes, as there are only eight examples.

Unclassified shell tools: Forty-four worked implements roughly the size of celts and chisels have been left unclassified as their use is unknown and they do not fall into distinct types. Some of them are roughly semi-lunar and about 14 centimeters long. Like the celts, they are cut from *Strombus* shells and left unpolished. There are no cutting edges or points. Two specimens are dagger-shaped with something resembling a hilt, but the point is blunt. Of these one is small and quite well finished, the other is large and rough. One example has the outline of the three-pointed ceremonial objects, but is flat like the celts or hoes. Another is a long, slender, blade-like implement with well-finished edges, but it also is blunt. Of the 44 examples, no two are identical. Some may be tools in the process of manufacture, but others are evidently finished implements of some sort. It may be that some were used as net measures, and yet none are notched. They have not been termed ceremonial as is often customary, because none is carefully made or finished.

Shell discs: Of the 8 disc-shaped artifacts, 5 are rough, irregular, and unpolished. The convolutions of the shell still appear on the surfaces and the edges remain jagged or rough. One has a small perforation near the edge. The diameters are 6, 8, 9, 9, and $9\frac{1}{2}$ centimeters. The 3 remaining have been partly polished on both surfaces and the edges have been ground smooth. One is perforated at the center, while another has a perforation at the center and also a series of perforations circling the rim. These rim perforations are spaced regularly approximately 1 centimeter apart. The use of these discs remains uncertain. The discs with holes at the center cannot be spindle whorls as the holes are much too small for a spindle. They seem to be rather large and rough for ornaments, $8\frac{1}{2}$ centimeters in diameter. The unfinished discs may be counters or weights.

Shell ornaments: Only 4 specimens can quite definitely be termed ornaments. One is a small, flat, rectangular piece, 4 by 3 centimeters,

which is perforated at the center and engraved with what is probably a conventionalized frog figure. Legs and feet are clearly shown drawn up in a flexed position, but no head is represented. Another specimen is a simple, flat, oval ring, 4 centimeters in diameter, with grooves cut on one side at each end. A third is a small and very thin disc 3 centimeters in diameter and less than $\frac{1}{2}$ millimeter in thickness with a tiny hole at the center. It may have been sewn on some garment. The fourth is an I-shaped object 6 centimeters long, 2 centimeters wide, and 3 millimeters thick. It is carefully made and well polished, but it is not perforated or engraved.

A cylindrical shell object, 6 centimeters long, may represent a shell bead in the process of construction. A curious triangular object, 6 centimeters high and $1\frac{1}{2}$ centimeters thick, is notched at the top and engraved with a series of parallel transverse lines across the bottom. Its use is problematic, but because of its finish and engraving it has been grouped with ornaments.

Shell "zemi": A small three-pointed object resembling the three-pointed stone zemis of the fourth class as established by Dr. Fewkes was found at a depth of 50 centimeters. It has exactly the same shape as the stone objects of this type found at Barrio Coto and Barrio Mouserrate. It forms an equilateral triangle 6 centimeters long at the base, 3 centimeters high, and 2 centimeters thick. The base is flat and there are no carvings or engravings.

STONE IMPLEMENTS.—*Petaloid celts*: The polished triangular, or so-called petaloid celts, common to all the West Indies, are present throughout the whole Shell Level at Canas. There were 21 examples found which could be identified as petaloid shapes although the majority are fragmentary. Most of them are made of a very dense green stone, but a few were made of black stone. All but one are highly polished and evenly made with a poll that is generally blunt-pointed, and a sharp and semi-circular bit. The more or less complete examples vary in length from 6 to 12 centimeters, and from 4 to 8 centimeters in width at the cutting edge. Petaloid celts in the Shell Level become very significant, since they stand in sharp contrast to the rectangular adze-like celts found in the Crab Level below.

Stone beads: The term bead may be poorly chosen for a group of stone objects which are unique and characteristic of the Shell Level. They are tubular, well-polished stone objects which have the shape of pork sausages. They vary in length from 5 to 9 centimeters and in diameter from 2 to 3 centimeters. Most of the examples have been drilled longitudinally, while some were evidently discarded in the

process of drilling, since the holes remain unfinished. All were made from a black and white mottled granite. Many of them seem unusually large and heavy for use as beads, but the perforations indicate suspension of some sort. There were 8 of these objects found.

Stone hammers and rubbing stones form a group of objects varying in shape and form, which were found in the culture deposit and show some use. Some have a chipped surface at the butt showing use as striking implements, while others have a smoothed surface caused by rubbing or polishing. A few stones of this group have the "mano" shape, but show no signs of having been artificially formed.

Pitted and grooved stones are exceptionally rare. Two examples are water-worn pebbles which are flat and oval. They are pitted on each side and roughly grooved at both edges. Another example is grooved but not pitted. All three are probably hammer stones, as the ends are chipped from striking.

Carved stone figures: Small zoomorphic figures carved in stone are represented by 3 specimens, all of which are of the same type. The figures are executed in three-quarters round and have a flat back or base. Heads and faces which are well formed probably represent those of men, animals, or mythical beings. The arms, which are not clearly shown, seem to be drawn back as if tied behind the back. Legs and feet are present on one specimen, and are drawn up in the flexed position. A common trait of all three is a prominent penis. All are perforated at the position of the shoulders. They were evidently tied against some flat surface, possibly the forehead of the wearer, or suspended. These little stone figures are not uncommon in many private collections in Porto Rico, and are remarkably uniform in such characteristics as the flat back, bound and flexed position, prominent penis, and double holes for suspension at the shoulders. Evidently the position was symbolic in some way, and the figures were more than ornamental. Two of the figures found are 3 centimeters long and $1\frac{1}{2}$ centimeters wide. The other is 5 by $2\frac{1}{2}$ centimeters.

A very small cylindrical object cut with three encircling grooves may have been a bead or pendant. It is 2 centimeters long and 5 millimeters in diameter.

A cylindrical object with slightly concave sides is ornamented by two encircling grooves and four raised oval knobs, which in turn are engraved with a cross punctured at the intersection. Holes were made at each end slanting through the edge. It is $6\frac{3}{4}$ centimeters long and $1\frac{1}{2}$ centimeters in diameter, and is probably a symbolic ceremonial figure.

Stone "zemi": Only one three-pointed stone was found at Canas. It is the type referred to as the fourth class, and is unornamented in any way. Much smaller than the large, carved, three-pointed stone zemis so common in archaeological collections from Porto Rico, it measures 7 centimeters in length at the base and 6 centimeters in height at the central point.

Toy "dujo": A very small stone object has the form of the wooden "dujo" or stool with its four legs and curved seat. It is roughly formed from coral limestone, and is probably the utilization of an accidental shape. It is 16 centimeters in length and stands 9 centimeters high. The four legs are roughly formed, and it is difficult to tell how much has been worked and how much is natural.

Flint chips: Chips or flakes of flint were found throughout the deposit but were not abundant. None of them shows secondary chipping. It is possible that many of these flakes were utilized but no manufactured implements of flint were found.

Miscellaneous objects of stone: One implement found in the shell deposit has the shape of the so-called "Carib-stones" or "eared axes" which are numerous in the Lesser Antilles. It resembles the blade of a broad paddle and tapers down at the poll to a slender neck with knobs on the poll which may be termed ears. It is 16 centimeters in length, 9 centimeters in greatest width, and 4 centimeters thick at the center. There is no sharp edge or bit, and the edges have a rough, pecked appearance. It has been ground down but is not polished.

A fragment of what was evidently a boat-shaped stone bowl was found at the bottom of the Shell Level. The fragment is a triangular piece including a section of the rim. It was evidently pecked out of a coarse granular stone, and resembles an Eskimo stone lamp rather than a well-finished, thin-walled bowl. It is rough and unpolished.

A roughly rectangular stone 14 by 10 centimeters, found at the bottom of the Shell Level, is cut with transverse grooves. There are three grooves on one side and two on the other. The grooves are straight and parallel, about 1 centimeter wide and $\frac{1}{2}$ centimeter deep. Such a stone may have been used to sharpen pointed implements, or possibly as an arrow shaft straightener.

BONE IMPLEMENTS.—*Worked manati ribs*: One manati rib found has been ground down to form a sharp, curved, pick-like implement 20 centimeters in length and $2\frac{1}{2}$ centimeters wide at the butt. This was the only complete and well-worked implement of manati rib found in the deposit. The other ribs which show any kind of working are only roughly grooved. Many of these have been broken at the

groove, suggesting that the grooves were cut in order to break the ribs in sections. Possibly these fragments represent the discards, the section of the bone cut away having been used for some finished implement. Excepting the pick, no such finished implements were found.

Turtle shell spatulas: One object which has been termed a spatula is shaped like a narrow paddle blade, rounded at one end and squared off at the other. The edges are regularly cut and smooth, and the surfaces show some rubbing. It is 16 centimeters long, 6 centimeters wide, and 5 millimeters thick. It is slightly curved with the natural curve of the shell. The other object termed a spatula is fragmentary. The piece is rectangular, and three sides are well cut and ground smooth. The longest edge is beveled, forming a sharp bit. The sharp edge or bit is 10 centimeters long. The rounded edges are 8 centimeters long. The fourth side is the rough broken edge. The thickness is 5 millimeters.

Bone tubes: Three tubes are almost identical in size, 8 centimeters long, and 8 millimeters in diameter. They were probably cut from bird bones and then ground smooth to some extent. The ends show marks of cutting. As a whole they are not well finished nor polished. A fourth tube is very small ($2\frac{1}{2}$ centimeters long, 5 millimeters in diameter) and might be termed a bead. It is well polished. Grooves encircle the ends.

Bone awls or needles: The triggers from trigger fish would undoubtedly make very serviceable awls and needles. A great many of these were found in the deposit, and a few of them show that they have been refashioned for such a use. Worked examples have been ground down and resharpened, and the hole which is present in the hinge or butt has been enlarged as if to take a thread. Since the triggers are normally smooth and sharp, no retouching is necessary, and it is probable many more were used than are represented by the few definitely worked examples.

Awls cut from large bones are rare. Only 3 examples were found. One is smooth and sharp, and is 17 centimeters long. The other two are fragmentary and apparently less well finished.

Fish vertebrae counters: Fish vertebrae which have been cut down to form a spool-shaped or checker-like object were found in all sites excavated, but only one specimen was found at Canas. This is well finished and the central hole has been enlarged, forming a ring-like object. It is 2 centimeters in diameter.

Figures carved from bone: Probably the most remarkable single object found at Canas is the representation of a human being carved

in low relief on what is evidently a human long bone. The complete surface is utilized. Thus, the figure in relief extends completely around the bone, with the head at one end and the feet at the other. It is in a seated position and the hands rest on the knees. Most of the face is missing. A female figure is probably intended, as breasts are clearly shown. The most peculiar feature is a greatly exaggerated navel, which is represented by a large perforated disc. The perforation extends through to the hollow section of the bone. A carved figure found at Barrio Coto portrayed the same peculiarly exaggerated navel, which fact suggests a religious symbolism in this feature. The whole carved figure is $10\frac{1}{2}$ centimeters high, and the bone on which it is carved is 14 centimeters long and $2\frac{1}{2}$ centimeters in diameter. The figure is carefully executed and the bone is remarkably well polished. Holes for suspension appear at the back of the neck and at the top of the head. The specimen was found at a depth of 2 meters and at the bottom of the refuse deposit.

Another carved bone object is fragmentary and unidentifiable. A solid cylindrical bone, which is undoubtedly manati, is topped by a curious winged figure. One side of this figure has two large, round humps, while the other side contains a figure in relief which probably represents a lizard. This figure is indistinct and apparently has no head. The bone has been broken away at both ends, and all the carved figure is not present. The fragment is 13 centimeters long and 4 centimeters in diameter. The carved figure at the end is 4 centimeters long. Possibly this is a fragment of a "swallow-stick."

The third carved bone object represents the head of a duck. It has been cut from manati bone and is 12 centimeters long and 4 centimeters in diameter.

CLAY OBJECTS.—*Clay discs*: Discs which were evidently made from potsherds were found in all three major sites. Only 2 were taken from the deposit at Canas, 1 of Red Ware and 1 of Crude Ware. Perforated discs were common at Barrio Monserrate and suggest spindle whorls, but none of this type was found at Canas.

Clay ear plug: A small clay ring 18 millimeters in diameter and 8 millimeters wide was found in the Shell Level material. The ring is raised at the edges, forming a broad groove around its circumference. A ring of the same type was found at Barrio Monserrate lying beside the head of a skeleton, which suggests that such rings were worn as ear plugs.

OUTLINE OF POTTERY TYPES AND TRAITS.—The following outline of Shell Level pottery types is given in order to summarize the de-

scriptions which have been given, and to indicate the relative numbers of sherds representing each type.

Crude Ware.....	(No. of sherds)	2662
Red Ware.....	(No. of sherds)	253
	Total No. of sherds	2915

Classification of shapes based upon identifiable fragments.

Shape A.	Boat-shaped with loop handles.....	No. identified	424
		Probable fragments	892
Shape A ₁ .	Boat-shaped with ridge lugs.....	No. identified	42
Shape B.	Boat-shaped with rectangular lugs.....	No. identified	47
Shape B ₁ .	Boat-shaped with semi-lunar lugs.....	No. identified	7
Shape C.	Boat-shaped with modeled head lugs.....	No. identified	47
Shape D.	Indefinite round bowl sherds.....	Possible fragments	543
Shape E.	No. identified	159
Rare shapes.			
Shape f.	Vessels with spouts.....	No. identified	3
Shape g.	Vessel with hole for pouring.....	No. identified	1
Shape h.	Round bowls with vertical rim.....	No. identified	2
Shape i.	Round bowl with restricted mouth.....	No. identified	1
Shape j.	Bowls with indented rim.....	No. identified	8
Shape k.	Vessels with restricted necks.....	No. identified	4
Shape l.	Bowls with partition.....	No. identified	3

Classification of the aspects of ornamentation based on sherds.

A.	Modeled head lugs on rims.....	(No.)	68
	Class a.....	21	
	Class b.....	10	
	Class c.....	3	
	Class d.....	4	
	Class e.....	2	
	Unclassified.....	27	
B.	Modeled forms on loop handles.....	(No.)	76
	Class a.....	57	
	Class b.....	19	
C.	Modeled figures in relief on vessel walls.....	(No.)	31
	Class a.....	8	
	Class b.....	3	
	Class c.....	14	
	Class d.....	6	
D.	Incised decoration.....	(No.)	35
	Class a.....	20	
	Class b.....	12	
	Class c.....	3	
E.	Painted decoration.....	(No.)	6

Total number of ornamented sherds 216

Complex of traits distinguishing the Shell Level material.

1. Deposition in refuse heaps of marine shells.
2. Crude pottery unpainted and unslipped forming bulk of deposit.
3. Red Slipped Ware (rare).
4. Deep boat-shaped bowls with loop handles.
5. Shallow boat-shaped bowls with modeled head lugs.
6. Shallow boat-shaped bowls with rectangular lugs.
7. Double bowls.
8. Bowls with spouts.
9. All vessels with vertical or incurving rims.
10. Bat-head adornos on rims.
11. Crude human-head adornos on rims.
12. Modeled decoration on vessel walls.
13. Modeled decoration on broad loop handles.
14. Parallel incised line patterns terminating in pits or punctures.
15. Petaloid stone celts.
16. Shell chisels.
17. Shell celts.
18. Shell hoes.
19. Shell discs.
20. Carved shell ornaments or amulets.
21. Tubular stone beads.
22. Carved stone figures.
23. Three-pointed objects of shell and stone.

VARIATION WITHIN THE SHELL LEVEL

During the excavation of the Canas site it was remarked that the modeled head lugs or adornos appeared more frequently in the first 25 centimeter cut or at the top of the deposit. These clay heads are one of the most striking characteristics of all pottery collections in Porto Rico. With the descriptions of pottery which have just been given, it is seen that certain types of modeled heads are characteristic of the Shell Level, while other types are characteristic of the Crab Level and these types have been distinguished in the classification.

Excavation No. 1 was a series of cuts through a deposit which was limited to Shell Level refuse. The maximum depth of this deposit at the center of the midden was slightly over 2 meters. Since a variation of pottery within the Shell Level was suggested by the noticeable predominance of modeled head lugs in the first 25 centimeter cut, the collections from Canas, excavation No. 1, have been used for a stratigraphic study of Shell Level material. This excludes material from excavation No. 2 where the Shell Level overlying the Crab Level did not average over 1 meter in depth.

Only those elements which were numerous enough to be meaningful in such a study were used. The following charts show the result of

this stratigraphic analysis. Certain limitations of this method are seen in the fact that the amount of deposit and the consequent number of specimens removed from the upper levels is much greater than that from the lower levels. Only in a very limited area in the midden did the deposit reach a depth of two meters. Another factor to be considered is the probable shifting or sliding of the refuse during the process of deposit. The refuse in excavation No. 1 was primarily composed of large marine shells and ashes with very little soil. During deposition this refuse was apparently heaped up and would undoubtedly slide and shift about during the period of occupation. With these conditions in mind, charts showing distribution of sherds illustrating various types of pottery must be taken with some reservation.

CHART SHOWING FREQUENCY OF BOWL SHAPES AND ORNAMENTAL ELEMENTS IN RELATION TO DEPTH IN THE SHELL LEVEL IN EXCAVATION NO. 1, CANAS

Depth in cms.	0	25	50	75	100	125	150	175	175
	to 25	to 50	to 75	to 100	to 125	to 150	to 175	to 200	to
Cubic meters removed.....	37	37	27	27	19	15	15	7	7
Shape A. Loop handles....	24	62	41	50	36	25	25	5	5
Shape A-1. Ridge lugs.....	4	10	2	2	1	1			
Shape B. Rectangular lugs.	2	17	2	4	4	2	10	2	2
Shape C. Modeled head lugs	7	9	6	5	1				
Crude Ware.....	360	680	459	226	172	114	96	40	40
Red Ware.....	30	48	40	37	12	7	2		
Modeled heads on rims....	21	12	8	5	1				
Modeled forms on loop handles.....	6	6	12	9	5				
Modeled forms on vessel walls	5	9	3	1		1			
Incised designs.....	17	11	2	1					
Bat-head adornos.....	6	4	2	1					
Human-head adornos.....	2	4	3	3	1				

The preceding chart indicates that modeled and incised elements of ornamentation are practically limited to the first meter of deposit. Considering the fact that the great bulk of the material was found in the first meter and that modeled and incised elements on sherds are comparatively rare as a whole, the condition is not definitely indicative of a change in the material culture represented. The presence of 21 modeled heads on vessel rims in the first 25 centimeter level, with a sudden decrease in the next four levels, quite clearly shows, however, that this type of ornamentation was made use of more commonly

during the last phase of occupation of the site. It will be seen from the chart that incised ornamentation also became much more common in the last phase. The dominant vessel shapes and the types of ware appear in approximately the same proportion throughout the deposit.

The sudden increase of modeled heads and incised designs near the surface of the deposit may represent an impetus from other regions at a later period and the significance of this condition may become clear when the material from Canas is correlated with that from other sites.

POTTERY OF THE CRAB LEVEL

The pottery of the lower or Crab Level cannot adequately be classified in the same manner as the pottery of the upper or Shell Level. Classification on the basis of vessel shapes becomes much more difficult in dealing with the Crab Level material because the boat-shaped vessels typical of the Shell Level, which are easily determined by large sherds, are here absent, and the great variety of new shapes suggested by the sherds cannot definitely be determined. Furthermore, the presence of a large number of painted sherds makes it necessary to place the emphasis on ornamentation and on the use of paint.

Since there are 15 vessels which are complete, or sufficiently so to determine the original shape, they have been treated separately, and reference is made at all times to the sherds in order to indicate as far as possible the prevalence of various types. The sherds collected (859) do not represent the entire number of sherds in the deposit, since only large rim fragments, painted sherds, and lugs and handles were retained for analysis. Obviously this makes the percentage of painted and unpainted sherds relatively meaningless, but with this in mind it will be seen, when the figures are given, that painted pottery forms a rather small proportion of the whole. Lugs and handles fall readily into distinct types, and although they cannot be used to determine vessel shapes as they could with Shell Level material and its dominant boat shapes, they can be used as characterizing elements. Thus the Crab Level material is classified in three ways: first, with reference to pottery shapes on the basis of complete or nearly complete pots; second, with reference to color of ware and painted and incised ornamentation; and third, with reference to types of handles and lugs. As far as possible, the techniques of painting and the various types of lugs and handles are correlated with the pottery shapes.

CLASSIFICATION OF POTTERY SHAPES BASED UPON COMPLETE OR PARTIALLY COMPLETE VESSELS (FIGURE 5).—*Shape A*: A round

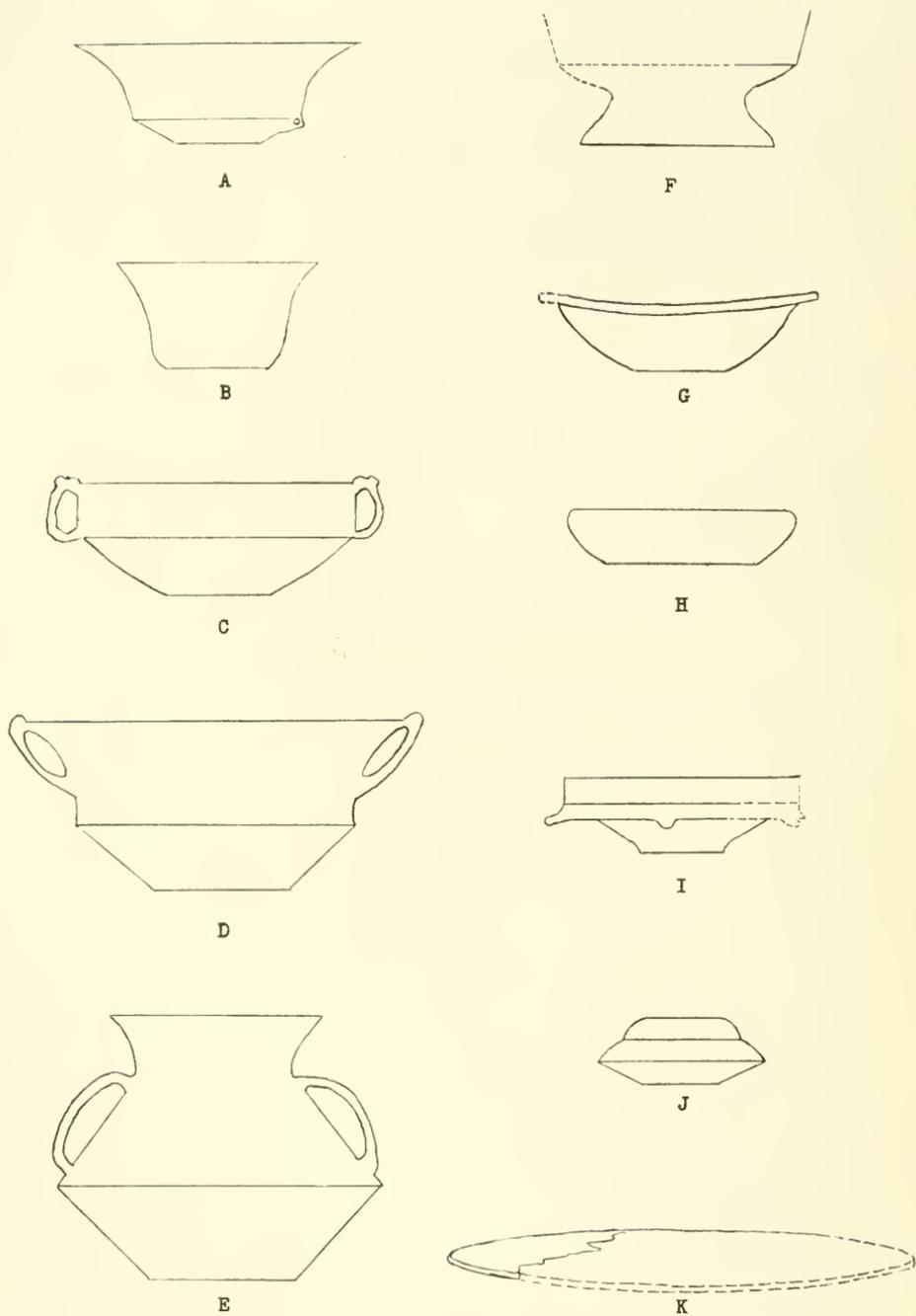


FIGURE 5. Crab Level vessel shapes.

bowl type with a flat base and a wide flaring rim is represented by one complete and one partially complete vessel. Bowls of this type rise from a small, flat, circular base at a wide angle, then turn abruptly upward, and gradually flare out to a wide, open mouth. A characteristic of shape A bowls is a line or ridge about the circumference of the body where the angle of the wall is changed. The complete bowl is 9 centimeters high and 25 centimeters in diameter at the lip. The line about the circumference is 3 centimeters above the base. The partially complete bowl is 8 centimeters high and 32 centimeters in diameter at the lip. The line about the circumference is 8 centimeters above the base. The lip of the larger bowl is slightly thickened, while that of the smaller is not.

A characteristic of shape A is a small, perforated knob which is applied at the line or ridge circling the wall. Twenty-two sherds with this perforated knob are apparently fragments of this type of bowl. The knob is lacking on the partially complete example, but it is possible that it was broken away with the missing part.

The complete specimen is of unpainted ware, while the incomplete is decorated with red and white paint.

Shape B: Three bowls which are partially complete represent a type which is not unlike shape A, but which is distinguished by the absence of the encircling ridge or line. In other words, the bowls rise with a slight bulge from a flat, circular base, and then gradually flare out to a wide, open mouth. There is no sharp change in the angle of the wall. All 3 examples of shape B vary to some degree. The first is 10 centimeters high and 29 centimeters in diameter at the lip, which is noticeably thicker than the rest of the vessel wall. The bulge from the base is slight and there is little variation in the angle of the wall from base to lip. The second is 12 centimeters high and 21 centimeters in diameter at the lip. The base has a greater diameter than the first example and the bulge from the base is more pronounced. The lip is not thickened. The third is 10 centimeters high and 13 centimeters in diameter at the lip which is very slightly thickened. The bulge at the base is intermediate between the first and second examples.

All 3 bowls of shape B are ornamented on the outer wall with designs in red and white paint.

Fragments of shapes A and B, for the most part, cannot be distinguished from one another. Bowls with a wide flaring rim which are probably one shape or the other, are indicated, however, by 168 large sherds. Many smaller sherds may be fragments of vessels of this shape since they indicate a flaring rim, but their definite allocation

to shapes A and B would be very uncertain. The 168 sherds show that shapes A and B fall into the unpainted ware, red painted ware, and red and white painted ware groups.

Shape C: Round bowls with vertical handles at the rim on each side form a type which may be termed cooking pots. Two examples of this shape are complete, and a third is recognizable, though fragmentary. All 3 examples are of plain unpainted ware and fire-blackened on the outer surface. They are thin walled and well formed, although less well finished than vessels of shape A and B. The bowls rise with a slight bulge and at a broad angle from a flat, circular base and then continue upward to form a vertical rim. The line formed by the change in the angle of the wall is not a sharp ridge as it is on vessels of shape A, but is rounded and more gradual. D-shaped handles of the second class, which will be described in detail later, are applied at the rim on opposite sides. They are vertical and do not extend over the lip. One complete pot is 20 centimeters in diameter at the lip and 10 centimeters high. The vertical rim is 4 centimeters wide. The other pot is 22 centimeters in diameter, 9 centimeters high, and has a vertical rim 5 centimeters wide.

Apparently bowls of this type are much less common than shapes A and B as only 14 sherds can quite definitely be associated with this shape. The 34 D-shaped handles of the second class may in part be fragments of such bowls, but many of them indicate larger and heavier vessels which undoubtedly vary in shape. All sherds recognized as fragments of this shape are unpainted and fire-blackened.

Shape D: A large, round bowl with D-shaped vertical handles of the first class represents a distinct type of cooking pot. With the exception of the handles, it is not unlike shape A, since it rises from a flat base to a sharp line about the circumference, then turns upward and gradually flares out to a wide mouth. It is unpainted and fire-blackened like the vessels of shape C. The handles are applied at the rim but do not extend over the lip. It is 35 centimeters in diameter at the lip and 16 centimeters high. The encircling line or ridge is 6 centimeters above the base.

Sherds which can be associated with shape D are rare. Some of the 23 D-shaped handles of the first class present in the collection may be from vessels of this kind, but only 3 can quite definitely be allocated by means of the curvature of the rim and the fire-blackening.

Shape E: Large, thick-walled jars with restricted necks are represented by one complete vessel and nine fragments. The complete jar flares out from a flat base to a height of 9 centimeters, then turns up-

ward and inward for 13 centimeters to the neck, where it again flares outward 6 centimeters to the lip. The greatest diameter is at the equator which is 35 centimeters. The height over all is 24 centimeters. D-shaped vertical handles are applied at opposite sides and extend between the neck and the equator. This jar was found at the bottom of the Crab Level and was filled with crab claws.

The 9 fragments associated with shape E because they represent large heavy jars with loop handles and restricted necks indicate certain variants of the shape described, but none are large enough to suggest the complete shape. The complete jar and the sherds are all plain undecorated ware.

Shape F: Round bowl forms with high, broad, annular bases are represented by one partially complete vessel, and 16 recognizable fragments which are complete or fragmentary bases. The original form of the bowls cannot be determined from the vessel which is partially complete since the upper part of the bowl is gone, and the type is based primarily on the presence of the bases. These annular bases resemble an inverted bowl with straight, flaring sides, varying in height from 2 to 6 centimeters and in diameter from 9 to 19 centimeters. The vessels with annular bases, as indicated by the partially complete example, are apparently chalice-like with a broad open bowl above the wide flaring base. The bowl forms a sharp angle with the base since both base and bowl flare sharply outward from the point at which they join. Vessels of this type were probably made as a unit, since the bottom of the bowl and the top of the hollow base are one, and no bowl fragments were found from which the base had been broken. On the other hand, several complete bases retain the jagged edges of the bowl which has been broken away.

The 8 fragments of shape F and the partially complete example are red and white painted, 7 are plain unpainted ware, and 1 is red painted ware.

Shape G: An oval bowl with a rounded body and a sharp right-angle rim or lip is a single example of a distinct shape. It rests on a flat oval base and rounds gradually outward and upward to the edge, where it suddenly turns sharply out to form a horizontal right-angle rim $1\frac{1}{2}$ centimeters wide. Its length is 26 centimeters and its width 20 centimeters. The height is 7 centimeters. Part of a rectangular lug formed by an extension of the right-angle rim remains at one end, while the rim at the other end is broken away. It is probable that rectangular lugs were affixed at each end. This bowl to some extent suggests the boat shapes of the Shell Level material, but it lacks the high bow and stern and the sloping rim.

Shape G is evidently a rare form as only 2 fragments are from oval-shaped bowls and these lack the right-angle rim. Rim fragments of the right-angle type number only 12 and are not large enough to show the oval shape of the bowl. Rectangular lugs are rare, with only 9 examples, but these may be fragments of shape G. The complete bowl is of red-painted ware.

Shape H: One vessel which is partially complete is a shallow, round bowl which rests on a broad, flat base and rounds gradually outward and upward to a height of 6 centimeters. It is 21 centimeters in diameter. The lip is slightly thicker than the wall and is stippled with rows of indentations which are bounded by an incised line. There are no sherds which can definitely be associated with this shape, although there are many sherds from a rounded bowl form. The single example is of red-painted ware.

Shape I: Another single example of a distinct shape is a partially complete bowl which is distinguished by the application of a collar about the circumference where the vertical rim joins the body of the vessel. It is a round bowl which rests on a flat base, flares sharply outward and upward, and then turns straight up forming a vertical rim 3 centimeters wide. The diameter is 22 centimeters and the height 8 centimeters. The collar was applied as a triangular fillet of clay which was broken away from the bowl during excavation. Raised knobs appear on the collar at two points, but a good part of the collar is missing and more knobs of this kind were probably originally present.

None of the sherds in the collection can be recognized as fragments of this shape, although it is possible that many of them may be, since the rim alone is not an unusual type. The single example is Red Painted Ware.

Shape J: Another unusual shape is represented by a single complete vessel. It is a small discus-shaped bowl with a small restricted mouth. The wall rises very gradually from a flat base to the equator, where it turns sharply in and rises gradually to a small mouth. There is a restriction about the vessel half way between the equator and the mouth. The diameter at the equator is 16 centimeters, while the diameter at the mouth, which is the same as that of the base, is 7 centimeters. The height is $6\frac{1}{2}$ centimeters. The wall of the vessel above the restriction is ornamented with incised lines inlaid with white paint, thus forming a panel or border of painted and incised decoration about the mouth.

There are no large fragments which can definitely be allocated to this shape, but 9 small sherds of those ornamented with incised and

inlaid designs show the sharp angle of the wall and the restriction, and may well be fragments of this type.

Shape K: The flat platters or griddles so common in the West Indies are present in the Crab Level as well as in the Shell Level. No complete examples were found, but 40 rim fragments indicate the usual form, a round, flat, thick platter generally thicker at the edge than at the center. No griddles with rude incisions about the rim were found in the Crab Level. A unique specimen is a griddle fragment which was treated with a well-polished red slip or paint on both sides. The rest are coarse rough clay generally rubbed smooth on the upper side only.

Shape L: Some form of vessel with legs is indicated by 1 sherd. This sherd is a hollow pottery leg which contains rattling pellets. The leg is 4 centimeters long and 2 centimeters in diameter. It is perforated on one side and at the bottom with small round holes through which the clay pellets were probably inserted. The only other examples of objects containing rattling clay pellets are 2 modeled clay heads, or "adornos," which will be described in a following section.

CLASSIFICATION OF THE ASPECTS OF PAINTED AND INCISED ORNAMENTATION, BASED PRIMARILY UPON SHERDS.—All pottery of the Crab Level stands in sharp contrast to pottery of the Shell Level because of the quality of the ware.* Crab Level pottery is, as a whole,

* A few sherds of Crab Level type as well as some from the Shell Level have been examined by Anna O. Shepard of the Laboratory of Anthropology. Her descriptions and comments referring to Crab Level types are as follows:

"Two of the specimens examined contained numerous calcareous tests. One of these (F-11 1.75) has a homogeneous, extremely fine textured, calcareous paste. Mineral inclusions, principally quartz and feldspar, are fine and sparse. The organic remains are mostly fragmentary but they appear to have been principally foraminifera, a species of *Rotalia* being abundant and *Tetularia* less common. There are also larger fragments from the shell of some bivalve.

"The surface of F-11 1.75 (thin section 1419) is highly polished but when a section through the vessel wall is examined with a binocular microscope, magnification of 48 diameters, a distinct surface coat cannot be detected. The difference in color between surface and paste is only such as might result from difference in texture. The flaking of the surface noticeable on the interior just below the rim is unusual, however, for a polished paste and the thin section shows an exceedingly thin layer of a material similar to the paste in color when viewed in transmitted light but more brightly birefringent. The thin section was cut on a diagonal through the vessel wall instead of cross sectioning, therefore the thickness as measured from the thin section is greater than the actual thickness of the coat. This measurement, 0.016 mm., gives some idea of the extreme thinness of the surface film.

"D-3 1.00 (thin section 1420) (White paint on red) is sherd tempered. The fragments of sherd temper have a fine textured, dark red-brown paste. Mineral grains, principally quartz and feldspar are of the same grading and as abundant as the sherd fragments.

"D-3 1.00 (thin section 1421) (White paint on red) contains numerous angular to sub-angular grains of quartz, feldspar and green hornblende. A few irregular dark brown, nearly opaque fragments with inclusions of quartz may be potsherd but are too rare in occurrence to have been intentionally introduced as temper.

"As there are no two sherds in the lot with identical paste, the fact that the two white on red sherds differ from the others does not necessarily indicate foreign origin. The use of sherd temper does represent, however, a distinct ceramic technique, whereas the mineralogi-

thin, well fired, polished or rubbed to a smooth surface, and is composed of a fine-grained clay. Pottery of the Shell Level is coarse, thick, granular, and in many cases tends to crumble. Pottery of the Crab Level is hard, brittle and well knit. When struck it rings, in some cases like tile, in others like porcelain. Unquestionably a much more advanced technique in pottery manufacture and firing is shown in all forms of the Crab Level pottery. On the basis of color the ware falls into three groups: Plain Brown Ware, Red Painted Ware, and Red and White Painted Ware.

Plain Brown Ware: This type of ware forms the largest percentage of all sherds removed from the deposit. It might be considered as the service ware of everyday use. The color varies from a light reddish brown to a dark smoke-blackened brown. Of the 859 sherds retained for analysis 492 are of the plain unpainted brown variety, but these figures do not indicate the true proportion, since all sherds of the red and white painted type were conserved while only large rim fragments, lugs, and handles of the plain were taken. Thus plain ware forms a larger proportion of the pottery remains than is indicated in the collection.

Plain Ware is generally slipped with a very fine brown clay or, when all clay used in the construction was of the very fine kind, the surface was polished without the addition of the slip. Thus, the sherds which have relatively the same surface appearance actually represent two distinct techniques of manufacture; pottery composed of a coarse clay was treated with a thick slip of fine clay and polished, or pottery composed throughout of fine clay was polished without the addition of a slip. The firing process may change the composition of the surface of a vessel so that it appears to be slipped when actually no such technique was employed, but many sherds in the collection definitely indicate a slip since this has begun to disintegrate, leaving part of the sherd slipped and part unslipped. Broken sherds often show a black

cal differences in the paste of unslipped and red slipped sherds may result merely from minor local variations in materials. The percentage occurrence of the various pastes could be determined by examining a large number of sherds which would show whether the paste of the white on red sherds occurs in any types recognized as indigenous and also whether the white on red ware is uniform in paste.

"Although the tempering material in these sherds is of considerable interest, the style of decoration of the new ware is so distinctive it would seem to offer the most simple and convenient means of studying chronological and geographic distribution and thus determining whether this ware is intrusive, introduced, or of local origin.

"The technique of decoration of the white on red ware seems unusual. The white paint was in part painted directly on the highly polished surface of the paste and on one of the sherds examined only lines and smaller areas were applied on the red, which therefore is hardly a slip in the ordinary sense of the word. If entire vessels or larger fragments are available for examination a study of the layout of the design should be of particular interest."

interior and brown surfaces, but more commonly the composition is of a brown or bay-colored clay which varies in shade.

All pottery shapes which have been distinguished, with the exception of the discus-shaped bowl, are represented in Plain Ware, but wide, flaring-rimmed bowls of shapes A and B are unquestionably the most numerous.

Class a. Incised designs applied before firing are found on only 7 sherds of the Plain Ware. In every case they are found on the inside of what are apparently shallow bowl forms. There are 6 of the sherds which show a simple pattern of concentric circles in most cases engraved about the flat bottom of the bowl. The seventh has a design composed of a series of parallel straight lines. The incisions are all deep, smooth and regular. As will be seen, incised designs appear on Painted Ware as well as on Plain Ware, but are as a whole very unusual.

Class b. Incised designs applied after firing are found on 11 sherds of the Plain Ware. Designs of this kind are all of the same type and appear in every case in a panel on the inside of the rim of bowls. The deep incised parallel lines marking the panel enclose a solid field of fine cross-hatchings which have the appearance of a small meshed net. Panels of cross-hatching may be double or arranged in long rectangles, but always are restricted to a rim border. The technique of incising after the pottery has been fired is peculiar to the Crab Level and is limited to cross-hatch designs at the rim.

Red Painted Ware: Pottery which has been treated with red paint is of the same general composition as Plain Brown Ware. That is, it is simply slipped and polished Brown Ware to which red paint has been applied. In no case has red paint been applied to both the inside and the outside of the same vessel. It is clearly a paint and not a slip since the majority of sherds show both the brown slip and the superimposed red paint. Painted surfaces are generally a bright red which is burnished until it shines. It contrasts clearly with the Red Ware of the Shell Level, which is a dull pinkish red applied as a clay slip.

Red Painted sherds have been divided into three groups; those showing paint on the rim or lip only, those showing paint on one side entire, and those which indicate a simple pattern in red paint outlined by incisions. Obviously such a classification is subject to error since a sherd classed as painted on the rim only may be a fragment of a vessel which was ornamented with a painted design. However, since only large rim fragments as a rule were retained, and since complete vessels of the various types were found, the classification has some point and will suffice as a basis of description.

Class a. Sherds indicating paint on the rim or lip only are numerous, and are predominantly fragments of bowls with a thick rim, or a rim which is at right angles to the wall. On sherds of this kind the paint appears only in a narrow band along the lip. Thus the edge of the sherd alone is red and the rest of the surface is the polished brown. There are a few sherds of wide, flaring-rimmed bowls which show paint applied in a wide band along the inside on the curve of the flaring rim. Many red-painted sherds suggest that they are fragments of shape G, the oval bowl with right-angle rim, but no definite association can be made. Of the 165 sherds of Red Painted Ware, 68 show paint on the rim only.

Class b. Sherds painted on only one side have been grouped together as representing vessels which were treated with red paint on the inside or the outside. As has been observed above, the classification is subject to error since a fragment does not determine the treatment of the whole, but numerous large sherds which extend from lip to base of vessels indicate that complete bowls were ornamented in this manner. Sherds painted on one side, numbering 78, are slightly more numerous than those painted on rim alone. The majority appear to be fragments of flaring-rimmed bowls of shapes A and B, while a few are bowl forms with an incurving rim, and others are of indeterminate shapes. A distinctive feature is that red paint is in no case applied to both the inside and outside surfaces of the same vessel.

Class c. Sherds bearing simple designs in red paint outlined by incisions are, apparently, fragments of shallow bowl shapes, and the designs are in all cases on the interior of the vessel. The most common design of this kind is a red disc which was applied at the bottom of the bowl (FIGURE 7-2). The flat bottom has been outlined by a deep incised circle which is filled in with red paint. There is one V-shaped figure on the inner wall outlined by incisions and filled in with red. Another figure resembles the letter G. Two of these figures appear back to back on a fragment, and are painted and incised (FIGURE 7-1). The other designs of this type are fragmentary and the elements are not clear, but in all cases painting and incising appear together, and circles or curvilinear designs are paramount. Sherds of this type are the least common of the Red Painted Ware group, numbering 19.

Red and White Painted Ware: The most striking feature of Crab Level pottery is the use of red and white paint in the formation of numerous and complicated designs. Some 7 bowls which are nearly complete and 202 sherds, many of which are large fragments of bowls, comprise the collection of Red and White Painted Ware. From these

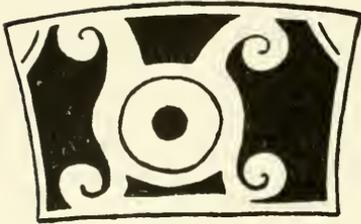
it can be seen that certain characteristic traits hold for all pottery ornamented in this manner. Designs are in all cases restricted to the outer surface, while the inner surface remains the polished brown color common to all pottery of the Crab Level. In many cases the painted design is limited to an upper or lower section of the outer surface, and it is clear that this type of ware is again the Plain Brown Ware with its slip and polish to which the red and white painted designs have been added. All designs are executed in white paint on a red background, that is, in all cases white paint is applied over red paint, and the red is applied over a polished or slipped brown surface.

Another characteristic of this type of ware is the presence of negative designs. On all sherds which are large enough to carry a recognizable design, part or all of the design elements are in the negative red outlined by white paint. In some cases design elements are in white paint and therefore positive, as the white is always the last to be applied, but they are in turn always associated with elements in red which naturally are in the negative. It is difficult to determine from small sherds and fragmentary designs whether the elements in their complete form are negative or positive, but it is clear from large sherds that negative designs in red predominate (FIGURE 6).

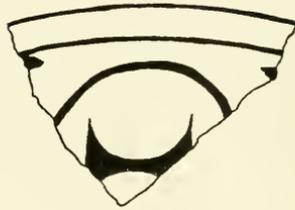
A thick bright red paint has been used which has been polished to a glossy surface. It rarely shows disintegration in any way and remains surprisingly vivid. The white paint on many sherds is thick, polished, and very slightly disintegrated, but on others it has cracked away and partly disappeared so that spots of red paint show through the white.

The Red and White Painted Ware has been divided into four groups on the basis of the technique of ornamentation: (a) sherds with two color designs, (b) those with two color designs with white inlaid in an incised pattern, (c) those with three color designs, a small group in which the polished brown surface has been left to form an element in the design, and (d) an aberrant group of four sherds on which new colors are used to form a three color design.

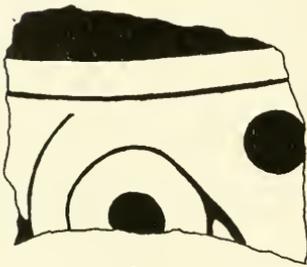
Class a. (PLATE 3) Sherds ornamented with two color designs far outnumber the other three classes since 161 of the 202 sherds are of this type. The designs are all geometric and are composed of scrolls, circles, dots, and various other geometric figures as well as straight and curving lines or bands. A general characteristic which can be determined from the complete bowls and the large sherds is the use of decorative panels or distinct fields of ornamentation. In no case does a single pattern or design element extend completely around the vessel. These panels are apparently rectangular sections which en-



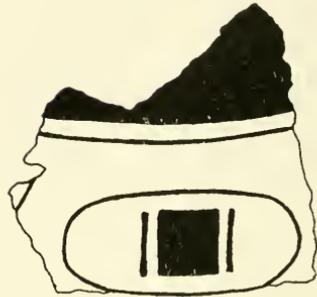
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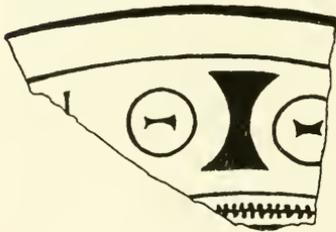
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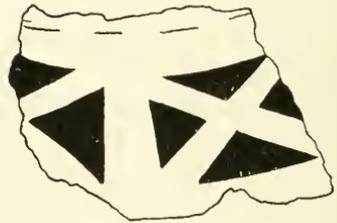
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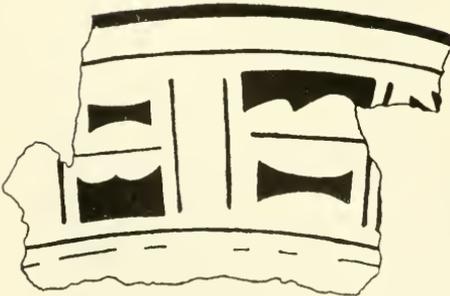
6



3



7



4



8

FIGURE 6. Crab Level red and white painted designs.

close a single design unit. A common design unit of this kind is a spool-shaped figure in negative red in a field of white which is in turn outlined by a rectangle formed by a negative red line (FIGURE 6-4). Another unit of this type is a circle with four tangential scrolls in white on a red field again forming a rectangular panel (FIGURE 6-1).

Since the possibility of distinguishing complete patterns or design units on a collection of sherds is very limited and subject to so much error, no attempt will be made to base the description on designs as a whole. After the passing remarks concerning the use of the panel, it seems best to break the designs up into common elements and describe them on that basis.

Linear elements are present on all sherds. If the sherds were grouped according to the dominant design element the majority would fall into a "linear group," which is probably quite natural in dealing with a large number of small sherds. Certainly straight and parallel lines go to make up a large part of every pattern. Broad parallel bands and lines are commonly found circling the edge of rim fragments. Straight horizontal and vertical lines in red and white regularly separate the design panels.

Curvilinear elements are present on the 44 sherds which are the large fragments. Practically all large sherds carry a curvilinear element in some form. There are four main curvilinear forms: scrolls, circles, dots, and elliptical figures. They appear in negative red or in white. Thirteen scrolls appear on the sherds and fourteen on the partially complete vessels. Many are apparently tangent to circles, and not uncommonly they are connected, forming a double scroll unit. Circles are present on 12 sherds and it is probable that many of the curved lines on broken sherds are segments of circles. Circles appear regularly in negative red, and at times enclose another figure or a dot. Dots are distinguished clearly on only 7 sherds and are usually enclosed by circles or lines forming part of a design. Elliptical figures in red and white are distinct on only 4 sherds, but again curved lines on fragments probably indicate figures of this kind (FIGURE 6).

A spool-shaped figure in negative red is the most common and distinctive single element on all Red and White Painted pottery. It is usually the central figure in a panel, and may be horizontal or vertical. It is often enclosed by a circle or rectangle. There are 34 examples of this spool shape present on the sherds, and in all cases it is a distinct element created purposely and not the result of a design pattern.

A series of crosses formed by white lines on a red field appear on the fragment on an annular base. This element is unique in the Canas material, but appears again on an annular base found at Monserrate (FIGURE 6-7).

Rectangles and squares of solid color or in outline in red and white are common, and as has been mentioned, generally form the boundaries of design panels.

Conventionalized zoomorphic faces composed of geometric elements are present on 3 large sherds (FIGURE 6-3). Faces of this kind are represented in a triangular panel. Eyes appear as red dots or as red rings enclosing a horizontal spool-shaped figure representing the pupil. The nose of each face is a vertical spool-shaped element, and the mouth is a long rectangular element in which teeth are represented by two rows of white dots. Thus both negative red and positive white elements make up the figure. These are the only examples of realistic representation of any kind, and are entirely made up of geometric elements.

Class b. Two color designs with white inlaid in an incised pattern are present on 23 sherds and on 1 complete pot (shape J discussed, small-mouthed bowl). Pottery of this kind has been incised with deep regular grooves which have been filled with white paint, forming a pattern on a red background (FIGURE 7-3, 4). In a few cases a triangular or rectangular area in the design confined by incised lines has been entirely filled in with white paint, but ordinarily the white is limited to the grooves. Spiral and scroll designs are apparently the most common. Four tight spiral figures remain partially intact on the sherds. Two of these have as many as six turns forming the spiral or spring-like figure. One sherd carries a design formed by two interlocking scrolls. The complete pot is decorated with a panel about the rim which is composed of a flat scroll design extending completely around the mouth. A section of this design looks like a series of horizontal parallel lines, but as a unit it is seen as a complicated scroll figure. It is probable that many of the sherds which contain a series of parallel lines are fragments of such a design.

Most of the sherds of this group are small and the designs cannot be distinguished, but it is clear that straight and curving lines, spirals and scrolls make up the majority of the patterns.

Class c. Three color designs in red, white, and brown slip appear on only 14 small sherds (FIGURE 7-5). A variant of the customary technique is seen in the use of the basic slip color to form an element in the design. The sherds are so small that no complete designs can be

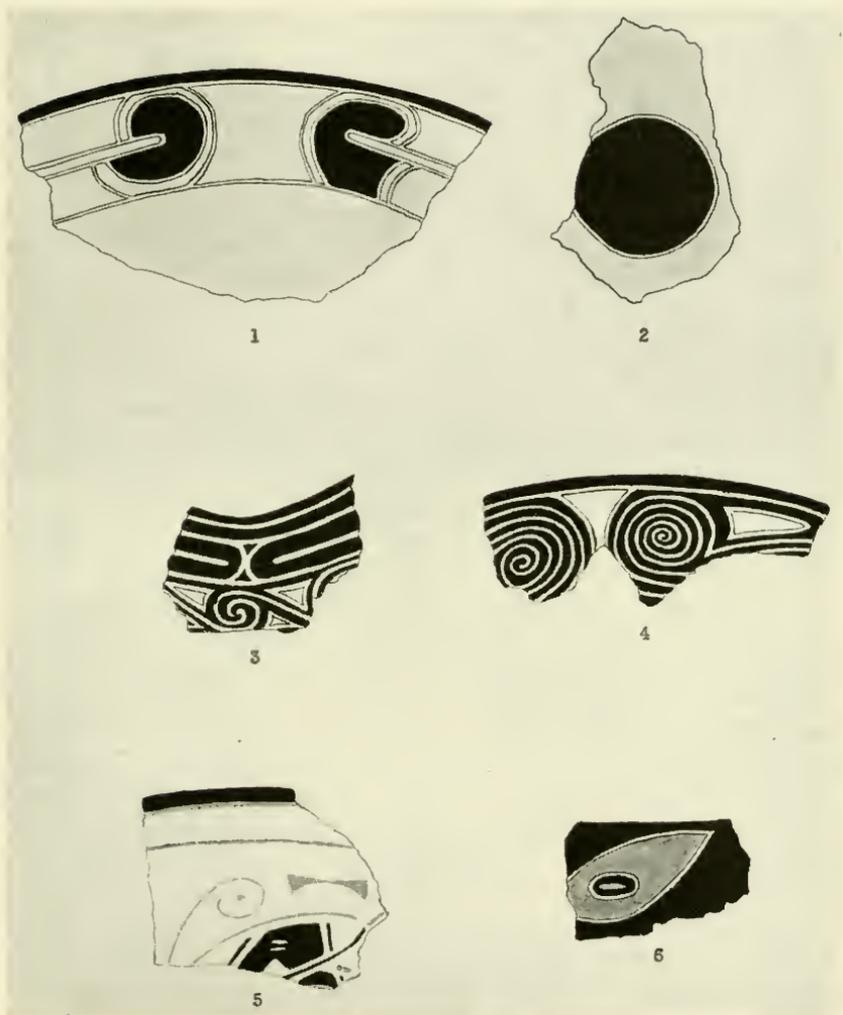


FIGURE 7. Crab Level painted sherds. 1. Red Painted Ware, class c. Red painted design outlined by incisions. G. figures. 2. Red Painted Ware, class c. Red painted design outlined by incisions. Red disc figure. 3. Red and White Painted Ware, class b. White paint inlaid in an incised pattern. Locked scroll figures. 4. Red and White Painted Ware, class b. White inlaid in an incised pattern. Spiral figures. 5. Red and White Painted Ware, class c. Three color design with the brown slip exposed to form the third color element. Spool figure and scroll enclosing a dot. 6. Red and White Painted Ware, class d. Miscellaneous sherds. Salmon-colored paint used with red and white to form an eye figure.

determined, and even the elements of design are fragmentary. It is clear, however, that designs as a whole were laid in red paint over the brown polished slip and then outlined by lines or bands of white paint. Both straight and curved lines are present. One sherd of this type bears the spool-shaped figure in negative brown slip outlined by a field of white paint. On the same sherd appears a scroll figure enclosing a dot, both in negative brown slip in a field of white. The rest of the design is in red and white. A wavy line in white paint which is the only example of such an element on any of the sherds appears on one of these three color fragments.

Class d. Four sherds form an aberrant group which might be included with the three-color-design group except that new and rare colors are employed. On 2 of these sherds black paint is used with red and white to make up the design. Apparently red was applied to the slip, black over the red, and white over the black, all three colors being exposed in certain areas to make up the pattern. Circles and spool-shaped figures are present. The other 2 sherds carry red, white, and salmon colors on a brown slip, but only the red, white, and salmon form the design. A peculiar figure is executed on these 2 sherds. It resembles a long, slanted eye in salmon color on a red field, the salmon and red being separated by a white line. The pupil of the eye is red outlined by white on the salmon-colored field (FIGURE 7-6).

Summary of Red and White Painted Ware: A synthesis of the characteristics of red and white painted ware may be given as follows: geometric designs in red and white are applied at all times to the outer surface of vessels; the painted designs are in all cases applied over a brown polished slip and may cover part or all of the outer surface; white is at all times applied over the red; designs are in negative red or positive white, or both; designs commonly appear in units segregated in panels; the elements of ornamentation are spirals, scrolls (double and interlocked), circles, dots, straight, and curving lines; the most outstanding single element or unit is a spool-shaped figure in negative red; in the incised patterns included with this group, white is inlaid in the incisions; three-color designs are present with the basic slip color forming the third element.

So far as can be determined, there were examples of pottery decorated with red and white paint of each shape distinguished, but sherds indicate that the majority of red and white painted vessels were wide flaring-mouthed bowls similar to shapes A and B. Bowls with handles are represented by only 5 sherds. Bowls with annular bases treated with red and white paint are indicated by 7 fragments.

CLASSIFICATION OF HANDLES AND LUGS BASED UPON SHERDS (PLATE 4).—Pottery fragments which are easily distinguishable, and which form a definite class of objects, are the handles and lugs broken from various vessels the shapes of which, as a rule, cannot adequately be determined. As was observed above, handles and lugs of the Crab Level are fragments of many undetermined vessels, and unlike handles and lugs of the Shell Level, which regularly can be identified as fragments of definite boat-shaped bowls, they are not used to designate recognizable shapes. Fragments of this type have been arranged in five groups: (a) D-shaped handles, (b) rectangular lugs, (c) semi-lunar lugs, (d) perforated knobs on vessel walls, and (e) modeled head lugs. When possible these fragments are correlated with known pottery shapes.

D-shaped handles: All true handles of the Crab Level pottery are characterized by the outline which forms a D against the vessel wall. They are all broad bands or ribbons of clay attached to the wall, and do not extend over the lip. The D-shape and the application to the wall, which does not allow for an extension over the lip, sharply distinguish all handles of the Crab Level from those of the Shell Level which regularly form a flat loop extending above the rim. Crab Level handles are further distinguished by being thicker and heavier. The edges are rounded off and smoothed down. The handles fall into four sub-classes.

In the first class are grouped the simple D-shapes which are vertical on the vessels and not distinguished by added modeled forms. Handles of this class were applied on the wall extending from the lip downward, or less commonly on the body of the vessel below the rim. The second class of D handles is distinguished from the first by the presence of a low round knob at the top of the handle. This knob, or button, which is found on a large number of D handles at Canas as well as at all the other sites, is a distinct trait of Crab Level pottery. The purpose of this knob has not been determined. It can hardly be termed a decorative element and yet it apparently has no serviceable function. Of the 108 complete and fragmentary handles in the Crab Level deposit at Canas, 68 are complete enough to be recognizable without question, and of these 34 are of the second class with the knob or button. The third class are D handles which are applied vertically from the rim down and are topped by a semi-lunar, lug-like appendage. In other words, a semi-lunar flange or ridge is added to the handle where it joins the rim of the vessel. Only 8 examples of this class were found. The fourth class is limited to 4 examples. These are D-shaped but are applied horizontally near the rim.

A correlation of these four classes of handles with definite bowl types is not possible. From complete specimens we know that handles of the second class are found on shape C, and handles of the first class are found on shapes D and E. A good many of the separate handles suggest these shapes, but it is also true that other forms are indicated. It is certain that all D-shaped handles were applied to round vessels of some sort and never to oval or boat-shaped vessels.

Rectangular lugs: Lugs formed by an extension of the rim to produce a rectangular flange are present in the Crab Level as they are in the Shell Level. The smallest of these is 5 centimeters long and 2 centimeters high. The largest is 9 centimeters long and 3 centimeters high. In no case does the lug form a sharp right angle with the rim, but always joins it in a more or less gradual curve. In some cases the corners of the lug are drawn up so that the upper edge is concave. Only 10 of these rectangular lugs were found, of which 7 are Red Painted Ware, with the paint limited to the rim and lug. A rectangular lug is attached to the complete bowl, shape G, which is oval in shape. Several of the separate lugs suggest oval forms of some kind, while others are evidently fragments of round bowl forms.

Semi-lunar lugs: There are 6 sherds which are fragments of shallow round bowl forms with semi-lunar-shaped lugs. Four of these lugs are perforated, apparently for the suspension of the bowls. Lugs of this type actually vary little from rectangular lugs since they are drawn out from the lip in the same manner and simply have a convex upper edge instead of a straight or slightly concave edge.

Perforated knobs on vessel walls: Like the curious knobs on D-shaped handles, perforated knobs on the vessel walls are a distinctive trait of Crab Level pottery. The low round buttons or knobs are the same as those on the handles except that they are transversely perforated at the base. A knob of this kind is found on one complete vessel, shape A, which is a deep bowl with a wide flaring rim and a line or ridge about the equator where the wall turns abruptly upward before flaring out to the lip. The knob was applied to this line or ridge. All the 24 sherds which bear this type of perforated knob are apparently fragments of Shape A bowls, and the knob in all cases was applied on or near the encircling ridge. It is probable that vessels of this kind were suspended by means of the perforated knob, but it is curious that on the complete vessel only one knob is present, which suggests that vessels were hung up by means of this perforation when not in use.

Modeled head lugs: "Adornos," or modeled figures, on pottery of the Crab Level are represented by 23 fragments of vessels. All but two are attached to the rim. One of the 2 exceptions is modeled on the vessel wall about 2 centimeters below the lip and the other appears on a D-shaped handle. There are 6 attached to the rim where the rim is joined by a handle but the rest are not associated with handles. As far as can be determined, the 21 adornos attached to the rim face the interior of the vessel.

None of the modeled heads found in the Crab Level resemble any of the heads found in the Shell Level. Although Crab Level heads are zoomorphic representations of some sort, none resembles the familiar bat-heads and only two might be termed human representations. All Crab Level heads are more carefully formed and polished. There are 8 ornamented with red and white paint, 7 are painted red, and 8 are of Brown Polished Ware. As a whole, Crab Level heads are distinguished from Shell Level heads by the technique of the formation of the features. On the former, features are more carefully modeled and emphasized by deep incised lines. On the latter, features such as eyes, mouth, and nose were apparently often applied to the figure separately, and are rough and irregular.

A distinctive trait of the majority of the Crab Level heads is the bulging or protruding perforated eye which is emphasized by a deep incised line about the base. Knobs, bumps, or buttons regularly appear on all heads as features or added adornments. All these buttons are rubbed smooth. Many represent mouths which, like the eyes, are emphasized by encircling incised lines. The modeled heads have been divided into four groups, three of which represent distinctive types. The fourth group is composed of various unique forms which do not readily fall into any classification.

Type a. Semi-spherical heads. The features face the interior of the vessel and the back of the head has been pushed in to form a cup-shaped hollow. Hollow semi-spherical heads of this kind, although limited to 5 specimens, indicate a unique technique of modeling. One of these heads probably represents a human being with perforated ears, a well-formed nose, and eyes and mouth shaped like a coffee bean. The other 4 are indistinguishable, but all have the characteristic bulging eyes.

Type b. A flat semi-lunar form upon which is modeled in relief a long straight nose flanked by two protruding eyes. On one of these, the nose-like ridge has been drawn up to form a loop. Heads of this kind might be described as semi-lunar lugs upon which nose ridge

and eyes have been added. One head of this type was found on a large fragment of a round shallow bowl red-painted about the rim. The others are fragments of undetermined vessel shapes and are of Brown Polished Ware.

Type e. Hollow spherical heads which contain rattling pellets. Only 2 such heads were found. Both are perforated at the back which suggests that the pellets were inserted through this hole after the formation of the head. Both these heads are white painted, and both have the characteristic bulging eyes and mouth. One appears to be a combination bird-human being with the nose developing into a crest over the top of the head.

Of the various heads which do not fall into the three groups described above, 3 probably represent the manati. The only features are bulging eyes and a slit-like mouth, but the shape is that of a manati head with its blunt snout. Another quite clearly represents a turtle's head and neck. A fifth head suggests a crab with great protruding eyes, but it is further complicated by a row of triangular incisions alternating red and white. Another unique specimen of this group probably represents a human head with perforated ears, well-formed nose, puffed cheeks and coffee-bean eyes and mouth. Of this group, five are red and white painted, three are red painted, and four are Plain Brown Ware. The trait common to all is the bulging perforated eye outlined by deep incision.

A correlation of modeled head lugs with definite bowl shapes is impossible. It can be determined, however, that the heads were attached to some form of round open bowl, and to bowls with D-shaped handles. No complete vessels with modeled head lugs were found.

ASSOCIATED ARTIFACTS OF THE CRAB LEVEL

SHELL ARTIFACTS.—Celts, hoes and chisels which are abundant in the Shell Level are entirely lacking in the Crab Level. Shell artifacts of any kind are noticeably rare, and of those found, the majority are individual. A group of eight objects has been set aside as problematic, and although each has a distinct shape and size, all have a common origin in the *Cassia tuberosa* shell lip. They are elongate in form and well rubbed or polished. Rarely is any remnant of the shell surface left. They are not pointed or sharpened in any way, and none has a flat, smooth surface. None of the shapes suggests a use or function, but all are unquestionably manufactured by hand. It is possible that they represent tools in the process of manufacture, but if so, one should expect to find at least fragments of the finished tools. As a whole

these problematic objects are distinct from the problematic objects of the Shell Level in that they are much smaller and more thoroughly rubbed. They vary in length from 5 to 10 centimeters and in width from $1\frac{1}{2}$ to 3 centimeters.

A shell cup found in the deposit is a *Cassis tuberosa* shell, the interior coils of which have been cut away. The vessel is not well finished since the cut edges remain rough and jagged and the original surface of the shell remains. The lip of the shell forms the lip of the cup, and the point of the shell forms a sort of rough spout.

A spoon made of a *Cypraea* (Cowry) shell is another unique object. The shell has been cut away in such a manner as to leave an implement with well-polished edges which resembles the head of a deep spoon with a square tip. The object is 5 centimeters wide and 6 centimeters long. Spoon shapes of this kind are found in all the other sites associated with Crab Level material, and although the total number is small it seems likely that this shell spoon is characteristic of the Crab Level.

Two of the olivia shell rattles, common to the whole region, were found in the Crab Level at Canas. They are made by cutting the shell in two transversely and then rubbing through a hole for perforation on the side of the shell at the uncut end.

Two flat polished shell objects probably are ornaments or amulets in the process of manufacture. One is an oval shape 8 centimeters in length with well-polished surfaces and well-rounded edges. The other is rectangular and also well polished. It is 3 by 5 centimeters.

A shell cylinder 5 centimeters long and 1 centimeter in diameter appears to be a bead in the making, since a longitudinal perforation has been begun at one end.

A curious shell object found in the Crab Level looks very much like a cleat for fastening a line. The object rests on a flat rectangular base and has prongs at each end which extend up and outward. It is horizontally perforated at the base of each prong, and apparently was bound against a flat surface. The object is 6 centimeters long on the base and the prongs extend upward 2 centimeters. It is very well polished and regularly formed. An object of the same kind was found at Barrio Coto.

STONE IMPLEMENTS.—No petaloid stone celts were found in the Crab Level at Canas. The typical stone implement in this level is a rectangular adze-like celt with one flat surface and one convex surface. There were nine celts of this type obtained. In cross-section it would appear as a half moon. The bit is sharp and semi-circular. The celts

are made with remarkable precision, and the sharp edges of the flat side are as straight as if made on a plane table. Contrasting with the petaloid celts of the Shell Level, these rectangular adze-like celts become one of the most distinctive characteristics of the Crab Level.

Two of the celts found are variants of this type with two flat surfaces instead of one. On these the bit is bevelled and straight rather than semi-circular.

Most of these rectangular celts have been broken so that the exact shape of the poll is questionable, but the complete examples are either rounded or straight on the butt. No marks of hafting can be seen. One of the celts is of a fine-grained, green stone, while all the rest are of a black fine-grained stone. All are remarkably well polished, and the regularity of their manufacture places them among the finest examples of polished stone implements found in the West Indies.

There are 4 fragments of celts which lack the flat surface. These 4 fragments are of chert which is patinated so that the objects appear to be covered with a white paint. The complete shapes cannot be determined, but they are distinct from the rectangular celts, lacking the flat surface. The bits are curvilinear.

Fragments of polished stone, which were found, may be tools in process of manufacture or else rubbing and polishing stones. They are broken so that the original form is questionable. One has a roughly formed, gouge-like bit.

One discoidal stone has evidently been worked down for some purpose. Numerous elongate stones with blunt points may represent some form of tool but none shows marks of use and it is possible that they are only water-worn pebbles which have been used for rubbing and polishing.

A few fragments of flint in the form of chips or flakes were found, but there are no signs of secondary chipping, and if the flint flakes were utilized it could have been only as rude scrapers.

BONE IMPLEMENTS.—The only object of bone identified as a tool is a fragment of a manati rib which has been worked to a blunt point. The object is probably part of one of the manati rib picks. There are four more manati rib segments which have been rubbed down and charred in the fire. It is possible that they are also sections of picks.

A thick, heavy piece of turtle shell has, roughly, the form of a large, stemmed spear head. It has obviously been rubbed down for some purpose but its use is questionable. It is 14 centimeters long and 6 centimeters wide at the shoulders. A small, rectangular piece of turtle shell also shows rubbing and polishing. The edges are ground

smooth and regular, and one surface is polished. It has evidently been broken away from a larger section.

OUTLINE OF POTTERY TYPES AND TRAITS.—The following outline summarizes the Crab Level pottery types and the traits which particularly characterize the Crab Level material.

Classification of shapes based upon complete or partially complete vessels.

- Shape A. Round, open bowl with wide flaring rim and perforated knob at ridge about circumference.
- Shape B. Round, open bowl with wide flaring rim.
- Shape C. Round, flat-bottomed cooking bowl, wide vertical rim and D-shaped handles.
- Shape D. Round, flat-bottomed cooking bowl with flaring rim and D-shaped handles.
- Shape E. Large, heavy jar with restricted neck and D-shaped handle.
- Shape F. Round bowl with high annular base.
- Shape G. Oval bowl with right-angle rim and rectangular lugs.
- Shape H. Round, shallow bowl with walls curving in at rim.
- Shape I. Round bowl with vertical rim and collar.
- Shape J. Discus-shaped, small-mouthed bowl.
- Shape K. Griddles.
- Shape L. Unidentified vessel with hollow legs containing rattling clay pellets.

Classification of the aspects of painted and incised ornamentation based primarily upon sherds.

Plain Brown Ware.....	(No. of sherds)	492
a. Incised designs.....	7	
b. Incised designs applied after firing.....	11	
Red Painted Ware.....	(No. of sherds)	165
a. On rim or lip only.....	68	
b. On one side.....	78	
c. In simple pattern outlined by incisions.....	19	
Red and White Painted Ware.....	(No. of sherds)	202
a. Two color designs.....	161	
b. Two color designs with white inlaid in an incised pattern.....	23	
c. Three color designs.....	14	
d. Miscellaneous.....	4	
Total Number of sherds.....		859

Classification of handles and lugs based upon sherds.

D-shaped handles.....	(No. of sherds)	108
1st class.....	23	
2nd class.....	34	
3rd class.....	8	
4th class.....	3	
Rectangular lugs.....	(No. of sherds)	10
Semi-lunar lugs.....	(No. of sherds)	6
Perforated knobs on vessel walls.....		24
Modeled head lugs.....		23

Type a—hollow semi-spherical	5
Type b—semi-lunar	3
Type c—hollow, spherical, with pellets	2

Complex of Traits Characterizing the Crab Level Material

1. Deposition in yellow soil and disintegrated land crab shells below the normal shell heap.
2. An advanced technique in pottery manufacture with the bulk of the pottery slipped and polished, fine-grained, hard, thin, and regularly formed.
3. Red and white painted designs over a brown slip.
4. White paint at all times applied over red.
5. Negative designs.
6. White paint inlaid in an incised pattern.
7. Simple red painted designs outlined by incisions.
8. Incised cross-hatch designs applied after firing.
9. Round bowls with D-shaped handles.
10. Jars with restricted necks.
11. Oval bowls with rectangular lugs.
12. The great majority of vessels with a flaring rim.
13. Round bowls with high annular bases.
14. Zoomorphic "adornos" on rims and handles with bulging features emphasized by deep incised lines. "Adornos" commonly painted red and white.
15. Concave zoomorphic "adornos" on rims facing the interior of vessels.
16. Hollow zoomorphic "adornos" containing a rattling clay pellet.
17. Perforated knobs on vessel walls.
18. Low round knobs or buttons on D-shaped handles.
19. Rectangular adze-like stone celts with one side flat and the other convex.
20. Celts of chert with a white patination.

CONCLUSIONS

The preceding descriptions of Shell Level and Crab Level artifacts have been based on the material removed from each of two strata of deposition distinguished by different types of food refuse. A comparison of the artifacts deposited during the two periods of occupation represented by these strata is presented in the following tabulation.

POTTERY	SHELL LEVEL	CRAB LEVEL
Types of Ware	Crude Ware without slip, polish, or paint	Polished and slipped Brown Ware
	Thick, coarse-grained (predominating)	Hard, thin, fine-grained (predominating)
	Red Slipped Ware, pink to red (rare)	Red Painted Ware
		Paint applied over polished and slipped Brown Ware (abundant)
		Red and White Painted Ware
		Painted designs applied over polished and slipped Brown Ware (abundant)

POTTERY	SHELL LEVEL	CRAB LEVEL
Shapes	Boat-shaped bowls (predominating) Some round bowl forms Vessel rims vertical or incurving	Round bowl forms (predominating) Oval shapes rare, no boat-shapes Annular bases Vessel rims principally wide-flaring but occasionally straight and incurving.
Handles and Lugs	Flat loop handles extending over rim on boat-shaped vessels Rectangular lugs on rim of boat-shaped vessels Semi-lunar lugs on rim of boat-shaped vessels Ridge lugs on boat-shaped vessels Modeled head lugs on round and boat-shaped vessels	D-shaped handles on walls of round bowls never extending over rim Four distinct types Rectangular lugs on rim of oval and round bowls Semi-lunar lugs on round bowls Modeled head lugs on round bowls Perforated knobs on vessel walls
Elements of ornamentation	Modeled head lugs on vessel rims Rough zoomorphic figures principally representing bat and human heads in the round Modeled figures on loop handles Geometric figures in relief and small, crude bat and human heads Modeled figures on vessel walls Geometric and zoomorphic Incised decoration on the exterior of bowls in panels near rim Parallel lines terminating in punctures Painted decoration Six sherds with crude curvilinear figures in red on Crude Ware	Modeled head lugs on vessel rims Polished, painted, well formed Unknown zoomorphic beings Semi-lunar, semi-spherical, and spherical-hollow with pellets Modeled figures on D-shaped handles Large, painted Like those figures recorded above Incised curvilinear designs on the inside of shallow bowls (rare) Cross-hatch incised designs applied after firing Red painted designs outlined by incisions Bowls with red painted lip Bowls red painted on one side Red and White Painted Ware Two color designs Two color designs with white inlaid in incisions Three color designs
Associated Artifacts	Chisels Hoes	
Shell Objects	Celts Problematic Implements Discs Ornaments Three-pointed "zemi"	Problematic Implements One spoon One cup Two rattles One cleat-like object

POTTERY	SHELL LEVEL	CRAB LEVEL
Stone	Petaloid celts	Rectangular adze-like celts
Objects	Tubular beads	White patinated celts of chert, shape uncertain
	Hammers and rubbing stones	Rubbing stones
	Small carved zoomorphic figures	
	Three-pointed "zemi"	
Bone	Worked manati ribs	Worked manati ribs
	Small tubes	
	Awls and needles	
	Carved figures	

All pottery found in the Crab Level deposit is easily distinguished from that found in the Shell Level because of the type of ware, and indicates a much more advanced technique of modeling and firing. The only identifiable shape common to both levels is the clay griddle, and this is found throughout the West Indies and northern South America. Rectangular and semi-lunar lugs appear on sherds from both levels, but so far as can be determined were applied to vessels of different shape. Modeled head lugs were found in both levels but distinct types were limited to each level, and there is a marked difference between all such figures found in the Shell Level and those found in the Crab Level. Incised ornamentation is found on sherds from both levels but the types of incision are distinct, and a new technique of incising appears in the Crab Level which has been termed incising after firing. Painted designs are limited to the Crab Level pottery, except for crude curvilinear designs painted on six sherds found in the Shell Level. Shell chisels, celts, hoes, discs and ornaments were found only in the Shell Level. Petaloid stone celts, tubular beads, carved figures and zemis were limited to the Shell Level, while rectangular adze-like stone celts, and white patinated chert celts were found only in the Crab Level.

Such distinctions between the artifacts found in the two strata of occupation unquestionably indicate that the site was occupied during the late period by a people with a material culture distinct from that of those who settled there in the early period. The conditions of the deposit and the distinctive traits are such that an immigration of an alien people may be inferred, and quite definitely no cultural fusion took place, since traits characterizing the early culture were not taken over by the late. The fact that traits were not adopted suggests that some time elapsed between the two periods of occupation. If an immigrating group had come in contact with an early population either in a friendly or a hostile relation, it is probable that some elements, at least, of the early ceramic complex would have been taken

over as units or combined with the ceramic complex of the new group. The fact that types of ware, vessel shapes excepting the griddle, and elements of ornamentation are all distinctive in each stratum precludes the possibility of adoption or combination. Furthermore, the abrupt change in the type of food refuse substantiates the inference that some time elapsed before the arrival of the immigrating group, since direct contact would undoubtedly result in a carry-over of the food complex, at least for a certain time, before giving way to a gradual change.

An analysis of the collections has led to the following conclusions; Canas was occupied at an early period by a group of people with a material culture which, judging from the pottery remains, was surprisingly advanced in comparison to the material culture represented by remains found throughout the Greater Antilles. These people disappeared, and were followed after some lapse of time by an immigrating group with a ceramic complex less well developed but with a technique of stone carving more advanced, if it is justifiable to judge from a few examples of small carved stone figures. The complex of traits characterizing this late culture is in detail distinct from that of the early culture, but a basic similarity exists, which suggests a common place of origin or a common source of diffusion.

Evidence of a common prototype is indicated in such general similarities as: the application of modeled zoomorphic figures on the rims of vessels; clay griddles or burens; rectangular and semi-lunar lugs; the relation between oval and boat-shaped vessels; polished stone implements and the absence of chipped flint tools; and the relation between flat loop and D-shaped handles. These basic elements are found throughout the West Indies and in northern South America. Future work may lead to the discovery of the diffusion center for the two cultures represented in the Canas deposit, since it is obvious that the late culture did not develop directly from the early culture.

The presence of remarkably well made pottery decorated with designs in red and white, in the early period deposit, was the most striking element encountered. It is so markedly distinct from the pottery in collections from Porto Rico that its discovery came as a complete surprise. Stray sherds have been found in southwestern Porto Rico from time to time, but have remained a puzzle since the composition did not in any way correspond with the general ceramic development represented by the more or less crude forms of pottery found scattered over a large part of the island. Its deposition in a

sub-stratum explains its rarity in collections. As a description of the following excavations will show, this painted pottery is not restricted to southwestern Porto Rico and in all cases appears in stratification as a deposit of an early period. It becomes the easily recognized criterion of the early culture.

Excavations in Barrio Coto

Coto is a barrio of the municipality of Isabela which lies between the city of Isabela and the mouth of the Guajataca river on the northwest coast of Porto Rico. This section of the island is a plateau-like area, dotted with low rolling hills, which drops suddenly to the shore of the ocean in sheer rocky cliffs. Rainfall is abundant and the land is fertile though rough and rocky in many sections. At the present time most of the barrio is under cultivation. It is divided into small plots, and farmed by individual families who raise various food products for sale and for their own consumption. Large cane plantations are rare in this region due to the rolling terrain.

Four kilometers west of the mouth of the Guajataca river and two kilometers from the shore is a valley surrounded by low hills. The floor of this valley is very fertile and is now almost entirely under cultivation. Near the center of the valley is a low hill approximately one-half kilometer in diameter, over the surface of which are scattered numerous shells, potsherds, and broken implements. The shells are primarily terrestrial gastropods although various marine shells also are found. Collectors of relics have gathered numerous prehistoric artifacts from the fields which extend over a large part of this low hill, and have made various minor excavations on the west side which at present is pasture land.

No mounds appear on the site and there are no pits, earth works, or other indications of dwelling sites.

Excavation of the site was undertaken by cutting a series of trenches through the deposit on the western side of the hill (FIGURE 8). All trenches were divided into sections four by four meters and each section was given a key letter and number. All material was removed in 25 centimeter levels, and the artifacts from each section and level were packed in bags as a unit. Unfortunately the deposit had been much disturbed throughout. The numerous pits dug by collectors spread across the side of the hill, and many had been filled in and grown over so that the disturbance could not be detected until cut by the trenches. Furthermore, the slope of the hill was such that considerable erosion had taken place.

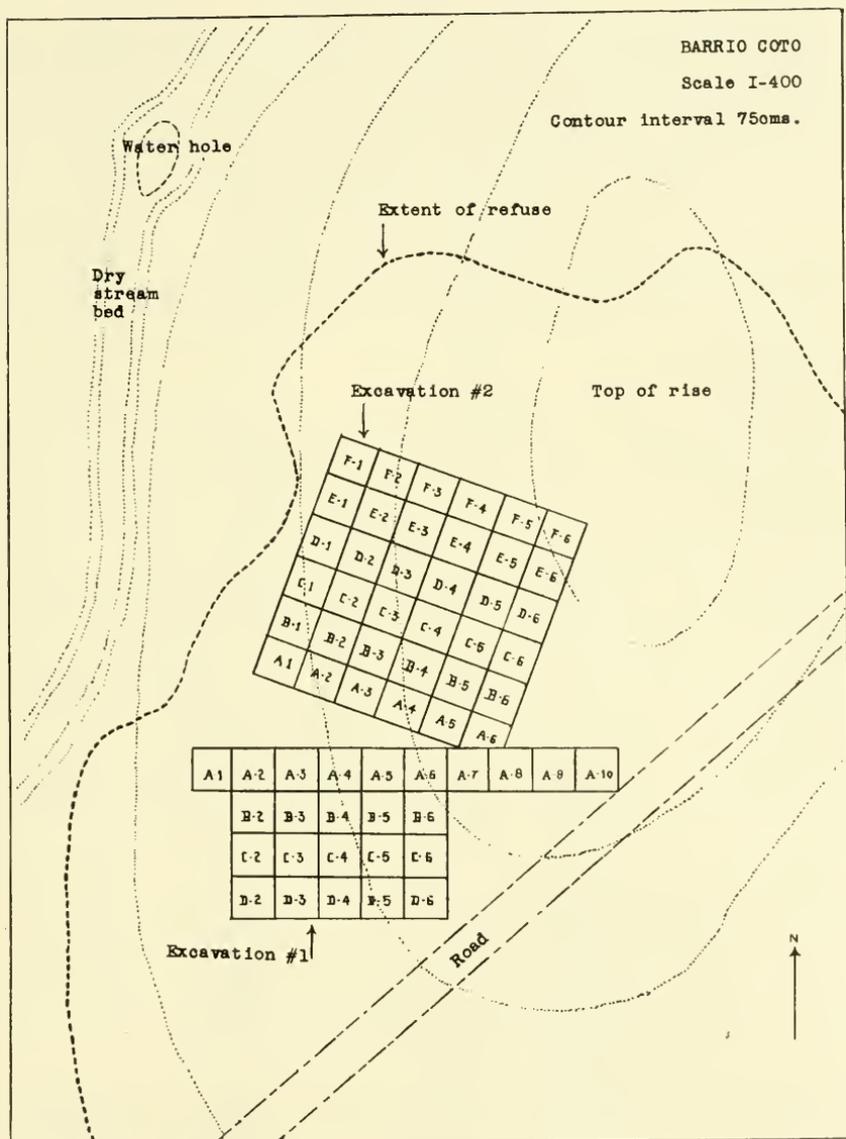


FIGURE 8. Chart of Barrio Coto site.

EXCAVATION NUMBER 1

The first trench was forty meters in length and extended from the base of the hill to the comparatively level summit. It was divided into ten sections which are referred to as A-1 to A-10, with section A-1 at the base and A-10 at the top. Excavation was continued well into sterile sub-soil at the bottom of the refuse deposit throughout the length of the trench. Refuse was found to a depth of 25 centimeters in section A-1 at the base of the hill. Proceeding up the slope it increased gradually to 75 centimeters at the crest from which it decreased gradually to 65 centimeters in A-10 on the level summit. A cross-section of this deposit is shown on the accompanying chart (FIGURE 9).

The deposit removed from this trench was primarily composed of blackened sandy soil through which were scattered numerous terrestrial gastropod shells, a few marine shells of various species, some land crab shells, charcoal and ashes, hutia, manati, fish and bird bones, potsherds, and implements of shell and stone. The shell content of this deposit was relatively very low when compared to that removed in Barrio Canas. In some limited sections only scattered bits of shell appeared. No stratification of refuse could be determined in any section, although toward the bottom of the deposit the soil was less blackened with charcoal and organic decay. Also artifacts appeared less commonly in the lowest 25 centimeters of deposit.

Burials were encountered in sections A-6 at 50 centimeters, A-3 at 50 centimeters, A-2 at 50 centimeters, A-4 at 75 centimeters, A-7 at 25 centimeters, A-6 at 50 centimeters, A-2 at 75 centimeters, A-7 at 50 centimeters, and A-7 at 75 centimeters. Complete clay vessels were found with three of these skeletons, associated so that they were obviously buried with the bodies. One of the skeletons was that of a child and the other two were those of adults. Detailed description of each of these burials appears in the appendix. Three skeletons were found lying in sterile sub-soil below the refuse deposit, and the others lay in the refuse in all levels from the top to the bottom.

A second trench was cut parallel to the first and joining it along its southern edge. This trench was divided into sections corresponding to those in the first trench and the key letters and numbers B-2, B-3, B-4, B-5 and B-6 were used to designate these sections which corresponded with A-2 to A-6 in the first trench.

The deposit of refuse removed from this second trench (trench B) varied in depth between 25 and 75 centimeters. The greatest depth was found near the crest of the hill and the least depth near the base.

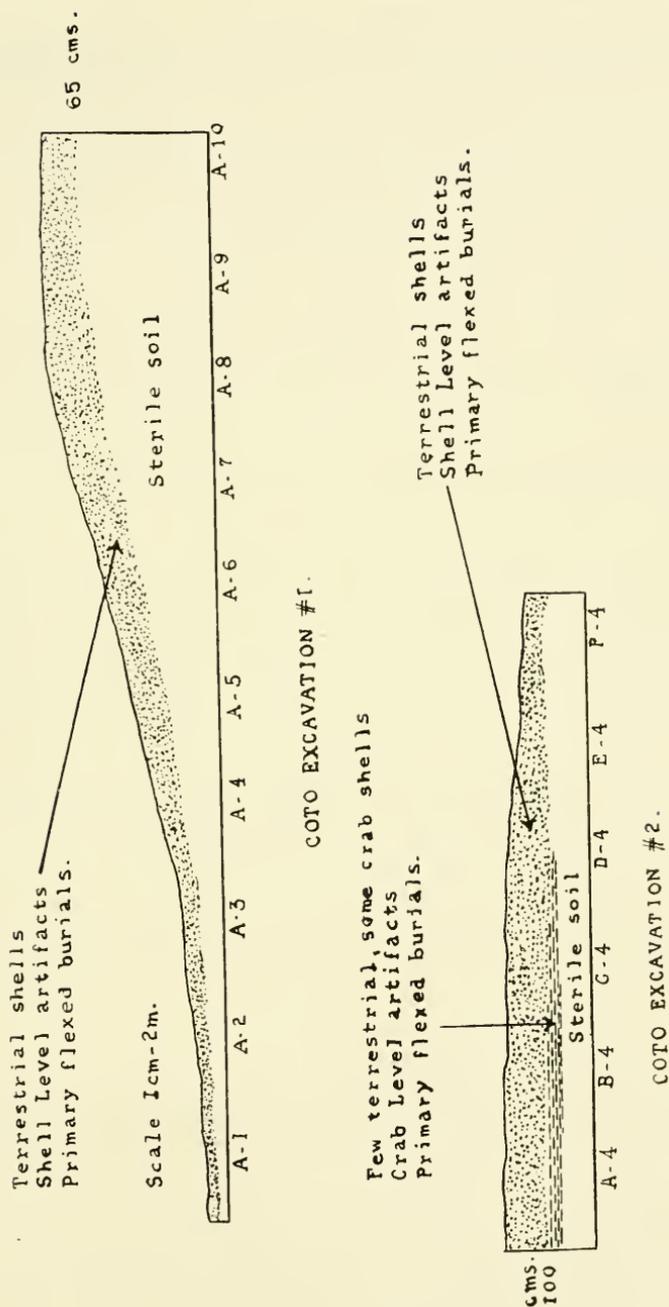


FIGURE 9. Cross-sections of Barrio Coto excavations.

The composition of the refuse was much the same as that already described. Terrestrial gastropod shells were scattered through blackened soil. Some marine shells and land crab shells were also found. Potsherds were numerous in the upper levels but gradually decreased in number toward the bottom. Shell and stone implements were found in all levels. Sections of the deposit in trench B contained more wood ash, charcoal, shells, and general culture refuse than others, but no well defined fire pits or distinct hearths were found. No stratification of refuse appeared.

Burials were struck in sections B-6 at 25 centimeters, B-5 at 50 centimeters, B-6 at 50 centimeters, B-4 at 50 centimeters, B-2 at 50 centimeters, B-6 at 75 centimeters, and B-3 at 50 centimeters. One of these burials was that of a baby, the bones of which were contained in a small shallow bowl. This apparently was a secondary burial of bones since the bowl was too small to contain the entire body of a child. Details of each burial are given in the appendix.

A third trench (trench C) was cut paralleling trench B and extending the same length, or 20 meters. The deposit in this trench varied in depth between 25 and 50 centimeters. It was of the same general composition as that in the first two trenches and contained numerous potsherds and implements and a few burials. The material was removed and recorded in the same manner as that from the other trenches.

A fourth trench (trench D) was next run paralleling trench C through its entire length of 20 meters. The refuse deposit was noticeably decreasing in the trench, varying between 20 and 40 centimeters. The number of artifacts perceptibly decreased and burials were much less common.

These excavations which were proceeding southward along the west side of the hill were finally interrupted by a road running diagonally across the top of the hill.

EXCAVATION NUMBER 2

Owing to certain restrictions imposed by the owner of this site it was necessary to leave a small section unexcavated between the first series of trenches and the second series. This second series (excavation No. 2) was begun with a trench 24 meters in length running in a northeasterly direction along the base of the hill, 8 meters north of section A-1 in excavation No. 1. Five trenches 4 meters wide were dug paralleling this first trench and proceeding toward the summit of the hill. Each trench was divided into six sections and each section

given a key letter and number. All refuse was removed in 25 centimeters levels and the artifacts from each level in each section were packed as a unit.

The first three trenches of excavation No. 2 exposed a deposit similar to that found throughout excavation No. 1. The depth varied between 25 and 75 centimeters with the greatest depth in those sections near the crest of the hill. Terrestrial gastropods made up the bulk of the food refuse but scattered marine shells, land crab shells, and bones of manatis, hutia, fish and birds were also found. Fire pits or hearths were not clearly defined although charcoal and ashes were abundant throughout. Sherds and broken implements were numerous though less common toward the bottom of the deposit. No clay vessels or other artifacts were found with any of these. There was no evidence of stratification in the deposit.

The next two trenches (trenches 4 and 5), which extended along the crest of the hill, cut through a deposit of refuse which reached a depth of one meter. This depth of deposit was confined to sections A-4, B-4, C-4, A-5, B-5, and C-5, or an area of 96 square meters. Toward the bottom of the deposit in these sections the soil became yellow, and terrestrial and marine shells less common. A few red and white painted sherds were found, and all the pottery removed from this yellowish soil near the bottom of the deposit was like that found in the Crab Level at Canas. No distinct line of separation between an upper and a lower level could be seen when trench walls were squared off and charted, but a change in the nature of the refuse was unmistakable between 20 and 30 centimeters from the bottom.

Burials were numerous in trenches 4 and 5 at all levels. In sections D-4, E-4, D-5 and E-5, five burials were found within a radius of 3 meters lying from 50 to 75 centimeters in depth. Two well preserved skeletons were found in the last traces of refuse at 1 meter. The details are given in the appendix.

Trench 6, the last to be excavated, was not entirely completed. The depth of deposit in this trench, which was cut across the summit of the hill, was definitely decreasing. The refuse was like that throughout most of the deposit and contained numerous artifacts.

SUMMARY

The refuse deposit exposed by the series of trenches in excavation No. 1 and in excavation No. 2, for the most part varied between 25 and 75 centimeters in depth. It was composed of blackened sandy soil, ashes, charcoal, terrestrial gastropod shells, scattered marine

shells, a few land crab shells, and bones of hutias, manatis, birds and fishes. Shells of various terrestrial gastropods made up the major part of the food refuse. Potsherds, and artifacts made of shell and stone, were numerous throughout the deposit. As the following descriptions of the collections will indicate, the great majority of all artifacts found in the deposit were similar to those found in the Shell Level at Canas, but Canas Crab Level types were also found in limited numbers.

In a limited area in excavation No. 2 the deposit reached a depth of 1 meter, and in this section there was a noticeable change in the composition of the refuse near the bottom. The deepest 20 to 30 centimeters of deposit was yellow and contained only scattered terrestrial and marine shells. Land crab shells were found but in no great numbers. Ashes and charcoal were less abundant and artifacts were more rare than in the upper 75 centimeters of refuse. The artifacts found in this lower level were almost entirely of Crab Level type. There was no distinct line separating an upper from a lower level of occupation, and no complete segregation of distinct types of food refuse as in the Canas site. A noticeable change in the types of artifacts indicates, however, a condition very similar to that in Barrio Canas where two periods of occupation were observed.

There were 60 burials encountered during the excavations. They were found scattered throughout the refuse deposit in all sections at all levels and also in clear sub-soil below the refuse. No particular orientation of the skeletons prevailed since they were found lying in all directions. Many were so entirely disintegrated that the position of interment could not be determined, while others were fairly well preserved, and could be photographed in position and removed for study.

Of the intact skeletons 17 were found to lie on the left side with the legs flexed. The amount of flexing varied considerably from a slight bend of the knees to a tight flex in which the knees reached to within a few inches of the forehead. Many skeletons lay as if the body had been tightly bound when interred. There were 18 skeletons which lay on the right side in the same flexed position.

Also there were 14 skeletons found which lay on the back with the legs drawn up and flexed tight against the body. With this type of burial the skull was generally found forced forward or raised above the level of the spinal column. One skeleton lay on its face with the legs flexed beneath the body. Another burial was evidently a secondary burial of bones with the flesh removed since the bones were found stacked in a heap, one fragment of the skull lying over another.

A single urn burial encountered was that of a baby, the bones of which filled a small round bowl. It was clearly a secondary burial of the bones after the flesh had been removed.

Clay vessels were found associated with 3 skeletons as mortuary offerings. In a few cases artifacts such as worked bones, single beads, and roughly worked or fragmentary stone implements were found in close proximity to skeletons, but since all lay in a matrix of culture refuse, it could not definitely be determined that they were buried with the body.

The details of each burial are given in the appendix.

Collections from Barrio Coto

Complete vessels were rare in the deposit in Barrio Coto and the five that were found intact were associated with burials. Large fragments, however, were common, and throughout the excavation only these large fragments and sherds which carried handles, lugs, or ornamental elements were retained. It may be estimated that over half of the potsherds removed were discarded since they lacked any kind of ornamentation and were too small to indicate the vessel shape. As at Barrio Canas, the great majority of sherds were unpainted.

A study of the collections has made it clear that the pottery of Coto to a large extent duplicates that found at Canas. The great majority of pottery types, the characteristics of vessel shapes, composition of wares, and elements of ornamentation identified in the Canas collections appear again in the Coto material. As described in the section concerning excavations, however, clear stratification of refuse deposit with the definite segregation of certain pottery types in each level of occupation was not found in the Coto deposit. The sub-stratum found in sections A-4, B-4, C-4, A-5, B-5, and C-5 closely resembled the sub-stratum or Crab Level at Barrio Canas, and the pottery found in this sub-stratum duplicates that found in the Canas Crab Level, but all the rest of the Coto deposit contained pottery which correlates with the pottery from both Crab Level and Shell Level at Canas, with the latter predominating.

The pottery and associated artifacts from Coto are described by means of the following charts which list the Canas Shell Level and Crab Level types found at Coto. New types found at Coto are described in sections following the charts. The collection has been treated as a single unit since the sub-stratum was very limited and not clearly distinguished from the rest of the deposit. The distribution of the various types in relation to depth in the deposit and the stratigraphic significance are discussed in a following section.

POTTERY OF SHELL LEVEL TYPE

The following chart lists those pottery types identified with the Shell Level at Canas which are found in the collections from Coto. Depth in the deposit is indicated in 25 centimeter levels. The numbers refer to identifiable sherds.

Depth in cms.	0	25	50	75	Total No. of sherds
	to 25	to 50	to 75	to 100	
Crude Ware.....	349	324	134	9	816
Red Ware.....	37	49	14		100
Shape A.....	132	161	71	5	369
Shape A-1.....	15	12	2		29
Shape B.....	7	20	13	1	41
Shape C.....	19	10	8	3	40
Shape D.....	Round bowl sherds present, but not definitely identifiable				
Shape E.....	Griddles present, but not distinguished from Crab Level type				
Shape F.....	3	2	1		6
Shape J.....	4	4			8
Shape L.....	1				1
Modeled head lugs, class A.....	16	2	1	3	22
Modeled head lugs, class B.....	17	8	3		28
Modeled head lugs, class C.....		1	1		2
Modeled head lugs, class D.....	1				1
Modeled head lugs, class E.....	1	1			2
Modeled head lugs, unclassified.....	10	6	3		19
Modeled forms on handles, class A.....	10	7	1		18
Modeled forms on handles, class B.....	6	6	1		13
Modeled figures on vessel walls, class A.....	2	5	2		9
Modeled figures on vessel walls, class B.....	2	2			4
Modeled figures on vessel walls, class C.....	3				3
Modeled figures on vessel walls, class D.....	8	4			12
Incised decoration, class A.....	38	12	9		59
Incised decoration, class B.....	5	3	2		10

Canas Shell Level pottery types not found in the Coto material are the following: vessel shapes B₁, g, h, i; incised decoration, class c; and red painted decoration of the Shell Level type which is the application of simple curvilinear designs on the inside of Crude Ware bowls. Only six sherds of this kind were found at Canas.

NEW TYPES FOUND AT COTO.—The rounded bottom of a vessel with four legs is a unique specimen in the Coto collections. The fragment has been broken away from a vessel the shape of which is unidentifi-

able. It was supported on four short solid legs which have been partially broken away and remain about 1 centimeter in length and 1 centimeter in diameter. Four sherds which are undoubtedly pottery legs were also found and may be fragments of other vessels of this kind. The legs and the partially complete vessels are of the Crude Ware typical of the Canas Shell Level and may be associated with the Shell Level complex.

POTTERY OF CRAB LEVEL TYPE

The following chart lists those pottery types identified with the Crab Level at Canas which are found in the Coto collections. Depth in the deposit is indicated in centimeters. The numbers refer to identifiable sherds.

Depth in cms.	0	25	50	75	Total
	to 25	to 50	to 75	to 100	No. of sherds
Shapes A and B (fragments of each type not distinguishable).....	1	3	6	8	18
Shape F.....	1		7	2	10
Shape G.....		1	2		3
Shape K.....	Griddles present, but not distinguished from Shell Level type				
Plain Brown Ware.....	21	41	57	39	158
Red Painted Ware, class A.....	1	6	7	4	18
Red Painted Ware, class B.....			1		1
Red Painted Ware, class C.....		1		1	2
Red and White Painted Ware, class A.....	1	6	7	4	18
D-shaped handles, 1st class.....	8	15	19	17	59
D-shaped handles, 2nd class.....	4	8	12	6	30
D-shaped handles, 3rd class.....	1				1
Rectangular lugs.....	4	6	6		16
Perforated knobs.....			2	2	4
Modeled head lugs, type B.....	1	2	1	1	5
Modeled head lugs, unclassified.....		3	1		4

Canas Crab Level types absent from the Coto collections—No example of shapes C, D, E, H, I, J, and L could definitely be determined from sherds at Coto. Since these types are based on complete or partially complete vessels found at Canas, and complete bowls were very rare at Coto, the absence is not surprising. As explained in the discussion of Canas material, Crab Level shapes are difficult to determine by means of sherds, while Shell Level shapes are easily distinguished because of the predominating boat-shape.

Red and White Painted Ware sherds of classes b, c, and d are not found. These types, which are rare at Canas, are defined as: (b), two color designs with white inlaid in an incised pattern; (c) three color designs; and (d) miscellaneous Painted Ware, a group of four sherds found at Canas with black and salmon-colored designs. Red and White Painted Ware found at Coto is comparatively rare as a whole and the sherds of this type which were found are for the most part small fragments. No complete design patterns were found and consequently a comparison of designs on sherds from the two sites is not possible. Linear and curvilinear elements are found on all sherds. It is clear even from fragmentary design elements that many are in negative red as they were at Canas. White is in all cases applied over red and both red and white over a polished or slipped brown surface. The red and white paints used at Coto appear less well preserved on the sherds, and lack the gloss or burnish of the paints on Canas sherds. Apparently the technique of painting and firing was less advanced at Coto, or else the materials at hand were not so durable. It is also possible that the natural conditions at Coto were less adapted to the preservation of the paint.

Modeled clay heads of type a, or the semi-spherical heads impressed from the back, and of type e, the hollow heads with clay pellet rattles, are not represented in the Coto collections. These heads were rare at Canas.

NEW TYPES FOUND AT COTO.—An oval bowl with a sharp right-angle rim or lip resembles the Canas Crab Level shape G, except that it lacks the rectangular lugs. It is of Red Painted Ware, class A. Numerous sherds found at Coto may be fragments of such oval bowls but cannot be classed definitely as such.

A modeled head lug of Crab Level Red Painted Ware, found in the deposit, is an unusual type. It is in the form of some zoomorphic head with a sharp snout and two pronged appendages on the head resembling horns. Another unique modeled head clearly represents a lizard.

ASSOCIATED ARTIFACTS

Shell, stone, and bone implements found in the Coto deposit to a large extent duplicate those found at Canas. The chart on page 73 lists these implements under the type headings described in the section concerning the Canas collections. It will be seen that, with the exception of 4, all the implements listed are of the Canas Shell Level type. Two of these exceptions are shell spoons which are the same as the one found in the Canas Crab Level, while the other 2 are rectangu-

lar adze-like celts. These celts are of exactly the same type as the celts limited to the Crab Level at Canas. One was found in the substratum at Coto and 1 was found in the surface 25 centimeters level.

Three unusual objects found at Coto (PLATE 5) require individual description since objects of this kind were not found at Canas.

One of these is a bone piece $11\frac{1}{2}$ centimeters long and 2 centimeters broad which has been carved into a shape resembling a canoe paddle with a T-shaped handle and a broad pointed blade. This was found at a depth between 75–100 centimeters near a flexed burial.

Another bone artifact is composed of two polished bone tubes which were found glued together in a V-shape. A carved shell ring bound the tubes together at the apex of the V. Carved bone rings were applied about the opposite ends of the tubes. The tubes were 11 centimeters long and 1 centimeter in diameter. The object was found in the surface 25 centimeters level. Tubes, used for snuffing piptadenia among the Ouitoto, examples of which are reproduced from Crevaux by W. E. Roth (1924: pl. 52), are not unlike the object found at Coto (see PLATE 5, FIGURE 3).

The third unusual object is a small carved figure probably representing a human being. It was found in excavation No. 1, A-4, at 25–50

CHART INDICATING DISTRIBUTION OF TOOLS AND IMPLEMENTS OF SHELL, STONE, AND BONE IN THE COTO DEPOSIT

Depth in cms.	0	25	50	75	Total Number
	to 25	to 50	to 75	to 100	
Shell chisels.....	2	2	1		5
Shell celts.....	2		1		3
Problematic shell implements.....	9	3		3	15
Shell discs.....			1		1
Shell discs, perforated.....	1				1
Shell rattles.....	2	2	2	1	7
Shell spoons (Crab Level type?).....		2			2
Petaloid stone celts.....	23	9	20		52
Rubbing stones.....		6	1		7
Tubular stone beads.....	2	2			4
Rectangular adze-like celt.....	1			1	2
3-pointed stones.....	2				2
Carved stone figures.....	1	1			2
Eared Carib stones.....			1		1
Bone awls.....			2		2
Worked manati ribs.....			1		1
Worked tortoise shell.....			1	1	2

centimeters. It is 6 centimeters high and 3 centimeters wide and carved in the half-round from some unidentified material with the consistency of wood or burned bone. It is jet black and may be a carved coroso seed. The eyes and teeth are inlaid with shell. A crest on the top of the head resembles a three-pointed zemi. A transverse perforation at the back of the head may indicate that it was suspended. A curious feature is an exaggerated navel represented by a perforated disc in relief. The same kind of navel appeared on a carved bone figure found at Canas.

CONCLUSIONS

The charts listing the pottery types characteristic of the Shell Level and the Crab Level at Canas which appear in the Coto collections, indicate that the percentage of Crab Level types increases with the depth of the deposit, and that the percentage of Shell Level types decreases with the depth. This is more clearly shown in the following simplified chart.

Depth in cms.	0-25	25-50	50-75	75-100
Sherds classed as Shell Level type.....	386	373	148	18
Sherds classed as Crab Level type.....	48	85	102	64

The limited sub-stratum contained Crab Level pottery types only, and may be considered as duplicating the sub-stratum found in Barrio Canas. This correlates with the early period of occupation and the early culture distinguished at Canas. Crab Level pottery types were found, however, throughout all levels of the deposit associated with Shell Level types which represent the late culture at Canas.

The first interpretation suggested by this condition of the deposit is that a cultural fusion took place in Barrio Coto. That is, that the late arrivals either united with or took over the material culture of the early group and deposited the bulk of the refuse found. A significant fact, however, makes this interpretation unlikely. Crab Level pottery traits are not found in combination with Shell Level traits in the composition of a single vessel. For example, in no case is a decorative element characteristic of the Shell Level found on a polished or slipped Brown Ware, Red Painted Ware, or Red and White Painted Ware vessel. Likewise, no Crab Level ornamental technique is found on a vessel of Shell Level shape or ware. If a fusion of material cultures had taken place, some combinations of ceramic traits would undoubtedly appear.

As described in the sections concerning excavations, cuts were made along the side of a hill with a pronounced incline, and considerable erosion apparently had taken place. Furthermore, numerous pits had been dug and refilled by various collectors. The entire deposit did not reach a depth of over 1 meter and for the most part was less than 75 centimeters in depth, so that these disturbances would affect sections of the deposit from the surface to the bottom. A significant condition appears in the fact that sherds classed as Crab Level types regularly appeared in groups and were not scattered at random through the upper levels of the refuse. The general disturbance of the site, and the appearance of Crab Level sherds in groups in the upper levels, would suggest that the intermixture of Crab Level and Shell Level pottery in the deposit was due to this disturbance, and that they were originally deposited in stratified levels as at Barrio Canas.

The nature of the deposition at Coto remains something of a problem. It is clear, however, that the two periods of occupation and the two cultures found at Canas are again represented at Barrio Coto. The great majority of the traits characterizing each level at Canas reappeared at Coto, which undoubtedly indicates a close cultural connection between the two regions of the island during both periods of occupation.

Excavations in Barrio Monserrate

The site excavated in Barrio Monserrate is situated on Embarcaderos Point which is on the northeast coast of Porto Rico just west of the town of Luquillo. The point is a low flat sandy area which is now planted in cocoanut palms. A barrier reef extends along the shore and encloses a shallow bay where shell fish of many varieties are abundant. Conchs are found along the reef and the deep-sea fishing outside the reef is excellent.

The refuse of a prehistoric settlement is found scattered over an irregular area approximately 300 meters in length by 200 meters in width which extends along the shore of the bay and a lagoon that joins the bay at this point. Potsherds are strewn over the entire area, and many artifacts made of shell and stone have been exposed by the burrowings of numerous land crabs. Five low mounds can be distinguished. They rise a meter, or a meter and a half, above the level of the surrounding area. One of these mounds had been partly cut away by the surf, and culture refuse was exposed to a depth of one meter.

During a month of excavation at this site, trenches were cut through three of these mounds, mounds A, B, and E as shown on the chart

(FIGURE 10). The method of excavation was the same as that carried out at the other sites. All trenches were divided into sections, in this case 4 by 4 meters, and the refuse removed in 25 centimeters levels. The artifacts from each level of each section were separated and packed as a unit.

MOUND A

A trench 32 meters long and 4 meters wide was cut the length of the mound with the western edge of the trench passing approximately through the center. A deposit of refuse was found to a depth of 1.50 meters near the center of the mound at its highest point. At the edge of the mound the deposit decreased to approximately 25 centimeters. The last traces of refuse lay in wet sand slightly above sea level.

The general composition of the deposit was similar to that found in the Shell Level at Barrio Canas. Marine shells, principally *Strombus*, *Tellina* and *Chama*, were numerous and made up the bulk of the food refuse. They were scattered in varying quantities through blackened sandy soil. Ashes, charcoal, and bones of manatis, hutias, fishes and birds were found intermixed with the shells and the blackened sand. Artifacts were more numerous in this deposit than in any removed up to this time. At the center of the mound in sections A-3, A-4, A-5 and A-6 some variation in the composition could be determined. The first 50 to 60 centimeters contained a greater percentage of shells than the lower levels, and also more ash, charcoal, bones, and artifacts. In the next 40 to 50 centimeters shells were less abundant and the number of artifacts decreased perceptibly. The last 40 centimeters of deposit contained few shells and artifacts, and was generally gray in color with small quantities of ash and charcoal mixed with yellow sand. Below this was clear sand at sea level. Sections dug to a depth of 1.60 to 1.70 meters rapidly filled with water.

No burials were found in the first 50 centimeters of deposit, which contained the greatest number of shells and artifacts.

The next 50 centimeters contained several primary flexed burials and a limited number of burial urns containing the bones of very small children.

In the 50 centimeters at the bottom, flexed primary burials were very numerous, often lying so close together that one skeleton could be distinguished only with difficulty from another.

Below all culture refuse in clear sand fragmentary skeletons were found lying partly in the water which filled the trenches and marked the sea level.

A second trench was cut through mound A parallel to and joining

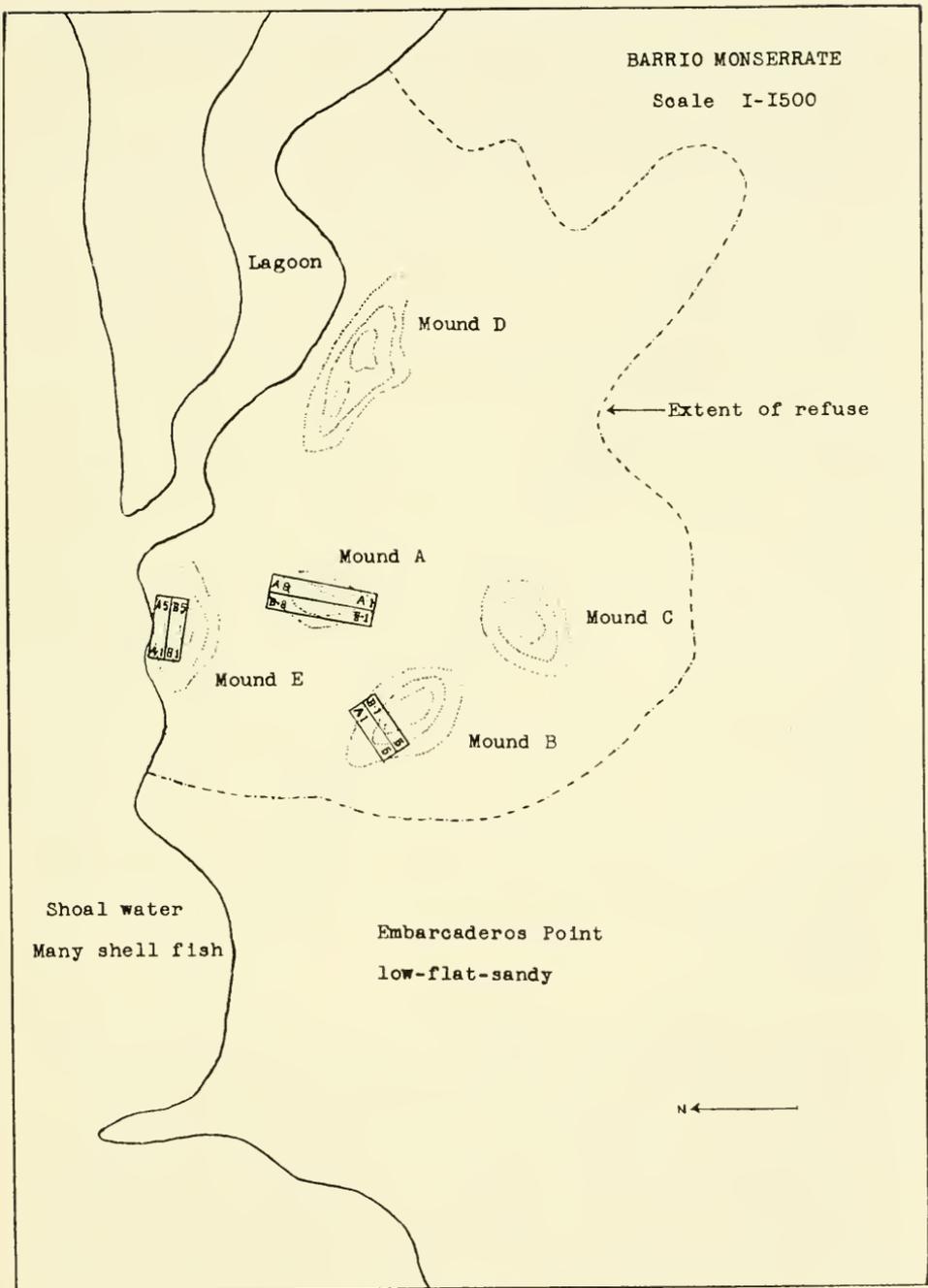


FIGURE 10. Chart of Monserrate site.

the first trench along the western edge. These two trenches which made an excavation 32 meters long and 8 meters wide removed all the central and highest section of the mound.

The deposit removed during the excavation of the second trench was similar to that removed from the first. In sections B-3, B-4, B-5 and B-6, which were the area containing the greatest deposit, the same variation in composition was found. The surface 50 to 60 centimeters contained a great number of marine shells, black sand, bones, ashes, and numerous artifacts, but no burials. The next 50 centimeters contained less food refuse and artifacts, but several primary flexed burials, and child burial urns. The lowest 40 to 50 centimeters of deposit was filled with primary flexed burials, but still less food refuse was found and artifacts were comparatively rare. In section B-5 from a depth of 75 centimeters to 1.50 meters the deposit was so filled with skeletons that some sections appeared to contain a massed burial. Below all refuse in clear sand and half submerged in water were several skeletons, some of which were fairly well preserved.

The chart (FIGURE 11) shows a cross-section of mound A through the long axis at the center. No distinct stratification of refuse appeared, and the levels indicated on the chart were not sharply segregated in the mound. These levels are simply distinguished on the basis of more or less refuse content of the same general type, and by the absence or presence of different types of burial. The composition of the mound clearly indicates that during the last phase of occupation no interments were made with the refuse. During an earlier period child urn burial was not uncommon and this type of interment was practiced along with primary flexed burial in the refuse. Apparently when the site was first occupied primary flexed burial prevailed and urns were not used for the interment of small children.

Descriptions of each burial found in mound A are given in the appendix.

MOUND B

A house and garden plot occupied a large part of mound B so that it was necessary to limit excavation to the northern end. A trench 4 meters wide was begun on the northeastern side and run in a south-westerly direction through and a few meters beyond the highest rise. The trench was 20 meters long and was divided into five sections, numbered A-1, A-2, A-3, A-4, and A-5. A rich deposit of marine shells and artifacts was found to a depth of 20 centimeters in section A-1, and this deposit gradually increased to 75 centimeters in sections A-4 and A-5 at the highest rise. This deposit was very similar to that

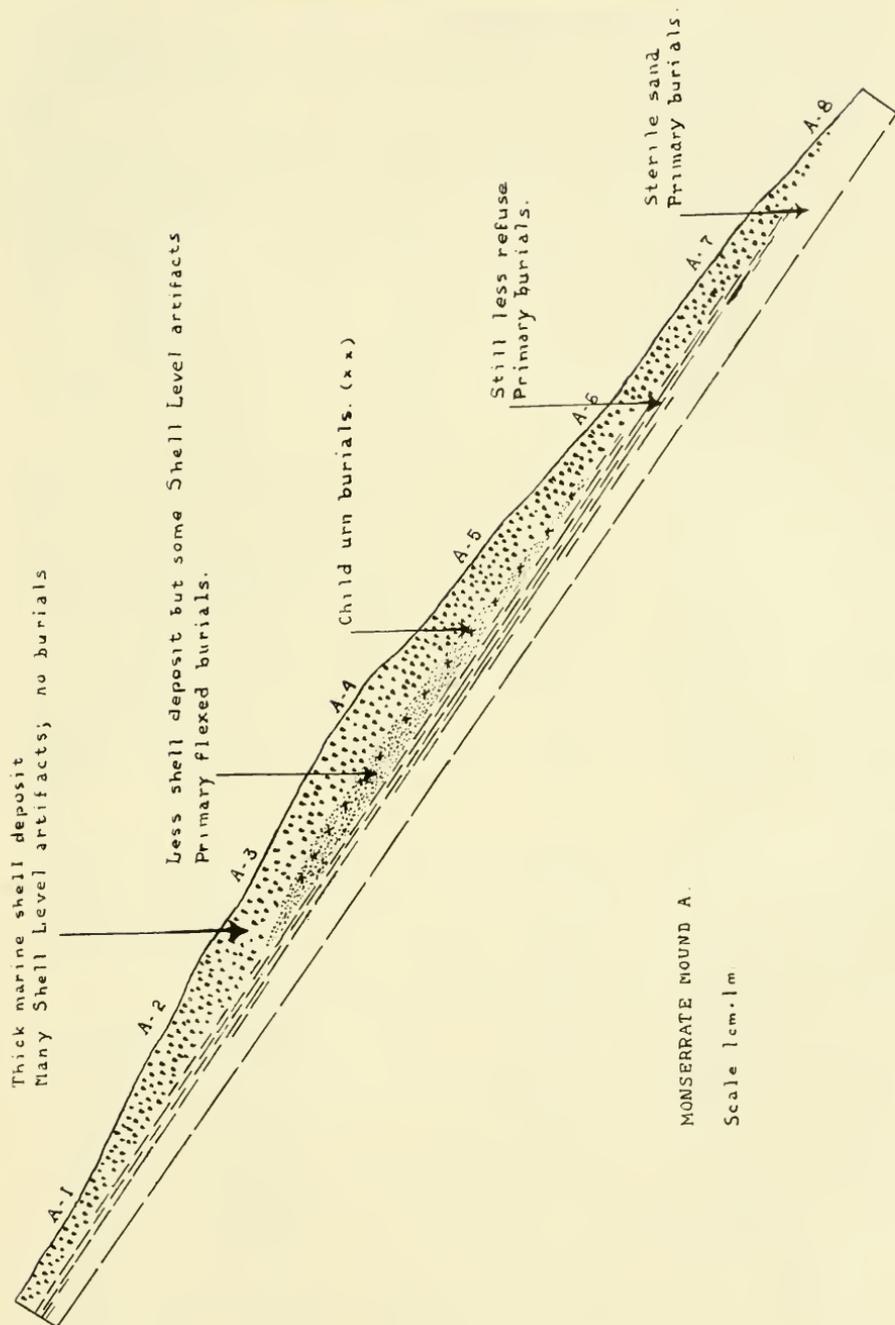


FIGURE 11. Cross-section of mound A, Monserrate.

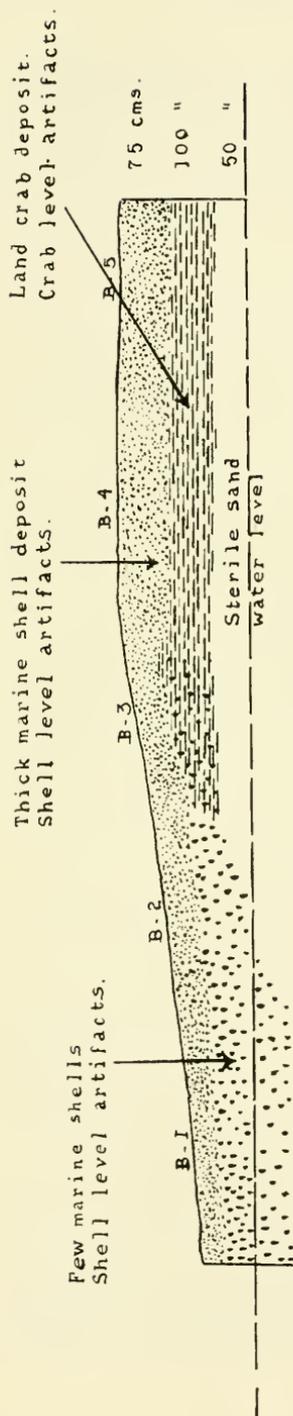
found in the surface 50 centimeters of mound A, being made up of marine shells, some land crab shells, black sandy soil, ashes, charcoal, bones, and artifacts.

Below this compact deposit of shells and artifacts in section A-1 a few artifacts and scattered marine shells were found in yellowish to gray sand extending on down to the water level and below. Sterile sub-soil was not reached in section A-1 since water rapidly filled the trench below 1 meter. In section A-2 gray sand and scattered shells and artifacts were found to a depth of 75 centimeters and below this was clear sterile sand. In section A-3 the compact mass of shells and artifacts reached a depth varying between 50 and 75 centimeters, and below this appeared gray to yellow sand through which were scattered land crab shells. Sterile sand was reached at 1.50 meters. In section A-4 a sub-stratum of deposit was distinguished below the mass of marine shells. This was composed of gray soil and land crab shells with scattered potsherds which reached a depth of 1.75 meters. Section A-5 exposed a stratified deposit the same as that found in Barrio Canas. A 75 centimeters deposit of marine shells, blackened sand, various food refuse and artifacts lay above a well-defined stratum of yellowish sand filled with masses of disintegrated land crab shells, some ash and charcoal, and artifacts, among which were numerous red and white painted sherds. The sub-stratum reached a depth of 1.50 meters and lay on sterile sand. The line between these refuse levels was indistinct in sections A-3 and A-4, but was clearly defined in section A-5.

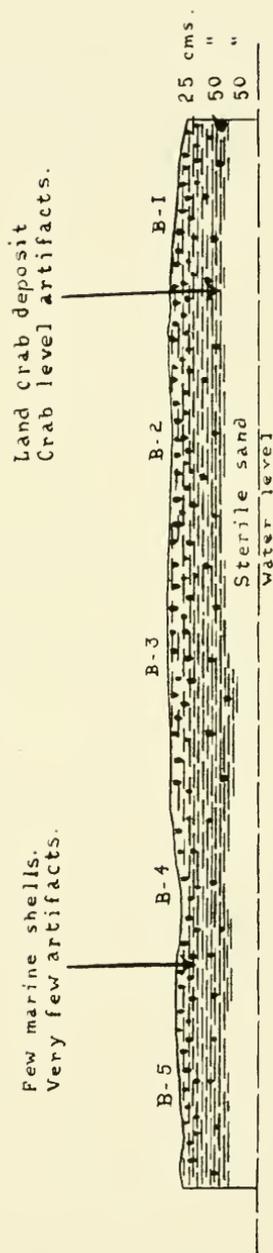
A second trench (FIGURE 12) was cut through mound B joining the first trench along its southern edge and extending the same length. The deposit exposed was essentially the same as that found in the first trench with some variation in the depth of deposit. The sub-stratum of land crab shells appeared in section B-3 and was distinct in section B-5. The maximum depth of deposit was 1.75 meters.

Two refuse levels, or periods of occupation during which different kinds of food refuse were deposited, could readily be distinguished near the center of mound B. It is unfortunate that excavations could not be continued southward through the highest and most extensive section where the house and garden were situated, since the sub-stratum appeared to be increasing in depth in that direction. With the excavations completed, the extent of the early deposit of land crab remains was not determined.

Burials were rare in mound B trenches. The three that were found are recorded in the appendix. No burials were found in the land crab deposit.



MONSERRATE MOUND B.
Scale 1 cm. 1 in.



MONSERRATE MOUND E.
Scale 1 cm. 1 in.

FIGURE 12. Cross-sections of mound B and mound E, Monserrate.

MOUND E

The third mound to be excavated lay along the edge of the water, and a section at the north side had been cut away by the surf. A trench 20 meters long and 4 meters wide was run along this northern side and excavated to the depth of the water level. This trench extended through the highest elevation but did not pass through the entire length of the mound.

Refuse was found in limited sections to a depth of 1 meter and below this there was a level of clear wet sand which extended below the high tide level. The composition of the refuse in mound E was considerably different from that found in mounds A and B. The surface 25 to 35 centimeters removed contained scattered marine shells, some ash and charcoal, gray sand and a few scattered potsherds. Below this and extending down to sterile sand, marine shells were still more rare, land crab shells appeared in increasing numbers to the bottom of the deposit, the sand was yellow in general appearance, ashes and charcoal were scarce, and potsherds were more numerous although not so plentiful as in the upper levels of mounds A and B.

In clear sand and partly below sea level a deposit of conch shells was found. No artifacts, bones, ashes, or other culture refuse were found with them. The conch shells were complete, and it is probable that they were a natural deposition since they lay at the water's edge.

A second trench was excavated along the southern edge of the first and extending the same length. The refuse reached a depth of 1 meter, and was similar to that removed from the first trench with some variation. The upper 20 to 35 centimeters contained less marine shells and more land crab shells. Sherds were very scarce and fragmentary. Below this a few scattered marine shells were found but land crab shells became abundant and in some sections the bulk of the deposit was like that found in the sub-stratum of mound B.

As a whole the deposit exposed in mound E more closely resembled that found at the bottom of mound B than the deposit found in the upper levels of mound B, and the bulk of mound A. Crab shell was the most common type of food refuse throughout, but marine shells were numerous near the surface and scattered through all levels.

The number of burials found in mound E was very limited. They are recorded in the appendix. There was one unusual burial, however, encountered in the first trench, which requires special comment in this section. This was an adult skeleton which lay on the left side with the legs flexed, at a depth of 50 centimeters. Covering the skull was part of a large open dish, over the right shoulder was a second

bowl right side up containing a third bowl, and in the bend of the knees was a fourth bowl bottom side up. The burial was the only one found in mound E with which artifacts were associated. The vessels were all of Shell Level type. As a description of the material from mound E will show in the following section, all other pottery found in mound E was of Crab Level type. This fact undoubtedly indicates that the burial was intrusive and not made during the deposition of the mound.

SUMMARY

The two periods of occupation discovered in Barrio Canas and again in Barrio Coto appear for a third time in Barrio Monserrate. Distinctly stratified deposits were found only in a limited section of mound B but were sufficient to indicate that during the earliest period of occupation land crab shells made up the bulk of the food refuse. Again, the extent of the early occupation could not be determined. The composition of mound E was somewhat confusing as was that of the midden in Barrio Coto, but apparently it was deposited primarily during the early period. During the late period, or that in which marine shells were deposited, occupation extended over the entire site.

Further excavation at the Monserrate site would be profitable since no cuts were made in mounds C and D and a large part of mound B. It is one of the most extensive prehistoric dwelling sites in Porto Rico, and was undoubtedly occupied over a long period, and very possibly from time to time since the first occupation of the island, as the conditions for fishing and also for agriculture are excellent.

Collections from Barrio Monserrate

There was some variation in the kind of refuse deposit and in the types of artifacts removed from each of the three mounds excavated. However, the majority of the artifacts found duplicate those removed from the Barrio Canas and Barrio Coto sites, and in the following description charts are employed to indicate these duplications at Monserrate.

The collections from each mound are treated separately. Culture refuse extends over the entire area and no segregation of the mounds appears on the surface, but the excavations made it clear that the occupation of all mounds was not contemporaneous.

Potsherds found at Monserrate, as at the other sites, made up the great majority of all artifacts present. It may be estimated that less than half of these sherds were retained in the collections since all but large rim fragments, handles, lugs, and ornamented sherds were discarded throughout the excavation. Large collections of sherds and

associated artifacts were sent to the University of Porto Rico and are not recorded in the following descriptions. Complete or partially complete vessels were comparatively numerous for a refuse site, and these have made it possible to determine the prevailing shapes. All pottery types which are distinct from those encountered in the other sites are described separately.

Objects of shell, stone, and bone in the collections represent all that were found in the deposit, since all such objects recognized as artifacts were retained. They are, for the most part, similar to those found at the other sites. The exceptions are described in some detail.

POTTERY OF SHELL LEVEL TYPE IN MOUND A

The following chart lists those pottery types identified with the Shell Level in Canas which are found in the collections from mound A at Monserrate. Depth in the deposit is indicated in 25 centimeter levels. The numbers refer to identifiable sherds or rarely to complete vessels.

Depth in cms.	0	25	50	75	100	Total No. of sherds
	to 25	to 50	to 75	to 100	to 125	
Crude Ware.....	112	138	60	36	10	356
Red Slipped Ware.....	23	32	9	1		65
Shape A.....	10	25	13	13		61
Shape A-1.....	5	5	3	1		14
Shape B.....	6	5	2	6	3	22
Shape B-1.....	2	1	1			4
Shape C.....	7	8	1		1	17
Shape D.....	Round bowl sherds present, but not definitely identifiable					
Shape E.....	10	10	4			24
Shape f.....		1	1			2
Shape h.....		1				1
Shape i.....	1			3		4
Shape j.....				1		1
Shape k.....		4	2	8		14
Shape l.....		1	1			2
Modeled head lugs on rims, class b.....	3	6	1		1	11
Modeled head lugs on rims, class d.....	2					2
Modeled head lugs on rims, unclassified..	8	7				15
Modeled figures on vessel walls, class a..	1					1
Modeled figures on vessel walls, class b..		2				2
Modeled figures on vessel walls, class c..	3	2	4			9
Modeled figures on vessel walls, class d..	3	3				6
Incised decoration, class a.....	5	2				7
Incised decoration, class b.....	2	4				6
Incised decoration, class c.....	3	1	1			5
Painted decoration.....	36	50	45	26	12	169

Shell Level pottery types which do not appear in the Monserrate mound A collections are listed as follows:

- Miscellaneous rare vessel, shape g.
- Modeled figures on loop handles, class a.
- Modeled figures on loop handles, class b.
- Modeled head lugs on rims, class a.
- Modeled head lugs on rims, class c.

The absence of modeled figures on broad loop handles of boat-shaped vessels is significant in the Monserrate site, since this is a relatively common element of ornamentation, primarily in the late phase of the Shell Level deposit, at Canas and also at Coto.

The absence of class a, modeled head lugs on rims, is even more significant, since this type is based on the bat-heads so common in Porto Rican collections and found in large numbers in the last phase of the Shell Level deposit, at Barrio Canas. Since the other pottery types conform to those found at Canas, the suggestion is made that the mound A deposit correlates with an earlier phase of the Shell Level deposit at Canas.

Another distinctive variation in the mound A collections is the large number of sherds bearing crude red painted designs. Only 6 sherds of this type were found at Canas and none appeared at Coto. One complete and two partially complete vessels with this type of painted ornamentation were found in mound A. Sherds were abundant. Paint was applied in a band about the rim or lip of vessels and in broad, irregular curvilinear patterns on the interior of what were apparently shallow open bowls or dishes. The bowls and sherds are of Crude Ware regularly associated with the Shell Level deposits, and the paint varies from a pink to red resembling the slip on the Red Slipped Ware. The complete vessel is a shallow boat-shaped bowl with rectangular lugs (shape B). A double scroll figure is painted on the interior.

Seven large burial urns found in mound A were intact or complete enough so that the shapes could be ascertained (FIGURE 13). One is a large boat-shaped bowl with semi-lunar lugs which resemble shape B-1, except that it is much larger than bowls of this shape found in mound A or in the other sites. The others are simple, round, open bowl forms similar to those smaller vessels which have been grouped as indefinite round bowls, shape D. All the urns are of thick, coarse, crude ware, and undecorated in any way.

A singular object, found at a depth of 50 centimeters in refuse, is a miniature boat-shaped vessel with four short, solid legs. It is 8 centi-

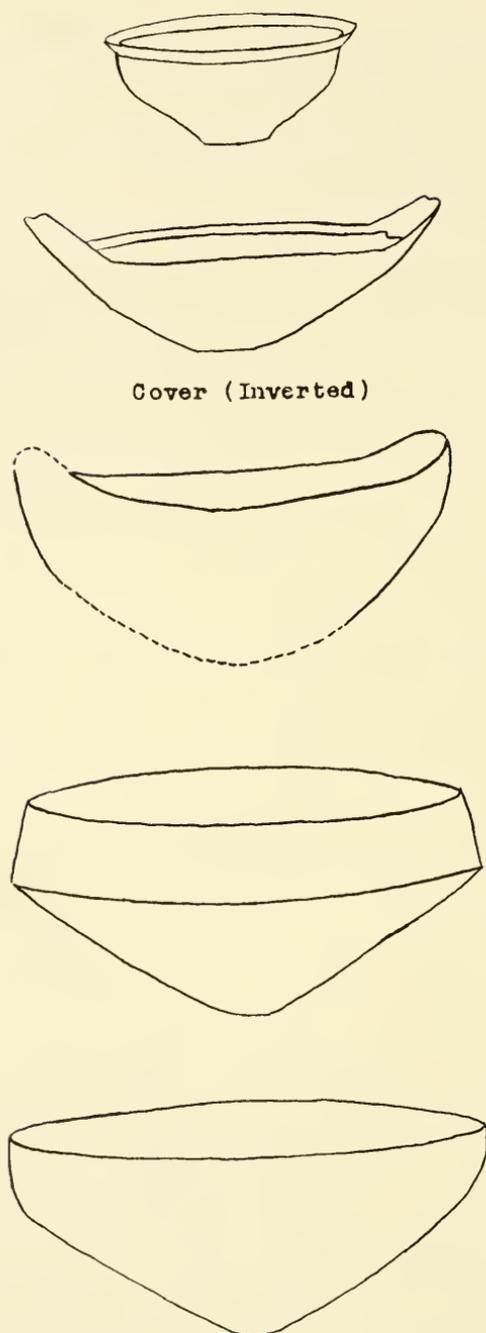


FIGURE 13. Shapes of child burial urns from Monserrate.

meters long and stands 4 centimeters high. The modeling is unusually crude and the surfaces are rough. It has the appearance of having been hurriedly pressed out of a small lump of clay with no attention to symmetry or finish. Irregular lumps and ridges remain on the surface. The whole has been slipped with a thick pink clay.

In the last traces of refuse at the bottom of mound A, three sherds of Crab Level type were found. One is an annular base designating the Crab Level shape F. Another is the rim of a shallow round bowl with a red painted lip; and the third is a D-shaped handle sherd of the first class. The three sherds are distinguished from the Shell Level types on the basis of ware and shape.

ASSOCIATED ARTIFACTS IN MOUND A

The mound A deposit produced numerous implements of shell and stone. Bone objects were very rare. Practically all material of this kind duplicates that found in the Shell Level at Canas. None of the rectangular adze-like celts or shell spoons found in the Canas Crab Level were present.

A stone pipe bowl taken from the first 25 centimeter level is the only object of this kind found in all excavations made. It is approximately the same shape and size as a modern European tobacco pipe bowl. The stem has been broken away. It is made of a soft granular trap or limestone and is ornamented by rude cross-hatched incisions about the entire bowl. The interior is obviously smoke-blackened. Since the pipe was found within a few centimeters of the surface it may be of modern origin.

A bird figure in clay found at a depth of 50 centimeters closely resembles the carved 3-pointed stone *zemis* so common in Porto Rican collections. The head has been broken away but the wings and tail are well represented. The figure is crouched on an elongated base and rises to a blunt point to form, in outline, a rough triangle. The complete object is 10 centimeters long and 6 centimeters high.

Perforated clay discs appear in the Monserrate excavations, but are absent at Canas and Coto. Six of these were found in mound A. They are evidently made of potsherds and vary in diameter from 3 to 6 centimeters. The perforations are in all cases at the center and vary slightly about 1 centimeter in diameter. The size of the discs and the size of the perforations suggest that they were used as spindle whorls.

CHART INDICATING THE DISTRIBUTION OF SHELL, STONE, AND BONE ARTIFACTS IN THE DEPOSIT OF MOUND A AT MONSERRATE

Depth in cms.	0	25	50	75	100	Total No.
	to 25	to 50	to 75	to 100	to 125	
Shell chisels.....	2	6	2			10
Shell celts.....	4	2	3	1		10
Shell hoes.....		7	2	1	1	11
Problematic shell implements.....	4	6	4	3	3	20
Shell discs.....		1	2			3
Shell discs perforated.....	1	1		1	1	4
Olivia shell rattles.....	1					1
Petaloid stone celts.....	24	20	9	7	6	66
Rubbing stones.....	4	5	1			10
Tubular stone beads.....	1		1			2
Bone awls.....	2					2
Worked manati ribs.....	4				2	6
Worked tortoise shell.....				1		1

POTTERY OF SHELL LEVEL TYPE IN MOUND B

The following chart lists those pottery types identified with the Shell Level in Canas which are found in the collections from mound B at Monserrate. Depth in the deposit is indicated in centimeters. The numbers refer to identifiable sherds.

Depth in cms.	0	25	50	75	Total No.
	to 25	to 50	to 75	to 100	
Crude Ware.....	13	26	27	6	72
Red Ware.....	4	1	1		6
Shape A.....	6	12	17	2	37
Shape A-1.....	15	3			18
Shape B.....	3	4	4	1	12
Shape B-1.....			1		1
Shape C.....	3	2			5
Shape D.....	Round bowl sherds present, but not definitely identifiable				
Shape E.....	7	4	1		12
Shape i.....		1			1
Shape k.....		1			1
Modeled head lugs on rim, class b.....	5				5
Modeled head lugs on rim, unclassified.....	4				4
Modeled figures on vessel wall, class b.....	1				1
Modeled figures on vessel wall, class c.....	5				5
Modeled figures on vessel wall, class d.....	2				2
Incised decoration, class a.....	1				1
Incised decoration, class b.....	4				4
Incised decoration, class c.....	5				5
Painted decoration.....	2	22	12	3	39

Shell Level types which do not appear in the mound B collections are listed as follows:

- Miscellaneous rare shapes f, g, h, j, and i.
- Modeled head lugs on rims, classes a, c, d, and e.
- Modeled figures on loop handles, classes a and b.
- Modeled figures on vessel walls, class a.

It will be noted that the types absent from mound B are those which are absent from mound A. Most significant of these are the bat-heads and the modeled figures on loop handles.

Sherds with red painted decoration are also numerous in mound B collections, and are of the same type as the red painted sherds in mound A.

A distinctly new type of modeled zoomorphic figure was found on a few Crude Ware sherds. These figures are modeled in the round and applied to the rim of round bowl sherds. Heads and forelimbs are represented in such a manner that the creature appears to be crawling over the rim into the vessel. In general composition the figures resembled the usual modeled "adornos" found on Shell Level pottery, but the added forelimbs and the position on the rim distinguish them from other Shell Level types.

POTTERY OF CRAB LEVEL TYPE IN MOUND B

The following chart lists those pottery types identified with the Crab Level in Canas which are found in the collections from mound B at Monserrate. The depth in the deposit is indicated in centimeters. The numbers refer to identifiable sherds.

Depth in cms.	0	25	50	75	100	125	150	Totals
	to 25	to 50	to 75	to 100	to 125	to 150	to 175	
Shape A or B.		1	3	3	2			9
Shape F.			1	1	1			3
Plain Brown Ware.		4	16	32	18	3	2	75
Plain Brown Ware, class b.				1	2	4		7
Red Painted Ware, class a.		3			7	3	2	16
Red and White Painted Ware, class a				2	6	6	2	17
D-shaped handles, 1st class.		1	3	6				10
D-shaped handles, 2nd class.					5	7	1	13
Rectangular lugs.				3	2	2		7
Perforated knobs.				3	1	1		5
Modeled head lugs, type a.					2		1	3

Crab Level types which do not appear in the mound B collections are as follows:

- Shapes C, D, E, G, H, I, J, and L.
- Plain Brown Ware, class a.
- Red Painted Ware, classes b and c.
- Red and White Painted Ware, classes b, c, and d.
- D-shaped handles, 3rd and 4th classes.
- Semi-lunar lugs.
- Modeled head lugs, types b and c.

Since the classification of Crab Level shapes was based on a few complete or partially complete vessels found at Canas, and since complete vessels found in mound B were very rare, a correlation of shapes is not very significant. As mentioned before, the determination of vessel shapes from sherds of Crab Level type is difficult and subject to much error. The significant fact remains, however, that boat-shapes are absent and that rim sherds, for the most part, indicate round vessels with wide flaring rims.

The types of ware and the elements of ornamentation which are missing in mound B were rare in the Canas deposit. Red and White Painted Ware, which is the most striking element of Crab Level pottery, is not abundant in mound B collections, but enough sherds are present to show a marked similarity with those found at Canas. White is in all cases applied over red and both colors are applied over a polished or slipped Brown Ware. Negative designs in red and positive designs in white make up geometric patterns. Panels of decoration, a series of crosses in white paint, and the spool-shaped figure appear in the mound B sherds, which definitely correlate with similar design elements found on sherds in the Canas collections. The paint is less vivid than that found at Canas and in many cases is partly disintegrated. In this respect the painted sherds resemble those found at Coto.

A unique type of vessel is represented by a single fragment found at a depth of 75-100 centimeters. The fragment is a hollow effigy head of a human being, the neck of which apparently formed the neck of a jar. A prominent nose and brow ridges are modeled in relief. The eyes are represented by two round punctures and the mouth by a long straight slit. Prominent rectangular and engraved ears are appended. A hole 2 centimeters in diameter passes through one ear to the interior of the effigy and has the appearance of a spout, or hole, for pouring. The object is 10 centimeters from ear tip to ear tip and is 5 centimeters deep. The piece may be the upper section of an

effigy water jar similar to those found in Santo Domingo, but the features are on the top surface and not on the side. Strangely enough, the object suggests a clay lamp with the perforated ear forming a wick aperture, but there is no precedent for this in West Indian collections. It is of hard, thin, slipped Brown Ware and was associated with Crab Level pottery.

A comparison of the charts on page 88 and on page 89 will indicate that Shell Level types dominate in the upper 75 centimeters of the mound, while Crab Level types dominate in the lower 75 centimeters. During the excavations clear stratification of refuse was found in the central sections of the deposit only, and it was observed that in these sections Shell Level types were limited entirely to the upper level, and Crab Level types entirely to the lower level. This complete segregation does not appear on the charts since all the pottery from the mound has been presented as a unit and the arbitrary levels of the chart do not conform to the levels of deposition. Furthermore, near the edges of the mound there was an obvious confusion of refuse levels and an intermixture of Shell Level and Crab Level pottery types.

ASSOCIATED ARTIFACTS IN MOUND B

Mound B, like mound A, produced shell, and stone objects which to a large extent duplicate those found in the Shell Level at Canas and at Coto. All but 6 of these (5 shell discs, 1 shell hoe) were found in the upper 75 centimeters of deposit with Shell Level pottery.

A shell spoon and 2 white patinated chert celts were found in the lower level, or sub-stratum, with Crab Level pottery. Similar objects were found in the Crab Level at Canas. Rubbing stones and worked manati ribs found in the lowest level in mound B were found in both Shell and Crab Level at Canas.

There were 9 unusual petaloid stone celts found in the lowest 75 centimeters. These have the petaloid shape characteristic of all Shell Level celts but they remain unpolished. The facets of a flaking process of manufacture can be seen on the surfaces, and no section has been rubbed or polished. The implements are regularly made and symmetrically shaped. The curved bits are relatively sharp. In general appearance they resemble a well-flaked flint celt.

A unique object found at a depth of 50 centimeters resembles the artifacts generally referred to as pottery stamps. It is made of baked clay and in outline is midway between a bell and a cone-shape. On the broad end is an engraved pattern composed of straight lines and punctures. It is 6 centimeters in length and 5 centimeters in diameter

at the flaring base. Since none of the pottery found is ornamented with a stamped design, in all probability the object is not a pottery stamp, but it may have been used for some other stamping process. It is remarkable that no other object of this kind was found in all the excavations undertaken.

The following chart indicates the distribution of shell, stone, and bone objects in the deposit of mound B at Monserrate.

Depth in cms.	0	25	50	75	100	125	Total No.
	to 25	to 50	to 75	to 100	to 125	to 150	
Shell chisels.....	2	1	1				4
Shell celts.....	2	1	1				4
Shell hoes.....		2	1	1			4
Problematic shell implements.....	11	1					12
Shell discs.....		1	2	3	2		8
Shell discs perforated.....		1	1				2
Shell rattles.....		2					2
3-pointed stones.....	1						1
Rubbing stones.....	1			2	2		5
Petaloid stone celts—polished.....	19	9	15				43
Petaloid stone celts—flaked.....				4	4	1	9
White patinated chert celts. Crab Level type.....				1	1		2
Shell spoons. Crab Level type.....				1			1
Worked manati ribs.....	2	3	1	2	1		9

POTTERY OF CRAB LEVEL TYPE IN MOUND E

The chart on page 93 lists those pottery types identified with the Crab Level at Canas which are found in the collections from mound E at Monserrate. Depth in the deposit is indicated in centimeters. The numbers refer to identifiable sherds and in some cases to complete or partially complete vessels.

Crab Level types which do not appear in the mound E collections are as follows:

- Vessel shapes C, D, G, H, I and J.
- Plain Brown Ware, class a.
- Red Painted Ware, classes b and d.
- Red and White Painted Ware, classes b, c, and d.
- D-shaped handles, 3rd and 4th classes.
- Perforated knobs on vessel walls.
- Modeled head lugs, types a and c.

The vessel shapes and types of ware which are absent, were rare in the Canas collections. D-shaped handles of the 3rd and 4th classes

Depth in cms.	0	25	50	75	100	125	Total No.
	to 25	to 50	to 75	to 100	to 125	to 150	
Shape A or B.....		4	5	3	3		15
Shape A.....				1			1
Shape B.....		2	2	4			8
Shape E.....		1					1
Shape F.....	1	1	3	2			7
Shape K (Griddles—not distinguished from Shell Level type).....	1		1	1			3
Plain Brown Ware.....	9	24	30	17	14	5	99
Plain Brown Ware, class b.....		1					1
Red Painted Ware, class a.....	2	19	15	7	8		51
Red Painted Ware, class c.....			3				3
Red and White Painted Ware, class a....	1	1	4	1			7
D-shaped handles, 1st class.....	5	10	13	13	3	4	48
D-shaped handles, 2nd class.....	1		1	2		1	5
Rectangular lugs.....		4	5	3	2		14
Semi-lunar lugs.....	1						1
Modeled head lugs, class b.....		2					2

were also rare, but perforated knobs on vessel walls were common. Their absence in mound E collections may be significant. Half the material removed from mound E was sent to the University of Porto Rico and has not been studied so that the correlations are not exact.

Three unusual modeled head lugs were found at a depth of 75 centimeters in mound E. All of them clearly represent turtle heads, and fore-flippers are modeled on the vessels at each side of the heads. The figures, with eye punctures and mouth slits, are applied about one inch below the lip on the outside of round bowl sherds with red painted rims. The sherds are Crab Level Red Painted Ware, class a. The fragments apparently represent bowl shapes A or B.

Another unique object is a three-legged disc-shaped vessel. A slightly concave disc 10 centimeters in diameter rests on three solid legs 2 centimeters high. It resembles a miniature griddle on legs. The center of the top surface of the disc has been burned black and has partly crumbled. It has the appearance of a crucible on which a hot flame has been concentrated. The object is light brown in color and resembles the usual Plain Brown Ware of the Crab Level.

A miniature boat-shaped vessel 6 centimeters in length and 2 centimeters high was found at a depth of 1 meter. The rim of the vessel rises to a peak at each end and one of these peaks is perforated. It is irregularly made and poorly fired. This tiny boat-shaped vessel is peculiarly significant in a mound which contained pottery of Crab

Level type only, since boat-shapes normally are not associated with Crab Level pottery.

A sherd in the form of a vessel spout was found at a depth of 1.25 meters. It is 3 centimeters long and 1 centimeter in diameter, and is slipped and polished Brown Ware. The object quite definitely represents a vessel spout since a small segment of the wall remains, but nothing of the complete shape or position on the wall can be determined.

With the exception of the 4 bowls of Shell Level type, found associated with a burial, which have been referred to in the section concerning excavations as intrusive, and the miniature boat-shaped vessel, all pottery found in mound E is of Crab Level type. Some of the types established at Canas are absent and there is some variation within the types recorded but, as a whole, the pottery correlates very closely with that in the type site. A comparison of the charts indicating the Crab Level types in mound B and in mound E will show an even closer similarity, and the assumption has been made that the deposition of mound E and of the lower levels of mound B was contemporaneous.

ASSOCIATED ARTIFACTS IN MOUND E

Numerous objects of shell and stone found in mound E introduce something of a problem. The 2 shell chisels, 8 shell discs, and 9 polished stone celts are types of artifacts which have been correlated with the Shell Level deposit in Canas, Coto, and in mounds A and B. The pottery of mound E is all of Crab Level type.

The 5 shell spoons are the same as the one found in the Crab Level at Canas and two found in the Crab Level of mound B. The other shell and stone objects and the worked manati ribs are not distinctive of either level.

This association of a few shell and stone objects of Shell Level type with Crab Level pottery in a mound which was composed of an intermixture of marine shells and land crab shells, is difficult to interpret in relation to the deposits at Canas and in mound B. If the deposit of mound E was contemporaneous with the early deposit in mound B, which is definitely indicated by the pottery types, then some Shell Level implements may have been in use during this early period. It is not entirely impossible, however, that these implements were intrusive from a late occupation. Refuse of the late occupation was found scattered over the entire site and the refuse in the top 25 centimeters level was obviously the same as that in the entire deposit of mound A. This refuse was primarily marine shells, but in the upper

25 centimeters of mound E only a few scattered artifacts were found. Some intrusion into the lower levels of mound E would be possible as the discovery of a burial associated with Shell Level pottery has shown. This may be, however, the interpretation of the nature of the deposition in mound E remains an embarrassing problem.

There are 21 rough-flaked petaloid stone celts which were found in mound E, and are similar to implements of this kind found in mound B. They have the shape of the Shell Level polished petaloid celts but the surfaces remain with the facets of a flaking process. The number found precludes the possibility that these implements were the common petaloid celts in the process of manufacture and indicates that they were in use during the early period of occupation. Rough-flaked celts of this kind were found only in the lower or Crab Level of mound B and in mound E. No objects of the kind were found in mound A or in the deposits of Barrio Canas and Barrio Coto.

The following chart indicates the distribution of objects of shell, stone, and bone in the deposit of mound E, at Monserrate.

Depth in cms.	0	25	50	75	100	Total
	to 25	to 50	to 75	to 100	to 125	
Shell chisels				2		2
Problematic shell implements		11	3	1	1	16
Shell spatula		1				1
Shell discs		1	5			6
Shell discs perforated		1	1			2
Shell rattles		4		2		6
Shell spoons		2	1	1	1	5
Petaloid stone celts polished	2	5	2			9
Petaloid stone celts rough-flaked		9	4	5	3	21
Rubbing stones	1					1
Worked manati ribs		2	2	2		6

CONCLUSIONS

Excavations in Barrio Monserrate were limited to three low mounds of the five which appeared in an extensive area strewn with the refuse of prehistoric occupation. These mounds have been referred to as A, B, and E.

Mound A was composed of culture refuse which was similar to that found in the Shell Level at Canas. Marine shells made up the bulk of the food refuse and the artifacts were of Shell Level type. Some variation in the deposit could be determined. The upper levels con-

tained a great mass of food refuse and large quantities of potsherds and associated artifacts, but no burials. Below this was an indistinct stratum containing markedly less culture refuse but numerous primary flexed burials and several child urn burials. The last 40 to 50 centimeters of deposit contained still less refuse and a large number of primary flexed burials often lying so closely associated that one skeleton could be distinguished only with difficulty from another. There were no urn burials in this lowest stratum. No marked distinctions in types of artifacts could be determined in the levels and all pottery and associated artifacts found throughout, to a large extent, duplicated those found in the Shell Level at Canas.

Mound B definitely indicated two periods of occupation. In the central sections of the mound, a distinct stratum of land crab shells was found below the stratum of marine shells. The lower stratum contained pottery which was entirely of Crab Level type as established at Canas, and the upper stratum contained pottery which was of Shell Level type. Burials were unusually rare in mound B.

Mound E, as a whole, contained much less culture refuse than the other two mounds. The surface 20 to 25 centimeters were composed of humus interspersed with marine shells and scattered land crab shells. Below this, marine shells appeared in small numbers and land crab shells were numerous, but were not found in masses as at Canas and in mound B. Only a few scattered sherds were found in the first 20 to 25 centimeters of deposit, and below this, sherds and associated artifacts were more numerous but relatively scarce. Practically all pottery found was of Crab Level type. Some of the associated artifacts were of Crab and some were of Shell Level type. Only a very few burials were found.

All Shell Level types established at Barrio Canas were not found at Monserrate. Most significant of these were the bat-head "adornos" and the modeled figures on broad loop handles. These were absent from mound A as well as mound B. Pottery with crude curvilinear designs in red paint was abundant in the marine shell deposits of both mound A and mound B. Only six sherds of this type of ware were found in the Shell Level at Canas. With these exceptions and also with the exceptions of a few rare pieces, the marine shell deposit at Monserrate duplicated the marine shell deposits at Canas.

Crab Level types of pottery found in the sub-stratum of mound B were the same as those found throughout mound E. A few of the Crab Level types established at Canas were absent. Most significant of these were Red and White Painted Ware, classes b and c, and the

perforated knobs on vessel walls. The great majority of the types were present. Red and White Painted Ware was not abundant but the technique and the elements of design on the sherds that were found resembled those on the sherds of this kind from Canas. Only three types of associated artifacts were distinctive of the Crab Level at Canas. Two of these types, shell spoons and white patinated chert celts, were found at Monserrate. Rectangular adze-like celts were absent. A new type of artifact found in mound B and mound E was associated with Crab Level pottery. This type is a petaloid stone celt which in shape resembles the petaloid celt of the Shell Level, but which is distinguished by the fact that the surfaces retain the facets of a flaking process, and are not rubbed or polished smooth like the petaloid celts of the Shell Level. With the exceptions recorded above, the Crab Shell deposit of mound B and the intermixed marine and land crab shell deposit of mound E duplicate the Crab Level deposit at Canas.

From these facts it has been concluded that the site at Monserrate as a whole, illustrates the same two periods of occupation and the same distinct cultures discovered in the deposit at Canas. Stratified deposits were found only in mound B. Mound A correlates with the late period and mound E with the early period. Test pits disclosed that late period refuse was scattered over the whole site. The extent of the early period deposits could not be determined since only three of the five mounds were excavated. It is unfortunate that only a small portion of the northern end of mound B could be removed because of the house and garden occupying the major part. The amount of early period deposit appeared to be increasing toward the center of the mound and it is possible that further excavations would disclose the largest deposit of the early period yet found.

Additional Excavations in 1935

An opportunity for limited excavations presented itself in the summer of 1935 while the writer was engaged in teaching a course in archaeology during the six weeks summer term at the University of Porto Rico. In July, test pits and trenches were cut through four ball-courts or "juegos de bola" in the vicinity of Orocovis which is approximately at the center of the island in the high mountainous region. This work was conducted in cooperation with the University of Porto Rico and one of the objectives was the collection of material to be used in a proposed archaeological museum for that institution. The material obtained from test cuts in the ball-courts of the interior

was so limited that it was deemed advisable to carry on excavations at Monserrate during August, where museum material could be obtained. Nine days, therefore, were spent in continued excavations at the site in Barrio Monserrate which had been partially excavated the preceding summer. All objects removed from the ball-courts and from the Monserrate site in 1935 were deposited with the University of Porto Rico and have not yet been studied in detail. It is not possible, therefore, to present a description and analysis of this material comparable to that presented in the preceding section. During the excavation, however, the material was classified to some extent, and notes were made recording the various types represented. A brief description of these excavations and collections is included here since some interesting information was obtained regarding the relation of certain types of sites on the island.

BALL-COURTS IN THE MUNICIPALITY OF OROCOVIS

The aboriginal structures known locally in Porto Rico as "juegos de bola" and described by Dr. J. W. Fewkes as Indian dance grounds, are numerous in the region about Orocovis and Barranquitas, municipalities in the central part of the island. Most structures of this kind are found at the present in the interior, but it is highly possible that more intensive cultivation along the coastal regions has destroyed similar structures in those areas. Those which remain are usually rectangular depressions in the soil outlined by embankments or rows of oblong stones set on end. Many of these stones are engraved with petroglyphs, some of which have been described by Dr. Fewkes, J. Alden Mason, H. K. Haerberlin and Adolfo de Hostos. In some cases the stones have been removed from the site or piled up in a heap to allow for cultivation so that the original contour of the ball-court is difficult to determine, but in most cases some depression remains, indicating the original structure.

Locating at the village of Orocovis, Mr. Arturo Morales Carrión of the University of Porto Rico and the writer found four ball-courts suitable for excavation. One is on the outskirts of the village of Orocovis, two are in Barrio Sabana, and one in Barrio Pelleja. All are in the municipality of Orocovis. With the aid of Federal Relief Administration laborers we cross-cut all of these courts with trenches and series of pits in an attempt to find refuse deposits of aboriginal occupation. No attempt was made to excavate completely or to determine the original form of any one of these courts as the objective was the discovery of refuse material which could be compared with

that found in the large midden deposits of the coasts. The test cuts were made so that they would not destroy or disarrange the alignments, and they were filled in later to preserve the structures intact. Trenches and pits were also dug through the fields surrounding the courts and in all mound-like eminences which appeared to be in relation to the court. All artifacts removed were segregated according to their depth in the soil and their position in and around the structure.

BARRIO OROCOVIS.—The ball-court in the outskirts of the village is a rectangular depression measuring 35 by 40 meters. It is surrounded by low embankments approximately 50 centimeters high. A few oblong stones remain in position bordering the depression and there are several piled up at one side. Test cuts dug across the court and through the bordering embankment reached sterile undisturbed soil at a depth varying between 25 centimeters and 1 meter. The only cultural remains encountered were scattered potsherds which were not associated with charcoal, shells, bones, or other refuse of occupation. Trenches and test pits in the area surrounding the court also disclosed a few scattered sherds in otherwise sterile soil. Approximately 14 meters from the southern end in a flat area outside the court, however, a fire pit was encountered which produced abundant charcoal, ashes, and potsherds, but no shell or bone refuse. This pit was shaped like an inverted cone and was 1.5 meters in diameter 25 centimeters below the surface, tapering down to a point at a depth of 1.5 meters.

Approximately 1000 small sherds were found in and around this court, of which some 900 were encountered in the fire pit. As far as can be judged from observations during the excavation, all of these are types common to the Shell Level deposits of the coast. The bulk are the familiar crude ware but a few are Red Slipped Ware. Fragments of boat-shaped bowls with loop handles, and of shallow boat-shaped bowls with bat-head and human-head "adornos," sherds bearing modeled heads and arms in low relief, and incised decoration similar to that of the Shell Level, quite certainly indicate that the pottery as a whole conforms to that found in the Shell Level of the coastal middens. A polished petaloid stone celt found in the fire pit is also typical of the Shell Level. An unusual object found in the pit is undoubtedly a segment of a stone collar, a type of artifact which is not uncommon in Porto Rican collections, but which was not found during the 1934 excavations.

BARRIO PELLEJA.—The structure in Barrio Pelleja is apparently composed of two ball courts. One is a rectangular depression measur-

ing 17 by 28 meters with embankments and rows of oblong stones along both sides and one end. About 30 meters from one corner of the first court there is another rectangular depression measuring 10 by 12 meters which is marked by a low embankment on three sides; there are no stones. The two courts are on a broad terrace about 30 meters below the top of a mountain. Test trenches were dug across both courts, through a low mound near the first court, and outside of both courts through the surrounding terrace. Numerous pits were also dug in and about the depressions.

Approximately 500 very small potsherds were found in the pits and trenches in and about the courts at a depth never greater than 30 centimeters. No charcoal, shells, bones or other refuse of occupation were encountered. All sherds are of a very crude ware which is apparently similar to that found in the Shell Level deposits of the coast. A loop handle with raised ears, a few incised sherds, and a sherd with a worm-like decorative motive in relief indicate pottery types characteristic of the Shell Level deposits.

BARRIO SABANA, COURT No. 1.—The first court examined in Barrio Sabana has been almost completely destroyed by cultivation. Many of the stones which outlined the structure within the memory of natives of the barrio, remain piled up in the vicinity of the court, but its original size and form can no longer be determined. Dr. Montalvo-Guenard of Ponce examined this court several years ago and removed stones bearing petroglyphs which are now in his collection.

Test pits and trenches dug in and around the remains of the structure disclosed scattered sherds to a depth not greater than 50 centimeters, but no shells, bones, charcoal, or other culture refuse was found. Of the 120 small sherds encountered only three bore decoration of any kind. One of these was ornamented with the line and puncture design and the other 2 with the vertical parallel incision about the rim, incised designs characteristic of Shell Level deposits. All pottery was of the Crude Ware type. A fragment of a polished petaloid stone celt was also found.

BARRIO SABANA, COURT No. 2.—A second court in Barrio Sabana which lay about 2 kilometers from the first, was tested under the direction of Arturo Morales Carrión. The drawings and descriptions of this court indicate that it is similar in size and shape to the largest rectangular court in Barrio Pelleja. Some of the bordering stones still remain. Trenches and pits again cut through and around the court all produced scattered sherds which were not associated with other refuse of occupation.

The potsherds, which were found at a depth never greater than 25 centimeters, were much more numerous than at the other three courts, numbering approximately 2400. The great majority are very small fragments but there are 22 large rim sherds and 255 large and small sherds bearing incised decoration. All pottery is of the Crude Ware type found in the coastal Shell Levels. Fragments of boat-shaped bowls, sherds with a worm-like figure in relief and with arms and zoomorphic heads in relief, and sherds with the familiar line and puncture incision indicate pottery types similar to those found in the Shell Level of the coastal middens. A large number of the incised sherds, however, bear complicated incised patterns unlike anything previously found. Most of these designs are composed of straight and curving lines included in a panel about the vessel rim. The line and puncture motive is present but it is often associated with circles and ellipses. A striking element of these designs is a circle or an ellipse enclosing a central puncture (PLATE 7, FIGURE 2). These elaborate incised sherds, although bearing some elements found on coastal pottery, distinguish the Barrio Sabana No. 2 court from the other three excavated and introduce a curious problem in the explanation of the relation between ball-court sites and the large shell middens.

SUMMARY OF THE BALL-COURT EXCAVATIONS.—The only evidence of permanent occupation in association with a ball-court was found during the excavation of that court which lay on the outskirts of the village of Orocovis, and here the refuse was limited to a single fire pit. Although excavation at each site was by no means exhaustive, it is relatively certain that these ball-courts were not the center of a camp or village and that they were used only temporarily, possibly, as Dr. Fewkes suggests, for ceremonial performances. No burials were found in association with these courts as at the court near Utuado excavated by Dr. Fewkes (1907: 83). The absence of cultural refuse other than scattered potsherds conforms to the conditions existing at all the courts near Utuado excavated by Fewkes, Mason, and Aiken.

Although a thorough study of the pottery removed from the courts investigated has not been undertaken, observations made during the excavation suggest that the majority of the sherds are very similar to those found in the Shell Levels at Canas, Coto, and Monserrate. The elaborately incised sherds found in Barrio Sabana, court No. 2, however, are an exception, bearing unusual designs in combination with the familiar line and puncture elements in a panel about the rim. Further excavations of the numerous ball-courts in Porto Rico are necessary before definite correlations between ball-courts and coastal

shell middens can be made, but the pottery found in the test cuts through these four courts in the municipality of Orocovis suggests that they were built and used by the people who deposited the Shell Level material on the coast.

CONTINUED EXCAVATION AT MONSERRATE

At the re-opening of the Monserrate site in August, 1935, most of the members of the 1934 crew of Federal Relief laborers reported for work, and excavation proceeded with the system used during the preceding summer. All deposit was removed in 25 centimeter levels and the artifacts were segregated according to their depth and section in the mounds. One of the objectives in additional excavation at this site was the recovery of complete skeletal material and with this in view the remaining section of mound A was removed since it had produced numerous burials in 1934. At the same time a second crew was set to work running a trench across the shore side of mound D which had not been opened during the preceding summer. As stated above, the specimens removed were deposited with the University of Porto Rico and have not been studied, so that it is not possible to include their description with the preceding analysis of the Monserrate site.

MOUND A.—The specimens removed from the remaining part of mound A were classified to some extent and recorded during the excavation. The pottery and associated objects were as a whole similar to those artifacts removed in 1934 and so far as observed were of the Shell Level types. Burials were rare in this section of mound A, and those which were found were almost entirely disintegrated. Two burial urns containing bones of children were found between 75 and 100 centimeters in depth, but these also were much disintegrated.

There were 6 objects found in this section, however, which were quite different from any found in 1934 and these merit particular attention.

Four of these objects are fragments of massive but well-formed stone collars. Three were found in the surface 25 centimeter level and 1 at a depth of 1.5 meters, below the water level and at the base of the mound deposit. Stone collars are relatively numerous in surface collections from Porto Rico and many have been described by Dr. J. W. Fewkes, O. T. Mason and Adolfo de Hostos, but no objects of this kind were found in any of the sites excavated in 1934. All the fragments are small, varying in length from 10 to 14 centimeters and in diameter from 8 to 10 centimeters. None is ornamented with carved

figures as are many in the collections, and all the fragments indicate the massive, undecorated stone collars described by Fewkes (1922).

The fifth unusual object is a carved stone figure representing a human or mythical being (PLATE 7, FIGURE 1). It is 11 centimeters high and executed in the round. The features of the face are formed by deeply incised grooves and sockets which combine to reproduce the semblance of a human face with deep set eyes, a prominent nose, and a broad smile. A head-dress surmounts the brow and, apparently, continues on down each side of the face. The shoulders are prominent and the arms akimbo, with the hands, represented by incisions, resting on the body at each side of a protruding belly. The legs are merely short stumps. Over the whole body, both front and back, are engraved curious and intricate patterns composed of circles within circles, punctures, parallel lines, V-shaped figures and ellipses. The protruding belly suggests the representation of a pregnant woman but breasts and sex organ are absent.

The figure is cut from sandstone and was found at a depth of approximately 50 centimeters. Both the composition and the fine decorative incisions indicate a technique of stone carving rather foreign to the Shell Level material as a whole.

The sixth unusual object is a large rim sherd of crude ware which bears an elaborate incised design similar to those found in the Barrio Sabana ball-court No. 2. This was found near the base of the deposit at a depth of approximately one meter. The design forms a panel just below the rim and contains a double circle, at the center of which is a single puncture. In association with the incised pattern is a worm-like figure modeled in relief. This is the only sherd found in any of the coastal middens excavated which closely resembles the incised sherds from the Sabana ball-court.

MOUND D.—A trench 3 meters wide and 24 meters long which was cut the length of mound D on the side nearest the shore exposed a deposit of shell refuse similar to that found in other mounds at Monserrate and described in the section dealing with the 1934 excavations of that site. The upper 50 to 75 centimeters contained masses of marine shells and artifacts which, so far as noted, were largely of Shell Level types. The lower refuse extending from 75 to 125 centimeters in depth was composed primarily of land crab shells with some intermixture of marine shells, and contained artifacts which were largely of Crab Level types. A thorough analysis of the material is, of course, necessary before this stratigraphy of types can definitely be related to the similar stratigraphy in mound B, but the conditions as

observed during the excavation were very similar to those found in mound B. A second trench, begun but not entirely completed, was cut paralleling the first and extending through the approximate center of the mound. Marine shell deposit in this trench reached a depth of only 25 to 50 centimeters and below this there was a mixture of marine shells and land crab shells which gradually gave place to a straight land crab shell deposit at the lower levels. It was observed that there was a noticeable intermixture of Shell Level and Crab Level artifact types in this section of the mound. With the termination of work in mound D it could be seen that the bulk of the deposit on the shore side of the mound was made up of marine shells while that on the inland side was primarily composed of land crab shells, but in all sections removed some land crab shell deposit lay below the marine shells. The significance of the intermixture observed in mound D can only be determined by an analysis of the specimens.

CONCLUSIONS

The surface collections from Porto Rico described by O. T. Mason (1877), J. W. Fewkes (1922), and Adolfo de Hostos (1923, 1924, 1926) include stone collars, elbow stones, three pointed stones ("zemis"), stone masks, stone pestles, stone seats ("dujos"), and engraved celts. Many artifacts of this kind demonstrate a highly developed technique of stone carving. Elaborately carved stone objects are extremely rare in the collections from the excavations. During the excavations of 1934 miniature three-pointed objects of shell and stone were found in the Shell Culture deposit at all three sites. These have the same outline as the well-known three-pointed stones, but they are much smaller and are not carved to represent zoomorphic figures as are the large objects in collections, upon which the familiar types are based. Small stone figures carved to represent some zoomorphic being in a flexed position were also found in the Shell Culture deposits, but stone collars, elbow stones, large carved three-pointed stones, masks, pestles, seats and engraved celts did not appear. The absence of these carved objects from the midden deposits suggested that they may have been made and used during a subsequent period, since all have been found on the surface or plowed up in fields. A third "problematic recent period" was hypothesized on the basis of the presence of these objects in surface collections and their absence in the Shell Culture deposits (Rainey 1935).

In the excavations of 1935 a fragment of a stone collar was found in the ball-court at Barrio Orocovis and four more fragments were found

in the Shell Culture deposit of mound A at Monserrate. Also an elaborately carved stone figure (PLATE 7, FIGURE 1) was found in the Shell Level at Monserrate, mound A. The discovery of these fragments of stone collars, although they are not engraved with figures, and of the carved human figure, in deposits of the Shell Culture tend to show that the existence of a third or "problematic recent period" is less likely. The fact remains, however, that the technique of stone carving evidenced by many of the carved stones in surface collections is far beyond anything found in the middens and there may be some basis for assuming a third and more recent culture or phase in which these carved stones were made. The large carved three-pointed stone zemis, for example, may be a late development of the miniature three-pointed stones found in the middens. The designation of a cultural period on largely negative information is dubious, and it must remain for further investigation to determine the relation between the advanced stone carvings and the culture complexes represented in the coastal middens.

General Conclusions

Three major archaeological sites were excavated during the first season's work in Porto Rico. The first of these was in Barrio Canas on the southwest coast of the island. The second was in Barrio Coto on the northwest coast, and the third was in Barrio Monserrate on the northeast coast. The three sites were chosen from a large number located, because they were extensive refuse deposits with a greater depth than ordinarily encountered in Porto Rican sites. Also it was thought advisable to excavate in three widely separated regions so that the collections would represent regional variations should such exist. There are three kinds of prehistoric sites found throughout the island, which may be termed shell heaps or middens, cave dwellings, and "juegos de bola" or ball-courts. All of the sites excavated during the first season are of the first kind. Ball-court sites are still found in the interior mountainous regions, and cave dwellings both along the coast and in the interior. Surprisingly enough, shell heaps or middens are often encountered many miles inland separated from any body of water, but generally when so situated are not extensive.

The site in Barrio Canas was an extensive midden site located 3 kilometers from the shore in a fertile plain. Several low mounds could be distinguished in an area of refuse covering several acres. Excavation was primarily limited to one mound which was roughly oval in shape and approximately 65 meters in length with an elevation of 2 meters. A large part of the mound was composed of food refuse which

was principally marine shells; but below the marine shells at the western end was a sub-stratum of refuse primarily composed of land crab shells. Artifacts removed from these refuse levels were for the most part potsherds, associated with which were objects of shell, stone, and bone, complete and fragmentary. The artifacts found in the sub-stratum were of types distinct from those in the large marine shell deposit above. A study of the collections has resulted in the conclusions that two prehistoric cultures are represented. Furthermore, it is probable that some time elapsed between the two periods of occupation since traits characterizing the early culture were not carried over or combined with traits characterizing the late culture.

The site in Barrio Coto covered a low hill at the center of a valley about 2.5 kilometers inland. No mounds could be distinguished. Food refuse was primarily terrestrial gastropod shells, but some land crab shells and scattered marine shells were also present. The deposit reached a depth of 1 meter in a limited area, and in this section an indistinct sub-stratum of yellowish soil contained cultural artifacts similar to those found in the sub-stratum at Barrio Canas. The bulk of the deposit contained artifacts which, as a whole, correlated with those in the marine shell deposit at Canas, but it also contained scattered objects similar to those in the Canas sub-stratum. The nature of the deposition remains a problem, but due to the fact that considerable disturbance had taken place in the deposit, it was tentatively concluded that two periods of occupation were indicated, and that all Canas Crab Level type artifacts had been deposited during an early period. A study of the collections from Barrio Coto disclosed that the great majority of the types of pottery and associated artifacts found in the marine shell deposit at Canas were also present in the upper levels at Coto. Distinctive decorative motives on pottery, vessel shapes, types of ware, and distinctive implements of stone, shell, and bone illustrated a close cultural connection. The majority of the types of artifacts found in the sub-stratum at Canas were also found in the sub-stratum, or scattered through the upper levels, at Coto. These types correspond to such a degree that a definite cultural connection during the early period of deposit was likewise illustrated.

In Barrio Monserrate three mounds of cultural refuse which appeared in a wide area of occupation were excavated. One of these was primarily composed of marine shells and contained cultural artifacts which correlate with those found in the Shell Level at Canas and in the upper levels at Coto. Another was built up of land crab shells, scattered marine shells and earth. It contained artifacts of

types associated with the Crab Level at Canas and the sub-stratum at Coto. The third mound demonstrated two periods of occupation with a stratum of land crab shells below a deposit of marine shells. This mound duplicated the conditions at Canas with the artifacts of each level corresponding. The site as a whole illustrated two periods of occupation similar to those periods recognized at Canas and at Coto. A comparison of the artifacts has shown that all major and the majority of minor types reappear in the Monserrate deposit and indicate cultural affiliations between this site and the other two, during both periods of occupation.

The correlations of the material from each of the levels or periods of occupation, each midden, and each site have been based on distinctive types such as Red and White Painted Ware, modeled head lugs representing the bat, definite types of boat-shaped bowls, and so forth. There is naturally, some variation in the objects grouped under a type heading, but the objective has been to limit a type to such a degree that all specimens included have a real and definable similarity. Thus, a modeled head lug, class a, is a distinctive unit which is characterized by a number of single elements. When the charts show the presence of modeled head lugs, class a, in the Coto deposit they refer to objects which cannot be distinguished from a class of objects found at Barrio Canas. The presence of the majority of these types at Coto indicates a real connection between the collections removed from the two sites. In other words, the repetition of these types in Coto and Monserrate deposits unquestionably demonstrates that the same complex of traits of material culture prevailed, and that, in the archaeological sense, the cultures distinguished at Canas reappear at Coto and Monserrate.

From these correlations the following conclusions have been made.

Porto Rico was occupied at an early period by a population with an advanced technique of pottery manufacture which is particularly characterized by the use of Red and White paint in the ornamentation of vessels. Shell and stone implements were used, and of these the most common was a rectangular adze-like stone celt. The food of these early people was to a large extent the land crab (*Cardisoma guanhumí*) but manatis, hutias, fish and birds were also eaten. It is probable that they were primarily an agricultural people since fragments of the griddles, or burens, used for the cooking of manioc at the time of the conquest, were numerous in the deposits. Excavations have shown that this early population inhabited the northeast, northwest and south coast so that it is possible to assume that they inhabited the

entire coast line. Since the artifacts left by this early population were commonly found in a deposit of land crab shells and have been termed Crab Level type, the name Crab Culture is used in the following discussion to refer to this early group.

An immigrating population succeeded the early group probably after some lapse of time. Their material culture is characterized by a less well-developed technique of pottery manufacture and a more extensive use of shell and stone implements. Pottery was in common use but was for the most part rough, coarse, crude, and unpainted. Polished petaloid stone celts, numerous shell celts and hoes, and a limited number of carved stone figures were associated with this pottery and contrast with the associated artifacts of the Crab Culture. The food of this late population was essentially marine shell fish but manatis, lutias, fish and birds were eaten as they were in the early period. It is probable that agriculture was practiced since the manioc griddles were in common use. Cultural remains of this late group have been found overlying Crab Culture deposits at all three sites excavated, and it may be assumed that this new group settled the whole coast, at least. The general complex of traits characterizing this late occupation is that which has been referred to in archaeological literature as the Arawak culture. The association of an historical linguistic stock with this archaeological culture has not yet been demonstrated. The use of the term Arawak has come from the historical account that Arawak speaking peoples occupied Porto Rico at the time of the conquest, and it has been assumed that archaeological objects found were left by these Arawak tribes. In the following discussion, the complex of traits associated with the marine shell deposits, which represent a late occupation, will be referred to as the Shell Culture.

In the conclusions to the section concerning the collections from Barrio Canas, it was suggested that there was a basic similarity between the artifacts characterizing each of the two cultures. Specific and distinctive traits are limited to each culture, and there is no evidence of a fusion of cultures through direct contact. Basic similarities which have been enumerated are: the application of modeled zoomorphic figures on the rims of vessels; clay griddles; rectangular and semi-lunar lugs; the relation between oval and boat-shaped vessels; polished stone implements and the absence of chipped flint tools; and the relation between flat loop and D-shaped handles. These indicate a general affiliation and suggest that the cultures have a common center of diffusion. It is clear that the change in material culture indicated was not a local development. Since the general traits common to the

Crab Culture and the Shell Culture also appear widely distributed in the West Indies and in northern South America, it may be possible in future work in the region to trace the migration represented, and to locate the common source.

A stratigraphic study of the marine shell deposit in Barrio Canas disclosed that modeled head lugs applied to vessels, increased in number during the late period of occupation. Bat-heads are the most widely distributed and distinctive form of these lugs. It was suggested that the modeled heads might indicate a late introduction from another region. In the Coto deposits, modeled lugs also increased in number during the late period, while bat-heads were more numerous than at Canas. At Monserrate, modeled head lugs were very rare and bat-heads were absent. Since Coto is on the northwest coast, Canas on the southwest coast, and Monserrate on the northeast coast, this distribution and position in the deposits may illustrate an introduction of modeled lugs, and particularly the bat-head elements, from the west. It will be seen in a later section that modeled lugs resembling the bat-heads are numerous in Santo Domingo, west of Porto Rico, and it is significant that they are more numerous in western than in eastern Porto Rico.

Another indication of diffusion during the era of the Shell Culture is the presence in the Monserrate deposit of a large number of Crude Ware sherds with rough red painted designs. Only 6 sherds of this kind were found at Canas and none at Coto. A large number of sherds from the Virgin Islands, now in the collections of the Heye Museum, are of this type. From these facts the suggestion is made that the use of curvilinear designs in red for decorating Crude Ware of the Shell Culture was introduced from the Virgin Islands, that it was a common practice at Monserrate, rarely employed at Canas, and not introduced at Coto. This would suggest a diffusion from east to west during the period of the Shell Culture.

The limited excavations undertaken at four ball-courts in the municipality of Orocovis during the summer of 1935 produced potsherds which are as a whole similar to those removed from the Shell Culture deposits in the coastal middens. Although the collections from these courts were small and have not been entirely analysed, there is every indication at the present time that the ball-courts in Orocovis were constructed and used during the period of the Shell Culture. The test trenches and pits cut through and around these courts indicated that they were not the centers of permanent settlements, since culture refuse other than scattered sherds was found

nowhere except in a single fire pit near the Barrio Orocovis court. It would appear that these structures were used temporarily as centers for ceremonial practices such as the mortuary dances or "areitos" described by Fewkes (1907: 83). No burials, however, were found associated with these courts. The collections from one of them in Barrio Sabana contain elaborately incised sherds which are not characteristic of the Shell Culture deposits, but they also contain many sherds which are distinctly of Shell Culture type. In mound A at Monserrate during the 1935 excavations one sherd was found with an incised design very similar to the exceptional sherds from the Sabana court. This is further evidence that the courts belong to the Shell Culture period even though aberrant types of incised sherds were found in one. It may be that these aberrant sherds are fragments of ceremonial vessels used for special purposes.*

It would be premature to associate all ball-court structures in Porto Rico with the Shell Culture found along the coast on the basis of these recent excavations, but there is some ground for this conclusion. Future work should be directed toward more intensive study of the ball-courts and also of the dwelling-sites in the interior.

A chronology of prehistoric cultures in Porto Rico, in so far as determined at the present time, is suggested as follows:

II. Shell Culture (so-called Arawak culture)

Late phase (presence of modeled "adornos")

Early phase (absence of modeled "adornos")

I. Crab Culture

These two cultures are well established by stratified deposits containing distinctive types of artifacts. If future work in Porto Rico does not isolate a culture subsequent to the Shell Culture, this may then be correlated with the Arawak-speaking peoples who occupied the island at the time of the Conquest.†

* Incised sherds resembling these have been found by the writer in refuse middens of the Fort Liberté Bay region in North Haiti (Rainey 1936).

† Since this report of the 1934 and 1935 excavations in Porto Rico was written, Irving Rouse of Peabody Museum, Yale University, directed a subsequent research in Porto Rico and has published a brief account of his first season's excavations (Rouse 1937) in which he suggests an amendment of this chronology. During a survey of the eastern end of the island he excavated test pits four meters square in twelve sites, and in two, Cidra and Trujillo Alto, he found what he believes to be evidence of a transition from Crab Culture to Shell Culture. Correlating these sites with others excavated by himself and by the writer he has interpreted certain material from several sites as representing an intermediate period which may correlate with the early phase of the Shell Culture as described here. He concludes that, "The time when pottery was used can be divided into three periods, the Crab Period when pottery was characteristically painted, the Intermediate Period when it was usually left undecorated, and the Shell Period when it was characteristically incised. During

The following sections are concerned with the distribution throughout the West Indies of the two cultures established. The distributional study is carried out on the basis of the complex of traits characterizing each culture, and has as its object the determination of culture movements and migrations throughout the Islands.

DISTRIBUTION IN THE WEST INDIES OF THE CULTURES DISTINGUISHED IN PORTO RICO

Previous Excavations in Porto Rico

Archaeological collections from Porto Rico are found in many museums in Europe and America. Intense cultivation in Porto Rico since the European conquest has exposed hundreds of thousands of artifacts, and remarkably extensive collections are still being made, particularly by private individuals on the island. Collectors number in the hundreds and many possess several thousand specimens. The majority of collections both in museums and in the possession of private individuals are made up of objects picked up on the surface, at random throughout the island, which are not catalogued in relation to the particular section in which they were found, and are of little use for distributional study.

Stone objects make up the larger part of all Porto Rican collections. This fact is somewhat surprising, since excavations on the island produce a large amount of pottery and very few stone objects. The pottery is fragmentary, however, and in general would not be considered desirable as a collector's item. Adolpho de Hostos (1919: 379) states that not over twenty-five complete vessels have been found. Dr. Lothrop (1927: 324) estimates this number at less than fifty. Pottery is rarely found associated with burials and for the most part appears in dwelling sites, in a fragmentary condition, scattered through the refuse of occupation. This probably accounts for the rarity of complete vessels in collections.

The majority of the published accounts of Porto Rican archaeology are based upon these random collections. The publications of O. T. Mason, J. W. Fewkes, and Adolpho de Hostos are particularly outstanding. Such accounts have served to present a description of the numerous stone objects found on the surface, and to correlate Porto

these periods a single descent of people, perhaps the ancestors of the historic Borinquen Indians, seem to have lived in Puerto Rico" (1937: 185). Since this appears to express largely a difference in interpretation of similar material, the writer prefers to reserve comment until this new evidence is presented in detail.

Rico with other islands of the Antilles on the basis of this type of material.

A detailed study of the relation and distribution of archaeological objects within the island naturally must depend upon material which is localized or which has been found *in situ*. Material of this kind is surprisingly rare and is primarily confined to that which has been excavated systematically. Fortunately some work of this kind has been done previous to the excavations undertaken by the writer, and it is upon this work that further correlations rely.

The abundance of pottery and the relative rarity of other artifacts found in excavations make it necessary to depend largely upon pottery in determining cultural distributions and relations.

The following section presents a summary of the excavations undertaken in Porto Rico previous to 1934. The descriptions are grouped according to the location of the sites, and appear under headings which refer to the municipality where the excavations were made. The object is a correlation of these sites with those excavated by the writer in 1934, and an attempt is made to show the distribution of the Shell Culture and the Crab Culture so far as known at the present time.

SANTA ISABEL

A.—The first excavation in Porto Rico, known to the writer, was undertaken by Dr. Souquet. He is said to have excavated the large part of a shell heap at Cayito, near Salinas and on the left bank of the Coamo River (Fewkes 1907: 86). This is now in the municipality of Santa Isabel. Augustine Navarette describes this shell heap and some of the artifacts found there in the newspaper "El Noticiero," May, 1896. He says that Dr. Souquet excavated this site some eighteen or twenty years earlier and obtained 600 "caricetas," or clay heads. The following description is given by Navarette:

"A quince ó veinte metros de la costa y en linea recta de este lugar, encontramos un vasto solar, verdadero 'kiquem dingo' danés, circunscrito de un lado por la costa y el otro por el rio; en él y casi á superficie recogimos más de 50 fragmentos de cerámica indo-borineana, entre ellos varios cabezas de idolillos y penates, habiendo uno muy curioso porque sobre la frente y en el centro del tocado, tiene un verdadero caseabel de barro que suena cuando se le agita. Estos fragmentos de objetos de usos doméstico y religioso, tienen muy diversos dibujos; entre los que me he traído hay uno que figura la cabeza de un murciélago, mide una pulgada de tamaño y parece estuvo adherido á alguna vasija ó cántara. Es de notarse que en todos los lugares á que aludimos, se camina sobre una enorme cantidad de restos de moluscos, los que se hallan en la superficie ó revueltos en la tierra á poco que con el pie se ahonde."

Very little can be gathered from such a limited account, but a few

features appear significant in relation to the recent excavations. A heap of marine shells contained numerous potsherds among which were many "cabezas de idolillos," which are undoubtedly the modeled head lugs commonly found in the marine shell deposits. One of these heads resembled the head of a bat, and heads of this kind are typical of the Shell Culture. Dr. Fewkes visited this site in 1904 and obtained a few clay heads from the natives living there. He remarks (1907: 87) that the clay heads resemble those from shell heaps in Jamaica.

B.—Dr. H. J. Spinden excavated a site in Santa Isabel at a place called La Florida. This work was undertaken in 1916. No published account has, as yet, appeared. In 1934 the writer examined this site but did not excavate. Extensive shell middens still remain, and numerous artifacts are still collected as cultivation uncovers more of the deposit. Four petaloid stone celts and three clay heads were obtained from "peones" living on the site. The three clay figures are peculiarly interesting since the type of modeling is unusual for Porto Rican objects of this kind. The eyes are deep-set and the sharp line of the brow juts out to a point above the eyes. It is curious that these figures are unusual in Porto Rico but common types in Santo Domingo and Haiti. Krieger (1931) figures clay heads or "adornos" which closely resemble the La Florida heads, in his publication describing the pottery of Santo Domingo.

UTUADO

A.—In 1903 Dr. J. W. Fewkes excavated a mound near one of the inclosures known as "juegos de bola" or ball-courts which was situated three miles from Utuado on the left side of the road to Adjuntas. The site is referred to in three publications by Dr. Fewkes, but in none does he give more than a very brief description. The following account appeared in the *American Anthropologist* (Fewkes 1903b: 457).

"In my studies of one of these inclosures at Utuado I found that the main road from that town to Adjuntas had cut through the edge of one of the mounds, revealing, a few feet below the surface, a layer of soil containing fragments of pottery, a few broken celts, and the long bones of an adult. This discovery induced me to extend a trench diametrically through the mound, parallel with the sides of the inclosure. The depth of this trench, at the middle of the mound, was about nine feet. The excavation revealed that the mound rested on a hard gravel base and was composed of soil so rich that some of it was carried away by the neighboring farmer for use as fertilizer. This earth was very moist and ill adapted to the preservation of bones or other fibrous material. Nevertheless, we found ten skeletons of adults and infants, with mortuary objects so distributed as to indicate that they had been placed there as offerings. One of the best preserved of these skeletons was found in a sitting posture with its legs drawn to its chest and with

ceramic objects lying at one side. The frontal bones of the skulls were abnormally flattened, as in those from the caves in the northern part of Santo Domingo, described by Dr. Llenas."

No description of the artifacts found in this site appears in any one of the reports. The position of the flexed skeleton described resembles the position of many skeletons in the refuse deposits at Canas, Coto, and Monserrate. Mortuary objects with burials were rare in these sites, and if they were as numerous in the Utuado site as the account infers, considerable variation in the type of site is indicated. No mention is made of the presence of shell refuse in the Utuado site, whereas all sites excavated by the writer contained large quantities of shell. Dr. Fewkes (1907: 83) believes that this mound, which was associated with a ball-court, was essentially a burial mound, and concludes that the ball-courts were used for the elaborate "areitos" or mortuary dances.

B.—Another "juego de bola" in the municipality of Utuado was excavated by J. Alden Mason in 1915. This site was situated in Barrio Caguana. The work was a part of the scientific survey of Porto Rico conducted by the New York Academy of Sciences, and was under the supervision of Dr. Franz Boas.

Six rectangular inclosures ranging from 75 to 125 feet in length and from 25 to 40 feet in width were found on the site. They were courts or "plazas" which had been leveled off and bounded by lines of stones set in the ground. Excavation exposed 29 house posts in two groups. Many remained intact. The artifacts discovered during the excavation were limited to potsherds. No description of these sherds is given in the account by Mason (1917: 220-223). A detailed description of these excavations is now ready for publication.

C.—A third "juego de bola" in the municipality of Utuado was excavated by Herman K. Haerberlin in 1915, as a part of the scientific survey of the island. This site was located in Barrio Rio Arriba de Arecibo. Two parallel rows of stones bounded a horizontal and level floor. A trench run the length of the court disclosed a dark surface layer covering another of yellow clay. All artifacts were found between these layers, and Haerberlin (1917: 217) concludes that the top of the yellow clay was the original surface of the "juego de bola."

Artifacts chiefly consisted of potsherds, and all of these were the type of ware which Haerberlin (1917: 218) refers to as "dark red pottery." No traces of paint could be found. Ornamentation was limited to incised work and this was composed of "scroll-work" or combinations of straight lines.

The "dark red pottery" is probably not the Red Slipped Ware described by the writer, and may refer to pottery like that found in a "juego de bola" near Penuelas, which is made of a dull red clay. Figure 11 in this paper by Haeberlin represents four incised rim sherds. All have been incised in a panel about the rim, and one shows the parallel lines terminating in punctures. This latter is a type found in all sites excavated by the writer, which has been termed incised ornamentation, class a. Further correlations are not possible since the descriptions of artifacts found in this "juego de bola" are limited to those recorded above.

D.—The Cueva de la Ceiba, situated about 1 mile west of the "juego de bola" just described, was also excavated by Haeberlin in 1915. This cave contained a number of rock carvings which were crude representations of faces. The cave floor had not been disturbed by previous diggers and contained numerous potsherds, crab shells, gastropods, snail shells, rodent bones, bird bones, charcoal and ashes. A single skeleton of a very small baby was found in the ashy soil of the cave floor. Potsherds were for the most part undecorated. The incised line patterns so common in the "juego de bola" site were very rare. A single petaloid celt of a polished green stone was found (Haeberlin 1917: 220-229).

Figures 16 and 17 in Haeberlin's report represent large handle-sherds. These sherds clearly are fragments of the boat-shaped bowls with broad loop handles which were numerous in all Shell Culture sites excavated by the writer, which have been termed shape A. One has a modeled figure on the top of the handle and represents a type referred to as modeled forms on loop handles, class a. Sherds of this kind were numerous in the Cueva de la Ceiba, and indicate a significant link with the Shell Culture. The petaloid celt is another trait characteristic of the Shell Culture. It is interesting to note that the rarity of ornamented sherds and the distinct types of bowl shapes indicated by the sherds, distinguish the cave material from the "juego de bola" material, according to Haeberlin (1917: 227).

E.—A second cave in the municipality of Utuado was excavated in 1915 by Robert T. Aitken (1917: 224-227) who was also connected with the scientific survey of Porto Rico. This cave was known as Hollow Hill, or Antonio's Cave, and was situated 10 miles west of the town of Utuado in the mountainous country bordering Tanamá River. Thirty-nine skeletons were found in the soil on the cave floor, lying at a depth which varied from 15 to 40 inches. The majority were skeletons of children or adolescents, and lay, as a rule, on the right

side in the flexed position. No artifacts were associated with any of the burials. In the deposit removed, only a half dozen potsherds were found. "Skulls of a rodent—an entirely new species," were also found.

Flexed burials without mortuary offerings were found in all sites excavated by the writer.

It is a notable fact that, of the two caves in the Utuado region excavated in 1915, one was essentially a cave dwelling, while the other was exclusively a burial cave.

MANATÍ

A cave called the Cueva de las Golondrinas, which is situated near Manatí on the north coast, was excavated by Dr. Fewkes in 1903. The floor of the cave contained refuse of occupation to a depth of 10 feet. This refuse was composed of fragments of pottery, charred wood and ashes, shells, worked bone objects, and bones of many animals. A brief description of the artifacts is given as follows:

"The pottery consisted of broken fragments—no whole jars were obtained—mainly handles of large ollas, or cooking pots. They belong to ware of the coarsest kind, and many still show soot on their surfaces. There were a few specimens of polished red ware, but none were painted or had evidences of glazing or vitrified surfaces. In one or two instances ridges indicating the coiled method of manufacture were detected, but as a rule these coils had been rubbed down, making a smooth surface. The curvature of the large fragments indicates various forms of ceramic objects. There are evidences that some of them were vases and bowls of almost globular shape; others were boat-shaped or more like trenchers, and still others were flat dishes or plates. Some of the last-mentioned kind had raised ribs across their bases. Small clay heads, more than 25 of which were removed from this cave, are fragments of relief decoration on pottery. Their general forms, as seen in some of the plates illustrating this work, do not greatly differ from those found in the burial mounds, a fact which would indicate identity of culture in their makers."

"The few celts which were exhumed from the floor of this cave are petaloid in form, but one specimen is beautifully polished and grooved, resembling the axes characteristic of the Carib of St. Vincent of Dominica." (Fewkes 1907: 89.)

This description, brief as it is, indicates many striking similarities between the artifacts found in the Cueva de las Golondrinas and those found in the marine shell deposits recently excavated. Dr. Fewkes' "ware of the coarsest kind" probably refers to pottery similar in composition to that termed Crude Ware in the description of the Canas collections. The "few specimens of polished red ware" may be correlated with the Red Slipped Ware of the Shell Culture. The boat-shaped bowls and petaloid celts, which he mentions, are also typical of the Shell Culture. Photographs of sherds from this cave

(Fewkes 1907: pl. 73) represent the broad loop handles of boat-shaped bowls, and all of these are decorated with modeled geometric figures in relief. They are the same as modeled figures on handles, class a, which were found at Canas and at Coto. On the same plate is figured a rim sherd with a modeled figure resembling the sigmoid scroll figure which is also a Shell Culture type. Unfortunately, no description of the clay heads is given.

Shell Culture types in this cave deposit are listed as follows:

- Crude Ware (predominating).
- Red Ware (limited).
- Boat-shaped bowls with broad loop handles, shape A.
- Modeled forms on loop handles, class a.
- Modeled forms on vessel walls, class a.
- Petaloid stone celts.

Although the descriptions and illustrations of the Cueva de las Golondrinas material are very brief, the outstanding traits recorded definitely associate the material with the Shell Culture complex.

CABO ROJO

A.—In 1916 Dr. Herbert J. Spinden excavated a large shell midden at Punta Ostiones which is situated on the west coast of Porto Rico in the municipality of Cabo Rojo. An account of these excavations has not yet been published. The material obtained is now in the American Museum in New York. Adolpho de Hostos has also undertaken excavations at this site, and has published an account in the *American Anthropologist* (1919). In May, 1934, the writer visited the site shortly after the owner had removed a small shell mound to make room for a garden plot. Many of the artifacts taken from this shell heap had been retained by the owner, and these were purchased for the Peabody Museum of Yale University.

The midden at Punta Ostiones is situated on a low, flat, sandy point. According to a diagram made by Dr. Spinden, the deposit formed a low mound or series of mounds, roughly in the shape of a horseshoe. In May, 1934, the appearance of this site had been greatly altered by various excavations. The mounds were composed of marine shells through which were scattered potsherds, bones, charcoal and ashes, a few stone and shell implements, and refuse-blackened soil.

The artifacts obtained in 1934, although a limited selection of objects found in the midden, are sufficient to show a marked similarity to those found in all marine shell deposits excavated by the writer.

All material in this collection is of Shell Culture type. Four fragments of polished celts indicate the petaloid form. A tubular stone bead made of mottled granite is the same type as the tubular beads found in all Shell Culture deposits. A shell celt is also a Shell Culture type. The potsherds are predominantly Crude Ware, but there are many Red Slipped Ware fragments. Four fragments can be identified as shallow boat-shaped bowls, shape C. One rim sherd has the indented rim which characterizes the Shell Culture shape j. Sixteen modeled head lugs represent bat heads and in all details correspond to the modeled head lugs, class a. Fourteen lugs in the collection represent human heads and in every detail correspond to the modeled head lugs, class b. One sherd has the parallel line incisions about the rim which terminate in punctures. This is the Shell Culture incised decoration, class a. Shell Culture traits found at Punta Ostiones are listed as follows:

- Deposition in marine shells.
- Crude Ware (dominant).
- Red Slipped Ware (limited).
- Shallow boat-shaped vessels, shape C.
- Bowls with indented rim, shape j.
- Modeled head lugs, class a.
- Modeled head lugs, class b.
- Modeled figures on vessel walls, class d (limb of zoomorphic figure in relief).
- Incised decoration, class a.
- Polished petaloid stone celts.
- Shell celt.
- Tubular stone bead.

The presence of so many of the traits associated with the marine shell deposits excavated during the summer of 1934, quite definitely correlated the Punta Ostiones midden with the Shell Culture.

B.—In Barrio Boqueron, also in the municipality of Cabo Rojo, appears another large shell midden. No extensive excavations have as yet been made at this site. Several sherds of the typical Shell Culture Crude Ware, and three modeled head lugs, class a (bat-heads), were found on the surface.

SUMMARY

The limited number of excavations hitherto undertaken in Porto Rico, and the abbreviated reports of these excavations available at the present time do not permit an adequate study of cultural distribution on the island. A thorough study of all surface collections which are catalogued according to location would be an important contribu-

tion to such a study, but accurate information essentially depends upon further field research.

The information at hand, however, does give some indication concerning distribution of the Shell Culture throughout the island. The Cueva de la Ceiba in the municipality of Utuado contained a deposit which may tentatively be correlated with the Shell Culture. The Cueva de las Golondrinas deposit in Manatí is quite definitely a Shell Culture site. The midden at Punta Ostiones in the municipality of Cabo Rojo also may be designated as a Shell Culture deposit. With the three sites excavated in 1934 (FIGURE 1), the distribution appears as follows:*

- Fajardo (Barrio Monserrate)—northeast coast.
- Utuado (Cueva de la Ceiba)—west central, inland.
- Manatí (Cueva de las Golondrinas)—central north coast.
- Ponce (Barrio Canas)—central south coast.
- Cabo Rojo (Punta Ostiones)—southern part of west coast.
- Isabela (Barrio Coto)—northwest coast.

The ball-courts in the municipality of Orocovis, excavated in 1935, were probably made and used by people of the Shell Culture, but they cannot be designated as actual settlements or village sites since no extensive refuse of occupation was found. The only evidence so far of a Shell Culture settlement in the interior of the island is in the cave of Utuado. The cave in Manatí is in a mountainous region but not over 5 kilometers from the shore. It is significant that Shell Culture deposits are found in caves as well as in open dwelling sites along the coast since it is an indication that cave dwellings were roughly contemporaneous with villages in the open.

The present status of archaeological research in Porto Rico may be summarized as follows: deposits of an early period of occupation referred to as the Crab Culture have been found below three shell middens on the coast; deposits of a second period of occupation designated as the Shell Culture have been found in four shell middens on the coast, in one cave near the coast, and in one cave in the interior. Scattered potsherds removed from four ball-courts in the central

* Since this report was written, Irving Rouse of Peabody Museum, Yale University, has carried on archaeological research in Porto Rico during the summers of 1936 and 1937. In a brief account of the 1936 season he (1937) describes the excavation of test pits in twelve sites. Six sites in the municipalities of Barranquitas, Arroya, Ceiba, Coamo, Loisa, and Santa Isabel he correlates with the shell Culture Period; one site in Trujillo Alto with the Crab Culture Period and his Intermediate Period; one site in San Juan with his Intermediate Period; and two sites in Salinas and Cidra with Intermediate and Shell Culture Periods. Another site in Ceiba (Ceiba No. 1) and one in Guayama contained no pottery and the only artifacts were chisel-like conch-shell objects. Rouse observes that these sites suggest an early period when pottery was not in use.

mountainous region near Orocovis indicate that these courts were made and used by Shell Culture people, although not, apparently, for permanent settlements.

Santo Domingo

The first archaeological investigations in Santo Domingo were conducted by Sir Robert Schomburgk. No excavations were undertaken. A report of this research was published in December, 1854, and includes a description of some archaeological objects from Santo Domingo with an account of travels and observations on the island. This account contains the first descriptions of the stone inclosures at San Juan de Maguana in the province of Azua. During the period between 1869 and 1871, William M. Gabb explored some caves on the south shore of Samaná Bay. He (1881) found extensive shell deposits on the floor of the caves, and in one, excavated to a depth of 9 feet. Potsherds were found scattered through refuse composed of shells, bones, and ashes. No stone implements were found. A description of the pottery is not included in his report.

The first extensive research in Santo Domingo was undertaken by Theodoor de Booy in 1913 for the Museum of the American Indian, Heye Foundation. An investigation of the eastern end of Saona Island proved relatively unprofitable, and the major investigations were confined to the district of Cape Macao. The following section summarizes the work in this region.

CAPE MACAO

In the vicinity of Salado, and near the Anamuya river, de Booy discovered eight large caverns within an area of 1 square mile. In all of these caves, Indian pottery was found scattered about the floor and in niches in the walls. Most of it had been broken, partly by the original inhabitants, and partly by falling slabs of stone. Evidently the caves had not been used as dwelling sites, as there was no deposit of food refuse. Two of the caves contained fresh-water lakes and many sherds were found lying in the water, which in some places reached a depth of 12 feet. De Booy (1915: 85-88) was unable to find a dwelling site in the vicinity of the caves. It is possible that the lakes served as a water supply during temporary occupations of the district (de Booy).

Water vessels make up a large part of all pottery found in the Salado caves. Complete vessels are globular in form, and rise to narrow necks and restricted mouths. In some cases the upper part of the neck is enlarged to a bulb-like shape. A great number of these vessel necks were found, and many are ornamented with modeled zoomorphic

heads. These are figures in relief which extend around the neck. A complete jar (de Booy 1915: *pl.* 7, a), has a modeled figure on the neck which de Booy suggests was intended to represent a monkey, and to which he refers as a usual feature of Antillean pottery. The figure in many details resembles the so-called bat-heads which are often referred to as monkey-heads. One large fragment of a vessel is undoubtedly a human effigy. The head and neck of a human figure form the neck of the jar, and the opening is at the top of the head (de Booy 1915: *pl.* 5, b). Two unique fragments of jars indicate vessels which have been termed filter jars. A perforated disc separates the upper enlarged neck section from the lower body of the jar (de Booy 1915: figs. 23 and 24). Incised ornamentation appears on many of the vessel fragments, but is in all cases confined to a panel about the neck or about the body at the base of the neck. Designs are linear and curvilinear. A distinctive feature is the familiar design composed of parallel lines which terminate in pits or punctures (de Booy 1915: 91).

A large fragment of a bowl (de Booy 1915: *pl.* 7, e) is from a shallow boat-shaped vessel the ends of which are ornamented with modeled zoomorphic heads. In a panel about the rim is the incised design composed of parallel lines terminating in pits. This type of bowl was common in the Shell Culture deposits in Porto Rico, and was termed shape C.

A few fragments of the clay griddles common to all deposits in the West Indies were found (de Booy 1915: 94).

Pottery objects resembling stamps were numerous in the Salado caves. They are disc-shaped, circular or oval. Some have incised designs on both surfaces, while others have a modeled figure in relief on one side and an incised design on the other. The modeled figures represent small animals with outspread legs (de Booy 1915: *pl.* 9).

The shallow boat-shape with modeled head lugs, and the incised designs composed of parallel lines terminating in pits, are pottery traits which are typical of the Shell Culture in Porto Rico. Linear and curvilinear incised designs in panels are also Shell Culture traits. Complete jars with narrow necks and globular bodies were not found in the Porto Rican middens, but rare sherds indicated some form of vessel with restricted neck. A single object found in Shell Culture deposits at Monserrate is similar to the pottery stamps found in the Salado caves. The modeled heads, which de Booy believes represent the monkey, in many respects resemble the familiar bat-heads of the Shell Culture, and it is notable that the Porto Rican bat-heads are often referred to as monkey heads.

The limited comparisons which are possible, indicate marked similarities between the pottery found by de Booy in the Cape Macao region and the pottery of the Shell Culture in Porto Rico.

SAN PEDRO DE MACORIS

During the summer of 1916, Theodoor de Booy excavated a large shell heap on the Cristóbal Colón sugar plantation situated on the Higuamo river about 3 miles above the coast town of San Pedro de Macoris. The site (de Booy 1919b) appeared as a mound approximately 80 feet in width by 188 feet in length. A refuse deposit which varied from 1 inch to 1 foot in depth covered the mound, and contained marine shells, land shells, mammal bones, bird bones, fish bones, ash, charcoal, and artifacts. Beneath the midden deposit was an artificial mound of black earth which contained numerous burials. De Booy (1919b: 129-133) concludes that the burials were made during the occupancy of the site, since refuse from the upper level was found covering the skeletons, and they were not entirely surrounded by the black earth of the mound.

All interments were secondary burials of bones, made only after the flesh had been removed, or a type known as "bundle burials." Nine adult and 2 child skeletons were covered with inverted clay vessels. In three cases a second vessel was also associated with the burial. In some instances the inverted bowls covered the entire skeleton, of which the bones were deposited in a heap, while in other cases the bowls covered only the skulls. None of the mortuary vessels had been "killed" by puncturing or breaking. Six burials were found without pottery vessels or other artifacts.

No classification or description of the artifacts found in the refuse deposit, nor of the vessels associated with the burials, is given by de Booy. Several photographs of sherds from the refuse, and of complete vessels found with the burials, however, are included with the report. From these it is possible to obtain at least a general idea of the material.

The only stone artifacts illustrated are 2 conical stone pestles, a rough oval mortar, and an "elbow stone." This latter object is a type of problematic artifact which has received considerable attention in all descriptive reports of archæological objects from Porto Rico and Santo Domingo. It is generally believed that the elbow stones are in some way related to the large stone collars. Many have been found on the surface in Porto Rico.

On plate 9 (de Booy 1919b) 10 broad loop handles of vessels are illustrated. In shape the handles are very similar to the loop handles

of boat-shaped bowls which are so common in Porto Rican Shell Culture deposits, but they are distinguished by the presence of parallel incised lines which terminate in punctures. Incising of this kind was found on rims of bowls in Shell Culture deposits, but never on the handles. Two of the handles illustrated are perforated with triangular openings, and appear as an open-work structure composed of crossed bands of clay. Three of the handles are surmounted by small zoomorphic heads. Several of the handle sherds indicate the familiar boat-shape.

De Booy's plate 11 illustrates ten modeled clay heads broken from vessel rims. The majority of these can be recognized as variants of figures generally referred to as monkey-heads. Several closely resemble the heads on the water jugs found in the Salado caves. The deep-sunken eyes shaped like a doughnut, the snout and the head-dress are traits which are common to the bat-heads of the Shell Culture. On the same sherds, associated with the modeled head lugs, appear the incised lines which terminate in punctures.

Plate 14 illustrates 1 semi-lunar lug and 3 roughly rectangular lugs. Two are perforated, two bear modeled relief figures, and all are incised with the line and puncture design.

Fifteen bowls which were found associated with burials are illustrated on a series of plates in de Booy's report. Ten of these are round bowls with straight or incurving rims, three are deep boat-shaped bowls, and two are shallow boat-shaped bowls. Eight of the bowls are ornamented with panels of incised design about the rim or about the equator. The dominant design element is the line and puncture, but there are also circles enclosing punctures. Five vessels are ornamented with modeled head lugs at the rim. One vessel carries a modeled relief figure on the equator which is identical with the worm-like figure on pottery of the Shell Culture.

No description of the composition of the ware is given, but from the photographs the pottery, as a whole, appears to be rough and crude. Apparently it is not slipped or polished.

The boat-shaped vessels with broad loop handles and modeled head lugs (Shell Culture shapes A and C), the round bowls with straight or incurving rims, the modeled heads on loop handles, the line and puncture incised designs in panels, the worm-like figure in relief, the modeled head lugs which probably represent the bat, and the crude type of ware are traits which characterize Shell Culture pottery. Such distinctive traits as the line and puncture design, the worm-like figure, and the boat-shaped vessels cannot be accidental similarities,

and indicate a real connection between the San Pedro de Macoris deposits and the Shell Culture deposits of Porto Rico. Shell Culture traits in the Santo Domingo deposit may be listed as follows:

- Deposition in marine shells.
- Crude Ware.
- Vessel shape A.
- Vessel shape C.
- Vessel shape D (round bowls, straight or incurving rims).
- Vessel shape E (griddles. de Booy 1919b: fig. 8).
- Modeled head lugs on rims, class a (definitely similar but not identical).
- Modeled forms on loop handles, class b.
- Modeled forms on vessel walls, class a.
- Incised designs, class a.
- Incised designs, class b.
- Incised designs, class c.

HATT'S EXCAVATIONS IN EASTERN AND CENTRAL SANTO DOMINGO

In 1923 Gudmund Hatt carried on archaeological field-work in the Dominican Republic for a period of two months, investigating a number of sites on the coast near the mouth of Rio Nisibón, Rio Maimón, Rio Chavón and at La Caleta; also in the Constanza Valley, Cibao Mountains, and west of Azua at La Barrera. Only a brief note (Hatt 1932) on these investigations has been published.

The most interesting sites excavated in the eastern section were those at Rio Chavón on the southeast coast, and at Rio Nisibón on the northeast coast. The ceramic art at Rio Chavón represented by pottery decorated with incised geometric designs was more highly developed than at Rio Nisibón.* The few pottery fragments illustrated by Hatt appear to correlate with the general Shell Culture pattern.

Investigations in the Constanza Valley were chiefly concerned with earth works and stone enclosures known as ball-courts or "batey," with which there were apparently no associated kitchen-middens or other cultural refuse of any extent.

Flint artifacts were found in one site at La Barrera near Azua on the south coast. Unfortunately Hatt does not state whether they occurred in kitchen-middens and in association with pottery and other familiar midden refuse. Although crude flint implements have been reported from Jamaica and Cuba, implements from the La Barrera site illustrated by Hatt are unusual and appear to resemble in detail the flint implements found by the writer in middens near Fort Liberty

* A similar variation in pottery decoration was found in different shell middens at Fort Liberty Bay, Haiti, in 1935 by the writer and Irving Rouse.

Bay, north Haiti, where pottery and the familiar stone and shell implements are absent.

SAMANÁ BAY CAVES

In 1928 Herbert W. Krieger of the U. S. National Museum excavated a series of caves on the Playa Honda coast along the south shore of Samaná Bay. Major excavations were undertaken in three caves in the region, which are known as Boca del Infierno, Cueva del Templo, and San Gabriel. Shell deposits, or refuse middens, which in limited areas reached a maximum depth of 9 feet, were found on the cave floors. These deposits contained "conch, clam, and other species of shell, crab claws, mammal, fish, turtle, and bird bones cast there by the pre-Columbian Indian cave dwellers. The bottom of the deposits of shell is embedded in the yellowish soil, while the upper sections are interspersed with deposits of ash, charcoal, and a small quantity of artifacts, such as shell utensils, sherds of broken pottery, and implements of flaked stone" (Krieger 1931: 28-29).

A.—In the Cueva del Templo a stratification of deposit was found. A deposit varying from 3 to 5 feet in thickness contained clam and oyster shells thickly interspersed with animal, bird, and fish bones, and crab claws. Below this was a layer of black loamy soil approximately 8 inches thick. Underneath this was a deposit from 4 to 6 feet in thickness which included conch shells and a few animal bones. "Crude implements of shell, bone, and flaked stone were recovered from this lower culture deposit, while pottery sherds, some of which are decorated, and food bowls of pottery were excavated from the upper culture stratum" (Krieger 1931: 30).

B.—Two burial places were discovered on the south shore of Samaná Bay. These were rock clefts near the mouth of the Barracote River at the head of the bay. Fragmentary skeletal material was abundant. "Pottery sherds from burial urns, decorated stone beads, and carved figurines of shell and ivory were with the skeletal material." (Krieger 1929: 9).

Pottery from the Samaná caves is, for the most part, unpainted but some "revealed patches of a firmly incrustated red or lavender-hued slip." "Globular shallow bowls," "plain necked water canteen," and "hemispherical" vessel shapes were identified from the sherds. Broad, flat loop handles, were characteristic of the pottery. Decorative panels composed of alternating horizontal and vertical incised lines terminating in pits, on the shoulder or rim of vessels, are a common ornamental technique. Modeled head lugs of the monkey type are also typical (Krieger 1931: 74-76).

Gouges and celts made from the lip of the large conch shell were found in the cave deposits. Those figured on plate 8 (Krieger 1929), and the shell celts and "hoes" typical of the Porto Rican Shell Culture are practically identical.

The extended description of artifacts removed during these cave excavations, Krieger groups with the descriptions of the artifacts from the Samaná region as a whole, which includes material from open dwelling sites. For this reason, an accurate comparison of the Samaná cave artifacts with those from the Porto Rican Shell Culture deposits is not possible. The preponderance of unpainted ware, the sherds of red-slipped ware, the broad loop handles, the line and puncture incised decoration, the monkey-heads (bat-heads) and the shell celts and gouges are, however, all traits of the Shell Culture and suggest a definite relationship. The lower stratum in the Cueva del Templo introduces the possibility of an earlier and less well developed culture which may precede the Shell Culture type in the Samaná region. A description of the material from this lower stratum is not given and its relation to the upper deposit remains a matter of conjecture. Krieger (1931: 33) concludes:

"The lower stratum of cave deposits belongs perhaps to pre-Ciguayan troglodytic population, but the artifacts found there were so few that any conclusion formed on the strength of negative evidence alone is of the nature of an assumption."

SAMANÁ PENINSULA, VILLAGE SITES

A.—A village site on the north shore of Samaná Bay, at a place called Anadel, was also excavated by Krieger in 1928. This was a refuse midden containing marine shells, bones of mammals, turtles, birds, and fish, which extended over an area of 5 acres. A small portion of the site excavated produced a greater variety of artifacts than the cave middens on the south shore of Samaná Bay, but Krieger (1931: 33) concludes that,

"Artifacts from Anadel on the north shore of Samaná Bay and from the cave middens are sufficiently similar to justify a belief in a certain degree of tribal identity for the two regions."

B.—The most extensive site excavated in 1928 was at the mouth of the San Juan River on the north coast of Samaná Peninsula. This was a large village site similar to that at Anadel except that a large number of pigeon and manati bones were found in the San Juan refuse while none appeared in the Anadel deposit.

No concise classification or description of pottery from the San

Juan site is given by Krieger, but with the descriptions and illustrations which are given a general knowledge of the characteristic traits may be obtained. Krieger (1931: 78) states that a limited number of red slipped ware sherds, found at San Juan, closely resemble the red slipped ware sherds from the Cueva de las Golondrinas in Porto Rico which were found by Dr. Fewkes. There is no description of the kind of ware represented by the majority of the sherds found, but since no special mention is made, it may be inferred that San Juan pottery is primarily the coarse unslipped ware previously described for the Samaná area.

Boat-shaped bowls are typical of the San Juan site (Krieger 1931: pl. 47). The broad loop handles attached to boat-shaped vessel fragments were numerous in the deposit (Krieger 1929: pl. 26). Krieger (1931: 77) further states that, "much of the ware, especially the plain handles and handle lugs from San Juan, resemble and in many cases are identical with those from the 'Cueva de las Golondrinas' of Puerto Rico." Round and globular bowls were also found in the deposit. A shallow vessel divided into two compartments by a narrow partition is figured on Krieger's plate 47. On the walls of this bowl are vertical ridge lugs similar to those found in all Shell Culture deposits in Porto Rico. Incised pottery stamps, similar to those found by de Booy in the Salado caves, were also found at the San Juan site (Krieger 1931: 79).

The familiar parallel line and puncture incised designs in panels, again appear on pottery from the San Juan site (Krieger 1931: pl. 47). Modeled head lugs were also found in large numbers. Some of these can be recognized as the so-called monkey-heads which closely resemble the bat-heads of the Shell Culture (Krieger 1931: pl. 27, figs. 5, 6, 9). One example is similar to the human-heads of the Porto Rican deposits with the prominent nose, and the eyes and mouth represented by punctured slits (Krieger 1931: pl. 28). Modeled figures in relief on vessel walls, which represent the head and fore limbs of a zoomorphic creature, are also similar to an element of ornamentation typical of the Shell Culture (Krieger 1931: pl. 28).

Shell celts and "gouges" were numerous in the San Juan deposit.

Picks worked out of the manati ribs were also found (Krieger 1931: pl. 12).

Petaloid stone celts were typical of the San Juan deposit and most of them revealed a high polish. Several of these are figured on Krieger's plate 5 (1929).

Shell Culture traits in the San Juan deposit are listed as follows:

- Deposition in marine shells.
- Crude Ware predominating (?).
- Red Slipped Ware, limited.
- Boat-shaped vessels, shapes A and C.
- Bowls with partitions.
- Modeled head lugs, class a (monkey-heads similar to bat-heads).
- Modeled head lugs, class b (human-heads).
- Modeled figures on vessel walls, class d (head and fore limbs in relief).
- Incised decoration, class a (parallel lines terminating in punctures).
- Shell celts.
- Shell hoes (gouges).
- Petaloid stone celts.

MONTE CRISTI PROVINCE

During the following year, 1929, Krieger excavated three village sites southeast of the town of Monte Cristi and midway between the Haitian village, Petite Saline, and the Dominican town, El Duro. Monte Cristi is an arid region which contrasts with the humid Samaná district. The village sites are kitchen middens, or refuse deposits, composed of marine shells, ashes, mammal, fish, and bird bones, interspersed with cultural artifacts. The depth of deposit was never greater than 7 feet (Krieger 1931: 35-36).

No description of the artifacts removed from the Monte Cristi middens is given. Krieger states, however, that, "many types of vessels and sherds are identical with those from Samaná, both as to form and design, although a certain similarity is to be noted with pottery from Northern Haiti." (Krieger, 1931: 37). On plate 16 of this report, appears a photograph of 10 modeled clay heads from Monte Cristi. Three of these are the monkey-heads typical of all Santo Dominican deposits and closely related to the bat-heads of Porto Rico. Plate 17 figures 2 water bottle necks similar to those found in the Salado caves. Plate 19 contains the photograph of a sherd with the head and limbs of a zoomorphic figure modeled in relief, which is very similar to an aspect of ornamentation typical of the Shell Culture. Plate 22 shows a rim sherd with a modeled relief figure identical with the "worm-like" figures on sherds from the Shell Culture deposits. This type has been termed "modeled figures in relief on vessel walls, class a." On the same plate is a sherd with the incised line and puncture design.

ANDRES PROVINCE

An extensive Indian cemetery near Andres, on the Bay of Andres, was discovered in 1928 by the owner of the Boca Chica Sugar Central. A large number of skeletons and clay vessels were removed during the excavation for a warehouse. In 1929 Dr. Shapiro, of the American

Museum in New York, visited the site and obtained a collection of pottery and skeletal material. Some time later, Dr. Narciso Alberti, from the National Museum of the Dominican Republic, continued excavation of the site and also obtained a large collection. In 1930 Krieger continued excavation in the cemetery and in the associated refuse midden.

A sand spit, jutting out into the Bay of Andres, was utilized as a burial place, joining which is an unusually large shell midden which rests on solid coral and in sections reaches a depth of 5 feet (Krieger 1931: 41). The burials in the sand spit were, apparently, all primary flexed burials without any particular orientation. Each burial was accompanied by one or more clay bowls or jars. Pottery from the midden was similar to that found with the burials (Krieger 1931: 40).

A large number of the vessels found in the Andres cemetery are described and illustrated by Krieger, but no detailed classification of the pottery is presented. From the descriptions and illustrations, it is apparent that there are three major types on the basis of shape. The majority are boat-shaped, many are round or hemispherical with straight or incurving rims, and a few are globular with bottle-necks. This third type includes jars which are restricted about the circumference above the equator, in such a manner that a form of double jar is suggested, with an upper and lower compartment. Three effigy jars representing seated human figures are also illustrated on his plate 8. A shallow boat-shaped bowl with a rectangular lug (Krieger 1931: pl. 50) closely resembles the Shell Culture shape B. Boat-shaped bowls with broad loop handles are lacking. Modeled zoomorphic figures are a common decorative element. These are attached to the peaks of the boat-shaped vessels and to the rim or on the walls of the round bowls. Modeled figures commonly appear on the necks of the jars. The detail of the modeled head lugs cannot be distinguished in most of the illustrations, but it is clear that many are the so-called monkey-head type.

The most common aspect of ornamentation is the incised design in panels, generally about the rim, and composed of parallel lines which terminate in pits or punctures. Curvilinear incised designs are also present. A common motif is a circle enclosing a puncture.

A few of the vessels are slipped with red clay (Krieger 1931: 101), but apparently the majority are unslipped and unpainted. Surfaces appear to be rough, or unpolished, and in many cases the vessels are irregularly shaped. In composition they resemble the Crude Ware of the Shell Culture.

An adequate comparison of the Andres cemetery pottery with the Shell Culture pottery is difficult without a detailed classification, or without actually examining the Andres collection. Nevertheless, many significant Shell Culture traits can be recognized. The dominant boat-shape is one of the most outstanding Shell Culture traits. The shapes of some Andres vessels are identical with vessels found in Shell Culture deposits in Porto Rico. All round or hemispherical bowls from Andres have straight or incurving rims, which is also a Shell Culture trait. The dominant elements of ornamentation, modeled head lugs and incised design, are in detail Shell Culture types. The chief variations in the Andres pottery are the bottle-necked and effigy jars. No vessels of these shapes were found in the Porto Rican deposits.

The following Shell Culture traits are recognized in the Andres collections:

- Crude Ware (?).
- Red Slipped Ware.
- Boat-shaped bowls, shapes B and C.
- Round bowls with straight or incurving rims.
- Modeled head lugs, class a (monkey-heads similar to bat-heads).
- Incised decoration, class a (parallel lines terminating in pits).

A significant relation between the Andres site and all Shell Culture sites in Porto Rico is the method of burial. As at Andres, the majority of the skeletons in Porto Rican excavations were found in the tightly flexed position, lying on either side, and without particular orientation. Mortuary vessels, however, were rarely associated with the Shell Culture burials.

SUMMARY

The preceding descriptions of excavations in Santo Domingo have indicated that all deposits have much in common with Shell Culture deposits in Porto Rico. Pottery found in Dominican caves, village sites, and cemeteries generally corresponds to Shell Culture pottery, in composition of ware, shape, and ornamental technique. Such distinctive types as the boat-shaped vessels, the line and puncture incised designs, the relief figures representing the head and fore limbs of zoomorphic beings, and the modeled head lugs generally termed monkey-heads, are found on both islands and indicate a definite cultural relation. The monkey-heads of Santo Domingo can be distinguished from those in Porto Rico, but the elements of composition are similar and they obviously represent the same creature. These heads from both islands have universally been called monkey-heads

but, since monkeys have never been known in the West Indies, and since the cave bats have features remarkably like the monkey, it is probable that this type of clay head is a representation of the bat and not the monkey.

The bottle-necked jars found in Santo Domingo are not typical of the Shell Culture, so far as known at the present time. Shell Culture traits, however, were established primarily on fragmentary material which did indicate some vessel shape with a restricted neck, and it is very possible that a collection of complete vessels from Porto Rican Shell Culture deposits would contain pottery with shapes related to the Santo Domingo bottle-necked jars.

Incised designs are, apparently, more common in Santo Domingo than in Porto Rico. This fact may be significant in a detailed study of the diffusion of culture, since it was observed in Shell Culture deposits that incised designs were more common in the later phase of deposition. Also, more incised ware was found in western Porto Rico than in the eastern part. The elements of incised design are so distinctive that a cultural relation might be established on this trait alone.

It will be remarked that no Crab Culture trait has been recorded from Santo Domingo. Krieger reports a few sherds of painted ware from Samaná Peninsula (1931: 59) but he has informed the writer that these sherds are in no way similar to the Red and White Painted Ware of the Crab Culture.

Dr. J. W. Fewkes (1922: 169) includes Santo Domingo and Haiti with Porto Rico in a single Porto Rican culture area. This is done on the basis of surface collections, and primarily upon the similarity of stone objects found on both islands. As pointed out in the conclusions to the description of Porto Rican excavations, there is a marked dissimilarity between stone objects in surface collections and those found in excavations.

At the present time it is possible to correlate most of the artifacts from excavated sites in Santo Domingo with those from the Shell Culture deposits in Porto Rico, indicating that the Shell Culture complex extended over Santo Domingo during the second period of occupation in the West Indies.

Haiti

The Republic of Haiti occupies the western part of the island formerly called Hispaniola. The eastern border is the western boundary of the Dominican Republic. Archaeologically very little is known of the section of the island which is now Haiti. Several surface col-

lections have been made and a few of these have found their way to museums, while others remain on the island. Dr. Fewkes made a study of some material from Haiti which he illustrates in the 34th Annual Report of the Bureau of American Ethnology in connection with his general study of the West Indies. On the basis of these objects, which are principally stone artifacts, he includes Haiti with Santo Domingo in the Porto Rican culture area.

In 1931 H. W. Krieger conducted an archaeological reconnaissance of Haiti while engaged in his more extensive research in Santo Domingo, and carried out some excavations in the Plaine du Hinche, near Ouanaminthe, in the valley of the Riviere Romeo, in the vicinity of Fort Liberty Bay, on the Riviere Tron, Caracol Bay, Limbe River, near Gros Morne, and near Cap Haitien. A brief account of this reconnaissance is given in *Field Work of the Smithsonian Institution* in 1931 (Krieger 1932) but the material is not described. During the winter of 1934, a party from the Museum of the American Indian, Heye Foundation, also visited the site at Fort Liberty, but did not attempt excavation of any kind. From Fort Liberty the party proceeded to Ile à Vache which lies just off the south coast of Haiti. A small cave and a large shell midden were partially excavated. No report has been published.

FORT LIBERTY BAY

During the winter and spring of 1934, the writer, on behalf of Peabody Museum, made two visits to Haiti in a general survey of West Indian archaeology, on the research yacht owned by Mr. Allison V. Armour. In April, during the second visit to Haiti, some time was spent in the region of Fort Liberty Bay. The Haitian American Development Corporation, under the direction of Mr. Robert L. Pettigrew, now operates a sisal plantation in this region, and during the past few years clearing and cultivation have exposed many prehistoric dwelling sites. Minor excavations were made by the writer at two of these sites. Mrs. Robert Pettigrew has made extensive collections of artifacts from five sites and has contributed a large part of them to Peabody Museum of Yale University.

In the spring of 1935 the writer and Mr. Irving Rouse, also of Peabody Museum, returned to Fort Liberty Bay to continue excavations in this region with the financial aid of Mr. Allison V. Armour. During May, June and part of July eleven prehistoric dwelling sites were excavated. Six of these sites produced pottery and associated objects which as a whole correlate with those excavated from the Shell

Culture deposits in Porto Rico. Since the collections are not yet analysed, an adequate comparison is not possible, but during the excavations the major types of the Shell Culture complex were observed. The Crude Ware, boat-shaped bowls, modeled head lugs of the human-head and monkey-head (bat-head) types, modeled figures in relief, line and puncture incisions, shell celts and petaloid stone celts, all wide-spread traits of the Shell Culture, were characteristic of these deposits.

Although the six sites produced objects which definitely belong to the Shell Culture pattern, it was observed that two, designated as Carrier and Dialé No. 2, contained certain types of pottery not found in the other four which have been termed Meillae, Moyeaux, Macady, and Dialé No. 1. In turn these last four contained certain types which were not found at Carrier and Dialé No. 2. The pottery from the Carrier site and Dialé No. 2 has been termed the Carrier type, while that from Meillae, Moyeaux, Macady and Dialé No. 1 has been termed the Meillae type. The distinctions are based primarily on pottery ornamentations, the stone and shell implements found in all pottery-bearing sites being essentially the same. Briefly, the Carrier type is characterized by vessels decorated with elaborate incising and with a peculiar modeled head lug or "adorno," while the Meillae type is characterized by numerous boat-shaped bowls with loop handles, modeled head lugs of a much simpler form, and incised decoration limited to parallel lines and cross-hatching. Pottery from both types of sites is relatively crude and coarse in composition, and the distinction is based primarily on the technique of ornamentation which is more sophisticated on pottery of the Carrier type. Unfortunately no stratified deposits were found and it is not possible at present to say which of the two types is the earlier. There is some evidence that the Meillae type may correspond to the early phase of the Shell Culture in Porto Rico and that the Carrier type may correspond to the late phase. The thorough analysis of these Haitian collections now being made by Mr. Rouse is necessary, however, before the significance of the deposits can be made clear.

The other five deposits excavated near Fort Liberty Bay produced no pottery but they did contain numerous flint tools, some rubbing stones and some notched axe-like objects, all of which are foreign to the pottery-bearing sites. The flint tools are well formed, secondarily chipped implements which may be roughly classed as scrapers, knives, and spear-heads. These five deposits which have been termed Couri No. 1, Couri No. 2, La Rivière Maurice, Savanne Carrée No. 1 and

Savanne Carrée No. 2, undoubtedly indicate the existence of a distinct culture which is assumed to be older than either the Shell or the Crab Culture. The technique of pottery manufacture was known throughout the West Indies at the time of the Spanish Conquest and it is highly improbable that a people who did not make pottery would exist on this island contemporaneously with people who had learned the process.

The complete description of these sites and the material removed is now in preparation and will be published in the near future.*

ILE DES CABRITS

On the Ile des Cabrits, which lies at the head of Port au Prince Bay, is a large midden deposit which extends over most of the island. A test pit sunk in the site uncovered potsherds similar to those found at Fort Liberty Bay. Some were the clay figures of the monkey-head type, and others bore the familiar line and puncture incised design. A large number of artifacts has been removed from Ile des Cabrits by private collectors. An extensive excavation of the deposit would be profitable.

LA GONAVE

The large island in Port au Prince Bay, called La Gonave, has also produced numerous archaeological specimens, but no excavations have been undertaken. In January, 1934, the writer made a hurried survey of the island assisted by Lieutenant Murat Bissainthe. Near the "caille" of Madame Theagene St. Fleur, at the top of a mountain near the eastern end of the island a refuse deposit was found which contained large numbers of potsherds. Those which were collected from the surface are similar to Fort Liberty sherds. Monkey-heads, and line and puncture incised sherds were present. Two caves near Madame St. Fleur's farm apparently were not occupied in the prehistoric period. Test pits uncovered no refuse of any kind.

SUMMARY

The analysis of the Fort Liberty Bay collections will undoubtedly demonstrate that this region falls in the area of the Shell Culture occupation and it may also show that the two phases indicated in the Canas Shell Culture deposit are present in the Meillac and Carrier types. Since no other extensive excavations in Haiti have been reported, further correlations are not possible, but the few specimens obtained from Ile des Cabrits and La Gonave suggest that the Shell

* A brief summary of these excavations has been published by the writer. (Rainey 1936.)

Culture may be more widely spread on the Haitian end of the island. Dr. Fewkes' study (1922: 169) of stone objects in surface collections from Haiti has convinced him that the region falls under the same culture area as Santo Domingo and Porto Rico, but in Haiti as in Porto Rico there is a marked difference between the stone objects in the surface collections and those found in the middens.

There is no evidence of the Crab Culture in Haiti as yet reported. The five middens near Fort Liberty Bay, however, represent a third distinct culture which is characterized by the absence of pottery and the presence of well formed flint tools.

Cuba

Archaeological research in Cuba began as early as 1847 with the investigation of D. Miguel Rodriguez-Ferrer. During a period of years, he made collections and excavations in caves and village sites at Mayari, Camagüey, Manzanillo, Maisi, Cabo Cruz, Pinar del Rio and Banes. The results of these researches were published by him in "Naturaleza y Civilizacion de la Grandiosa Isla de Cuba," Madrid, 1876. This investigation and the early investigations which are recorded in the following paragraphs, are summarized by M. R. Harrington (1921) who correlates the information with his own researches of 1915 and 1919.

In 1850, Dr. Eusebio Jimenez excavated two mounds near the town of Moron. This excavation and following research by Jimenez are described by Andres Poey in his paper, "Cuban Antiquities.—A brief description of some relics found in the island of Cuba" (Jimenez 1853).

A burial cave at Sancti Spiritus was excavated in 1888 by Dr. Luis Montané, professor of Anthropology in the National University at Havana, and the results published, 1906, in his "L'homme de Sancti Spiritus (Île de Cuba)." In 1902 Dr. Montané made an investigation of the Maisí region from Baracoa along the coast to Cape Maisí and south to Guantanamo. At this time he discovered another cemetery. Some account of the investigation is published in his "Rapport sur l'état des sciences Anthropologiques à Cuba" (1909).

Dr. Carlos de la Torre y Huerta, professor in the University of Havana, investigated some caves in Oriente province in 1890. Some account of this exploration is included in his "Conferencia Científica" (1890).

In 1901, Mr. Stewart Culin, who was connected with the Free Museum of Science and Art of the University of Pennsylvania, went

to Cuba in search of a wild tribe of Indians living in the mountainous eastern section of the island. At this time he visited some caves in the Baracoa district and a refuse site at Pueblo Viejo. A brief account is given in his "The Indians of Cuba" (1902).

Dr. J. W. Fewkes made a brief visit to Cuba in 1904 but undertook no excavation. His paper, "Prehistoric Culture of Cuba," was published in the *American Anthropologist*, and again in the 48th Annual Report of the Bureau of American Ethnology.

José Antonio Cosculluela, a Cuban engineer, began investigations in the Ciénaga de Zapata country in 1913. The following year Dr. Montané and Dr. Victor J. Rodríguez continued excavation in the Zapata swamps and an account of the work was published by Cosculluela in his book, "Cuatro Anos en la Ciénaga de Zapata," Havana, 1908. This includes a chapter by Dr. Montané on the excavation of a mound at Guayabo Blanco, and also Cosculluela's description of the famous pile-dwellings on the island in the Laguna del Tesoro.

GRAN TIERRA DE MAYA

In 1914, Theodoor de Booy of the Museum of the American Indian, Heye Foundation, undertook some excavations at Gran Tierra de Maya. His report of this work is published with M. R. Harrington's account of later research, which appears in the *Indian Notes and Monographs of the Heye Foundation* (1921: 239-244). De Booy found some forty low refuse mounds or middens on the Finca Caridad and another group of approximately twenty-five on the Finca Sitges. A midden at each site was excavated. Refuse deposits which contained marine and land shells, a few bones, ashes, charcoal, and earth were found to a depth of only a few inches. A brief description of the numerous potsherds found at both sites records the presence of shallow round bowl or dish fragments, large segments of boat-shaped bowls with the raised peaks, modeled head lugs, one of which was the human-head type and another the monkey-head type, and numerous rim sherds with incised line decoration which de Booy believes resemble similar patterns on pottery from Santo Domingo and Porto Rico. Two small perforated shell pendants were also found in the deposits.

M. R. Harrington, also of the Museum of the American Indian, carried on extensive explorations in Cuba in 1915 and again in 1919. In 1921, Harrington published his "Cuba Before Columbus" in the *Indian Notes and Monographs of the Heye Foundation*. This report includes an admirable summary of all previous work in Cuba and a correlation of this work with his own investigations. The accounts

published prior to "Cuba Before Columbus" contain very little detailed description of the artifacts obtained in excavation, but the historic information presented is carefully reworked. Harrington's work remains the outstanding contribution to Cuban archaeology.

The excavations and collections of 1915 and 1919 are extracted from his monograph and briefly summarized in the following outline:

JAUCO REGION—EASTERN CUBA

A. Mesa Buena Vista—4 to 5 miles west of Boca Jauco.

Tests pits were made in two rock shelters.

A refuse deposit was found which contained shells, bones, and ashes.

Artifacts: crude plain sherds, and flint chips (page 179).

Test pits were made in a village site.

The refuse contained shells, bones, and ashes.

Artifacts: crude potsherds with cross-hatch and line incisions, a grinding stone, a stone celt, 2 shell gouges, and flint chips.

Test pits were made in two low refuse mounds, containing shells, bones, and ashes.

Artifacts: abundant pottery, some decorated with modeled head lugs; (fig. 34 illustrates a head of the Shell Culture, class b); petaloid stone celts, hammerstones, flint chips, a crude flint implement and a perforated shell ornament (page 183). The material is said to represent the Ciboney and Tainan cultures.

B. Mesa del Sorda—just west of Buena Vista.

Material collected from the surface of a shell midden included a small carved stone figure of the flexed or seated type similar to the Shell Culture carved figures (fig. 35).

C. Cueva Dujo—one-half mile east of Jauco river mouth.

Part of a clay vessel and a wooden seat, or dujo, were found in a cave (page 188).

D. Caletica Cave—just east of Cueva Dujo.

Excavations were made in the floor of the cave which contained refuse composed of shells, bones, and ashes.

Artifacts: shell gouges, a shell cup, olivia shell rattles, hammerstones, mortars, a rubbing stone, a shark tooth pendant, a few crude flint implements and flint chips. The material is called Ciboney (page 190).

E. Cave Village—one mile east of Caletica cave.

Test pits were made in a refuse deposit similar to the last cave.

Artifacts: shell gouges, shell celt, shell rattles, shell cups, stone mortars, flint flakes, flint chips, and large number of potsherds. It is called a Ciboney site (page 192).

F. Bone Cave—one-half mile east of Cave Village.

The rocky floor of the cave was found covered with charred human bones.

G. Caleta Cavern—three-fourths of a mile east of La Caleta river mouth.

Test pits were made in a shallow refuse deposit of shells, bones, including those of ground sloth, *Megalocnus*, and ashes.

Artifacts: Plain potsherds, flint chips, hammerstones, and shell objects.

Both cultures were said to be found (page 199).

MONTE CRISTO REGION—EASTERN CUBA

A. Monte Cristo village site.

Test pits were made in three low mounds composed of refuse from occupation.

Artifacts: Numerous potsherds, some with line and puncture incised designs, and some with modeled head lugs; a round bowl with incised designs in a panel about the rim (fig. 44). (Shell Culture, shape h); an oval bowl with rectangular lugs (pl. 61) similar to Shell Culture, shape B; hammerstones, petaloid celts, shell pendants, carved shell teeth similar to those found in a Shell Culture effigy figure, stone and shell beads, 2 small clay figurines, and crude flint implements. It is termed a Tainan site (page 205).

B. Cantillo—six miles towards Maisi from the Monte Cristo village site.

Some complete vessels were found in niches in a cave. One (pl. 62, a) is a shallow round bowl similar to Shell Culture, shape D. Another (pl. 63) is a round bowl with modeled head lugs and a line and puncture incised design about the rim. Another cave produced a wooden paddle. The material is termed Tainan (page 208).

C. Cueva de los Indios.

Excavations were made in the midden refuse near the mouth of the cave.

Burials which were flexed, and others which were extended lying on the face, were found in the refuse.

Artifacts: oval pestles, flint scrapers, shell celt, shell cup, petaloid stone celts, and potsherds. The material is termed Ciboney and Taino (page 218).

D. Flint Cave—just north of Cueva de los Indios.

Test pits were made in the shell, bone, and ash midden refuse. Some human bones were found.

Artifacts: flint chips, and worked flints, rubbing stones, shell gouges, shell cups, and shell beads (page 224). No pottery.

GRAN TIERRA REGION—EASTERN CUBA

A. La Patana village site.

Trenches were dug in refuse deposits or middens composed of shells, soil, ashes, and bones. The maximum depth was 15 inches.

Artifacts: many potsherds, some with modeled head lugs; (fig. 67 represents a large fragment of a vessel similar to Shell Culture, shape C); olivia shell rattles, shell pendants, shell earplugs, stone and shell beads, fragments of clay idols or dolls, a stone pestle, rubbing stones, and petaloid stone celts.

B. La Patana Burial Caves.

Test trenches were made in three caves.

In one cave a primary flexed burial and 2 unidentifiable burials were found in the earth of the floor.

In another a number of charred human bones were found.

In the third cave a large quantity of burned human bones were found in a 2-foot deposit on the floor. There was also a wooden platform on poles cut by a stone axe (page 258).

Petroglyphs were found in a fourth cave.

C. Mylodon Cave.

A 4-inch deposit of midden refuse was found on the floor.

Two flexed burials were found.

Artifacts: rude pottery with cross-hatch decoration.

It is said to be a Ciboney site with some Tainan potsherds (page 275).

D. Big Wall site—at San Lucas on the northern side of Rio Maya Canon.

Trenches were cut in an elongated mound or wall of refuse, and in low round refuse mounds. The deposit was composed of marine and terrestrial shells, fish, bird, and hutia bones, ashes, and soil. The maximum depth was 4 feet, 7 inches. Seven burials were found in the refuse, lying in the flexed position.

Artifacts: abundant potsherds, many with modeled head lugs, and some with modeled figures in relief; (fig. 78 illustrates a sherd with head and limbs in relief similar to Shell Culture modeled forms on vessel walls, class d); shallow round bowls (pl. 67); hammerstones, petaloid stone celts, stone beads, crude stone figures, flint flakes and implements, a cache of petaloid celts (unfinished), shell pendants, olivia shell rattles, shell teeth, bone spoons, and a bone swallow-stick, carved with a conventional head. In the lower levels were found sherds which "although similar to the rest, were decidedly crude and archaic in decoration" (page 293).

E. El Lindero village site—near Rio Maya Canon.

Digging by the natives exposed a midden site 4 to 5 feet deep with the usual type of refuse.

Artifacts: many potsherds (two restored vessels (pl. 68) are round bowls with modeled head lugs of the monkey-head type. One has the line and puncture incised design on a panel about the rim), a shell pendant (carved and perforated disc), a crude stone fetish, and a bone "swallow-stick."

F. Laguna Limones Site.

A large rectangular earth work similar to the "ball-courts" of Porto Rico was found at this site.

Test pits within the enclosure disclosed midden refuse.

Pits dug in six low round mounds 2 to 4 feet high indicated that they were composed of midden refuse.

Artifacts: Tainan Culture type, no description is given (pl. 62, b, illustrates a boat-shaped bowl with modeled head lugs, Shell Culture, shape C), 3 carved shell amulets and 1 stone tubular bead. It is called a Tainan site (page 307).

G. Maisf Site.

No excavation was undertaken. Material collected on the surface was said to represent both Tainan and Ciboney cultures (page 308).

SANTIAGO REGION—SOUTHEASTERN CUBA

H. Cueva del Muerto—near village of Siboney.

A trench was cut from a point outside, through the cave floor. The maximum depth of deposit was 18 inches.

Artifacts: crude pottery (some resembling Jamaican ware), flint flakes showing use, hammerstones, mortars, a small perforated stone pendant, shell gouges, a shell celt, a bone awl, and a bead, and one flattened skull.

All the material is called Ciboney except the potsherds and the flattened skull which were called Tainan (page 315).

I. Aserraderos Site—near Santiago.

No excavations were undertaken but native laborers found several objects in caves.

Artifacts: a shallow, boat-shaped bowl (pl. 81, Shell Culture, shape C), and two round bowls (pl. 81 and 82) resembling Shell Culture, shape I.

A large number of polished petaloid stone celts have been found near Santiago (pl. 78).

PINAR DEL RIO REGION—WESTERN CUBA

A survey of the region was made in 1915 and excavations resumed in 1919.

A. Portales Rock Shelter—near Guane.

A trench was made through a refuse deposit composed of earth, land and river shells, crab shells, bones of hutias, ground sloth, fish, and turtles, ashes, and charcoal, which reached a maximum depth of 2 feet 10 inches.

Artifacts: rude hammerstones, a shallow mortar, flint chips, notched stones, a stone pendant, and a partially perforated pebble.

B. Cueva de Cenizas—near Guane.

Pits were dug in the cave floor which contained ashes, bones, shells of marine and river species, and a large number of land crab shells.

Artifacts: a pitted hammerstone, slender "whetstones," pecked pebbles, shell gouges, a shell cup, flint chips without retouching. It is called a Ciboney site (page 341).

C. La Guira—near Remates de Guane.

No excavation was undertaken but three polished stone petaloid celts and a conical stone pestle were found on the surface (page 344).

D. Lake at Malpoton—near Remates.

The dredging of the lake exposed a carved wooden staff, a wooden arrow, a fire stick, and two wooden bowls (page 349).

E. Cabo San Antonio Site.

Test holes were dug in a large midden 3 to 4 feet deep which contained marine shells, land crab shells, earth and ashes, with some bones of hutias, fish, and turtles.

Artifacts: flint chips, shell gouges, shell beads, broken shell vessels, and hammerstones.

SUMMARY

Harrington (1921: 410, 412) concludes from his own investigations and the correlation with previous research, that prehistoric remains in Cuba represent two aboriginal cultures. The earliest and most primitive he has termed Ciboney, and the later and more advanced Taino. Ciboney is derived from the historian Las Casas, who asserts that the people of Cuba subjugated by the invaders from Haiti, were called Ciboneyes. Taino is taken from Peter Martyr, who tells how

the Spanish on Columbus' second voyage were approached by Indians in Hispaniola who said that they were Tainos, "good men and not cannibals." The term has been extended to all Arawak-speaking tribes in the Greater Antilles.

The characteristics of the Ciboney Culture are summarized by Harrington (1921: 385-396) as follows:

Artifacts:

- Shell gouges, abundant.
- Shell celts, rarer.
- Pitted hammerstones, common.
- Stone mortars with deep cup-shaped holes.
- Shell bowls, made by pecking out the interior of a conch shell.
- Pendants, rude and oval, made of beach-worn shells, or pebbles, perforated near one edge for suspension.

Habitat:

- In eastern Cuba, particularly in Baracoa. In rock shelters, cave mouths, and open-air village sites. In western Cuba. In large, open-air village sites, and in caves on the coast and inland.

Burials:

- In soil of cave floors without regular position or orientation.

Skull form:

- Natural.

The characteristics of the Tainan culture are given by Harrington (1921: 386-390) as follows:

Artifacts:

- Petaloid stone celts, polished.
- Short squat pestles of stone, occasionally with carved figures.
- Rubbing stones, globular.
- Rasps, thin slabs of gritty stone.
- Earthen ware vessels—bowls, plates, kettles, bottles and erratic forms; decorated with incised lines, raised ridges and nodes forming designs; decorative handles modeled in the round (grotesque effigies of men or animals); and combinations of these decorative elements; cassava griddles.
- Ear plugs of shell, like a collar button.
- Pendants of shell in disc or claw-like shapes.
- Olivia shell rattles, sometimes carved.
- Amulets in the form of little figures of shell and stone.
- Beads, well made and often ornate.
- Carved shell objects representing teeth, used as inlays for wooden effigies.
- Bone swallow-sticks, carved and spoon-like.
- Wood carving—seats (*dujos*); platters, paddles.

Habitat:

- In eastern Cuba, primarily in uplands but also on the coast. In open village sites and caves. Scattered remains in western Cuba.

Burials:

In outskirts of village or in the middens, in a flexed position on the side, often facing east.

Occasionally bodies deposited in cave floors.

Skull form:

Artificially flattened.

All reference to pottery is omitted from the summary of Ciboney culture traits, but in a following section appears the statement:

"Pottery of any kind is very rare on Ciboney sites, except in certain cases where it is found on or near the surface and is obviously Tainan and intrusive, but once in a while, as at the early village-site at Mesa Buena Vista, near Jauco, may be found sherds, usually plain but sometimes decorated with simple angular patterns, or rather rude vessels which seem to have been of flattened globular form, like the more recent Pinar del Rio vessels shown in Fig. 93, or of the type known as "boat-shape," oval in outline and pointed at both ends. Now, semi-globular and boat-shaped forms and angular patterns are by no means unknown to Tainan ware, although they are not common; yet it seems significant that such forms and such patterns, and these only, should be found apparently associated with the Ciboney culture." (Harrington 1921: 394-395.)

Harrington's methods (1921: 184) of determining two archaeological cultures in Cuba, when examined on the basis of his excavations, are somewhat surprising. The two cultures are first mentioned in connection with the excavation of refuse sites at Mesa Buena Vista, near Jauco. One midden was thought to produce Ciboney material and the other Taino material. No detailed descriptions of the material or the differences are given. The statement is made that, "there is no doubt that the coastal or Ciboney culture is the older, for when traces of both are found together it always lies beneath." Each site Harrington refers to as Ciboney or Taino on the basis of material found. In many sites the distinguishing types are apparently intermixed.

A typical determination of the cultures represented in an excavation is given on page 199 in his report and refers to a deposit at the Caleta cavern near the mouth of La Caleta River: "Both cultures found. Most of the pottery came from near the surface, and was typical of the Taino culture, as were several of the other objects found; but a fair percentage of the collection appeared to be the work of the Ciboney people, so it is evident the place has been occupied by both." The Ciboney Culture is first correlated with the coast and the Taino Culture with the interior, but later both cultures are reported on the coast and inland, in cave deposits and in open dwelling sites or refuse middens.

The most unusual objects found in the Cuban sites are the crude retouched flint knives and scrapers which are rare in other West Indian collections. These are found both in Tainan and Ciboney sites and are not associated with either culture although Harrington states that they are more numerous in Ciboney sites. They are not, apparently, segregated in non-pottery sites as in North Haiți (Rainey 1936) and the types do not correlate with the numerous well-formed flint implements found there, although the technique of chipping appears to be somewhat similar.

There are, certainly, indications of a more primitive or less developed cultural phase in such sites as the Caleta Cave and the Flint Cave in eastern Cuba, and the Portales Rock Shelter, Cueva de Cenizas, and Cabo San Antonio midden in western Cuba, where pottery appears to be absent and where the peculiar type of shell gouge is characteristic, but other traits characterizing the Ciboney culture are not particularly distinctive in West Indian sites. Shell bowls made from the conch, stone mortars, and hammerstones are found in Porto Rican shell-middens and shell celts are one of the most characteristic implements in Shell Culture deposits.

Although the methods of determining the age of sites, their interrelation, and the relation of certain types of artifacts with each culture are somewhat arbitrary, the presence of a primitive culture in Cuba, as suggested by Fewkes, appears to be substantiated, and it seems probable that it is in some way connected with the primitive, pre-pottery, culture in North Haiti. The selection of the terms Tainan and Ciboney for archaeological cultures in Cuba appeals to the writer as unfortunate. It is conceivable that the Tainan culture traits may be referred to the Indians of Arawak stock known to inhabit Cuba at the time of the conquest, but without correlating a specific site with a historic Indian settlement and without adequate accounts of Arawak material culture, the allocation of a large number of sites and varying collections to a relatively little known historic group, is dubious. Even less certain is the connection between old sites (association with *Megalocenus*) and vaguely known primitive tribes in western Cuba, particularly now that primitive pre-pottery cultures have begun to appear through researches in Haiti, Santo Domingo, and the Virgin Islands. It has been customary in West Indian archaeological research to associate all objects found with the historic native groups, which implies relatively recent settlement in the islands or unusually static populations. The segregation of a non-pottery culture in Haiti and the discovery of two distinct cultural periods succeeding this

primitive stage should lend perspective to archaeological research in these islands and emphasize the conclusion that historic Indian groups with any degree of accuracy may be correlated only with specific sites and the most recent material obtained at these sites.

All the types of artifacts by which the Tainan culture is characterized were found in Porto Rican Shell Culture deposits, except the stone pestles, bottle-necked vessels, carved wooden objects, and shell ear-plugs, but clay ear-plugs, shaped like the Cuban specimens, were found. Flexed burials with deformed skulls are also typical of Shell Culture deposits.

The shell celts (Ciboney), the shell pendants (Ciboney), the boat-shaped bowls (Ciboney), and the (Tainan) polished petaloid stone celts, shallow round bowls with straight or incurving rim, boat-shaped bowls with modeled head lugs, incised designs on panels about the rims of vessels, the shell disc pendants, carved amulets, beads, shell "teeth," and carved bone "swallow-sticks" are all characterizing traits of the Shell Culture in Porto Rico. The distinctive elements such as the boat-shaped bowls, the modeled head lugs of the monkey-head and human-head types, the modeled figures on vessel walls representing the head and forelimbs of a zoomorphic being, the line and puncture incised patterns in panels (rare in Cuba), and the carved human figures in the flexed or bound position, are detailed aspects of Cuban Archaeology which indicate a significant connection with the Shell Culture deposits of Porto Rico and Santo Domingo.

Many of the Shell Culture traits such as Red Slipped Ware, broad loop handles on boat-shaped vessels, modeled forms on these handles, and various types of modeled figures on vessel walls, which are found in Porto Rico and Santo Domingo, are absent from the Cuban collections. These facts suggest that Cuban material represents a local variation of the Shell Culture.

There is no mention of any distinctive Crab Culture trait in the Cuban collections. Pottery, so far as can be determined from the descriptions, is similar to the Shell Culture Crude Ware, and painted ware has not been found. At the present time, there is no evidence of an early period of occupation in Cuba corresponding to that found in Porto Rico.

Jamaica

NORBROOK

An article concerning the life of Columbus and the discovery of Jamaica, by Frank Cundall (1894) contains a brief description of some archaeological material found in Jamaica. Most of the objects de-

scribed or illustrated, were found in a shell midden at Norbrook, in St. Andrews, and were in the collection of Lady Blake. Pen drawings on pages 71 and 73 of this report illustrate several potsherds removed from this midden. Four sherds carry modeled figures in relief similar to the usual modeled head lugs on pottery from the Greater Antilles. One sherd carries a modeled figure which appears to be the same as the sigmoid scroll design found in Porto Rican Shell Culture deposits and termed, modeled figures on vessel walls, class a. Three rim sherds are ornamented with incised designs and one of these, apparently, is the line and puncture design. Three petaloid stone celts, a monolithic stone axe, some tubular stone beads, a notched flint arrowhead* and 3 chisel-like stone implements are figured on page 74. At the time this article was written, Cundall knew of very few archaeological objects from Jamaica (1894: 72).

VERE

In 1898, Mr. R. C. MacCormack carried out several excavations in shell middens and caves in the region of Vere in the parish of Clarendon. A short account is published in the *Journal of the Institute of Jamaica*, Vol. 2, 1898. The middens excavated are described on page 446 as follows:

"Of the three mounds or refuse-heaps which I have searched in the neighborhood of Portland and Salt River, all have yielded great quantities of broken pottery and shells, and fish, turtle, coney [hutia], manatee, and crocodile bones; broken shell and stone implements, ashes, charcoal, coral, and stones blackened by fire, have also been obtained. The accumulations are not of any great depth, rarely more than three feet."

Several caves explored, contained some refuse of occupation, six complete clay vessels, and several skeletons. No urn burials, rock-carvings, or wooden images were found (MacCormack 1898: 447).

A large number of potsherds and several complete vessels were found in the shell middens and the caves.

"All vessels are either circular or boat-shaped; and somewhat thin, considering the coarse material of which they are made. Some of the circular vessels are

* Dr. Sven Lovén (1932) describes seventy-five flint arrow heads said to have been found by a Swedish sailor in a mound near Old Harbour. They were donated to the Museum of Gothenburg, Sweden, by Lieutenant A. F. Scholander who obtained them from the sailor. Duerden states that "flaked flints" are found in most shell heaps on the island but that "shaped flint implements are not known in Jamaica" (Lovén 1932). In other descriptions of archaeological material from the island no flint artifacts are recorded. The objects are complete and fragmentary points chipped on both surfaces and some have a well-marked tang or stem. Lovén apparently accepts these chipped flint arrow points as definitely Jamaican and as originating among the Tainan Indian population even though objects of the kind are without parallel in the West Indies and their discovery is somewhat obscure. They are not related to the flint objects found in Cuba, Santo Domingo, and Haiti.

without handles, while others have them well formed and prominent.—From a mound in Portland a handle of a boat-shaped vessel was secured with a head and face modeled on it. The face is a good representation, the nose is especially well formed; the eyes are represented by two oblique incisions not distinct from the head.—The ornamental work on the handles and on the body of the vessels consists chiefly of lines or incisions often forming a W-shaped pattern." (MacCormack 1898: 446.)

Many petaloid stone celts were found in the deposits in open village sites and in caves. Most of them are highly polished. A few stone implements, shaped like "a blacksmith's cold-chisel" were also found. Two petaloid shell celts made of the giant conch shell were found at Salt River (MacCormack 1898: 445).

All of the 13 skulls collected from the caves in the Portland hills have the forehead flattened (MacCormack 1898: 448).

RETREAT

In 1913, Theodoor de Booy excavated four shell middens at a place known as the Retreat property, situated between Brown's Town and Stewart Town, in St. Ann. Previous excavations undertaken by Miss Moulton Barrett in these middens are recorded by J. E. Duerden.

Trenches cut through the middens by de Booy exposed refuse varying from a few inches to 4 feet in depth. The deposit was principally composed of land-snails, ashes, and earth, but there were also marine shells, fish, and hutia bones (de Booy 1913b: 427).

"The predominating type of pottery vessel in these middens, as well as in other middens of Jamaica investigated by the author, is a boat-shaped type, and while naturally no entire vessel was found, enough remains of several of them to show their form quite distinctly.—Many of these boat-shaped vessels have handles that are more elaborately decorated, and one occasionally finds handles that show a conventionally modeled parrot's head. Human heads are also depicted. Plate XXXIII, 1, shows some of the handles of these types. Fragments of decorated rims also were found in abundance, the decoration consisting chiefly of straight line incisions, while serrated lugs under the rim are not uncommon" (de Booy 1913b: 432).

The serrated lugs illustrated on his plate 33 are the type of modeled ornamentation described as worm-like, modeled figures on vessel walls, class c in the Shell Culture deposits in Porto Rico. The human-head lugs are also similar to figures of this kind on Shell Culture pottery.

Two rim sherds on the same plate are ornamented with vertical, parallel, incised lines which form a border about the rim. This type of design is the Shell Culture, incised ornamentation, class c.

De Booy (1913b: 432, 433) points out that none of the sherds collected by him have the line and puncture incised design which is

characteristic of incised ornamentation on pottery from other islands of the Greater Antilles, and suggests that Jamaican pottery belongs in a class by itself. Another distinctive trait of Jamaican pottery indicated is the presence of sherds with handles composed of raised knobs which are perforated laterally. These knobs apparently represent a crude face with a secondary raised and slit knob representing a mouth, and with perforations representing the eyes. "Raised, serrated ornamentations" are applied under the lug, "as if the potter endeavored in her crude way to represent the tentacles of an octopus."

Fragments of clay griddles, petaloid stone celts, hammerstones, rubbing stones, and a single shell celt made of a conch shell lip, were also found in the middens (de Booy 1913b: 434).

JAMAICAN COLLECTIONS

J. E. Duerden's description of Indian remains in Jamaica (1897) includes a list of numerous shell midden deposits in Jamaica, and a description of the artifacts in the Museum of the Institute of Jamaica as well as in the possession of private collectors. The artifacts in the Institute were derived from several of these deposits recorded but the large part were evidently taken from the Norbrook midden. The descriptions treat the material from Jamaica as a single unit.

Duerden (1897: 38) states that,

"the general characteristic of the Jamaican aboriginal vessels may be briefly summed up as follows: circular or oval in outline; generally shallow, with an in-turned upper part; nearly always rounded at the base; margin often thickened by an additional fillet of clay; handle either luted on or formed as a prolongation of the ends, generally simple in character, but with gradation leading up to more ornamental types; occasionally perforated at the handles for suspension; ornamentation, with exception of the handles, limited to dots, straight indented lines, and fillets; surface unglazed, blackish, dirty red or yellow in colour, often with construction or smoothing marks upon it; clay varying in fineness, and generally mixed with pulverized siliceous minerals."

Of the 7 complete vessels which Duerden figures on plate 5, 4 are shallow boat-shaped bowls and 2 of these have rectangular lugs at each peaked end. They are the same type of vessel as those found in the Shell Culture deposits in Porto Rico which are termed, vessel shape B. The remaining 3 vessels are round, semi-spherical bowls with incurving rims similar to the Shell Culture, shape I. Sherds illustrated on his plate 3 and in figure 10 show the broad loop handles on fragments of boat-shaped bowls, small modeled head lugs on shallow boat-shaped bowl fragments, the laterally perforated knobs described by de Booy, and the incised line and puncture design.

Stone celts are numerous in the collections described by Duerden (1897: 31), and of these "about 90 per cent belong to the well known petaloid or almond-shaped celts, with only slight variations in form." An elongate, spindle-shaped, stone celt sharpened at both ends, is illustrated in figure 7 of his report. A type of grooved axe similar to the eared-axes of the Lesser Antilles is also illustrated on plate 2. Shell celts are illustrated in figure 3, but are said to be rare in the Jamaican collections (Duerden 1897: 36). Four conical stone pestles with carved zoomorphic heads at the apex, are illustrated on plate 4. Objects of this kind were not found in the Porto Rican Shell Culture deposits, but they are not uncommon in surface collections from Santo Domingo. Small carved amulets of marble, which he illustrates in figure 8, represent zoomorphic figures in the bound, or flexed, position characteristic of the carved figures in the Porto Rican Shell Culture deposits. A number of olivia shell rattles were found in cave earth at Richmond Hill (Duerden 1897: 45). Objects of this kind were found in Porto Rico but were not definitely associated with either the Shell Culture or the Crab Culture. Chaledony beads, found in the region of Vere (figure 2) are tubular and longitudinally drilled, but are much smaller than the tubular stone beads found in the Porto Rican Shell Culture deposits.

The brief descriptions and the illustrations of Jamaican artifacts allow for a general comparison with the Porto Rican material. The crude pottery, boat-shaped vessels, modeled head lugs, modeled figures on vessel walls, line and puncture incised design (rare), petaloid stone celts, shell celts, and small, carved, stone figures in the bound position, conform to the Shell Culture complex as established in Porto Rico. The absence of Red Slipped Ware, modeled head lugs representing the bat, the limited number of modeled lugs, the rarity of the line and puncture incised design, and the general crudeness of the pottery indicate a noticeable variation of the Shell Culture complex, and suggest a certain cultural segregation in Jamaica. The perforated knobs modified to form a crude representation of a zoomorphic being, as described by de Booy, were not found in Porto Rico, and so far as the writer knows, are also absent in collections from the other islands of the Greater Antilles.

Shell Culture traits recognized in the Jamaican collections are listed as follows:

Crude Ware.

Vessel shape A (boat-shaped bowls with loop handles).

Vessel shape B (shallow boat-shaped bowls with rectangular lugs).

Vessel shape C (shallow boat-shaped bowls with modeled head lugs).

Vessel shape I (round bowls with incurving rims).

Modeled head lugs on rims, class b (crude human-heads).

Modeled figures on vessel walls, class a (worm-like figures).

Incised ornamentation, class a (line and puncture design, rare).

Incised ornamentation, class c (vertical, parallel lines in a border about the rim).

Petaloid stone celts.

Shell celts (rare).

Small carved stone figures in the bound, or flexed, position.

Bahama Islands

The paper by W. K. Brooks in the *Memoirs of the National Academy of Sciences*, Vol. 4, 1888, is the first published account concerned with the archaeology of the Bahamas. It is a description of four skulls found in caves on New Providence Island and on unidentified "out-islands." Two of these skulls still remain in the Nassau Public Library. All the skulls are large, massive, and artificially flattened with frontal-occipital pressure. Brooks (1888: 22) compares the skulls with others from Florida described by Wyman in 1871 (4th Ann. Rep. Trustees Peabody Mus. Amer. Arch. Ethn., Boston), and by Ecker in 1878 (*Zur Kenntniss des Körperbaues früherer Einwohner der Halbinsel Florida*; Arch. f. Anthropol. vol. 10), and concludes that the similarities are such that the Florida Indians were probably an offshoot of the inhabitants of the Greater Antilles.

In 1912, Theodoor de Booy of the Museum of the American Indian, Heye Foundation, spent six months in archaeological exploration on various islands of the Bahama chain and undertook excavations in the Caicos Islands, one of the southernmost groups. A brief report was published in 1912 in the *American Anthropologist*, vol. 14.

CAICOS GROUP

A.—Two caves near Juba Point on the island of Providenciales were explored by de Booy, and excavations were made in one. The cave earth contained "charred wood, a few turtle and other bones, some fragments of pottery, and a small jadeite hatchet" (de Booy 1912: 91). A few sherds were ornamented with incisions. De Booy's figure 4 illustrates a sherd with the familiar parallel line and puncture design.

B.—Another cave at West Harbour Bluff on the Island of Providenciales was also excavated. Cave-earth deposits on the floor reached a maximum depth of 4 feet. This earth is called guano and is said to be the excrement of bats. The following description of the material removed is given by de Booy (1912: 92):

"Several bones and bone implements, among which were a hoe fashioned out of a turtle bone; three awls; one or two smaller, pointed bones probably used for ornamenting pottery, and the fang of a boar, probably employed for the same purpose. I also found about ten sherds of unornamented pottery, and three decorated fragments. Fig. 2, d, shows a sherd of brown clay with incised and impressed circular ornamentation. Fragment b, of the same illustration, is a part of the rim of a bowl of dark-brown ware and is decorated with incised straight lines. The third incised sherd is too small to be of special interest."

"In addition to these fragments I found a small head (Fig. 5, a) which evidently had been part of a bowl. It is of light-brown clay, and it is noteworthy that the sloping Lucayan forehead is clearly indicated. I have noticed this peculiarity in all other heads I have been able to find."

C.—On North Caicos Island, excavations were made in a cave at Sandy Point. Some turtle bones, an incised sherd, five or six plain sherds, a brown flint "hatchet-head," and a highly polished "black flint chisel" were found in the cave-earth. One sherd carries a lug or handle (de Booy 1912: 94). In another cave, at Pumpkin Bluff, North Caicos Island, de Booy (1912: fig. 7) found a fragment of a shallow bowl with a modeled head lug and a line and puncture incised design about the rim.

D.—At Bottle Creek, also on North Caicos Island, de Booy (1912: 97) found several mounds made of limestone boulders which he concludes had been covered with sand and used as the foundations of Indian dwellings. Plain and incised sherds, and one hammerstone were found in one of the mounds. One sherd is the flaring rim of a vessel.

A stone idol found at Kew on North Caicos Island is a seated or flexed figure similar to the small carved stone figures found in Shell Culture deposits in Porto Rico (de Booy 1912: pl. 6).

E.—On Grand Caicos Island, 4 miles southwest of the Lorimer settlement, de Booy (1912: 101) found another group of mounds built of limestone boulders. The mounds were arranged in crescents with not more than six mounds to a group. They averaged 3 feet high, 8 feet wide, and about 12 feet long. Around these structures were found a few fragments of incised pottery, and a stone knife of dark green jadeite.

D.—On East Caicos Island, near the settlement of Jacksonville, there is a cave which contains numerous petroglyphs carved on the walls (de Booy 1912: fig. 16). On Flamingo Hill, also near the Jacksonville settlement, are another group of the boulder mounds. Near them de Booy (1912: 104) found a small stone fetish, a jadeite chisel, some fragments of stone implements, a few incised sherds, and a modeled head lug.

BAHAMA COLLECTIONS

In a later paper de Booy (1913a) describes three objects from the Bahamas acquired by the Heye Foundation. One of these is a wooden paddle which he found in a cave on Mores Island, a small cay just west of Abaco Island in the northern Bahamas. Another is a four-legged wooden seat, or "dujo," which was found in a cave on Aeklins Island. The third is a stone celt with a carved seated human figure in relief, which was found on the surface at Mariguana Island.

When Columbus landed on San Salvador Island (sometimes called Watlings), the Indians told him that the islands were called the Lucayas and that the Indians called themselves Ceboynas (Brooks 1888: 215). Historians, such as Acosta, called the natives of the Bahamas, Lucayans, and the name has remained in common use. In his journals, Columbus states that the Lucayans spoke the same language as the natives of Haiti and Porto Rico and it has been assumed by all later writers that the Lucayans were an Arawak stock which occupied the Greater Antilles at the time of the Conquest. De Booy (1912: 88) believes the Lucayans were an Arawak group which were driven north through the Antilles by the Carib a short time before the arrival of Columbus.

All the artifacts found in the Bahamas de Booy terms Lucayan remains.

Archaeological material from the Bahamas is remarkably rare. The only collection of any extent known to the writer are those in the Heye Museum and that owned by the estate of Benjamin Arnold which remains in his home in Albany, N. Y. The Public Library in Nassau has a few pieces, and there is a small museum with some material on Turks Island, in the southern Bahamas.

SURVEY OF THE BAHAMAS

In 1934, the writer, on behalf of Peabody Museum of Yale University, made an archaeological survey of the Bahamas on Mr. Allison V. Armour's research yacht, the *Utowana*. Investigations were undertaken on Grand Bahama, Great Abaco, New Providence, Eleuthera, San Salvador, Cat, Rum, Conception, Long, Crooked, and Great Inagua Islands. Cave deposits were excavated on Great Abaco, Eleuthera, San Salvador, Rum Cay, Long, and Crooked. The detailed report of these investigations and excavations has not been written, but a brief summary is presented here as data for comparison with the other islands of the West Indies.

A.—On the southern tip of Great Abaco Island near the Imperial lighthouse a small cave was excavated. In a section, the earth on the floor reached a depth of $2\frac{1}{2}$ feet. Scattered through the earth were a few hutia, fish, and bird bones, a few conch shells, and some charcoal. Near the surface were the cranium, jaw, and a few long bones of a human skeleton. The only artifacts found were five small sherds of very crude, undecorated pottery.

B.—Three caves on the southern end of Eleuthera Island produced scattered skeletal material but no artifacts of any kind. Several well polished, petaloid stone celts were purchased from the natives living in this region.

C.—On San Salvador Island several caves were investigated. In two of them a shallow deposit of cave-earth produced scattered marine shells, a few hutia, fish, and bird bones, some human skeletal remains, and a few sherds of crude pottery. Some of the sherds were ornamented with a cross-hatch design. Several petaloid stone celts were purchased from the local residents.

D.—On Rum Cay numerous skeletons were removed from the Port Boyd cave. There were no artifacts of any kind. A large cave on the north coast contained several petroglyphs, some of which are figured by Mallory in the Tenth Annual Report of the Bureau of American Ethnology (1893: 139). Petaloid stone celts were also purchased on Rum Cay.

E.—Near Clarence Harbour on Long Island, skeletons were found in two caves. In one there was evidence of occupation, and most of the cave-earth was removed. A single crude undecorated sherd was the only artifact found.

F.—On the northeast coast of Crooked Island, at a place called Gordon Hill, there are a series of large dry caves facing the shore. The excavation of one produced the lower portion of a primary flexed burial, and scattered skeletal material. A second cave contained an undisturbed refuse deposit approximately 25 centimeters deep. Extensive excavation in this cave disclosed a large number of fish, bird, and hutia bones, and a few scattered marine shells. The dried foot of the conch shellfish was the most common type of food refuse. This material was mixed through a deposit of charcoal, ashes, and dry powdery sand, small potsherds of unusually coarse ware, found in the deposit were undecorated in any way. Bone awls, shell pendants, a wooden object which was probably part of a fire-making apparatus, and several well made tortoise shell fish hooks comprised the majority of artifacts removed.

G.—On Great Inagua Island no refuse deposits were found but several petaloid stone celts were purchased from the natives.

SUMMARY

It is a peculiarly significant fact that open dwelling sites marked by shell middens have never been reported in the Bahamas. Inquiries made by the writer on all islands investigated failed to locate any such deposit. It is quite certain that none exist, since the islands have been thoroughly cultivated for a long period and such deposits invariably attract the attention of the natives who work the fields. The only refuse deposits found were confined to the earth of the caves and these are very rare and never extensive. Furthermore, the cave deposits do not contain any amount of shell refuse.

A few potsherds found by de Booy on Caicos Islands in the southern Bahamas were ornamented with modeled lugs of the human-head type, and with the line and puncture incised designs, which are traits of Shell Culture pottery found in Porto Rico, Santo Domingo, and Cuba. Sherds of this kind have been found on no other island in the Bahamas, so far as the writer knows. Petaloid stone celts, which have been correlated with the so-called Arawak culture, and which are characteristic of the Shell Culture, are found in limited numbers on all of the larger islands. A few wooden objects described by de Booy have been termed Arawak.

The refuse deposits found by the writer on Crooked Island contained none of the distinctive Shell Culture artifacts and the fish hooks found there are not reported from any other island in the West Indies.

At the present time, it is impossible to determine the relation between the aboriginal inhabitants of the Bahamas and those of the other islands in the West Indies, but the following conclusions are suggested: the Caicos Islands in the southern Bahamas show traces of Shell Culture occupation (de Booy's sherds with line and puncture incisions and modeled head lugs); all other islands lying to the north show no trace of extensive Shell Culture occupation but were probably visited from time to time by people from Santo Domingo or Cuba (absence of shell middens, but the presence of a few petaloid celts and, rarely, carved wooden paddles and dujos, and the presence of Arawak-speaking people at the time of the conquest). There is a suggestion of a primitive fishing culture, distinct from the Shell Culture, in the Crooked Island cave deposit.

The Virgin Islands

The first systematic archaeological investigation in the Virgin Islands was undertaken by Theodoor de Booy in 1916 and 1917 for the Museum of the American Indian. Extensive excavations were made in village sites or refuse middens at Magen's Bay, St. Thomas Island, and at Salt River, St. Croix Island.

DE BOOY'S EXCAVATIONS

A.—The midden at Magen's Bay was found on a low hill and extended over an area 30 by 75 feet. At the central and highest point the refuse of the midden reached a depth of $9\frac{1}{2}$ feet. A diluvial deposit 2 feet thick covered the mound and contained no cultural artifacts. Below this was the refuse of occupation which contained a large amount of soil, marine and land shells, ashes, bones of the manati, hutia, various fish and bird bones, and artifacts of aboriginal manufacture. The deposit indicated two periods of occupation with an apparent lapse of time between, but the artifacts found in each level were of the same type and no cultural change was observed (de Booy 1919a: 24-26).

Nine burials were found in the Magen's Bay midden. Seven appeared in the sand below the deposit but surrounded by culture refuse. Two lay in the lowest level of deposit. Seven lay in the flexed or "embryonic" position and two lay "recumbent." Six of the burials were associated with mortuary clay vessels, some with one and others with as many as three (de Booy 1919a: 40-41).

B.—The kitchen middens at Salt River, St. Croix Island, were found to be more extensive than the deposit at Magen's Bay on St. Thomas, but did not differ materially in composition. Midden deposits were found in a semi-circle around a small hill on the western bank of Salt River. In a large midden excavated, a diluvial deposit varying from 1 to $2\frac{1}{2}$ feet was found overlying a $2\frac{1}{2}$ foot deposit of culture refuse similar to that at Magen's Bay. The shell, bone, ash, and artifact content was the same, except that numerous land crab claws (*Cardisoma guanhumii*) were found in the Salt River deposit. Burials similar to those at Magen's Bay were found in the Salt River, St. Croix, middens and a number were associated with clay vessels (de Booy 1919a: 42-47).

Numerous petroglyphs were found on St. John Island near Reef Bay, and on Congo Cay between St. Thomas and St. John Islands (de Booy 1919a: 47-58).

The artifacts found on St. Thomas and on St. Croix correspond to

such a degree that de Booy (1919a: 60) believes they pertain to the same culture and he describes the collections as a single unit.

Pottery vessels and sherds from the middens are divided into two classes: "those having painted decoration and those having none"—"the plain pottery from the two islands is the crudest found in the Antilles." (de Booy 1919a: 65). Red Slipped Ware was also found but was relatively rare (de Booy, 1919a: 77). The painted ware was treated with red paint which was applied in bands about the rim in simple curvilinear patterns on the interior of shallow bowls and dishes. The paint appears over thick, "well fired, brown clay" (de Booy 1919a: 77). Figure 21 of de Booy's report illustrates the interior of a shallow bowl with four scroll figures in red paint.

The two major types of vessel shape are illustrated by de Booy in figures 12 and 13. One is the familiar boat-shaped bowl with peaks at each end and the other is the shallow round bowl with incurving rim. A boat-shaped bowl with rectangular lugs is a usual type and one is figured on page 68. Clay griddle fragments were abundant (de Booy 1919a: 88). A large fragment of a bowl figured on his plate 8 indicates a double vessel with a partition modeled across the interior. Bowls with broad, flat loop handles were common, and one is figured on plate 7. Several of the bowls found with burials are illustrated, of which some are shallow boat-shaped vessels, and others are round bowls, the rims of which curve in from the equator. All are devoid of any kind of ornamentation (de Booy 1919a: 60).

Incised decoration is not common on the vessels and sherds from the two islands. Patterns are crude and apparently confined to simple parallel lines in a panel about the rim (de Booy 1919a: 72, fig. 17).

Modeled ornamentation is also rare on the sherds and vessels in the collection. One rim sherd carries the head and forelimbs of a zoomorphic being modeled in such a way that the figure appears to be crawling over the rim into the vessel (de Booy 1919a: fig. 26). Another sherd is a large fragment of a shallow boat-shaped bowl with a bat-head modeled on the peak (fig. 24). De Booy believes this vessel must have been traded in from Porto Rico as the object is typical of Porto Rican ceramics (de Booy 1919a: 82). Two loop handle sherds were found which carry a ridge modeled in relief and impressed with lateral incisions (fig. 27).

A single sherd found at Salt River, St. Croix, is ornamented with a red and white painted design.

"Another interesting sherd, illustrated in Fig. 25, shows a striking resemblance to some of the painted ware found on the island of Trinidad, such as has been

illustrated in a former paper. Not only does the decoration consist of white-painted lines applied on the red slip that covered the original ware, but the unusually hard-fired clay resembles that of the painted ware from Trinidad" (de Booy 1919a: 83).

Numerous perforated clay discs made from potsherds, which are termed spindle-whorls, were found in the St. Thomas and St. Croix deposits (de Booy 1919a: 87).

Petaloid stone celts were found in the deposit and purchased from natives who had found them on the surface. A few stone axes of the notched and "eared" type typical of the Lesser Antilles and commonly termed "Carib stones" were also found. Two small "three-pointed stones" of coral were removed from the deposits, one on St. Thomas and one on St. Croix. These stones (de Booy 1919a: fig. 30) have no carved figures upon them and belong to a class of objects which Dr. Fewkes has termed "3-pointed stones of the fourth type." Four elongated pestles of coral stone were also found. A slender "stone collar" found on the surface in St. Croix was presented to de Booy (de Booy 1919a: 89-95).

A carved bone object representing a human figure in the round was found in the Magen's Bay deposit on St. Thomas. It is termed a "swallow-stick" and is compared to similar objects found in Porto Rico (de Booy 1919a: 95-97, pl. 9).

The description of the St. Thomas and St. Croix midden artifacts indicates that they conform in practically every detail to those found in the Shell Culture deposits at Barrio Monserrate on the eastern end of Porto Rico. Crude Ware, Red Slipped Ware, and Red Painted Ware are present in apparently the same proportion. The application of red paint on plain ware, in bands about the rim and in curvilinear patterns on the interior of shallow bowls, is a trait particularly characteristic of the Monserrate Shell Culture deposit and also found in the Barrio Canas deposit. The design composed of four scroll figures on the inside of a shallow bowl (de Booy 1919a: fig. 21) is the same as the design on a bowl found at Monserrate. The boat-shaped bowls with and without rectangular lugs are particularly characteristic of the Shell Culture. Flat loop handles, found in the deposits, are also a Shell Culture trait. The round or hemispherical bowls found with the burials on both St. Thomas and St. Croix were found in all Shell Culture deposits in Porto Rico and are referred to as shapes D, h, and i, depending upon the angle of the rims which in all cases are straight or incurving. The majority of the burial urns found at Monserrate were of this type. The bowls with partitions (shape 1) are another characteristic Shell Culture trait.

The line and puncture incised decoration is apparently not found in the St. Thomas and St. Croix sites, but the incised designs that were found are parallel incisions in a panel about the rim, which conforms to the Shell Culture patterns.

The modeled figure found on the rim of a sherd from the St. Thomas midden (de Booy 1919a: fig. 26) is practically identical with a rare type of modeled figure found at Barrio Monserrate. The ridges incised with lateral grooves, found on loop handles from both St. Thomas and St. Croix were also found on handles in the Monserrate deposit, and the type of ornamentation was grouped with the worm-like figures commonly found on Shell Culture vessels. The bat-head, as de Booy (1919a: fig. 24) points out, is typical of Porto Rico.

Spindle-whorls, or perforated clay discs, were numerous in the Monserrate and Coto Shell Culture deposits. The petaloid stone celts and small three-pointed stones of the "fourth type" are also distinctive Shell Culture traits.

A list of Shell Culture traits found in the St. Thomas and St. Croix middens is given as follows:

- Crude Ware (predominating).
- Red Slipped Ware (rare).
- Boat-shaped vessels.
 - shape A (?) loop handles.
 - shape B rectangular lugs.
 - shape C modeled head lugs.
- Round bowls with straight or incurving rims.
 - shape h straight rim.
 - shape i incurving rim.
- Clay Griddles, shape E.
- Bowls with partitions, shape l.
- Modeled head lugs on rims, class a, rare (bat-heads).
- Modeled forms on vessel walls, class c (worm-like—on handles at Monserrate and at St. Thomas and St. Croix).
- Incised ornamentation (parallel lines in panels about rim but lacking the Shell Culture line and puncture design).
- Painted decoration (red bands on rims and simple curvilinear designs in red on the interior of bowls. Abundant at Monserrate, rare at Canas, absent at Coto).
- Petaloid stone celts.
- Three-pointed stones of the "fourth type."
- Clay spindle-whorls.

It is significant that the majority of the burials found by de Booy were the flexed or "embryonic" type, since the majority of all burials in the Shell Culture deposits in Porto Rico were also of this kind.

The presence of a single red and white painted sherd of "unusually hard-fired clay" in the St. Croix deposit is peculiarly interesting.

The description would indicate that it is definitely a Crab Culture object similar to pottery of the Crab Culture deposits in Porto Rico. De Booy mentions a large number of land crab claws in the St. Croix midden where the sherd was found, but unfortunately the relative depth of the sherd and the crab claws are not reported.

HATT'S EXCAVATIONS

In 1922 and 1923, Gudmund Hatt carried out extensive excavations in several midden deposits on St. Thomas, St. John, and St. Croix. He was in cooperation with Professor de Josselin de Jong of Leiden. A brief account of these excavations was published by Hatt (1924).

The sites excavated are divided into three groups on the basis of the types of artifacts removed.

A.—The small shell heaps at Krum Bay, St. Thomas, are distinguished from all other deposits investigated.

“They are situated at a sheltered bay, but upon rocks, and good farming land is not to be found in the immediate neighborhood. Furthermore, these shell heaps are almost devoid of pottery—a few fragments only were found quite near to the surface. Small petaloid stone axes are very common in all the other sites which we have examined; but they are conspicuously absent at Krum Bay. On the other hand, we found at Krum Bay a number of specimens of a peculiar long and narrow type of stone axe. Characteristic of the Krum Bay middens is also a great quantity of red ochre; this colouring material has been pounded by means of hammerstones. This seems peculiar, because red ochre was almost entirely absent from all other prehistoric sites examined by us. I am strongly tempted to regard the Krum Bay middens as remnants of a culture, earlier and more primitive than those represented in the other sites. Unfortunately, however, we did not succeed in finding any other example of this primitive culture in the Virgin Islands nor in Santo Domingo, and it is not possible to identify it with M. R. Harrington's primitive “Ciboney Culture” in Cuba, because the implements found at Krum Bay are quite different from Ciboney artifacts” (Hatt, 1924: 31).

B.—A second group of deposits indicating cultural identity comprise those at Magen's Bay and the small sites along the north coast on St. Thomas, and those at Salt River, Glynn, and Fair Plain on St. Croix (Hatt 1924: 31). Traits characterizing the Magen's Bay—Salt River group are:

“round bowls . . . the bottom is very narrow, flat or nearly flat, the sides diverge widely, but their upper part is falling inwards, toward the rim. In some instances, this upper part has incised ornamentation . . . This type of vessel is well known from the Greater Antilles. One single piece from Salt River (Fig. 3, d) has very deeply incised decoration, the lines terminated with small pits; this specimen may have been imported to St. Croix from Puerto Rico. Characteristic of Magen's Bay and Salt River are also boat-shaped vessels (Fig. 2, d, and Fig. 3, e) with decoration in relief and head-shaped handle. Several fragments

of double bowls were found at Magen's Bay and Salt River. Red-painted rims and black- and red-painted ornamentation are found on some shallow dishes and plates of the type shown in Fig. 2, g" (Hatt 1924: 32).

Modeled head lugs from Magen's Bay and Salt River illustrated on his plate 3 show the bat-heads, crude human-heads, and bird-heads, generally attached to peaked rim fragments of shallow boat-shaped bowls.

Shell chisels made of the lip of the *Cassia tuberosa* shell (Hatt 1924: 34, fig. 9, c), engraved shell amulets (page 35, fig. 10, h, i), carved shell discs (fig. 9, h), bone spatulas (page 35), tubular stone beads (page 35), spindle-whorls made of potsherds (page 35), and a large number of small three-pointed objects of shell and stone (fig. 21), were limited to the Magen's Bay—Salt River deposits.

Primary flexed burials and child urn burials were found in the refuse at Salt River and Magen's Bay and are typical of this group of deposits (Hatt 1924: 39).

Hatt (1924: 41) suggests that,

"the Indians at Salt River and Magen's Bay must have had a rather lively connection with the Tainan area (i. e., Puerto Rico, Hispaniola, and Cuba) especially toward the close of the prehistoric era."

The material obtained by Hatt, together with that obtained by de Booy, duplicates practically all the material found in the Shell Culture deposits in Porto Rico and illustrates a cultural identity. Shell Culture traits described and illustrated by Hatt (1924) from the Salt River—Magen's Bay deposits, are listed as follows:

Crude Ware.

Boat-shaped bowls.

shape A—(fig. 2, h).

shape C—(fig. 3, e).

Round bowls with straight or incurving rim.

shape D—(fig. 3, b, g).

shape h—(fig. 2, d).

shape i—(fig. 3, c, h).

Griddles, shape E—(fig. 3, b).

Bowls with partitions, shape l—(fig. 2, f).

Modeled head lugs on rims.

Class a—bat-heads (fig. 5, a, h, i).

Class b—human-heads (fig. 4, i, fig. 5, n).

Class d—bird-heads (fig. 5, s, t)

Modeled figures in relief on vessel walls, Class d—head and forelimbs (fig. 3, e).

Incised decoration.

Class a—line and puncture (fig. 3, d).

Class c—curvilinear in panel on rim (fig. 3, e).

Painted decoration; Red paint applied to rims and in simple curvilinear designs on the interior of shallow bowls of Crude Ware (page 32).

Shell chisels (fig. 9, c).

Engraved shell amulets (fig. 10, h, i).

Shell discs (fig. 9, h).

Bone spatulas (page 35).

Carved bone object (page 35).

Petaloid stone celts (page 34).

Tubular stone beads (page 35).

Three-pointed objects of shell and stone (fig. 21), 3-pointed "zemis" of 4th type.

Clay spindle-whorls (page 35).

Primary flexed burials in refuse are typical of all Shell Culture deposits in Porto Rico. Child urn burials were numerous in the Shell Culture deposit at Barrio Monserrate and one was found at Barrio Coto.

C.—The third group of deposits segregated by Hatt (1924) as showing cultural identity are those at Coral Bay and Little Cruz Bay on St. John, and at Longford, Fair Ham, and Sprat Hall on St. Croix. The pottery from the Coral Bay-Longford group of deposits is characterized by the "thinness and fineness of the ware" (Hatt 1924: 32), the use of red and white paint (rarely yellow) (page 33), round bowls with straight or flaring rims (figs. 6, 7), D-shaped handles (fig. 6, b, fig. 7, c), annular bases (page 33), and "flat handles with faces in relief" (page 33). Unfortunately, the descriptions of the pottery from the Coral Bay-Longford group of deposits is very brief and does not allow for a detailed comparison. The distinctive traits which are recorded, such as red and white painted pottery, thin and fine ware, annular bases, D-shaped handles, and the semi-lunar lugs with ridge nose and eyes, correlate, however, with the Crab Culture in Porto Rico and indicate a close cultural relation.

A bowl which is illustrated (Hatt 1924: fig. 7, b) has the flaring rim and the ridge about the circumference where the angle of the wall is changed, typical of shape A bowls in the Crab Culture deposits. Another round bowl (fig. 6, b) has a vertical rim with D-shaped handles and is apparently identical with the shape C cooking bowls of the Crab Culture. High annular bases are numerous in the Coral Bay-Longford midden collections (page 34, fig. 7, c). This is a particularly characteristic trait of the Crab Culture. The presence of D-shaped handles which carry a button-like knob and have been termed D-shaped handles of the 2nd class, in the Coral Bay-Longford middens, is a detailed trait which alone would indicate a cultural connection between these deposits and the Crab Culture deposits in Porto Rico. No detailed description of the red and white painted sherds is given,

but in the Heye Museum collections in New York are several sherds from St. Croix which are the same as Porto Rican Crab Culture sherds. The white is applied over red paint and the same designs can be recognized. Chief among these is the spool-shaped figure. The semi-lunar lugs with the nose ridge and protruding eyes, found in the Coral Bay-Longford middens, and the modeled head lugs, type b, found in the Porto Rican Crab Culture deposits are identical. A large number of lugs of this kind have been acquired recently on St. Croix by Mr. Korn for the Heye Museum. All of them are on the rims of polished and slipped Brown Ware bowl fragments, and many of these fragments show the red-painted rim typical of the Crab Culture.

Crab Culture traits in the Coral Bay-Longford middens are listed as follows:

- Round open bowls with a wide flaring rim, shape A (except for perforated knob).
- Round bowls with a vertical rim and D-shaped handles, shape C.
- Round bowls with high annular bases, shape F.
- Plain Brown Ware (hard, thin pottery with a slip or polish).
- Red Painted Ware, class a (red paint on rim over a brown slip).
- Red and White Painted Ware (two color designs with white on red. A spool-shaped figure is a characteristic element).
- D-shaped handles, 1st class and 2nd class.
- Modeled head lugs, type b (semi-lunar lug with ridge nose and protruding eyes).

Hatt (1924: 34) points out that,

“the ceramics of the Coral Bay-Longford group have very little in common with the art of the Greater Antilles, but more with that of the Lesser Antilles, especially with that of St. Kitts and Nevis, described by C. W. Branch in the *American Anthropologist*, n. s., vol. 9, and that of St. Eustatius, lately excavated by de Josselin de Jong and still unpublished. Similarities may even be pointed out between the Coral Bay-Longford group and Erin Bay on Trinidad; the peculiarly tipped handles of the vessel, Fig. 7, c [D-shaped handles of the 2nd class] remind one of those from Erin Bay . . . The annular base is also a trait, indicating influence from the Lesser Antilles. Likewise the use of painted decoration is characteristic of the Lesser Antilles.”

SUMMARY

It is clear that both the Shell Culture and the Crab Culture, as established in Porto Rico, appear in the Virgin Islands. No stratification was found, but Hatt (1924: 33) points out that the Coral Bay-Longford ceramic complex (Crab Culture) is undoubtedly older than the Magen's Bay-Salt River complex (Shell Culture), since “the interrelation between the two groups is most evident in the lower and older part of the Magen's Bay and Salt River deposits, [and] it is in the upper and younger parts of these deposits that ceramic influence from the Greater Antilles is most clearly to be seen.”

St. Kitts and Nevis

No extensive archaeological excavation on St. Kitts or Nevis has been reported. Several collections of artifacts, however, have been made, and these are described in publications by Dr. C. W. Branch and by Dr. J. W. Fewkes. A large number of specimens were collected by Dr. Branch prior to 1900 which are now in the National Museum in Washington.

Six aboriginal settlements or midden sites on St. Kitts and two on Nevis were located by Dr. Branch. Road cuts and cultivation exposed refuse which was composed primarily of land crab shells, with occasional sea-crab, welk (*Turbo pica*), queen-conch (*Cassis tuberosa*), king-conch (*Strombus gigas*), and other marine shells. Fish, bird, and a small mammal's bones were also found in the refuse. Fragments of pottery were numerous (Branch 1907: 331-332).

A single aboriginal burial found on St. Kitts, in a roadside cut near West-farm, is described by Dr. Branch (1907: 333):

"The body was buried facing the east, in a sitting position with the arms crossed and the fingers resting on the shoulders. The face was upturned. The pottery had been placed evidently in front of the feet. The bones are those of a male adult. The occiput was flattened to such a degree that the outline of the back of the neck must have continued straight to the vertex."

Pottery collected from the surface of the midden sites was fragmentary, but a few sherds were large enough to indicate the vessel shape and various bowls have been restored (Branch 1907, fig. 29). Two round bowls with a flaring rim, a round bowl with a vertical rim, and a high annular base, a small cup-shaped bowl, and two shallow bowls or dishes with a thickened or "right-angle" rim, are represented. Fragments of "baking slabs" recorded by Branch (1907: 325), probably are segments of the so-called cassava griddles commonly found throughout the West Indies.

Some of the pottery found is coarse and unpainted, while some is slipped and painted. "Thin, unpainted ware of dark clay" is occasionally incised with a fine cross-hatch design. Branch (1907: fig. 26) illustrates 5 sherds of this kind with cross-hatch designs in a panel about the inside of the vessel rim.

"On some vessels red paint is applied thickly over the whole outside, or the whole inside, but rarely over both . . . The thick rim of unpainted vessels usually is painted dark red . . . Incisions are occasionally employed on thick painted vessels to define the painted areas."

"Painted patterns are also conventional; they are made up mostly of spirals and curves, along with straight lines . . . The patterns are in white or sometimes light blue, on a red ground or on the unpainted reddish clay . . . A

walnut-black stain, probably of vegetable origin, is used inside the lips of basins. The colors used are vermilion, light red, and dark red, and dark red for slips (orange occurs on part of one well finished article); white and light blue for patterns; and the black stain mentioned above" (Branch 1907: 327-328).

Well-made shell spoons (Branch 1907: fig. 23), shell celts (page 322), hammerstones (page 318), conical and bell-shaped stone pestles (plate 21), polished petaloid stone celts, and rectangular "Scandinavian type" stone celts (page 319) have been collected on St. Kitts and Nevis and are described by Branch.

A comparison of the pottery from St. Kitts and Nevis now in the National Museum, with the pottery from the Crab Culture deposits in Porto Rico, indicates a remarkable similarity. The unusually hard, thin, brittle, and well-fired ware which characterizes the bulk of the pottery in Crab Culture deposits is also present on St. Kitts and Nevis. Red and white paint is applied in the same manner on Brown Slipped Ware and the designs correspond in minute detail. The spool-shaped figures, the scrolls and circles in negative red enclosing dots, the use of white paint inlaid in an incised spiral pattern, red painted discs on brown slipped ware outlined by incisions, and the application of designs in panels on the outside of vessels are detailed elements of decoration found on St. Kitts and Nevis as well as in Crab Culture deposits in Porto Rico.

The D-shaped handles with the peculiar button-like knob are also present in the St. Kitts-Nevis collections. The perforated buttons on vessel walls are another distinctive Crab Culture trait. The cross-hatch designs in panels about the inside of vessel rims, found on St. Kitts and Nevis, were applied after the vessel was fired as is characteristic of these designs on Crab Culture pottery. Bowls with flaring and "right-angle" rims predominate on St. Kitts and Nevis as in the Crab Culture deposits. Another trait linking these collections is the presence of modeled head lugs which have been termed semi-spherical, on vessel rims. Zoomorphic clay heads of this type have been impressed at the back to form a cup-shape. The features are modeled on the convex surface and are outlined by deep incisions (FIGURE 14).

Crab Culture traits identified in the collections from St. Kitts and Nevis are listed as follows:

- Vessel shape A (Round, open bowl, with wide flaring rim and perforated knob at ridge about circumference).
- Vessel shape B (round, open bowl with wide flaring rim).
- Vessel shape F (round bowl with high annular base).
- Vessel shape K (griddles).

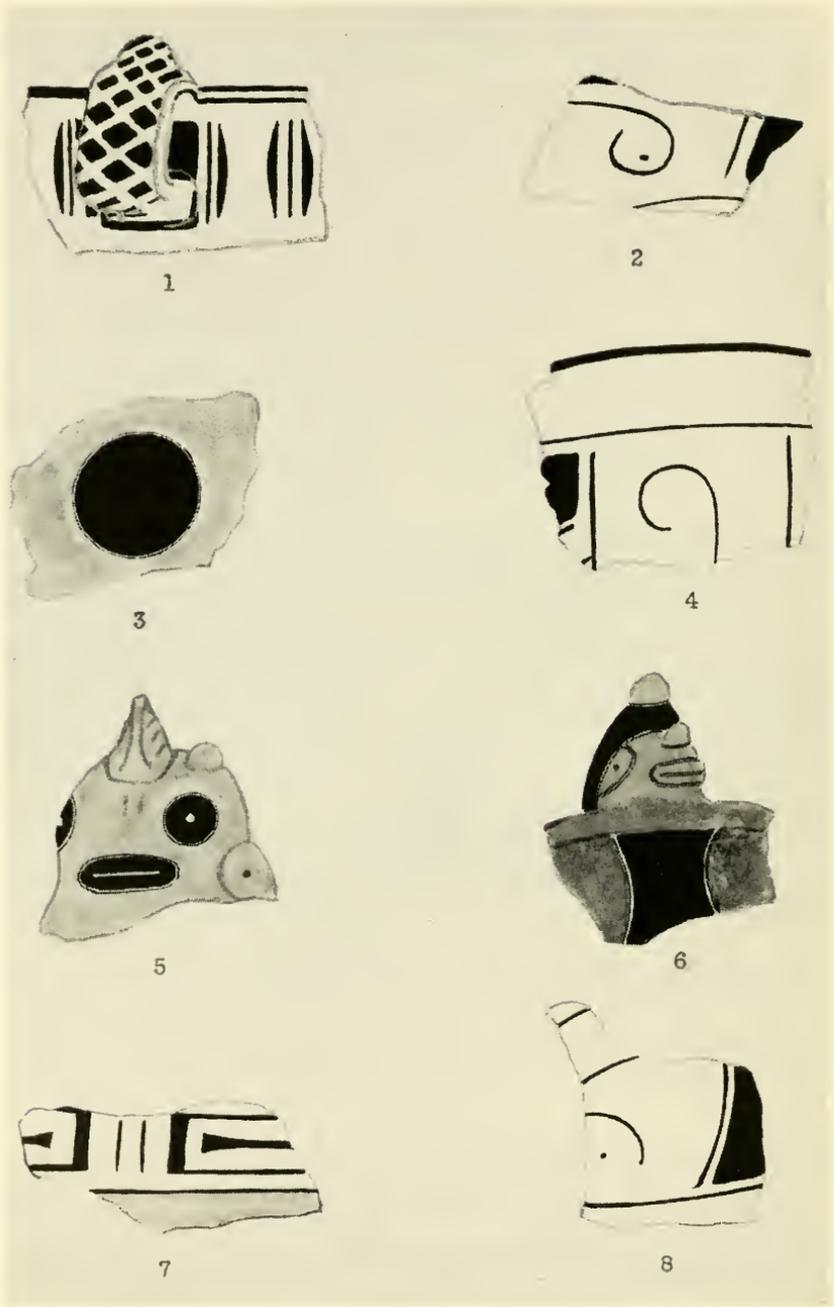


FIGURE 14

Plain Brown Ware (thin, hard, and well fired, generally slipped or polished).

Class a (curvilinear designs on the interior of bowls).

Class b (cross-hatch incised designs on the interior of rims, applied after firing).

Red Painted Ware (red painted on Plain Brown Ware).

Class a (paint on rim only).

Class b (paint on one side, never on both).

Class c (in patterns outlined by incisions—often a red disc at the bottom and inside of vessels).

Red and White Painted Ware (white applied over red and both generally over a brown slip).

Class a (two color designs, spool-shaped, spirals enclosing dots, applied in panels).

Class b (two color designs with white inlaid in an incised pattern).

Class c (three color designs, white on red over a brown slip with the slip forming a third color element of the design).

Class d (Miscellaneous, rarely black or salmon colors. On St. Kitts, some orange and blue).

D-shaped handles.

1st class (plain).

2nd class (with button-like knob).

Perforated knobs on vessel walls.

Modeled head lugs.

Type a (semi-spherical).

The shell spoon figured by Branch (1907: fig. 23) is very similar to objects of this kind tentatively associated with the Crab Culture in Porto Rico. The "Scandinavian type" rectangular stone celts appear to be similar to the Crab Culture "rectangular adze-like celts," but a definite comparison is not possible with illustrations alone. Shell celts were associated with the Shell Culture and not the Crab Culture in Porto Rico. Conical and bell-shaped stone pestles in the St. Kitts-Nevis collections have no cognates in the Porto Rican collections made by the writer.

It is peculiarly significant that the St. Kitts-Nevis artifacts are

FIGURE 14. Distinct Crab culture types from the Lesser Antilles. 1. St. Croix. Red and White Painted Ware, class a. Negative red design, and positive white cross design. D-shaped handle of the 2nd class. From the Heye Museum collections. 2. St. Kitts. Red and White Painted Ware, class a. Negative red scroll enclosing a dot. From C. W. Branch (1907, pl. 22). 3. Montserrat. Red Painted Ware, class c. Red disc outlined by an incision, at the bottom, inside of a vessel. From the Heye Museum collections. 4. St. Vincent. Red and White Painted Ware, class a. Negative scroll figure. From the Heye Museum collections. 5. Mustique. Red Painted Ware, class c. Modeled head lug, type c (hollow, spherical). Bulging eyes and mouth outlined by incisions. From the Heye Museum collections. 6. Carriacou. Red, white and black painted sherd, with the white inlaid in the incisions. The spool-shaped figure in black. Modeled head lug, type c. (Semi-spherical, impressed at back to form cup-shape.) Bulging eyes and mouth outlined by incisions. From the Heye Museum collections. 7. Grenada. Red and White Painted Ware, class a. Negative red spool-shaped figure in a rectangular panel. From the Heye Museum collections. 8. Trinidad. Red and White Painted Ware, class a. Negative red scroll figure enclosing a dot. From the Heye Museum collections.

found in food refuse which is primarily composed of land crab shells, since this type of food refuse is always found associated with Crab Culture artifacts in Porto Rico.

The detailed correspondence between the St. Kitts-Nevis collections and the Porto Rican Crab Culture collections is such that a cultural identity is clearly demonstrated. The presence of identical design elements on the pottery in both collections indicates a contemporaneous occupation by closely related peoples or a migration from one region to the other.

Montserrat

Montserrat is a small island in the Lesser Antilles which lies approximately thirty-five miles south of Nevis and forty miles northeast of Guadeloupe. No account of archaeological excavations or collections on the island has been published, so far as the writer knows. In the Museum of the American Indian, however, there is a large collection of artifacts from the island and these have been examined by the writer for comparison with the artifacts excavated in Porto Rico.

In this collection the following Crab Culture pottery traits have been recognized:

Vessel shape A (round, open bowl with wide flaring rim and ridge about circumference; identical except for perforated knob).

Vessel shape B (round, open bowl with wide flaring rim).

Vessel shape C (round, flat-bottomed cooking bowl with vertical rim and D-shaped handle).

Vessel shape E (large, heavy jar with restricted neck and D-shaped handles).

Vessel shape F (round bowl with high annular base).

Plain Brown Ware (hard, thin, well-fired ware, generally slipped or polished).

Red Painted Ware.

Class a (red paint applied on Brown Ware in a band on the rim only).

Class b (red paint applied over one side).

Class c (red paint applied in patterns outlined by incisions; a common pattern is the red disc on the bottom, inside of bowls).

Red and White Painted Ware.

Class a (two color designs with white always applied over red and both on Plain Brown Ware in decorative panels; negative red, spiral and spool-shaped elements).

Class b (two color designs with white inlaid in incised patterns).

D-shaped handles.

1st class (simple, broad, D-shaped handles).

3rd class (D-shaped handles terminating at rim with a semi-lunar lug).

Modeled head lugs (characterized by bulging eyes and mouth, outlined by incisions).

Type a (semi-spherical heads, impressed at back to form a cup-shaped figure with features modeled on the outer convex side).

Type c (spherical, hollow heads, often containing rattling clay pellets).

The shell spoons in the Montserrat collections and those associated with Crab Culture artifacts in Porto Rico are identical. Several jade ornaments, stone beads, and a few shell celts in the Montserrat collections are not Crab Culture traits as established in Porto Rico, and the shell celts are, in part, similar to Shell Culture implements.

The pottery from Montserrat, like that from St. Kitts and Nevis, corresponds even in minute detail to that characterizing the Crab Culture and indicates a definite cultural affiliation.

Guadeloupe

Professor O. T. Mason (1885) has published a description of archaeological material in the Guesde collection which is now in the Berlin Museum für Volkerkunde. This collection is probably the largest ever made on the island of Guadeloupe and it is the only one described in a publication. Dr. Fewkes (1922) quotes from Professor Mason's descriptions and illustrates a large number of stone objects from this collection.

The descriptions and illustrations are confined principally to stone objects found on the island and no description of pottery is given. The large number of peculiar "problematic" stone objects and the so-called "cared axes" described by Mason have come to be known in later publications, and popularly in the West Indies, as "Carib stones." On the basis of the stone objects, Dr. Fewkes (1922: 128) refers to Guadeloupe as "the most aberrant island, archaeologically speaking, of the St. Vincent Culture area." One "cared axe" similar to the Guadeloupe specimens was found in the Barrio Canas Shell Culture deposit and another in the Barrio Coto Shell Culture deposit, in Porto Rico. The great majority of the objects figured do not resemble any of the stone implements found in Porto Rican excavations.

Dominica

Dominica is another of the volcanic islands in the chain known as the Lesser Antilles. It lies approximately thirty miles south of Guadeloupe. No extensive archaeological investigation on the island has been reported, but Dr. Fewkes examined some local collections during a brief visit to Dominica, and discusses some of the stone objects in his "A Prehistoric Island Culture Area of America" (1922).

Petaloid stone celts, a few notched axes, and some grinding stones are described. No mention of pottery appears. Dr. Fewkes (1922: 126) concludes that,

"the various objects obtained from Dominica belong to the same type as those used by an agricultural people, and probably belonged to a race antecedent to the

Carib. This points the same way as the archaeological material from the other Lesser Antilles, and supports the theory that the original inhabitants of these islands had a kinship with those of Santo Domingo and Puerto Rico."

In the Museum of the American Indian there are a few potsherds from Dominica. All of these sherds are rough, coarse ware resembling the Shell Culture Crude Ware in Porto Rico. One sherd carries a monkey-head (or bat-head) very similar to the type found in Santo Domingo. There are also sherds with the line and puncture designs in panels about the rim, which is a characteristic aspect of ornamentation on Shell Culture pottery. These few sherds from Dominica stand in sharp contrast to the pottery from the Lesser Antilles in general which is thin, hard, brittle, and well fired, often slipped, polished and painted. Although no conclusions can be based on a few sherds from Dominica, it is significant that distinctive Shell Culture traits are found, and that Fewkes suggests a connection between Dominica and the Greater Antilles, where Shell Culture artifacts predominate, on the basis of stone implements, which are primarily petaloid celts. Dominica will probably prove to contain Shell Culture deposits correlating with the second period of occupation in Porto Rico.

Barbados

Dr. J. W. Fewkes includes a brief description of the archaeology of Barbados in his last publication (1922) concerned with the West Indies. Excavation was not undertaken, but Fewkes located ten midden deposits, some cave deposits, and some "Indian excavations" which are rectangular rooms hewn out of the rock. Fewkes also examined several collections of artifacts from Barbados and includes a commentary on the type of material found.

A globular bowl with a spout, hourglass-shaped pottery rests, pottery heads of "characteristic form," sherds of "coarse red ware, showing no signs of painting," stone celts of the petaloid and "Scandinavian" types, a carved shell fetish, and many shell chisels are mentioned (Fewkes 1922: 86-87). Fewkes concludes that "the pottery from Barbados is as a rule coarse, the relief decorations low and crude. It can hardly be placed in the same category as the beautiful ware from Trinidad" (Fewkes 1922: 260).

St. Vincent

St. Vincent lies in the Lesser Antillean chain approximately half way between Guadeloupe and Trinidad. Archaeologically, Dr. Fewkes has grouped it with Grenada, Bequia, Carriacou, Battowia,

and Balliceaux, in a St. Vincent-Grenada area (Fewkes 1922: 88). A large collection of artifacts from St. Vincent, made by Rev. Thomas Huckerby, was purchased by Mr. Heye for the Museum of the American Indian. Rev. Huckerby (1914) has published pictures of the pictographs found on St. Vincent. Dr. Fewkes has examined the Huckerby collection and published (1922) a description in his "A Prehistoric Island Culture Area of America."

The descriptions presented by Dr. Fewkes are limited to the numerous stone objects in the Huckerby collection. The majority of these objects are the "problematic" stones and "cared-axes" referred to, in general, as "Carib stones." As stated in a previous section, these artifacts are found throughout the Lesser Antilles but are not characteristic of the Shell Culture or Crab Culture as established in Porto Rico. Some petaloid celts (Shell Culture trait) and also some rectangular adze-like celts are illustrated by Fewkes (1922: pl. 11, K, and pl. 12, A). The rectangular celts appear to be similar to the Crab Culture type. The pottery from St. Vincent, Fewkes associates with that from Carriacou, and Grenada (1922: 118).

The collections in the Museum of the American Indian contain numerous specimens of St. Vincent pottery and the majority correspond, in a remarkable degree, to pottery from the Crab Culture deposits in Porto Rico. The following distinctive Crab Culture traits are present:

Round bowl sherds with wide flaring rim suggesting shapes A and B.

Plain Brown Ware (hard, thin, brittle, and well fired, generally slipped and polished).

Class b (plain Brown Ware with fine cross-hatch designs about the inside of the rim, applied after firing).

Red Painted Ware.

Class b (red paint applied over one side of Brown Ware vessels).

Class c (red painted designs outlined by incisions).

Red and White Painted Ware.

Class a (two color designs with white applied over red and both on Plain Brown Ware, in design panels; spirals enclosing dots, negative designs in red, detailed designs corresponding to those in Crab Culture deposits in Porto Rico).

Class b (two color designs with white inlaid in an incised pattern, spiral designs).

D-shaped handles.

1st Class (simple D-shape).

2nd Class (D-shaped handles with button-like knob).

Modeled head lugs (characterized by protruding eyes and mouth outlined by incision).

Type a (semi-spherical with the back impressed to form a cup-shape and with features modeled on convex side).

Type b (flat, semi-lunar lugs with nose ridge and protruding eyes).

Type c (spherical, often containing rattling pellets).

Modeled head lugs in the St. Vincent collection are much more numerous than in collections taken from Crab Culture deposits in Porto Rico, and various distinct types can be recognized which were not found in Porto Rico, but all have in common the smoothly modeled, bulging features outlined by deep incision. None of the pottery carries ornamental elements characteristic of the Shell Culture and all of it belongs to the class of pottery showing an advanced technique of manufacture. On the basis of pottery, St. Vincent clearly falls in the area and period of Crab Culture occupation.

Mustique

In the Museum of the American Indian there are a few potsherds from Mustique, a small island which lies a few miles south of St. Vincent in the Lesser Antillean chain. The specimens are very similar to those found on St. Vincent and are also characteristic of the Crab Culture. The sherds are all rim fragments which carry modeled head lugs. The ware is thin, hard, brittle, and well fired. Some of the sherds are of Plain Brown Ware, slipped and polished. Others are red painted in part, and one is red and white painted with the white applied over the red, and inlaid in incisions. Most of the modeled head lugs have the protruding eyes and mouth outlined by incisions, and one is concave or semi-spherical with the form characteristic of Crab Culture modeled head lugs, type a.

Carriacou

Pottery from Carriacou, another small island of the Lesser Antilles which lies just south of Mustique, is also present in the collections of the Museum of the American Indian. Some of this is described and figured by J. W. Fewkes in the 34th Annual Report of the Bureau of American Ethnology. Many of the sherds figured by Dr. Fewkes, and others in the collection, are clearly of Crab Culture type, but some appear to correlate with the Shell Culture, and a few carry ornamental elements which have not been associated with either ceramic complex.

Brown Ware sherds with a slip and polish, Red Painted Ware sherds with paint applied to the rim, Red and White Painted sherds with the white inlaid in an incised pattern, Red, White, and Black Painted sherds with the characteristic spool-shaped figure, and modeled head lugs with protruding eyes and mouth outlined by

incisions, some of which have the semi-spherical form, definitely correlate with the Crab Culture ceramic complex. D-shaped handles, and bowls with annular bases (Fewkes 1922: pl. 62) are also distinctive Crab Culture traits.

A few Crude Ware sherds with modeled head lugs of the human-head type indicate the Shell Culture complex. A double bowl and two boat-shaped bowls figured by Fewkes (1922: pl. 62, D, and pl. 68, B, C) are similar in form to distinctive Shell Culture bowl shapes. A number of modeled head lugs figured by Fewkes (1922: pl. 67) have some of the characteristics of Crab Culture lugs (features outlined by incisions), but in general appearance are distinct from lugs associated with either ceramic complex.

Grenada

Grenada, which lies at the southern end of the Lesser Antillean chain, approximately seventy miles northwest of Trinidad, has also produced pottery which corresponds in remarkable detail to the Crab Culture type. In the large collection from Grenada, now in the Museum of the American Indian, the following Crab Culture ceramic traits have been recognized:

Bowl sherds with wide flaring rims which suggest shapes A and B.

Vessel shape F (bowl with a high annular base—in the collection is one semi-boat-shaped bowl resting on a high annular base).

Plain Brown Ware (thin, brittle, well fired ware generally slipped and polished).

Class a (curvilinear incised designs on the inside of Brown Ware bowls).

Class b (fine cross-hatch designs on the inside of the rim of Brown Ware bowls, applied after firing).

Red Painted Ware.

Class a (red paint applied on the rim of Brown Ware bowls).

Class c (simple designs in red outlined by incisions).

Red and White Painted Ware.

Class a (two color designs with white applied over red and both applied over Brown Ware; negative red elements predominating, with scroll and spool-shaped figures duplicating the characteristic Crab Culture design elements).

Class c (three color designs with the basic brown slip forming a third color element in the design).

Class d (miscellaneous, some black paint used with white and red to form the design).

D-shaped handles.

4th class (horizontal to the rim).

Modeled head lugs (characterized by protruding eyes and mouth outlined by incisions).

Type a (semi-spherical heads with the back impressed to form a cup-shape with the features modeled on the convex surface).

On the basis of stone implements in the collections from Grenada,

Dr. Fewkes associates the island with St. Vincent to the north and Trinidad to the south (Fewkes 1922: 88). The pottery in the collections correlates with the Crab Culture complex in most particularized details, and clearly illustrates a Crab Culture occupation.

Trinidad

ERIN BAY

In the winter of 1912-13, Dr. J. W. Fewkes excavated the Teip-Teip shell heap at Erin Bay, Trinidad. A brief description by him (1914a: 205) of the deposit is given as follows:

"The shells in the mound at Erin are in layers alternating with vegetable mold, ashes, and soil, forming a sticky mass that clings tenaciously to the specimens and almost conceals their identity. The terra-cotta heads, when dug out of the earth, were completely coated with mud which had to be removed by washing, and by so doing some of the red pigment which covered them disappeared. As the ceramic objects had been painted after they were fired, the color is not permanent, and the length of time they had been in the ground caused it to come off even more readily."

A complete bowl found by Fewkes in the Teip-Teip deposit, and illustrated in his figure 64, is a round vessel with an equatorial ridge, which stands on an annular base. The upper half of the bowl is ornamented with deep, broad, parallel incised lines. Another complete vessel is rectangular and stands on four short legs. The outer surface is also engraved with broad incised lines (Fewkes 1914a: fig. 67). A third vessel, which is nearly complete, is evidently a turtle effigy with a modeled head and flippers (1914a: fig. 68). A few fragments of turtle effigy vessels were found in the Crab Culture deposits in Barrio Monserrate, in Porto Rico.

The majority of the pottery fragments from the Teip-Teip deposit, described and illustrated by Fewkes, are rim and handle sherds which carry modeled head lugs. All of these lugs are characterized by the bulging features which are outlined by deep, broad, incised lines. The incisions also extend along the rim on several sherds illustrated. The heads represent a great variety in composition but the bulging features and incised lines are common to all.

Petaloid stone celts, notched axes, chisels, pecking-stones, mortars, pestles, and a jadeite pendant are recorded from the excavation but only one notched axe, and the pendant are described and illustrated.

Dr. Fewkes (1914a: 219) concludes:

"The well made pottery of Erin Bay suggests an agricultural population rather than the nomadic Carib people, and the form of certain flat clay pottery, or griddles, is not unlike those used by the Arawak in the preparation of meal for cassava cakes. The aborigines who made these objects were in a stage of culture

similar to that of a people of the West Indies before the coming of the Carib in prehistoric times."

CAPE MAYARO

In 1915, Theodoor de Booy continued archaeological excavations in Trinidad after completing his investigations on Margarita Island (Venezuela). The site chosen for his excavations was an extensive shell deposit on the St. Bernard property, about one and a half miles south of Cape Mayaro on the east coast of the island. Trenches, cut through the midden-mound, exposed several layers of shell and other refuse to a depth of 7 feet. Clean shell-layers apparently alternated with ash-layers. De Booy (1917: 472-476) estimates that some forty per cent of the shells were of *Tivela mactroides* and some fifty per cent of *Donax variabilis*. There were also some fresh-water shells, land shells, a large number of land crab shells, and some bones of fish, deer, peccary, and turtle.

On the Cocal property, about four miles north of Cape Mayaro, de Booy (1917: 477) ran a trench into a large shell mound 12 feet high and about 55 feet in diameter which was composed almost exclusively of the shells of *Tivela mactroides*. Not a single potsherd was found in the deposit, although several had been picked up on the surface of the mound. Three hammerstones and two small rock crystals were the only artifacts removed.

"The most typical of all the various pottery vessels found in the St. Bernard middens is a shallow bowl form with a broad annular rim. It is safe to say that of the sherds found, at least 75 per cent indicated that they belonged originally to a vessel of this type and this form" (de Booy 1917: 478). Many rim sherds of this type of bowl were painted red along the rim (1917: 478). Modeled head lugs and loop-handles were commonly found on vessels and sherds of this type (de Booy 1917: pl. 5). A unique vessel (probably unique in all West Indian collections also) is figured on his plate 5. It is rectangular and the corners are raised to peaks. Two corners are ornamented with modeled head lugs. A small bowl with a partition modeled across the interior, and a globular bowl with a restricted neck are figured on plate 6. A large number of spool-shaped pottery rests were also found (de Booy 1917: 483, pl. 7). Fragments of annular bases were not uncommon (1917: pl. 8).

Modeled head lugs were very numerous in the Mayaro midden, and, according to de Booy (1917: 483, 484-485),

"the heads shown in Dr. Fewkes' paper, from Erin Bay on the south coast of Trinidad are of a slightly coarser manufacture, but resemble the Mayaro specimens in type."

"A very large number of fragments were found . . . upon which was found a heavy slip of solidly-applied pigment in geometrical designs and these fragments seem to have been subjected to great heat in the firing and are far less brittle [?] than the specimens previously described . . . The ware appears to be far better baked and is not so fragile; the slip is thick and consists of red, brown, yellow, black, and white pigment. The designs are applied in geometrical patterns and it is to be regretted that not enough of one design is left on any one sherd to enable the writer to work it out. The vessels were frequently provided with handles, upon which the potter also placed a painted design."

The writer has examined the pottery excavated by de Booy in the Mayaro deposit, which is now in the Museum of the American Indian, and has identified the following Crab Culture ceramic traits:

Round bowl sherds with wide flaring rims suggesting shapes A and B.

Vessel shape F (round bowl with high annular base).

Vessel shape G (oval bowl with right-angle rim and rectangular lugs).

(Round bowls with right-angle rims similar to those in the Mayaro middens were found in Crab Culture deposits in Porto Rico, but the rims were less broad).

Plain Brown Ware (thin, brittle, and well-fired ware, generally slipped and polished).

Class b (fine cross-hatch designs applied inside the rim of Brown Ware bowls, after firing).

Red Painted Ware.

Class a (red applied to the rim of Brown Ware bowls).

Class c (simple designs in red paint outlined by incisions).

Red and White Painted Ware.

Class a (two-color designs with white applied over red and both over a brown slip; the characteristic design elements composed of spool-figures, scrolls and circles enclosing dots, the application of designs in panels, and the predominance of negative red designs).

Class c (three-colored designs with the basic brown slip forming a third color design element).

Class d (miscellaneous; some additional colors, black, salmon).

D-shaped handles.

1st class (simple D-form).

2nd class (D-shape with button-like knob).

Modeled head lugs (characterized by protruding features outlined by incisions).

Type a (semi-spherical with the back impressed to form a cup-shape).

SUMMARY

Pottery from the Teip-Teip shell heap at Erin Bay, as described by Dr. Fewkes, cannot be correlated definitely with either the Shell Culture or the Crab Culture ceramic complex. The annular bases, the red painted ware, and the modeled head lugs suggest the Crab Culture but are not sufficient evidence to establish a relationship. The pottery from the Mayaro deposit, however, illustrates most of the distinctive Crab Culture traits, and, apparently, none of the Shell

Culture types. The large number of shallow round bowls with wide annular rims are similar to the Crab Culture shape I, but are distinct in detail. None of the spool-shaped pottery rests were found in Crab Culture deposits in Porto Rico. Modeled head lugs in the Mayaro deposit, which are much more numerous than in the Porto Rican deposits, have the same distinctive characteristics but represent many new forms.

The presence in the Mayaro deposit of the majority of the distinctive traits of the Crab Culture (FIGURE 14), and the absence of any markedly different trait, demonstrate a remarkable similarity between this material and that from the deposits in Porto Rico. It is difficult to express, in written description, the similarity between two large collections of pottery, but one who examines the Mayaro specimens can have little doubt that they were manufactured by people closely related to the potters who made the Crab Culture vessels in Porto Rico. Red and white painted designs composed of the same elements were applied over pottery of the same composition and shape. Peculiar traits, such as the fine cross-hatch designs in panels applied after firing, and the button-like knob on D-shaped handles, are as distinctive as a potter's trademark, and these are found on pottery in sites designated as Crab Culture deposits from Porto Rico, through the Lesser Antilles, to Trinidad.

General Conclusions

Archaeological excavations in Porto Rico undertaken by Fewkes, de Hostos, Haerberlin, and Spinden produced material which, to a large extent, duplicates the material designated as the Shell Culture in this report. Cave deposits at Manatí and Utuado and the midden deposit at Cabo Rojo contained artifacts which are clearly of Shell Culture type. Excavations of "juegos de bola" in the region of Utuado have not been reported in sufficient detail to allow for a correlation of the artifacts removed with those found in the midden and cave deposits, but scattered sherds from the "juegos de bola" near Orocovis are definitely of Shell Culture types. None of the distinctive Crab Culture traits have been reported from sites excavated prior to 1934. At the present time, three Crab Culture deposits and four Shell culture deposits have been recognized on the island.* Their distribution is shown on the map (FIGURE 15).

In Santo Domingo the work of de Booy and Krieger has indicated

* Additional sites containing evidence of both cultures have been found in recent research by Rouse (1937).

that the artifacts from cave and midden deposits in the region of Samaná Bay, from middens in Monte Cristi Province on the north coast, and from middens in Santo Domingo Province on the south coast are closely related to the artifacts from Shell Culture deposits in Porto Rico. Slight variations occur, but the general complex of traits is present and a similar cultural pattern is represented. None of the Crab Culture traits are reported. In one of the Samaná Bay caves Krieger found some indications of an early occupation with more primitive or less developed artifacts.

Excavations in Haiti have not been reported, but material excavated at Fort Liberty Bay and collected on Ile des Cabrits in Port au Prince Bay, examined by the writer, in general conforms to the Shell Culture type and resembles the material from the eastern end of the island (Santo Domingo) in minute detail. There is evidence of a distinct and more primitive culture in the Fort Liberty Bay region where a chipped flint industry appears in five deposits which do not contain pottery.

A large number of cave and midden deposits in Cuba excavated by Rodriguez-Ferrer, de Booy, Harrington and others, have been correlated by Harrington with a primitive Ciboney and a more advanced Tainan culture. Most of the traits by which he characterizes the Tainan culture and some of the Ciboney traits are typical of the Shell Culture complex in Porto Rico. Most unusual implements in Cuba are the re-touched flint implements which appear to be more common in the Ciboney sites. Certain sites in eastern and western Cuba, which contain no pottery, indicate a more primitive stage which may be related to the pre-pottery, flint-working culture in North Haiti.

Excavations in Jamaica, undertaken by MacCormack and de Booy, and the collected material described by Cundall and Duerden, indicate that Jamaican material, so far as it is known at present, is also related to the Shell Culture type. In some respects it is less developed, or cruder, and some of the characteristic elements are lacking, but there is an unmistakable similarity in general form to the Shell Culture pattern.

De Booy's investigations in the Bahama Islands have shown that some of the characteristic Shell Culture traits are found in the Caicos Islands in the southern Bahamas. Investigations on most of the islands lying north of the Caicos, undertaken by de Booy and by the writer, have disclosed no refuse deposits containing Shell Culture artifacts. In a cave on Crooked Island, the writer found an unusual type of refuse containing material which may indicate a more primitive culture, as yet not recorded from the West Indies.

The excavations in the Virgin Islands, carried out by de Booy and Hatt, have disclosed artifacts which Hatt divides into two cultural types. A group of middens on St. Thomas and St. Croix produced artifacts which Hatt believes are similar to those found in the Greater Antilles. Another group of middens on St. John and St. Croix contained artifacts which Hatt believes are related to the artifacts found in the Lesser Antilles. Material from the second group (that associated with the Lesser Antilles) he believes indicates the earlier occupation, and that from the first group (associated with the Greater Antilles) indicates a later occupation. An examination of the material from the St. Thomas-St. Croix group of middens has shown that it is all of Shell Culture type, and an examination of the material from the St. John-St. Croix group of deposits has indicated that this is of Crab Culture type. Investigations in the Virgin Islands have demonstrated, therefore, that both cultures established in Porto Rico are present in the Virgin Islands and that the earlier culture in Porto Rico is also earlier in the Virgin Islands. At Krum Bay on St. Thomas, Hatt (1924: 31) discovered a midden deposit which suggests, "a culture, earlier and more primitive than those represented in the other sites."

Excavations near Cape Mayaro on Trinidad, undertaken by de Booy, disclosed artifacts remarkably like the Crab Culture artifacts in Porto Rico. The site at Erin Bay, Trinidad, excavated by Fewkes, contained material which is also similar to the Crab Culture complex, so far as can be determined from his description.

No extensive excavations on the other islands of the Lesser Antilles, which lie between the Virgin Islands and Trinidad, have been reported. There are collections, however, from several of these islands in the Museum of the American Indian and in the National Museum, which have been correlated with the excavated material from other islands. The ceramics, in the collections from St. Kitts, Nevis, Montserrat, St. Vincent, Mustique, Carriacou, and Grenada, are closely related to the Crab Culture collections from Porto Rico. Ceramic elements associated with the Shell Culture in Porto Rico are noticeably absent from the collections obtained on the Lesser Antilles, but a few traits have been noted in collections from Dominica, Barbados, and Carriacou. Petaloid stone celts and shell celts (Shell Culture traits) are found on most of the Lesser Antilles.

Margarita, Bonaire, Curacao, and Aruba, although nominally a part of the Lesser Antilles, are geographically and culturally so far removed that they have not been included in this survey of West Indian archaeology.

To summarize: the complex of traits designated as the Shell Culture is found in the upper level of deposits in Porto Rico, in demonstrably recent deposits in the Virgin Islands, and in numerous deposits in Santo Domingo, Haiti, Jamaica, Cuba, and the Caicos group of the Bahamas. The complex of traits referred to as the Crab Culture is found in refuse deposits in Porto Rico lying below the Shell Culture, in deposits in the Virgin Islands which are demonstrably older than Shell Culture deposits on the same islands, and in deposits and surface collections on several islands of the Lesser Antilles from the Virgin Islands to Trinidad. Isolated sites in the Bahamas and Greater Antilles suggest a distinct, more primitive development not correlated with either Shell or Crab Culture.

The significance of this distribution will remain uncertain until further work in the West Indies, particularly in the Lesser Antilles, has been completed.

THE PROBLEM OF CULTURAL INFLUENCE IN THE CARRIBBEAN REGION

With the discovery of stratified deposits in Porto Rico, and because of the affiliation of the cultures represented in these stratified deposits, some of the various interpretations of cultural movement in the West Indies, expressed by former investigators in the region, are demonstrably incorrect, and all are inadequate. These earlier investigations have been based to a large extent upon historic information and are not analogous to this study, which has been confined to archaeological research. The object of this paper has been to demonstrate that there were two distinct culture periods in Porto Rico, and that the traits characterizing the earlier period are found in the Lesser Antilles, while the traits characterizing the later period appear throughout the Greater Antilles. No attempt has been made to determine the source of the cultural movements suggested by this distribution of traits, but a brief consideration of the conclusions expressed by earlier writers may be advisable at this time, since the recent excavations throw considerable light upon cultural influence from areas outside of the West Indies.

All writers concerned with aboriginal cultures in the West Indies recognize at least two major types which have been referred to as Arawak and Carib. The Arawak culture has been associated with the Greater Antilles and the Carib with the Lesser Antilles. Artifacts from the Lesser Antilles have been popularly termed Carib, and the Lesser Antillean painted pottery in the Museum of the American

Indian has also been termed Carib. Dr. Fewkes (1922: 267) believes that both the Greater and the Lesser Antillean cultures had their origin in South America, that the culture associated with the Lesser Antilles, based on highly developed pottery (which he terms pre-Carib) came after and submerged the earlier culture (termed Tainan) and that both were succeeded by a recent Carib migration to the Lesser Antilles, excepting Trinidad. Recent excavations have shown, however, that the Lesser Antillean culture, characterized by highly-developed pottery, cannot have submerged the Greater Antillean culture, since this finer type of pottery has been found in stratified sites in Porto Rico below pottery typical of the Greater Antilles. Nor can this Lesser Antillean pottery, since it has been found in an early culture horizon in Porto Rico, be associated with the Carib peoples who are known to have been late arrivals in the West Indies. It is probable that the late Shell Culture found throughout the Greater Antilles can be associated with the Arawak stock, but there is no definite proof of such a conclusion.

A third culture reported in historic accounts and associated by M. R. Harrington with an archaeological complex in Cuba, has been termed Ciboney. The recent excavations have had no bearing on this Ciboney culture except to show that some of the traits by which it is characterized according to Harrington are found in the late, Shell Culture, deposits in Porto Rico.

Sven Lovén (1924), relying principally on historic data but to some extent on the various archaeological investigations summarized in this report, recognizes four stocks, or cultural groups, in the West Indies. All of them were reported in the West Indies at the time of the conquest. Lovén believes that the "Guanahatabeyer," cave dwellers in western Cuba, were the earliest arrivals, and he correlates this group with Harrington's Ciboney Culture in Cuba. He states that the original source of this group remains a problem, but that it may be related to primitive cultures reported in Florida, and migrations either to or from the mainland are conceivable.* The "Inselaruaken" were the next group to arrive in the West Indies, according to Lovén, and he places their origin on the mainland of South America. The culture of the "Inselaruaken" developed in, and spread throughout, both the Lesser and Greater Antilles. The third ethnic group, which has been located in northeastern Hispaniola (Santo Domingo), Lovén

* In a revised edition of his "Über die Wurzeln der Tainischen Kultur" published in English as "Origins of the Tainan Culture" (1935) Lovén assumes that the "Siboneyes" immigrated to Cuba from Florida.

has termed "Mazoriger" or "Ciguayer." These people represent, he believes, a second movement of an Arawak stock, probably from one of the Lesser Antilles to Santo Domingo. The fourth stock recognized by Lovén is the "Inselcaraiben," which he limits to the islands of the Lesser Antilles, including Trinidad in disagreement with Fewkes. The Carib, according to Lovén, who on this point agrees with all other writers on the subject, represent a recent movement into the West Indies from South America. The Carib are believed to have conquered all of the Lesser Antilles except Trinidad, and to have been encroaching on the Greater Antilles at the time of the Spanish Conquest.

Lovén's work represents a thorough investigation of all historic information concerning the aboriginal inhabitants of the West Indies, but it does not explain the cultural movements indicated by the archaeological excavations recently completed.

Charlotte Gower (1927: 48) concludes, from a study of historic and archaeological information, that "the similarities between the Antillean culture and that of South America are so strong as to indicate the southern continent as the source for most, if not all, of the West Indian population," but that "the traces of South American-Antillean culture in the southeast [United States] are too great to be merely fortuitous." And, "they may be accounted for by the existence of a common primitive culture, or by a series of not extremely intimate contacts occurring at intervals over a long period of time, or by both." These conclusions, to a large extent, support Fewkes' belief in a South American source for all Antillean cultures, but do not exclude the possibility of a movement from North America to the Antilles. Dr. Sterling's research in Florida, and the work which is now being undertaken in southeastern United States, when published, will undoubtedly contribute materially to the solution of this problem.

The recent investigations have shown that two major culture types* in the West Indies must be considered, and that one is demonstrably older than the other in at least Porto Rico and the Virgin Islands. The later culture in this region may be associated with the historic Arawak peoples, but the earlier does not figure in discussions of cultural movement and influence which are based on historic accounts. A satisfactory explanation of the origin of these cultures must depend upon further archaeological investigations in the continental regions north and south of the islands. At present, the relation and distribution within the West Indies introduces several possibilities.

* A third, the "Flint Culture" of North Haiti, which may be associated with certain non-pottery sites in Cuba, has not been published in detail.

The possible explanations of this distribution may be summarized as follows: (a) the Crab Culture originated in the Lesser Antilles, and during an early period spread as far north as Porto Rico; the Shell Culture originated in the Greater Antilles and spread as far south as the Virgin Islands at a time later than the Crab Culture occupation; (b) the Crab Culture, or its prototype, originated in South America and spread through the Lesser Antilles to Porto Rico; the Shell Culture originated in southeastern United States and spread through the Greater Antilles, reaching as far south as the Virgin Islands during a period following the Crab Culture occupation; (c) the Crab Culture represents an early culture movement from South America, which extended to Porto Rico; the Shell Culture represents a late culture movement from South America, which passed through the Lesser Antilles without permanent settlement, to the Virgin Islands, and then spread throughout the Greater Antilles. Any combination of these influences and movements is, of course, possible.

The distribution of archaeological cultures, as shown on the map (FIGURE 15) suggests an early movement (Crab Culture) from South America through the Lesser Antilles to Porto Rico and a later movement (Shell Culture) from North America through the Greater Antilles to the Virgin Islands, but there are many factors which do not agree with this hypothesis. In the first place, archaeological excavations in the Lesser Antilles have been very limited and it is not impossible that intensive research in some of the islands would disclose Shell Culture deposits. Furthermore, an examination of material from these islands has shown that certain Shell Culture traits (petaloid stone celts and shell celts) are found on most of them, and that there are some indications of true Shell Culture deposits on at least two, Dominica and Barbados. A second objection to this hypothesis lies in the fact that there are many basic similarities between the collections representing these two cultures, which suggest a common origin. These similarities, which have been recorded in a preceding section, include: clay griddles, modeled head lugs on the rims of vessels; rectangular and semi-lunar lugs; the relation between boat-shaped and oval bowls; the relation between loop and D-shaped handles; polished stone implements; and the absence of flint tools. It has been shown that the Shell Culture was not directly derived from the earlier Crab Culture in Porto Rico. The similarities can best be explained by a common source of diffusion rather than by direct contact. If this is true, obviously one culture could not have been derived from South and the other from North America.

W. H. Holmes (1894: 74) points out that there are some indications of a relation between incised decoration on pottery from the Caribbean region and from southeastern United States, but that there is no evidence that Caribbean peoples belonged to or had taken permanent possession of the Florida-Georgia region. Like all writers interested in the Antillean problem, he recognizes a dominant influence from the south. The recent excavations do not alter this general conception even though the distribution of cultures shown on the map suggests a late movement from the north. It is quite clear that the Crab Culture complex is associated with northern South America, since distinctive elements can be traced from Porto Rico through the Lesser Antilles to Trinidad which is in sight of the mainland, and since painted pottery is found in South America and not in Hispaniola, Cuba and southeastern United States. Some of the traits which are common to both Shell Culture and Crab Culture, such as clay griddles and modeled head lugs, are particularly characteristic of northern South America. It is true that some modeled heads on vessels have been found in Florida but this type of ornamentation is more typical of pottery from Venezuela, as the excavations of Bennett, Osgood, and Kidder have shown.

Since the Crab Culture is quite certainly South American in origin, and since a common source of diffusion for the Crab Culture and the Shell Culture is indicated by the material, the origin of both cultures in South America is suggested. Furthermore, characteristic traits of the Shell Culture, apparently, are more typical of South than of North America. Even though Shell Culture deposits have, as yet, not been found in the Lesser Antilles, where one would expect to find them if the Shell Culture was derived from South America, the evidence, at present, points to the southern continent as the source of both culture types established in Porto Rico and traced through the West Indies.

KEY TO THE MAP OF CULTURE DISTRIBUTION IN THE WEST INDIES

(FIGURE 15)

1. Shell Culture and Crab Culture—in a stratified midden deposit—Barrio Canas, Porto Rico—excavated by Rainey, 1934.
2. Shell Culture and Crab Culture—in a stratified midden deposit—Barrio Coto, Porto Rico—excavated by Rainey, 1934.
3. Shell Culture and Crab Culture—in a stratified midden deposit—Barrio Monserrate, Porto Rico—excavated by Rainey, 1934.
4. Shell Culture—Cueva de la Ceiba near Utuado, Porto Rico—excavated by Haeblerlin, 1915. (Haeblerlin 1917.)

5. Shell Culture—Cueva de las Golindrinas near Manatí, Porto Rico—excavated by Fewkes, 1903. (Fewkes 1907.)
6. Shell Culture—in a midden deposit at Punta Ostiones near Cabo Rojo, Porto Rico—excavated by Spinden, 1916. (Unpublished.)
7. Shell Culture—in a midden deposit near San Pedro de Macoris, Santo Domingo—excavated by de Booy, 1916. (de Booy 1919 b.)
8. Shell Culture—in Samaná Bay caves on the south shore of Samaná Bay—excavated by Krieger, 1928. (Krieger 1931.)
9. Shell Culture—in a midden deposit near Anadel on the north shore of Samaná Bay, Santo Domingo—excavated by Krieger, 1928. (Krieger 1931.)
10. Shell Culture—in a midden deposit near the mouth of the San Juan River on the north coast of Samaná Peninsula, Santo Domingo—excavated by Krieger, 1928. (Krieger 1931.)
11. Shell Culture—in three midden deposits near Monte Cristi, Santo Domingo—excavated by Krieger, 1929. (Krieger 1931.)
12. Shell Culture—in a cemetery and midden deposit on the Bay of Andres, Santo Domingo—excavated by Shapiro, Alberti, and Krieger. (Krieger 1931.)
13. Shell Culture—in a midden deposit near Fort Liberty Bay, Haiti—excavated by Krieger and by Rainey. (Unpublished.)
14. Shell Culture—in caves and open midden deposits in the Jauco region, Cuba—excavated by Harrington, 1915. (Harrington 1921.)
15. Shell Culture—in caves and open midden deposits in the Monte Cristo region, Cuba—excavated by Harrington, 1915. (Harrington 1921.)
16. Shell Culture—in caves and open midden deposits in the Gran Tierra region, Cuba—excavated by Harrington, 1915. (Harrington 1921.)
17. Shell Culture—in a cave deposit near Siboney, Cuba—excavated by Harrington, 1915. (Harrington 1921.)
18. Shell Culture—in a cave deposit near Asserrederos, Cuba—excavated by de Booy, 1914. (Harrington 1921.)
19. Shell Culture—in caves and open midden deposits in the Pinar del Rio region, Cuba—excavated by Harrington, 1919. (Harrington 1921.)
20. Shell Culture—in caves and open midden deposits near Manzanillo, Cuba—excavated by Rodriguez—Ferrer, 1847. (Harrington 1921.)
21. Shell Culture—in open midden deposits near Moron, Cuba—excavated by Jiménez, 1850. (Harrington 1921.)
22. Shell Culture—in caves and open midden deposits in the Holquin-Banes district, Cuba—excavated by García Fera. (Harrington 1921.)
23. Shell Culture—in caves and open village sites on Providenciales and the Caicos Islands, the Bahamas—excavated by de Booy, 1912. (de Booy 1912.)
24. Shell Culture—in a refuse midden at Norbrook, Jamaica—reported by Cundall. (Cundall 1894.)
25. Shell Culture—in caves and open midden deposits near Vere, Jamaica—excavated by MacCormack, 1898. (MacCormack 1898.)
26. Shell Culture—in open midden deposits near Retreat, Jamaica—excavated by de Booy, 1913. (de Booy 1913b.)
27. Shell Culture—in open midden deposits at Magens Bay (St. Thomas) and Salt River (St. Croix), Virgin Islands—excavated by de Booy, 1916, and by Hatt, 1922–23. (de Booy 1919a) (Hatt 1924.)
28. Crab Culture—in open midden deposits at Coral Bay (St. John) and Longford (St. Croix), Virgin Islands—excavated by Hatt, 1922–23. (Hatt, 1924.)

29. Crab Culture—in open midden deposits on St. Kitts. Collected by Branch. (Branch 1907.)
30. Crab Culture—in open midden deposits on Nevis. Collected by Branch. (Branch 1907.)
31. Crab Culture—collections of pottery from Montserrat now in the Museum of the American Indian, New York.
32. Crab Culture—collections of pottery from St. Vincent now in the Museum of the American Indian, New York.
33. Crab Culture—collections of pottery from Mustique now in the Museum of the American Indian, New York.
34. Crab Culture—collections of pottery from Carriacou now in the Museum of the American Indian, New York.
35. Crab Culture—collections of pottery from Grenada now in the Museum of the American Indian, New York.
36. Crab Culture—in open midden deposits near Cape Mayaro, Trinidad—excavated by de Booy, 1915. (de Booy 1917.)
37. Indications of a more primitive or less developed culture—in a cave deposit near Gordon Hill on Crooked Island, the Bahamas—excavated by Rainey, 1934. (Unpublished.)
38. Indications of a more primitive culture, termed Ciboney by Harrington—in cave deposits and open midden sites in eastern Cuba—excavated by Harrington, 1919. (Harrington 1921.)
39. Indications of a more primitive culture, termed Ciboney by Harrington—in caves and open midden deposits in western Cuba—excavated by Harrington, 1919. (Harrington 1921.)
40. Indications of a more primitive or less developed culture—lying below Shell Culture material in a cave deposit on the south shore of Samaná Bay, Santo Domingo—excavated by Krieger, 1928. (Krieger 1931.)
41. Non-pottery-making, flint-working culture assumed to be older than both Shell and Crab Cultures. Found in five shell deposits near Fort Liberty Bay, Haiti—excavated by Rainey, 1935. (Unpublished.)
42. Indications of a more primitive or less developed culture in a shell heap near Krum Bay on St. Thomas, Virgin Islands—excavated by Hatt, 1922–23. (Hatt 1924.)

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APPENDIX

Barrio Canas

Burials encountered in excavation No. 1.

- Section C-1. Depth 75 centimeters. Adult. In refuse deposit. Badly decayed. Only a few teeth and two long bones remaining. Position and type unknown.
- Section D-1. Depth 75 centimeters. Adult. In culture refuse. Disarticulated. Half of cranium lying over long bones, mandible at one side. Badly decayed. Secondary burial.
- Section E-1. Depth 1 meter. Adult. In refuse deposit. Lying on back in extended position. Head toward center of mound. Badly decayed. Primary burial.
- Section E-1. Depth 1 meter. Adult. Lying on back in extended position. Feet near those of skeleton recorded above and body lying at right angles to it. Badly decayed. Primary burial.
- Section E-1. Depth 1.25 meters. Adult. In refuse near bottom of deposit. Lying on left side, flexed. Badly decomposed. Primary burial.
- Section E-1. Depth 1.25 meters. Adult. In refuse near bottom of deposit. Disintegrated. Position and type unknown.
- Section F-1. Depth 1.75 meters. Child. Below refuse deposit in sterile subsoil. Disintegrated. Position unknown.
- Section F-3. Depth 1 meter. Adult. In last of culture refuse. Lying on left side, flexed. Primary burial.
- Section F-6. Depth 1.75 meters. Child. In last of culture refuse. Badly disintegrated. Possibly a seated burial. Head forced forward over skeleton. Primary burial.
- Section F-8. Depth 1 meter. Adult. In refuse deposit. Disintegrated. Position unknown.
- Section F-8. Depth 1.25 meters. Adult. Lying in culture refuse. On right side, flexed. Badly disintegrated. Primary burial.
- Section H-12. Depth 1.50 meters. Adult. Lying in last traces of shell deposit. Position uncertain with femurs lying over pelvis. Possibly secondary burial. Disintegrated.
- Section H-16. Depth 1.75 meters. Adult. Lying in sterile soil just below shell deposit. Lying on back with knees drawn up and legs flexed tight against body. Hands crossed over sternum. Primary burial.
- Section I-1. Depth 1.50 meters. Small child. Just below refuse in sterile subsoil. Badly decayed. Position uncertain. Probably a primary burial.
- Section I-2. Depth 1.75 meters. Child. In last traces of refuse deposit. Disintegrated. Position unknown.

Burials encountered in excavation No. 2.

- Section E-5. Depth 1.25 meters. Adult. Lying in Crab Level refuse. Disintegrated. Position uncertain.
- Section E-6. Depth 1.25 meters. Adult. Lying in Crab Level refuse. Extended lying on back with hands crossed over pubic region. Between this and the one recorded above was a hole resembling a post hole. Primary burial.
- Section F-5. Depth 75 centimeters. Adult. Lying in Crab Level refuse. Extended, lying on face. Head roughly toward east. Disintegrated when removed. Primary burial.

Section G-6. Depth (?). Aged adult. Lying in Shell Level deposit. Decayed so that position was uncertain but apparently twisted or distorted into small area. Possibly secondary burial.

Section I-7. Depth 50 centimeters. In upper Shell Level. Badly disintegrated. Position and type uncertain.

Section I-8. Depth 1.25 meters. Small child. Lying in Crab Level refuse. Badly disintegrated. Position and type unknown.

Section I-9. Depth 1.50 meters. Adult. Lying in Crab Level refuse. Disintegrated. Position and type unknown.

Section J-1. Depth 1.25 meters. Adult. In Crab Level refuse. Lying on face, extended. Head toward the east. Disintegrated when removed. Primary burial.

Section K-1. Depth 1 meter. Child. In Crab Level deposit. Disintegrated. Position unknown.

Barrio Coto

Burials encountered in excavation No. 1.

Section A-2. Depth 50 centimeters. Child. In refuse deposit. Lying on left side, flexed. Disintegrated when removed.

Section A-2. Depth 75 centimeters. Adult. In clear sand below refuse deposit. Flexed, on left side. Disintegrated. Primary burial.

Section A-3. Depth 50 centimeters. Adult. In culture refuse. Lying on back with head forced forward, knees drawn up and legs flexed tight against body. Primary burial.

Section A-3. Depth 50 centimeters. Adult. In culture refuse. Lying on back, knees drawn up and legs flexed tight against body. Head forced forward. Primary burial.

Section A-4. Depth 75 centimeters. Adult. In culture refuse. Flexed, on right side. Primary burial. Between knees and head was an inverted cooking pot badly disintegrated.

Section A-4. Depth 75 centimeters. Adult. In culture refuse. Flexed, on right side. Primary burial.

Section A-6. Depth 50 centimeters. Child. In culture refuse. Pieces of skull placed one on top of the other. Part of the maxilla inside cranium. All placed over long bones. Secondary burial. Against fragments of the skull was a small round bowl, complete.

Section A-6. Depth 50 centimeters. Adult. In culture refuse. Lying on right side, flexed. Heels against buttocks. Head forced forward. Primary burial. Pressed against the forehead were two clay vessels (boat-shaped). One was right side up and the other was inverted over it.

Section A-6. Depth 50 centimeters. Adult. In culture refuse. Flexed, on right side. Primary burial.

Section A-6. Depth 50 centimeters. Child. In culture refuse a few inches from adult recorded above. Disintegrated. Probably primary burial.

Section A-7. Depth 25 centimeters. Adult. In culture refuse. Flexed, on right side. Primary burial. Well preserved.

Section A-7. Depth 50 centimeters. Small child. In culture refuse. Lying on back with knees drawn up and legs flexed tight against body. Head forced forward. Disintegrated. Primary burial.

Section A-7. Depth 75 centimeters. Adult. Below culture refuse. Flexed, on left side. Disintegrated. Primary burial.

- Section B-2. Depth 50 centimeters. Adult. Just below culture refuse in sterile sub-soil. Lying partly on back and partly on left side with legs flexed. Primary burial. Lying above knees and on top of hands was a bowl with loop handles.
- Section B-3. Depth 50 centimeters. Adult. In refuse. Only a few fragments were found. Position and type unknown.
- Section B-3. Depth 75 centimeters. Adult. In refuse. Lying on back with knees flexed tight against shoulders. Head forced forward. Badly decayed. Primary burial.
- Section B-3. Depth (?). Adult. In sub-soil below culture refuse. Flexed, on left side. Primary burial.
- Section B-4. Depth 50 centimeters. Adult. In culture refuse. Badly decayed. Probably flexed, on back and side. Primary burial.
- Section B-5. Depth 50 centimeters. Adult. In culture refuse. Flexed, on back and right side. Legs flexed tight against body. Primary burial.
- Section C-5. Depth 25 centimeters. Child. In refuse. Flexed, on right side. Disintegrated. Primary burial.
- Section C-5. Depth 25 centimeters. Adult. In refuse. Lying on back and right side, flexed. Lying across the mouth of this skeleton was a large manati bone.
- Section C-5. Depth 50 centimeters. Adult. In refuse. Lying on back and left side, flexed. Primary burial.
- Section C-5. Depth 1 meter. Adult. In yellow sub-soil below culture deposit. Lying on back with head forced forward. Legs flexed with knees tight against body. Primary burial.
- Section B-6. Depth 25 centimeters. Small child. In culture refuse. Bones of baby found in small round bowl no bigger than a human head. Part of skull lying beside bowl. Disintegrated. Secondary urn burial.
- Section B-6. Depth 50 centimeters. Adult. In culture refuse. Flexed, on left side. Disintegrated. Primary burial.
- Section B-6. Depth 50 centimeters. Small child. In culture refuse. Disintegrated. Position uncertain.
- Section B-6. Depth 50 centimeters. Adult. In culture refuse. Lying on face. Skeleton distorted. Partly flexed. Disarticulated. Type uncertain.
- Section B-6. Depth 50 centimeters. Adult. In refuse. Badly decomposed but probably flexed. Face down and position distorted. Primary burial. Near skull were a rectangular polished piece of tortoise shell and a broken zoomorphic head in stone.
- Section B-6. Depth 75 centimeters. Adult. In refuse. Flexed, on left side. Only legs and pelvic bones remained. Primary burial.
- Section C-3. Depth 75 centimeters. Adult. In yellow sub-soil just below culture deposit. Lying on left side. Legs flexed with heels against buttocks. Primary burial.
- Section C-3. Depth 1 meter. Adult. In yellow sub-soil below refuse. Lying on right side with heels against buttocks. Hands against forehead. Primary burial.
- Section C-4. Depth 1 meter. Adult. In yellow sub-soil just below culture refuse. Lying on back and right side, flexed. Primary burial.
- Section C-4. Depth 1 meter. Child. In yellow sub-soil in last of culture refuse. Lying on right side, flexed. Primary burial.

- Section C-6. Depth 50 centimeters. Adult. In refuse. Lying on right side with legs flexed. Heels against buttocks. Hands over pubic region. Near hands and in pubic region was a small round stone like a marble. Primary burial.
- Section C-6. Depth 50 centimeters. Adult. In refuse. Lying on right side, flexed, with knees against chin. About skeleton were found two pieces of worked tortoise shell, a small polished pebble, a stone resembling a crude celt, a rectangular polishing stone, and a crude implement of manati bone resembling a broad spatula. Primary burial.
- Section C-6. Depth 50 centimeters. Adult. In refuse. Fragments of flexed burial. Disintegrated. Probably primary burial.
- Section D-6. Depth 25 centimeters. Adult. In refuse. Lying on right side. Legs flexed with heels against buttocks.
- Section D-6. Depth 50 centimeters. Adult. In refuse. Lying on right side, flexed, with heels against buttocks. Primary burial.
- Section A-2. Depth 50 centimeters. Adult. In refuse. Disintegrated, but probably flexed. Primary burial.
- Section A-5. Depth 1 meter. Adult. In yellow soil below shell refuse, possibly Crab Level deposit. Lying on left side, flexed. Primary burial.
- Section A-5. Depth 1 meter. Youth. In yellow soil below shell deposit, possibly in Crab Level deposit. Lying on back and left side, flexed. Hands on pubic region. Primary burial.
- Section A-6. Depth 50 centimeters. Adult. In refuse. Disintegrated but clearly flexed. Primary burial. At base of skull lay a large perforated tubular stone bead.
- Section A-6. Depth (?). Adult. In refuse. Disintegrated, but probably flexed. Primary burial.
- Section B-4. Depth 1 meter. Small child. In yellow soil below shell refuse. Possibly Crab Level deposit. Flexed, on right side. Disintegrated. Primary burial.
- Section B-4. Depth 1 meter. Adult. In yellow soil below shell refuse. Possibly Crab Level deposit. Lying on back, knees drawn up against chin. Primary burial. Near buttocks of this skeleton was found a small bone spatula resembling a canoe paddle in shape.
- Section D-2. Depth 25 centimeters. Child. In refuse. Disintegrated. No information.
- Section D-4. Depth 25 centimeters. Adult. In refuse. Flexed, on left side. Hands over pubic region. Primary burial.
- Section D-4. Depth 25 centimeters. Child. In refuse. Lying flexed, on right side with back about one foot from adult recorded above. Primary burial.
- Section D-4. Depth 1 meter. Adult. In yellow sub-soil below shell deposit. Possibly in Crab Level deposit. Flexed, on left side. Primary burial.
- Section E-2. Depth 25 centimeters. Adult. In refuse. Flexed, on left side. Primary burial.
- Section E-4. Depth 50 centimeters. Adult. In refuse. Flexed, on left side. Knees almost touching forehead. Primary burial.
- Section E-4. Depth 50 centimeters. Adult. In refuse. Flexed, on right side. Knees nearly touching forehead. Primary burial.
- Section E-4. Depth 25 centimeters. Adult. In refuse. Only a few bones remained. Position unknown.

- Section E-4. Depth 50 centimeters. Adult. In refuse. Flexed, on left side. Forehead nearly touching knees. Primary burial.
- Section E-5. Depth 50 centimeters. Child. In refuse. Lying on right side, flexed. Primary burial.
- Section E-5. Depth 50 centimeters. Child. In refuse. Lying on right side, flexed. Primary burial. Second, 75 centimeters from first in same level.
- Section E-5. Depth 50 centimeters. Child. In refuse. Fragments only. Position uncertain.
- Section F-1. Depth 25 centimeters. Small child. In refuse. Flexed, on left side. Primary burial.
- Section F-1. Depth 50 centimeters. Adult. Below refuse in sterile sub-soil. Lying on back with knees drawn up tight against shoulders. Head forced forward. Primary burial.
- Section F-3. Depth 50 centimeters. Child. In refuse. Flexed, on left side.
- Section F-4. Depth 50 centimeters. Adult. In refuse. Lying on back and right side. Legs slightly flexed. Head thrust forward. Hands over pubic region.
- Section F-4. Depth 75 centimeters. Adult. In sub-soil below refuse. Flexed, on left side.
- Section F-5. Depth 50 centimeters. Small child. In sub-soil just below culture refuse. Lying on right side, flexed.

Barrio Monserrate

Burials encountered in mound A

- Section A-1. Depth 1 meter. Adult. Lying on sterile sub-soil in last of culture refuse. Lying on left side, flexed. Badly decayed. Primary burial.
- Section A-2. Depth 1 meter. Adult. In last of culture refuse. Lying on face with knees drawn up under body. Much distorted. Possibly buried sitting. Primary burial.
- Section A-2. Depth 1.25 meters. Child. In last of refuse. Disintegrated, but probably flexed primary burial.
- Section A-2. Depth 1.25 meters. Child. In last of refuse. Disintegrated, but probably flexed primary burial. This skeleton lay only a few centimeters from the one recorded above.
- Section A-2. Depth 50 centimeters. Small child. In refuse. Disintegrated. Position unknown.
- Section A-3. Depth 1 meter. Adult. In refuse. Lying on back with knees drawn up against chest. Head forward and on right side. Primary burial.
- Section A-4. Depth 1 meter. Child. In last of culture refuse. Lying on right side with legs flexed and heels against buttocks. The skull lay in a large open dish. Covering the skull was half of a large round bowl and over this lay the other half of the same bowl. Over shoulder of skeleton, inverted, lay another bowl which was practically complete.
- Section A-4. Depth 1 meter. Adult. In last of culture refuse. Lying on right side, flexed. The skull of this skeleton lay about 25 cms. from the skull of the child recorded above, and the body stretched away in the same line but in the opposite direction. Primary burial.
- Section A-3. Depth 1.60 meters. Baby. In clear sand below refuse. Bones of a small baby in a large open urn which lay inverted. Bones disintegrated but probably indicating a primary urn burial.

- Section A-4. Depth 1.25 meters. Child. In last traces of culture refuse. Disintegrated. Probably flexed primary burial.
- Section A-4. Depth 1.25 meters. Adult. In last of culture refuse. Lying on right side and face with legs flexed. Arms at sides. Primary burial.
- Section A-5. Depth 75 centimeters. Adult. In refuse. Lying on back and left side tightly flexed. All bones in place except skull and mandible. The skull lay inverted over the pubic region, and beside it lay the mandible. Body a primary burial. Skull and jaw buried with it disarticulated.
- Section A-5. Depth 1 meter. Adult. In refuse. Lying on back and right side. Primary burial.
- Section A-5. Depth 1 meter. Baby. In refuse. Bones of very small child in large urn covered by piece of another vessel. Bones disintegrated. Impossible to determine whether it was a primary or secondary burial. Urn burial.
- Section A-5. Depth 1 meter. Adult. In refuse. Lying on left side, flexed. Primary burial.
- Section A-5. Depth 1 meter. Baby. In refuse. Bones of tiny baby in a large round urn. Probably a primary burial. Much disintegrated. Urn burial.
- Section A-5. Depth 1 meter. Baby. In refuse. Bones of a small baby in a large open bowl covered by fragment of another bowl. Probably a primary, urn burial.
- Section A-6. Depth 1 meter. Adult. In refuse. Lying on back and left side, flexed. Primary burial.
- Section A-6. Depth 1.25 meters. Adult. In last of refuse. Fragments of a flexed burial. Probably primary burial.
- Section A-6. Depth 1.25 meters. Child. In clear sand just below refuse. Fragments of flexed burial. Probably primary burial.
- Section A-7. Depth 1 meter. Small child. In refuse. Lying on left side, flexed. Primary burial.
- Section A-7. Depth 1.25 meters. Adult. In clear sand just below refuse deposit. Lying on back and right side with legs tightly flexed against body. Primary burial.
- Section B-1. Depth 50 centimeters. Baby. In last of culture refuse. Bones of small baby under large open urn which lay inverted. Probably a primary, urn burial.
- Section B-1. Depth 50 centimeters. Adult. In last of culture refuse. Skeleton disintegrated but probably flexed primary burial. Beside the skull lay a small round clay cylinder which was probably an ear ring.
- Section B-2. Depth 1 meter. Adult. In last of culture refuse. Lying on left side, flexed, face down. Primary burial. Associated with skeleton were a small plain bowl and a stone cylindrical head.
- Section B-3. Depth 75 centimeters. Adult. In refuse. Lying on right side, flexed. Badly decayed. Primary burial.
- Section B-3. Depth 1.25 meters. Adult. In last of culture refuse. Lying on right side tightly flexed. Primary burial.
- Section B-3. Depth 1.25 meters. Adult. In last of culture refuse. Lying on back with legs flexed tight against body. Primary burial.
- Section B-4. Depth 1.25 meters. Baby. In last of refuse. Bones of small baby in an urn. Disintegrated. Urn burial.
- Section B-4. Depth 1.50 meters. Adult. In clear sand below refuse in salt

- water at sea level. Lying on face with legs flexed underneath body. Primary burial.
- Section B-4. Depth 1.25 meters. Adult. In last of refuse. Lying on face with legs flexed against body. Primary burial.
- Section B-4. Depth 1.25 meters. Adult and two babies. In last of refuse deposit. Adult lying on back with legs flexed and knees spread wide apart. One hand at side, one under buttocks. Skeleton of a very small baby lay along neck and back behind skull of adult. Child also in flexed position. Three inches from pubic synthesis of adult skeleton lay the cranium of a second small baby. Primary burial of adult and two babies.
- Section B-4. Depth 1.50 meters. Adult. In last of culture refuse. Lying on left side tightly flexed with knees against forehead. Badly decayed. Primary burial.
- Section B-4. Depth 1.50 meters. Adult. In last of culture refuse. Lying on back and right side. Primary burial.
- Section B-5. Depth 1.25 meters. Adult. In last of culture refuse. Lying on back with knees flexed tightly against chest. Hands crossed over pubic region and under flexed legs. Primary burial.
- Section B-5. Depth 1.50 meters. Three adult burials. In sand below refuse. One slight skeleton lay on the back with legs spread apart and flexed over body. Hands over pubic region. Face looking up. At right angles to this skeleton was a large heavy skeleton with the shoulders lying on the first skeleton. The head of the second was twisted around so that the eyes looked into the eyes of the skeleton below. This second skeleton lay on its back with the legs flexed against the body and the knees spread wide apart. Six inches from the skulls of the first two burials were the flexed leg bones of a third skeleton. This was flexed on the left side and in a half sitting position. It had the appearance of having been buried kneeling. The jaw was broken away from the maxilla and hung down. Hands were over the pubic region. All three skeletons were undoubtedly buried at the same time as none of the bones were disturbed. Primary burials.
- Section B-5. Depth 1.50 meters. Adult. In sand below refuse, practically at sea level. Lying on back and right side, tightly flexed. Head forced forward. Primary burial.
- Section B-5. Depth 1.50 meters. Adult. In sand below refuse practically at sea level. Fragments. Position unknown.
- Section B-5. Depth 1 meter. Baby. In last of culture refuse. Bones of baby in large urn which lay right side up. Urn full of dirt and on top of urn were two small bowls, one on top of the other and both right side up. Urn and skeleton badly decayed. Child probably primary urn burial.
- Section B-5. Depth 1 meter. Adult. In refuse. Lying on right side, flexed. Decayed but probably primary burial.
- Section B-5. Depth 1 meter. Adult. In refuse. Lying on back and right side, flexed. Hands over stomach. Between the hands were pieces of different vessels roughly forming a container. Within this container were the bones of fishes, shells, and complete shell (top and bottom) of a turtle. Primary burial.
- Section B-5. Depth 1 meter. Baby. In refuse. Bones of very small baby lying in a large boat-shaped bowl and covered with a fragment of another vessel. Probably primary urn burial.

Section B-5. Depth 1 meter. Baby. In refuse. Bones of small baby lying in a large round urn. Skeleton covered by a piece of clay griddle. Probably primary urn burial.

Section B-5. Depth 1 meter. Baby. In refuse. Bones of baby lying under large bowl which lay inverted covering them. This burial clearly primary. Skeleton lying on right side, flexed.

These four child burial urns formed a half-circle around the adult skeleton which held the makeshift vessel containing the turtle. All on the same level. The urns were about 2 feet from the skeleton.

Section B-5. Depth 1.50 meters. Adult. In sand below refuse. Lying on back with legs flexed over body and to right side. Hands over pubic region. Primary burial.

Section B-5. Depth 1.25 meters. Adult. In refuse. Lying on back and left side, legs flexed with heels against buttocks. Primary burial.

Section B-5. Depth 1.25 meters. Adult. In last of culture refuse. Lying on right side, flexed. Hands over pubic region. Under the back of this skeleton was a hole in the deposit about 8 inches deep.

Section B-5. Depth 1.50 meters. Adult. In last of culture refuse. Lying on right side, flexed. Primary burial.

Section B-5. Depth 1.50 meters. Adult. Skull in last of refuse, body in clear sand below. Skull lay beneath left shoulder of skeleton recorded above. Lying on back with knees flexed over body. Primary burial.

Section B-5. Depth 1.65 meters. Three adult burials. In clear yellow sand below refuse deposit in seepage water at sea level. All three lying on right side with legs flexed and knees nearly touching forehead. All three within a few centimeters of each other. Primary burial.

Section B-6. Depth 1 meter. Adult. In last of culture refuse. Lying on right side, flexed. Knees six inches from forehead. Primary burial.

Burials encountered in mound B

Section A-1. Depth 1 meter. Adult. In clear sand below refuse deposit. Disintegrated. Probably flexed primary burial.

Section B-2. Depth 50 centimeters. Adult. In refuse. Fragments of skeleton. Position and type unknown.

Section B-5. Depth 50 centimeters. Adult. In refuse. Disintegrated. Position unknown.

Burials encountered in mound E

Section A-4. Depth 50 centimeters. Adult. In refuse. Lying on left side, flexed. Primary burial. Over the skull lay part of an inverted bowl. Lying on the right shoulder was a bowl right side up which contained a third bowl. In the bend of the flexed legs was a fourth bowl with broad loop handles, lying inverted. A shell disc and a shell spatula were found a few inches from the skeleton, but the exact relation was not determined. This burial was not over 10 feet from the edge of the ocean.

Section B-2. Depth 1 meter. Adult. In refuse. Lying on left side, flexed. Badly decayed. Primary burial.

Section B-5. Depth 50 centimeters. Adult. In refuse. Lying on right side, flexed. Primary burial.

Section B-5. Depth 75 centimeters. Adult. In refuse. Fragments of burial. Position unknown.



EXPLANATION OF PLATES

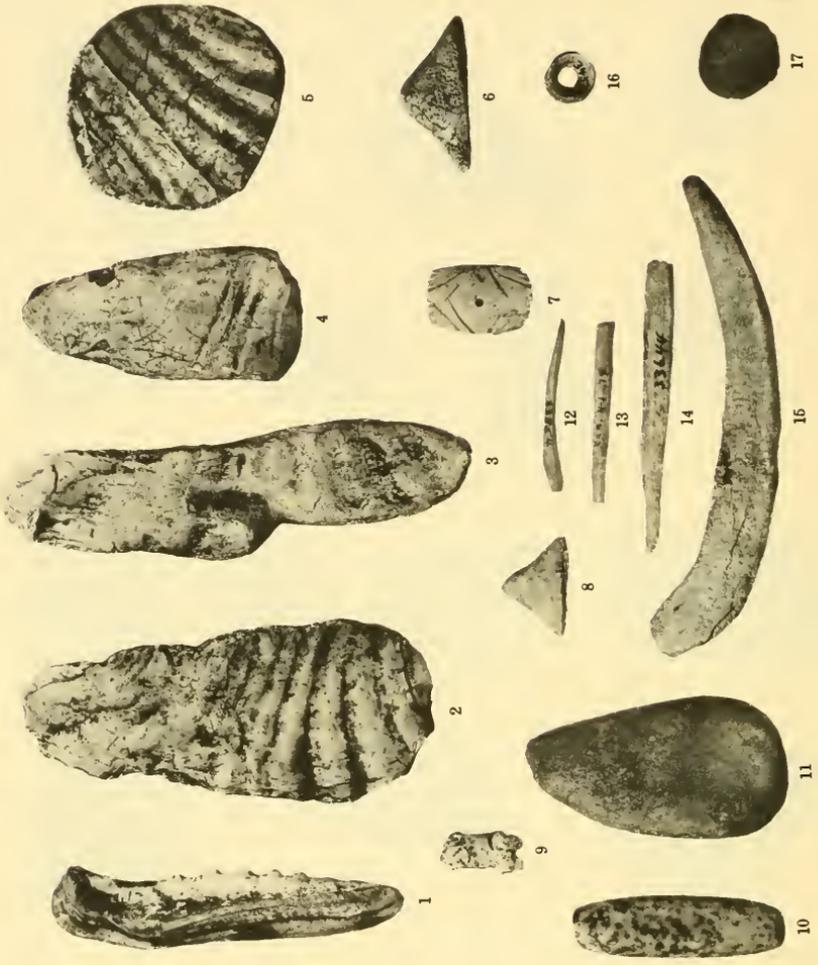
PLATE I

Pottery of the Shell Level

- FIGURE 1. Modeled head lugs on rims, class a (bat-heads).
FIGURE 2. Modeled head lugs on rims, class b (human-heads).
FIGURE 3. Modeled head lugs on rims, class c (cat-like heads).
FIGURE 4. Modeled head lugs on rims, class d (bird-heads).
FIGURE 5. Modeled head lugs on rims, class e (pelican-heads).
FIGURE 6. Modeled forms on loop handles, class a (geometric).
FIGURE 7. Modeled forms on loop handles, class b (zoomorphic).
FIGURE 8. Modeled figures on vessel walls, class a (sigmoid).
FIGURE 9. Modeled figures on vessel walls, class b (spiral).
FIGURE 10. Modeled figures on vessel walls, class c (worm-like).
FIGURE 11. Modeled figures on vessel walls, class d (zoomorphic).
FIGURE 12. Incised decoration, class a (line and puncture).
FIGURE 13. Incised decoration, class b (curvilinear).
FIGURE 14. Incised decoration, class c (vertical-parallel).



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RAINEY: PORTO RICAN ARCHAEOLOGY

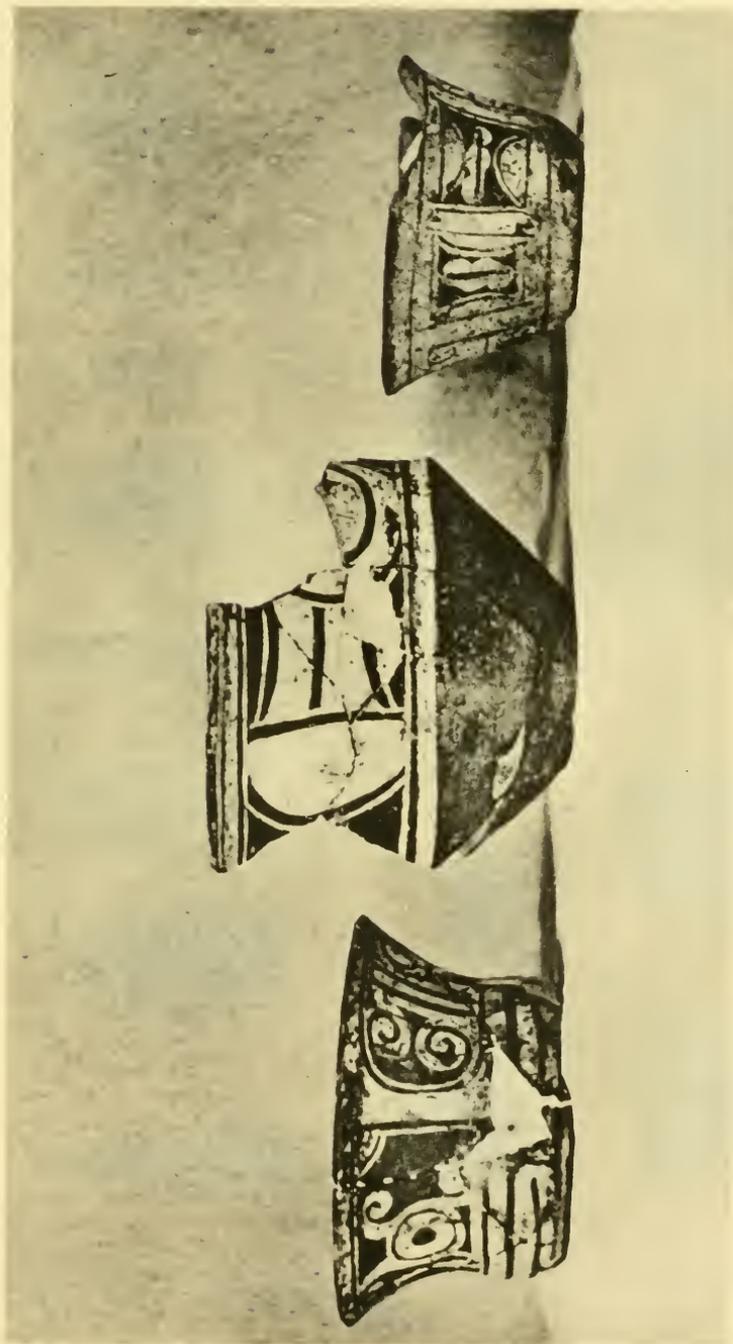
PLATE 2

Associated Artifacts of the Shell Level at Canas

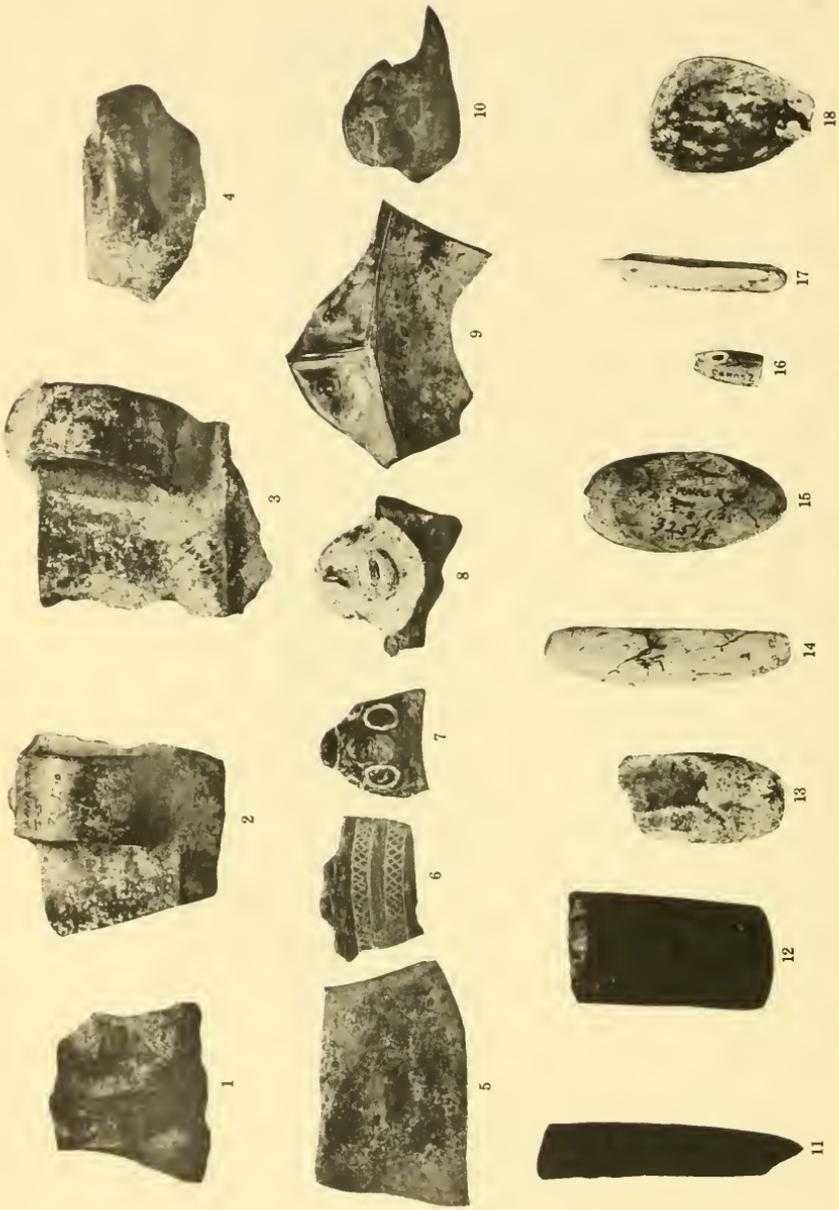
- FIGURE 1. Shell chisel.
- FIGURE 2. Shell hoe.
- FIGURE 3. Problematic shell implement.
- FIGURE 4. Shell celt.
- FIGURE 5. Shell disc.
- FIGURE 6. Three-pointed shell "zemi."
- FIGURE 7. Engraved shell ornament.
- FIGURE 8. Three-pointed stone "zemi."
- FIGURE 9. Small carved stone figure.
- FIGURE 10. Tubular stone bead.
- FIGURE 11. Petaloid stone celt.
- FIGURE 12. Worked trigger of the trigger-fish.
- FIGURE 13. Bone tube.
- FIGURE 14. Bone awl.
- FIGURE 15. Manati rib pick.
- FIGURE 16. Fish vertebrae counter.
- FIGURE 17. Clay disc.

PLATE 3

Red and White Painted Ware, class a



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PLATE 4
Crab Level Types

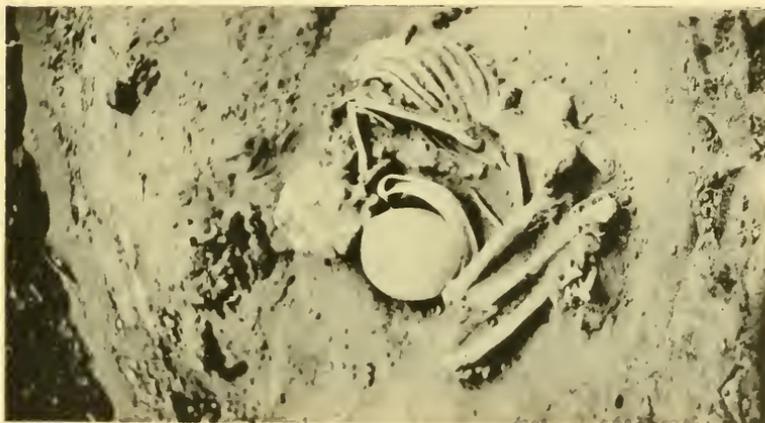
- FIGURE 1. D-shaped handle, 1st class.
FIGURE 2. D-shaped handle, 2nd class.
FIGURE 3. D-shaped handle, 3rd class.
FIGURE 4. D-shaped handle, 4th class.
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FIGURE 8. Modeled head lug, type c (hollow, spherical, with rattling clay pellet).
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FIGURE 13. White patinated chert celt.
FIGURE 14. Problematic shell object.
FIGURE 15. Problematic shell object.
FIGURE 16. Olivia shell rattle.
FIGURE 17. Cleat-like shell object.
FIGURE 18. Shell spoon.

PLATE 5

- FIGURE 1. Excavation No. 2, Barrio Coto.
- FIGURE 2. Flexed burial with associated clay vessels, found in excavation No. 1, Barrio Coto.
- FIGURE 3. Bone snuffing tubes; a carved figure with shell inlaid eyes and teeth; a paddle-shaped bone object; found in the deposit at Barrio Coto.



1



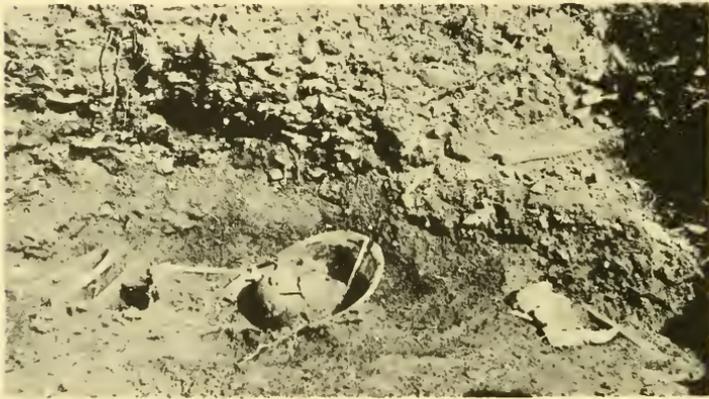
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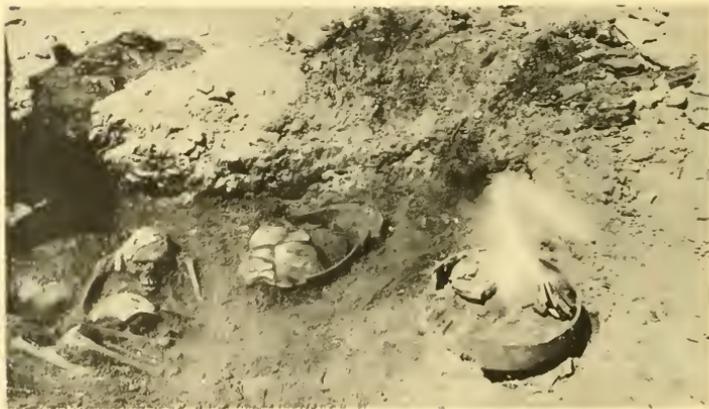
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PLATE 6

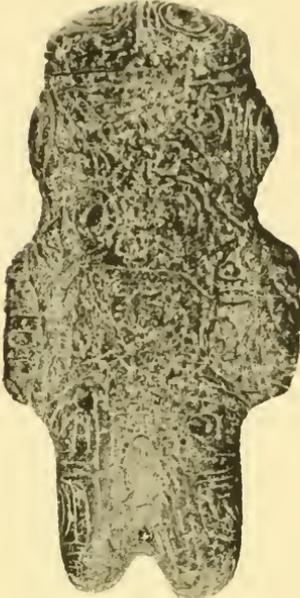
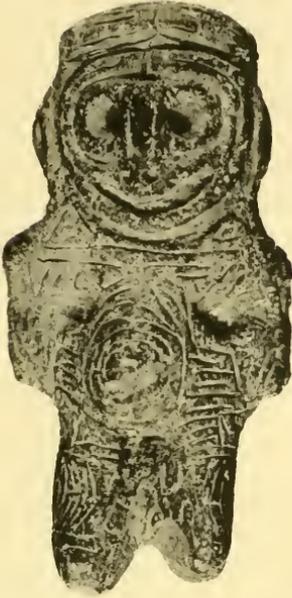
- FIGURE 1. Looking from mound A to mound B at site in Barrio Monserrate.
- FIGURE 2. Burial of young person. Lying on the right side, flexed. The skull lay in an open dish. Covering the skull were two halves of a round bowl. Another bowl lay bottom side up over the left shoulder. Section A-4, depth 1.00 meter. Mound A at Monserrate.
- FIGURE 3. Burial urns containing the bones of infants. One urn was covered with a shallow boat-shaped bowl. The flexed adult burial held a rough container made up of pieces of different bowls which contained a complete turtle shell, some fish bones, and marine shells. Section B-5, depth 1.00 meter. Mound A at Monserrate.

PLATE 7

1935 Excavations

FIGURE 1. Carved stone figure from Barrio Monserrate, mound A.

FIGURE 2. Incised sherds from Barrio Sabana, ball-court No. 2.



1

2



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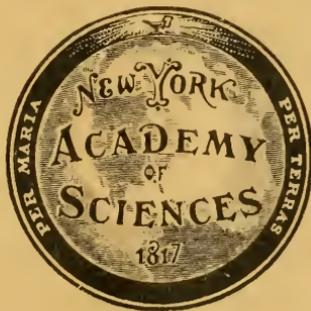
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A Large Archaeological Site at Capá, Utuado, with Notes on
other Porto Rico Sites Visited in 1914-1915

J. Alden Mason

Appendix.—An Analysis of the Artifacts of the 1914-1915
Porto Rican Survey

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A LARGE ARCHAEOLOGICAL SITE AT CAPÁ, UTUADO, WITH NOTES ON OTHER PORTO RICO SITES VISITED IN 1914-1915

By J. ALDEN MASON

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FOREWORD

The anthropological section of the Porto Rican Survey was begun under the direction of Dr. Franz Boas in 1914. During the latter months of that year and the first half of 1915 I devoted my time to collecting folk-lore and data for the study of Porto Rican Spanish dialectology while making archaeological observations whenever possible. The folk-lore, one of the largest collections from Spanish

America, has been published under the editorship of Dr. Aurelio M. Espinosa (Mason 1916, 1918, 1921, 1922, 1924, 1925, 1926a, b, 1927, 1929; Espinosa 1918); the dialectology remains to date unstudied.

Upon the arrival in Porto Rico of Drs. Boas, Haeberlin, and Aitken in June, 1915, the fields of research turned to archaeology and physical anthropology. Anthropometric and dental observations were made by Drs. Boas, Aitken, and myself on school children in Utuado, and by Dr. Boas on soldiers in San Juan. A few studies have been published as a result of this work (Boas 1916; Spier 1918a, 1918b, 1919), but the data have not been fully utilized.

Archaeological excavations were made by Dr. Haeberlin (1917), and by Dr. Aitken (1917, 1918) and me. Each party excavated a cave and adjacent small "juego de bola." Reports on both of these have been published.

After completing the cave excavation Dr. Aitken and I undertook the excavation of the large site at Capá which is the topic of the present report. A brief announcement of this work was presented at the Americanist Congress in Washington in 1915 (Mason 1917). This published report, though short, was well illustrated and some of the photographs therein published have not been duplicated in the present fuller article.

The work herein described was done in 1915 and the report submitted soon thereafter. Hastily prepared, it was not in shape for publication, but as this was not possible until the present, the report lay untouched until 1940. I have doctored its many prolixities and repetitions, and condensed it by eliminating much detailed data of no significance.

The large plan is mainly the work of my associate, Dr. Robert T. Aitken, but it was drawn up on the basis of the first three weeks' superficial clearing. I have made a few additions and changes on the basis of the later excavations. Where the details in the two plans differ, that of the smaller one should be preferred. Some data have also been added from a surveyed plan of the site made for the Insular Commissioner of the Interior.

Every archaeological report should include the pertinent results of a thorough study of the original historical sources and of other archaeological investigations in the area. I greatly regret that I have been unable to do this and to make this report more than purely factual. The picture of aboriginal culture sequences in Porto Rico has been greatly changed by the researches of the past decade. Some of these omissions will be corrected better than I could do it by Dr. Irving Rouse in the appendix.

THE CAPÁ SITE

Introduction

While engaged in various other phases of anthropological work in the region of Utuado in June, 1915, the attention of Dr. Boas was called to a site of archaeological promise in the locality known as Capá, in the barrio of Caguana, municipality of Utuado, district of Arecibo. Although at that time the site was so overgrown that the details of the place were entirely obscured, evidences of aboriginal handicraft were encountered so constantly over a large area that it was at once evident that a site of great archaeological importance lay there.

Accordingly, on July 2nd, after completing the excavation of the "Cerro Hueco" or "Cueva de Antonio" several miles away in the same barrio, Dr. Robert T. Aitken and I undertook the investigation and excavation of the Capá site. The owner of the land, Sr. D. Aquino González, with great kindness and public spirit, not only granted full permission to make any excavations, but also offered us many courtesies and great hospitality. To him and to Mr. Leopold B. Strube of Utuado, as well as to many other citizens of the region, we take this opportunity to acknowledge our indebtedness for innumerable kindnesses and favors.

Although in a region of rather intensive cultivation where nearly every acre is devoted to coffee, fortunately the site had not been under cultivation for some years and was merely covered with a valueless growth of bush. More fortunately yet, it was completely bare of tree growth, and the few stumps encountered indicated that apparently it had not been forested since its abandonment by the native population. Although surrounded by a dense forest shielding coffee bushes, the trees had encroached upon the architectural features at only a few points and no felling was necessary.

Consequently a few days' work with a large group of men with machetes served to clear the site and to bring to view its full extent. After the clearing it was evident at once that the place was unusually large and important, and that the short time remaining at our disposal would permit of no intensive excavation but that our efforts would have to be devoted exclusively to uncovering and mapping the structures.

When the underbrush had been removed a series of terraces and courts was uncovered, and several lines of large limestone slabs set on edge and others of great boulders were evident, but in addition to these, throughout the four or five acres in the central part of the area,

the tops of smaller stones were encountered barely projecting above the surface of the earth or hidden in the grass. The greater part of the month was spent in the uncovering of these lines of stones and of others completely buried. Machetes and trowels were the principal implements employed; occasionally hoes were used but never spades or picks.

Finally all the stone structures of which any trace appeared superficially were exposed, but it is quite probable that a complete excavation would have brought others to light. In the last few days a mound in the center of the site was excavated, but absolutely nothing was revealed. The work was suspended on the 24th of July.

After a short visit home I returned and recommenced work September 15th, continuing until December 11th. During this time the work was more intensive, a small part of the site being completely excavated to the original subsoil. By this intensive work it was hoped that the details of construction would be elucidated and that by noting and following disturbances in the subsoil the location of the aboriginal houses and other superstructures might be determined. These hopes were realized to a considerable extent. Since December 1915, no intensive work has been done on the site to my knowledge, and it therefore remains only partly excavated. However, Dr. Irving Rouse made a few stratigraphical tests there a few years ago.

Location and Description

Capá, so called from the numbers of capá trees, *Cordia alliodora*, which are found in the vicinity, lies on the east bank of the Tanamá River on the trail from Utuado to Lares and about half way between these two towns. It is about a two-hours' horseback ride from Utuado along the meandering and picturesque mountain road which connects the two places. The site lies but a few hundred yards south of the ford where the road crosses the Tanamá.

This region marks the division between the belt of limestone formation which borders the northern coast for some ten miles inland and the mountainous interior of the island which is of igneous origin. In this part the two formations are separated by a pleasant little valley through which the Tanamá River runs northward to join the Arecibo just before it debouches into the Atlantic near the town of the same name. To the north rise the steep and precipitous crags of limestone cliffs, while to the south the slopes are more gentle and rolling.

Close by the river lies the site of aboriginal occupancy. It is an ideal location for a stronghold. From the river two ravines extend

inward which are dry in rainless seasons but carry off the surplus water in times of rain. Though probably a quarter mile apart at their mouths, the upper reaches of these ravines converge until, at a point about a quarter mile from the river, they leave between them a narrow neck of land not more than thirty feet in width at the top and gently sloping to the bottoms of the ravines some forty feet below. A roughly triangular piece of land is thus nearly circumscribed, enclosing about six or seven acres of nearly level ground, at a height of possibly eighty feet above the river. On practically every side the descent is steep. Near the southwest edge it is nearly perpendicular to the river below. From here the river makes a wide bend to the northwest away from the site, but the steep-cut bank forming the western boundary, which was probably the bank of the river in a former epoch, does not follow the present meanderings of the river, but runs straight, leaving a wide fluvial plain between its base and the river. The descents to the ravines at the two sides, while not precipitous, are steep and susceptible of easy defense; thus the only easy approach to the site is over the long neck or ridge of land which forms a gradual but continuous descent from the high ground above. On this neck there are certain unnatural features of contour which suggest that there may have been some earthen defensive works there. At one or two places here the descent is rather steep. As soon as the ridge opens out, however, the land becomes practically level with a slope of not over five percent towards the river and none towards the side ravines. It forms an ideal site for a native stronghold, easily defensible and yet offering every possible advantage for occupation (PLATE 2, FIGURE 1).

No evidences of aboriginal occupancy were discovered beyond the limits of the level floor of the site and the upper portion of the slope to the southern ravine. But on the floor itself, the greater part of the area has been disturbed and modified by the work of man. The aboriginal modifications of the site may be classified under three heads: first, the alteration of the contour by cutting and filling, excavating and levelling to create flat courts, and piling earth to make terraces and mounds; second, the placing of stones and slabs to form boundaries, pavements and similar features; and third, the sinking of posts and the erection of structures of wood. It may be stated here categorically that there is absolutely no evidence of any masonry or superstructure of stone, thus radically differentiating the culture from those of Mexico, Yucatan, and Peru. While quantities of stones were used on the site, none of them was worked except for the production of pictographs, and in no instance was one stone laid over another. The

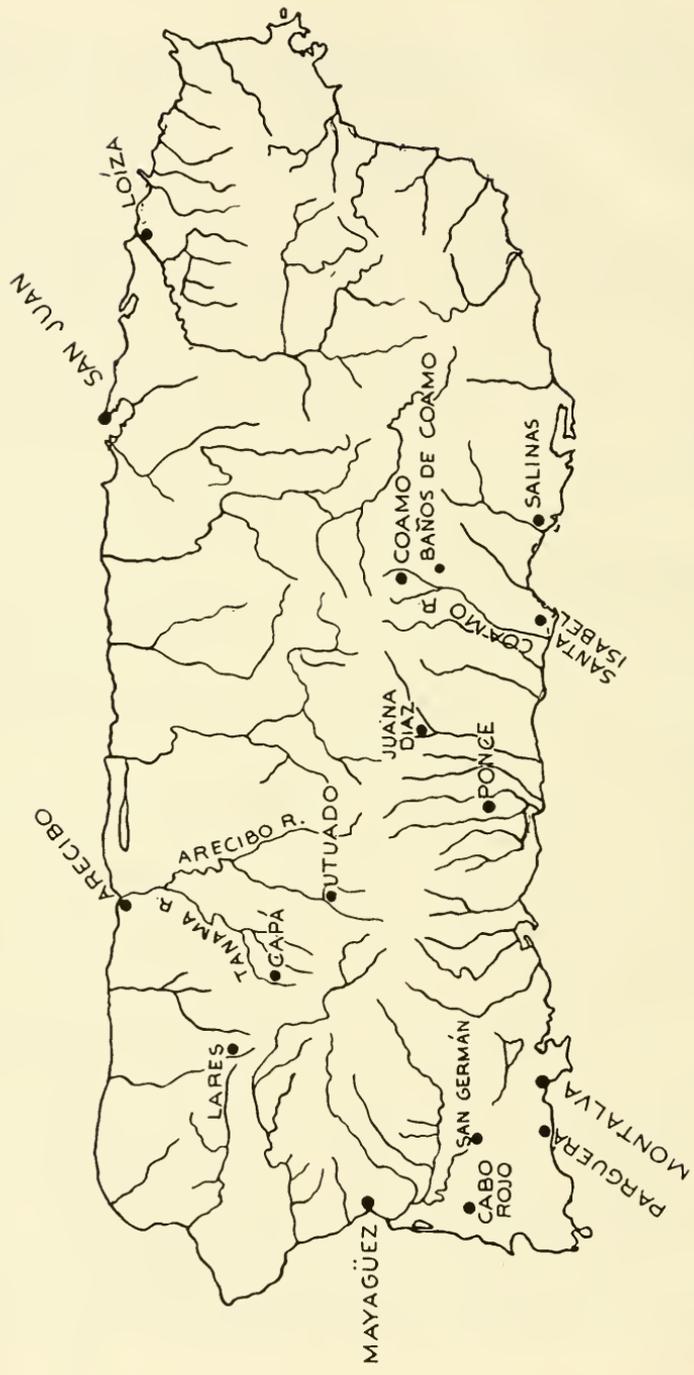


FIGURE 1. Map of Porto Rico showing locations of sites.



Panorama of Capá site before excavation. Photo No. 5.

MASON: ARCHAEOLOGICAL SITES



FIGURE 1. Bird's eye view of site from the northwest. Photo No. 10.



FIGURE 2. Limestone slab with carved human face in original vertical position in east line of plaza A. Photo No. 8.

erection of stone masonry was evidently a concept utterly unknown to the Antillean architect, even though capable of producing small stone sculptures of excellent quality.

Radically different in ensemble from any other site heretofore reported in the West Indies, or in America, the individual features are similar to those of smaller sites in the region and in other parts of the island. It is practically an aggregation of a number of courts, or "juegos de bola," which are normally found small and isolated. With these are other features foreign to the usual "juego" but built in the same general style. There is nothing to suggest any difference in culture or anything except an unusual development of the typical insular culture.

Situated as it is on relatively high ground above the river, the erosion is naturally away from the site and no accumulation of strata or debris could be expected. It was evidently a place of relatively late and short occupancy, and stratigraphical observations were precluded.

The internal core of the promontory is a red clay of relatively homogeneous consistency and of considerable depth. No traces of rock were found at the greatest depth of excavation reached, but at a depth of about six feet the smooth texture of the clay becomes sandy, and at about ten feet begins to become hard and gritty. Probably this differentiation may be ascribed to variation in fluvatile deposition.

The upper surface of the clay stratum generally is marked quite clearly and exactly, and lies at an average depth of some eighteen inches below the present surface. Commonly it is thickly interspersed with white or gray-blue veins which appear to be the result of the decomposition of roots or other organic material. When the clay surface is laid bare, any disturbances or excavations in it are at once plainly evident.

The thin stratum of earth overlying the clay appears to be composed principally of humus. Over a considerable part of the site this is in undisturbed condition, but in the making of most of the courts the earth was removed down to, or frequently below, the former level of the clay. In the centuries which have elapsed since the abandonment of the site, these courts have again been covered to varying slight depth by soil.

The principal features of the site are thirteen in number (PLATE 1). These are, as lettered on the accompanying plans:

- A. A great, nearly square court, or plaza, evidently the principal feature of the plan, levelled by excavation and bounded on two sides by a walk or pavement, on one by a line of limestone slabs and on the other by a line of igneous boulders.

- B. A long, roughly oblong levelled court, lined on the sides by limestone slabs and bounded on the ends by lines of small river stones.
- C. An elevated oval space adjoining the northwest corner of the main plaza A and surrounded by limestone slabs.
- D. An oblong space adjoining the oval and the main plaza, bounded by the western line of the main plaza, the southern section of the oval and the eastern boundary of the court E.
- E. A small court parallel with the space D and immediately west of it.
- F. A large mound of earth situated in the angle between the oblong court B, the oval space C, and the structure G.
- G. A rectangular structure of unusual plan running from the mound F to the western courts H and I.
- H. An oblong court artificially levelled with lines of river stones on the sides, the ends open.
- I. An oblong court nearly parallel to court H and similar to it in form, to the south of the latter.
- J. A smaller court bounded on the long sides with lines of river stones, situated on the northeastern periphery of the site, near the edge of the ravine and within the trees.
- K. An oblong court near the southeastern edge of the site, bounded on the sides by lines of river stones.
- L. A line of stones northeast of the latter, possibly one side of another court.
- M. Two parallel lines of stones situated at the southern end of the site on the edge of the woods.

Several other short lines of stones were found and a jumbled mass of stones at N was said to be the remains of a modern house undoubtedly built of stones taken from the disrupted structures.

The main axis of the entire site runs through the length of the large oblong court B, across the house site, diagonally across the square plaza A from the northwest to the southeast corner, and down the center of the court K. In this order, each of these is at a slightly higher level, making three planes in all. Even on the apparently level courts, however, there is an appreciable drainage.

The highest spot on the site was apparently just outside of the southeast corner of the quadrangular plaza A and stood about eight feet higher than the plaza below it. It is possible that there was a mound here, but it was not excavated. The lowest point was probably at the edge of the ravine between the western courts H and I.

The maximum dimensions of the area occupied by lines of stones are about 650 by 375 feet. Though apparently none of the stone lines is exactly oriented, there was obviously an intention to make the main direction of the features north and south. This orientation is followed by structures A, D, E, H, and I; B and J run noticeably west of north. Structures G and M lie approximately east and west, K and L south-east.



FIGURE 2. Plan of the large site at Capá, Utuado. By Robert T. Aitken and J. Alden Mason. The larger scale plan shown elsewhere of features C, D, and parts of A, B, E, and F, outlined here by a rectangle, is more accurate. Dot-and-dash lines bound topographic features and levels. Broken lines outline excavated areas. Dotted lines outline areas of

dark subsoil or other apparent subsoil disturbances. Solid black features are stones, hatched small areas with central dot posts, hatched small areas without central dot shafts or other places of deep subsoil disturbance. Numbers in circles indicate positions from which photographs were made. See numbers in captions of plates.

The Quadrangular Plaza A

The great quadrangular plaza A is the first feature encountered upon entering the site from the east along the narrow ridge. It is a level depressed court about one hundred and twenty feet in width from east to west and one hundred and sixty feet in length from north to south. At its western end it was probably excavated slightly if at all and was nearly even with the original level of the surface, but towards the east the floor of the court was levelled by excavation as the natural slope of the land from the east rendered necessary. This naturally caused a pronounced terrace to encircle the court on three sides, and this was probably heightened by the piling of the earth excavated during the levelling process. This terrace is some six feet above the level of the court at the east side, falling to the latter's level at the southwest corner. On the northern side the excavation for the long court B and for the space between this and the square plaza causes the terrace to turn to the north and to continue to near the northern limit of the long court where normal ground level is again reached.

The greater part of the plaza was thus originally excavated to a slight depth in order to make it level. In the interior absolutely no evidences of any structures were found; however, time did not permit of an excavation to the clay level. No stones certainly *in situ* and few scattered stones occur within the limits of this plaza, which may have been a kind of open parade ground for the performance of "areitos" and other religious and ceremonial functions. A few feet inside the northwestern corner, however, several small flat stones were found evidently in position, but they could not be connected with any of the adjoining features. Several trenches driven across for the purpose of drainage disclosed nothing except that the stratum of humus above the clay level is unusually thin, three to eight inches, probably this accumulation of earth being entirely post-Columbian. It is quite possible that a thorough excavation of the clay surface would reveal some features of interest.

Near the eastern and the northern sides of the plaza, the drainage trenches exposed several strata of different natures. To the east a stratum of some six inches of dark humus overlies the clay subsoil, then a very thin, one-inch stratum of soil very black with charcoal, above this, two or three inches of red clay, and then, uppermost, four inches of humus again. This superposition of strata extends from a point some fourteen feet from the line of boundary slabs to a point some twenty-five feet from them into the court, beyond which the

single three-inch stratum of humus is found overlying the clay. A similar stratigraphical formation is found in a band of some six feet in width near the boundary walk to the north. These thin strata of charcoal and clay, occurring as they do in the only two places excavated, suggest that a similar stratification might be found around all, or at any rate around three, sides of the plaza. The charcoal is evidently the result of a fire, possibly from the destruction of a bower or some other wooden structure around the edges of the plaza; the two layers of humus obviously were natural accumulation before and after such a conflagration. The stratum of hard clay, which gives the appearance of having been baked by the fire, is less easily explained. Beyond this, and close to the inner edge of the stones of the walk bounding the plaza on the north, the stratum of upper earth attains a depth of fifteen inches.

When first seen, the plaza was limited on the east by a short but steep slope from the high ground above, at the base of which on the plaza floor were four large isolated limestone slabs set on edge in a line. One of these bore a large carved face (PLATE 2, FIGURE 2) and several of the others showed traces of similar faces, now eroded. Excavation brought to light a complete line of slabs, most of them fallen forward into the plaza on account of the pressure from the washing-down of the terrace above (PLATE 3). It would seem that wherever on the site limestone slabs were placed on edge, they were not imbedded deeply enough or braced strongly enough, and in all but a few cases fell into the courts which they surround and were buried by earth. Some twenty-five of these buried slabs were thus uncovered here, all very much eroded and broken. The weathered remains of pictographs are discernible on some of them, and it is probable that every one originally contained some incised or carved face or other design. Circular holes some six inches in diameter, apparently drilled, are observed on several. The slabs average six inches in thickness and some have a length and breadth of six feet or more (PLATE 3). When in their original place and position, they must have presented an impressive sight. These slabs appear to have been placed by the same method as other similar ones on the site,—by digging a trench and placing the slabs in position, then placing smaller stones at their bases to brace them and filling the trench with earth.

At both ends of this line of slabs the side-walks, or double lines of stones which bound the plaza to north and south, appear to turn at right angles and to parallel the slabs for a few paces several feet above them on the terrace, as will be explained later. There is, furthermore,



Two views of limestone slabs forming east boundary of plaza A. Photos No. 49 (above) and No. 36 (below).

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FIGURE 1. Double line of stones forming southern boundary of plaza A. Photo No. 39.

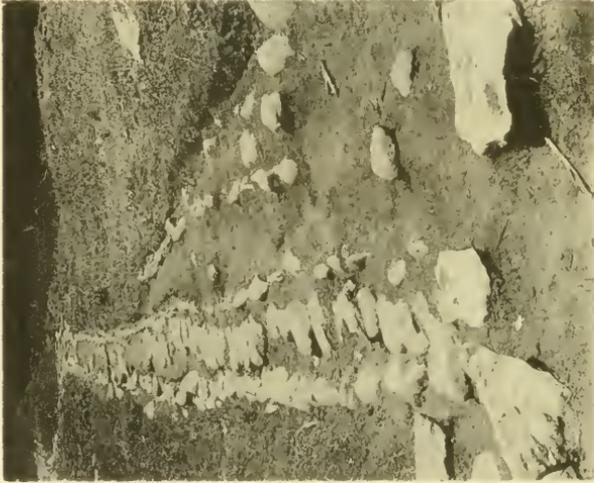


FIGURE 2. Stone "side-walk" forming northern boundary of plaza A. From the east. Photo No. 40.



FIGURE 3. Stone "side-walk" forming northern boundary of plaza A. From the west. Photo No. 37.

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a slightly curving line of small stones set on edge on the ridge of the terrace several feet east of the southern end of the line of slabs. Its convex side is toward the line of slabs. This line seems to have no relation to the surrounding structures and its purpose is problematical; it may have had some connection with court K southeast of it.

To north and south the plaza is bounded by what appear to have been side-walks or pavements on the lower slopes of the side terraces and at a level possibly a foot or so higher than that of the plaza. Though at present much disrupted, each seems to have consisted of two parallel lines of river stones set on edge. These are of approximately uniform size but unworked, averaging about eighteen inches in length by twelve in width, and three or four in thickness. They are buried for about half their width in the earth, their ends close together. The lines are about four feet apart, the outer line a trifle higher on the terrace than the inner. The southern walk consists only of these two lines of stones, and many of them have been torn out and are scattered around in the neighborhood (PLATE 4, FIGURE 1); it was only slightly covered with earth and easily destroyed. But the northern walk, particularly at the eastern end where the erosion from the upper terrace had covered the stones deeply, displayed upon excavation a line of similar stones laid flat on their faces in the center of the two parallel lines, forming a perfect paved walk from the eastern line of slabs to the oval space C. These stepping stones did not rest on up-rights, but were laid directly on the earth (PLATE 4, FIGURES 2, 3).

These two walks are slightly modified at either end, that to the south less completely than that to the north, but on the same plan. Near the eastern end of the northern walk, a third line of stones set on edge parallels the outermost edge of the walk for about twenty feet at a distance of some five feet from it and higher on the terrace (PLATE 4, FIGURE 2). The purpose of this in the architectural scheme is not clear; there seems to be no evidence of any corresponding line on the southern side.

At their eastern ends the walks appear to bend around the line of slabs for a short distance as if leading to or from the center of the terrace above the plaza. This phenomenon is again better developed in the case of the northern walk. This walk with its two lines of side stones and its center paving stones turns southward with a gradual curve to a right angle following the base of the terrace, and continues for a few feet until it meets the last slab of the eastern boundary against which a larger mass of limestone is set at right angles, evidently to mark the limit of the line of slabs (PLATE 5, FIGURES 1, 2).

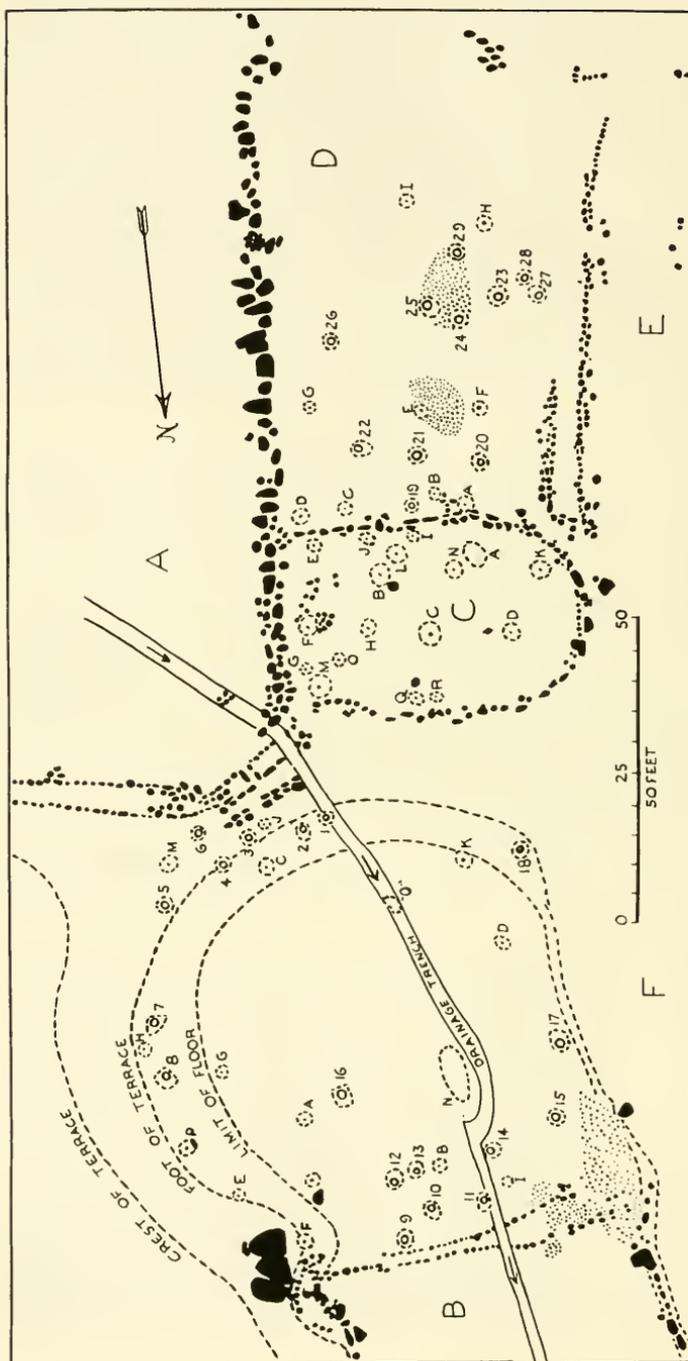


FIGURE 3. Central area including parts of features A to F, showing locations of house-posts and other subsoil disturbances. Posts are indicated by small broken circles enclosing solid circles, other shafts by small broken circles. Stippled areas indicate large disturbances in the subsoil.



FIGURE 1. Limestone masses at the northeastern corner of plaza A. Photo No. 58.



FIGURE 2. The northeastern corner of plaza A. The northern "side-walk" turns the corner to the eastern line of slabs. Photo No. 57.

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FIGURE 1. The oval feature C. In the foreground, the western end of the northern "side-walk" of plaza A with the angled turn. Photo No. 25.



FIGURE 2. Line of large boulders forming the western boundary of plaza A (background), and low slabs of the oval ring C (foreground). Photo No. 31.

MASON: ARCHAEOLOGICAL SITES

Here the walk seems to come to an end, neither leading within the plaza nor mounting to the terrace above it. The line of slabs, therefore, does not extend for the entire length of the eastern boundary but is replaced for some fifteen feet on either end by the continuation of the side-walks.

The outer isolated line of stones at the northeast corner, although much disrupted, appears to follow the same course, a few feet higher on the terrace, and comes to a sudden end at the same relative point. On the slopes of the terrace north of the walk just before its junction with the eastern line of slabs are several large limestone slabs lying on their faces. Their original position is a matter of doubt.

At their western ends the walks bend inward at an angle of about forty-five degrees for a short distance to meet the line of great boulders which forms the western boundary of the plaza. On the southern side only a single line of stones is found; the other may have been disrupted, but this walk probably was never functional and the one line merely filled out the general architectural plan. At the northwest corner of the plaza the north walk undergoes some interesting developments.

The entire walk bends inward at an abrupt angle, evidently to afford access to the oval raised space C, which seems to have been the central feature of the site (PLATE 6, FIGURE 1). At a distance of about twenty feet from the ring of stone slabs which surrounds the oval space the two side lines of the walk converge by reason of an abrupt angle in the inner line until they are not more than a foot apart. From here they diverge again until the normal width of four feet is again attained. At a distance of some nine feet from the ring of slabs C, the walk is terminated by a long stone set on end transversely across it, but a foot farther to the west the walk recommences with two transverse stones paralleling the end stone to the east. The reasons for these peculiarities are not clear. Throughout this part of the walk many of the flat central paving stones are in place.

A drainage trench that had been cut through the walk at some earlier time, disrupting some of the stones, revealed the fact that for a width of five feet, including the walk and a little space on either side of it, the normal red clay was replaced by a material full of small nodules which were almost entirely carbonized. These nodules are roughly spherical, hard, black, and about a quarter inch in diameter, with a nucleus and an outer layer. They were found in many restricted localities throughout the site but principally on the level spaces within the courts; at least few occurrences were noted in unmodified areas. They extended to a depth of not more than four

feet in any instance and were generally so thick as to give the appearance of raisins in a fruitcake. The evidence seemed to suggest that in places these nodules were utilized as a sort of paving material within the level areas, though this is by no means beyond question. These nodules were identified by the late Dr. Millspaugh of Field Museum of Natural History as seeds of a palm, probably the "palma de cojollo," *Thrinax ponciana*. These seeds would naturally fall from the trees and form a solid mass in definite strata of slight depth if not interfered with, and evidently would not have formed the homogeneous deep masses of mixed seeds and sandy earth which were often found. In the particular case under discussion it appeared that a trench had been dug for the side-walk and the stones then set in position and partially covered by this paving mixture.

Some three feet to the northwest of the walk at this point a second walk parallels it for a short distance, though broken and apparently aimless. A row of side stones is in place, set on their edges, and a line of central paving stones, but the outer line of side stones seems to be missing and the walk as a whole to be aberrant. Two of the posts of the aboriginal houses to be discussed later (nos. 3 and 6) approach very closely to the outer stones of these walks.

The western side of the plaza is delimited by a row of great granitic boulders which is one of the striking features of the site (PLATE 6, FIGURE 2; PLATE 7, FIGURE 1). These are unshaped masses of rock of a roughly columnar or quadrilateral shape, planted upright in the ground. Like most of the other similar features, they were not planted deeply enough, and many of them have toppled over, destroying the symmetry of the line. Smaller stones were planted at their bases to strengthen them, and this evidence suggests that, as in the case of the lines of limestone slabs, they were buried in a trench dug for the purpose. Many of these boulders are of considerable size, the largest ones measuring possibly six feet in length, three in width, and two in thickness. Such a stone must exceed a ton in weight. There are no igneous rocks on the site, and the surrounding hills are entirely of limestone; therefore they must have been transported from the bed of the river at the closest, several hundred yards away and possibly sixty feet up a steep bank. This feat must have taxed the ingenuity of the natives and probably was performed by a multitude of workers with ropes of strong vines and log rollers.

The largest stones are found near the center of the line, smaller ones nearer the ends. It is highly probable that each of these stones originally carried an incised or carved petroglyph. Most of these were

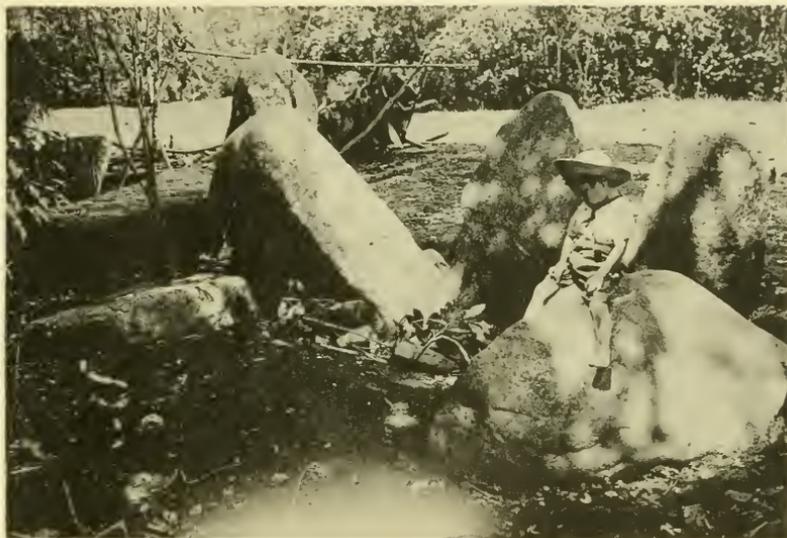


FIGURE 1. Large boulders at west of plaza A. Photo No. 30.



FIGURE 2. Shallow incised human petroglyph on one of large boulders. Photo No. 32.

MASON: ARCHAEOLOGICAL SITES



FIGURE 1. Two petroglyphs on boulders at east side of oval ring C. Photo No. 2.



FIGURE 2. Incised human face on boulder. Photo No. 45.



FIGURE 3. Large spheroidal stone balls and broken limestone slab with carved human face. Photo No. 41.

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probably shallowly incised and have eroded. Several show evidences of this, but the full extent of the pictographs cannot be traced. Others had fallen on their faces and been buried (PLATE 7, FIGURE 2), one such was turned over and a very characteristic engraved figure found (PLATE 8, FIGURE 1). Several of the smaller stones to the northern end carry well-carved and well-preserved figures (PLATE 8, FIGURE 2). The workmen claimed that until recently a limestone slab with carved face stood in the center of this line of boulders, facing the central similar slab in the eastern line. A broken slab answering this description lay in the neighborhood (PLATE 8, FIGURE 3).

The Large Long Court B

The long horseshoe-shaped court B is the feature of second interest. It is situated in the northeastern part of the site and runs at a slightly different angle from the majority of the other structures, a few degrees northwest and southeast instead of practically north and south as seems to be the general plan. This was probably due to the exigencies of the contour and limits of the land.

In effect, this court is a long level space roughly two hundred feet in length by fifty-five in width bounded on each long side by a line of limestone slabs set on edge, on the northern end by a semicircular wall with flat capstones, and on the southern end by a low double line of small stones set on edge (PLATE 9, FIGURE 1).

This court, like the large quadrangular plaza, was produced by excavating in the sloping ground so as to produce a level space. On the western or lower side little excavation was necessary and the level of the court is practically the same as that of the unexcavated ground west of it, while on the high or eastern side a greater depth of excavation was required, though not so much as in the case of the wider plaza A. This excavation likewise caused a terrace to be left on the east side of the court.

The court was evidently first excavated to the required even level. On the west side the level of the clay subsoil is practically the same inside and outside the court, indicating that on this side only the surface soil was removed, but on the eastern side the present level of the clay is considerably higher on the terrace outside the court than within it, indicating that the levelling process here required the removal of some of the subsoil. The average level of the court is eighteen inches below that of plaza A. After this levelling the side lines were evidently made. To this end trenches were dug with concave bottoms averaging eighteen inches in width and twelve in depth. It appears

that a trench was dug for each slab individually, not one long continuous trench. Rough slabs of limestone, some of them nine feet in length by six in width and eight inches in thickness, were then set on edge in these trenches, and river stones set against their bases on either side to brace and strengthen them (PLATE 9, FIGURE 2). The stones on the outer sides apparently were at a higher level. After this, earth was filled in to the normal court level. Unfortunately, the interment and strengthening were not firm enough and the majority of the slabs have fallen, at present only some thirteen remaining upright (PLATE 10, FIGURE 1). These are, naturally, along the western side and at the northern end of the eastern line, the places where there was the least pressure from earth on a higher level. The majority of the slabs of either line have fallen forward into the court, thus proving that the level of the court was below that of the surrounding areas.

Taking up the construction of the court in detail, we shall begin at the northern end. The level is the lowest at this end, the drainage being down from the square plaza. The northern limit of the court is practically on the edge of the ravine and, when first found, the terminal semicircle was completely covered by humus and vegetable mould from the foliage. This semicircular wall is rather different from any other feature on the site, inasmuch as a double width of stones, both vertical and horizontal, was employed, the nearest approach to true masonry observed.

Each of the side lines of limestone slabs, east and west, is terminated at the northern end by a large mass of limestone, in place of the usual slab, forming terminal monuments (PLATE 10, FIGURE 2). That at the end of the eastern line is the larger, being about four feet in length by three in width and standing five feet above ground; the western terminal is slightly smaller. These are not in exactly corresponding position, since a line perpendicular to the axis of the court and passing through the eastern terminal falls eight feet short of the western terminal. But since both lines of slabs bend to the east a few degrees during the last twenty feet, the deflection being about two feet, a line struck at right angles to this deflection corrects the variation of the terminals.

These two terminals are fifty-five feet apart, that being the width of the court at this point, and the central point of a line connecting them is almost the geometric center of the arc of the circle of the semicircular end wall, the middle point of this wall being twenty-seven feet from the line connecting the two terminals.

This semicircle (PLATE 11, FIGURE 1) is practically continuous from



FIGURE 1. Large court B after excavation. Curving northern end boundary at rear. Southern limiting line in center. Rain-filled excavations for posts in foreground. Photo No. 79.

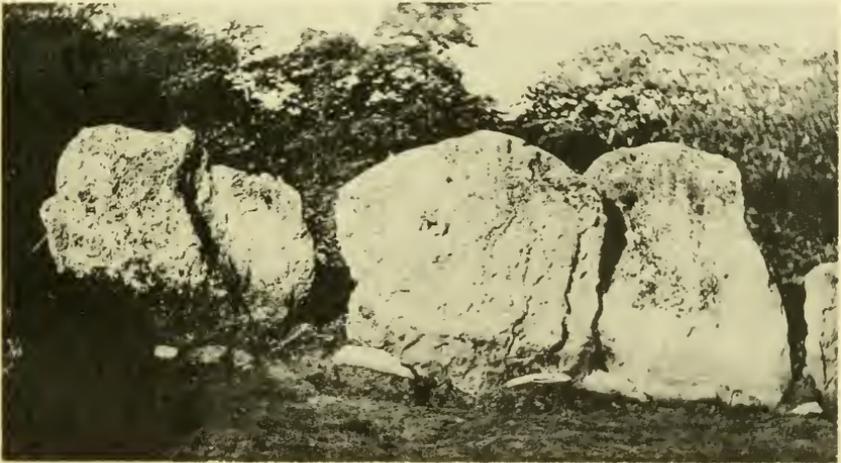


FIGURE 2. Large limestone slabs *in situ* in western line of court B, showing bracing stones at their feet. Photo No. 88.



FIGURE 1. Large limestone slabs, mainly fallen, on sides of court B. Photo No. 35.



FIGURE 2. Large limestone mass marking northern end of west line of slabs of court B. Photo No. 67.

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the eastern terminal mass except at one point where it has been broken through for a drainage ditch, but is broken for a large part of the segment beyond the western terminal. It begins immediately behind the eastern terminal mass with a "walk" consisting of flat stones laid in a single line which proceeds in a gentle curve for fourteen feet to the drainage trench. This line of stones is practically missing on the western side, though the quantity of scattered stones found on this side suggests that a formerly existing line may have been destroyed. The principal drainage trench passes through on this side and there is evidence of much destruction there. At present the semicircle for some twenty-five feet beyond the western terminal is entirely bare except for scattered and disrupted stones. On the northern side of the western trench the "wall" begins in almost perfect condition.

Beyond the trench on the eastern side the single line of stones recommences, but here it is covered and confused by the superposition of other stones, some of them probably disrupted in the making of the trench, others apparently in original position. At a distance of ten feet beyond the trench the line is widened by the placing of a double line of flat paving stones, which is raised above the surface of the court. Six feet farther west, approaching the central axis, another innovation is introduced in the form of side or batter stones placed on end and leaning against the core of the walk, which by this time has risen to a height of eighteen inches or two feet. The method of manufacture seems to have been as follows: the ground having been excavated to the required depth, a central core was made by piling small stones of odd shapes in a curve to a height of a foot or more. Then, at the front or concave side, a facing of selected flattish river stones of relatively uniform size was placed, sloping slightly from vertical, their lower edges on the court floor. These evidently served an esthetic rather than a utilitarian purpose. There are twenty-six of these, extending about fifteen feet to either side of the middle of the arc. Similar, and often larger, stones were then placed flat as caps in two rows. At the two ends those of the inner row rest on the upper edges of the batter facing stones at a height of little more than one foot, but in the center, where the wall reaches a height of two feet, earth intervenes. These caps are generally oval and placed with their short edges to the front. The width of the wall also varies, from three feet in the center to two at the sides. At the back no excavation seems to have been made, and the rear edges of the second line of caps evidently rest on the original soil level.

From its central point the semi-circle continues nineteen feet to the

last stone on the west and the same distance to the end of the double line on the east. As already stated, on the latter side it continues in modified form, but on the west side it comes to a stop, possibly being interrupted here by the later digging of the drainage trench. The last six feet of the wall to this side also are much disrupted and the stones displaced. The last six feet of double capping to the east are without the vertical front stones. The curve is only roughly a true arc, there being several breaks and angles.

From the two terminal limestone masses the side walls of the court run parallel somewhat east of south. Originally both sides consisted of undecorated large slabs of limestone set on their edges, but time has affected the various parts of the lines differently.

From the terminal limestone mass of the eastern wall most of the slabs are still in place for some forty feet to the south, unfallen though leaning, as the terrace behind them is nearly on the same level as the court and the pressure from behind is not great. There are eight standing slabs of different dimensions in this distance. In the next forty feet there are eight fallen and two standing slabs, nearly all of medium size. The last standing slab, about eighty feet from the terminal mass, appears to be imbedded in clay which stands at a level some eight inches higher than the floor of the court. The third forty feet is occupied by seven slabs, all fallen, of unusually large size; the largest three measure nine by seven feet and six inches in thickness, eight by seven feet and eight inches in thickness, and eight by five feet and six inches in thickness. Most of these fallen slabs were buried under from six to twenty-four inches of soil. Their bases appear to be at a level of twelve inches above that of the court. The next twenty-five feet is occupied only by small or broken slabs, and the following eighteen feet by three slabs of medium size. This reaches a point some one hundred and sixty feet from the terminal mass and one hundred and ninety feet from the center of the end semicircle.

The final fifteen feet is unique in construction. First, at a distance of some fifteen feet north of the southern transverse stone line, a broken slab, the base still in position, is set at variance to the others, its northern end pointing several degrees into the court. At the southern end of this slab there is a much thicker one, evidently cognate to the limestone terminal mass at the north, which sets at a right angle to the last slab, and consequently abruptly into the court. This marks the southern end of the eastern side line. However, the actual end of the court as delimited by the transverse line of stones is some ten feet farther south, two hundred and three feet from the center of



FIGURE 1. Two views of curving "wall" forming northern boundary of court B. Photo No. 81 (above) and No. 84 (below).



FIGURE 2. Salient, and limestone slabs at southeastern corner of court B. Photo No. 87.



FIGURE 1. A house-post *in situ*, partly excavated. Photo No. 92.



FIGURE 2. Post excavation, showing mould of bark against side of hole. Photo No. 97.



FIGURE 3. House-post excavated and removed. Photo No. 101.

the northern semi-circle. The intervening ten feet is occupied at the east side by a niche or salient which extends into the terrace several feet outside of the theoretical projection of the east line (PLATE 11, FIGURE 2). After reaching this projection of the east line, the southern transverse line swings northward in an arc until it strikes the terminal limestone mass already mentioned, thus forming a salient of some three feet in width. This salient is a continuation of the floor of the court and was evidently a place of some ceremonial importance, as many decorated potsherds were found there. An unusual number of decorated potsherds were also found all along the base of the eastern line of slabs.

Higher up on the terrace is a second encircling line of river boulders (PLATE 11, FIGURE 2), starting from a point some three feet north of the northern end of the salient, curving some four feet beyond it up on the terrace and extending to the edge of the court some three feet south of the southern limit of the transverse line. At its end, extending out into the court, appears a low mound of earth about ten feet in greatest diameter, north to south. A little higher on the terrace, some eight feet from the edge of the mound, are two large limestone slabs now fallen but probably in their original position, and behind these, two river stones set on edge. No more stones were visible to the south but original excavation was apparent.

That all these features had some definite esoteric value and were not purely fortuitous or the result of the architect's fault or fancy is seen by a comparison of this corner with the northeast corner of the square plaza A, where almost every feature is duplicated.

The east line of the court is not absolutely straight, since a sight taken along the line of the three principal standing slabs near the northern end falls about four feet within the court at the southern end of the line, demonstrating that much divergence from a straight line.

The western line of slabs is very similar in general effect to the eastern line. North of the northern terminal limestone mass, as before noted, there is an unoccupied space. This may have been a feature of the original plan but more likely produced in recent times by the removal of the stones here. The side line itself is composed of slabs generally smaller than those used in the eastern line, but more of them are standing. They are, however, more weathered and broken. For the space of some sixty feet from the northern end most of the slabs are still in place, beyond this many are broken or fallen.

At about the one-hundred-and-sixty-four-foot mark, approximately opposite the southern terminal mass of the eastern line, the western

line is brought to an end by a well-squared rectangular stone set on edge which lies at an angle slightly southwest and northeast and consequently parallel with the corresponding stone at the end of the eastern line. Its outer end stands eighteen inches outside of the line of slabs. Beyond it are several more stones lying in the same axis. These stones seem to direct the course of the court to the southwest toward the mound. Two feet beyond this, the transverse line of stones begins which runs across the court to the eastern line.

It is probable that originally there was a semi-circular salient at this corner of the court similar to the one at the opposite corner, but, if so, it has been entirely disrupted. Beyond the southern transverse wall the details were very difficult to plot because they had been covered by earth from the excavation of the mound F early in the work. There appears to be no small mound corresponding to that on the east side, but a limestone slab is found approximately opposite the large slabs on the other side of the court. This is at the base of the big mound, five feet west of the projection of the side line at the one-hundred-and-eighty-five-foot mark.

The southern transverse line, fifty-four feet in length, is not perpendicular to the axis of the court, the east court side line being six feet longer than the west. Wavering and disrupted in places, it is composed of river stones of igneous rock of small to medium size set firmly on edge; before excavation few of these showed above the soil.

As the side lines of the court are only approximately straight and parallel, both being slightly, but unequally, convex towards the west, the width of the court varies slightly, from fifty-five feet at the north to fifty feet at the south and in the center. At the southern end the distance between the limestone slabs on the east terrace and at the foot of the large mound F at the west is sixty feet.

The floor of the court is practically level with a slight gradient for drainage from south to north. The upper soil had an average depth of eight inches, with a range from six to twelve. The level of the clay subsoil is higher at the sides than in the center of the court, probably for drainage. The clay is of a brownish-yellow color and the line of separation from the upper humus sharp. Considerable charcoal was found at the bottom of the humus just above the clay, but very few small stones and potsherds, the latter all small and much weathered. These data indicate that the court was originally dug to or below the level of the clay subsoil, and that the upper humus is mainly the natural accumulation since the abandonment of the site.

Close to the northern semi-circular limit the soil was fifteen to eight-

een inches deep, the surface at the level of the cap-stones. This "wall," at the edge of the woods, would naturally catch wind-blown leaves and dust. Here a thin reddish stratum, evidently clay from the subsoil, overlaid the humus. It probably represented earth from the digging of the drainage trench in recent years.

Near the southern transverse line the humus was unusually dark in color and the subsoil division-line especially plain. The charcoal was especially thick in some parts on the east side of the court.

A few shallow square holes were found in the clay subsoil which at first presented a puzzling problem. They average eighteen inches square and eight inches in depth with nearly straight perpendicular sides and slightly concave bottoms, being filled with dark surface soil and much charecoal. It was at last decided that they were made in recent years for the planting of coffee and bananas. They are much more frequent in and around the northwestern court H.

At the far northwestern corner near the ravine the level of the clay subsoil dipped so that in order to make the level court as long as possible the floor is of humus instead of clay. At the western end of the semi-circle the clay subsoil is eighteen to twenty-four inches below its usual level. The absence of charcoal and potsherds in this humus floor, as well as the gradual transition from black humus to red clay instead of the usual sharp break, indicate that this was not an artificial fill. In the upper humus here, above the court level, potsherds, charcoal and small stones were more frequent than usual.

Over several large, and small, areas the clay subsoil is full of small black bits that seem like charcoal and leave a black streak when cut through. They are of irregular shape with a definite cleavage and differ from the concentric nodules, probably carbonized palm seeds, found in some other parts of the site. They resemble coal, and it was claimed that there is a vein of lignite close by. Generally the mixture is sparse but in some parts so thick as to resemble fruit-cake. These areas seem to occur mainly within the courts and to a slight depth with average of ten to twelve inches and maximum of twenty. Though of puzzling nature, there is no evidence for their artificial placement, and they are probably of natural origin. The largest area is on the western side of the court from the semi-circular ring at the north for one hundred feet south. In the northwestern corner the black fragments are mixed with the earth floor as well as with the clay. Other similar areas were found in the far southwest corner, on both sides of the southern transverse line and close to the west line, and also some small areas on the east side of the court.

A few other modifications of, or disturbances in, the clay subsoil were noted, but all were of minor importance. It is evident that court B was, like plaza A, a flat space for the performance of ceremonies, dances, or games, and contained no superstructures.

Several disturbed areas of considerable size but of slight depth were found. At about the one-hundred-and-forty-foot mark an oblong area of dark-colored soil was encountered at about five feet from the west line. It was roughly ten feet in length by four in width, the long axis northwest to southeast, but only five to eight inches deep. The sides of the area were steep but not abrupt. It was filled with clay of a dark color interspersed with many small stones, but contained neither potsherds nor charcoal.

A similar but smaller space lying in the same general direction was at approximately the one-hundred-and-thirty-foot mark, and five to ten feet from the west line. It was roughly six feet in length by two in width. The dark earth extended to a depth of approximately twelve inches, but five small dark cores along the medial line continued to a depth of fifteen to eighteen inches. A shallow depression close to the west line was filled with a dozen or more small stones.

In seven places vertical "cores" of dark earth were found in the clay, but the diameters were never over four inches, nor the depth in excess of thirty inches. In no case was any woody fiber or much charcoal noted, but the presumption is that they represented stakes or poles sunk for some purpose, but probably post-Columbian in age. Several were apparently braced by small stones near the top of the clay subsoil. Four of these in the northern end of the court are of approximately the same bore and depth, and stand at approximately equal distance in a rough rectangle.

The terrace east of this court is partly natural on account of the higher ground there, but had been accentuated by the piling of earth from the excavation. At the far northern end, the ground is at the same level within and without the court, the difference being only a few inches. The rise is gradual going southward. For the first forty feet the rise is inconsiderable; at this point the clay level immediately behind the slabs stands twelve inches higher than the court level, demonstrating that amount of excavation. Twenty feet behind the slabs the top of the terrace is at a level two feet higher. At the eighty-foot mark the same vertical cut of twelve inches is maintained but fifteen feet behind the line of slabs the terrace rises to a height of four feet. At the largest slab at the hundred-and-ten-foot mark, the clay level is eighteen inches higher than the foot of the slab and consequent-

ly thirty inches higher than the court level. Fifteen feet behind the line the top of the terrace stands at a level five feet higher than the court. From this point southward the same level of the terrace is maintained and not increased.

South of the transverse line the level court space widens out and eneroaches upon the terrace, so that the rise is more rapid in order to attain the same height in a shorter distance. As there are no boundary slabs in this region, the exact line of demarcation is difficult to determine. In this region the soil seems to be thicker, eighteen to thirty inches, while further northward it is from twelve to eighteen.

The terrace thus runs from the northern end of the long court southward along this court and its continuation, and then turns eastward nearly at right angles and encompasses three sides of the square plaza, coming to an end at the southwest corner of the latter. It is partly natural, caused by the excavation of earth, and partly artificial, caused by the piling of the excavated earth on its edge. It reaches its widest extent at the corner of the square plaza A and the extension of the long court B, where it turns at an angle. This was probably a point of considerable interest and should be investigated, as it is possible that some kind of a structure stood upon this elevated point. A short semicircular line of nine stones laid flat on their faces is found at the edge of the terrace at this angle; other lines might be exposed on excavation. Similar isolated lines of stones are found behind this point at the edge of the woods and more at the northeastern corner of the square plaza. Along the eastern side of the plaza the terrace stands at a height of some three feet above the level of the latter and very probably is a point of considerable importance which would repay excavation. The artificially levelled part of the terrace is from about half way along the side of the long court to about half way along the north side of the plaza which was undoubtedly the important part of it. The balance retains its natural gradient.

From the ends and the center of the eastern line of court B three trenches were run at right angles across the terrace and area to the east. That at the northern end terminated at the ravine, the others at the west line of small court J. Also holes were dug for the corner posts of a shelter-house erected on the edge of the terrace. No unquestionable disturbances in the subsoil were noted in the two southern trenches, but in the northern one several cores were found. One, of ten inches diameter, descended to a depth of four feet, but no woody fiber was noted; another large core was not excavated. These, especially the latter, may have represented house-posts. The other two

cores, of six inches diameter and eighteen inches depth, were probably stakes. The upper humus, as shown by these trenches, was relatively sterile of potsherds and charcoal, and evidently undisturbed. More sherds and charcoal were found in the southern trench. In the excavation for the house-posts considerable charcoal and several sherds were found just above the clay level at eighteen inches depth. As there could have been little accumulation of earth on this terrace edge through erosion deposition, it would appear probable that the overlying earth was deposited here.

In the northern trench the soil depth was slight, twelve inches, and the clay level the same inside and outside the court, indicating no aboriginal excavation here. The stratification noted in the two southern trenches proves that the terrace was levelled and widened towards the west by the superposition of earth, probably from the excavated court. Though the clay level sinks towards the west, the surface soil is level, twenty-four inches in depth at the edge of the terrace, twelve inches deep near court J. At the edge of the terrace, which is at an average distance of fifteen feet from the east line of slabs, the following stratification was noted, in ascending order: 1. clay subsoil; 2. ten inches of dark humus, probably the original surface; 3. six inches of brown soil, probably a mixture of humus and clay, thrown up from the court excavations; 4. three to ten inches of black humus, the recent accumulation.

The area to the west of court B and between that and the lower northwestern court H is unaltered and stands at its natural level and gradient, a gentle even slope. Along the west edge of court B the surface level varies from eight and six inches above the court level at the north and south ends respectively, to fifteen to eighteen inches in the center. The level of the clay at the ends seemed to be about the same as within the court, but six inches higher at the middle, indicating that the court was levelled through the uneven clay surface.

Three trenches were run across this area at right angles to the west line of court B to or towards court H. The humus varies from eight to sixteen inches in thickness and is of a brownish color, blacker and thicker in the central trench where some charcoal and sherds were found at the bottom; these were almost entirely missing in the other trenches. The line of demarcation from the red clay is marked. The depth of the soil decreased from east to west. In the southern trench, opposite the southern transverse line of court B, the clay is yellow and full of carbonized palm seeds which reach to a depth of twenty inches from the surface of the clay. Several apparent filled-in excava-

tions in this trench were followed to depths of forty and twenty-four inches without revealing any points of interest.

A deep filled-in hole was found in the central trench about seven feet west of the west line of slabs. To a depth of two feet below the level of the clay and four feet below that of the surface the depression was concave and filled with dark earth. At the bottom of this depression two roughly circular cores of six or eight inches in diameter continued. These seemed to be of a clay of a bluish tinge and were thickly interspersed with bits of charcoal. No woody fiber was found but the impression given was that of stakes driven into the clay at the bottom of the hole. The cores were thirty inches apart, one in the center of the depression, the other in the northwest corner of it. It is possible that investigation in corresponding places would show a line of posts paralleling the wall and a few feet from it, supporting a superstructure at the side of the court.

Since this space retains its natural gradient, and the surface soil for the greater part is without artifacts or charcoal, it follows that it was never cleared or levelled, but the disturbances in the subsoil in which stones, potsherds, and charcoal are found indicate that some aboriginal excavations were made here for various reasons. Being located between two of the principal courts, it is probable that temporary houses, sheds, or other superstructures were erected here from time to time, and a complete excavation of the area, which was impossible in the limited time at disposal, might bring to light many phenomena of interest.

The House Area Between Courts A and B

Investigation showed the area south of the transverse terminal line of the large court B to be one of the most important parts of the site. It is practically an extension of the oblong court, being at the same level and of approximately the same width, but is not bounded by stones on any side. It is in effect a roughly circular space seventy feet in diameter. As the court itself is about fifty-five feet in width at the transverse line, the level floor was widened by some fifteen feet south of the terminal line. This was done by cutting back the terrace some ten feet on the east and including some five feet more of the ground on the west.

Immediately south of the southern transverse boundary of the long court B a line of stones appears which may be considered as belonging to the circular space under consideration. As will be seen on the plan this line extends only partially across the center of the court. At the eastern side of the court this second line is parallel to, and an exact

duplicate of, the first, fifteen to twenty-four inches further south. It comes to an abrupt end ten feet from the eastern line. On the west side this southern line, beginning at a point some three feet south of the northern line, runs in a slight curve to a point some eight feet south of the latter line and nine feet from the western line, where it comes to a sudden end with many large scattered stones. It is probable that a few of the stones at this end of this line have been disrupted, but the line probably never ran much further. In details of construction it resembles the northern line, being a series of river stones of rough lozenge shape set on end in a line. One curious feature is that close to the western boundary of the court, three feet south of the northern line, there are three stones in position parallel to this line, in exactly the position the southern line would have occupied had it remained throughout parallel to the northern one.

The western limit of this circular area is difficult to determine, as there are neither boundary stones nor a terrace on this side, but it may be considered as extending to the foot of the mound F immediately to the west. Near the base of this mound the surface soil was thicker, ten to twelve inches, probably due to erosion from the mound, and also blacker, with small quantities of charcoal and potsherds. Four stones were also found near the surface.

The southern boundary was formed by a low ridge of about one foot in height running from the corner of the terrace on the east to the space between the mound F and the oval C on the west. This is the sole object that separates the level of the court B from that of the quadrangular plaza A. This is roughly sixty to seventy feet from the southern transverse line of court B, the east-west diameter of the circle being about the same distance, and two hundred and seventy-four feet from the center of the northern semicircle of court B. This ridge seems to be artificial,—the surface soil is thicker than in any other place, up to eighteen inches; beneath this there is a thin stratum of charcoal, and then a stratum, six to twelve inches thick, of a mixture of clay, earth, charcoal, bits of burnt clay, potsherds, and small stones above the subsoil.

To the east the space is bounded by the terrace which descends gradually to the floor and which therefore cannot be delimited exactly. The depth of the surface soil increases from six inches in the center to fifteen or eighteen inches at the foot of the terrace, obviously due to deposition from above. Here the soil is dark, and the stratum immediately above the clay subsoil contains much charcoal and unusual quantities of decorated potsherds and small stones; on the slopes of the terrace charcoal and potsherds are scarce.

The average depth of soil, especially in the center, was rather slight, about six inches, and rather dark in color, probably a post-occupational deposit; around the periphery this upper soil was thicker. This layer contained few if any artifacts except at the very bottom. Generally underlying the thicker peripheral soil was a stratum of ten inches average thickness of mixed earth and clay together with charcoal and potsherds, evidently an accumulation of the occupational period. This, together with the many evidences of fire and the house-posts to be later noted, proves that this was an area of constant or frequent occupation, though houses and fires, when not conflagrational, were probably of ceremonial purpose. The potsherds found were generally decorated, while the few found in court B were rude and undecorated. Loose stones were occasionally found above the clay subsoil in the western and southwestern sections. Several limestone slabs were also found, one with cup-shaped depressions on its under surface. In the northern center a carved stone of "zemi" type was found and a large natural stone nearby.

Often the lower occupational layer appeared to be divided into two parts, the lower one just above the subsoil being especially dark and full of charcoal, or solid charcoal in places. These obviously represent fires, either from fireplaces, or from house conflagrations. Ash and fragments of burnt clay are often found with the charcoal, and the clay subsoil beneath is sometimes baked red and hard. Most of the southern half of the area is covered by a thin stratum of ash, charcoal, baked clay fragments, and occasional pieces of flint. A similar but smaller area is at the north, between the two lines of stones at either end. The ash is often of a greenish color. Another small area of charcoal was in the west center. As will be seen later, these areas are in general those of the house-posts.

In several areas, especially to the north and south peripheries, the lowest occupation stratum, in addition to charcoal, contained quantities of spherical black nodules which seemed to be palm seeds. In most cases it was noted that these lay in soil of a sandy nature, rather than in clay or humus.

The level of the clay subsoil was slightly concave, that near the eastern edge being apparently about three feet higher than in the center. Three large flat stones lay imbedded in the surface of the clay near the center of the area, in a line about four feet long. Another large flat stone was found near the eastern edge in the northeastern quadrant.

Over much of the southern half the red clay surface was replaced by

a stratum of varying depth up to one foot, of clay generally of a yellowish color and sandy consistency, thickly mixed with the small black nodules, probably palm seeds, frequently mentioned before. Though containing no potsherds or other artifacts, it had the appearance of an artificial pavement, possibly laid to level irregularities in the subsoil surface. Some of it may be composed of bits of mineral carbon. Similar smaller areas were noted at the west and northwest. In the south-central part, a "ribbon" of this nature with sharply marked sides and ends but of slight depth, two to three inches, was observed. From twenty-one to thirty inches in width and eighteen feet in length, it ran east and west. A smaller similar feature in the northern part ran towards the south.

In a number of places the clay surface had been baked red and hard, doubtless by fires on it. These areas are generally small, of slight depth and were found in almost all parts except the very center. They seemed to have little relationship to the large areas of charcoal in the soil above, and were apparently due to intentional fires rather than to the conflagration of the houses. One such area in the south center measured about four by six feet, and six inches in depth. At the bottom a limestone slab, about twenty by forty inches in diameter, lay flat. Two other smaller limestone slabs and several basaltic river stones were found not far away; probably these were the stones of a hearth.

In the surface of the clay subsoil evidences of former disturbance and excavation were frequent. All of these were investigated by excavation, though many not entirely. Some were of relatively large extent and relatively slight depth, many of slight area and depth; a few were large in both area and depth, many were shafts of slight area and considerable depth. Most of the latter evidently represented the posts for houses. In eighteen instances this was verified by the discovery of actual posts in the ground, in other cases the features indicated a post though no wood was found, and the post presumably had rotted. Other excavations probably represented subsoil fireplaces, and many were of unknown purpose.

This roughly circular area was therefore not an open dance or parade ground as apparently were the long courts and the square plaza. It was evidently a space occupied by aboriginal houses; we may assume that these were of ceremonial nature and probably larger than, and possibly of different construction from, the ordinary dwelling houses. Unfortunately the locations of the posts give no clue, at least to the writer, of the number, shape, and size of the houses.

Such a determination is complicated by a number of factors. The houses may have been of unusual size or shape. Some of the shafts in which no posts were found may once have held posts, others not. Moreover it is likely that the posts of several successive houses, occupying the same place, are represented. The evidence indicated that many, if not all, of the posts had been burnt to or below the ground. It is obvious that with houses of posts with thatch roofs, conflagrations must have been frequent. Presumably, when a house was burnt to the ground, the bases of the house-posts would have been left in the ground, new excavations made and new posts erected close to the old ones. From the data at hand, therefore, any determination of the shape, size, location, and number of houses, successive or contemporary, is unlikely, though not impossible.

Fewkes (1907) searched the original sources for descriptions of native Antillean houses at the time of the Conquest and gives a resumé with quotations. He says,

“There is good evidence that in every pueblo one house, different from the rest, was always set apart for religious purposes, and in this house idols and other paraphernalia of worship were always kept.”

We may be reasonably sure that the houses upon the Capá site were temples. Muñoz (1793) describes a village which was discovered by Columbus on the west coast of the island. The houses of this town were arranged around a central square or enclosure.

Oviedo (1851) describes the houses of the aboriginal Haitians but says at the end, “Thus are the houses of this and of the other islands.” The houses, of which he gives drawings, were of two types, circular and rectangular. The posts of the wall of a circular house were, “four or five paces apart”, and there was also a post in the center of the house. Strangely, Oviedo speaks of these posts as being driven into the ground (*hincados*) instead of buried, and specifically states that the central post was “fixed” at a depth of four or five hand’s-breadths only. The actual walls were of cane, also planted in the ground.

The rectangular houses were made of the same materials, for chiefs and other important men, according to Oviedo. They seem to have had windows and a porch, both of which the circular type lacked. The roofs of both types were thatched with cane and leaves. In the illustrations given by Oviedo, balls are shown along the ridge of the rectangular type and at the apex of the circular type. Fewkes thinks that these may have been stone weights to strengthen the house in hurricanes, and makes the plausible suggestion that the spherical

stones (PLATE 8, FIGURE 3) so often found in the neighborhood of archaeological sites may have been used for this purpose.

The above data give us little help in determining the nature of the houses on the Capá site which were presumably temples. Aboriginal American temples are generally of a different shape from dwelling houses as well as of larger size; it is likely that the Porto Rican temples were windowless round houses.

We may assume that the holes for the posts were dug by loosening the clay with wooden implements with pointed and fire-hardened ends. A man probably entered the narrow shaft and passed up baskets of earth. The trees were probably felled by charring and hacking with stone axes, the branches removed and the posts cut to desired length by the latter method. The holes were filled with earth and stones.

Thirteen of these eighteen posts were in two main groups, six at the southern end of the area, seven at the northern end; two were to the east, two to the west, and one near the center. Their approximate positions may be seen in the accompanying plans. No definite order could be observed. Except for three in the southern group, the locations of all were observed when the upper soil was cleared off to the level of the clay subsoil; then the excavation made for the interment of the post was readily visible. These three, nos. 3, 4, and 6, were on the low southern ridge and their tops showed above the subsoil level, though below that of the upper soil. In the other cases the discolored core was excavated until the woody fiber of the top of the post was encountered at various depths. In several cases the post was completely carbonized for a short distance below clay level, and continued in fibrous condition, sometimes rotten, sometimes relatively solid. The upper carbonized part evidently represented the extent of the subterranean burning.

Detailed notes and measurements were taken upon all, but as these seem to point to no important conclusions, variations from normal apparently being of no significance, their publication here would have only nuisance value.

The excavations for the burying of the posts were of small dimensions, never over two by three feet, oval, quasi-circular or quasi-rectangular. Probably they were made just wide enough for one man to enter, dig, and pass up baskets of earth. Generally the post was set against one side of this hole (PLATE 12, FIGURE 1), which was then filled up, usually stones being added to brace the post. Naturally the filled-in earth always contains more or less charcoal and sometimes a few potsherds, and is always darker than the clay subsoil. Most of the

posts were interred with the bark on, though a few seem to have been stripped. The bark is always rotted to a plastic watery clay about two inches thick, the corrugations of the bark surface showing against the clay subsoil or fill (PLATE 12, FIGURE 2). This rotted bark is generally of a markedly blue color, most of these were termed "ortegon" by the workmen. A few were a steel-gray, and these were generally identified as "higuerillo."

The posts varied in size from five by seven inches to ten by fifteen and twelve by twelve inches, the average about eight to nine inches in diameter. Their tops were found at from a little above clay level down to three feet below it. The workmen generally had definite ideas as to the identity of the wood. Seven were agreed upon as "ortegon," *Coccoloba rugosa*, two as "higuerillo," *Crescentia cucurbitina* (calabash tree), one as "white capá," *Petitia domingensis*. In two cases the men disputed as between higuerillo and capá, and in two others a number of possibilities were suggested, including the above and "moralon," *Coccoloba grandiflora* and "cedro macho" (either *Laurus pendula* or *Hieronymia clusioides*). The coccolobas are said to be the longest-lived wood on the island. The workmen expressed their surprise at the poor quality of the posts used, claiming that within their memory better pieces of timber could have been obtained at no very great distance. They were often rather crooked, with knots. Possibly at the time of the erection of these buildings these trees grew in the neighborhood of the site; at present most of them are said to be found only in small quantities further in the interior.

Three of these posts, nos. 9, 14, 17, were completely excavated and removed (PLATE 12, FIGURE 3), the others only partly uncovered. These three were of eight, ten, and seven inches diameter. The shafts dug for their interment were six feet six inches, nine feet, and eight feet two inches beneath the clay subsoil. Nothing had been buried under the posts, their lower ends were roughly pointed. The depths to which these posts were buried, six to nine feet, is surprising. The workmen said that they plant their houseposts at present to no more than four feet. These houses may have been larger than modern ones, or especial strength desired to withstand hurricanes.

In addition to these posts, numerous other disturbances of great or slight depth and of large or small area were found in this space. The distinctions between them are not clear cut,—apparently a few are house-posts that had entirely rotted; other broad and shallow depressions could not have been posts; a number of relatively deep ones are equivocal.

Three deep shafts, marked A, B, C on the plan, were followed to depths of six feet four inches, six feet six inches, and eight feet eight inches. The shafts were eighteen to twenty-four inches in diameter and contained much charcoal, frequent stones, and some potsherds, occurring at all depths to the bottom. The central cores consisted of the bluish clay that seems to result from the rotting of posts, but their diameters could not be ascertained, and no woody fiber was noted. It may be assumed, nevertheless, that these represent small posts that had entirely rotted.

Several instances were noted of narrow deep cores of bluish clay without the usual shafts with charcoal, stones, and potsherds. These probably represent small posts or poles driven into the ground by force without excavation. One such, D, extended down to eight feet, but the upper half had been excavated and filled. Another, E, six inches in diameter, extended to a depth of six feet. Another shaft, F, of the usual nature, with black core and bluish surface, and fill with charcoal and potsherds extended to a depth of four feet, below which a core of nine inches diameter extended to an undetermined depth.

A number of other shafts of considerable depth contained the usual filling material of charcoal, stones, and potsherds, but lacking the core, bluish clay, or other evidences of the former existence of posts or poles; their nature is uncertain. Shaft G was eighteen inches in diameter at the surface and of conical shape to its bottom at five feet six inches. H, a shaft with charcoal but without stones, potsherds, or central core, extended to six feet. I, with stones and potsherds, was followed to a depth of four feet six inches. Shaft J ended at five feet depth, but it seemed to be continuous with the excavation for post no. 2, two feet away. At the surface of the clay, resting in the fill, were a small limestone slab on edge and a small basaltic stone. A shaft, about twenty-two inches in diameter, with mottled clay but little charcoal, extended from the bottom of depression K at a depth of five feet six inches to six feet six inches. The upper part was broader than the lower shaft and contained many stones, and some bluish clay. Near the bottom a polished celt was found and near the top two large stones which filled the whole shaft and did not brace any possible post. L was full of charcoal and potsherds, with several stones at a depth of two feet. In M several potsherds were found; the maximum depth of this was five feet.

There were four areas of disturbance or fill of large extent and considerable depth. One, N, showed on the subsoil surface as a large oval dark area ten feet in greatest diameter. Of concave section, the

diameter was three feet at four feet depth, the maximum depth five feet six inches. Eight stones, and considerable quantities of dark earth, charcoal, ash, and potsherds were found, suggesting a fireplace; but there was no definite shaft or core. Another similar space, O, had a large oval surface area, and extended to a depth of eight feet. Five large stones were found at various depths, three of them at a depth of two feet having the appearance of the three stones of a fireplace. Other small stones, apparently fire-broken, lay on or near the surface. The quantity of charcoal and ash throughout the upper half suggested a fireplace.

The other two areas were smaller. In D a group of four stones placed on edge in the form of a fireplace lay just under the subsoil surface in a typical fill of clay, earth, charcoal, and burnt clay,—and a foot below this was a layer of burnt clay. The surface area was three by five feet, the maximum depth four feet, but beneath this a post core continued to eight feet. The upper part also showed some of the bluish clay from woody material, several more stones, much ash, and a potsherd. Another area P, three by four feet at the surface, also suggested a depression for fires. At a depth of two feet it still had a diameter of over three feet; in depth it extended below five feet. No large stones were found, but much charcoal, ash, small stones, and potsherds. Just on the surface of the subsoil but under two feet of earth, probably washed down from the adjacent terrace, was found a piece of Spanish glazed pottery, proving that at the time of the Conquest the space was cleared to subsoil level.

Twenty-seven shallow shafts or cores of dark fill were also noted in this area. Of the fourteen whose widths were noted all but one were from four to eight inches, the exception was fifteen inches. The interesting feature is that these narrow shafts occurred in five groups of three each; the depths were from two to twenty-four inches with an average of thirteen inches. The twelve isolated ones were all over ten inches in depth and three were abandoned at depths of over three feet. Most of them contained charcoal, some held small stones, potsherds, and burnt clay. They evidently represented shallow excavations made for some purpose, probably a ceremonial one.

The Oval Space C

Possibly the central feature of the entire site, the place of primary importance, was the small oval space C (PLATE 6, FIGURE 1). Here probably the most important "areitos" and other religious ceremonies were performed. It may have been an entirely open space. No

certain remains of house-posts were found in it, but some disturbances in the subsoil are suggestive of these.

This oval, which measured about fifty feet in diameter east to west by forty feet north to south, stood at a level probably two feet higher than that of the great plaza A to the southeast and three feet higher than that of the oblong court B to the north. This difference in height was caused both by the aboriginal excavation of these latter-named areas, the level of the clay subsoil in the oval being somewhat higher than that of the plaza A and thus again proving the aboriginal excavation of the latter, and also because of the superposition on the oval of some earth probably excavated from these other sites. Its height was also somewhat greater than that of the rectangular spaces D to the south and E to the southwest.

On the surface a stratum of dark humus from three to twelve inches in depth was found, this probably being the natural accumulation of recent years. A number of well-decorated aboriginal potsherds were found in it. Others were coarse and very thick, an inch or more, and evidently belonged to very large vessels. These were found at from three to ten inches depth. Near the bottom of this stratum at a depth of about ten inches an old Spanish coin, apparently bearing the date 1810, was found.

Beneath the humus came a stratum of about a foot in thickness of a streaky bronze color, evidently a mixture of earth and clay. Charcoal and potsherds were present in considerable quantities in this stratum which appeared to be an intentional superposition during the carrying-out of the original plan. This covered the entire oval to an approximately even depth.

In the southern part of the oval beneath these two upper strata a thin stratum of pure charcoal only an inch or two in thickness was found. This occurred at equal depth within the oval and south of it in the space D. This stratum was apparently the result of the burning of one of the houses erected on the space D to the south. The earth and clay beneath it appeared to be baked in some places as if by fire. Next came a stratum twelve to eighteen inches in thickness, of black soil full of charcoal and some potsherds; this lay on the clay subsoil. Probably it represented the original surface soil.

This oval was bounded for three quarters of its circumference by a continuous ring of limestone slabs set on edge (PLATE 13, FIGURE 1). To the east this was replaced by the line of boulders which bounds the western side of the great plaza A (PLATE 6, FIGURE 2). These slabs are not upright but all set a little slanting, falling outwards. They



FIGURE 1. Oval ring C, of limestone slabs and river stones. Photo No. 29.

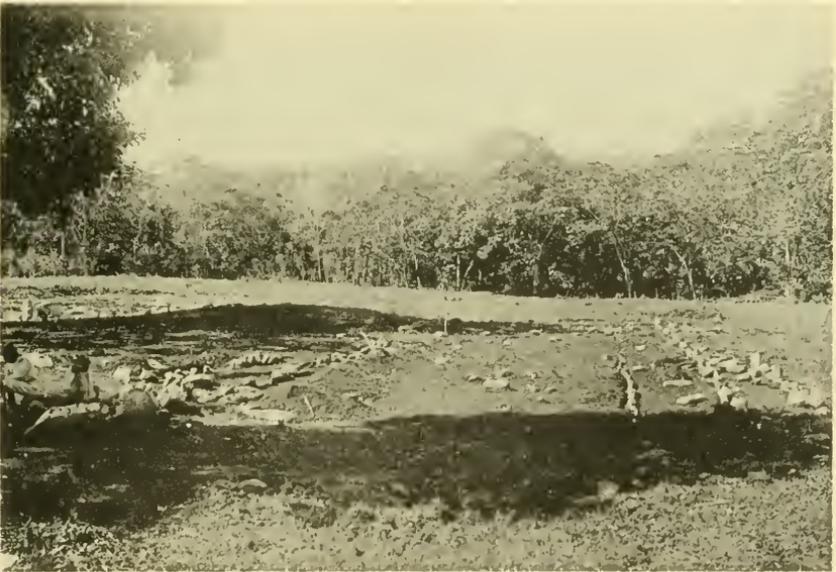


FIGURE 2. Court E. From the north. Photo No. 21.

MASON: ARCHAEOLOGICAL SITES



FIGURE 1. Lines of stones forming western boundary of court E. From the north. Photo No. 38.



FIGURE 2. Feature G. From the east. Photo No. 33.



FIGURE 3. Feature G, after excavation. From the west. Photo No. 73.

averaged eighteen to fifty inches in length by eight to forty inches in width and four to eight inches in thickness. The method of interment was the same as that employed for slabs elsewhere such as those along the sides of court B. A trench was dug to a depth of possibly twenty inches beneath the level of the clay and the slabs interred in this. Large stones were then placed against the base of the slabs at the inside to strengthen them, and the trench was then filled up with debris of earth, clay, stones, and charcoal.

Along the feet of these leaning slabs were found unusual numbers of well-decorated potsherds as well as several very well-made small celts, and a portion of a stone "collar," indicating that this was a very important area.

Lying on the surface of the oval near the center was a very large unworked reddish boulder; it may have served as a seat or altar. Throughout the surface were many other smaller stones, some of them evidently intentionally placed on edge, and below the surface many others were found. Near the eastern edge nine stones were found in line on one side of shaft F, and on the opposite side three or four stones in a row with a considerable number of other stones piled on top of them.

Although, in contrast to the areas F immediately to the north and D immediately to the south, no remains or definite evidences of house-posts were found within this oval, a number of disturbances were noted in the clay subsoil, when the upper strata were removed. These, about twenty-five in number, were all excavated. The detailed notes probably do not merit publication space; the locations may be seen in the accompanying plans. Their natures are dubious. In no case was any woody fiber found, nor was any mention made in the notes of the plastic bluish clay that seems to result from the decay of posts, especially of their bark. But in many respects they resembled the shafts and cores of house-posts. The depths varied from eighteen inches to eight feet with an average of forty inches. These depths were measured from the base of the uppermost humus stratum, since the other strata above the clay subsoil seem to have been superimposed before these disturbances in the subsoil were made, although the disturbances were not so easily traced above. In most cases they were cylindrical shafts, sometimes with smaller and darker interior cores. In several cases a large surface area of disturbance resolved itself into two or three such shafts or cores. The diameters of the cores were noted in only six instances, five of eight or nine inches, one of twenty-four inches. The occurrence in the shaft of charcoal was

noted in almost every case, generally also small stones and potsherds. The absence of any core was noted in the deepest shaft F which extended to eight feet, the average depth for the interment of house-posts. In one, shaft M, a limestone slab and several other smaller stones, all interred on edge, were found at a depth of three feet.

The House Area D

The point of next interest is the small oblong area D which adjoins the oval C. The convex line of bounding slabs of this oval forms its northern boundary, the large boulders of the great plaza A its eastern boundary, and the low lines of stones of the court E its western boundary. There is no definite limit to the south, but some scattered stones and a broken stone line were found there. The space thus bounded is thus not one of the architectural features of the site, which, it would seem, were always left bare for the performance of dances and ceremonies, but was the space between several of these features. Being thus in the center of the site and adjoining the most important structures without being one of them, it was naturally utilized for the erection of one or more of the large houses and evidently was a situation of considerable importance.

The southern part of this space was occupied by a low mound of possibly two feet in height composed of earth and many stones of good size; this was entirely excavated. Several of the large spherical stone balls which are frequently found on ball-courts and which are popularly supposed to have been the balls used in playing were found in this mound (PLATE 8, FIGURE 3) as well as a small celt, a piece of coral rock, and several stones of peculiar shapes.

The northern half of the space was evidently occupied by a large house, or possibly several successive ones, the posts of which were found here, together with the evidences of many other excavations and disturbances in the subsoil which seem to have been made for other purposes. There seems to have been neither excavation nor filling on this site and the level of the clay subsoil stands possibly a foot higher than in the plaza to the east.

To the northern end of the space, in the region of the house-posts, the surface soil was very thick and dark, with many well-decorated potsherds. This would appear to indicate that the greater part of this soil accumulated during the period of occupancy; as this was high ground, the accumulation of late years would necessarily have been slight. A fine amulet or "zemi" of carved stone somewhat resembling a turtle was found here, also a crudely carved stone, and many pottery

handles to vessels in the form of heads. Both large and small stones were also frequent.

Below the upper stratum of earth came a thick layer of soil more brownish and sandy. This evidently consisted of mixed earth and clay, probably the earth from the excavation of the adjoining great plaza A. This averaged twelve inches in thickness and contained much charcoal and a few potsherds.

In the southern part of the space near the former mound the strata were different. Here the upper stratum was slightly brownish and not carboniferous, about six inches in thickness and giving the appearance of a natural accumulation of years, uninfluenced by occupation.

As already mentioned, in the far northern end of this area, near the oval ring, a thick stratum of solid charcoal was found at a depth of about one foot. It measured one to two inches in thickness and continued beyond the slabs and stones of the oval where it reappeared at the same depth within the oval ring. It appeared in greatest thickness in the center of the far northern end, close to the ring of slabs, and was found also in the far northwest corner, but not to the south. It was evident by the appearance that the trench for the oval ring had been dug though this stratum of charcoal which must, therefore, have been pre-existent. Yet the restricted area of the stratum indicated a conflagration of small extent, and the burnt brick-clay beneath indicated one *in situ*. The natural inference is that a house had been erected on the site and burnt down before the construction of the oval ring. The ring would therefore be one of the late structures of the site. The earth above the charcoal stratum indicates, furthermore, that a layer of earth was subsequently superimposed upon it. This charcoal layer is at a depth of fifteen inches close to the oval and about six inches at ten feet from it (post 21), about twenty inches below the tops of the slabs of the ring and ten inches above their bases. The cores of some of the post-holes were evident above the charcoal stratum.

In the northwestern part of this area some expanses of hard, red burnt clay were noted. To the northeast the soil was thin and the clay subsoil close to the surface. What soil there was, was full of charcoal. All along the line of boulders to the east the upper soil was relatively thin. In the center of the area a thin stratum of dark material mixed with charcoal appeared at a depth of twelve to eighteen inches. Beneath this was a thin stratum of charcoal and then clay interspersed with the black nodules of palm seed already mentioned.

Time did not permit a thorough excavation of this area, and work

ceased before subsoil had been reached. Nevertheless a condition very similar to that in the circular space south of court B was revealed. Eleven house-posts were discovered as well as many other disturbances in the subsoil for which no purpose could be assigned. As before, no definite grouping or arrangement of these posts was disclosed. However, they might be considered as falling into two groups: four, posts nos. 19 to 22, to the north; and seven, posts nos. 23 to 29, to the south; possibly they were at opposite sides of a large house.

In most cases the excavation of a post was not continued after the discovery of woody fiber had proved its nature, and few were followed to the bottom,—the base of one was found at ten feet, four inches from the level of the subsoil. A few of them appeared above the surface of the subsoil; other shafts or cores were excavated to a depth as great as seven feet before woody fiber was found. In five cases an identification of the wood was hazarded by the workmen: three *ortegón*, one *moralón*, and one *higuerillo*. The posts or cores ranged from six to ten inches in diameter. Charcoal, stones and potsherds were found in the shafts of many. When the top of the post was close to the surface, it was generally entirely carbonized, probably as a result of slowly smouldering under ground. In several cases the post-shafts began at the bottom of filled depressions. One such large area included three posts, nos. 24, 25, and 29, and extended to a depth of two or three feet. Deeper, at the depth of five feet, a horizontal shaft of filled material connected the shafts of two of these posts, nos. 24 and 29. The average diameter of the post-shafts seemed to be about thirty inches. In one instance the lower part of the core was not surrounded by a shaft, indicating that the post had been forced into the ground for a slight distance.

In addition to these cases in which the discovery of woody fiber proved the former existence of posts, a number of other shafts and disturbances of other natures were found. Since in some of the proved cases the wood found was only a few splinters, and since some of the other shafts differed in no other particular, it is probable that some of these other filled holes also represented posts. Others of less depth were probably for other purposes. The occurrence of charcoal, small stones, and potsherds in almost all of these areas of subsoil disturbance proved their artificial nature. There were several filled areas of large extent, and often shafts or cores extended into the undisturbed clay from the bottoms of these.

About twenty-three such shafts and cores were noted, extending to depths of from three to ten feet, with an average of five feet. Diame-

ters were noted in only a very few instances, these were from eight to fifteen inches. Frequently several, from two to four, cores were noted close together in the same superficial disturbed area; at greater depths some were separated by rather thin septums of undisturbed clay, indicating that they were not interred at the same time. Five cores of from five to six and one-half feet depth were found near, and in the large filled areas of posts 25, 27, 28, and 29. One puzzling feature was the apparently indubitable discovery of a bit of iron against post 25 at a depth of about three feet. At a depth of five feet the core near post 27 became a filled tunnel, full of charcoal, narrow but long, extending southwestward to an undetermined distance.

The other eighteen cores in nine holes (one with three, another with four cores) were, with two exceptions, under five feet in depth; these two were six and one-half (B), and ten feet (C). Several of the others may have been of equally great depth as they were not all followed to their bottoms. The locations of only these nine shafts (A-I) are shown on the accompanying plan, in addition to the posts 19-29. Charcoal, stones, and potsherds, the latter often well decorated and in considerable quantities, were found in almost all, several fragments of bone in one at a depth of three feet.

One of the most interesting and peculiar features of the site was a great filled depression in the approximate center of this area D. If one large house occupied most of this area, this feature would have been in the center of the house. At the surface it showed as a dark oval twelve by eight feet, with the long axis pointing northwest. The concave depression was full of the usual mixed earth and clay, with charcoal, small stones, and potsherds interspersed. The bottom had not been reached at ten feet when operations ceased. Four large stones and a potsherd were found at a depth of nine feet. A darker vertical core which ended at a depth of five feet was observed near the center. Against the southwest side of the filled depression six flat stones were found in descending order like a stair.

The Small Court E

The small court E lies to the west of area D, and its eastern line forms the western boundary of the latter. But little can be said of this structure as it was not excavated nor accurately surveyed. It was obviously an oblong court or "juego" like many of the other features of this site, seventy-five feet long by twenty-five feet wide (PLATE 13, FIGURE 2). These are about the dimensions of the average "juego." The area thus included was a flat plane, evidently so made by excava-

tion and filling. The boundary lines are rows of flattish river stones, imbedded on edge (PLATE 14, FIGURE 1), the greater part of the stone being under the surface; most of these rows were completely covered on first observation. The northern end was open, the southern end marked by a low line of stones isolated beyond the ends of the side lines, broken and scarcely visible. The two side rows were of similar lines but these turned outwards in a loop at their northern ends and retraced themselves southward for some twenty-five feet in parallel lines, six feet apart. The loop of the eastern line almost touched the slabs of the oval ring. The western boundary, furthermore, was paralleled for the entire length by another row of similarly imbedded stones, some six feet inside or to the east, thus making a long alley to the west in addition to the two partial alleys within the loops. The purpose of these architectural features is quite uncertain, but all of them are very characteristic and are repeated on other parts of the site. The rows of stones were very much disrupted and the court full of scattered stones.

The Mound F

The mound F occupied a prominent place in the plan of the site and probably also in its purpose. Its closest connection was evidently with the structure G to be next described, but it occupied a position bringing it adjacent to the house site at the southern end of court B, and to the oval ring C. Though of slight elevation, it stood in the approximate center of the main architectural features and may have been the central point of observation from which all activities were observed or directed. It probably consisted of earth removed from the adjacent features during their construction. It is reasonably certain that no superstructure was erected upon it.

The sides were gently sloping and the height not over four feet, though both were probably more accentuated at the time of occupancy. The width was probably about fifty by forty feet, making the space slightly oval. A trench had been run in from one side, evidently a number of years before. The owner of the site claimed that it had been done by a "scientist" many years before, while a neighbor was equally certain that he himself had dug it some twenty years before and had taken out a number of "idols." This mound was completely excavated by us and the earth piled around the periphery, but nothing of interest was discovered except the interment of a horse.

The composition of the interior was of mixed earth and clay, and was thickly interspersed with carbonized palm seeds and decorated potsherds, together with small quantities of chert or flint. Near the

bottom a stratum of hard reddish material appeared. Under this was a stratum of dark soft earth mixed with charcoal, six to eight inches thick, probably the former humus level, and beneath this again was the natural clay thickly mixed with carbonized palm seeds.

Two exploratory trenches were driven approximately westward from the house-post area south of court B through the region of mound F toward feature G, one beginning at forty feet, the other at fifty-five feet south of the terminal south line of B. The upper earth stratum was from one to two feet in thickness, was dark with charcoal, and seemed to contain an unusual number of potsherds.

In each trench was found a deep filled shaft in the subsoil containing charcoal, potsherds, and stones. One extended to fifty-four inches, the other indefinitely below the subsoil surface. The latter, almost in the center of the former mound F, consisted of a blue-gray core eight inches in diameter. The color indicated a rotted post, but as no shaft surrounding it was found, it must have been forced into the ground, not buried in an excavated hole. The upper forty-six inches was a large depression full of carbonized palm seeds.

In this southernmost trench was also found the westernmost of the house-posts, no. 18; splinters and wood-fiber proved its nature.

The Feature G

Nearly due westward from the side of mound F to the southern end of court H ran an unusual structure G (PLATE 14, FIGURE 2). Since it was practically level, and as the western courts are at a somewhat lower level than the more central and eastern ones, the feature was, at its western end, made upon built ground from which a series of steps apparently descended to the courts below. For this reason it was impossible to clear this western end down to subsoil without disturbing the lines of stones. There was absolutely no evidence, however, of any superstructure upon this feature.

It is quite possible that the lines of stones connecting the two levels represent terraces rather than steps, and that feature G was rather a raised coign of vantage from which the activities in the courts below could be observed and contests judged.

Roughly described, this raised level plane measured twenty-seven feet in width at its western end, and some sixty-two feet in length, east to west, the eastern line being at the base of the mound F, the western line at twelve feet east of the eastern side line of court H. A drainage ditch was located at either side, sixteen or seventeen feet long, diverging as they extended westward and standing thirty-six

feet apart at about half distance. The principal features, however, were two long parallel lines of stones which extended the length of the structure, set on their edges in the made ground. They averaged eleven feet apart and met the western terminal line at a right angle but ended about six feet from the eastern line. At the western end, midway between and parallel to these two lines, was a pavement of flat stones extending from the western line about twenty feet eastward; these rest as caps on upright stones (FIGURE 7).

Near the southwestern corner of the structure, projecting into the court below and approximately on the line of extension of the east wall of the northwest court H, some twelve feet beyond the western line of slabs of G, which marks the crest of the upper level, a mound extended into the lower level at approximately the level of structure G itself. This was not excavated but gave every evidence of being artificial. The earth was hard packed and brown, like that in the larger mound F at the east end of the structure.

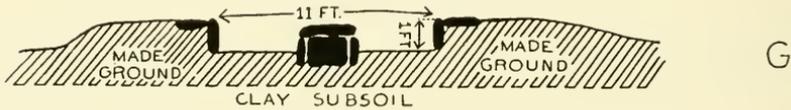


FIGURE 4. Section of feature G. Not to scale.

The northern side of the entire structure is approximately at the level of the surrounding ground but at the southeast corner it was evidently excavated somewhat, since the ground outside is at a level twenty to thirty inches higher. Many carbonized palm seeds were found in the strata at the eastern end.

The details of the eastern or uppermost part were much obscured and destroyed. It is quite probable that there were originally three stairs or terraces with facings and cap-stones, and three levels of slight width at the base of the large mound F. There are many flat stones in the neighborhood, but the total rise seems to have been not over one foot. The upright stones forming the facings of these stairs were plainly visible in two lines with traces of a third. The middle line was the best preserved, consisting of a line of small uniformly sized boulders set on edge at right-angles to the side lines. The upper line was suggested by a number of flat stones, and a few set on edge, on a higher level. The lower line was very uncertain with two stones in a line, lying on their sides. These lines are slightly convex toward the west.

The middle line seemed to be over twenty feet in length, about double the distance between the two long east-west lines of stones and overlapping them on both ends. At present the northern line ends at six feet from the middle eastern line, and the southern line, apparently much torn out, fails to reach it by twenty-three feet. Possibly both lines originally ended at about six feet from the main eastern line; the easternmost stone at present is a little larger than the others and turns slightly outwards. There may, however, have been outer east-west lines. A line of six stones runs westward for eight feet from the southern end of the main east line, and there may have been a similar feature at the north end, for there are many loose stones in this region. Unfortunately this area was covered over with ejecta from the excavation of the large mound early in the progress of the work, and not subsequently cleared.

Judging from a very few stones still in position, both of these east-west lines originally consisted of a line of uprights with capstones laid flat upon them on the outside. The space between these two lines was originally at a level several inches below the outer soil, a construction common to many of the courts.

The pavement in the middle was certainly made in this same technique, of two parallel lines of stones set on their edges with capstones connecting them. This walk, about fifteen feet in length, ran clear to the west limit of the structure, meeting the upper west line, while the side lines end some five feet east of this point. The southern line has a terminal stone set at right angles at its western end, and possibly there was originally a similar one at the end of the northern line.

Over the greater part of the structure, the upper stratum of earth was thin and dark, the next stratum being of a brown color and containing more or less charcoal.

The details of the western end of the structure are difficult to determine since the stones, being on the crest and slopes, have been largely disrupted and destroyed. There were at least two and possibly three steps or terraces leading down to the lower level (PLATE 14, FIGURE 3). These are of considerable width and height and probably were terraces rather than stairs. True steps may have descended from the central pavement. The height from the level of the lower courts to that of structure G is approximately four feet, thirty inches of this being the height to the lower line of stones.

The uppermost western line, at the crest, is represented by five or six small river stones of uniform size, probably originally set on edge but now fallen. The caps, if they ever existed, have disappeared.

The second line, about half way between the two levels, is composed of seven or eight limestone slabs set on edge. They appear to stand too high to have ever been the faces of steps with capstones. These are arranged in a slight arc, convex toward the lower courts. Between the northernmost pair of slabs is a terminal mass of limestone, something like those which limited the northern ends of the side lines of court B, but no corresponding mass is noticed to the south. There is a break in the middle of this line where the medial pavement meets it at right angles. Above the base of these slabs, but below the level of their tops, is a line of small flat stones, probably to brace them, less likely the caps of the stairs. Below to the west are a number of flat stones, possibly the caps of the next lower stair or terrace but without any uprights.

An excavation made near the crest at the western end showed two feet of dark soil and eighteen inches of red-brown clay with charcoal mixture, with undisturbed red clay subsoil beneath this; another revealed one foot of dark humus. A fragment of a stone collar was found hereabouts at a depth of four to six inches.

The Long Court H

Court H lying to the far northwestern limit of the site was the only other portion completely excavated and was, in point of time, the first structure worked upon.

This feature is merely an open court or "juego de bola" like many others on this and similar sites, of rather larger size and more careful construction than the majority but with no peculiar characteristics. The sole architectural features were the two parallel side lines of stones, approximately one hundred and thirty feet in length and twenty-four feet apart, enclosing between them a level court (PLATE 15, FIGURE 1). As the location was near the edge of the flat area and the bank of the river, the gradient is more pronounced than on the upper stretches, and more grading had to be done by the makers of the site. The western line was at practically present normal ground level and the stones composing it had been liable to disruption throughout many centuries, resulting in partial destruction. Most of the uprights are still in position, but the capstones which evidently rested on them, as in the eastern line and on other lines on the site, were disrupted, except in a few instances, leaving the surrounding soil full of these uniformly shaped river stones. During the work of the excavation these were taken up and piled against the line as seen in the photograph (PLATE 15, FIGURE 2).

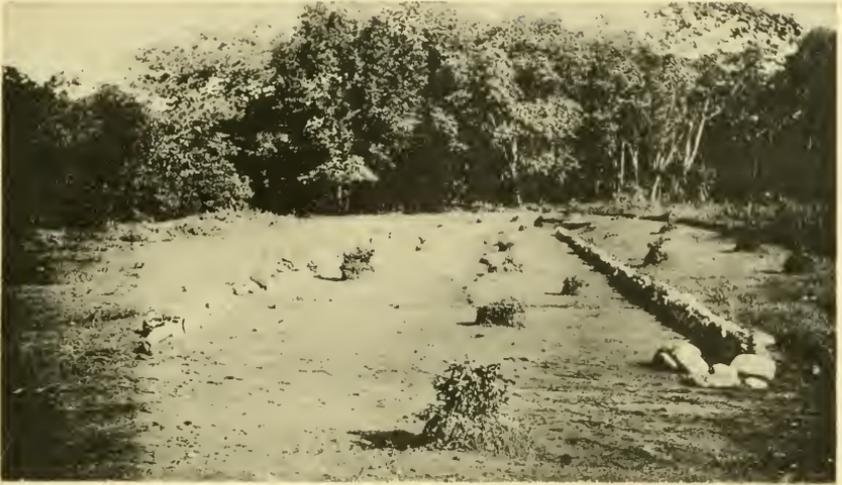


FIGURE 1. Court H, after excavation. From the south. Photo No. 109.



FIGURE 2. Court H, after excavation. From the southwest. Photo No. 82.

MASON: ARCHAEOLOGICAL SITES

In making the court, some eighteen inches or two feet of soil seem to have been removed, leaving a terrace of some three feet height rising just east of the eastern line. Naturally, after the abandonment of the site, the erosion from this terrace covered the eastern side line, obscuring it from sight but keeping it in perfect preservation. Rising above the general height to the level of the soil, a few stones showed its situation, and excavation revealed a perfect line of lozenge-shaped river stones set on their edges, each capped with a similar stone laid flat with its western edge on the upright; from their eastern edges the ground rose rapidly to the crest at the original height of the soil. A few of the uprights of the eastern line are limestone slabs, though by far the greater number are river stones. As in many similar cases, the northern end of the eastern line was terminated by a larger-sized stone of irregular contour. The western line came to an end four feet short of this point, the terminal stones probably having been torn out.

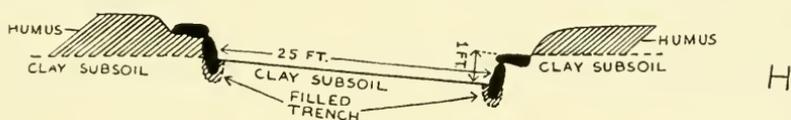


FIGURE 5. Section of court H. Not to scale.

Over the greater part of the court, the surface soil contained no charcoal and few postherds or small stones except just above the level of the clay subsoil, thus indicating that the uppermost stratum was the accumulation of years of abandonment.

In the northern part of the court the upper stratum was of dark soil to a depth of ten to fifteen inches,—it was deeper and darker on the eastern side, browner and shallower to the west. The division between the accumulated earth and the clay subsoil marking the former level of the court was very marked and noticeable. This clay subsoil was very red in the northern part.

In the southern part the dark humus was twelve to fifteen inches deep with few potsherds or stones. But considerable quantities of charcoal were noticed just above the clay subsoil and the line of demarcation between the two strata was very marked. These phenomena prove that the court was excavated into the clay, and this is further indicated by the fact that in the surrounding untouched regions the clay level is higher than within the court (FIGURE 5). In this region the subsoil was overlaid with a sandy stratum much mixed with palm seed nodules which gave very much the appearance of an artificial paving laid to fill in a low depression.

In the south central part of the court the "fruitcake" stratum of palm seed extended to a depth of one foot. This stratum was found only in the southern eighteen feet of the court; some large pieces of charcoal and potsherds were found on its surface indicating that it was the original level of the court. The upright stones of the eastern line are not imbedded in this carboniferous clay, but rest just at its surface.

In a quadrangular dark space within the confines of the court just below the level of the clay a coarse pottery vessel was found, unbroken and full of mud. This space was close to the eastern line just north of the limit of the carboniferous clay.

In the north-central part of the court, the earth is darker and deeper to the east, a lighter brown to the west. This is probably because of the erosion from the terrace above the court on the east side. The division line of the earth and clay was marked on the east but difficult to distinguish on the west. Large pieces of charcoal were also more frequent on the eastern side.

As in the large oblong court B and other courts on the site, the level area was not confined within the side lines but continued beyond at either end in a widened arc, making a dumb-bell-shaped area.

At the north end the level space continued, forming a level quasi-circular area some twenty-two feet long by thirty wide. To the west the limit was hardly noticeable since the level of the court was only slightly lower than that of the surrounding natural earth. On the east the circle encroached somewhat on the terrace which here reached its highest point. This naturally caused the ascent to the crest of the terrace to be more abrupt than usual.

The edge of the northern circle was marked by a very slight ridge of earth like that found at the southern end of the large court B. This ridge was of slight height, however, probably not over six inches, and hardly noticeable. North of it, and slightly to the west, an interesting place was excavated which probably represented an aboriginal fireplace and may possibly have been the site of a small house. At the south the floor sank to a depth of one foot, to the west to an equal depth, to the east a sudden fall of thirty inches and to the north a steep fall of two feet. This depression was nearly completely filled to the surrounding level; its floor seemed to be about on the same level as the court. A much greater number of small stones, potsherds, and charcoal than usual was found in the fill at all levels, together with a quantity of congealed ash. All the evidence indicated that here was a fireplace which rose in height with the accumulation of ash and fire-stones.

This depression measured fifteen feet in length north and south by twelve feet in width from east to west. The center was some six feet west of the central axis of the court and thirty feet north of the last stone of the western line of the court. The material filling the depression was of a dull lead color and of a clayish consistency, evidently an accumulation of ash. One spot of a greenish color and another of a manganese color were found. Small stones were found throughout at various levels, but ten larger stones were also found, most of these at approximately the same level, about eight to ten inches above the clay floor; these probably represented the stones used for the support of cooking pots over the fire.

A number of circular "cores," twelve or thirteen in number, were found but no definite arrangement was noticed. They were observed as circular discolorations about four to six inches in diameter continuing down into the red clay. They were of brownish, maroon, or violet tints, but were quite different from the house-posts discovered on the other parts of the site and were not surrounded by shafts. These cores seem to gather into two groups,—inner and outer. Four near the center of the fireplace were nearly equidistant and in a square, five to six inches apart. The others were less regular in position and outside of these. They probably represent small stakes driven into the earth. (The absence of data in the 1915 field notes indicates that these were not excavated and depths not ascertained.)

Between the fireplace and the northern end of the court the soil was very much like that to the west of the court, the dark brown earth overlying the red clay to a depth of from two to eight inches. It contained little charcoal and few potsherds but a number of small stones.

At the southern end of the western line an irregular line of stones branched off at an angle of possibly thirty degrees towards the southwest, but as none of them was set in the earth this arrangement may have been accidental. To the east no such stones were found, but the rise of the terrace, which begins close behind the stone line, bends eastward a few feet as in the case of the terrace above the court B, then swings around to form a low ridge marking the southern end of the circle, just as at the northern end and as in the case of the area south of court B. It is not complete, however, as a slight drainage depression runs down from the higher land at this point and cuts through this ridge, leaving a slowly descending level from the court towards the southwest. The ridge, at its southernmost point, was approximately twenty-four feet from the end of the stone lines, the space thus delineated being of slightly greater width than the width of the court,

its length a little less than this. The maximum height of the ridge at the southernmost part is eighteen inches to two feet, from which point it descends rapidly to the level of the court.

This circular extension, together with the southern end of the court and part of the surrounding region, is covered with an upper stratum which is composed very largely of the little spherical concentric nodules which give the appearance of charcoal. They vary from very minute to five-eighths of an inch in diameter and are probably the seeds of the cojollo palm.

It is to be observed that in almost every detail the southern circular extension displays symmetrical resemblances to the northern circular space. Thus it was circumscribed by a low ridge of earth which became practically non-existent on the western side, affording ingress and egress, and which as we shall see later, rose to a mound on the eastern side. A fireplace corresponding to that at the north might therefore be expected at the south, and there are some evidences that such was the case.

Some forty feet south of the end of the eastern line the level of the clay dipped abruptly down, causing a depression full of very dark earth, ash, many small stones, and potsherds. A fair quantity of large stones was also found. The earth was of a grayish color and clammy consistency, giving the same appearance as in the fireplace to the north; the position was also corresponding. This was not entirely excavated. It is to be noted that this location is about half way between the two courts H and I to north and south, and nearly opposite the raised structure G on the terrace to the east.

The area surrounding this court was also excavated to subsoil level and examined. West of the court the earth was cleared almost to the edge of the ravine, and to the north beyond the fireplace it was cleared to the edge of the woods nearly one hundred feet beyond the northern end of the court side lines. To the east the slope of the terrace was excavated to the crest.

The large region surrounding the court to north and west to the edge of the flat area was the first part of the site to be cleared and excavated, and consequently more time and attention were given to this than results justified. Practically the sole items of interest uncovered were many rectangular excavations at approximately regular intervals though without regular arrangement which extended for a few inches depth into the subsoil through the upper stratum of humus. These averaged possibly eighteen by twelve inches and six inches depth and had sloping sides with concave bottoms. They invariably were filled

with dark humus and frequently contained large quantities of charcoal. For a long time they gave considerable concern, as the workmen denied all knowledge of them, but they were finally agreed to be more or less modern excavations made for the planting of coffee or banana plants.

On the high ground near the edge of the woods to the north the surface soil was of slight depth, two to six inches, with red clay beneath. Potsherds were few. All this region evidently stood at its natural level, unchanged by any grading.

Evidently the space between the western line of stones and the edge of the ravine was also unchanged and at natural level. The surface soil was of slight depth, four to six inches, with few potsherds, small stones, and little charcoal, but many scattered large stones evidently disrupted from the western line. The few potsherds found in this region were coarse and undecorated, or slightly decorated and much weathered, while the majority of those from the more important parts of the site were well decorated. Potsherds and charcoal increased in amount towards the southern end of this space.

At the southern end of the western line a slight mound of earth about sixteen inches in height was observed just on the outer side of the line. The spur of stones at the end of the wall seemed to mark the base of this mound. Beneath its surface lay a stratum of brownish nature, evidently a mixture of clay and earth containing occasional potsherds. It is probable that this mound consisted of the material excavated from the court during its construction in aboriginal times. In the surrounding region were few potsherds and little charcoal, but a fair number of small stones. South of the mound the palm-seed stratum began.

From the east line of stones the ground rose rapidly for some eighteen inches to the normal level of the earth which was reached some three feet to the east. This terrace was cleared down to the level of the subsoil as far as the crest of the rise; the stratum of soil over the slope was slight. Practically the only point of interest found along this stretch was at about the central point, and at four feet from the line. A quadrilateral core about fifteen inches in diameter was noted with a stone projecting above the surface. Seven large heavy stones and one limestone slab completely filled the upper part of this core to about two feet depth. Below this the shaft of dark earth, gradually diminishing in diameter, continued to a depth of four feet below clay level. It was evident that a hole had been made here which was subsequently filled up with earth and stones but the purpose and use is problematical.

North of the northern end of the eastern side line, where the circular extension begins, the terrace to the east naturally recedes eastward and becomes more abrupt. This rapid rise is about twenty inches to two feet in height. It then swings to the northwest towards the fireplace. At a point some twenty feet north of the northern end of the eastern line a mound was found extending from the terrace out into the court towards the ridge separating the court from the fireplace. Here a stratum of reddish clay was found on the surface above dark earth, some two feet in height. The stratification seemed to indicate that the site had been excavated almost to the level of the court and the earth piled to form this mound. To the west, the clay seemed to continue at its normal level as far as the fireplace.

A corresponding arrangement was noted at the southern end of the court beyond the end of the eastern side line. Here also the eastern edge of the circular level extension bends eastward for a foot or so before swinging around in the little ridge before mentioned. South of this ridge, practically in a line with the projection of the eastern line, twenty-eight feet beyond its southern end and therefore in a position corresponding with the mound in the northern part of the court, a similar mound was found. The brown soil on the surface was very shallow, about six inches, and the line of distinction from the material beneath was difficult to ascertain. To the west, the grade was gentle to the level surface of the court, a drop of two to three feet. The slope was equally gentle northward, but a little more abrupt north-westward. Towards structure G on higher ground to the east there was a very slight drop and then a rise to its level. In the surface soil of this mound small stones and potsherds were unusually thick, charcoal scarce. A small stone figure and a celt, both much eroded, were uncovered here.

This southern mound was located nearly midway between the two courts H and I to north and south, and nearly in front of the structure G to the east and at a higher level; it was actually closer to the northern end of the southern court only ten feet distant. It must, therefore, have been a position of considerable importance.

Beneath the slight depth of surface soil, there was a thin stratum of red clay, then ten to fifteen inches of heavy brownish, clayish soil, evidently a mixture of clay and humus, containing small quantities of potsherds, small stones, and charcoal. This establishes beyond doubt the fact that the mound was of artificial construction. The actual subsoil here is full of the before-mentioned charcoal nodules. The material of which the mound is composed shades into this without a definite line of demarcation.

The entire complex of the court is thus seen to be much like court B, *viz.*, a levelled space between two lines of stone. Like court B, this space was always an open court without any structures within it, and probably was used as a dance or game court, possibly, as commonly believed, a "juego de bola," a place where the ceremonial ball-games were performed. This court was extended like a dumb-bell at either end, and there was no terminal stone boundary line at either end as found in the case of court B. The terminal extensions were probably used as parts of the court, not as house-sites as was the southern extension of the large court B. A mound was found in corresponding position beyond either end of the court, and also possibly a fireplace. There may also have been an entrance at either end from the flat ground between the court and the ravine at southwest and northwest.

Features I to N

This completes the description of the features of the site which were excavated. The remaining ones, some of them probably of considerable importance, were not investigated for lack of time. It was possible only to clear, measure, and describe them.

South of court H is another similar and perhaps complimentary court, I. Its axis is nearly parallel to that of court H, but tends a few degrees more northeastward. It is also of greater width and less length, measuring roughly one hundred and ten by thirty-eight feet. The two courts lie at approximately the same level and the projection of the eastern line of the northern court strikes about the center of the southern one, their ends being about fifty feet apart. Both of the side lines of this court were much disrupted, the southernmost thirty feet of the eastern line being entirely gone. But from all appearances the plan was identical with that of the northern court, the gently sloping gradient having been levelled by cutting on the east side, and side walls with uprights and caps erected. No terminal boundary lines were evident.

East of the long court B and on the high ground back of the crest of the terrace, at present in the woods close to and paralleling the edge of the ravine, lies the court J. This was a smaller court some eighty by twenty-five feet. Probably the space was very level originally and little excavation was required, but it appears to have been slightly excavated on the western side and the southern end. It is a typical court, without limiting end boundaries to north or south, but with two parallel side lines of upright stones without cappings and with occasional slabs of limestone, the stones being much disrupted. The general direction follows that of the large court B below it.

On the high ground southeast of the great plaza A lies another smaller court K. This was well preserved as it had been dug more deeply and later the stones had been covered with eroded earth. It measures roughly eighty-five by forty feet. The direction of its axis is the most unusual of any on the site, approximately northwest. As usual there were no limiting lines of stone at the two ends but the two side lines were well preserved with their uprights and caps, particularly the northern line, making a sort of long bench along the sides above which the outer earth rose to a height of about three feet. The southeastern end ran nearly to the edge of the southern ravine. The level of the floor was about three feet higher than that of the great plaza A. Possibly this court originally continued thirty feet further to the edge of the ravine as there are other stones on this edge. From here there is a gradual and easy slope to the bottom of the ravine which has somewhat the appearance of having been modified artificially. A large stone marking the western end of the northern line has a well-carved pictograph on it. Possibly there was originally some architectural connection with the great plaza A, as there are scattered stones all between.

Fifty feet northeast of court K is another nearly parallel line of similar stones about seventy-five feet long which would seem to be the western side line of another court L. The level interior of an oblong court is plainly evident at a level three feet higher than that of K, but the other side line is not visible above the level of the soil nor did it appear on superficial search. The stones of the solitary line were much disrupted. The excavation had been slight to the south, greater to the north. It also extends close to the edge of the ravine and there are more stones in place in the woods.

In the far southern end of the site, close to the edge of the southern ravine, is a feature of considerable individuality, structure M. This consists of two parallel lines of stones some eighty-five feet in length but only about eight feet apart. Moreover, they are connected by loops at the ends so that they form a continuous line. These are not upright, but flat stones, evidently forming a pavement for some purpose. The axis is roughly east and west, and from the western end two lines of stones break off in arcs very much as seen in the southeastern corner of court B and the northeastern corner of plaza A. The lines are approximately parallel to the pavements of the plaza and much resemble them. Little or no levelling seems to have been done in the manufacture of this site, possibly a little excavation to the east and filling to the west. From here the descent to the stream at

the bottom of the ravine is very gentle, and half way down a small leveled space was noticed.

Southwest of the great plaza and near the edge of the western ravine, the river proper, a great mass of scattered stones was found, marked as N. This was claimed by the workmen to have been the site of an old Spanish house which was built of stones from the site. Probably many stones were taken from lines and walls for this purpose. West of it is a short line of stones still *in situ* but having no relation to any other line.

The remainder of the surface of the site was unaltered and left at natural level. Time and funds did not permit any of it to be cleared or investigated. It is quite probable, nevertheless, that these are the very places which would have been utilized for the erection of wooden temples and houses, adjoining, yet not conflicting with, the ball and dance grounds.

Summary and Deductions

The archaeological site of Capá consists of twelve main features:

- 6 long courts with parallel side lines of stones, and open ends (E, H, I, J, K, L)
- 1 large long court with parallel side lines of slabs, and closed ends (B)
- 1 long narrow structure of parallel lines of stones (M)
- 1 large rectangular plaza bounded by a line of slabs, a line of large boulders, and two double lines of stones (A)
- 1 oval or horseshoe-shaped enclosure, bounded by a ring of stones (C)
- 1 smaller structure of parallel and transverse lines of stones (G)
- 1 large (F) and several smaller mounds of earth.

Important also are two areas (D) without individual boundaries on which the posts of houses were found. True masonry is missing.

Probably the entire site was the ceremonial center for a large village or populated area, and the ten stone-bounded enclosures were used for the performances of ceremonial dances, games, and other rites.

This large number of features, as well as the unusual size and quality of workmanship of the individual structures, makes this site by far the largest and most important one so far known in Porto Rico. Archaeological sites with boundaries of lines of stones are common on the island, but in almost every other known case they consist merely of one oblong court like the six on the Capá site. Stone structures of

the other five types found at Capá are not known, or well-known, elsewhere.

These common courts, oblong level spaces between two parallel lines of stones or slabs and with open ends, found frequently throughout the island, are known as ball-courts or "juegos de bola." It is likely that this name is traditional, dating from the time of the Spanish Conquest, and with an historical basis.

Oviedo (1851) describes the native ball-game as played on the island of Santo Domingo, but later, treating of Porto Rico, says that, in regard to ball-games and certain other features, the inhabitants of all the islands were very similar. A digest of his remarks follows:

In every open space (plaza) in a village there was a place specifically for the ball-game or batey. Also at the entrance to the village was a ball-court with seats for spectators, larger than those of the village plazas. (In two different chapters Oviedo distinguishes between the ball-courts in the village plazas and those where the roads left the villages.) Around the ball-courts were stone seats, but the chiefs and important men used their portable wooden seats or duhos.

Since Oviedo nowhere mentions the striking and uniform feature of the stone side walls of the courts but does mention the surrounding stone seats it is quite likely that the side walls were used as long benches for spectators. The side walls of the six typical courts at Capá may well have served as such long benches, as well as boundaries.

Oviedo's description of the ball, heavy, solid, black, lively, as large as a European inflated ball, leaves no doubt that it was made of some sort of rubber although, according to Fewkes, Dr. Stahl claims that there is no natural vegetable product in Porto Rico that could have produced an elastic gum. Oviedo says that it was composed of tree roots, plants, and juices, cooked to a spongy paste and molded to form. The players hit the ball with shoulder, elbow, head, knee, and especially with the hip, probably much as in a modern game of soccer. Apparently there were no goals, but the two sides batted the ball to and fro, it being considered in play until it was either knocked out of bounds, or ceased to bounce and rolled or came to a stop. The side not at fault then counted one point and the game continued for the number of points agreed upon in advance. The play began by one side throwing the ball into the air. The number of players on a side varied as did the status and sex of the players, men, women, sides of mixed sex, and even married women against unmarried ones.

Although extra-Antillean connections are beyond our present subject, the resemblance between this description and that given by

the Spanish Conquerors on the mainland is so close as to be worthy of note. The Mayas and Aztecs played a very similar game in special courts with a rubber ball which might not be thrown or kicked. Except that the courts were better built of masonry and that, at least in later years, a goal of ring-form was used, the resemblance is very close. It is likely that both games had a common root in South America, not that there was direct influence via Cuba and Yucatan.

The foregoing description of Oviedo seems to make it indubitable that the Indians of Porto Rico played a game with an elastic ball in special courts, and it is quite probable that the many oblong courts with stone-lined sides and open ends still found on the island and known as "ball games" (*juegos de bola*) were those used for the ceremonial games. The large stone balls, sometimes a foot or more in diameter, frequently found in the neighborhood of them and locally presumed to have been the balls employed, of course could not have been those actually used. Probably all other ceremonies and religious dances, areito, were performed on these courts in addition to the ball-games, *batey*.

Six of the structures at the Capá site, E, H, I, J, K, L, are of the usual type of ball-court, with open ends, and presumably were used primarily for this purpose. Most of these, however, are larger and better made than the average court on the island. Size and proportion between length and width vary considerably. Some if not all were lined and bounded by upright stones and capstones which may have served as the seats mentioned by Oviedo. Those that were carefully excavated suggested that the playing field extended beyond the ends of the side walls. The structure G may well have served as a grandstand for the prominent men, from which they observed the games on the courts H and I.

The large oblong court B was probably also a ball-court of exceptional quality, much larger and better made than the average and the others on this site, with vertical slabs on the sides in place of low stone benches, and with the terminal apron extension of the playing court, at least at the north side, bounded by a stone circle.

The great quadrangular plaza A and the small oval or horseshoe-shaped area C are unique features, probably found only on large important ceremonial centers such as this. Both were probably employed for special ceremonies and dances other than ball games.

A careful study of the original sources from the time of the Spanish Conquest might reveal some more or less definite reference to the Capá site that would permit its identification. The present condition,

the state of preservation of the house-posts, as well as the nature of the potsherds and other artifacts (see Appendix) indicate that it cannot be of great age and presumably was of immediate pre-Conquest period; it may have been destroyed by the Spaniards about the beginning of the sixteenth century. As it seems to be the largest known site of its kind on the island it must have been the seat of an important group and cacique.

Fewkes states (1907: 39):

"The caciquedom of Guarionex lay in the mountains east of those of Aymamon and Urayoan, and west of the site of the present town of Utuado, which was in his domain. Little seems to be recorded of this cacique except that he was of Carib extraction and that he marshaled 3,000 warriors and destroyed the pueblo of Sotomayor. The mountains west of Utuado are named Guarionex mountains on the older maps, probably from the former cacique of this region. The province over which he ruled was apparently known as Utuao, a name which survives in that of the present settlement Utuado."

The Capá site fits this location perfectly, and it is a reasonable deduction that it was the ceremonial center of the people led by the chief Guarionex.

ARCHAEOLOGICAL OBSERVATIONS IN OTHER PORTO RICO SITES VISITED IN 1914-1915

Region of Utuado

The region of Utuado seems to have been the center of a large aboriginal population, for native artifacts and places showing evidence of native occupancy are frequently encountered in this district. As the former have been treated at length, mainly by Fewkes (1907, 1922), they need not be considered further.

The archaeological sites are of two classes, natural and artificial. The former class is represented by caves, the latter principally by the structures locally known as "juegos de bola." The former abound in the coastal limestone region to the north of Utuado, while the latter are found principally in the central cordillera of igneous material to the south.

Many or most of the caves of this region were used at some time either as places of burial or of habitation, but this is seldom apparent until excavations have revealed skeletal remains or, less frequently, artifacts. In most cases these are found when caves are investigated.

Quite a number of caves in the limestone region between Utuado and Arecibo was inspected. Some of these are of great length, others

merely rock-shelters. The majority are uninhabitable except near the mouth on account of percolating water, but a few are perfectly dry and form ideal places of refuge or habitation for primitive people. Unfortunately for archaeology, so intensive is the present state of agriculture on the island that the majority of these caves have been exploited in search of bat guano for fertilizer, the skeletal remains destroyed and the few artifacts found dispersed.

The only cave that we excavated intensively has been described in a report by Dr. Robert T. Aitken (1917, 1918), but the few notes taken on short visits to other caves may tend to confirm the results of that work.

At the entrance to the "Cueva de los Muertos," an hour and a half by horseback northwest of Capá (Coll y Toste 1907: 38), the cliff is high and overhanging, forming a dry shelter fifty by one hundred and fifty feet. cursory excavations in this shelter revealed an upper stratum of fine white ash of about a foot in depth in which human bones were frequently encountered. Beneath this another stratum of darker material containing much charcoal, of about the same thickness, rested on the undisturbed gravel. Most of the human bones were broken and scattered, but one complete interment of a child in natal position was uncovered, on its side with the face turned slightly upward, facing south or southeast. Many shells of snails and crayfish, some river pebbles, pieces of flint, and a piece of conch shell were encountered.

The "Cerro Hueco" in Cayuco, Caguana, is a large tunnel-like cave with two entrances, much like Cueva Antonio. Near the mouth the ash and guano is deep, shells of snails and crayfish thick, and many human bones have been found there. There are doubtless many interments both within and at the mouth of the cave.

In the barrio of Angeles, on the lands of Sr. Lecaros y Villamil, are several large caves, the "Cueva Clara" and the "Cueva Oscura." Artifacts are claimed to have been found in both of these, among them a celt and a spindle-whorl (?). In the valley below the caves are many limestone slabs and evidences of grading, but time did not permit a thorough survey.

A short distance from the above-mentioned caves on the lands of Luisa Soler, is one of the most interesting caves in the region. The entrance is small but the cavé large and very dry with deep guano. The entrance is of very white limestone with stalactites and covered with pictographs not incised or pecked, but painted in a black pigment (one in brown). Their remarkable freshness at first glance suggested

modern schoolboy handicraft and it was only by a study of the pictorial elements themselves that the conviction of aboriginality was established. For the symbols are not modern and are typical of Caribbean archaeology. They give the impression of having been done in crayon, as the coloring was applied dry, but will not rub or smear. Some few are nearly effaced but the great majority are absolutely clear. They continue for a long distance within the dark cave. Unfortunately time permitted of only casual sketches of a few of the pictographs, but a complete study of these as well as excavation of the cave should yield important results.*

The inferences to be drawn from the investigation of the Utuado caves must be founded on the following data. Human skeletal remains are very frequent, generally in scattered condition, less frequently intact; charcoal, bones of animals, and shells of snails and crayfish are generally present,—artifacts and potsherds are very few. The former would indicate that caves were regularly used as places of burial, the latter that they were not customarily used as places of habitation. But the presence of charcoal and food-refuse suggests that they were occupied as places of refuge when the natives were forced from their homes by tempestuous climatic conditions or warlike attack.

The paucity of artifacts naturally precluded the possibility of a stratigraphical study for the purpose of establishing any chronological sequence of cultures.

The small, flat enclosed courts known as "juegos de bola" are, or were, found in great numbers around Utuado, principally in the region to the south where the country is less craggy and precipitous, being of igneous formation, than nearer the coast. In the last few years the great increase in the area of cultivated land has resulted in the destruction and ploughing-up of many of these sites. Most of these in the immediate neighborhood of Utuado have gone as well as many of the more distant ones. On many level places throughout this region these courts are met but attract slight attention unless actively sought. An unusually good specimen lies at the base of the cave excavated (Aitken 1917, 1918), and another was excavated by Dr. Haeberlin (1917).

Close to the village of Las Pastales is a "juego" of a little more than usual size. It is in a flat meadow now under cultivation and much has

* A fuller report on this cave, entitled "Painted Cave Petroglyphs in Puerto Rico" was read at the 27th International Congress of Americanists in Lima, Peru, 1939, and presumably will be published in the Proceedings.

been destroyed. The principal feature is a line of limestone slabs set on end which forms one side of the court. There are about sixteen of these,—the largest, three feet square, running east and about a foot high. As usual, the court is not bounded on the ends. Judging from usual proportions, the lines must have been originally over a hundred feet in length. Through the meadow run other lines of smaller stones, without obvious plan and now nearly obliterated. Nearby is a low mound consisting of earth, two kinds of snail shells, potsherds, pieces of flint, etc. On excavation it was found to be about a foot in depth and full of charcoal, probably a refuse heap. Nearby was a heap of stones, some placed in the ground on edge and much baked by fire, probably the fireplace. Probably this place was like the site at Capá but on a smaller scale, and it is said to have been large and important once.

Near the house of Genaro Pagán, Bayané, Hatillo, is a large site, covered with many lines of stones, many of which have been partially destroyed. The principal plaza seems to be of the usual oblong shape, but there are other structures whose characters were not determined. A "three-pointed" stone was recently found on this site. Nearby are some very large caves in which a stone collar was said to have been found (Coll y Toste 1907: 33), but investigation showed no signs of occupancy. A large human skeleton was exhumed from a rock-shelter close by.

A well-preserved juego is found close to the north of the village of Las Pastales in a coffee patch by a brook. The two side lines of stones are sixty-three feet in length, which seems to be about the normal size of a juego. The space was levelled by cutting on the high side and filling on the brook side. The direction of the axis is probably east and west. The stone boundary to the north or brook side is composed of slabs of limestone averaging eighteen inches across, the largest being two feet six inches by three feet. On the outer side they are braced by river stones. At each end of the line is a large boulder placed on end, about four feet in height by thirty inches in section. The court measures roughly thirty-five feet in width. The southern inner boundary partakes more of the nature of a retaining wall, the stones more round and in cases piled one upon another. There are no terminal boulders. As usual there are no boundaries to the court on the short sides and no mounds or other structures are evident. But beyond the terminal boulder of the northern boundary line, a line of flat stones, like a pavement, bends in at an angle of thirty degrees and follows the edge of the ravine for fourteen feet.

At Santa Isabel on the Tanamá River in the barrio of Angeles, a juego of unusual type was noticed. The main court is roughly oblong, one hundred and fifteen feet on one side by ninety on the other, and fifty-four feet wide. The court runs roughly north and south along the river. The eastern boundary wall is double or triple and filled with earth, thus forming a ridge about ten feet in width. A low line of stones bounds the court on the short southern side, an exceptional condition; there may have been a similar boundary at the north, now destroyed. On the west side, away from the river, the ground being a little higher, the court is bounded by a low retaining wall twelve to fifteen inches in height, above which is a level terrace extending back some seventy feet to a mound of stones fifteen feet in diameter and two feet in height. This terrace is apparently unbounded on the sides, being roughly triangular in the mouth of a small ravine.

The most undisturbed site was found at El Cordón, barrio of Caguana. Here a flat space has been made by the side of a ravine, running generally north and south. On three sides there is a descent, but on the east or high side a little cutting has been done to a depth of two feet. The two long boundary lines are sixty-three feet long and twenty feet apart, built of limestone slabs placed on end, the largest being eighteen by twenty-four inches. There is no boundary at the northern short end but a little beyond the lines of stones is a depression supposed to be an interment. A similar depression was found to the northwest outside of the court. This was excavated by the owner to a considerable depth but nothing found. At the southern end of the court is a natural large flat disk-shaped rock of limestone which probably served as a sort of altar, extending the entire width of the court. On the other three sides the descent is steep to a level six feet below. These slopes are composed of debris and refuse consisting of snail shells, charcoal, potsherds (most of them well decorated), and a few bones. In it originally was placed a circle of slabs on edge encircling the large rock, some of which still remain. The depth of the deposit is considerable.

As these ball-courts probably were made and occupied only by small groups during a short space of time one should not expect any stratigraphical data in them which might tend to elucidate any historical facts. Time did not permit of any extensive excavations being attempted on the sites observed.

Petroglyphs are by no means frequent in this region and are found only in groups in scattered localities. One large group occurs a little south of Utuado on large boulders in the river. These have already

been described and figured by Fewkes (1907: 150-154, pl. 60). The majority are so eroded by floods as to be practically effaced. They consist almost entirely of human or anthropomorphic faces pecked in the rock.

Village of Loíza

The little negro village of Loíza is situated on the flat coastal plain at the mouth of the river of that name. It offers little of value to the archaeologist. The main limestone hills are many miles back, but immediately behind the village are several of the last remaining hummocks of the Bayamón limestone. In one of these is a large cave in which aboriginal artifacts are said to have been found. On the floor is a large shellmound, probably artificial. Around the base of one of these limestone masses numerous native potsherds were found.

Region of Coamo

Several days were devoted to archaeological investigations in the region of Coamo, a town near the center of the island on the south side of the central mountains and near the inner limit of the coastal plain. In this region a large number of sites of aboriginal occupancy are found. North of the town, caves and terraced works are to be found while numerous shellmounds occur in the coastal plain to the south.

The shellmound mentioned by Fewkes on the ground of Sr. Vicente Usera (Fewkes 1907: 87) extends for quite a distance along the east bank of the Coamo River between the Baños de Coamo and the irrigation reservoir. Much of it has been carried away by the action of the river. As with the majority of Porto Rican shellmounds, the depth is very superficial, only twelve to eighteen inches. This stratum is composed largely of quantities of marine shells, principally of bivalve molluses, though large conchs and other univalve shells are frequently met. The most puzzling feature is the fact that considerable quantities of coral and other inedible marine food products are found, although the mound is probably five miles from the ocean and thirty feet or more above the level of the river. It is most surprising that the shells and inedible corals should have been brought so far inland. Various theories may be proposed to explain this; it is possible that these shallow inland mounds were accumulated in the later days when danger of Carib or Spanish attack did not permit a long sojourn on the coast. Certain of the mounds on the coast, as for instance those at Salinas, are reported to have been very thick. Mixed in with the shells are quantities of potsherds, most of them crude and undecorated.

A short distance down stream and on the opposite side of the river is a smaller mound similar in appearance where some oyster shells are found.

The largest shellmound in this region is on the land of Sr. Florencio Santiago about half way between Coamo and Juana Diaz and a short distance south of the Military Road. It likewise lies on the east bank of the river and on a plain about thirty feet above it. Here are found large quantities of shell similar to those of the other mound but with a much larger proportion of univalves. The stratum appears to be about the same depth, twelve to eighteen inches, and is probably less disturbed than the former.

Larger mounds are known to exist along the southern shore south of Coamo, particularly at Los Indios, near Santa Isabel and at Salinas.

Caves are comparatively frequent in the region north of Coamo, such as Santa Catalina, Pedro García, etc. Objects of native manufacture have been found in them and in some of them petroglyphs may be seen.

In the barrio of Coamo Arriba many native artifacts and evidences of a considerable aboriginal population are found. A terraced hillside which has every indication of native work may be seen there. The terraces are made with piles, mounds, and crude walls of stones.

The Southwestern Sector

The southwestern corner of the island, for which San Germán forms a convenient center, likewise seems to have supported a large native population. Numerous caves are found in the limestone formation and small shellheaps are frequent, often many miles from the ocean. Large mounds are met closer to the ocean. "Juegos de bola" are apparently unknown in this region.

The caves of Hoconuco Bajo, Rosario Peñón, Majina, and Rayo were visited without anything of interest being found, though natives assert that considerable numbers of artifacts have been removed from all of them.

In the cave of Monte Grande pictographs are seen on the walls, and a large quantity of shells with occasional potsherds on the floor. In the cave at Piñalejos evidences of Indian occupation in the form of shells and potsherds were abundant and many artifacts are reported to have been removed. In the caves at Lajas Arriba some pictographs are to be seen, and some very good stone artifacts and pottery vessels are known to have been taken from them.

The most interesting cave visited was at Cotui, southwest of San

Germán. The entrance is inconspicuous but the cave long. Beneath the entrance is a made plaza as for a juego but no stones are visible. A few potsherds were found near the entrance of the cave. About four hundred feet from the entrance the corridor opens into a chamber lighted by a dim light through a hole in the roof. Around the circumference of this chamber, quantities of large potsherds were encountered, together with shells and charcoal. Most of the potsherds are delicately made and well decorated. The shells are principally small bivalves, oyster, clam, and mussel. Small bones were also found. The depth of the deposit is very slight and it is probable that the cave was occupied only as a place of refuge from attack or storm.

Small shellmounds are frequently seen through the country, often five miles or more from the ocean. The deposits are a few inches in thickness and the shell very much pulverized. Potsherds are few. These probably represent family camps of short occupancy. Two large inland shellmounds were visited, one of them at Minillas Valle. Both are very large, covering considerably more than an acre, and the shell deposits thick. Great quantities of potsherds, many of them well decorated, handles of pots in the form of heads, broken celts, celts of shell, occasional beads, and other decorative objects are picked up. Both of the mounds are under annual cultivation for sugar cane and the ground has been so frequently ploughed that the best of the artifacts have been removed and all possibility of stratigraphical work probably precluded. The depth of the shell does not appear to be very great.

Shellmounds are frequent along the coast. At La Parguera there are several within a few miles, consisting principally of shallow deposits of conch and other univalve mollusc shells. Some amount of potsherds are found with them but the depth of the deposit is always slight.

Dr. N. C. Britton discovered a large mound on an island in the Bay of Montalva, not far from Guánica, and removed a large number of pottery heads, the handles to vessels. The island is about one hundred by thirty yards and is covered with a deposit of shell. Although very dense, it appears nowhere to exceed the usual depth of twelve to eighteen inches. Most of the shells are of large univalve molluscs, with smaller quantities of oyster, clam, mussel, and pecten shells. The potsherds found were very few and generally large and coarse, very different from the delicate ware found in the Cotui cave. They are undecorated and heavy, having handles formed by a wavy ridge made by finger impressions rather than the typical handle of an

animal or anthropomorphic head. Charcoal was rare. The difference between these coarse pots and the delicate pottery of the Cotui cave afforded the only case in which any cultural difference was observed.

APPENDIX

AN ANALYSIS OF THE ARTIFACTS OF THE 1914-1915 PORTO RICAN SURVEY

BY IRVING ROUSE

This appendix was first intended to deal only with the artifacts from Capá. As the work progressed, however, it became apparent that the Capá artifacts could be better understood if compared with the other artifacts collected by Dr. Mason and his associates during the 1914-1915 Porto Rican survey. The published reports on the other artifacts were not detailed enough for comparison; hence I have included in this appendix an analysis of all material obtained in quantity by members of the 1914-1915 field party headed by Dr. Franz Boas.*

The stray surface finds and unlabelled artifacts collected during the survey have not been studied.† Neither has attention been paid to the extensive series of soil samples and of mineral and organic specimens. The remaining seven hundred and sixty-nine artifacts have been segregated according to site and they will be so discussed below, the material from two caves being treated first and then the artifacts from three "juegos de bola" and one shell heap. The purposes of the following discussion are first to analyze and describe the artifacts from each site and second to determine the significance of the material relative to the archaeological work that has been done in Porto Rico since 1915.

DESCRIPTION OF ARTIFACTS

Cueva de Antonio

This cave, also called Cerro Hueco, is located in Barrio Caguana, municipality of Utuado. It was excavated by Drs. J. A. Mason and R. T. Aitken. Reports of the field work have been published by the latter (1917, 1918).

Sixteen of the artifacts in the collection are from the Cueva de Antonio; two are European remains, twelve are Indian potsherds, and

* This material is now in the American Museum of Natural History in New York City, where it is known as "the Boas Collection." I am indebted to the American Museum for providing facilities for study and also for the photography.

† For a description of most of these finds, see Haerberlin (1917).

two are flint chips. The two European specimens are a cylindrical glass bead and a sherd from the annular base of a pot; the latter shows evidence of having been made on a wheel.

The twelve Indian potsherds all appear to be of a single type, which may be called type A.* They are large, firm, and well made. They are brown in color both on the surfaces and in the fractures. The fractured surfaces are earthen. The fractures are fairly regular. The sherds vary in thickness from 0.6 centimeter to 1.0 centimeter, and in hardness from 2.5–3.0 to 4.0–4.5.† They seem to be made of fine clay with grit inclusions, and are sparsely tempered.‡

There is a trace of coiling on one sherd, and of scraping of the surface on another. All the sherds except one are well-smoothed, both inside and out, but not polished. There is no slip. Only one specimen has a firing cloud, and that is relatively faint. Two sherds are coated with soot which may indicate use for cooking.

Nine of the sherds are plain and give no indication of shape and decoration. The other three are rim sherds (FIGURE 6 a, b, and c). It may be suggested that all three sherds come from open bowls, a and b being from bowls with upcurving sides and c from a bowl whose side curves inwards. There is one flat rim top and two round rim tops. One of the latter sherds tapers towards the rim. The other two do not. The high point on one of the round rims is in the center of the sherd. The other is towards the outside.

* Aitken (1918: 304) says the sherds from the cave are of two types rather than one. He does not illustrate sherds of the two types, but does figure photomicrographs. The photomicrograph of the first type is catalogued as $\frac{25.0}{1406}$. That of the second type is catalogued as $\frac{25.0}{1425}$. According to the American Museum catalogue, only the former comes from the cave, the latter being from the ball court below the cave. This agrees with the situation at the Cueva de la Seiba, the other cave dug during the Porto Rican survey, where one type of pottery was found in the cave and another in the ball court at the base of the cave. It would seem reasonable to suppose, therefore, that Aitken made an error in assigning his second type to the cave, and should have assigned it to the ball court.

However, Aitken himself compares his two types with those at the Cueva de la Seiba and comes to the conclusion that his second type ($\frac{25.0}{1425}$) is similar to the material from the cave, and his first type ($\frac{25.0}{1406}$) is similar to the sherds from the ball court. This is the opposite of the conclusion reached in the preceding paragraph, that $\frac{25.0}{1406}$ came from the cave and $\frac{25.0}{1425}$ from the ball court.

Because of these inconsistencies, I have disregarded Aitken's statements and have based the present discussion upon the American Museum catalogue and my own observations. They lead to the conclusion that the pottery from the cave is $\frac{25.0}{1406}$ (plus $\frac{25.0}{1402}$ and $\frac{25.0}{1403}$) and that it is all of one type. The pottery from the ball court is probably $\frac{25.0}{1425}$ and it, too, is of a single type but different from that of the cave.

† Measured by March's modification of Moh's scale.

‡ These megascopic observations conform more to Aitken's microscopical analysis of $\frac{25.0}{1425}$ than to $\frac{25.0}{1406}$, although there are some similarities to both.

Sherds 1a and 1c are decorated, 1b is not. 1a bears three parallel incised lines just beneath the rim on the inside of the pot. 1c bears a series of incised lines and dashes beneath the rim on the outside of the pot. The design on 1a is of the type which below will be called horizontal-parallel-line design. 1c will be referred to as the inclined-line-and-dash design. Neither is complete enough to illustrate a whole design, as is the case with some of the sherds to be discussed from other sites. The incisions seem to have been made with a blunt tool, which was drawn along the surface of the clay. The edges of the incision were smoothed down afterwards.

The two flint specimens (PLATE 19, FIGURES 1, 2) measure respectively 7.0 by 2.5 by 0.9 centimeters and 6.0 by 2.2 by 1.3 centimeters. Parts of the original nodules show on both as whitish areas, the rest of the surfaces being covered with a tan patination. The specimens are irregular in shape but resemble blades. Striking platforms and bulbs of percussion are not present. Probably, these are natural chips, picked up and used perhaps as cutting tools. Along the edges is fine chipping, which may be the result of use.*

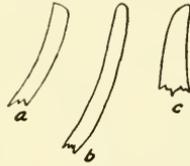


FIGURE 6. Rim profiles, type A pottery. Cueva de Antonio. Am. Mus. nos. $\frac{25.0}{1402-3}$, $\frac{25.0}{1406}$.

Cueva de la Seiba

This site is on the Hacienda Jobo in Barrio Rio Arriba de Arcibo, municipality of Utuado. It is northwest of the town, whereas Cueva de Antonio is more nearly west. It was excavated by Dr. H. K. Haerberlin, who has published an account of the work (1917: 220-238).

Four hundred and six of the artifacts come from this site: three hundred and eighty-four potsherds, eighteen griddle sherds, two hammerstones, one fragment of coral, and one carved shell pendant. According to Haerberlin's report (1917: 229, fig. 20), there should be a fragment of a petaloid stone celt, too, but I have been unable to find it in the collections. Samples of the potsherds are illustrated on PLATE 16, FIGURES 1-10. They are all of type A, as described above for Cueva de Antonio. They resemble the sherds from the latter cave in material,

* Aitken (1918: 304) calls this "secondary chipping." In the author's opinion, the specimens were not manufactured by man, unless by some sort of heating process.

techniques, and for the most part also in shape and decoration. The main difference is that loop handles are present at the Cueva de la Seiba but not at the Cueva de Antonio. This may or may not be the result of the smallness of the sherd sample at Cueva de Antonio.

The sherds are the largest in size of any in the collections, some being nearly 13 centimeters across. They average about 5 centimeters. A sample series of twenty sherds varied in thickness from 0.5 to 1.3 centimeters. The average was 0.7 centimeters. The color, both of the surfaces and the fractures, ranges from dark brown to

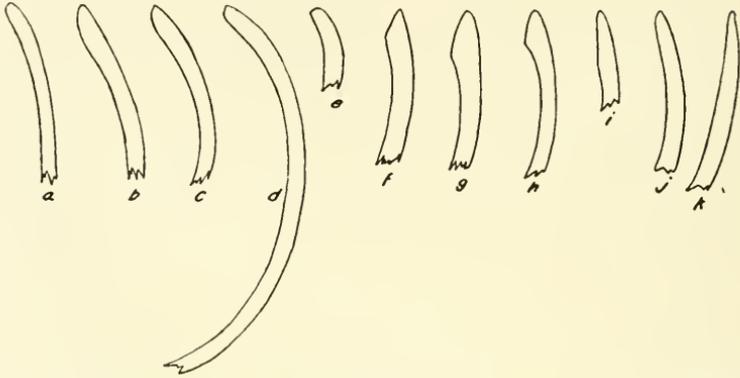


FIGURE 7. Rim profiles, type A pottery. Cueva de la Seiba. Am. Mus. nos. $\frac{25.0}{1561-2}$ $\frac{25.0}{1542}$ $\frac{25.0}{1558}$

reddish brown. The fractures are fairly regular and the fractured surfaces are earthen. The surfaces of the sherds are hard. A sample series of ten sherds varied in hardness from 2.5–3.0 to 4.0–4.5. The average was 3.5–4.0. The clay is fine in consistency. It is sparsely tempered with grit inclusions.

Haerberlin had a microscopic analysis made of one of the sherds (1917: 227, 228, fig. 18). It showed a fairly coarse grain, a great variety in the size and composition of the grain, a large amount of dark material, much clay filling or binding, and a "pronounced flowage structure, a structure that must have been developed in the modeling of the product."

Several sherds bear traces of a coiling process. Others indicate that the vessel surfaces were scraped. They were well-smoothed but not polished. There is no slip. Firing clouds are occasional. A number of sherds are discolored with soot.

Seven of the sherds are from the ends of elongated, or boat-shaped

bowls. There is no indication whether the round bowl shape was present. The bottoms of the bowls must have been round, for there are no sherds with distinctive bottom shapes. Profiles of sherds from the walls and rims of vessels are given on FIGURE 7 a-k. They indicate that the vessel sides were part globular in shape, the aperture being sometimes at the middle of the globe so that the walls were upcurving, or sometimes further up, in which case the walls were more or less incurving. The rims are of three types: round and blunt, round and tapering, or triangular. There are thirty examples of round and blunt rims (FIGURE 7 a-c; PLATE 16, FIGURE 4). The high point is either on the middle of the rim (eighteen cases, such as FIGURE 7 a) or towards the inside (nine cases, such as FIGURE 7 c) or towards the outside (three cases, FIGURE 7 b, d). Seventeen rims are round and tapering (FIGURE 7 i-k). The taper is gradual, beginning 1.0 to 2.5 cm. back from the rim. Nine of the rims are triangular (FIGURE 7 f-h; PLATE 16, FIGURE 5). There is one flat rim, with the clay pushed out in front of the rim to form a slight ridge (PLATE 16, FIGURE 6). The apparent simplicity in shape of the vessel walls should be noted. There are no shoulders or necks. Each vessel wall has a single unbroken curve.

Only twenty-one of the three hundred-odd sherds are decorated. The techniques include incision, affixation, and modelling. Punctuation and application are not present.* Four of the decorated sherds are incised (PLATE 16, FIGURE 9). The design is of the type which will hereafter be called curvilinear. The second incised design is of the inclined-line-and-dash variety. Not enough is left of the other two designs to determine their nature. All four designs seem to have been made by drawing a blunt tool across the surface of the pottery and then smoothing down the edges of the incisions.

Fifteen of the sherds are decorated by means of the technique of affixation. They all bear loop handles (FIGURE 8), which are strap-like. These begin at the rim, extend for 1.0 to 3.5 centimeters above the rim, and then loop over and down to the body of the vessel, varying in width from 3.5 to 7.6 centimeters. One handle has a lug on top of the loop (FIGURE 8 g; PLATE 16, FIGURE 2). This lug is of the type which will be called cleat-like.

The remaining two decorated sherds are modelled (PLATE 16, FIGURE

* The terms used in this appendix for techniques of decoration are the ones defined by the author (Rouse 1939). They may be briefly summarized as follows: incision signifies the tracing of lines in the surface of the clay with a pointed tool. Affixation refers to the process of attaching handles or lugs to the surface of the vessel. Modelling is the technique of shaping handles or lugs on the vessel surface with the hands. Punctuations means to punch holes or short dashes in the surface of the vessel. Finally, application, is the process of laying strips of clay over the surface of the vessel.

7). The other is similar. Both are merely ridges extending back from the rim, and may be vestigial handles.

The eighteen griddle sherds are distinct from the potsherds. One from another site is illustrated on **PLATE 16, FIGURE 11**. All these sherds are unusually thick. At the Cueva de la Seiba they range from 1.3 to 2.5 centimeters in thickness, and average 1.6 centimeters. The clay is reddish brown. It contains large grit particles, numerous enough so that the sherds may be considered medium tempered. The sherds are flat with a smooth upper surface and a rough lower one. There is one rim sherd, which indicates that the griddles were circular slabs with raised round edges. Presumably, they were used for baking cassava, in contradistinction to the pots which were used for boiling.

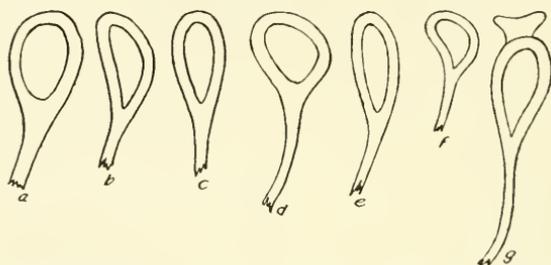


FIGURE 8. Handle profiles, type A pottery. Cueva de la Seiba. Am. Mus. nos. $\frac{25.0}{1558}$ $\frac{25.0}{1561}$.

The two hammerstones (**PLATE 19, FIGURES 4 and 6**) appear to be natural pebbles, picked up and used as they were found. They measure respectively 12.7 by 6.6 by 4.5 centimeters, and 3.8 centimeters in diameter. The one which is elongated (**FIGURE 4**), has traces of battering only on the ends, the other which is spherical (**FIGURE 6**), is battered over most of the surface. The material of which these specimens are made has not been identified.

The one piece of coral from the cave (**PLATE 19, FIGURE 8**) measures 6.4 centimeters in diameter and 2.5 centimeters in thickness. The back is a flat broken surface, not pitted like the front. Pieces of coral like this have been found in many of the West Indian shell heaps. They may have served as rasps, a use to which their pitted surfaces seem well adapted.

The shell pendant (**PLATE 19, FIGURE 10**)* measures 5.2 by 3.8 by 0.3 centimeters. It is a flat object, cut in the outline of a face. The

* Haerberlin (1917: 230), refers to it as a "bone pendant." It is catalogued as shell in the American Museum, however, and my own analysis indicated that it is shell.

facial features have been engraved in the surface of the object, partially by scratching and partially by gouging. The mouth and forehead are both decorated with an alternating-oblique-parallel-line design. There is a head-dress on top of the face which has been drilled in two places for suspension. Two other holes indicate where drilling was started and then abandoned. On one side of the face is an ear. The other side has been broken off and is missing.

The Cueva de la Seiba is the only site from which the positions of specimens are marked. One group of sherds is said to be from the "deepest" part of the cave. They are no different in type from the sherds from other parts of the cave, however.

"Juegos de Bola" at Capá

This is the site excavated by Drs. Mason and Aitken and described in the present volume. It is "several miles away" from the Cueva de Antonio in Barrio Caguana, Utuado. One hundred and thirteen of the artifacts in the collection come from this site: two European potsherds, one hundred and seven Indian potsherds, one flint chip, one stone figure, and two bone counters.

One of the European potsherds is glazed, the other is not. The former is a rim sherd and the latter a sherd from the bottom of a vessel. A fineness of clay and a uniformity in consistency distinguish both these sherds from the Indian potsherds.

The Indian potsherds are different in type from those described for the caves. They seem to be of two kinds, which will be called type B and type C. Twenty-three of the sherds are of type B and eighty-three of type C. In addition there is one complete pot of type C.

Sherds of type B (PLATE 17, FIGURES 1-14) resemble type A in material and construction, but differ in shape and decoration. The sherds are fairly large, averaging about 4 centimeters across. A sample series of ten sherds varied from 0.6 to 1.1 centimeters in thickness. The average was 0.8. The same sample varied in hardness from 2.0-2.5 to 3.5-4.0. The average was 2.5-3.0. The color of the clay, both on the surface and in fractures, is predominately reddish or purplish brown. A few sherds are dark brown. The clay seems to be of fine consistency. It is tempered sparsely with small grit particles. The fractures are relatively regular. The fractured surfaces are earthen. For the most part, the sherds have fractured parallel to the rim, a fact which is indirect evidence of coiling.

One sherd bears direct evidence of coiling. The thickness of the coil is 1.3 centimeters. The surfaces of the sherds have been scraped.

In some cases the scraping is well done, but in other instances it is crude and the surfaces are irregular. Some surfaces have been and some have not been smoothed off after the scraping. None are polished. Two of the sherds (PLATE 17, FIGURES 6, 7) are entirely covered with a red slip. The rest are not. Two sherds bear firing clouds, one only on the inside surface and the other throughout. None are coated with soot.

There is little evidence of the shape of vessels. One, at least, must have been a boat-shaped bowl (PLATE 17, FIGURE 1). No sherds from the bottoms of vessels are distinguishable. FIGURE 9 illustrates profiles of rim sherds. They have roughly the same general shapes as those illustrated for type A, either upcurving sides (FIGURE 9 a-c)

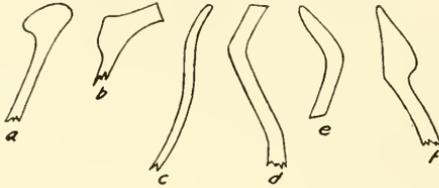


FIGURE 9. Rim profiles, type B pottery. "Juego de Bola," Capá. Am. Mus. nos. $\frac{25.0}{1413}$ $\frac{25.0}{1415}$.

or incurving sides (FIGURE 9 d-f). Three are upcurving-sided. The sides all slope slightly outwards and they are all straight, except for one which bows slightly (FIGURE 9 c). The remaining four distinguishable rim sherds are incurving-sided. The two which are large show an angle at the base of the incurve (FIGURE 9 d and e). This produces a definite shoulder, in contrast to the gradually incurving sides of type A pottery. The angle at the base of the shoulder is blunt but not pronounced.

One of the straight-sided sherds and two of the incurving-sided sherds have a slight neck above the side or shoulder (FIGURE 9 c, d, f). This has been produced by gradually curving the vessel wall outwards. The curve is never pronounced.

The rims themselves are of four different shapes: round and blunt (three examples, FIGURE 9 c), round and tapering (three examples, FIGURE 9 e), flat (two examples, FIGURE 9 d), and triangular (three examples, FIGURE 9 a). The high point on all round rims is in the middle (FIGURE 9 c and e). The triangular rims vary greatly in shape (FIGURE 9 a and f), one has a flange on the outside (FIGURE 9 b). Considered as a whole, the shapes of type B pottery are more complicated

and more varied than those of type A. The silhouettes are generally composite, rather than single curves.

Sixteen of the twenty-three sherds bear some sort of decoration. The designs are limited to the rims and shoulders of vessels. Nine of the twelve shoulder and rim sherds are decorated. The techniques used include incision; a combination of affixation, modelling, incision, and punctuation; and application.

The incision seems to have been done with a blunt tool, drawn across the surface of the vessel. The lines are not deep. There are six incised designs. Five are of the type which has been called horizontal-parallel-line design (PLATE 17, FIGURE 14). The one illustrated is an indistinct example on a rim flange. The rest are probably from the shoulders of vessels. The number of lines varies from two (three examples) to three (two examples). The one miscellaneous incised design consists of a combination of straight and parallel lines. It is not large enough to illustrate the total design.

The decoration executed in affixation and combined techniques, is located either on rims or on vessel walls. It consists entirely of lugs, rather than loop handles as in the case of type A. There are three different kinds: bat-heads (five examples, PLATE 17, FIGURES 1-3 and 5-6), human-heads (one example, PLATE 17, FIGURE 8), and geometric lugs (two examples, PLATE 17, FIGURES 4 and 7). The bat-heads, for the most part, resemble those figured by Dr. F. G. Rainey (1940: 200. pl. 1, fig. 1). Two are probably from the ends of boat-shaped bowls (PLATE 17, FIGURES 1-2). One is on a vessel wall (PLATE 17, FIGURE 3). The other two are on the rim (PLATE 17, FIGURES 5-6). They face along it instead of inwards as in FIGURE 1, PLATE 17 or outwards as in FIGURE 3, PLATE 17. The first three bat-head designs are modelled out of more or less spherical lugs, the details of the facial features being represented by means of incision and punctuation. The last two designs are made in the same way on the edges of flat lugs.

The human-head lug, like the bat-heads, is of a type named by Dr. Rainey (1940: 200, pl. 1, fig. 2). It is located on a vessel shoulder, just above a ridge. It has been pinched into shape, and then the facial features have been punctuated. The whole sherd is covered with a red slip. One of the two geometric lug sherds is also red-slipped (PLATE 17, FIGURE 7). It may be a conventionalized head lug. The other geometric lug is unpainted and incised. Both were probably located on the ends of boat-shaped bowls.

There are two applied designs, one on the sherd bearing the human-head and the other on a plain sherd (PLATE 17, FIGURES 8 and 9).

The former consists of a single ridge and the latter of two parallel ridges. Both sets of ridges are triangular in cross-section. In both cases, the applied ridges have been smoothed down into the vessel surface after application.

Sherds of type C from Capá (PLATE 18, FIGURES 1, 11, and 16-24) differ from types A and B in material and for the most part also in shape and decoration.* The sherds are relatively small. The largest one measures 7.6 centimeters across. The average is 3.5 centimeters, as compared with 5 centimeters for type A, and 4 centimeters for type B. The thickness of a sample series of twenty sherds varied from 0.5 to 1.1 centimeters. The average was 0.7 centimeters. The hardness of a sample series of ten sherds ranged from 2.0-2.5 to 2.5-3.0. The average was 2.0-2.5. Thus, the sherds of type C are both thinner and softer than those of types A and B. The clay, on the surface and in the fractures, varies from brick red to brown in color. It is lighter than the clay of type B (although not type A). The clay is of fine consistency. It is tempered with small sand particles. About two-thirds of the sherds are heavily tempered. Their fractured surfaces are sandy and the sherds themselves shed sand. One can, for example, break pieces off the edges of the sherds and with little effort crumble them into sand between the fingers. Apparently, the clay matrix of these sherds was sparse, and the material was not well fused together.

The remaining third of the sherds lack the sandy composition. They seem to be made of good clay, in the same proportions as the sherds of types A and B.

Most of the sherds have broken in regular fractures, parallel to the rim, which is an indication that coiling was practiced. One sherd bears traces of a coil, 1.0 centimeters wide. The lower edge of this coil overlaps the coil beneath it, there being a diagonal facet between them. Slight horizontal striations on the inside of several sherds may indicate a scraping technique. The surfaces are well-smoothed, but not polished. Several sherds bear firing clouds. Five are coated with soot.

Both the round and the boat shapes of bowl are present, but there is no indication of the proportions of each. The one complete bowl is round (PLATE 18, FIGURE 1), and measures 12.7 centimeters in diameter and 8.9 centimeters in height. It has a flat bottom, the only one of which there is evidence at Capá. Profiles of sherds from the

* Similarities have been noted above between the sherds of type B and the material excavated by Dr. F. G. Rainey in shell heaps along the Porto Rican coast. Sherds of type C, on the other hand, resemble the sherds obtained by Dr. Rainey (1940: 206. pl. 7, fig. 2) from ball court No. 2, Barrio Sabana, Orocovis, P. R.

upper parts of bodies are shown on FIGURE 10. All are from pots with inturned shoulders, there being no simple upcurving or incurving sides. The shoulder itself is generally narrow and flat (FIGURE 10 b). The width averages 3.1 centimeters. The angle at the base of the shoulder is either gradual (FIGURE 10 e), or sharp (FIGURE 10 b). The latter predominates. Sometimes the angle is made sharper by thickening the inturn (FIGURE 10 c). There are no necks.

The rims are round (FIGURE 9 a), except for several flat ones (FIGURE 10 g). They commonly taper, beginning about 2.5 centimeters back from the rim (FIGURE 10 e). The tapering is more pronounced on the inside than on the outside. The rims are so thin as the result of the

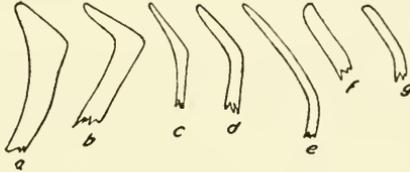


FIGURE 10. Rim profiles, type C pottery. "Juego de Bola," Capá. Am. Mus. nos. $\frac{25.0}{1413}$ $\frac{25.0}{1415}$.

tapering that they break off easily, particularly when the clay is sandy in consistency. There are no triangular rims, nor flanges. It will be noted that the type C profiles are more complicated than those of type A, since they have shoulders. They are not as complex as type B profiles, however, for they lack necks and elaborate rim forms.

Type C sherds are decorated primarily on the shoulder, with a few lugs being attached instead to the rim or inturn. Almost all vessels must have been decorated. Of the forty-nine shoulder sherds, forty-eight bear designs. The most common technique is incision, which is sometimes combined with punctuation. A combination of affixation, modelling, incision, and punctuation is also indicated. Finally, several sherds are applied, with or without incision of the applied strips.

Incision seems to have been done by drawing a blunt tool across the surface of the vessel. The surface was smoothed after incision, but there are still slight ridges along the edges of some incised lines. A few incised lines end in dots; the latter have apparently been punctuated with the same tool which was used for incision. The incised lines are shallow but broad, some spaced closely together, so that the areas between lines resemble ridges. In these cases, the

emphasis of the designs seems to be on the areas rather than the lines, and so the designs may be said to be negative.

Thirty-seven sherds are large enough to identify the designs. They are of five different types: horizontal-parallel-line design (nine examples, PLATE 18, FIGURE 3), ovoid design (three examples, PLATE 18, FIGURES 4, 5), curvilinear design (four examples, PLATE 18, FIGURE 6), alternating-oblique-parallel-line design (three examples, PLATE 18, FIGURES 7, 8), and inclined-line-and-dash design (eighteen examples, PLATE 18, FIGURES 9-14).

The number of lines in the horizontal-parallel-line design varies from three to five. They probably extended around the vessel. The ovoid design consists of a series of panels, in each of which a straight line terminating in dots is surrounded by an oval line. There may or may not be a bordering line above and below the panel. The curvilinear design is probably also made up of a series of panels, each consisting of an inclined straight line with various combinations of curved and straight lines above and below it. The alternating-oblique-parallel-line design consists of alternating units of parallel lines running in different directions. The number of lines in each unit varies from five to eight. The inclined-line-and-dash design is a heterogeneous category consisting of various combinations of dashes with curving and straight lines.*

Thirteen of the sherds are decorated by means of affixation, in combination with one or more other techniques. All bear lugs rather than loop handles. The lugs are difficult to classify because of a variation in appearance. There seem to be five different kinds: facial lugs (four examples, PLATE 18, FIGURES 15, 16), cleat-like lugs (four examples, PLATE 18, FIGURES 17, 18), a cylindrical lug (one example, PLATE 18, FIGURE 19), wedge-shaped lugs (three examples, PLATE 18, FIGURES 20, 21), and a semi-circular lug (one example, PLATE 18, FIGURE 22).

The facial lugs are more or less pyramidal in shape. The two upper surfaces bear a modelled and incised outline of a face (PLATE 18, FIGURE 15). The back of the lug may or may not be incised and punctuated also (PLATE 18, FIGURE 16). With one exception (FIGURE 16), there is no head-dress and snout above and below the face, like those of the bat-head lugs. The cleat-like lugs have two prongs. Two of the lugs are incised and punctuated (PLATE 18, FIGURE 17).

* All the above kinds of design except the last will be more fully illustrated and described in a forthcoming monograph by Dr. Rainey and myself on the archaeology of the Fort Liberté region, Haiti.

The other two are plain (PLATE 18, FIGURE 18). The single cylindrical lug is incised on top (PLATE 18, FIGURE 19), as are the three wedge-shaped lugs (PLATE 18, FIGURES 20, 21) and the semi-circular lug (PLATE 18, FIGURE 22).

Five sherds are decorated in the technique of application, or of application combined with incision. All except one are of the type which Dr. Rainey (1940: 200, pl. 1, fig. 10) has called worm-like. Two of the worm-like designs consist of a curving strip of clay, rectangular in cross-section and incised transversely (PLATE 18, FIGURES 1, 24). The other two are triangular in cross-section and without the incisions. In all four cases, the strips of clay have been smoothed down into the surfaces of the sherds. The fifth applied design consists of three rectangular strips of clay, incised transversely (PLATE 18, FIGURE 23).

The flint chip from the Capá site (PLATE 19, FIGURE 3) measures 2.5 centimeters in diameter and 0.6 centimeters in thickness. It is a natural chip, without striking platform or bulb of percussion. Parts of the original surface of the nodule are still present, and there is no apparent patination. The material has a pinkish tinge. The lower edge of the artifact is sharp, and could have served for scraping.

The stone figure (PLATE 19, FIGURE 11) measures 5.7 by 3.2 by 2.5 centimeters. It is composed of a "metamorphic silicate rock made up chiefly of diopside and amphibole" (Haeberlin 1917: 235). The grain is very fine. The location of the specimen is not given in the American Museum catalogue, but Dr. Mason thinks it came from Capá. The figure is of the kind which Dr. Fewkes (1907: 140, 141) has called the first type of amulet. It represents a human (or animal) being with the arms flexed alongside the head and the legs flexed alongside the body. There is a prominent penis. The features of this amulet are not as well delineated as is usual with such specimens. Only the head is clearly carved. The figure is pierced through the back edge of each arm, probably for use as a pendant. Specimens like these are said to have been worn on the forehead by warriors (Fewkes 1907: 139).

There are two bone specimens (PLATE 19, FIGURE 9) which are both fish vertebrae, with the spines missing. Neither is drilled for suspension. The one illustrated measures 1.4 centimeters in diameter and 0.8 centimeters in thickness. Dr. Rainey (1940: 30) has suggested that specimens like these were used as "counters." The fact that two of the vertebrae were found as far inland as Capá corroborates his suggestion.

"Juego de Bola" at the Cueva de Antonio

This juego is in the valley beneath the Cueva de Antonio in Barrio Caguana, Utuado. It has been excavated and described by Dr. Aitken (1918: 307-309). From it sixty-six artifacts were obtained: sixty-three are Indian potsherds, two are griddle sherds, and one is a hammerstone.

The potsherds are all of type C (PLATE 18, FIGURES 13-15) having the sandy consistency characteristic of the type C potsherds at Capá. Their size, color, hardness, and fracture all seem the same as at Capá. The construction and shape are also apparently similar, with one exception. A single rim (one out of four examples) is flat rather than round and lacks the taper.

The seven shoulder sherds are all decorated. The techniques are incision (with or without punctuation) and affixation (combined with modelling, incision, and punctuation). Application, the other technique at Capá, is not present. The incision, affixation, modelling, and punctuation are done in the same way as at Capá, with the exception that there are no dots at the ends of incised lines.

The incised designs are of three kinds: curvilinear design (one example), alternating-oblique-parallel-line design (one example), and inclined-line-and-dash design (three examples, PLATE 18, FIGURE 13). In addition, there is one unique design, characterized by an incised circle with a dot in the center (PLATE 18, FIGURE 14).

The affixed decoration consists of a single lug (PLATE 18, FIGURE 15) of the facial type, resembling the Capá lugs of that type. Loop handles are absent.

Two possible griddle sherds are included in the collection. They are much thicker than the potsherds (1.9 centimeters as compared with an average of 0.8 centimeters) and each is smooth on one surface and rough on the other. They are made of a reddish clay, which is sandy in consistency like the potsherds, and are heavily tempered with quartz inclusions of various sizes, which are clearly distinguishable from the sand. There is no indication of shape or decoration.

The final artifact is a hammerstone of unusual type (PLATE 19, FIGURE 5). It is a rough pebble, measuring 11.6 by 7.9 by 6.7 centimeters. According to Aitken (1918: 309), the material is quartz porphyry. The stone is grooved halfway around its center and there are evidences of hammering on the ungrooved side and on both ends.

"Juego de Bola" near the Quebrada de los Medinas

This juego is located on the Hacienda Jobo in Barrio Río Arriba de Arceibo, Utuado. It is about one mile west of the Cueva de la Seiba.

The site was dug by Dr. Haerberlin (1917: 214-220). One hundred and nineteen sherds from this site have been studied: one hundred and sixteen are Indian potsherds, one is a griddle sherd, one a hammerstone, and one a stone ball. According to the American Museum catalogue, one hundred more sherds and three petaloid stone celts come from the site. I was unable to find them.*

The potsherds studied are all of type C (PLATE 18, FIGURES 3-10, and 12). For purposes of orientation a complete pot of type C is shown on PLATE 18, FIGURE 2. It was found in a cave near the juego. The potsherds all have the sandy consistency characteristic of type C, there being no non-sandy sherds like the few at Capá. Haerberlin quotes the following analysis of the sherds:

"The microscope shows a very great abundance of fragments of comparatively clear mineral matters constituting the bulk of the material. They are bound together by a clayey product (or what was once clay) and this matter seems to have been present in not much greater amount than must have been necessary to hold the multitude of fragments together. The structure is essentially massive. Hardly anywhere is there any flowage effect. The general make-up seems to indicate that considerable care was taken to select comparatively pure, angular sand as one of the constituents; and a comparatively pure, fine clay as the other . . ."

The surfaces of some sherds are slightly pitted, a characteristic which is confined to the site under discussion. One sherd is drilled for mending, unlike those at the other sites. In the remaining characteristics of material and construction, the sherds resemble the type C potsherds from Capá. The details of shape, too, are the same as at Capá, with one exception. Two sherds are bent slightly upwards beneath the rim, so that they give a slight impression of a neck.

Forty-six of the forty-seven shoulder sherds are decorated. The techniques used are the same as at Capá,—incision (with or without punctuation), affixation (combined with modelling and incision), and application (also combined with incision).

There are forty-three examples of incision, all but three of which are large enough to identify the designs. As at Capá the incisions are sometimes negative, and incised lines often end in dots. All five of the Capá types of design are present: horizontal-parallel-line design (four examples, PLATE 18, FIGURE 3), ovoid design (eleven examples, PLATE 18, FIGURES 4, 5), curvilinear design (six examples, PLATE 18, FIGURE 6), alternating-oblique-parallel-line design (eight examples, PLATE 18, FIGURES 7, 8), and inclined-line-and-dash design (eleven examples, PLATE 18, FIGURES 9, 10, 12).

* Haerberlin (1917: 219, fig. 12) describes and figures one of these celts, which is made of coral. He does not mention the other two.

Lugs are affixed to two of the sherds. In both cases, the lugs are more or less pyramidal in shape. One lug is undecorated, the other one is incised horizontally in two places. There is a horizontal applied ridge on one sherd, just beneath the rim. It is rectangular in cross-section and has been smoothed down completely onto the surface of the vessel. The top edge of the ridge has been notched, perhaps with a stick.

The single griddle sherd is the same in material and surface finish as the griddle sherds at the juego beneath the Cueva de Antonio. It is from the rim, and indicates that the griddles were flat circular slabs, slightly elevated at the rim. The sherd tapers slightly towards the rim. The rim is round. The sherd is incised, unlike all other griddle sherds in the collection. There are three parallel straight lines forming a band just inside the rim.

The hammerstone is an ovoid pebble, which has been broken in half. It measures 7.6 centimeters wide, 7.0 centimeters thick, and 7.6 centimeters long (up to the broken surface). The rock is coarse-grained. Its exact nature was not determined, but there are evidences of use on the unbroken end and on one side edge. The top and bottom surfaces each bear a slight natural depression, which may have been used for holding the stone.

The stone ball (PLATE 19, FIGURE 7) measures 5.4 centimeters in diameter. The shape is spherical, but somewhat irregular. The surface is dark brown in color, and is smooth and highly polished. According to Haeberlin (1917: 220), it is a limonitic clay pebble.* The use of this stone is not known. It may have had some connection with the ball game.

Shell Heap at Montalva

The final site is a shell heap, located on an island in the bay of Montalva, barrio of that name in the municipality of Lajas. This site, unlike the others, is on the coast. Specimens were collected from its surface by Dr. N. C. Britton. So far as I know, no report on the site has been issued, except for the remarks on it in this volume by Dr. Mason.†

The artifacts from the Montalva shell heap number forty-nine: three European potsherds, eight others may be, thirty-seven Indian potsherds, and one griddle sherd. The three European potsherds are

* Haeberlin describes one other stone ball from the ball court. I was unable to find it in the American Museum catalogue.

† p. 271 above. I visited the site in 1937 during the course of an archaeological survey being undertaken jointly by the Yale Peabody Museum and the University of Porto Rico. A more extensive description of the site will probably be included in the report of that survey.

wheel-made, their clay is of very fine consistency, and they lack a slip. The eight sherds which may be European are not wheel-made; four of them come from a single bowl with flat bottom, perfectly straight flaring sides, and a flat rim. The bottom has a slight flange, unlike any Indian pottery I have seen. The sides are unusual, too, since they do not even have a slight bow. The rim differs from the Indian pottery in that its surface slopes obliquely inwards instead of being horizontal. The material is of reddish clay, of finer consistency than the obviously Indian pottery. The sherds are thinner than usual (0.6 centimeters) and also harder (3.5-4).

The remaining four of the possible non-Indian sherds are very thick and crude, averaging 1.3 centimeters in thickness. The clay is of medium consistency, reddish, and contains fine grit tempering in sparse amounts. One of the sherds is from the flat bottom of a vessel. The other three are from straight, probably vertical-sided vessels with ridges. The ridges are applied to the surface of the vessel, and are smoothed down into the surface. One is rectangular in cross-section and the other two are triangular. Two are notched (PLATE 17, FIGURE 15), and resemble the applied ridge on a potsherd at Quebrada de los Medinas. The other ridge bears a row of punctuations on its lower side.

The thirty-seven obviously Indian sherds are of type A. They are fairly large and thick. A sample series of ten sherds ranged from 0.6 to 1.0 centimeters in thickness. The average was 0.8 centimeters. The range in hardness of the sample was from 2.0-2.5 to 3.5-4.0. The average was 3.0-3.5. The color of the sherds, both on the surface and in fractures, varies from red to brown. The fractures are generally more or less parallel to the rim. The fractured surfaces are earthen. The sherds seem to be grit tempered. The tempering material is sparse. The particles are small.

The techniques of manufacture include coiling, scraping (of which there is evidence on the insides of several sherds), and smoothing. None of the sherds are polished, several have firing clouds, and a few bear traces of soot.

None of the sherds seem to have come from the bottoms of vessels. Six are rim sherds. Their profiles are illustrated on FIGURE 11. All consist of single curves, and therefore the pots were probably part globular, as at the Cueva de la Seiba. The forms are the same, up-curving sides (FIGURE 10 c-f) or incurving sides (FIGURE 10 a-b). There are the same three kinds of rim: round and blunt (FIGURE 11 c), round and tapering (FIGURE 11 a), and triangular (FIGURE 11 f).

Ten of the sherds seem to be from the area of incurve in the sides. Only two are decorated. One is incised with a horizontal-parallel-line design (FIGURE 11 a). The incision has been done the same way as at the other sites, presumably by drawing a pointed stick across the surface of the clay and then smoothing down the edges of the incisions. The other decorated sherd consists of a bat-head lug, very similar to the one from Capá (PLATE 17, FIGURE 1).

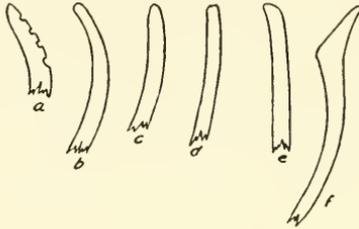


FIGURE 11. Rim profiles, type A pottery. Shell heap, Montalva. Am. Mus. no. $\frac{25.0}{1570-2}$.

A single griddle sherd from Montalva (PLATE 16, FIGURE 11) is 1.6 centimeters thick. Unlike the other griddle sherds, both top and bottom surfaces are smooth, and are not polished. The clay is reddish brown in color and there are several firing clouds. The sherd is from a rim, and as usual, the rim is round and is elevated slightly above the rest of the griddle. The rim does not taper. There is no decoration.

CONCLUSIONS

All the sites discussed can be classified in the category which Dr. Rainey (1940: 105-111) calls "Shell Culture," and which he contrasts in Porto Rico with an earlier "Crab Culture." This is demonstrable by a comparison of artifact types. The following are the types from the various sites:

- 1) Cueva de Antonio.—type A pottery, flint chip.
- 2) Cueva de la Seiva.—type A pottery, griddle, petaloid stone celt, plain hammerstone, coral fragment, shell pendant.
- 3) "Juego de bola" at Capá.—type B pottery, type C pottery, flint chip, stone figure, bone counter.
- 4) "Juego de bola" at Cueva de Antonio.—type C pottery, griddle, grooved hammerstone.
- 5) "Juego de bola" near the Quebrada de los Medinas.—type C pottery, griddle, petaloid stone celt, plain hammerstone, stone ball.
- 6) Shell heap at Montalva.—type A pottery, griddle.*

* European types are excluded from the above list on the assumption that they are intrusive.

All of these types except the pottery of type C, the grooved hammerstone, the stone ball, and the coral fragment are described by Dr. Rainey (1940: 58-60) from Shell Culture deposits in Porto Rico. I have since found pottery similar to type C in several Shell Culture sites, particularly the shell heap at the playa in Santa Isabel and the village site on Finca Santa Elena, Barrio Media Luna, Toa Baja.* Coral fragments, too, come from excavations in some of the Shell Culture sites, including the one at Toa Baja. There remain only two types out of a total of thirteen which are not present both in Shell Culture deposits and in the sites under study in this appendix. They are grooved hammerstone and stone ball.

On the other hand, only three of the types are common to Rainey's Crab Culture deposits and those under study here. They are griddle, flint chip, and petaloid stone celt (Rainey 1940: 58-60).† My excavations in Crab Culture sites do not add to this list. Hence, the sites studied in this appendix fall within the Shell Culture rather than the Crab Culture.

Rainey (1940: 110) subdivides the Shell Culture into two "phases," early and late. The former is characterized by the absence of modelled "adornos" and the latter by their presence. The two caves and the shell heap discussed in this appendix can be classified in the early phase because of the rarity of adornos (here called lugs). The three "juegos de bola," on the other hand, fall into the late phase, for lugs are common.‡

The classification implies a difference in chronology. The two caves and the shell heap should be earlier than the three "juegos de bola." This can be demonstrated more or less reliably in two ways; first, by an analysis of the pottery typology; and second, by a comparison of the pottery types in the sites under discussion with those in the stratified sites of later excavation.

The following are the characteristics of the three types of pottery described above, type A from the caves and shell heap, and types B and C from the "juegos de bola." X indicates that a characteristic is common, R that it is rare, and O that it is absent.

* Test pits were excavated in these sites during the recent archaeological survey of the Yale Peabody Museum and the University of Porto Rico. The work has not yet been published.

† Rainey does not include petaloid stone celts in this list because they are not present in the site under discussion. They occur in another site, however (1940: 95).

‡ In a future paper, I hope to apply the midwestern taxonomic system to Rainey's classification, calling the Crab and Shell Cultures "patterns" and the early and late phases "aspects." Then it will be possible to form other subdivisions in the classification, namely components, foci, and phases. This is outside the scope of the present appendix.

	Type A	Type B	Type C
Sherds large.....	X	X	O
Sherds small.....	O	O	X
Sherds thick.....	X	X	O
Sherds thin.....	O	O	X
Sherds hard.....	X	O	O
Sherds soft.....	O	X	X
Brown color.....	X	O	X
Dark brown color.....	O	X	O
Much clay.....	X	X	R
Little clay.....	O	O	X
Grit inclusions.....	X	X	R
Sand inclusions.....	O	O	X
Coiling.....	X	X	X
Seraping.....	X	X	X
Smoothing.....	X	X	X
Round bowl.....	O	O	X
Boat-shaped bowl.....	X	X	X
Vertical curving side.....	X	X	X
Incurving side.....	X	O	O
Shoulder.....	O	X	X
Neck.....	O	X	O
Round blunt rim.....	X	X	O
Round tapering rim.....	X	X	X
Flat rim.....	R	X	O
Triangular rim.....	X	X	O
Decoration.....	R	X	X
Incision.....	R	X	X
Horizontal-parallel-line design.....	R	X	X
Ovoid design.....	O	O	X
Curvilinear design.....	R	O	X
Alternating-oblique-parallel-line design.....	O	O	X
Inclined-line-and-dash design.....	R	O	X
Affixation.....	R	X	X
Modelling.....	R	X	X
Punctuation.....	R	X	X
Loop handle.....	X	O	O
Bat-head lug.....	R	X	O
Human-head lug.....	O	X	O
Facial lug.....	O	O	X
Cleat-like lug.....	R	O	X
Cylindrical lug.....	O	O	X
Wedge-shaped lug.....	O	O	X
Semi-circular lug.....	O	O	X
Miscellaneous geometric lugs.....	R	X	R
Application.....	O	X	X
Worm-like design.....	O	O	X
Miscellaneous applied designs.....	O	X	R

The table shows many correspondences between the three pottery types; hence they must be basically similar. Type A, however, seems less complex in shape and decoration than either type B or type C. Type A potsherds do not have shoulders, for one thing, whereas some sherds of types B and C do. Type A sherds bear no necks, whereas some type B sherds do. Decoration is rare on type A sherds but common on those of types B and C. Application, one of the techniques of decoration listed for types B and C, does not occur on type A pottery. Finally, several of the designs characteristic of type C are not found on type A sherds. They are ovoid design, alternating-oblique-parallel-line design, facial lug, cylindrical lug, wedge-shaped lug, semi-circular lug, and worm-like design.

These differences in the complexity of the types suggest that type A is earlier than types B and C. The recent stratigraphical excavations in Porto Rican shell heaps and other village sites substantiate this conclusion. Dr. Rainey (1940: 33-35) found pottery relatively undecorated like that of type A in the lower part of his shell stratum excavations at the Canas site, for example, and obtained pottery decorated like that of type B in the upper part of the stratum. The lower part of my test pit in the site on Finca Santa Elena, Toa Baja, contained pottery relatively undecorated like that of type A. From the upper levels were obtained sherds decorated like those of type C.

Other things being equal, then, the pottery of type A must be earlier than the pottery of types B and C. In a previous paper (Rouse 1937: 182-187), I have outlined four time periods in Porto Rican prehistory. Type A pottery is characteristic of the third period. Pottery of types B and C occurs in the fourth period. The following dating can be made for the sites containing the three types of pottery:

- Period IV: "Juego de bola" at Capá
 "Juego de bola" at the Cueva de Antonio
 "Juego de bola" near the Quebrada de los Medinas
- Period III: Cueva de Antonio
 Cueva de la Seiba
 Shell Heap at Montalva

Dr. Mason suggests in this volume that the Capá site was proto-historic. This is probably true of all the period IV sites. Indian pottery resembling that of type C has been found in the ruins of the Spanish town of Isabela in the northern part of the Dominican Republic.*

* By Mr. Maurice Ries of the Department of Middle American Research, Tulane University. This town was supposedly the second founded by the Spanish in the West Indies. Ries' specimens are unpublished, but he has kindly shown them to me.

The Indian pottery found by Ries at Isabela is of the Haitian type called Carrier. In a

Dr. Mason also suggests that Capá was a ceremonial and political center during protohistoric times. The fact that there are two types of pottery at the Capá site, B and C, and only one (C) at the other juegos may be an indication of this, since type B pottery is in my experience characteristic of the coastal sites and type C of the interior.

One other suggestion might be made in conclusion. The fact that all the caves here discussed are dateable in the Intermediate Period and all the juegos in the Shell Period does not imply that this is universally so. I have test-excavated several juegos, such as one on the Roig farm in Barrio Arenas, Utuado, which contain pottery similar to type A and are therefore assignable to Period III. Dr. Mason notes in this volume that the pottery of the Cotui cave was more delicately made and more decorated than the type A pottery of the Montalva shell heap. I was unable to locate the Cotui sherds at the American Museum, but Dr. Mason's account suggests that they were of type B or C, and that the cave was used during Period IV.*

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previous paper I (Rouse 1940: 49-80) tentatively applied the term "Carrier" to the Porto Rican pottery of types B and C, and used the term "Collores" for type A. In this appendix I have substituted letters for the names of the types, in order further to emphasize their tentative nature. It will not be possible to form definitive Porto Rican types until the collections of the Yale Peabody Museum-University of Porto Rico survey are more thoroughly studied.

* The occupation of the Cotui cave, probably during Period IV, must not be considered as similar to that of the Utuado caves in Period III. The latter was a true occupation, the artifacts excavated from habitation refuse. The potsherds in the Cotui and other caves in the southwestern region were found on the clean cave floor and indicated brief, possibly ceremonial, visits. J. A. M.

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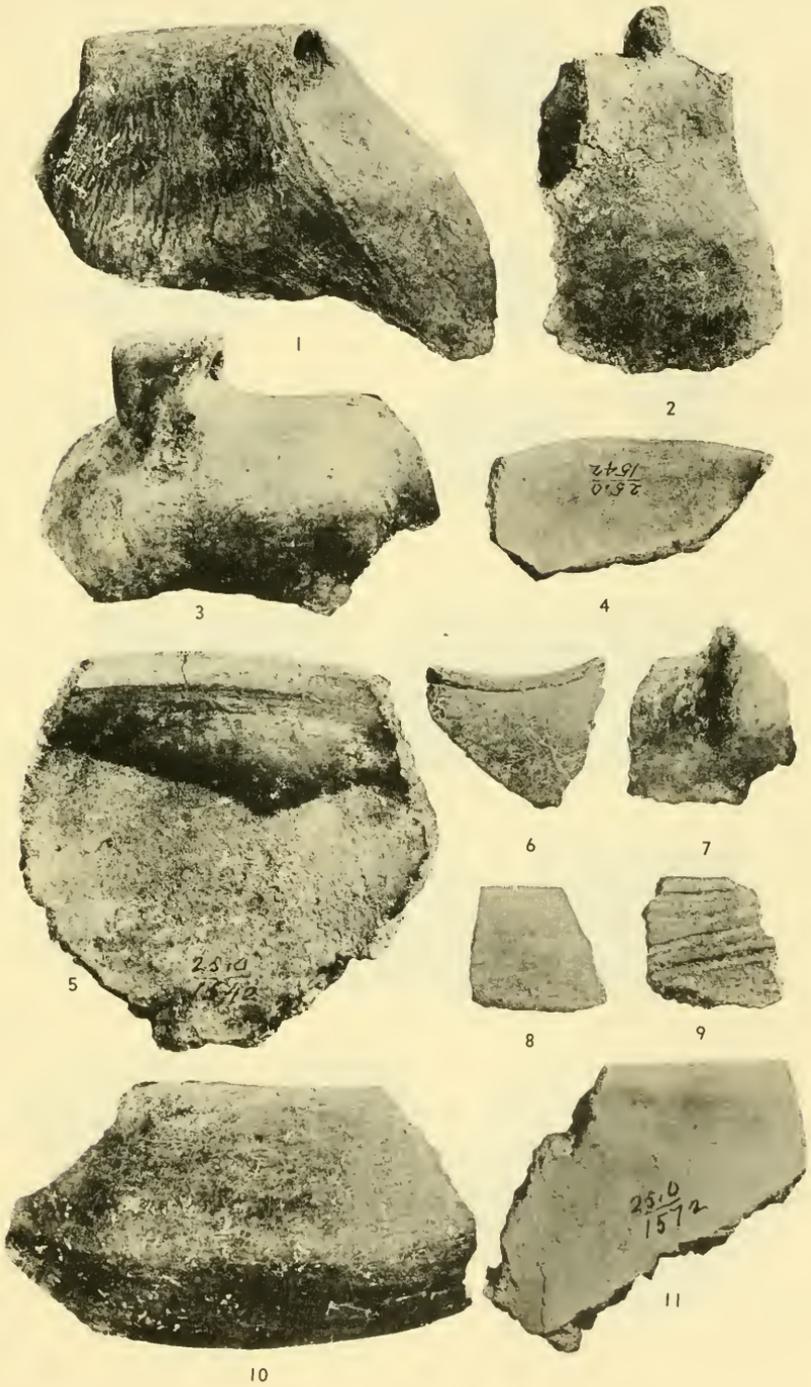
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EXPLANATION OF PLATES

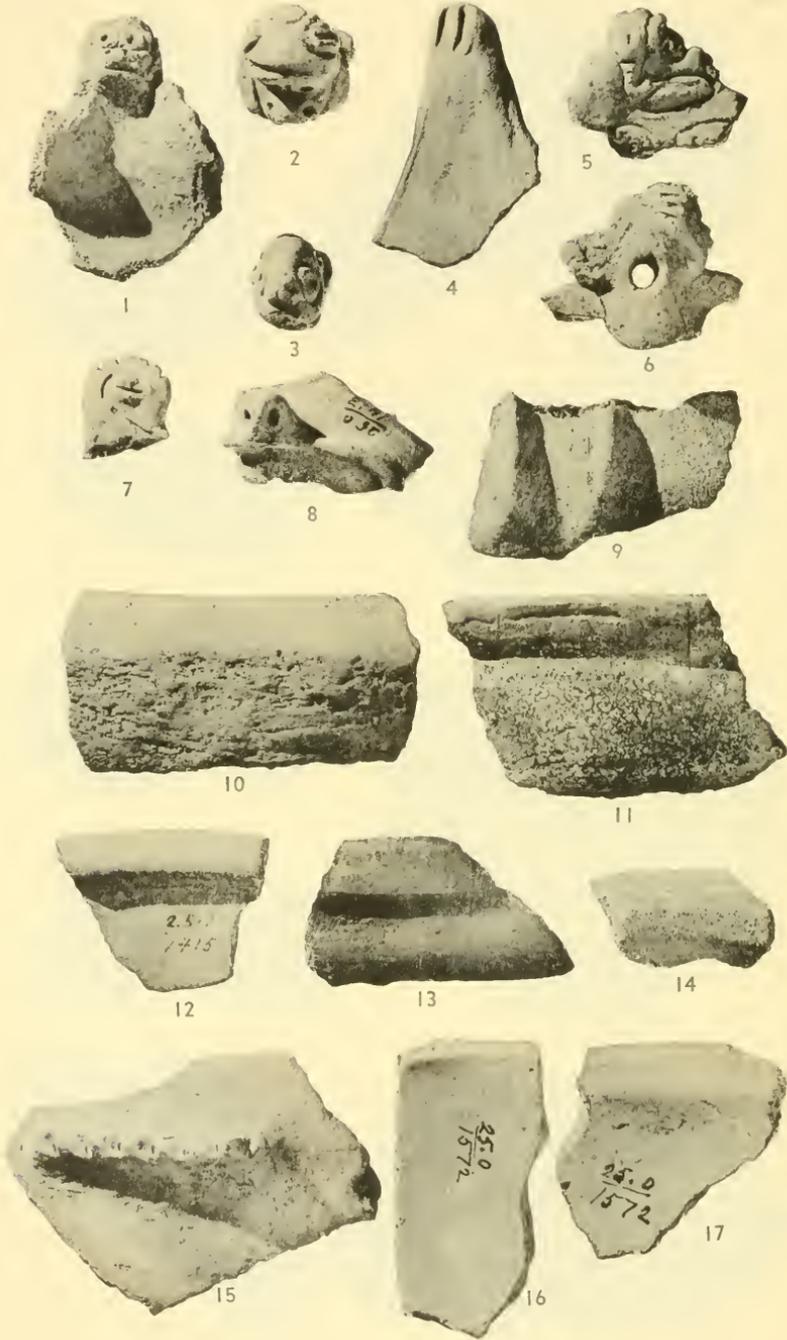
PLATE 16

Type A Pottery and Griddle Sherd

- FIGURE 1. Handle sherd, type A pottery. Cueva de la Seiba. Am. Mus. no. $\frac{25.0}{1561A}$
- FIGURE 2. Handle sherd, type A pottery. Cueva de la Seiba. Am. Mus. no. $\frac{25.0}{1558A}$
- FIGURE 3. Handle sherd, type A pottery. Cueva de la Seiba. Am. Mus. no. $\frac{25.0}{1561B}$
- FIGURE 4. Rim sherd, type A pottery. Cueva de la Seiba. Am. Mus. no. $\frac{25.0}{1542A}$
- FIGURE 5. Rim sherd, type A pottery. Cueva de la Seiba. Am. Mus. no. $\frac{25.0}{1542B}$
- FIGURE 6. Rim sherd, type A pottery. Cueva de la Seiba. Am. Mus. no. $\frac{25.0}{1542C}$
- FIGURE 7. Modelled sherd, type A pottery. Cueva de la Seiba. Am. Mus. no. $\frac{25.0}{1542D}$
- FIGURE 8. Rim sherd, type A pottery. Cueva de la Seiba. Am. Mus. no. $\frac{25.0}{1558B}$
- FIGURE 9. Incised sherd, type A pottery. Cueva de la Seiba. Am. Mus. no. $\frac{25.0}{1542E}$
- FIGURE 10. Rim sherd, type A pottery. Cueva de la Seiba. Am. Mus. no. $\frac{25.0}{1542F}$
- FIGURE 11. Griddle sherd. Shell mound, Montalva. Am. Mus. no. $\frac{25.0}{1572C}$



ROUSE: ANALYSIS OF ARTIFACTS



ROUSE: ANALYSIS OF ARTIFACTS

PLATE 17

Type A and B Pottery

- FIGURE 1. Lug sherd, type B pottery. "Juego de bola," Capá. Am. Mus. no.
 $\frac{25.0}{1415J}$
- FIGURE 2. Lug sherd, type B pottery. "Juego de bola," Capá. Am. Mus. no.
 $\frac{25.0}{1415K}$
- FIGURE 3. Lug sherd, type B pottery. "Juego de bola," Capá. Am. Mus. no.
 $\frac{25.0}{1415L}$
- FIGURE 4. Lug sherd, type B pottery. "Juego de bola," Capá. Am. Mus. no.
 $\frac{25.0}{1415M}$
- FIGURE 5. Lug sherd, type B pottery. "Juego de bola," Capá. Am. Mus. no.
 $\frac{25.0}{1415N}$
- FIGURE 6. Lug sherd, type B pottery. "Juego de bola," Capá. Am. Mus. no.
 $\frac{25.0}{1415O}$
- FIGURE 7. Lug sherd, type B pottery. "Juego de bola," Capá. Am. Mus. no.
 $\frac{25.0}{1413B}$
- FIGURE 8. Lug sherd, type B pottery. "Juego de bola," Capá. Am. Mus. no.
 $\frac{25.0}{1413C}$
- FIGURE 9. Applied sherd, type B pottery. "Juego de bola," Capá. Am. Mus.
 no. $\frac{25.0}{1415P}$
- FIGURE 10. Rim sherd, type B pottery. "Juego de bola," Capá. Am. Mus. no.
 $\frac{25.0}{1415Q}$
- FIGURE 11. Rim sherd, type B pottery. "Juego de bola," Capá. Am. Mus. no.
 $\frac{25.0}{1413D}$
- FIGURE 12. Rim sherd, type B pottery. "Juego de bola," Capá. Am. Mus. no.
 $\frac{25.0}{1415R}$
- FIGURE 13. Rim sherd, type B pottery. "Juego de bola," Capá. Am. Mus. no.
 $\frac{25.0}{1413E}$
- FIGURE 14. Incised sherd, type B pottery. "Juego de bola," Capá. Am. Mus.
 no. $\frac{25.0}{1415S}$

- FIGURE 15. Applied sherd, type A (?) pottery. Shell mound, Montalva. Am. Mus. no. $\frac{25.0}{1571}$.
- FIGURE 16. Rim sherd, type A (?) pottery. Shell mound, Montalva. Am. Mus. no. $\frac{25.0}{1572A}$.
- FIGURE 17. Rim sherd, type A (?) pottery. Shell mound, Montalva. Am. Mus. no. $\frac{25.0}{1572B}$.

PLATE 18

Type C Pottery

- FIGURE 1. Complete pot. "Juego de bola," Capá. Am. Mus. no. $\frac{25.0}{1414}$.
- FIGURE 2. Complete pot. Cave near the Juego, Quebrada de los Medinas. Am. Mus. no. $\frac{25.0}{1537}$.
- FIGURE 3. Incised sherd. "Juego de bola," Quebrada de los Medinas. Am. Mus. no. $\frac{25.0}{1536A}$.
- FIGURE 4. Incised sherd. "Juego de bola," Quebrada de los Medinas. Am. Mus. no. $\frac{25.0}{1536B}$.
- FIGURE 5. Incised sherd. "Juego de bola," Quebrada de los Medinas. Am. Mus. no. $\frac{25.0}{1536C}$.
- FIGURE 6. Incised sherd. "Juego de bola," Quebrada de los Medinas. Am. Mus. no. $\frac{25.0}{1536D}$.
- FIGURE 7. Incised sherd. "Juego de bola," Quebrada de los Medinas. Am. Mus. no. $\frac{25.0}{1536E}$.
- FIGURE 8. Incised sherd. "Juego de bola," Quebrada de los Medinas. Am. Mus. no. $\frac{25.0}{1536F}$.
- FIGURE 9. Incised sherd. "Juego de bola," Quebrada de los Medinas. Am. Mus. no. $\frac{25.0}{1536G}$.
- FIGURE 10. Incised sherd. "Juego de bola," Quebrada de los Medinas. Am. Mus. no. $\frac{25.0}{1536H}$.
- FIGURE 11. Incised sherd. "Juego de bola," Capá. Am. Mus. no. $\frac{25.0}{1413A}$.
- FIGURE 12. Incised sherd. "Juego de bola," Quebrada de los Medinas. Am. Mus. no. $\frac{25.0}{1536I}$.
- FIGURE 13. Incised sherd. "Juego de bola," Cueva de Antonio. Am. Mus. no. $\frac{25.0}{1425}$.



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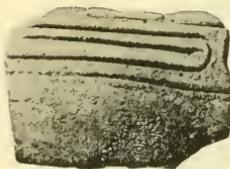
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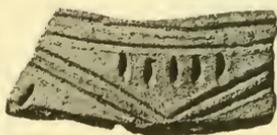
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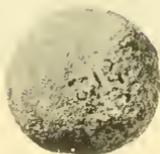
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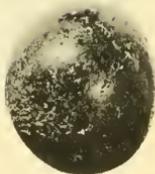
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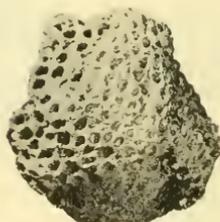
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FIGURE 14.	Incised sherd.	"Juego de bola," Cueva de Antonio.	Am. Mus. no.	$\frac{25.0}{1416A}$
FIGURE 15.	Lug sherd.	"Juego de bola," Cueva de Antonio.	Am. Mus. no.	$\frac{25.0}{1416B}$
FIGURE 16.	Lug sherd.	"Juego de bola," Capá.	Am. Mus. no.	$\frac{25.0}{1415A}$
FIGURE 17.	Lug sherd.	"Juego de bola," Capá.	Am. Mus. no.	$\frac{25.0}{1415B}$
FIGURE 18.	Lug sherd.	"Juego de bola," Capá.	Am. Mus. no.	$\frac{25.0}{1415C}$
FIGURE 19.	Lug sherd.	"Juego de bola," Capá.	Am. Mus. no.	$\frac{25.0}{1415D}$
FIGURE 20.	Lug sherd.	"Juego de bola," Capá.	Am. Mus. no.	$\frac{25.0}{1415E}$
FIGURE 21.	Lug sherd.	"Juego de bola," Capá.	Am. Mus. no.	$\frac{25.0}{1415F}$
FIGURE 22.	Lug sherd.	"Juego de bola," Capá.	Am. Mus. no.	$\frac{25.0}{1415G}$
FIGURE 23.	Lug sherd.	"Juego de bola," Capá.	Am. Mus. no.	$\frac{25.0}{1415H}$
FIGURE 24.	Lug sherd.	"Juego de bola," Capá.	Am. Mus. no.	$\frac{25.0}{1415I}$

PLATE 19

Stone, Bone, and Shell Artifacts

FIGURE 1.	Flint chip.	Cueva de Antonio.	Am. Mus. no.	$\frac{25.0}{1403A}$
FIGURE 2.	Flint chip.	Cueva de Antonio.	Am. Mus. no.	$\frac{25.0}{1403B}$
FIGURE 3.	Flint chip.	"Juego de bola," Capá.	Am. Mus. no.	$\frac{25.0}{1413F}$
FIGURE 4.	Hammerstone.	Cueva de la Seiba.	Am. Mus. no.	$\frac{25.0}{1562B}$
FIGURE 5.	Hammerstone.	"Juego de bola," Cueva de Antonio.	Am. Mus. no.	$\frac{25.0}{1411}$
FIGURE 6.	Hammerstone.	Cueva de la Seiba.	Am. Mus. no.	$\frac{25.0}{1542G}$
FIGURE 7.	Stone ball.	"Juego de bola," Quebrada de los Medinas.	Am. Mus. no.	$\frac{25.0}{1552}$
FIGURE 8.	Coral fragment.	Cueva de la Seiba.	Am. Mus. no.	$\frac{25.0}{1558C}$
FIGURE 9.	Bone counter.	"Juego de bola," Capá.	Am. Mus. no.	$\frac{25.0}{1413B}$
FIGURE 10.	Shell pendant.	Cueva de la Seiba.	Am. Mus. no.	$\frac{25.0}{1538}$
FIGURE 11.	Stone figure.	"Juego de bola," Capá (?).	Am. Mus. no.	$\frac{25.0}{1477}$

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SCIENTIFIC SURVEY OF PORTO RICO AND THE
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This natural history survey of Porto Rico and the Virgin Islands, conducted by the New York Academy of Sciences, was established in 1913. Continuous publication of the results of this survey is made possible through contributions from the Department of Agriculture and Commerce of Porto Rico, and the University of Porto Rico.

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PREFACE

This is one of a series of reports on archaeological research undertaken in Porto Rico during the summers of 1936, 1937, and 1938 as a part of the Caribbean Anthropological Program of the Yale Peabody Museum. The research was sponsored jointly by Yale University and the University of Porto Rico, which are sharing the collections obtained.

The work was a continuation of previous research in Porto Rico performed as a part of the Caribbean Anthropological Program by Dr. Froelich G. Rainey during the years 1934 and 1935. Excavating principally in three sites on the south, northwest, and northeast coasts of the island, Dr. Rainey had been able to demonstrate the existence of two prehistoric cultures, which he named the Crab and the Shell, and to show that the former was earlier than the latter (Rainey, 1940). The writer spent six months during the subsequent three summers in making a site survey and in digging test excavations in the hope of expanding Rainey's sequence.

This first paper contains a series of introductory sections describing the background of the work, outlining the procedures followed, and summarizing the results. Reports on the excavations in western and northern Porto Rico are also included. A second paper, comprising reports on the digging in the rest of Porto Rico and a discussion of the chronological significance of all the excavations, is in press.* Further publication is planned to analyze and define the ceramic styles and cultures in more detail, and to trace their distributions.

I am indebted to my colleagues in the Porto Rican field for generously providing advice and information. Before I left the United States, Drs. Rainey and Samuel K. Lothrop kindly turned over to me the notes, charts, and photographs on the work they had previously done in Porto Rico, and also gave advice as to the best sites to investigate. Lothrop's brief manuscript listing the archaeological sites in Porto Rico has been particularly helpful (Lothrop, ms.). In Porto Rico itself, Sr. Adolfo de Hostos, Dr. J. L. Montalvo Guenard, and Mr. R. L. Junghanns also provided lists of sites and advice concerning their relative importance. In addition, Dr. Montalvo Guenard personally conducted me to the best sites on the southern and southwestern coasts and he made the arrangements for me to excavate at several of them. I learned of the two best sites in the central and northern parts of the island from Sr. Benigno Fernández García, and many other people were also kind enough to furnish information.

To the owners of the sites excavated, whose names are mentioned in the text, I am grateful for their permission to dig, and also for the other facilities which many of them provided. At the University of Porto Rico, Dr. Gildo Massó, acting chancellor during the year 1936, and Dr. Juan Bautista Soto, the subsequent chancellor, were particularly helpful in arranging for the university to defray part of the expenses of the research. At Yale University, I am indebted to Dr. Cornelius Osgood, the director

* As Volume XVIII, Part 4 of this series.

of the Caribbean Anthropological Program, for first suggesting that I go to Porto Rico, for making possible the research, and for his constant advice and encouragement which have shaped its course.

While the primary analysis of the specimens has been made at the Laboratory for Anthropology in the Yale Peabody Museum, I have also worked over the Porto Rican collections at the American Museum of Natural History, the Museum of the American Indian, Heye Foundation, the Harvard Peabody Museum, and the United States National Museum. I am grateful to the authorities at those institutions for facilitating my study. In addition, I have drawn upon knowledge obtained while examining West Indian collections in northern Europe in 1939 under a fellowship from the Carnegie Foundation, awarded through the American Association of Museums.

The maps in this volume have been prepared by Mr. Leonard Mason, and the other text figures by Mrs. C. S. Ford. Mr. John M. Goggin has identified the shells, and I am also obligated to him for a number of suggestions concerning the typology of the shell artifacts. Parts of the manuscript have been read by Dr. Wendell C. Bennett and Mr. Martin D. Burkenroad, as well as by Dr. Osgood. I am indebted to them for valuable criticism.

Finally, I should like to express my appreciation to the people of Porto Rico for the kindness, hospitality, and cooperation with which I was met in all parts of the island, and without which a person unaccustomed as I was to a Latin country would have had difficulty accomplishing his aims.

Irving Rouse

Yale University, 1946.

In view of the fact that six years have elapsed since the final revision of this paper, the editors have offered me the opportunity of noting briefly several subsequent developments in Porto Rican archaeology. In the first place, both Dr. Montalvo Guenard and Mr. Junghanns, referred to above, have passed away. I particularly regret that the former is unable to see the published work, since he contributed so much to its development.

In 1947, the University of Porto Rico established a Centro de Investigaciones Arqueológicas in connection with its new Museo de Antropología, Historia y Arte. Sr. Ricardo E. Alegria, who is in charge, has carried on an active program of excavation in a number of sites, some known to me and others newly discovered by him (*American Antiquity*, **15**: 271, **16**: 348-352). Two of his finds are especially pertinent to the present study:

1. At the Cueva María de la Cruz near Loiza, Sr. Alegria discovered preceramic material underlying pottery-bearing (Cuevas) refuse. This material has yet to be compared with my finds at the Coroso group of sites, but its stratigraphy alone strengthens my suggestion (pp. 355, 381) that the Coroso specimens represent a distinct, nonceramic culture.

2. At a village site near Loiza Aldea, Sr. Alegria obtained pottery which, to judge from a sample collection he generously sent me, is of the Cuevas

style but represents a different variety of that style from the early and late forms distinguished by me. Sr. Alegria's material has a significantly larger proportion of fine-line crosshatching. Whereas, therefore, I considered crosshatching to be intrusive into my varieties of the Cuevas style (see p. 339 below), it is clearly an integral part of his. I hope that his report on the Loiza Aldea site will clarify the relationships among the three varieties of the Cuevas style.

Thanks to the generous financial support which the Yale Caribbean Program has received from the Wenner-Gren Foundation for Anthropological Research, Inc. (formerly the Viking Fund), I was able in 1950 to extend my research to Venezuela (Trans. N. Y. Acad. Sci. 13: 342-347). At Barrancas, just above the delta of the Orinoco River, J. M. Cruxent and I discovered a form of pottery which appears to be ancestral both to the Cuevas style in Porto Rico and to the related Cedros style of Trinidad. This strengthens the view expressed in the present paper (pp. 340, 359 below), that the Cuevas style, together with the associated Igneri culture, had its origin in South America.

The Andersen collection of Virgin Island artifacts, referred to on p. 346 below, has been returned from Hempstead, Long Island to St. Croix to serve as the nucleus of a new municipal museum. During the summer of 1951, Gary Vescelius, Allan Crofts, and Colin Eisler excavated a series of sites on St. Croix under the joint auspices of Yale and the new museum (*American Antiquity*, 17: 291). They encountered a ceramic sequence similar to that presented here (Table 1) and to this extent their work confirms mine.

As for relationships with the rest of the Greater Antilles, the reader is referred to my recent article in the *Southwestern Journal of Anthropology* (7: 248-265), in which I have incorporated the developments in the area since 1941 (the time of writing of my previous summary, although it is cited in this volume by its publication date, 1948).

Irving Rouse

Yale University, 1952.



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INTRODUCTION

Nature of the Study

From many standpoints, the archaeology of Porto Rico has been thoroughly investigated. The elaborate earthworks on the island, its unusual carved stone collars and three-pointed stones, and its other sites and artifacts of the more common West Indian types have long attracted the attention of archaeologists. Both the sites and the artifacts have been thoroughly analyzed, classified, and described; studies have been made of their artistic significance; and they have been interpreted from the viewpoints of ethnography, history, geography, and even of biology.*

Until the initiation of the Caribbean Anthropological Program of Yale University, however, little work had been done in another field of archaeological research. There existed no systematic study of the distribution of the various types of artifacts and of sites, or of the complexes thereof, either in time (from period to period) or in space (from one part of Porto Rico to another).† This was unfortunate, for the island's position on the eastern edge of the Greater Antilles and bordering the Lesser Antilles makes it of key importance for the study of distributions between the two areas (FIGURE 1).

Archaeologically, the Greater Antilles are characterized by incised pottery, zoomorphically carved stonework, and an elaborate ceremonial apparatus; the Lesser Antilles, by painted pottery, geometrically carved stonework, and a relatively simple ceremonial apparatus. Remains of both kinds are found in Porto Rico, and therefore distribution studies on that island offer the best opportunity for determining the relationships between the two.

Most authorities attribute the two kinds of remains to the Arawak Indians, a relatively peaceful, agricultural people who formed the bulk of the population of the West Indies at the time of historic contact. It is believed that the Greater Antillean remains were produced by a division of the Arawak known as Taino and the Lesser Antillean by a division called the Igneri (Fewkes, 1922: 259-265; Lovén, 1935: vi ff.). This being so, research on space and time perspective in Porto Rico might be expected to shed some light on the relationships between the Igneri and the Taino.

It is generally agreed that the Arawak entered the West Indies from South America by way of the Lesser Antilles. Upon reaching the Greater Antilles, they seized possession of it from the Ciboney, a preceramic, non-agricultural people supposed to have originated in Florida (Gower, 1927: 8-9; Rouse, 1948: 497). Traces of the Ciboney have so far been found only in Cuba and Hispaniola. Research on time perspective is also needed in Porto Rico to determine whether they had penetrated that island before the arrival of the Arawak.

* For further discussion of the kinds of archaeological research in Porto Rico, see de Hostos (1941: 3-4).

† De Hostos once published a plan for such a study, but, so far as the writer is aware, it has never been carried out (de Hostos, 1919: 399).

From the ethnological sources, we know that the Arawak were followed into the West Indies by a second group of agriculturalists, the Carib. More warlike and seafaring than either the Ciboney or the Arawak, the Carib arrived only a generation or two before the time of historic contact, conquered the Igneri branch of the Arawak in the Lesser Antilles, and, by the time of Columbus, were attacking the Taino branch in the Greater Antilles. Distribution studies in Porto Rico might be expected to reveal some of the effects of their attacks, of which the local Taino bore the brunt.

The Porto Rican research of the Caribbean Anthropological Program has been designed to realize these potentialities. In the hope of shedding light on the relationships among the Ciboney and Taino Indians of the



FIGURE 1. Map of the West Indies.

Greater Antilles and the Igneri and Carib of the Lesser Antilles, we present in this series of reports a detailed reconstruction of space and time perspective on the island.

*Previous Work of this Kind**

It will be necessary for an understanding of the work of the program to mention the most pertinent observations of the previous investigators, both in Porto Rico and on neighboring islands. Between 1869 and 1871, an American geologist, William H. Gabb, obtained the first stratigraphical sequence in the West Indies—if not in the New World—while digging a cave on Samaná Bay in the northeastern Dominican Republic (FIGURE 1). In this cave, he encountered a thick layer of food remains, apparently with-

* For a more complete history of archeological research in Porto Rico, see the introductions to the sections on excavations.

out artifacts, beneath a much thinner pottery deposit (Gabb, 1881: 146-147). His results were confirmed in 1928, 60 years later, when Herbert W. Krieger also found nonceramic refuse beneath that of the pottery-making Indians in another cave in the same vicinity. The nonceramic remains included vessels of shell and crude, undescribed implements of bone and flaked stone (Krieger, 1929: 5-6).

Commenting upon Krieger's find, the Swedish anthropologist, Sven Lovén, has suggested that the nonceramic material may be of Ciboney manufacture. At the same time, however, he notes that the evidence is inconclusive. It proves only that Hispaniola was occupied before ceramic times (Lovén, 1935: 11-12).

In Porto Rico itself, no chronological conclusions were drawn until the second decade of the present century, when J. Walter Fewkes "easily recognized" a difference between the Arawak pottery of the Cueva de las Golondrinas, where he excavated on the north coast of Porto Rico, and that from the caves in the interior of the island. Fewkes does not describe this difference in the report of his work, but he concludes from it that the Golondrinas pottery antedates the pottery of the interior (Fewkes, 1922: 268).

In 1919, Adolfo de Hostos reported on chronological distinctions observed during the excavation of an Arawak shell heap at the site of Ostiones near Cabo Rojo (see folding map at end). The excavation was at least 4.5 feet deep, but only the first 2.5 feet yielded red "painted ware. . . . Other layers contained in their respective order: unpainted but polished ware with relief decoration; coarse ware with incised decoration; undecorated specimens; and, lastly, finger pressure-made ware of the coarsest kind" (de Hostos, 1919: 383).

With reference to painting, de Hostos's sequence was confirmed in 1927 by Samuel K. Lothrop (1927: 324-331). That archaeologist had also undertaken stratigraphical excavations at the site of Punta Ostiones, and he too had observed that painted sherds were more common in the upper than in the lower levels. He makes no reference, however, to the other differences observed by de Hostos.

Lothrop also made an archaeological survey of the island, and he was able to contribute several observations concerning the geographical distribution of the pottery. He recognizes three classes: buff ware (apparently not present at the Punta Ostiones site), brown ware (the predominant type in the lower levels at Punta Ostiones), and brown ware with a red slip (the type characteristic of the upper levels; also called "red ware"). Lothrop reports that the buff ware is to be found chiefly on the south coast of the island, whereas the brown ware is spread throughout and is therefore the more typical of Porto Rico. A red slip occurs on the brown ware principally in the west and south (Lothrop, 1927: 324-331).

The buff ware, according to Lothrop, "shows extremely close affiliations with ceramic remains from Haiti, Jamaica, and Cuba, from which it may be plausibly argued that it is the product of the Tainan . . . Arawak group, the first migratory wave from South America." The brown ware, on the other hand, has the "strongest local flavor" and therefore may be considered

an indigenous development, apparently from the buff ware. The red slip, as found on the brown ware, "shows affinity with the Lesser Antilles" and may have developed as a result of late influences from the Carib Indians (Lothrop, 1927: 331).

In 1924, a Danish anthropologist, Gudmund Hatt, published a report on excavations which he had undertaken in the Virgin Islands, just east of Porto Rico (FIGURE 1). This report does not deal specifically with the situation in Porto Rico, but it has considerable bearing upon it, for the culture of the Virgin Islands seems to be very similar to that of Porto Rico. Hatt classified the sites he excavated into three chronologically successive groups. The earliest, consisting of three small shell heaps at Krum Bay, St. Thomas, contained no pottery except for a few sherds near the surface. Long narrow axes, hammerstones, and quantities of red ocher were apparently the only other artifacts present (Hatt, 1924: 31).

The second group of sites, typified by that at Coral Bay, St. John, and by the site of Longford, St. Croix, yielded fine, thin pottery, often decorated with white-on-red (and more rarely, with yellow). Most of the vessels were round bowls having straight or flaring rims. Annular bases, D-shaped handles (often with a peg on the top), and "flat handles with faces in relief" are the other elements of decoration mentioned (Hatt, 1924: 33).

The third, and apparently the latest, group of sites is typified by that at Magens Bay, St. Thomas, and by the one at Salt River, St. Croix. The pottery in these sites also consists of bowls, but many are boat-shaped rather than round. Moreover, the tops usually curve inwards instead of flaring outwards, and upon the shoulder thus formed are often incised designs, figures in relief, or handles. White-on-red painted decoration does not occur, but there is red paint on the rims of some shallow dishes and plates, and a few sherds bear black and red decoration. Other objects found in the latest groups of sites, but apparently not in the earlier groups, include spindle whorls made from potsherds; small, three-pointed objects of stone and shell; tubular stone beads; bone spatulas; carved shell discs; and engraved shell amulets. In addition, Hatt excavated a ball court at one of the sites of the third group and found there fragments of stone collars (Hatt, 1924: 38).

Only the apparent simplicity of the artifacts from the first group of sites, at Krum Bay, indicated that this group preceded the other two. The material in the top layers of the Coral Bay-Longford sites, however, was similar to that at the bottom of the Magens Bay-Salt River sites, a fact which leaves no doubt that the former were occupied before the latter. Also, it would appear that the second and third groups of sites, if not the first, represent a continuous sequence of cultural development.

As for the relationships between the contents of the three groups of sites and the cultures elsewhere in the Antilles, Hatt draws several interesting conclusions (Hatt, 1924: 31, 40-42). He suggests that the Krum Bay finds may be "remnants of a culture, earlier and more primitive than those in the other sites," but at the same time he notes that there is no resemblance to the Ciboney culture of Cuba. (He was apparently unaware of the pre-

ceramic remains in the Dominican Republic.) The Coral Bay-Longford group of sites is not identified ethnographically, but its pottery is said to resemble that in the rest of the Lesser Antilles, particularly in the presence of annular bases and in the white-on-red painted decoration. The Magens Bay-Salt River pottery, on the other hand, is stated to have many similarities with the ceramics of the Taino Indians in the Greater Antilles, as indicated by the boat-shape and the incised decoration. The ball court, the stone collars, and the three-pointed stones also link the third group of sites with the Taino. As a result, Hatt concludes that “. . . influences from the Lesser Antilles and from the Tainan area have mingled here [in the Virgin Islands] throughout a very long time; and it is quite evident that the Tainan influence had not disappeared towards the close of the prehistoric period—on the contrary, Tainan culture traits are especially strong in the upper layers of the deposits of Magens Bay and Salt River” (Hatt, 1924: 40-41).

Commenting on Hatt's conclusions, Lovén correlates the Coral Bay-Longford sites with the Igneri Arawak in the Lesser Antilles. He suggests that the latter were eventually replaced by Arawak of the Taino group from Porto Rico (Lovén, 1935: 89).

Until Lovén's time, none of the white-on-red painted pottery so common in the Igneri sites of the Virgin Islands and the rest of the Lesser Antilles had yet been found in the Greater Antilles. In 1933, however, Dr. J. L. Montalvo Guenard of Porto Rico published pictures of white-on-red painted pottery from a site near his home town, Ponce (Montalvo Guenard, 1933: 90). He gives no descriptions of the specimens, nor does he discuss their significance, but the sherds obviously resemble the painted pottery of the Lesser Antilles and there is little doubt that they indicate an extension of that ceramic style into Porto Rico, the closest of the Greater Antilles. In the light of Hatt's findings in the Virgin Islands, it can also be assumed that the sherds are from an earlier period than the incised pottery ordinarily found in Porto Rico. These specimens indicate the presence of the Igneri, to whom Lovén attributes the earlier sherds in the Virgin Islands.

This was the situation at the inception of the Porto Rican work of Yale's Anthropological Program in 1934. Rainey, who initiated the work, was the first to recognize the full significance of the white-on-red painted sherds on the island. Learning about them from Montalvo Guenard, he undertook excavations at the Cañas site near Ponce, where they had been discovered (see folding map at end). The upper levels of this site, containing predominantly sea shells, yielded pottery similar to that at the Magens Bay-Salt River group of sites in the Virgin Islands. The lower part of the site, in which there were many crab claws but few sea shells, yielded white-on-red painted pottery like that at the Coral Bay-Longford group of sites in the Virgin Islands. Thus, the sequence at the Cañas site in Porto Rico apparently resembles that observed by Hatt in the Virgin Islands (Rainey, 1935, 1940*).

There is, however, one important difference between the two sequences. The layers found by Rainey at Cañas did not show a gradual transition in

* In place of Canas in these reports, read "Cañas" (Gannett, 1901: 20).

culture like that between the two groups of sites in the Virgin Islands. Instead, they are sharply distinct and very different in content. As a result, Rainey concludes that each layer represents a separate complex of cultural traits, to the earliest of which he gives the name of Crab culture (after the principal animal remains of the lower level) and to the later, Shell culture (after the animal remains predominant in the upper level). He suggests that each of these cultures may represent a separate migration from South America.

This is quite different from Hatt's and Lovén's formulation for the Virgin Islands of a single cultural sequence changing gradually as the result of diffusion, first from the Lesser, and then from the Greater Antilles. Rainey's conclusions make it impossible, for example, to apply Lovén's terms *Igneri* and *Taino* to the Crab and Shell cultures respectively, for the *Igneri* lived in the Lesser Antilles almost until historic times, and Rainey assumes that by then his Crab culture had been replaced by the Shell. Rainey does not discuss this discrepancy between the previous conclusions and his own. He simply assigns the Coral Bay-Longford group of sites to his Crab culture and the Magens Bay-Salt River group to his Shell culture (Rainey, 1940: 158-161).

In addition to the site at Cañas, Rainey excavated at three other places in Porto Rico, seeking to determine whether both the Crab and the Shell cultures were distributed throughout the island (see folding map at end). At two of the places, Coto on the northwestern coast and Monserrate on the northeastern coast, he found the same sequence of Crab culture overlaid by Shell as at Cañas, but without such a sharp difference in strata and in the stratigraphical distribution of the two cultures. The third site, Collores near Juana Diaz on the south central coast of Porto Rico, yielded a mixture of Shell culture material with some Crab, including two red-on-white painted sherds at the bottom of the site. These excavations demonstrate that both the Crab and the Shell culture are to be found on all sides of the island, but they do not corroborate the sharp distinction between the two cultures that was observed at Cañas. Nevertheless, Rainey maintains his original opinion that the Crab and Shell cultures are not directly connected.*

In addition to his formulation of the Crab and Shell cultures, Rainey drew the following conclusions concerning the distributions of elements of the Shell culture at Cañas, Coto, and Monserrate: "A stratigraphic study of the marine shell deposit in Barrio Cañas disclosed that modeled head lugs applied to vessels, increased in number during the late period of occupation. Bat heads are the most widely distributed and distinctive form of these lugs. It was suggested that the modeled heads might indicate a late introduction from another region. In the Coto deposits, modeled lugs also increased in number during the late period, while bat heads were more numerous than at Cañas. At Monserrate, modeled head lugs were very rare and bat heads were absent. Since Coto is on the northwest coast,

* The excavations at Coto and Monserrate have been published by Rainey (1940: 62-96). The excavation at Collores, however, has not been mentioned before in print. The present writer is responsible for the above observations concerning it.

Cañas on the southwest coast, and Monserrate on the northeast coast, this distribution and position in the deposits may illustrate an introduction of modeled lugs, and particularly the bat head elements, from the west. . . . Modeled lugs resembling the bat heads are numerous in Santo Domingo, west of Porto Rico, and it is significant that they are more numerous in western than in eastern Porto Rico.

"Another indication of diffusion during the era of the Shell Culture is the presence in the Monserrate deposit of a large number of Crude Ware sherds with rough red painted designs. Only six sherds of this kind were found at Cañas and none at Coto. A large number of sherds from the Virgin Islands, now in the collections of the Heye Museum, are of this type. From these facts, the suggestion is made that the use of curvilinear designs in red for decorating Crude Ware of the Shell Culture was introduced from the Virgin Islands, that it was a common practice at Monserrate, rarely employed at Cañas, and not introduced at Coto. This would suggest a diffusion from east to west during the period of the Shell Culture" (Rainey, 1940: 109).

Incised as well as modeled elements of ornamentation increase in frequency from bottom to top of the Shell strata at Cañas and Monserrate (Rainey, 1940: 34, 84). These increases led Rainey to divide the Shell culture into two phases, early and late, "with the distinction based on more complex pottery ornamentation in the late phase" (Rainey, 1936: 7-8).

Rainey has also observed a difference in culture between the coastal shell heap sites, in which he did his main research, and the ball courts of the mountainous interior, where he excavated briefly during a later field trip. Before excavation, he was inclined to consider the ball courts a "problematic recent culture," different from either the Crab or Shell culture (Rainey, 1935: 13-14). The excavations revealed, however, that the courts belonged to the Shell culture, although some sherds in Ball Court 2 at Barrio Sabana, Orocovis, bore more complicated incised designs than those in the coastal shell heaps. The most striking feature of these designs is "a circle or an ellipse enclosing a central puncture. These elaborate incised sherds, although bearing some elements found on coastal pottery, distinguish the Barrio Sabana No. 2 court from the other three excavated and introduce a curious problem in the explanation of the relation between the ball-court sites and the large shell middens" (Rainey, 1940: 101).

To conclude this summary of the previous observations on the distributions of culture in Porto Rico and on the neighboring islands, we may note an appendix to the report by J. Alden Mason on the Capá site near Utuado in Porto Rico (Mason, 1941). This appendix, prepared by the present writer (Rouse, 1941), consists of analyses of the artifacts obtained by Mason and his associates, R. T. Aitken, N. C. Britton, and H. K. Haerberlin, at the ball court of Capá, at two other ball courts near Utuado, at two caves in the same vicinity, and at the shell heap of Montalva near Lajas (see folding map at end). The analyses indicate that the three ball courts are contemporaneous with the late phase of the Shell culture, as defined by Rainey. (Their pottery is like the divergent material which Rainey obtained

at Ball Court 2 in Barrio Sabana, Orocovis.) The two caves and the shell heap, on the other hand, seem to be contemporaneous with the early phase of the Shell culture. The material from the various sites does not differ from that described by Rainey, and therefore need not concern us here.

Problems Arising from the Previous Work

The reports of the previous workers raise a number of problems as to Porto Rican culture and its distribution, the resolution of any one of which might profitably have been the object of the present study. Are there, for example, preceramic cultures in Porto Rico, as in the Dominican Republic and the Virgin Islands on either side of Porto Rico? Can we attribute such preceramic remains to the Ciboney Indians? Do the ceramics of Porto Rico differ markedly from place to place, as stated by Lothrop, or are they geographically homogenous, as implied by Rainey? Were the similarities in pottery with the Greater Antilles early, as suggested by Lothrop, or were they late, as indicated by Hatt? Does Rainey's Crab-Shell sequence include all of the ceramic remains in Porto Rico? Did the changes in the elements of the Crab and Shell cultures happen all at once, as supposed by Rainey, or were they distributed over a period of time, as implied by Hatt? Can the Crab culture be attributed to the Igneri Indians and the Shell culture to the Taino? If so, did the latter develop in the Greater Antilles, as asserted by Hatt and Lovén, or was it a result of a migration from South America, as postulated by Lothrop and Rainey? Finally, how do the Carib fit into the picture? Is Lothrop correct in suggesting that they were the source of the red-painted pottery in Porto Rico?

In view of the number of these problems, it has seemed inadvisable in this study to concentrate on any one of them. Instead, the aim has been to make a comprehensive survey of the distribution of Porto Rican culture, in the hope that the problems would resolve themselves when viewed from the standpoint of such a study.

PROCEDURES

Field Work

Since the combinations of individual traits into cultures had been well worked out in the previous investigations, it has not seemed advisable to undertake the extensive excavations whereby such cultures are best revealed. Instead, we decided to dig small pits in a large number of sites, in the hope of obtaining a series of stratigraphical sequences with which to place the traits in time and also of collecting data on their geographical distribution.*

It was originally planned to supplement the material obtained from the pits with collections from the surfaces of the sites not excavated.† This proved to be impracticable, however, for the artifacts which could be collected upon the surface of any one site were too few in number to provide an adequate sample for comparison with the excavated material. Nevertheless, a survey was made of as many as possible of the Porto Rican sites, in order to provide a broad basis for selecting the places to be excavated, and also to obtain information on the geographical distribution of the types of sites. Altogether, 434 reports of sites were investigated; 281 of them were found to be authentic.‡

The area of the survey included Porto Rico itself and the small islands of Mona and Vieques off the west and east coasts of Porto Rico, respectively (see FIGURE 3 and folding map at end). Culebra, the other island to the east which is under the jurisdiction of Porto Rico, was not visited. As each site was surveyed, a judgment was made as to the importance of digging there. Excavation was undertaken only where it seemed to be needed either to cover fully the various types of Porto Rican sites, to include all parts of the island and all kinds of environment, to provide a complete stratigraphical sequence, or to exemplify all possible types of artifacts. Altogether, 44 sites were chosen for excavation.

One pit was dug in each site (PLATE 1), except in the few cases where the first pit yielded very few artifacts and it was thought that another part of the site might yield a greater number. Two pits were also excavated at the only site where the surface finds indicated that one part of the site was older than another. All the pits were sunk into refuse, ball courts and other artificial structures being avoided. In so far as possible, the pits were placed in the deepest parts of the refuse, where they would yield the maximum amount of stratigraphical data, and in the areas in which the specimens were most numerous, in order to secure the largest possible sherd sample.

Each pit was composed of four sections two meters square, staked out if possible in the form of a square four meters on a side. At a few sites where the nature of the terrain or the presence of crops made it impossible to do this, the sections were dug in the form of a trench eight meters long. Arti-

* For another use of this procedure, see Willey and Woodbury (1942).

† As in Spier (1919).

‡ The notes on these sites have been deposited in the Yale Peabody Museum, where they are available to those who are interested.

facts were so rare at several sites that the four original sections were increased to six or eight in an effort to obtain an adequate sherd sample.

Each section was dug in 25-centimeter levels, its artifacts being bagged according to section and level. No attempt was made to record the exact positions of the specimens within the sections and levels except in dealing with the most unusual finds; nor were the artifacts segregated according to soil strata, except at one site, where two strata seemed to differ in culture. At the latter site, all specimens within the level in which the change in strata took place were bagged according to stratum as well as to section and level.

All four sections in each pit were excavated simultaneously by a crew of eight men, two of whom were assigned to each section. One man worked with a pick and shovel in the section, throwing the soil outside to the other man, who searched it for artifacts and animal remains. Upon discovery of burials, fire pits, or other artificial structures, excavation was stopped and the writer dug carefully with a trowel, brush, and knives until the structure had been uncovered for charting and photographing. Charts and photographs were also made of the walls of each pit, and, as usual, the site itself was mapped and photographed, the pertinent facts concerning its appearance and composition being recorded in notes.

All artifacts were preserved, however small and fragmentary, except for the plain sherds (those which bore no traces of shape, slip, or decoration). Even the smallest rim sherds, for example, were kept, because of what they showed concerning rim profiles. All animal bones were preserved, but we bagged only a sample of the shells from each pit.

Altogether, 59 pits were dug in the 44 different sites. The number of specimens collected exceeds 40,000, or an average of nearly 1,000 per site.

The procedure of excavation was rather crude, and it has resulted in the partial destruction of a few artifacts and several of the artificial structures within the soil. The procedure seems justified, however, by the fact that the primary aim of the digging was not to develop a detailed description of the culture but to obtain data on distributions. It is to be hoped that, in the future, additional excavations, done in a more intensive and a more careful manner, will be undertaken in the larger sites from a descriptive standpoint.*

Laboratory Procedure

The aim of the laboratory work was to formulate units of culture for use in tracing distributions. Four kinds of classification were undertaken for this purpose. First, the writer classified the artifacts in terms of their component parts. All available Porto Rican collections were treated in this manner, but the work was limited to the pottery vessels and to their sherds, it not being considered necessary to examine the artifacts of stone, bone, shell, and coral in such detail. The following is an outline of the procedure: (1) identification of the component parts of the specimens; (2) classification of the specimens in terms of these components; (3) selection of typical

* Similar to Mason's excavations at Capá (Mason, 1941).

components; (4) definition of types of components; (5) testing of the definitions; and (6) naming of the types.*

The identification was accomplished by applying to the specimens the terms ordinarily used in archaeology to refer to the component parts of ceramic vessels and of their sherds. Each potsherd, for example, was examined for the presence of the attributes by which one usually identifies temper, rims, handles, incision, *etc.* Components like these were considered to be culturally distinctive and therefore worthy of study.

Each component was used as the basis for distributing the specimens into a series of classes. Sherds having rims, for example, were distributed into classes on the basis of their rims. If they also bore handles, they were redistributed into classes of handles. If also incised, they were, in addition, assigned to classes of incision; and so forth. In each case, this was done solely by comparing the appearances of the components, terminology and the previous formulations of archaeologists being avoided in so far as possible in order to reduce the amount of bias and to allow the components to "speak for themselves."

The most representative components in each class were selected for further study. As in forming the classes, this was done solely by comparing the appearances of the components and without recourse to previous archaeological formulations. In dealing with rims, for example, the writer simply chose those in each class which seemed to be the most typical.

In the case of each class, a list was next made of the attributes distinctive of its typical components and shared by all of them. This was done in an attempt to comprehend the essential character of the components or, in other words, to define the type exemplified by the components. Each list of attributes constitutes the definition of a type.

In order to test the definitions, a certain number of artifacts were reclassified in terms of each list of attributes. If this reclassification produced the same result as the original classification, it was assumed that the type had been correctly defined. If not, new typical components were selected and a new set of attributes was derived from them.

Each type was given a dual name, consisting of the noun applied to the corresponding components in order to identify them (step 1) and an adjectival term used in defining the type (step 5). The principal types of handle, for example, are the "loop handle" and the "D-shaped handle." Such names are applied not only to the types but also to the corresponding classes and components. Thus, one may speak of the type "loop handle," of the "loop" class of handle, and also of the "loop handles" which constitute the class.

For the purposes of this study, the types of components are more important than the classes or the individual components of the artifacts. In order to distinguish these types from the types of complete artifacts which are discussed below, they will be called "modes."† Each mode is a kind of part of artifacts. It consists of *the character, form, or structure common*

* This is the procedure developed in the writer's previous West Indian research (Rouse, 1939: 11-35 and 1941: 13-23).

† As in the writer's previous research, cited above.

to components of a number of artifacts and distinguishing them as a class.* Although, in accordance with the procedure just described, each mode is defined in terms of a number of attributes, it is assumed to be a single entity. It is regarded as a ceramic custom (Rouse, 1939: 15-23).

The second stage in the laboratory procedure was to classify the pits in terms of the modes. Not only the writer's pits, but also Rainey's excavations, were treated in this manner. The work of previous archaeologists had to be ignored, however, for none of them had dug according to section and level, and, as a result, their collections could not be manipulated in the necessary manner.

Only a part of the material excavated by Rainey during his first field trip has been available for classification. Many of the specimens collected during that trip, as well as all of those obtained subsequently, were deposited by Rainey at the University of Puerto Rico, where, at the time of the writer's visits, they had not yet been unpacked. As a result, it has been possible to study only the four of Rainey's sites excavated during his first trip, Cañas, Collores, Coto, and Monserrate.

Except at Collores, Rainey dug much more extensively than the writer. In an attempt to make his excavations at the other sites equivalent to the writer's, groups of one or more sections have been selected from each of them, and these groups, which will be called "pits," have been treated in the same manner as the writer's pits.†

The following is an outline of the procedure used to classify the pits: (1) counting of the specimens in each pit according to the modes; (2) classification of the pits in terms of the modes; (3) selection of typical pits; (4) formation of styles; (5) elimination of combined styles; and (6) naming of the styles.

In counting the specimens, the writer worked from level to level and, within the levels, from section to section, determining in each case the number of specimens, of which one or more parts corresponded to each mode. In making this count, just as in originally forming the modes, he worked intuitively, except in cases of doubt, when he examined each artifact rationally for the presence of the attributes diagnostic of the modes.

Lists were next made of the modes represented in each pit, together with their numerical frequencies. Comparisons of these lists revealed that many pits were characterized by the same modes. Accordingly, the pits were grouped on the basis of the lists. This was done purely by inspection, it not being considered necessary to calculate association coefficients as advocated by Kroeber (1942). All the pits which had a majority of their more frequent modes in common were placed in the same class.

One or more of the pits in each class were selected to be typical of the class. As in classifying the pits, this was done by comparing the lists of modes. Avoiding, in so far as possible, all previous formulations, the writer

* These definitions are adapted from the ones for "mode" and "type" in *Webster's New International Dictionary*, second edition.

† Only single sections were chosen from the Monserrate excavations, because each section at that site, being four meters on a side, was equivalent to one of the writer's pits. At the Coto site, the size of the sections was the same, but it was not practicable to use single sections as pits, because very few specimens had been preserved from each of them. Instead, each Coto pit consists of four sections. The same is true of the pits at Cañas, where Rainey's sections were only two meters square.

attempted intuitively to select the pits in each class which had the most representative lists.

In the case of each class, a compilation was made of the modes shared by the typical pits. These modes are assumed to constitute a complex, recurring in all pits of the class. As such, they will be termed a "style."^{*}

Comparison of the styles revealed that some contained all of the modes present in two or more others. That is, some styles appeared to be combinations of others. It seemed likely that the pits from which these combined styles were derived were not homogeneous.[†] These pits were accordingly restudied in terms of their sections and levels, and in all cases it proved possible to divide them into parts, each containing a different style. The combined styles were therefore eliminated, leaving only those which occurred singly, either in complete pits or in parts thereof.

This did not entirely solve the problem of non-homogeneity, for in most pits, or in the parts into which they have been divided, there still exist a few sherds which seem to conform to a style other than the predominating one. No way has been found to eliminate these intrusive sherds. Some of them appear to be the result of a mechanical mixture of refuse characterized by different styles, some seem to be trade objects, and others probably reflect transition from one style to another, either through time or in space.

In recognition of the fact that the styles were the result of classification of the pits, each was given the name of a typical site. In so far as possible, a rich site, and also a completely homogeneous one, was chosen, for it was desired that the name reflect the place where the style is best represented and is in its purest form.

For purposes of this paper, a style may be defined as *the modes shared by a group of pits, or divisions thereof, and distinguishing them as a class*. In other words, each style is a complex of modes which recurs from site to site. In the sites where it occurs alone, it is supposed to represent all of the ceramic customs present.

From the classification of sites, attention was turned again to the classification of artifacts, this time as complete objects rather than in terms of their component parts. All available Porto Rican artifacts were studied from this standpoint, in an attempt to make the types as representative as possible. An outline of the procedure follows: (1) identification of the artifacts, (2) classification of the artifacts, (3) subdivision of the classes, (4) selection of typical artifacts, (5) definition of types, (6) testing of the definitions, and (7) naming of the types.[‡]

For purposes of identification, the names in general use in the West Indies to refer to complete artifacts, such as bowl, jar, and celt, were first applied to the specimens. This was done by determining which specimens, whether complete or fragmentary, have the attributes usually implied by such terms.

^{*} As in Kroeber and Strong (1924) and in subsequent Peruvian reports. The concept of style is present only implicitly in the writer's previous research (cited above), as it also seems to be in the pottery types of the southeastern and southwestern United States (Krieger, 1944).

[†] The term "homogeneous" is used here in its statistical sense, to refer to specimens which can be considered samples of a single stylistic population (Simpson and Simpson, 1939: 166-169).

[‡] This procedure is basically the same as the one used to form types in the writer's previous research (cited above), but with the stylistic element removed. The procedure is intended to be comparable to those in Kidder (1932) and Osgood (1942).

Each potsherd, for example, was examined as to whether it had the attributes of a bowl, a jar, or a bottle. Specimens too small to be identified in this manner were ignored.

All of the artifacts having the same identification and made of the same material were grouped together and were considered to form a class. For example, all clay bowls, whether complete or fragmentary, were placed in one class; the stone bowls were placed in another.

The artifacts in most classes were so much alike that no further division was attempted. In a few cases, however, it was considered advisable to form smaller groups on the basis of the appearance of the artifacts as complete objects. The clay bottles, for example, were treated as a single class, because there seemed to be no appreciable differences between them, whereas the clay bowls were divided into sub-classes in order to eliminate such differences.

Artifacts representative of each class or sub-class were selected for further study. This was done by comparing the artifacts of the class in terms of their appearance, terminology and the previous formulations of archaeologists being avoided in so far as possible in an attempt to eliminate bias. The writer simply chose the artifacts which seemed to be typical of their class or sub-class.

In the case of each class or sub-class, a list was made of the attributes distinctive of its typical artifacts and shared by all of them. This list is intended to express the essential character of the class, or, in other words, to define the type to which the artifacts in the class conform.

Some artifacts in each class or sub-class were reclassified in terms of their diagnostic attributes in an attempt to eliminate errors in definition. If the reclassification produced the same result as the original classification, it was assumed that the definition was correct. If it did not, new typical artifacts were selected, and a new set of attributes was derived from these artifacts.

Each type was given a name consisting of the noun originally used to identify the artifacts in its class (step 1), an adjective referring to its material (step 2), and, in the case of the types derived from sub-classes, another adjective taken from the list of the diagnostic attributes (step 5). The names include, for example, "stone celt" and "open clay bowl." When in the singular, like this, the names refer to the types. When in the plural, they refer to the corresponding classes or to the artifacts in the classes. Thus, we may speak of the class of stone celts and of the stone celts themselves.

A few artifacts which have dual identifications have been given double names. Some stone celts, for example, also show traces of use as hammers and are, therefore, called "celt-hammers." They are considered to be different in type than either the plain celts or the pure hammers.

It will be apparent that the procedure of classifying the artifacts as complete objects was parallel to that used to classify them in terms of their component parts. The resultant types of complete artifacts, which will be termed simply "types," differ from the modes only in that each refers to entire specimens instead of to their component parts. Each type may be defined as *the character, form, or structure common to a number of artifacts and*

*distinguishing them as a class.** Each is considered to be a kind of tool, utensil, or other object used by the natives during the course of their cultural activities.

So far, it has been assumed that only the artifacts were typed. Actually, this paper is also concerned with types of sites, of their features, and of other traces of habitation within the sites. These have been formulated in the same manner as the types of artifacts, except that the procedure has not been so formal or as thorough.

The final stage in the laboratory procedure consisted of another classification of the pits, this time in terms of the types rather than the modes. As in the previous classification, this work was limited to the pits dug by Rainey and by the writer, they being the only ones excavated according to section and level. The following is an outline of the procedure: (1) counting of the artifacts from the standpoint of style and type, (2) division of the pits into groups of sections and levels on the basis of their styles, (3) classification of the divisions in terms of their types, (4) formulation of cultures, and (5) naming of the cultures.†

Working from level to level in each pit, the writer first counted the number of artifacts in each section which conform to each style and type. In the case of the styles, this work was limited by definition to the pottery vessels and their sherds. When sections and levels were stylistically homogeneous, it was necessary only to record the number of ceramic specimens present. Usually, however, the writer had to determine how many of the specimens exemplified each style. This was done intuitively, except in cases of doubt, when each artifact was examined rationally for the presence of the modes comprising the styles. Even so, the procedure was not always conclusive, for the styles, being multiple entities, are poorly reflected in single specimens. Moreover, some potsherds retain too few of the vessel components for adequate stylistic identification. Nevertheless, even the doubtful specimens were counted.‡

Not only the ceramic specimens but also the artifacts of stone, bone, shell, and coral were counted from a typological standpoint. Again, the procedure was intuitive except in cases of doubt, when each artifact was examined rationally for the presence of the attributes diagnostic of the type. If the artifacts were too fragmentary to exhibit enough of these attributes, as was true of some potsherds, it was not counted.

The next step was to divide the pits into stylistic units. For this purpose, tables were compiled showing the relative frequency of the styles according to section and level within each pit. If one style was predominant in all sections and levels of a pit, the latter was considered to be a single stylistic unit. If not, the pit was divided into smaller units. Working from level to level in each pit, the writer grouped together all of the sections in which a majority of the sherds were of the same style. This produced a series of divisions, each of which was named after its predominant style.

Lists were next made of the types represented in each division, and in each

* This definition is taken from *Webster's New International Dictionary*, second edition.

† Except for the use of styles in place of individual modes, this procedure is similar to the one used in the writer's previous Antillean research (Rouse, 1941b: 22-23 and 1942: 160-166).

‡ It was found helpful in some cases to proceed by elimination, for the styles to which a given sherd did not conform were often more apparent than the one to which it did.

of the undivided pits. To these lists were added the names of the associated types of sites, of features within the sites, and of animal remains. The lists were then used as the basis for classifying the divisions and pits, all those which had a majority of their types in common being assigned to the same class.

In the case of each class, a compilation was next made of the types represented in its component divisions and pits. These types are assumed to constitute a complex recurring in all of the sites of the class. As such, they will be called a "culture."*

Since the above procedure produced the same two cultures previously formulated by Loven (1935: vi ff.) and Rainey (1940: 110 ff.), the same terminology has been used. To each culture has been applied the name for its corresponding ethnic division, as used by Lovén, and, alternatively, the name for a typical food, as proposed by Rainey.

Among the sites excavated were several which lacked pottery and which, therefore, could not be treated according to the above procedure. Lists were made of the types of artifacts represented in each of these sites. Since the lists are alike, they have been compiled to formulate a non-ceramic culture named after a typical site and, alternatively, after the corresponding ethnic group.

For the purpose of this paper, a culture may be defined as *the types shared by a group of pits, or divisions thereof, and distinguishing them as a class*. In other words, each culture is a complex of types which recurs from site to site. In the sites where it occurs alone, it is supposed to comprise all of the kinds of artifacts represented.

It has not been considered pertinent to the objectives of this paper to fit the cultures into a taxonomic framework. For the benefit of those who are interested in such an approach, however, it may be noted that our pits, or divisions thereof, are equivalent to "components" in the Midwestern Taxonomic System, and our cultures, to "aspects" (McKern, 1939†). It is hoped that, in the future, someone will see fit to elaborate upon these units from a taxonomic standpoint.

Method of Interpretation

In all, the laboratory work resulted in the definition of some 200 modes, 6 styles, 130 types, and 3 cultures. It remained to trace the distribution of these units.

The procedure used to trace distributions has been described in detail elsewhere (Rouse, 1939: 27-35), and therefore only a summary will be given here. The procedure began with the formulation of a time scale, or sequence of periods. It was known that at least two of the styles, the Boca Chica and the Capá, were late, for they had been found in association with European trade objects and in sites mentioned in the historic sources. These two styles are almost entirely limited to the western part of Porto Rico. To the east, a third style, the Esperanza, is analogous to the first two.‡ All three

* As in Rainey (1940: 110 ff.) and Rouse (1942: 160-166).

† See also Osgood (1942: 52-56) and Rouse (1941: 155-168).

‡ The term "analogous" is used here, as in Colton (1943), to refer to the sharing of modes of decoration by different styles (or, in Colton's terminology, to the sharing of styles of decoration by several types).

have been found together along the line of juncture of their areas of distribution, and therefore they are assumed to be contemporaneous. They are considered diagnostic of the latest period on the Porto Rican time scale.

Two other styles, the Ostiones and the Santa Elena, also have different distributions and yet are analogous to each other. They center, respectively, in the western and eastern parts of the island, occurring together in numbers only along a line of contact in the central part of the island (and in one exceptional site to the east). Consequently, they are assumed to be contemporaneous. In a number of pits, one or the other of them had been found beneath one of the three late styles. This led to the conclusion that the Ostiones and Santa Elena styles belong to an earlier period than the Boca Chica, Capá, and Esperanza.

One other style, the Cuevas, remained to be fitted into the sequence. This had been found throughout the island, in several pits beneath the Ostiones style. Consequently, it was assumed to mark still an earlier period.

Finally, there were the few pits which lacked pottery. These were put at the bottom of the sequence in the belief that a preceramic period may have existed in Porto Rico, as on the neighboring islands. This gave the following sequence:

Period IV: Boca Chica, Capá, or Esperanza style;

Period III: Ostiones or Santa Elena style;

Period II: Cuevas style;

Period I: no pottery.

The pits assigned to Period IV fall into two groups, those containing European trade objects and those without. This was made the basis for subdividing the period as follows:

Period IVb: European objects;

Period IVa: no European objects.

Study of the pits containing the Ostiones style revealed that, in many of them, incision was limited to the upper levels. This made it possible to divide Period III into the following parts:

Period IIIb: incision;

Period IIIa: no incision.

This sequence holds true only for the Period III sites in the western part of the island, where the Ostiones style predominates. In the Period III sites to the east, which are characterized by the Santa Elena style, incision occurs in all levels and no comparable changes in the style have been noted. In several sites, however, Santa Elena sherds have been found above Ostiones pottery dating from Period IIIa, giving the following sequence:

Period IIIb: Santa Elena style;

Period IIIa: Ostiones style.

As will be explained below, our data are not sufficient to demonstrate whether this sequence applies to the entire eastern part of the island or only to the east-central section, where the Ostiones and the Santa Elena styles seem to have been in contact and the latter may have encroached upon the former. Nevertheless, we* assume that the Santa Elena style was everywhere limited to Period IIIb, basing our assumption on the fact that there is no evidence of its existence in Porto Rico during the first half of Period III.

Study of the Period II pits, characterized by the Cuevas style, revealed that in some of them white painting was limited to the lower levels. This made it possible to divide Period II into two parts, as follows:

Period IIb: no white painting;

Period IIa: white painting.

It has not proved possible to subdivide Period I. No significant distinctions according to level have been noted in the sites assigned to that period, and therefore it is assumed that they are chronologically homogeneous.

In summary, the following sequence has been used to date the excavations reported in this paper:

Period IVb: Boca Chica, Capá, or Esperanza style with European Objects;
 Period IVa: Boca Chica, Capá, or Esperanza style without European objects;

Period IIIb: Ostiones style with incision, or Santa Elena style;

Period IIIa: Ostiones style without incision;

Period IIb: Cuevas style without white paint.

Period IIa: Cuevas style with white paint;

Period I: no pottery.

Geographically, the country of Porto Rico was also divided into a series of areas, which are intended to constitute a scale in space comparable to that in time. These areas are purely topographic; Figure 3, the folding map at the end, and the following list of names, will give some idea of their extent: (1) Mona Island (to the west of Porto Rico); (2) west coast of Porto Rico; (3) north coast of Porto Rico; (4) mountainous interior; (5) south coast of Porto Rico; (6) east coast of Porto Rico; and (7) Vieques and Culebra Islands (to the east of Porto Rico).

The pits situated in each of these areas were in turn dated according to period and (where possible) sub-period. All pits without pottery were assigned to Period I. In the ceramic pits, the dating was done by section and level. All sections in each level containing a majority of sherds of the Cuevas style were placed in Period II. Those containing mainly sherds of the Period III styles were placed in that period; and so forth. If the Period II levels contained appreciable numbers (more than three) of white painted sherds, they were placed in Period IIa; if not, they were placed in Period IIb; and so forth.

It had been hoped to determine the chronological positions of the pits within Periods II and III more precisely than this by comparing the percentage frequencies of the more important modes by levels, as previously done in northern Haiti (Rouse, 1939: 76-82). An attempt was made to do this in the west coast area, but it had to be abandoned because of discrepancies between the datings reached by studying the percentage frequencies of the different modes. Apparently, the assumption underlying such statistical study, that similarities in percentage frequencies indicate contemporaneity, does not hold true for Porto Rico, either because the refuse did not accumulate at the same rate in different sites or because it was not continuously deposited in the same places.

After dating of the pits, attention was turned to the tracing of distribu-

tions. Working from area to area, the writer compiled lists of the modes, styles, types, and cultures present in the pits (or parts thereof) assigned to each period. Significant differences in occurrence and in frequency of occurrence within the pits (or their parts) were also noted. These data provided the basis for tracing the distribution of the modes, styles, types, and cultures from period to period in time and from area to area in space. Information from other collections was used wherever possible, but only supplementarily, for this information could not be accurately dated in the absence of information as to sections and levels.

Finally, an attempt was made to explain the distributions traced. This was done by developing theories of trade, migration, persistence, evolution, and fusion of culture.

Manner of Presentation

In presenting the results of the work, we have drawn an arbitrary distinction between the sites and specimens as such and the styles and cultures derived from them. The present paper, as well as its companion in this series,* are concerned primarily with the former. Subsequent reports are intended to concentrate upon the latter.

In the present pair of monographs, we concentrate on the excavated sites and specimens, describing the conditions encountered in each excavation and listing the material obtained. We also attempt to determine the dates when the material was deposited, thereby assigning each site and specimen to its proper place in time as well as in space.

In the subsequent papers, we plan to concentrate upon the styles and cultures, referring to the sites and specimens only to illustrate these abstract categories. Our purpose will be to define the styles and cultures, as well as their constituent modes and types. In addition, we plan to trace the distribution of all four kinds of categories in terms of the dates established in the present pair of reports.

Since knowledge of the styles is necessary for the dating of the sites and specimens, we include in this report a brief summary definition of each style, without, however, itemizing the constituent modes or presenting more data concerning them than are necessary to distinguish the sherds of each style. We have also included similar definitions of the cultures for the benefit of readers who may be primarily interested in those categories.

The definitions of the styles and cultures are followed by reports of excavations, arranged according to the areas. The section on each area begins with a summary of its geography, ethnography, history, and the previous archaeological work done there. The sites which we dug in the area are then discussed in alphabetical order. Each site is described, the pits dug in it are grouped or divided into stylistic units, the contents of each unit are listed according to style and type, and the units are dated on the time scale. Then we discuss briefly the excavations of previous workers at other sites, comparing them with our own. Finally, each section ends with a summary of the datings of the various pits and of the sequence of

* Volume XVIII, part 4.

styles represented in them. General conclusions will be found in a separate section at the end of the paper.

Certain aspects of the presentation require special comment. Among the ethnographic data are included the locations of the villages of the historic chiefs, some of which can be correlated with the sites as a check upon the chronology. Unfortunately, there is considerable difference of opinion concerning the numbers of these villages and their locations. After surveying the literature,* the writer has come to the conclusion that the version of Coll y Toste is the best, needing only to be modified in certain minor respects to improve the conformity of the villages to the terrain. Also, as explained in the south-coast section, we have added one village, mentioned in a source which Coll y Toste apparently overlooked. With these exceptions, our map (FIGURE 5) and discussions of the chieftainships conform to those of Coll y Toste.†

Conflicts of interpretation are also common among the data concerning Indian-Spanish relationships. Again, the writer has attempted to survey all conflicting opinions and to present the ones which are in best accord with the sources.‡ References to important alternatives are included in the notes, but obvious mistakes are ignored.

A dual nomenclature is employed to refer to the sites, as in the following example: Ostiones (Cabo Rojo 8). The first of these is the local name for the site; the second is its designation in our survey. (It indicates that the site was the eighth one visited in the municipality of Cabo Rojo.) The local names are given precedence in this paper because they form the basis for designating the styles.§ The survey names are added because the specimens have been catalogued in that terminology.

Space has been available to present only some of the maps and charts prepared during excavation. The most important sites are fully covered, but all other drawings have been eliminated unless they illustrate some unusual feature. The unpublished maps and charts have been retained, however, and are available for inspection at the Yale Peabody Museum.

The limitations of space have also caused the exclusion of most of the tables compiled to show the location of specimens according to section and level. Only the tables necessary to an understanding of the stylistic divisions are presented here, but the rest have been retained and are available for inspection at the Yale Peabody Museum.

More than once during the course of the preparation of this report, the writer has wondered whether detailed discussion of all the excavations is worth while. Why not limit the report to the more important excavations, using them as examples of the results obtained? It is common practice in defining styles and types to describe only typical examples (*e.g.*, Osgood, 1942). Why not follow the same procedure when dealing with excavations?

After considerable thought, the writer has come to the conclusion that

* The works consulted include Bachiller y Morales (1883), Brau (1904), Brau (1907), Coll y Toste (1907), Fewkes (1907), Morales Cabrera (1932), Nazario y Causel (1893), Stahl (1889), Torres de Mendoza (1880, 34: 336-515), and Zayas y Alfonso (1931).

† See particularly his map of the chiefs' villages (Coll y Toste, 1907: 1).

‡ De Hostos (1946) appeared too late to be taken into consideration.

§ Also for the sake of consistency with Rainey (1940).

the two cases are not comparable. In defining styles or types, whether of artifacts or of sites, as planned for the subsequent report, one deals with generalities rather than with specific phenomena. Each individual artifact or site is merely an example of the custom, or general category, under discussion.* It therefore matters little which particular artifacts or sites are used to illustrate the category, so long as they are not atypical.

In the present report, as noted above, our primary concern has been not with the styles and types as such but with the time during which each site was occupied and each artifact deposited. This time may be expected to have varied from site to site, with the result that each site and artifact is, chronologically speaking, a unique phenomenon. To be sure, in order to arrive at a chronology in this paper, we have had to assign the sites and specimens to arbitrary periods, but, wherever possible, we have attempted to distinguish the position of each site and specimen within its period, and to determine whether it survived from one period to another.

In our opinion, the measure of the success of this report is the extent to which it has been possible to discriminate between the time of occupation of each site and the time when each specimen was deposited. Our success in this direction has not been so great as was hoped, but we have been able to refine the chronological conclusions of the previous writers to a certain extent. Even for this purpose, however, as the body of the report will indicate, the mass of details presented here has not been entirely sufficient.

* For an extended discussion of this point, see Rouse (1939: 9-23).

DEFINITION OF CERAMIC STYLES

Cuevas Style

The Cuevas style includes the white-on-red painted pottery discovered by Montalvo Guenard at Cañas on the south coast of Porto Rico and used by Rainey to formulate his Crab (Igneri) culture (as noted above, p. 319). This Cañas material, however, cannot alone be used to define the style, since it is limited to the first half of the period of its existence. Instead, we have chosen Cuevas, on the north coast, as the type site, and base the following definition largely upon the material obtained there.*

Material. While some Cuevas pottery is crude, the majority of the sherds are unusually well made (*cf.* PLATE 2, K and L). Fine and hard, these sherds ring like porcelain when struck with metal. They are carefully finished and typically have a sleek appearance, although, even when polished, they are usually quite dull (PLATE 2, M).

The sherds are relatively thin, averaging about 5 mm. in thickness, and yet, probably because of their excellence of manufacture, do not break as easily as the sherds of the other styles. Perhaps for this reason, there are few holes for lacing cracks. The fractures are firm and finely granular. They vary in color from light brown to ivory, many having a characteristic chocolate tinge.

Shape. Gracefulness of shape is one of the best criteria for distinguishing Cuevas pottery (*e.g.*, PLATE 2, D). This is combined with an almost universal curvature of vessel walls and surfaces, which contrasts strongly with the angularity of some other styles (FIGURE 2, A-G). There are rarely any abrupt changes in the surfaces of Cuevas sherds. Instead, each element of shape merges smoothly and harmoniously into its neighbors.

With the exception of several cylindrical mugs and spherical bottles, all Cuevas vessels can be considered variations upon a simple hemispherical structure. For the most part, however, this structure is so greatly modified that it can scarcely be recognized. The following are the principal modifications.

Instead of a simple, convex base, most Cuevas vessels seem to have had bases which were flat or slightly concave (FIGURE 2, C, D, and G). The annular base is also present and is more diagnostic, since it is almost entirely limited to the Cuevas style (FIGURE 2, B). The bodies of most vessels are circular in outline, when viewed from the top, but fragments of distorted bodies are also common (PLATE 2, E). Some of the latter are elongated or boat shaped (PLATE 2, I). Others resemble kidneys, and a few are turtle-like (PLATE 2, E).

Looked at in profile, most vessels are provided with a shoulder, separated from the rest of the body by a bend, or keel (FIGURE 2, A, D-G). This shoulder is typically concave, *i.e.*, it forms a reverse curve with the main part of the vessel wall beneath it (FIGURE 2, D, E, G). In most cases, it slopes outwards from the keel. This slope, combined with the reverse

* For previous summary definitions of the Cuevas style, see Rouse (1940: 58-59 and 1948: 511).

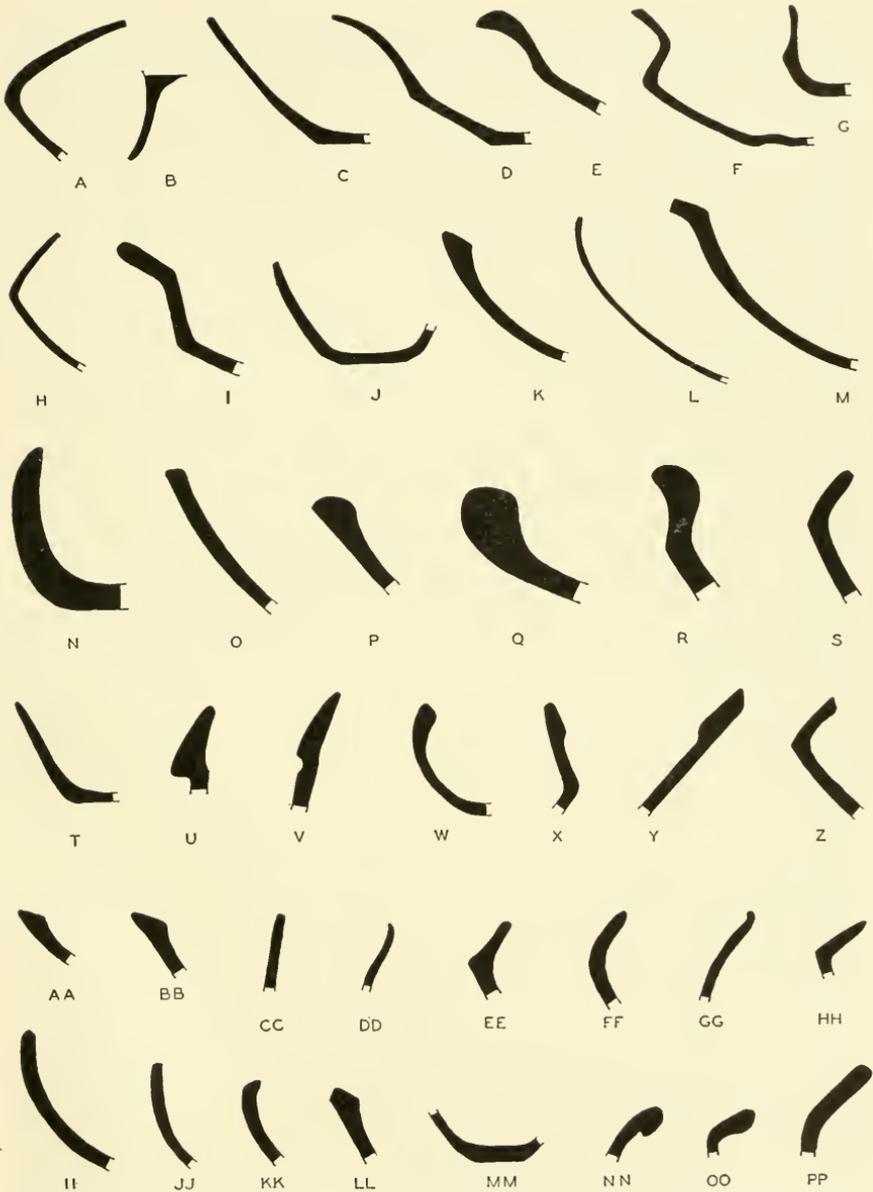


FIGURE 2. Profiles of typical potsherds: A-G, Cuevas; H-M, Ostiones; N-S, Santa Elena; T-Z, Boca Chica; AA-HH, Capá; II-PP, Esperanza.

curve, must have given the complete vessels the appearance of inverted bells (PLATE 2, D). Vertical and incurving shoulders are also present. Many of the latter are surmounted by tall, outcurving necks (*cf.* FIGURE 2, A and F).

Most sherds provided with shoulders and necks also show traces of small

apertures, for which reason it can be assumed that they are from jars. In all other cases, the sherds retain the broad apertures of the basic, hemispherical structure, and can therefore be considered fragments of bowls (PLATE 2, D).

Rims are typically thickened and show in profile a beveled or a rounded lip facing inwards (FIGURE 2, D-G). It is characteristic that the greatest thickness almost always comes near the lower edge of the lip instead of at its top or in the middle (FIGURE 2, D-G). Flanges, or extensions of the vessel wall perpendicular to the rim, are rare.

Decoration. About 40 per cent of the Cuevas sherds are decorated. Nevertheless, with the exception of a few incised and white-painted sherds, the material gives the impression of being plain, for the decoration is unobtrusive and easily overlooked by the untutored. This is probably the reason that Cuevas pottery was one of the last to be discovered in Porto Rico. Collectors have shown little interest in such drab material.

It is convenient to distinguish three kinds of decoration: structural, surface, and decorative designs. The first consists of those modifications in the shapes of vessels which seem to have been primarily ornamental, such as the addition of lugs. The second comprises modifications in the surfaces of the vessels for the same purpose, by means of either painting or polishing. The third includes all cases in which figures, as opposed to complete surfaces, have been painted, incised, or applied to the vessel in some other manner.

Cuevas decoration is primarily of the surface type, and this is probably the reason it appears so drab. Structural decoration ranks a poor second in frequency, while there are less decorative designs than in the case of any other style.

Most of the common forms of structural decoration are highly diagnostic. One is the elevation, usually accompanied by thickening, of a long section of the rim on either side of the vessel (PLATE 2, E). More commonly, a vertical strap handle is affixed to each end of the vessel. Most such handles are D-shaped; some are surmounted with single, peg-like lugs (PLATE 2, K). Rectangular or wedge-shaped lugs, extending upwards from the rim in the same direction as the vessel walls just beneath them, are particularly characteristic; most of these are plain in contrast to the lugs of other styles (PLATE 2, C). Perforation, either of the rim or of some form of lug, is also found. These perforations seem too small to have been used for suspension or to mend vessel walls (PLATE 2, D).

Perhaps the best means of identifying Cuevas pottery is by its surface decoration. This consists predominately of red paint, with black considerably less frequent. Contrary to the other styles, the paint rarely seems to have covered all the surfaces of the vessel. Instead, it is limited to either the inside or the outside of each sherd and to a single element of shape or structural decoration, particularly the shoulder, a lip thickened and beveled inwards, or a rectangular lug (PLATE 2, A and C). The inner or outer surface of such an element is completely covered, and the paint may extend from one element to its neighbor (PLATE 2, C). On a few sherds,

one element is painted red and another black. Many specimens are polished instead of being painted, or are polished over the paint. The polish usually covers all surfaces, but on a number of sherds it is limited, like the paint to the inside or outside of one or more of the elements of shape (PLATE 2, B).

There are three kinds of designs: plastic, incised, and painted. The first occurs mainly on lugs, the second on the inner surfaces of the vessels, and the third either inside or outside. The plastic designs are relatively simple. They consist for the most part of crescents or faces produced by means of modeling (PLATE 2, I). The number of incised designs is negligible, and there is some evidence that they are intrusive from the Lesser Antilles. Certain crosshatched sherds, for example, are reminiscent of the Cedros style in Trinidad (Rouse, 1947).

The painted designs are divisible into two groups, monochrome and polychrome. Most of the monochrome designs are on the inner surfaces of vessels. They consist primarily of crude red figures applied haphazardly to the unpainted clay. Circles, semicircles, and horizontal or vertical bands are the principal motives. In almost all cases, they occur singly (PLATE 2, F).

The polychrome designs are limited to the outer surfaces of vessels walls, to handles, and to lugs. Although nearly ten times as common as the monochrome designs, they occur on less than two per cent of the sherds. They make up for their scarcity, however, by a complex and striking appearance. The great majority consist of white designs on red-painted surfaces (PLATE 2, L and M). Like the latter, they tend to be limited to a single element of shape—in particular, the shoulder—and to cover that element completely. Each design is composed of a series of motives, such as circles, hour-glass figures, spirals, and straight lines, usually arranged in complicated patterns (Rainey, 1940: FIGURES 6 and 7, PLATE 3).

Variations within the Style. The incised and the polychrome designs are virtually restricted to the first half of the time of existence of the Cuevas style, *i.e.*, to Period IIa. On the other hand, the monochrome designs seem to have increased in frequency from Period IIa to IIb. In all other diagnostic characteristics, the style appears to have remained constant throughout its life span.

There are no fundamental local variations within the style. Nevertheless, a tendency can be detected, during the second half of its time of existence (Period IIb) towards variation in certain superficial respects. The pottery on the north coast, for example, becomes perceptibly cruder at this time, while that on the west coast remains fine. Such local variations are to be discussed in detail in the subsequent ceramic report.

Representation of the Style on the Associated Artifacts. Contrary to the situation in respect to some of the later styles, the Cuevas modes are largely restricted to pottery vessels. The clay griddles and other artifacts associated with the vessels reflect the style only in a certain graceful curvature of the surface and relative scarcity of designs.

Distribution. As already noted, the Cuevas style is the earliest known from Porto Rico and the only one in existence there during Periods IIa

and IIb. Hatt's Coral Bay-Longford pottery of the Virgin Islands seems to be Cuevas in style, although not exactly identical (Hatt, 1924). It, too, seems to date from Periods IIa and IIb. The pottery excavated by Krieger at Anadel and related sites on the north coast of the Dominican Republic can be considered late Cuevas (Rouse, 1948: 514). (It lacks incised and white-painted designs.) The exact position of this pottery, however, is uncertain. It was certainly present during Period IIb and may have survived into Period IIIa. Thus, the Cuevas style can be said to have occurred in the Virgin Islands and Porto Rico during Periods IIa

TABLE 1
DISTRIBUTION OF THE CERAMIC STYLES AND CULTURES IN PORTO RICO AND VICINITY

		Ceramic styles				Cultures			
		Dominican Republic	Western Porto Rico	Eastern Porto Rico	Virgin Islands	Dominican Republic	Western Porto Rico	Eastern Porto Rico	Virgin Islands
IV	b	Boca Chica	Capá	Esperanza	?	Taino			
	a				Late Magens Bay—Salt River pottery				
III	b	Anadel pottery	Ostiones	Santa Elena	Early Magens Bay—Salt River pottery	Igneri			
	a								
II	b	Cuevas	Cuevas	Coral Bay—Longford pottery	Pre-ceramic strata	Coroso (?) Krum Bay (?)			
	a								
I									

and IIb, and in the Dominican Republic, during Periods IIb and possibly IIIa (TABLE 1).

Relationships. The Cuevas pottery seems to be the local representative of a series of closely related ceramic styles extending from Porto Rico through the Lesser Antilles into Trinidad. The name "Cuevas horizon" has been given to these styles, because of the fact that they seem to have been more or less contemporaneous (Rouse, 1947: 97). As is to be discussed in detail in the subsequent ceramic report, there are reasons for correlating the Cuevas horizon with the first appearance of the Arawak in the West Indies (Rouse, 1948: 510).

Ostiones Style

The Ostiones style corresponds to Rainey's Shell Culture pottery, and his list of traits for that pottery provides a good definition of the style

(Rainey, 1940: 32-33). De Hostos's paper on Porto Rican ceramics is also largely concerned with the Ostiones style and can be used to supplement the following description (de Hostos, 1919, 1941: 7-29). When the writer first attempted to define the style, he used the name "Collores," after a site since discovered to be atypical (Rouse, 1940). Subsequently, the terms "Type A" and "Type B," referring respectively to the earlier and later phases of the style, were used as temporary substitutes (Rouse, 1941a). The style has been finally named after the west-coast site of Ostiones, and the following description is based primarily upon the collections from this site.*

Material. Ostiones potsherds, like the Cuevas, are predominantly well made, but there is also a considerable number of crude specimens (*cf.* PLATE 3, D and E). Most sherds are fine and hard, but they do not ring clearly when struck with metal. The surfaces are smooth and carefully finished. A lustrous sheen is characteristic of the polished specimens (PLATE 3, E).

The sherds vary considerably in thickness, but the average measurement is only about 6 mm. They break easily and, perhaps for this reason, crack-lacing is fairly common. The fractures are firm and finely granular. Their color is medium brown, characteristically tinged with red.

Shape. In general, Ostiones sherds are flat, angular, and poorly proportioned, contrasting strongly in these respects with Cuevas sherds, with their gracefulness and curvature of surfaces (FIGURE 2, H-M). They have a more commonplace appearance, as if artistry of shape was not valued by the potters.

No fragments of cylindrical mugs have been observed in the Ostiones collections, and there are few traces of spherical bottles. As in the case of Cuevas pottery, most vessels seem to have consisted of elaborations upon a simple hemispherical structure.

Flat bases are common among the Ostiones sherds, but the annular base is virtually absent. Viewed from above, the bodies are either circular, boat-shaped, double, or kidney-shaped (PLATE 3, A, I, and L). The turtle-like body of Cuevas pottery is not present.

Both keels and shoulders are widespread. Most of the latter are out-sloping or vertical, but not concave, the reverse curve of Cuevas pottery being rarely present. Incurving shoulders are somewhat more common than among Cuevas sherds (FIGURE 2, H, L). Tall, angular, out-sloping necks are also diagnostic (FIGURE 2, I).

As in the case of Cuevas pottery, the necks are associated with small apertures, indicating that they are from jars. Bowls having broad apertures are otherwise characteristic of the Ostiones style (PLATE 3, A).

Rims are typically thin and tapering (FIGURE 2, H, J, and L). The majority terminate in a flat or rounded lip facing upwards (FIGURE 2, L). Thickened lips, flatly beveled inwards, or bevels (*i.e.*, beveled surfaces just inside the lip and distinct from it) are also diagnostic (FIGURE 2, K, and M). A number of rims are everted or turned outwards, just beneath the lip (FIGURE 2, M).

* See Rouse (1948: 512-513) for a previous summary definition.

Decoration. About 50 per cent of the Ostiones sherds are decorated. For the most part, the decoration is obvious, as is indicated by the attraction which the pottery has for collectors. Structural decoration is much more common than on Cuevas pottery, competing with surface treatment for predominance. Although also more numerous, designs again rank third in frequency.

Modification of the vessel wall is accomplished primarily by twisting or adding points to the rim (PLATE 3, B). Rim elevations and comparable raised sections of shoulders are also present (PLATE 3, F). Vertical strap handles continue to be common but are now raised above the rim in a loop, contrasting with the D-shape of Cuevas handles (PLATE 3, C). They are often surmounted with lugs, which are typically wedge-shaped rather than peg-like (PLATE 3, O). Rectangular lugs are again an outstanding form. They can be distinguished from the comparable Cuevas lugs by their flatness and the fact that most of them project at an angle to the rim instead of forming an extension of it (PLATE 3, A). Solid, ovoid lugs are also characteristic (PLATE 3, M). Both rims and lugs are more often perforated than on Cuevas pottery (PLATE 3, K and L).

The surface decoration consists primarily of red, or rarely black, paint, as in the case of the Cuevas sherds. The red is easily distinguishable, however, as it has a lighter, somewhat rosy tinge. In most cases, the paint appears to have covered all surfaces of the vessels instead of being limited to one or more elements of shape (PLATE 3, E). Combinations of black and red paint are also less common (PLATE 3, G). All-over polish is diagnostic. It occurs on both painted and unpainted surfaces (PLATE 3, B and E).

Plastic designs are relatively complicated. Some are appliquéd and others modeled, with incision and punctation used as supplementary techniques in both cases (PLATE 3, M). Most of the designs are zoomorphic. They include the so-called "bat-heads," modeled on ovoid lugs; faces, applied to rectangular lugs; and limbs, most of which occur on vessel walls (PLATE 3, K and M). There are also some geometric figures, mainly on vessel walls, such as semicircular and sigmoid lines (PLATE 3, I). These various forms, being collectors' items, have received considerable attention in the literature, and further illustrations can be found in the reports of previous investigators, cited above.

Incised designs, although not so complicated as the plastic figures, are almost as common. Contrary to the other styles, these designs are virtually limited to bevels or a narrow band just inside the lip of the vessel, within which there is room for only simple motives in a small number of combinations (PLATE 3, J and N). These motives are entirely geometric and consist predominately of straight lines, some of which end in dots. Vertical, oblique, and horizontal parallel lines are the most common (PLATE 3, J). There are also a few ovoid figures (PLATE 3, N).

Painted designs are two-thirds as common as the incised designs. Entirely monochrome, they are all red (PLATE 3, H). The same figures are represented as in the case of the monochrome Cuevas designs: circles, semicircles, and bands, usually occurring singly on the inside of the vessel.

Variations within the Style. As pointed out by a number of previous writers (see above, pp. 317-18), Ostiones pottery has varied considerably during the time of its existence (from Period IIIa to IIIb). The earliest examples of the style, e.g., at the bottom of the site of Ostiones, are difficult to distinguish from late Cuevas pottery. As one proceeds upwards through the levels, the distinguishing characteristics of the style, as listed above, become more and more pronounced. The following changes, among others, take place: (1) thickened lips beveled inwards are common in the lower levels, as in the previous Cuevas deposits, but in the upper levels their place is taken by bevels distinct from the lip; (2) red paint, at first limited to single elements of shape such as the beveled lip, becomes increasingly over-all; (3) plastic designs increase in frequency and complexity, with application, incision, and punctuation more and more lavishly used to delineate the elements of the designs; and (4) incised designs reappear after having been absent during the second half of the period of existence of the Cuevas style (Period IIb). It is probably no accident that the incised designs are situated in the area of the bevel, the position previously favored by both Cuevas and Ostiones potters for the application of red paint.

Local variations in style, the beginnings of which can be traced to late Cuevas pottery, become increasingly common from the earlier to the later levels (Periods IIIa to IIIb). Only the more important of these variations will be mentioned here, since it is planned to discuss them in greater detail in the subsequent ceramic report. The pottery is the best made and the most elaborately decorated on the west coast of Porto Rico. As one moves eastward, it becomes progressively more crude and plain. (This is presumably the reason that Rainey has emphasized the crudity of Ostiones pottery more than we do. He considered the central, rather than the western, pottery to be typical [Rainey, 1940: 58].) Surface decoration and incised designs, in particular, are more common in the west than in the east. On the other hand, plastic and especially painted designs are more common in the east than in the west. The sherds appear to be thicker and less angular in the east.

The above variations are subject to the restriction, already noted, that, during the second half of the period of its existence (IIIb), the Ostiones style was limited to the western half of the main island, having apparently been replaced in the eastern half, as well as on Vieques Island, by the Santa Elena style. The sites along the line of contact between the two contain examples of both styles. In addition, some modes characteristic of the Santa Elena style are found on Ostiones sherds, and *vice versa*. Nevertheless, it is rarely difficult to distinguish between the two.

Representation of the Style on the Associated Artifacts. A few clay griddles are decorated with incised or painted designs like those on the pottery vessels. Some of the plastic designs, particularly the bat-head, are also carved in stone, bone, and shell upon the ornaments and ceremonial artifacts.

Distribution. The Ostiones style can be assigned to Periods IIIa and b. During the first of these, it was apparently distributed throughout Porto Rico and its dependencies (except Mona Island, which was presumably un-

inhabited at that time). During Period IIIb, however, it was restricted to the western half of the main island (TABLE 1).

Outside Porto Rico and its dependencies, no traces of the Ostiones style have been found, except in the form of trade sherds. The earliest pottery in the Magens Bay-Salt River sites of the Virgin Islands does have strong resemblances, but not enough to consider it identical in style. There is even less similarity with the supposedly contemporaneous Anadel and Boca Chica pottery of the Dominican Republic (Rouse, 1948: 513-514).

Relationships. It is believed that the Ostiones style developed in Porto Rico from the Cuevas style. This is indicated not only by our difficulty in distinguishing between the two in deposits where the former succeeds the latter, but also by the survival and intensification of the local variations in Cuevas pottery during Ostiones times. These two conditions would seem to preclude the derivation of the Ostiones style from Magens Bay-Salt River pottery of the Virgin Islands, as implied by Rainey (Rainey, 1940: 108, 156-157). In our opinion, the resemblances between Ostiones and Magens Bay-Salt River pottery can better be attributed to parallel development, accompanied by mutual influence. (Examples of the operation of these two factors are presented below in connection with the Santa Elena and Boca Chica styles.)

Santa Elena Style

So far as is known, the Santa Elena style had not been previously distinguished in Porto Rico. It resembles, however, certain pottery in the Virgin Islands, particularly the bulk of the pottery obtained by de Booy at Magens Bay and Salt River in the Virgin Islands, which is presumably later than Hatt's material referred to above (de Booy, 1919; Rouse, 1939: 98-102). It would, perhaps, have been advisable to name the style after one of these sites, but we have preferred to use a local site as the type. The following description is based largely upon our material from the north coast site of Santa Elena.*

Material. Santa Elena pottery is relatively crude, the majority of the sherds being coarse and fairly soft (PLATE 4). None of them rings when struck with metal. The surfaces, while sometimes smooth, are more often uneven, as if they had been only partially rubbed down (PLATE 4, G). A high polish is rare.

The sherds are the thickest in Porto Rico. They average 8 mm. in thickness and some are twice that amount. Nevertheless, they break easily. The fractures are coarsely granular and, in some cases, disintegrate when rubbed with a finger. For the most part, they are reddish brown in color.

Shape. In strong contrast to the Ostiones pottery, Santa Elena sherds are well rounded. In fact, both surfaces and vessel walls are often so strongly convex that they appear to bulge (FIGURE 2, N and Q). This tendency is accentuated by the fact that the elements of shape, as well as many of the decorative details, combine to give an impression of uniform curvature out from the base, up around the side of the vessel, and in over

* For a previous summary definition, see Rouse (1948: 512).

the rim (FIGURE 2, Q). In all cases, the curves are so gross that they can easily be distinguished from the gentler, more graceful curves of Cuevas pottery.

No evidence has been found among the Santa Elena sherds of any basic structure except the simple hemispherical form. The latter is in general less strongly modified than in the case of the styles previously discussed.

Flat bases are common on Santa Elena sherds (FIGURE 2, N), but the annular base is completely lacking. Most bodies are either circular or boat-shaped. Other distortions are rare.

Keels and shoulders are not so common as among the previous styles. Instead, a strongly convex, vertical side is characteristic (FIGURE 2, N and Q). Less sharply curved, outsloping sides are not uncommon (FIGURE 2, O and P). The reverse curve, however, is rare (FIGURE 2, R), and there are relatively few necks of jars.

A small aperture, like the neck, is rarely to be found among Santa Elena sherds. In other words, practically all of the vessels seem to have been bowls rather than jars.

Rims are typically thickened and rounded in cross section (FIGURE 2, Q and R). One of the best diagnostics of the style is a spherical rim coil, which in some cases has broken away from the rest of the vessel wall in the form of a cylinder (PLATE 4, B). Another is a thickened lip beveled inwards, the beveled surface of which is strongly convex, in contrast to the flatness of Ostiones bevels (FIGURE 2, P). The convexity is more pronounced than in the case of the Cuevas style. Moreover, it reaches its maximum thickness in the middle of the bevel rather than towards the bottom. Detached bevels, like those on Ostiones sherds, are virtually nonexistent. Everted rims are likewise rare.

Decoration. Somewhat less than half of the Santa Elena sherds are decorated. For the most part, the decoration is simple and obvious. Artistically, it is beneath the standards of the other styles. Structural and surface decoration are again predominant, with designs ranking third.

Decorative modifications of the vessel wall consist primarily of rim points and of vertical, curving ridges which appear to be vestigial strap handles (PLATE 4, G). True strap handles are somewhat less common than on Ostiones pottery but have the same loop shape. Both ovoid and rectangular lugs are present, as on Ostiones pottery, but with the proportions of the two reversed (PLATE 4, C). An amorphous lump-shaped lug and a crest rug, consisting of a disc perpendicular to the rim and extending down over it on either side, make their appearance (PLATE 4, D and I). Perforations are absent, their production precluded, perhaps, by the thickness of the pottery.

The surface painting is entirely red, there being none of the Ostiones black paint. In the majority of cases, the paint is on only one or two elements of shape, rather than overall (PLATE 4, F). Polishing is not very common. It is usually restricted to the painted surfaces (PLATE 4, A).

Plastic designs are either appliquéd or modeled, with incision and punctation again used to fill out the details. They are situated on lugs or vessel walls but, unlike Ostiones pottery, not on handles (PLATE 4, C and H).

The bat heads and limbs of Ostiones pottery are both present, but not the corresponding face design (PLATE 4, C). Among the geometric figures, vertical ridges are most common, some of them straight and others bowed (PLATE 4, J). Sigmoid designs are rare and semicircular figures absent.

While incised designs are common, they are almost without exception limited to two very simple motives, each of which occurs singly: horizontal and vertical parallel lines (PLATE 4, C and E). The former are inside the rim, as on Ostiones sherds, while the latter are situated on the outer surface of the shoulder, usually in combination with a vestigial handle or a vertical ridge (PLATE 4, G). These combinations are particularly diagnostic of the style.

The painted designs are monochrome. They may be said to duplicate in all essential respects the monochrome designs on Cuevas and Ostiones pottery, except that they are somewhat more common (PLATE 4, A and F).

Variations within the Style. The occurrence of certain Ostiones modes on the Santa Elena pottery found in sites along the line of contact between the two styles has already been noted. Otherwise, we have observed no significant variations, either in time or space, within the Santa Elena style.

Representation of the Style on the Associated Artifacts. Some incised and painted designs, comparable to those decorating the vessels, appear on the griddle sherds from Santa Elena deposits. In addition, the bat-head design is carved on an occasional stone, bone, or shell artifact from the same deposits.

Distribution. The Santa Elena style is more widespread in the Virgin Islands than in Porto Rico. It predominates in the three main collections from that area: de Booy's, Hatt's, and Andersen's.* Its exact chronological position in the Virgin Islands is uncertain. It was certainly present during Period IIIb. Whether the Ostiones-like pottery of Period IIIa should also be included remains to be determined. We have, however, so assumed in preparing TABLE 1.

In Porto Rico, the style is limited to Period IIIb (except possibly on the east coast and Vieques Island, where, as noted below, no early ceramic sites have been located). It is, moreover, restricted geographically to Vieques Island and the eastern half of the main island, contemporaneous with late Ostiones pottery in the western half of the main island (TABLE 1).

Relationships. Because of the restricted distribution of the style in Porto Rico, as compared with the Virgin Islands, it is believed to have developed in the latter area and to have spread from there to the adjacent parts of Porto Rico. This conclusion is corroborated by: (1) the relative ease in distinguishing between Ostiones and Santa Elena pottery, even when the two are found together, and (2) the increasing similarity between the two as one moves from west to east through Porto Rico towards the Virgin Islands. The latter suggests that the Santa Elena style originally developed as a local variation upon the Cuevas pottery of the Virgin Islands (TABLE 1).

This hypothesis assumes that most similarities between Ostiones and Santa Elena pottery, such as the common presence of loop handles and monochrome designs, are due to a common origin of the two styles in Cuevas

* These three, all studied by the writer, are situated, respectively, in the Museum of the American Indian, New York; the Danish National Museum, Copenhagen; and Andersen's home at Hempstead, Long Island.

pottery. A few modes, on the contrary, seem to have diffused from one style to the other. An example is the ovoid lug, with its bat-head design. Because the grossness and roundness of this lug seem more at home in the Santa Elena style, it may be assumed to have diffused from the latter to the late Ostiones pottery, on which it is also found. It is planned in the subsequent ceramic report to examine the histories of other modes in an attempt further to clarify the relationships between the styles.

Boca Chica Style

During the course of his Porto Rican research, Rainey visited the site of Cayito on the south coast and collected a number of modeled head lugs, about which he writes, "It is curious that these figures are unusual in Porto Rico but common types in Santo Domingo and Haiti" (Rainey, 1940: 13).^{*} The writer's own excavations at Cayito reveal that this statement is true not only of the lugs but also of the rest of the pottery. It is entirely Dominican rather than Porto Rican. In the writer's first discussion of the style, he grouped it with the Carrier pottery of northern Haiti (Rouse, 1940: 59-61). Subsequent research indicated that it should be distinguished from Carrier, and, at the suggestion of H. W. Krieger, it was named after the site of Boca Chica in the Dominican Republic, from which it is best known (Krieger, 1931, personal communication). The following definition, however, is based primarily upon our material from the three Porto Rican sites where it predominates: Cayito, Villón, and Sardinero (FIGURE 3, folding map at end).[†]

Material. Boca Chica pottery is better constructed than the pottery of the other two Carrier-like styles of Porto Rico: Capá and Esperanza. The sherds are fine and relatively hard, recalling in both these respects the previous Cuevas and Ostiones pottery. Their surfaces are carefully smoothed and, when polished, have a characteristically soft sheen.

The sherds are moderately thick, averaging 8 mm. They do not break as easily as Capá and Esperanza pottery. The fractures are firm and finely granular. They vary from tan to brown in color.

Shape. Boca Chica sherds are angular but not so flat-surfaced as the Ostiones specimens (FIGURE 2, T-Z). Poorly proportioned and relatively lacking in grace, they are chiefly distinguished by an appearance of sturdiness. Also, they exhibit the most complicated shapes in Porto Rico.

Particularly distinctive of the Boca Chica style are a series of fragments of spherical bottles (PLATE 5, H), such as are characteristic of the Dominican Republic (Krieger, 1931: 9 ff.). Otherwise, the sherds are all fragments of bowls or jars, which vary in the following ways from the simple hemispherical form.

The bases seem to have been predominantly flat rather than convex (FIGURE 2, W). The bodies were either round or boat-shaped but apparently lacked the other distortions of the previous styles (PLATE 5, J and K).

Keels and shoulders are diagnostic, the former characteristically blunt

^{*} Rainey wrote this passage in reference to the site of La Florida, but his field notes indicate that the specimens come instead from Cayito, and they are so catalogued in the Yale Peabody Museum.

[†] See Rouse (1948: 514) for a previous summary definition.

and the latter inturned (FIGURE 2, X-Z). Reverse curves, or sinuous profiles, are exceedingly rare.

Necks have a greater frequency than in the case of any other style. They are of two kinds: those occurring on bowls, and a small number attached to bottles (*cf.* FIGURE 2, X and U; PLATE 5, C and H). Only a few of the former continue the curve of the shoulder inwards and then outwards to the rim, as in the case of the previous styles. Instead, the majority angle sharply outwards from the shoulder and then curve gradually inwards (FIGURE 2, X). Such convex necks are an unfailing diagnostic of the style, as they occur on no other.

The second variety of neck, attached to bottles, is also unique. These necks are either cylindrical or globular in outline. All have a very small aperture (FIGURE 2, U; PLATE 5, H).

The rims are predominantly tapered and on most sherds are provided with lips rounded upwards or inwards (FIGURE 2, T-V, Z). A large proportion are slightly everted a short distance beneath the lip. Bevels are rare, but there are a number of ridges, some on the inside and others on the outside of the rim (FIGURE 2, U, V, X and Y). These ridges, which are rectangular in cross section, provide further evidence of the Dominican origin of the style. They occur otherwise only on a few Ostiones and Capá sherds in the western part of the main island, where they can be considered the result of Dominican influence.

Decoration. About half the Boca Chica sherds are decorated. The decoration is obvious and relatively complex. Designs predominate, contrary to the previous styles, with structural decoration second in importance and surface decoration a poor third.

Two rim points are the only decorative modifications of shape encountered. Strap handles, too, are virtually nonexistent. There are two main types of lugs: prismatic and flat. The former, tall, solid, triangular in cross section, and relatively large in proportion to the rest of the vessel, is particularly diagnostic, as it occurs otherwise only in Hispaniola (PLATE 5, M and N). The latter are flat ridges, recalling the rectangular lugs of previous styles, except that they are irregular in outline (PLATE 5, J). A few rectangular lugs are also present (PLATE 5, K).

Polishing is more common than painting of surfaces, contrary to the situation among the previous styles. In every case, the polish or paint appears to have been overall, either on the inside, the outside, or both sides of the vessel wall (PLATE 5, D and L). Red is the only color of paint used.

The plastic designs resemble those on Ostiones pottery, except that they are more complicated. Both applied strips and modeled features are more elaborately incised and punctated. The designs include bat-heads, faces, limbs, semicircular and sigmoid lines, and vertical ridges (PLATE 5, L-O).

The Boca Chica incised designs are the most elaborate in the Antilles. Most of them occur on the outer surfaces of inturned shoulders rather than inside the rim, in the position favored by Ostiones potters. Each consists of a series of motives extending around the vessel to form a continuous band and completely covering the surface of the shoulder. Those motives in-

clude circles, each with a dot in the center and flanked with semicircular lines; horizontal, oblique, and vertical parallel lines; ovoid figures, each encircling a line or a series of dots; and a maze-like arrangement of curved lines (PLATE 5, A-G, I-L, and O). Lines often end in dots, and many are negative, *i.e.*, they seem to outline surfaces which portray the designs, instead of themselves forming them (PLATE 5, B and O).

There are no painted designs. These do not seem to have carried over into any of the late styles.

Variations within the Style. The number of Boca Chica sites is too small and the deposits are too shallow to permit the determination of variations within the style.

Representation of the Style on the Associated Artifacts. The simpler of the Boca Chica incised designs also occur on the griddles associated with the style. Not enough material was obtained to demonstrate the extension of the style to ceremonial artifacts of stone, bone, and shell, as in the case of the Capá style, but it is assumed that there was such extension.

Distribution. As already noted, the Boca Chica style is characteristic of the Dominican Republic (TABLE 1). In fact, the Porto Rican sites of Cayito, Villón, and Sardinero are the only three outside the Dominican Republic at which it is known to predominate. Among the Dominican sites which have been excavated are the following: certain caves on Saona Island off the southeastern tip of the republic (de Booy, 1915); Cristobal Colón, near San Pedro de Macoris (de Booy, 1919b); Boca Chica itself, near Andres (Krieger, 1931: 38 ff.); La Caleta, somewhat further west (Herrera Fritot and Youmans, 1946). These sites provide a continuous distribution from Sardinero on Mona Island along the south coast of the Dominican Republic to the vicinity of Ciudad Trujillo (FIGURE 1). The occurrence of Boca Chica sherds among the ruins of Isabela, the first Spanish town on the north coast of Hispaniola, is also worth mentioning.*

Because of the lack of stratigraphy in the Dominican Republic, it is impossible to determine the exact chronological position of the style. There are grounds, however, for suggesting that it developed out of the Dominican variety of Cuevas some time during Period III and survived in that country during Periods IVa and b. Its appearance in Porto Rico seems to be limited to Periods IVa and b (TABLE 1; Rouse, 1948: 513).

Relationships. If the above distribution is correct, it follows that the Boca Chica style must have originated in the Dominican Republic and spread from there to Porto Rico. The list of sites enumerated above gives the probable route of diffusion: along the south coast of the Dominican Republic to Saona Island, to Mona Island, and thence along the south coast of Porto Rico to Cayito. The discontinuous distribution in Porto Rico, as well as the lack of previous occupations at Sardinero and Cayito, suggests that small groups of migrating Indians brought about this diffusion.

As will be discussed in detail in the subsequent ceramic report, there are reasons for believing that the Boca Chica style was the source of most of the incision which appears on late Porto Rican pottery. It is suggested that

* Specimens collected by Maurice Ries and now in the Middle American Research Institute at Tulane University.

a simple form of incision diffused from the early Boca Chica pottery of the Dominican Republic to the late Ostiones pottery of western Porto Rico, and that, subsequently, more complicated incised designs spread to become major components of the Capá and Esperanza styles, now to be described. The introduction of the Boca Chica style as a whole into Porto Rico undoubtedly had something to do with this later spread of incision, as explained below.*

Capá Style

Speaking of the pottery obtained at the Barrio Sabana ball court No. 2 (called "Sabana" in the present study), Rainey notes that "a large number of the incised sherds . . . bear complicated incised patterns unlike anything previously found," and, further, "it may be that these aberrant sherds are fragments of ceremonial vessels used for special purposes" (Rainey, 1940: 101, 110). The present writer's research has confirmed the distinctiveness of the Sabana sherds, but indicates that they are the result of a difference in style rather than function. (As demonstrated below, they predominate in the collections from certain sections of Rainey's excavations at the north coast site of Coto, where he assumes that the pottery is utilitarian.)

When the writer first attempted to define the style, he included it, together with the Boca Chica pottery, within the Carrier type characteristic of northern Haiti (Rouse, 1940: 59-61). Subsequently, the term "Type C" was used as a temporary substitute (Rouse, 1941a). It has finally seemed best to name the style after the interior site of Capá, whence come the most extensive collections (Mason, 1941). The following description is based primarily upon the material from this site.†

Material. Technologically (although not artistically), the Capá sherds are the crudest in the Antilles. Most specimens are unusually soft. It is common to find traces of a fine clay float or slip on the surfaces, but, in many cases, this has almost entirely disintegrated, exposing the coarsely grained interior. Many specimens are heavily impregnated with sand, which is shed from the fractures and the disintegrated surfaces. While these sherds were being removed from the trenches, and before they became dry, one could with little effort crumble them to sand between the fingers. It is presumed that their clay matrix was sparse and that, consequently, they did not fuse well. Even the well-fused specimens lack the smoothness and sheen of Boca Chica pottery. Their surfaces are often like fine sandpaper (PLATE 6, M).

Capá sherds are somewhat thinner than the Boca Chica, averaging about 7 mm. Perhaps because of their tendency to disintegrate, they are in smaller fragments, and there are relatively less of them (PLATE 6, A-O). Their color in the fractures varies from brown to brick red.

Shape. Capá sherds, like the Ostiones, tend to be flat, angular, and poorly proportioned (FIGURE 2, AA-HH). They are, however, not quite so lacking in grace. There is a delicacy to many of them which contrasts strongly with the sturdiness characteristic of Boca Chica pottery (*cf.* PLATES 5, F and 6, H).

* See also Rouse (1948: 513).

† See Rouse (1948: 513) for a previous summary definition.

All Capá vessels seem to have been basically hemispherical in structure. It is unlikely that many bases were unmodified from this structure, since very few of them are flat or otherwise distinctive. Bodies are similarly undistorted, except for a few fragments of boat-shaped vessels (PLATE 6, Q).

On the other hand, a keel and shoulder are typical elements of Capá shape and are relatively pronounced. The shoulder is characteristically narrow and incurving (FIGURE 2, DD-HH). Contrary to Boca Chica pottery, it is rarely surmounted by a neck. Broad apertures are the rule, and practically all the vessels must therefore have been bowls.

Rims are particularly diagnostic of the Capá style; they are predominantly tapering, everted, and provided with a narrow lip rounded inwards (FIGURE 2, DD, GG-HH). The tapering is characteristically more gradual than in the case of the other styles. Such rims are not always easy to find, as they disintegrate easily in the thin, tapered region adjacent to the lip. Contrary to the other styles, there are very few beveled or flat rims, and virtually no bevels or ridges.

Decoration. Capá sherds are more frequently decorated than in the case of any other style, the frequency in some cases reaching 60 or 70 per cent. The decoration is obvious and consists almost entirely of designs. Structural decoration is rare, and there are very few examples of surface treatment.

No decorative modifications of vessel shape have been observed, nor is there any evidence of handles. Lugs, however, are present. For the most part, they consist either of shapeless, mound-like lumps attached to the shoulder just beneath the rim or of short, knobbed ridges situated horizontally on the shoulder just above the keel (PLATE 6, F and K). There are also several ovoid and wedge-shaped lugs (PLATE 6, L and Q). It is noteworthy that few of the lugs project far from the vessel wall. If many did, it is doubtful that they would survive for long in face of the tendency for the pottery to disintegrate.

Several sherds bear an over all red slip, comparable in every respect to that on Ostiones pottery. One or two from each site are polished all over (PLATE 6, M). These are the only traces of the predominant surface decoration of the original Cuevas pottery.

Plastic designs are somewhat less frequent than in the case of the other styles. The majority are modeled, incised, and punctated, rather than appliquéd. An animal's head provided with a snout almost like that of a pig, is characteristic. There are also a number of limbs and vertical strips (PLATE 6, Q, G, O, and N).

It is the incised designs which primarily distinguish Capá pottery. They provide, proportionately, a greater part of the decoration than in the case of any other style. Contrary to Boca Chica incision, the lines are narrow and relatively deep, and they have had to be spaced more closely together because of the narrowness of the shoulders on which they are situated. This gives them a characteristic appearance of intricacy (PLATE 6). Otherwise, they resemble the Boca Chica incised designs, as already described, in all essential details.*

* For additional illustrations of this style, see Rainey (1940: Plate 7) and Rouse (1941a: Plate 18).

There are no painted designs.

Variations within the Style. The Capá style occurs primarily in the area of distribution of the Ostiones style, and it is to the pottery in this area that the above description applies. In addition, as demonstrated in the sections on excavations, the Capá style has succeeded the Santa Elena in a few sites just over the boundary between the distribution of the Ostiones and Santa Elena styles. In these sites, some of the characteristics of Santa Elena pottery, such as the concave, shoulderless side, the vestigial handle, and ridges flanked by vertical incised lines are also represented on some Capá specimens.

Representation of the Style on the Associated Artifacts. The Capá plastic and incised designs are to be found not only on potsherds but also upon some of the griddle sherds, clay stamps, and stone, bone, and shell artifacts associated with that pottery. Many of the decorative details of the so-called stone collars, elbow stones, and three-pointed stones, for example, resemble those on Capá, as well as Boca Chica, pottery (Fewkes, 1922: Figs. 34 ff.).

Distribution. Capá pottery is limited to Periods IVa and b. As already noted, its distribution coincides roughly with that of the late form of Ostiones pottery. (There is some overlapping into the area of Santa Elena pottery, but this is not very extensive.) In other words, Capá pottery is largely restricted to the western half of the main island of Porto Rico (TABLE 1).

Relationships. There seems little doubt that the Capá style developed from the Ostiones. This is indicated not only by the coincidence of their respective areas of distribution but also by the following facts: (1) a number of Ostiones sites also contain Capá deposits; (2) it is, in such cases, difficult to distinguish between the two styles, presumably because of transition from the former to the latter; and (3) as the above description will indicate, there is a considerable carry-over to the Capá style of traits characteristic of the Ostiones style.

As already noted, the spread of the Boca Chica style from Hispaniola to Porto Rico may have had something to do with the shift from Ostiones to Capá pottery. In particular, contact with the Boca Chica style may have caused the local potters (1) to shift their incised designs from a bevel inside the rim to the outer surface of the shoulder and (2) to adopt the series of motives common to the incised designs of both styles. It may be significant in this connection that Capá pottery is so crude. This crudeness suggests derivation of the style from the poorer, eastern variety of Ostiones pottery, which is located precisely where the contact between Boca Chica and Ostiones pottery is likely to have taken place: in the vicinity of the sites of Cayito and Villón (see folding map at end).

Esperanza Style

The remaining style has not been previously recognized, although it occurs as an important component of the Magens Bay-Salt River pottery of the Virgin Islands (Hatt, 1924).* It is named after the site of Esperanza on Vieques Island, where it appears unmixed with other styles.

* See also Rouse (1948: 512).

Material. The Esperanza pottery is technologically intermediate between Boca Chica and Capá. While not so well made as the former, it lacks the latter's tendency to crumble and disintegrate. The sherds are coarse and soft (PLATE 7). Many are even-surfaced, but some appear to have been only partially rubbed down. A smooth feel is characteristic, but high polish is rare.

The sherds are moderately thin, averaging 7 mm. and rarely measuring more than 10 mm. They break easily and were found only in small fragments. The fractured surfaces are coarsely granular, and some disintegrate when rubbed. They are reddish-brown in color.

Shape. Esperanza sherds are more rounded than Capá. They appear blunt, but do not have quite the grossness of Santa Elena pottery (FIGURE 2, II-PP). Otherwise, they are the most nondescript of the styles, their relative simplicity of shape and lack of extremes making it difficult to characterize them.

It may again be inferred that the vessels were basically hemispherical and varied little from the simplest form of this structure. Unmodified, round bases were apparently predominant, for there are relatively few flat ones (FIGURE 2, MM). Boat-shaped bodies are not very common either. Most bodies were probably round (*cf.* PLATE 7, A and B).

An incurving side, accompanied by a blunt, rounded keel, is characteristic (FIGURE 2, NN-PP). Less sharply curved, outslipping sides are also present (FIGURE 2, II-LL). The reverse curve is rare, and there are no necks. Since the small aperture is apparently also absent, it is unlikely that jars were present.

Rims are more often tapered than thickened, and are rounded either inwards or upwards (FIGURE 2, NN-PP). The tapering is not so pronounced as on Capá sherds, and the rounding not so gradual; hence, the blunt appearance. Cylindrical rim coils, a few of which have become detached as in the case of Santa Elena pottery, are present, but they are so small that they do not seem to have produced any marked thickening of the rim (PLATE 7, E). Everted rims are fairly common, but there are few bevels and beveled rims (FIGURE 2, LL).

Decoration. Slightly more than half of the Esperanza sherds are decorated. The decoration consists largely of designs, most of them relatively simple. Structural and surface decoration are again rare.

The only structural modifications of the vessel wall are an occasional rim point (PLATE 7, A). Strap handles are completely absent, but lugs are moderately common. These consist mainly of amorphous lumps or of pegs attached to the vessel wall and of flat disks affixed in pairs at an angle to the rim (PLATE 7, N and P). There are also several ovoid and rectangular lugs (PLATE 7, O and K). A few of the lugs are perforated (PLATE 7, N).

The surface painting is entirely red. In the majority of cases, it is overall. Limitation of paint to the outside or to the shoulder is also to be found (PLATE 7, P). Polishing is not very common. It is usually restricted to the painted surfaces (PLATE 7, P).

Plastic designs show the usual techniques of appliquéing and modeling, with incision and punctation used to fill out the details (PLATE 7, K-P).

They are situated both on lugs and on vessel walls. Bat-heads, a feather-like design, circular figures, and vertical ridges are characteristic (PLATE 7, O, F, P, and M).

As in the case of the other late styles, incised designs outweigh all other forms of decoration. The lines are spaced widely apart and are relatively broad, therefore providing none of the appearance of intricacy of Capá sherds. They are markedly simpler than either the Boca Chica or Capá designs. Pairs of parallel lines, either semicircular or straight and inclined alternately in opposite directions, are diagnostic (PLATE 7, B and J). There are also a few circles and vertical, as well as horizontal, parallel lines (PLATE 7, C). While a single horizontal line often is found above one of the other figures, bordering the rim, other combinations of motives are rare, in sharp contrast, again, to the Boca Chica and Capá styles (PLATE 7, H). Lines ending in dots are likewise scarce.

Painted designs are lacking, as in the case of the other late styles.

Variations within the Style. The number of sites in which the Esperanza style was found to predominate is not great enough to provide any indication of variation within the style, either in time or in space.

Representation of the Style on the Associated Artifacts. While some of the Esperanza incised designs vaguely resemble those on the associated artifacts, there is not so much similarity, as in the case of the other late styles, particularly the Capá.

Distribution. Esperanza pottery is limited to Periods IVa and IVb. Its distribution coincides roughly with that of the previous Santa Elena pottery; *i.e.*, it occurs in the Virgin Islands, on Vieques Island, and in the eastern half of the main island of Porto Rico (TABLE 1). It is mixed with Capá sherds in a line of sites running roughly from northeast to southwest across the middle of the main island, but otherwise the distribution of the two styles is mutually exclusive.

Relationships. Just as the Capá style may have developed from the Ostiones, so it is believed that the Esperanza has developed from the Santa Elena. This is indicated not only by the coincidence of distribution of the two but also by the carry-over of Santa Elena traits onto Esperanza pottery. In particular, the roundness of Esperanza shapes and the simplicity of its designs are grounds for concluding that it is in the Santa Elena tradition.

The shift from Santa Elena to Esperanza, like that from Ostiones to Capá, may have been touched off by the appearance of the Boca Chica style in Porto Rico. The Cayito and Villón sites, where we found the latter style, are on the boundary between the respective areas of distribution of the Santa Elena-Esperanza and Ostiones-Capá styles. It would have been quite possible, therefore, for the Boca Chica style to have influenced the former development as well as the latter. The series of incised motives which are characteristic of the Esperanza style may be copies of the Boca Chica motives in the simpler form characteristic of eastern Porto Rico and the Virgin Islands.

DEFINITION OF CULTURES

Coroso (?) Culture

Thirty-three of the sites surveyed were small shell heaps which appeared to lack pottery and therefore cannot be fitted into the foregoing classification of ceramic styles. Five of these heaps were trenched: Coroso on the west coast, Jobos and Papayos on the south coast, Playa Blanca on the west coast, and Caña Honda on Vieques Island (see folding map at end).

So little was obtained from these sites that their significance is in doubt. Three possible hypotheses can be offered: (1) they are places of habitation of a preceramic people who had a different culture than the pottery-making Indians; (2) they are spots to which the pottery-making Indians went intermittently to gather and eat shell food; and (3) they are places used by the modern Spanish population for the same purpose. The arguments for and against each of these hypotheses are presented below in connection with the discussion of the type site of Coroso. For the present, we need only note that the evidence is inconclusive. The following definition is therefore tentative and subject to correction if future work should happen to favor one of the alternative hypotheses.

Sites. If the current hypothesis is correct, the shell heaps under discussion are the remains of camps at which small groups of people lived for relatively short periods of time (FIGURE 6). They are situated close to the shore, in regions where shell fish are readily available. Most are also in dry, grassy areas unfavorable for agriculture. In all cases, there is a bay in the immediate vicinity, backed by a mud flat or a swamp which could have been used as a base for hunting and fishing.

In these respects, the sites resemble the nonceramic shell heaps of Hispaniola and Cuba (Rouse, 1948: 500). There is no evidence, however, of an accompanying habitation of caves, as in the other islands. Neither did we encounter burials, which must be located before the hypothesis of a distinct Coroso culture can be validated. Religious structures are also lacking, but this is not inconsistent with the crudity of the remains found.

As noted below in connection with the individual excavations, the shell heaps have yielded traces of fire. There is also abundant evidence of the consumption of shell fish, but animal and fish bones are rare. Although wild fruits and vegetables may have been eaten, sure evidence of this has not survived.

Clay Artifacts. No objects of clay were recovered, except for one Indian and several European sherds found near the surface and believed to be intrusive.

Stone Artifacts. The possible stone artifacts include several pebbles battered on their ends (PLATE 8, G), another with several grinding facets, a number of sharp-edged pieces of flint or other stone (PLATE 8, A), and several flat stone slabs (PLATE 8, J). These may have been used respectively as hammerstones, a grinding stone, knives, and milling stones, but in the absence of traces of manufacture there is no proof of this.

Bone Artifacts. No worked pieces of bone were recovered.

Shell Artifacts. A number of fragments of *Cassis* or *Strombus* shell may have been artifacts. These include nodes from the upper ends of the shells (PLATE 8, I); tips off the lower ends, some of which are plain (PLATE 8, C) and others fractured so that they form a beveled point (PLATE 8, B); and plates or segments from the outer whorls (PLATE 8, D). A few clam shells with blunted edges might also be included in this category (PLATE 8, E). Although similar Cuban specimens have been assumed to be artifacts (Osgood, 1942a: 26-27; Rouse, 1942: 143), there are no traces of manufacture or use, and it is, therefore, quite possible that these Coroso specimens are noncultural.

Coral Objects. Several pieces of coral were recovered (PLATE 8, F). These also show no traces of manufacture or use.

Intrusive Material. In addition to the Indian and European potsherds mentioned above, several fragments of iron were found in the Coroso sites. These were likewise at or near the surface and therefore are believed to be intrusive.

Summary. Not one of the specimens listed above, with the exception of those few believed to be intrusive, can definitely be accepted as artifacts. The shell objects show traces neither of manufacture nor of use. The stone specimens may have been used, although not manufactured, but there is no certainty of this. Our only artifactual evidence for the existence of a Coroso culture is, therefore, negative: the absence, except for several supposedly intrusive sherds, of pottery and of the other manufactures characteristic of the pottery-making Indians.

The sites provide better evidence, in that they imply the presence of a nonagricultural, hunting, fishing, and gathering people who lived in small bands and moved frequently from place to place—a pattern absent, so far as is known, from the ceramic, agricultural periods. Even this evidence, however, is susceptible of different interpretation, as already noted. Until further work has been done, we can only say that there is no proof either for or against the supposition that a distinct Coroso culture existed before the Igneri and Taino cultures defined below.

Distribution. In view of this situation, it would be premature to outline the distribution of the Coroso culture. We need only note that, in Porto Rico, its sites appear to be limited to the sheltered portions of the shore along the southwest, south, and east coasts and to Vieques Island. There is nothing exactly like it in the neighboring islands.

Relationships. Comparisons with the nonceramic shell heaps of Krum Bay, St. Thomas, and with the preceramic strata of the Samaná caves, Dominican Republic (TABLE 1), are difficult to make, because the remains from these sites have not yet been published in detail and the writer has been unable to obtain access to them. Hatt's brief description of the Krum Bay middens (Hatt, 1924: 31) suggests that they resemble the Porto Rican heaps in all their site details but differ in artifacts. Of the four types of artifacts whose presence is implied by Hatt's account—rectangular stone adzes, hammerstones, red ocher, and blunted clam shells—only the second

and fourth are represented in the Coroso group of sites of Porto Rico, the other two being characteristic instead of the Igneri culture. As for the Dominican material, it differs in its occurrence in caves and in the presence of shell vessels and implements of bone (Krieger, 1929: 5-6). No further comparisons can be made at present.

If the existence of a Coroso culture should be substantiated by further excavation, it would be attributable to the Ciboney Indians, who are probably responsible for the preceramic strata in the Dominican Republic as well as for the non-pottery sites in Haiti and Cuba further west (Rouse, 1948: 500). This conclusion, too, must be deferred pending further excavation.

Igneri Culture

Of the pottery-bearing sites, those characterized by the Cuevas style and by the earlier (unincised) Ostiones pottery appear to constitute a single cultural unit (TABLE 1). This is the unit already defined by Rainey (1940: 108 ff.) as the "Crab culture." We shall instead use the name "Igneri," following the previous practice of Lovén (1935: vi ff.).

This change in terminology is made to avoid confusion. While Rainey's contrast between the earlier predominance of crabs and the later prevalence of shells was sound in terms of his data, it conflicts with the facts subsequently obtained by us. As described below, most of our "Crab" culture sites lack an emphasis on crabs. Moreover, several contain abundant shell remains, whereas many of our "Shell" culture sites do not. In addition, the use of shells as a material for artifacts is not limited to "Shell" culture. It is nearly as common in the "Crab" culture.

The substitution of "Igneri" for "Crab" is also open to criticism, for this term originated as the label for an ethnographic group, the Arawak who inhabited the Lesser Antilles and Trinidad during protohistoric times (Rouse, 1948: 521). To apply the term, as Lovén and we do, to archaeological remains, implies a connection between the ethnographic and archaeological units. It is our belief that such is the case, and we shall attempt to demonstrate it in a subsequent report. Meanwhile, it seems better to follow Lovén's terminology than to coin a new set of names which will further complicate the picture.

Since Rainey has already defined the Igneri, or Crab, culture and we intend to discuss it in detail in the subsequent report, we shall only mention here the more important traits of the culture. Most of these were originally discovered by Rainey (1940: 58-62) at his type site of Cañas, but others have since been encountered by us in association with our Cuevas and earlier Ostiones pottery.

Sites. All known Igneri sites consist of the remains of villages, rather than camps (FIGURES 7 and 13). These seem to have been inhabited over fairly long periods of time. Most are situated in the vicinity of streams, either along the shore or a short distance inland, and on flat terrain favorable for agriculture.

The sites consist of one or more heaps of refuse. The remains of crabs

predominate in some heaps and those, of shells, in others (PLATE 1, lower right). Burials occur in the refuse. All are primary inhumations and, with one exception, lack grave objects (FIGURE 15, A). No ceremonial structures have been found among the Igneri deposits.

The absence of other than village sites is striking. Neither ball courts nor petroglyphs, for example, can be associated with the Igneri culture. Nor does there seem to have been any habitation of, or burial in, caves.

Clay Artifacts. Pottery vessels are, of course, the outstanding artifacts of clay. Open bowls, the greatest width of which is at the aperture, are characteristic, a fact which suggests that the custom of boiling food in the so-called "pepper-pot" was not so prevalent as during historic times, since the open bowls, with their flaring sides, are not well suited to this custom (PLATE 2, C and D). Griddles are the other common type of clay artifact (PLATE 9, H). They are known to have been used for baking cassava and are therefore an indication that agriculture had made its appearance (Rouse, 1941b: 107).

Although the Igneri people excelled in the making of pottery vessels and griddles, they seem to have used very little clay for other purposes. Ornaments of that material are rare, and there are no ceremonial or problematical artifacts.

Stone Artifacts. As Rainey (1940: 107) has pointed out, the rectangular stone adze is diagnostic of the Igneri culture, occurring in no other yet defined (PLATE 9, A). This type of implement, however, does not completely take the place of the petaloid stone celt, as Rainey thought. The latter is also present, becoming more and more common in the later sites, until it completely replaces the rectangular adze (PLATE 9, D). In addition, there are several chipped stone axes (PLATE 9, M). Pieces of flint, hammerstones, grinders, and slabs survive from the Coroso culture (PLATE 8, A, G, H, and J). There are also adze- and celt-hammers and hammer-grinders, the former consisting of worn-out adzes and celts (PLATE 9, B).

A number of stone ornaments have been recovered from the Igneri sites, including ear plugs and an adze-shaped pendant (PLATE 9, E and L). None of these is anthropomorphic, nor have we identified any ceremonial or problematical artifacts. These facts, combined with the absence of ball courts and petroglyphs, suggest that the worship of *zemis*, which is characteristic of the historic Indians, had not yet developed (Rouse, 1948: 513).

Bone Artifacts. Simple awls, picks, and beads are the principal artifacts of bone (PLATE 9, C). The only possible ceremonial object is a paddle-shaped specimen which, however, may have been simply a pendant (Rainey, 1940: PLATE 5: 3).

Shell Artifacts. Shell dishes (PLATE 9, I) and spoons (PLATE 9, H) are common, but celts, chisels, and hammers of that material do not seem to have been made. The ornaments include discoidal beads and pendants of three varieties: cylindrical, cleat-shaped, and Oliva-shell (PLATE 9, G; Rainey, 1940: PLATE 4: 17). While we found no ceremonial objects, there are several problematical forms, such as disks, as well as all of the kinds of dubious artifacts listed above for the supposed Coroso culture (PLATE 8, B-E and I).

Coral Objects. Pieces of coral are again common. Some may have been used as rasps.

Intrusive Material. Indian trade objects, apparently from the Lesser Antilles, were found in a number of Igneri deposits. There are none, however, from the rest of the Greater Antilles or of Spanish origin, except for specimens believed to have been dropped on the sites subsequent to habitation.

Summary. The foregoing outline indicates that the Igneri people had all the types of artifacts supposed to make up the Coroso culture and, in addition, possessed ceramics, chipped and ground stonework, and simpler manufactures of bone and shell. The practice of agriculture is indicated, and there are well-made ornaments as well as utilitarian artifacts. On the other hand, evidence of the artistic and ceremonial traits of the historic, Taino Indians is lacking. The absence of such elements of the ceremonial complex as ball courts, petroglyphs, and carvings of *zemis* in stone, bone, and shell is considered diagnostic of the culture.

Distribution. As Rainey (1940: 175-179) has demonstrated, the Igneri culture is widely spread east and south of Porto Rico, extending through the Lesser Antilles into Trinidad. It is not found further west in the Greater Antilles, except probably in the Dominican sites characterized by Anadel pottery (TABLE 1).

Relationships. The Igneri culture is comparable in general levels of development, if not in detail, to that of the Orinoco valley in Venezuela, as represented by such sites as Los Barrancos and Ronquín (Osgood and Howard, 1943: 111). Emphasis upon ceremonies is lacking in both cases, as is also the elaboration of burial customs otherwise characteristic of Venezuela. These resemblances are consistent with the hypothesis that the Cuevas style, with which Igneri culture is associated, was brought from the mainland by the first Arawak to migrate from northeastern South America (Rouse, 1947: 97; see also p. 340 above).

Taino Culture

The culture associated with the later (incised) Ostiones pottery and with the Santa Elena, Boca Chica, Capá, and Esperanza styles remains to be described. Following Lovén (1935: vi ff.), this culture will be called "Taino" in preference to Rainey's term "Shell culture" (Rainey, 1940: 108 ff.).

There can be no question about the propriety of applying the ethnological term "Taino" to this culture. Not only have we been able to demonstrate that some of the sites of the culture were inhabited during historic times (see, for example, the discussion of our excavations at the north coast site of Santa Elena), but, also, the culture itself corresponds in every recognizable respect to that of the historic, Taino Indians.

Rainey's definition of the Taino (his Shell) culture is limited by the fact that he based his original formulation entirely upon excavations in village sites, such as Cañas. By correlating all possible types of sites and artifacts with the various styles, and through the styles with each other, we have been able to arrive at a fuller definition, of which the following is a brief and incomplete summary.

Sites. The Taino lived in caves and rock shelters as well as in the open (cf. FIGURES 10 and 16). The majority of dwelling sites, however, appear to have been villages in the open. These are scattered through the mountainous interior as well as along the coast, a fact which suggests that the Taino had come to place more emphasis upon agriculture and less on sea food than during Igneri times. In all cases, the sites are close to terrain suitable for agriculture.

Some dwelling sites have yielded only refuse, with or without burials (PLATE 1, upper and lower left). At other sites we also encountered plazas, ball courts, petroglyphs, roads, and terraces (FIGURE 9; PLATE 1, upper right).^{*} It is likely that these sites were used for both ceremonies and habitation. In addition, there were a number of purely ceremonial sites such as cave burials and petroglyphs carved on cave walls, in stream beds, and along the shore.

The burials consist mainly of primary inhumation (FIGURE 15, B-D). In addition, some secondary burials are known. The bones of children were, in a few cases, found in urns, but other grave objects were rare.

Shells are frequent in the dwelling sites closest to the sources of supply but occur only rarely elsewhere. Since many of the sites are in the interior or on the north coast, where the environment is unfavorable for the growth of Mollusca, shell-free sites are not uncommon.

Clay Artifacts. Pottery vessels are as widespread, if not so well made, as in the Igneri culture. They now consist primarily of constricted bowls, in which the wall of the vessel slopes inwards at the rim instead of flaring outwards (PLATE 3, I). This is perhaps to be correlated with increased use of the "pepper-pot."

Griddles continue to be common and show little change. Clay stamps and figurines now make their appearance (PLATE 10, B), as well as cylinders and three-pointed objects, which may also be associated with the ceremonial complex.

Stone Artifacts. The rectangular adze is completely replaced in the Taino culture by the petaloid stone celt (PLATE 9, D). The rest of the Igneri implements survive, with the addition of mortars, pestles, and bowls (PLATE 10, G). While most stone implements and utensils are plain, as in the case of the Igneri culture, some bear pictures of *zemis*, thereby testifying to the development of the ceremonial aspects of the culture.†

Stone ornaments are more numerous in Taino than in Igneri sites and exhibit a greater variety of shape and decoration (e.g., the bead shown on PLATE 10, H). Amulets representing the *zemis* are particularly characteristic (PLATE 10, K).

Purely ceremonial objects such as collars and three-pointed stones can definitely be associated with the Taino culture (PLATE 10, D). In addition, there are a number of problematic objects, such as balls, cylinders, disks, and pegs of stone, which may also have had some function in con-

^{*} Most of these structures were encountered in the mountainous interior and therefore will be discussed in the next report (Volume xviii, Part 4 of this series).

† For pictures of these elaborate forms, of which, mainly, fragments were found in our excavations, see Fewkes (1907: Plates 24 ff.). The historical data upon which the identification as *zemis* is based are summarized in Rouse (1948: 535-537).

nection with the worship of *zemis* (PLATE 10, I and E; see also Fewkes, 1907: Plates 31-59 and 1922: Plates 101-111).

Bone Artifacts. The specimens of bone include utilitarian types comparable to those listed for the Igneri culture and also a series of ceremonial and problematical forms. As examples of the latter, we may mention snuffing tubes and spatulas used to induce vomiting, both typical components of the historic cult of the *zemis* (PLATE 10, A and J; see also Rainey, 1940: Plate 5: 3).

Shell Artifacts. The Taino used a number of implements of shell not present among the Igneri, such as celts, chisels, and hammers (PLATE 10, F and L). They also had more elaborate ornaments, some of them carved with religious motives (PLATE 10, C). The dubious artifacts mentioned above in connection with the Coroso and Igneri cultures continue present, and in addition, there are a number of problematical forms, like those of stone mentioned above.

Coral Objects. So far as is known, the Taino and the Igneri did not differ in their use of coral.

Intrusive Material. Indian trade objects from both the Greater and the Lesser Antilles can be identified. There are also animal bones and artifacts testifying to contact with Europeans.

Summary. The Taino are indicated to have placed more emphasis on agriculture than the Igneri and to have made a greater use of the "pepper pot." In addition, they had completely abandoned the use of rectangular stone adzes and had begun to make mortars, pestles, and bowls of stone and celts, chisels, and hammers of shell. Otherwise, their culture is similar in its utilitarian aspects to the Igneri.

The Taino ceremonial developments, on the other hand, are unique. The presence of structures like plazas and objects like amulets connected with the worship of *zemis* provides the primary basis for distinguishing between the Taino and Igneri cultures.

Distribution. As Rainey (1940: 179-183) has demonstrated, the Taino culture is limited to the northern and western parts of the Antilles, its distribution contrasting strongly in this respect with the southern and eastern position of the Igneri culture. The two overlap only in the Virgin Islands, Porto Rico, and the Dominican Republic (TABLE 1).

West of the area of overlap, the Taino culture occurs in association with the Carrier pottery of Haiti and the Pueblo Viejo style of eastern Cuba. The only other cultures known from this region are the Ciboney and sub-Taino, which survived until historic times in central and western Cuba (Rouse, 1942: 160-166).

To the east and south of the area of overlap, the Igneri culture alone seems to have been present in the Lesser Antilles and Trinidad. So far as is known, it was the earliest in those regions and survived until historic times, except where replaced by the culture of the Carib (Rouse, 1948: 516).

Relationships. If the above picture is correct, it follows that the Taino culture cannot have originated on the mainland, as Rainey (1940: 179-183) thought, for it is separated from South America by the Igneri culture and

from North and Central America by the Ciboney and sub-Taino cultures. Moreover, the writer knows of no comparable ceremonial developments on the mainland, from which the distinguishing characteristics of Taino culture could have been derived. Similarities between the esoteric Taino remains and those of western Venezuela, Columbia, and Central America, have been noted from time to time,* but such resemblances are not specific and fail to take into consideration the fact that the mainland specimens are primarily grave objects, whereas those of the Greater Antilles are almost never found in graves.

Under these circumstances, it becomes necessary to regard the Taino culture as a local development from its Ingeri predecessor. It is planned to discuss this point in more detail in a subsequent report, by which time it is hoped that further excavations will have either confirmed or refuted it. For the present, we note only that certain elements of the Taino complex, such as mortars, pestles, balls, and pegs of stone, may be the result of contact with the Ciboney, of whom these traits are characteristic.

* Most recently by Steward (1947).

EXCAVATIONS ON MONA ISLAND

Setting

Mona Island, called Amona by the aborigines, is situated in the passage of Mona, some 90 kilometers southwest of Porto Rico and 60 kilometers southeast of the coast of the Dominican Republic in Hispaniola (FIGURE 1). Although less than 10 kilometers long and 8 kilometers wide, it is the largest of the several small islands between Porto Rico and the Dominican Republic and is the only one on which traces of Indian remains have been found.

As one approaches the island from the north and east, it appears barren and forbidding (FIGURE 3). Steep cliffs rise sharply from the sea within a protecting barrier reef. At their top, 60 meters above the water, is a great mesa of coral limestone, only the crevices of which contain soil. The vegetation is sparse. Various kinds of cacti, alternating with grass and scrub bushes, combine with the jaggedness of the rocks to make traveling difficult. Rainfall is not uncommon, but most of the water is drained underground into the caves which honeycomb the mesa. Wild goats, boars, and bulls, descendants of the animals kept on the island by pirates, roam the mesa, and giant iguanas lurk among the rocks. The only human inhabitant is the lighthouse keeper on the east cape.

West of the mesa is a low, flat, sandy region which is more suitable for human habitation (FIGURE 3). Covering an area of three square kilometers from the beach of Sardinero on the north to that of Uvero on the south, this region could be intensively cultivated. A number of springs furnish drinking water, caves in the cliff provide shelter, and there is good fishing off shore. Except for a few palm trees, the present vegetation is scrubby, but the average annual rainfall of 104.1 centimeters is enough to support a larger growth of trees.*

At the time of European contact, Mona Island was inhabited by Taino Indians, comparable to those in the rest of Porto Rico. There were one or more chiefs, whose names are not known, and it has been suggested that they were subject to Agüeybana, the leading chief on the main island (Torres de Mendoza, 1880, **34**: 481-482; P.R.R.A., 1940: 39, 382). It is also possible that the island was a stopping place for the natives of Hispaniola and Porto Rico, who daily made the passage between the two islands (Las Casas, 1927, **2**: 290-291).

Columbus sighted Mona Island while sailing from Porto Rico to Hispaniola at the beginning of his second voyage in 1493, but he did not stop there until the following year, when a sickness developed just after he left the island forced abandonment of his plans to conduct a punitive expedition against the Carib in the Lesser Antilles (Jane, 1930: 40-41; Las Casas, 1927, **1**: 404-406). Fourteen years later, in 1508, Ponce de León paused there to obtain information before exploring the island of Porto Rico.

* The above data on the geography, climate, fauna, and flora of Mona Island are taken from Lobeck (1922: 372-373) and from P.R.R.A. (1940: 379-383).

Some historians have suggested that Ponce de León first met Agüeybana, the principal chief of Porto Rico, on Mona Island (P.R.R.A., 1940: 382). Ponce himself, however, speaks only of meeting "the chiefs and Indians of that island" (Torres de Mendoza, 1880, **34**: 481-482). A statement that, by the time of Ponce de León, the island had become a port of call for Spanish galleons also lacks confirmation (P.R.R.A., 1940: 181).

During the first years of colonization, Ponce de León seems to have exercised personal control over Mona, from which he obtained cassava for the support of the settlements in Porto Rico (Torres de Mendoza, 1880,

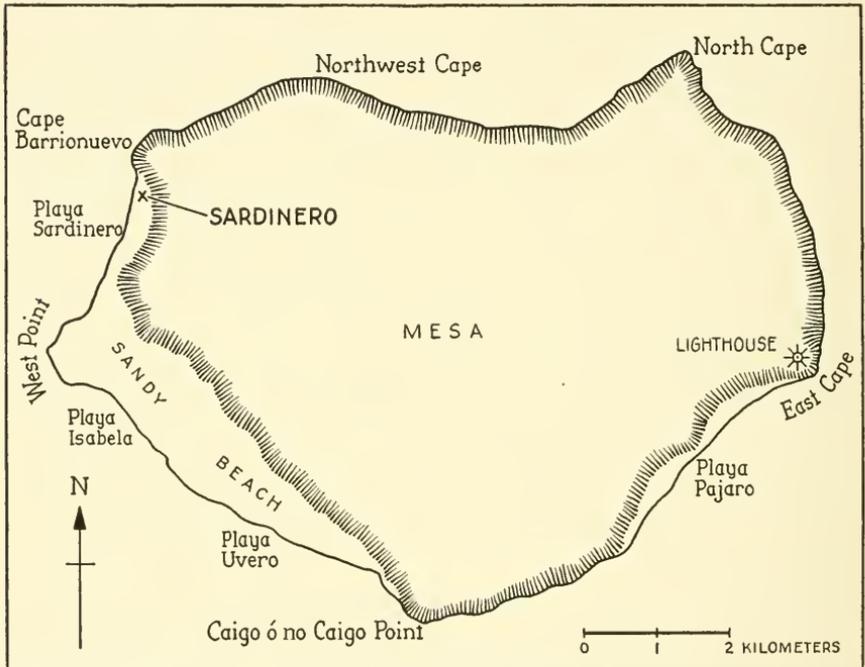


FIGURE 3. Map of Mona Island.

34: 392, 411, 422, 429, 435, 439, 482, 488-489). His control ended in 1511, when the king ordered that Mona be placed under the jurisdiction of the government of Porto Rico and then, reversing himself a month later, awarded it to Bartolomé Colón, the brother of the Admiral, giving him full rights over the Indians and their cassava plantations. Upon his death three years later, the island reverted to the crown and it was again placed under the jurisdiction of the government of Porto Rico. In 1520, its Indians were assigned to Francisco de Barrionuevo, one of the original settlers of Porto Rico (Charlevoix, 1733: 321; Abbad y Lasierra, 1866: 71, 143-144).

Meanwhile, despite a severe hurricane, which in 1511 killed many of the Indians and destroyed their plantations, the island had continued to furnish cassava and other food products to Porto Rico. According to a report of

the royal treasurer in 1515, the Indians had also begun to weave hammocks and shirts of cotton for export to Porto Rico. Christianity was introduced and the island became a port of call for voyagers from Hispaniola to Porto Rico (Oviedo y Valdés, 1851, 1: 465; Abbad y Lasierra, 1866: 96, 143-144; Morales Cabrera, 1932: 230-231; P.R.R.A., 1940: 380).

The effect upon Mona of the freeing of the Indians in 1544 is uncertain. According to one report, many of the Indians of Porto Rico elected to go to Mona in order to avoid the Spaniards (Brau, 1894: 363). According to another, which may refer to a later period, 30 of the Indians freed on Mona came to the main island to escape the raids of pirates (Brau, 1904: 81). When Bishop Bastedas, the official in charge of the freeing of the Indians in Porto Rico, visited Mona in 1548, there were still a number of Indians there. According to Bastedas, they were good Christians. Most of them were married; and they had their own church (Abbad y Lasierra, 1866: 144).

The Mona Indians had long been subject to destructive raids, first by Carib from the Lesser Antilles and later by pirates. In 1537 and again in 1551, the emperor was asked to provide for the construction of a fort to prevent these attacks, but he failed to heed the requests. In 1554, French pirates took possession of the island. In 1561, the lawyer Echagoian reported to King Philip II that the only inhabitants were some 50 Indians (ten years earlier, 25 had been reported). These natives were still producing more cassava, potatoes, and melons than they could consume. They gave them away to the pirates and to other mariners who touched at the island (Abbad y Lasierra, 1866: 144; P.R.R.A., 1940: 380).

The Mona Indians are mentioned again in 1574, and in 1584 (López de Velasco, 1894: 132; P.R.R.A., 1940: 380). Soon thereafter, however, they seem to have become extinct. Throughout the seventeenth and eighteenth centuries the island was apparently frequented only by pirates, who stopped there to and from raids on the towns of the Spanish main. During the early part of the nineteenth century, Mona became the hideout of Roberto Cofresí, a Porto Rican pirate. In 1874, a Spanish company received permission to exploit the guano in the caves of the island, where they found many traces of pirates. Thereafter, the island was uninhabited until 1910, when several families settled down in the caves, living principally by hunting and fishing. In 1937, the United States Forest Service in cooperation with the Porto Rican government established Camp Cofresí of the Civilian Conservation Corps on the island and began preparations for a tourist establishment to accommodate deep sea fishermen. Cabins have been built, an airport and a radio station have been constructed, and the soil is again under cultivation. Small boats now provide regular communication with Porto Rico (P.R.R.A., 1940: 380-383).

At least two people had searched Mona Island for Indian remains prior to the present research. In 1858, José Julián de Acosta y Calbo, a Porto Rican historian, went to Mona, but he was unable to find any trace of human habitation (Abbad y Lasierra, 1866: 144). Around 1930, Dr. J. L. Montalvo Guenard visited the island and located the site near Sardinero which is described in this paper (Montalvo Guenard, 1933: 48).

The writer spent five days on the island, from August 5 to 10, 1938.

During that time, he dug two pits in the site located at Sardinero by Dr. Montalvo Guenard, searched unsuccessfully for a ball court which was said by the inhabitants to be situated at the center of the rocky mesa, and explored the few beaches where the Indians might also have lived, again without success. Inquiry among the workers of the Civilian Conservation Corps revealed that three incised potsherds, comparable to those excavated at the Sardinero site, had been found in a cave on the north side of the island. It was not possible to visit this cave, since the wind had to be north in order to reach it by water and it was not so during my stay on the island, but I visited several other caves without finding any traces of human habitation.

*Sardinero (Mona I)**

The site of Sardinero is situated at the northern end of the low, sandy region on the western side of Mona Island, close to Camp Cofresí (FIGURE 3). At the time of the writer's visit, the main building of the camp was 100 meters north of the site, while a series of cabins constructed for the accommodation of deep sea fishermen lined the beach about the same distance to the west. Above the site towered the cliff at the western edge of the great rocky mesa comprising the bulk of the island. Rocks which had fallen from the cliff broke the flat terrain of the site, and in one place provided an overhanging shelter which may have been used by the Indians (FIGURE 4).

The existence of the site was well known to the workers of Camp Cofresí. They had previously found a stone celt there. In addition, they had removed a human skeleton from the Cueva del Muerto, a cave in the cliff 14 meters northeast of the site (FIGURE 4). The local belief is that this was the skeleton of "El Portugués," a companion of the pirate Roberto Cofresí. It may, instead, have been an Indian burial.

The site is apparently that of a village, for it consists of a large shell heap, some two square kilometers in area and 70 centimeters in maximum depth. It seems to be deepest close to the cliff, as if the latter had been used as a shelter. At the time of the writer's visit, the site had just been plowed for use by the Civilian Conservation Corps as a forest nursery, and this made it easy to examine the refuse. The soil in the furrows was dark brown and sandy. In addition to shells, it contained ash, charcoal, animal bones, and a relatively large number of artifacts, of which a collection was made.

Four sections two meters square were laid out in the form of a square near the center of the site (FIGURE 4). This first pit was dug to a depth of 50 centimeters. For the first 20 centimeters, the deposit was like that on the surface. Then the soil gradually became lighter in color and more sandy, and there was a decrease in the amount of cultural material. By 40 centimeters, the refuse had completely died out and had been replaced by pure white sand.

A second pit four meters square was next laid out closer to the cliff (FIGURE 4), and was dug to a depth of 75 centimeters. In the first two

* This designation is erroneous, as Mona Island is actually part of the municipality of Mayagüez.

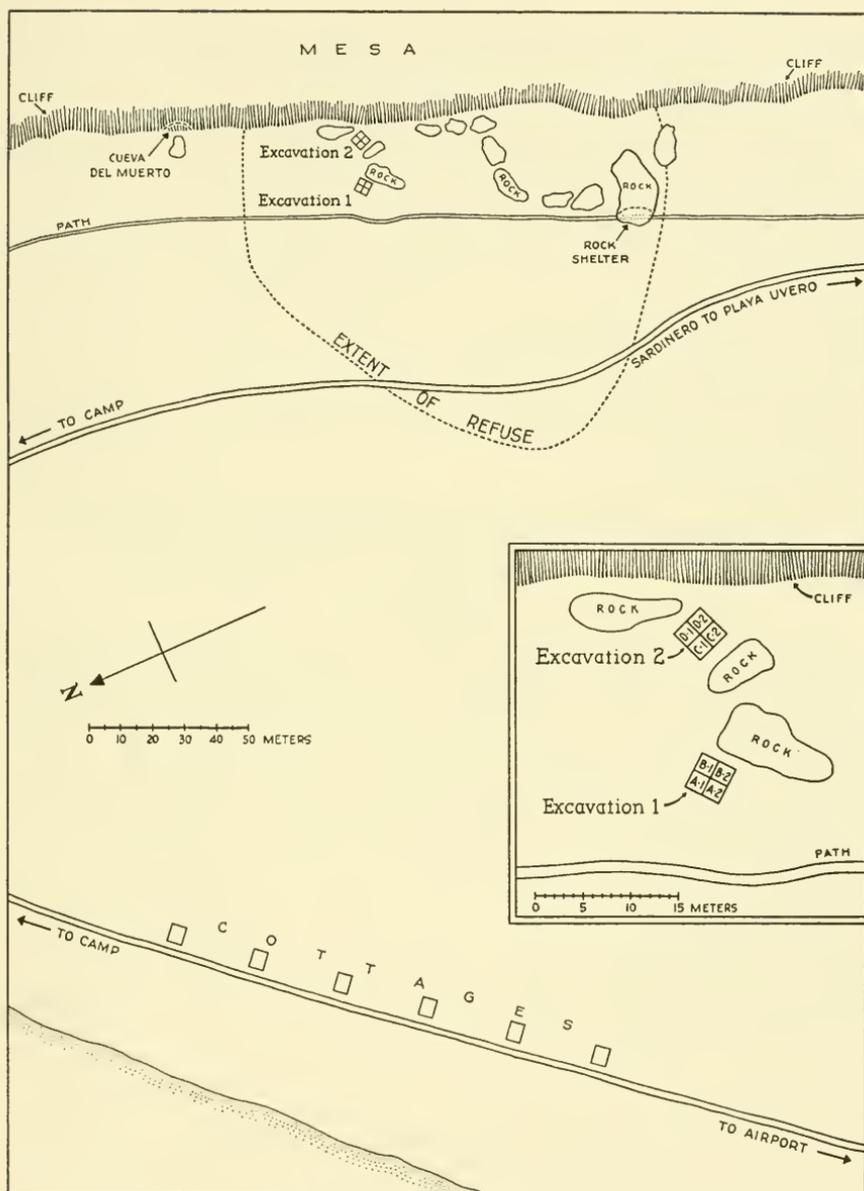


FIGURE 4. Plan of the site of Sardinero.

levels (0.00-0.50), the material resembled that on the surface. Then the soil gradually became lighter and the refuse rarer, until sterile white sand was reached at a depth of 65 centimeters. In neither of the pits was there any apparent difference of stratification.

Both pits appear to be stylistically homogeneous. In fact, with four

possible exceptions all of the sherds collected at the site are of a single style, the Boca Chica. One specimen from Pit 1 may instead be of the Ostiones style, two from Pit 2 may be Capá, and another sherd from Pit 2 is reminiscent of the Carrier style, the latest in Haiti (Rouse, 1948: 514).

The relative uniformity of style makes it possible to treat all the specimens from Sardinero, including those collected on the surface, as a unit. The following Indian potsherds were obtained: 16 from bottles, 51 from open bowls, 271 from constricted bowls, and 126 which could not be identified. The associated artifacts include 11 fragmentary griddles, a clay disk, a lump of clay, a stone chip, 2 bone disks, 2 shell dish-blanks, a shell cylinder, a shell blade, a *Strombus* lip, a fractured shell tip, 2 coral rasps, and 14 other pieces of coral. We also collected 14 European potsherds and a piece of iron. Bird, crab, fish, hutia, iguana, manatee, and turtle are represented among the bones. In addition, cow and another unidentified European mammal may have been present. The shells include one land and several marine gastropods.

No significant differences in level were noted among the Indian artifacts. The European artifacts and the bones of European mammals, however, were limited to the top level in each pit and to the surface finds.

Conclusions

The excavations at Sardinero confirm the accounts of Indian occupancy of Mona Island during historic times. The surface finds and the first 25-centimeter level in each pit, which contain the European objects, can be dated in the historic period (IVb). Level 2 in Pit 1 and levels 2-3 in Pit 2, which lack European objects, then fall logically into Period IVa.

These datings are corroborated by the Indian pottery from Sardinero. As already noted (p. 349 above), the prevalent style, Boca Chica, is best known from the Dominican Republic, where sherds of the style have been found at the site of the first Spanish settlement of Isabela as well as in prehistoric sites.

The few Ostiones, Capá, and Carrier sherds which have also been identified are probably trade objects. The first is out of place, since we have assumed it to be limited in Porto Rico to Period III, but the others confirm the Period IV date given above.

EXCAVATIONS ON THE WEST COAST

Setting

This section is concerned with the sites in the western part of the main island of Porto Rico. It covers all of the lowlands draining into Mona Passage along the 60 kilometers of shore line between the Caribbean Sea on the south and the Atlantic Ocean on the north (see folding map at end). These extend inland for an average distance of 15 kilometers and have an area of some 900 square kilometers.

The boundary chosen to separate this west coast area from the rest of the island begins in the south on Cabo Rojo (folding map). Then it swings inland towards the mountainous interior and, turning north, passes through the middle of the foothills. Near its northern end, the line curves back towards the coast, terminating on Punta Borinquén in the northwestern corner of the island.

The southern, central, and northern parts of the west coast area each have a different topography (folding map). In the south are three parallel ranges of hills, extending from the Cabo Rojo to the modern city of Mayagüez and separated from each other by the broad plains of the Ríos Boquerón and Guanajibo. These hills are low, rolling, and fertile, but the southernmost range is arid, and sufficient water for agriculture and for the growth of trees is provided only north of the Río Boquerón. Both on the south and on the west, the region is favored by a series of small, well-protected bays, which must have provided shelter for the aborigines while fishing. Even without these bays, however, the coast is the most sheltered on the island, for the prevailing northeastern winds do not reach it. Thus, conditions must have been ideal for the Indians, and in fact more sites have been located in this district than in any other comparable part of the island, with the possible exception of the district around Santa Isabel and Salinas on the south coast.*

Moving northward from the city of Mayagüez, one enters the broad valley of the Río Grande de Añasco, the largest river on the west coast of the island (folding map). This valley, more than ten kilometers wide and extending inland for twice that distance, must have provided the Indians with easy access to the interior of the island. Its land is fertile and well watered, and it is especially noted today for its fruit trees. Indian sites are scattered throughout the valley, most of them in the vicinity of the several open bays with which it is indented on the west rather than in the zone of foothills to the east (Lothrop, ms.: 1, 7, 10-11).

The valley of Añasco is bounded on the north by a steep range of hills, extending from the mountains to the very edge of the coast (folding map). Lesser hills stretch from this range into the northwestern corner of the island, where they are broken only by several narrow coastal plains and by the valley of the Río Culebrinas, south of the city of Aguadilla. The

* A picture of the distribution of these sites may be obtained from the maps in Montalvo Guenard (1933, opp. pp. 384, 402).

region is fertile and it is well supplied with water, not only by rivers and streams but also by a number of springs at Aguada and Aguadilla. Nevertheless, few traces of Indian remains have been found. Several dwelling sites near Rincón on the southern edge of the region and one on Punta Borinquén in the north are the only ones known to the writer. To some extent, this scarcity of dwelling sites is probably due to the force of the prevailing northeasterly winds and to the fact that the only important bay, that of Aguadilla, is too open to provide adequate shelter from the winds.*

The meagre references in the historical sources reveal that, at the time of historic contact, the west coast was inhabited by Taino Indians. They were divided into at least two chieftainships, each a district containing a number of Indian villages and ruled by a chief who lived in the principal



FIGURE 5. Locations of the villages of the Porto Rican chiefs: (1) Yagüeca (chief Urayoan); (2) Aymaco (chief Aymamón); (3) Guajataca (chief Mabodamaca); (4) Abacoa (chief Arasibo); (5) Sibuco (chief Guacabo); (6) Toa (chief Aramana); (7) Bayamón (chief Majagua); (8) Cayniabón (chief Canóbana); (9) Jaymanio (chieftainess Yuisa); (10) Otoao (chief Guarionex); (11) Jatibonico (chief Orocobix); (12) Guaynabo (chief Mabo); (13) Turabo (chief Caguax); (14) Guaynia (chiefs Agüeybana 1 and 2); (15) Abey (chief Abey); (16) Guayama (chief Guamani); (17) Guayaney (chief Guaraca); (18) Macao (chief Humacao); and (19) Daguao (chief Daguao). (See p. 334 for the sources of this map.)

village (Coll y Toste, 1907: 1, 97, 204, 220). In the valley of Añasco, as well as the adjoining foothills and mountains, was the chieftainship of Yagüeca, ruled from a village of the same name by a chief called Urayoan (FIGURE 5: 1). The territory surrounding the Río Culebrinas in the hilly northwestern part of the island constituted the chieftainship of Aymamón, ruled by a chief called Aymamón who lived in a village name Aymaco (FIGURE 5: 2).

So far as the writer is aware, nothing is said in the historic sources about a chieftainship in the southern part of the west-coast area, where most of the sites are located. In view of the unsystematic nature of the writings of the conquistadors, it is quite possible that they failed to record the name of the chief in this district. On the other hand, the district might have been abandoned before the coming of the Spaniards. The archaeological data presented below will shed some light on these two possibilities.

Columbus made his only landing in Porto Rico somewhere along the

* This information concerning the geography, topography, and climate of the west coast of Puerto Rico, was obtained from Lobeck (1922), Ober (1899: 11-43), P.R.R.A. (1940: 324-332), Roberts (1942), and the topographic maps of the United States Geological Survey.

west coast during the course of his second voyage. On November 20, 1493, having sailed along the southern shore of the island from the Lesser Antilles, he dropped anchor in a bay on the west coast in order to obtain fresh water and to take possession of the island in the name of the king and queen of Spain. An Indian village was situated near his landing place. It consisted of a dozen huts arranged in a circle around a central plaza and of a larger building of superior construction, the position of which is uncertain. From the plaza, a road lined with interwoven lanes extended to a raised stage or balcony on the shore. During the two days that the fleet was in the bay before setting sail for Hispaniola, no Indians appeared at the village. Presumably they had fled into the interior (F. Columbus, 1744: 529; Muñoz, 1793, **1**: 185; Martyr d'Anghera, 1912, **1**: 76-77).

The data provided by Columbus and his companions are too few to permit exact identification of his landfall. These data have been variously interpreted to identify the landing with every important bay on the west coast of Porto Rico, and as yet no single identification has been generally accepted.* From an archaeological standpoint, the attempt of Montalvo Guenard to demonstrate that the landing place was in the bay of Boquerón along the southern part of the west coast and that of de Hostos to locate it in the bay of Añasco near the center of the west coast are the most significant, since both these authors identify the Indian village observed by Columbus with an archaeological site, Montalvo Guenard choosing the site of Boquerón in the modern village of that name, and de Hostos selecting the site of Machuca near the mouth of the Río Grande de Añasco (Montalvo Guenard, 1933: 383-389; de Hostos, 1938: 166-167). We shall here adopt the identification of Montalvo Guenard, since it has been corroborated on purely nautical grounds by Morison, the latest writer (Morison, 1942, **2**: 89, 99).

In 1500, another Spanish navigator, Vincente Yañez Pinzón, visited Porto Rico to take on water, possibly in the same bay where the original landing had taken place. Five years later, one of his captains, García Alonso Cansino, returned to the bay and cast ashore pigs and goats in preparation for the establishment of a village which had been authorized by the king but which never materialized (Abbad y Lasierra, 1866: 21-23).

The actual colonization of the island began in 1508-09, when Juan Ponce de León made two trips to explore Porto Rico, bringing settlers from Hispaniola. On both trips, Ponce de León seems to have by-passed the west-coast area in favor of the south coast. He landed each time in the territory of the chief Agüeybana near Guánica (Torres de Mendoza, 1880, **34**: 481; Abbad y Lasierra, 1866: 24-26).† In his choice of the site for the first Spanish settlement, Ponce also ignored the west-coast area, founding instead the town of Caparra near San Juan on the north coast. It was not until 1510 that Cristóbal de Sotomayor established the first west-coast settlement, which bore his name, near the present town of Añasco (Oviedo y Valdés, 1851, **1**: 470).

The establishment of the town of Sotomayor was accompanied, as in the

* For a summary of the various identifications, see de Hostos (1938: 117-121).

† For another version of Ponce de León's landing place, see Brau (1907: 106-107).

rest of the island, by a *repartimiento* or distribution of the Indians among the Spaniards. This system, whereby the natives were forced to work as slaves for their masters, led in 1511 to a revolt in which the Indians of the west coast played a prominent part. Joining with Indians from the interior, they attacked and destroyed the settlement of Sotomayor. Later, they probably also fought under Mabodomaca, a north-coast chief, in a skirmish near Aymaco. The final battle of Yagüeca, in which more than 11,000 Indians were defeated, likewise took place in their territory towards the close of the year 1511 (Herrera y Tordesillas, 1729, 1: 224-226; Oviedo y Valdés, 1851, 1: 470-481).

Our knowledge of the chiefs in this area is mainly derived from their activities in the rebellion. It is said that the Indians at first hesitated to attack the Spaniards because of a feeling that they were supernatural. To overcome this feeling Urayoan, chief of the district of Yagüeca, had a Spaniard named Salcedo drowned in the river, proving by means of this experiment that the Spaniards were mortal beings. A few days later, Aymamón, the chief to the north, captured a Spanish youth. He and his followers were holding a game of ball to decide who should have the honor of killing the youth when Salazar, another Spaniard, came along to the place, put the Indians to flight, and liberated the youth. It is said that Aymamón was so impressed with Salazar's courage that he exchanged names with him (Herrera y Tordesillas, 1729, 1: 224-226; Oviedo y Valdés, 1851, 1: 470-481).

At the close of the rebellion, Luis de Añasco, a lieutenant of Ponce de León, obtained the right to exploit the chieftainship of Yagüeca. He and his companions apparently took control of the remaining natives in the area, working them for his own profit. When the natives were freed in 1544, most of them went into the mountains to avoid living with the Spaniards, or else they migrated to Mona Island. The only natives known to have lived in the area after that time are a group of laborers brought from the continent, who in 1770 had their own village of Cibuco near the present town of San Germán (de Hostos, 1938: 162; López de Velasco, 1894: 128-129).

The settlement of Sotomayor was apparently never reestablished after its destruction in the rebellion of 1511. Instead, the Spaniards formed a new village called San Germán near the modern town of Guayanilla on the south coast. In 1570, this village was moved to its present position in the southern part of the west-coast area, becoming the first permanent Spanish settlement in the area. In 1585, another village was founded at Aguada in the northern part of the west-coast area. Throughout the seventeenth century, these were the only two towns in the area. The eighteenth century, however, saw the establishment of most of the present settlements (Latorre, 1919: 39-40; López de Velasco, 1894: 129; Van Middeldyk 1903: 275-281).*

It will be noted that the west coast Indians had little time for contact with the Spaniards—at the most only three years—before they were removed

* For another version of the establishment of the town of San Germán see de Hostos (1938: 162).

from their villages to serve as slaves. As a result, one would not expect to find much of a historic period in the archaeological sites of western Porto Rico. This may explain the scarcity of European trade objects in the pits to be described below.

Perhaps the earliest archaeological work in the west-coast area was done by Dr. J. L. Montalvo Guenard, a native of Mayagüez, during the first three decades of the twentieth century. Dr. Montalvo Guenard located and explored a large number of sites in all parts of the west-coast area, amassing a collection which is probably the most representative for this part of Porto Rico. He has published only a brief account of this work, locating the sites in the area and illustrating a few potsherds (Montalvo Guenard, 1933: 383-389).

In 1914 and 1915, N. L. Britton (1919: 2-5, 1930: 167) and J. Alden Mason (1941: 270-272) made a survey of the sites in the thickly settled southern part of the west coast area under the auspices of the New York Academy of Sciences. A large number of shell heaps and caves, some of which contained refuse and some pictographs, were visited and several small collections were made.

Continuing the work of the New York Academy of Sciences, Herbert J. Spinden, in 1916, excavated at the site of Ostiones near Cabo Rojo in the southern part of the west coast area (Britton, 1919: 2-5 and 1930: 167). His extensive collection, which is as yet unpublished, is now at the American Museum of Natural History, where it would well repay detailed study as it contains the largest number of specimens of the Ostiones style, named after the site.

About the same time, Adolfo de Hostos, now the official historian of Porto Rico, also excavated at Ostiones and at the nearby site of Joyuda. The pottery of the Ostiones style obtained at these sites served as the basis for his paper on Porto Rican ceramics (de Hostos, 1919 and 1941: 7-29). In 1917, de Hostos likewise dug at the site of Las Cucharas near Lajas, but he has not published on this work.

During 1915 and 1916, Samuel K. Lothrop visited the west coast area during the course of his archaeological survey of Porto Rico. Locating a large number of sites, he excavated at five of them: Ensenada, Joyuda, Las Cucharas, Minillas, and Ostiones. The report which he prepared on this work was unfortunately lost and, as a result, the specimens, which are now in the Harvard Peabody Museum, have never been published (Lothrop, ms.; see also his field catalogue in the Harvard Peabody Museum).

In 1916, Theodoor de Booy collected specimens at Ostiones and excavated briefly at the site of Joyuda on behalf of the Museum of the American Indian, Heye Foundation, in New York. De Booy's death three years later apparently prevented publication of this research (Lothrop, ms.; Saville, 1919).

To the writer's knowledge, no further work was done in the west coast area, except for some collecting by a Dr. Llavat of Mayagüez, before the coming of Froelich G. Rainey in 1934. The latter archaeologist visited the sites of Boquerón and Ostiones in the southern part of the area, mak-

ing a surface collection at each, but he did not excavate (Rainey, 1940: 117-118).

During the six months spent in Porto Rico from 1936 to 1938, the present writer made a survey of the sites on the west coast of the island, based upon the previous survey by Lothrop and upon information supplied by de Hostos and Montalvo Guenard, and he dug single stratigraphic pits in eight of the most promising sites. The following discussion is concerned with these pits.

Boquerón (Cabo Rojo 1)

The modern village of Boquerón, located on the bay of that name in the municipality of Cabo Rojo, is built directly upon an extensive Indian site (see folding map at end). This site is one of those listed by Lothrop (ms.: 3). From it, Montalvo Guenard has obtained a large number of specimens including 4 sherds of the Ostiones style and 15 of the Capá, of which he has published an illustration (Montalvo Guenard, 1933: 367, 389, map opp. p. 402). On May 6, 1934, he took Rainey to the site, and the latter made a small collection, which is now in the Yale Peabody Museum (Rainey, 1940: 118; also his field notes in the museum). The present writer surveyed the site on July 28, 1937, also purchasing several specimens from the inhabitants of the area. A test pit was dug the same day, and the site was later visited again in an effort to determine its maximum extent.

Boquerón must have been an ideal location for an Indian village, with its fine beach along perhaps the best bay on the western coast of Porto Rico. The region is flat, fertile, and well watered. A large stream just south of the site could have furnished drinking water.

According to Montalvo Guenard (personal communication), the site consists of two shell heaps, one to the south of the modern village and the other in its northern half, the former being considerably larger, shallower, and less concentrated than the latter. Rainey, on the other hand, refers only to a single heap, presumably the one to the north, and this was the only one located by the writer. It extends over several plowed fields, being some 200 meters in diameter, a half a meter in depth, and 50 meters inland from the shore. Upon the surface, the sandy soil is mixed with a moderate amount of shells, with charcoal, and with potsherds, which at the time of the writer's visit were too scarce and too small for identification.

The test pit, divided into four sections two meters square, was laid out in the part of the midden where the shells appeared most numerous. Throughout the first 25-centimeter level, the deposit resembled that on the surface, with the addition of a few small fragments of animal bones. The second level, by contrast, had few shells and it lacked animal bones, but potsherds continued in appreciable numbers except in section A2. Towards the bottom of this second level (0.25-0.50), the soil gradually became light brown and the shells ceased to appear. Level 3 was dug in part, but it yielded so few specimens that excavation was discontinued at a depth of 65 centimeters.

A child's burial was encountered near the outside corner of section B2 at a depth of 40 centimeters, with the bones so badly decomposed that

it was not possible to determine the position of the body. There were no associated artifacts.

No part of the pit contained an appreciable division into strata, nor did the artifacts themselves appear, at the time of excavation, to vary in nature. Nevertheless, analysis of the specimens in the laboratory revealed that both the Cuevas and the Ostiones styles were represented. Potsherds of the Cuevas style predominated in sections A1 and A2 of level 1; A1, A2, and B1 of level 2; and in all parts of level 3. Potsherds of the Ostiones style predominated in sections B1 and B2 of level 1 and in section B2 of level 2 (TABLE 2). These two groups of sections and levels may therefore be considered stylistically distinct. They will be called the Cuevas and the Ostiones divisions.

From a typological standpoint, 81 of the potsherds obtained in the Cuevas division are from open bowls, 48 are from constricted bowls, three are from jars, and 41 are unidentifiable. The associated artifacts include seven

TABLE 2
DISTRIBUTION OF CUEVAS AND OSTIONES POTSHERDS AT BOQUERÓN*

	A1	A2	B1	B2	
1	33-6	54-4	9-19	4-31	Ostiones division
2	33-4	3-2	20-1	4-19	
3	1-0	0-0	1-0	1-0	Cuevas division

* *Explanation of Table.* The vertical columns in this table represent sections; the horizontal lines, levels. Within each square, the numbers of potsherds of the Cuevas and Ostiones styles are given in succession. The line marks the boundary between the Cuevas and the Ostiones divisions.

fragmentary griddles, two sections from clay patties, a stone chip, and a piece of red ocher. A human tooth is the only recognizable bone.

The burial already described was in the Ostiones division. Thirty-seven of the sherds from this division are fragments of open bowls, 20 are from constricted bowls, and 12 cannot be identified. They are accompanied by five broken clay griddles, a section of a discoidal clay stamp, an anthropomorphic stone pendant, and five stone chips. Several possible remnants of European mammals are the only bones.

The shell sample and the specimens collected on the surface by Rainey and by the writer cannot be assigned to the divisions. They include 15 potsherds, all of the Ostiones style. Five are from open bowls, one is from a constricted bowl, one is a miniature bowl, and eight are unidentifiable as to type. In addition, we obtained an anthropomorphic stone pendant, 11 stone chips, a shell blade, two *Strombus* lips, and a fractured shell tip. Marine gastropods and marine pelecypods are also represented. It is likely that most of these specimens come from the Ostiones division, but this is not certain.

In accordance with the method of dating defined above, the Cuevas division can be assigned to Period II and the Ostiones division to Period III.

Since the Cuevas pottery lacks white paint, the accumulation of that division would seem to have been limited to Period IIb. The presence of incised and modeled designs on the Ostiones pottery similarly dates that division in Period IIIb. This suggests that, despite the absence of distinct strata, there was a lapse of time between the accumulation of the two parts of the pit. During this interval, corresponding to Period IIIa, the inhabitants may have deposited their refuse elsewhere.

The lack of sherds of the Capá style, which are characteristic of Period IV, is surprising, for it conflicts with the previous discovery of such sherds at this site by Montalvo Guenard. It may be that the shell heap dug by us was limited to Periods II and III, and that during Period IV the population shifted to the more southerly midden which the writer failed to locate. This would be consistent with Montalvo Guenard's conclusion that Boquerón was the village observed by Columbus when he first landed in Porto Rico (as cited above).

Borinquén (Aguadilla 1)

There is a large shell heap 1.8 kilometers southeast of the lighthouse on Punta Borinquén in the municipality of Aguadilla (see folding map at end). This site is on a farm belonging to Pedro Hernández in the barrio of Borinquén, only 100 meters inland from the ruins of a former lighthouse on the shore of Aguadilla Bay. It is probably close to the Borinquén airport, which was built after the writer's visit to the site.

Lothrop seems to have been the first to report the existence of a site at Borinquén (Lothrop, ms.: 1). It is also included by Montalvo Guenard in his map of the sites on the west coast of Puerto Rico (Montalvo Guenard, 1933: 384). A small hollow in the southern part of the site was said by the local people to have been excavated by an American, who obtained there two skulls and numerous pieces of pottery. The writer surveyed Borinquén on July 12, 1937, and returned the following two days to dig a test pit.

At the time of the writer's visit, the level area of the site, long under cultivation, was planted with a grove of coconut palms. Although sandy, the soil appeared fertile. There was a good beach in front of the site, but it was relatively exposed, being at the northern edge of the bay of Aguadilla. Drinking water could have been obtained either from springs in the vicinity or from a river two kilometers southwest.

A village site some 75 meters in diameter, Borinquén consists of a single, circular shell deposit surrounded by an area of refuse without shells and bordered on the southeast by a scattering of potsherds. Upon first glance, this deposit seemed no higher than the surrounding terrain, but closer inspection revealed that it rose gradually towards the center, where several slight elevations may represent either middens or rises in the ground. Even on these elevations, the shells were not very common. Charcoal and a few animal bones also appeared on the surface of the dark, sandy soil, but there was no ash. Potsherds were unusually numerous, and many could be identified as Cuevas in style, despite the fact that they were badly broken by the plow. Several shell trumpets were also observed.

The top of what appeared to be the highest elevation in the site was chosen for excavation, and on it was staked out a square divided into four sections two meters on a side. The first three levels (0.00-0.75) contained a deposit like that on the surface, with small amounts of shells, charcoal, animal bones, and relatively large numbers of artifacts in the dark brown sand. In level 4 (0.75-1.00), the soil gradually became lighter in color; there was less charcoal; and the shells died out. Animal bones and potsherds continued in small numbers to a depth of 90 centimeters on the east and south sides of the pit and 125 centimeters on the opposite side, where the light brown sand gave way to heavy, sterile clay. Excavation was discontinued at the latter depth.

The Borinquén pit seems to be stylistically homogeneous. Cuevas potsherds, of which there are 1216, predominate in all sections and levels. In addition, there are 15 sherds of the Ostiones style, all from the top level, and one of the Capá, from level 2.

Five hundred and forty-six of the potsherds are from open bowls, 299 are from constricted bowls, 21 are from jars, and 366 could not be identified as to type. The associated artifacts include 86 fragmentary griddles, part of a lump of clay, the shank of a stone adze, two broken celt-hammers of stone, a stone polisher, 29 stone chips, one fragment of a stalactite, a shell dipper, four shell dishes, one dish-blank, two fragmentary spoons of shell, a longitudinal shell bead, a shell pendant-tinkler, a shell disk, a *Strombus* plate, two plain shell tips, and 28 fragments of coral. A Spanish coin, dated 1861 and perforated for suspension, is the only European artifact. Among the bones, it has been possible to identify bird, crab, fish, hutia, and turtle. The shells include marine pelecypods and both land and marine gastropods.

From a typological standpoint, the Indian specimens seem to have been evenly distributed throughout the site. The Spanish coin was found in the fourth level (0.75-1.00), a fact which is difficult to explain since the site appeared otherwise undisturbed. The writer neglected to inquire whether the coin had been lost by one of his workmen.

From the predominance of Cuevas potsherds in all sections and levels, it may be deduced that the refuse of the pit was deposited during Period II. Both parts of this period are apparently represented, Period IIa by levels 2-4 where white paint is present and Period IIb by level 1, where it is absent. Deposition presumably ceased in the area of the pit at the close of Period II, but it may have continued into Periods III and IV in other parts of the site. This would explain the presence of Ostiones and Capá sherds in the top levels. They could have been plowed into the pit from other areas, or else deposited on the surface by the later inhabitants.

Calvache (Rincón 2)

There are two village sites in the vicinity of the town of Rincón. Ensenada, the larger one, is situated on the point of the same name northwest of the town, while the smaller Calvache is southeast of the town in Barrio Calvache (see folding map at end). The writer had intended to

dig in the former place, but, permission not being obtainable, he was forced to work at the less important Calvache. About two kilometers inland, this site is located on the farm of Antonio Santos in the municipality of Rincón, 200 meters northeast of kilometer post 20 on Highway 2.

Lothrop had previously made a small collection at Calvache, consisting of 19 Ostiones and four Capá sherds, five pieces of griddles, part of a discoidal clay stamp, a stone polisher, three *Strombus* lips, a plain shell tip, and a water-worn shell fragment (Lothrop, ms.: 11). The writer surveyed the site on July 20, 1937, and returned the following three days for the excavation of a test pit.

A stream flows just southeast of the highway, and the site is located in a level cane field between this stream and a low hill. A village site, it consists of a single circular deposit of shells, some four acres in area and one meter deep. Apparently as the result of extensive cultivation, shells and artifacts were rare and unusually fragmentary on the surface, and it was impossible to identify the varieties. The soil was dark brown and showed no traces of ash, charcoal, or animal bones.

Only one place was available for excavation, a small area not planted in sugar cane beneath a tree at the northeastern edge of the site. Four two-meter square sections were staked out in this area. In the first 25-centimeter level, the refuse resembled that on the surface, with the addition of some charcoal and animal bones. Below that level, the soil became darker and was packed with shells. Artifacts and animal bones were also more numerous, and there were several fragments of human bones. This condition continued almost to the bottom of level 3 (0.50-0.75), where the pottery became less frequent and there were fewer shells. Except in section A1, level 4 (0.75-1.00) contained comparatively little pottery and few shells, although animal bones, an occasional human bone, and charcoal continued as before. Level 5 (1.00-1.25) yielded almost no shells and very little pottery. The soil was still dark brown, but few traces of charcoal and of animal bones were obtained. By the bottom of that level, the ground was sterile and excavation was therefore discontinued despite the absence of a sub-soil.

Four styles are represented in the Calvache pit. Ostiones potsherds, of which there are 1,245, predominate in all sections and levels. There are 11 Cuevas potsherds, also well distributed throughout the pit. Two Santa Elena and 14 Capá sherds were limited to the top two levels.

One hundred and eighty-six of the potsherds come from open bowls, 634 from constricted bowls, 28 from jars, and 424 from unidentifiable vessels. Accompanying them are 31 fragmentary clay griddles, four broken discoidal stamps of clay, a clay cylinder, two clay disks, one stone celt, one stone polisher, 27 chips of stone, one bone bead, three shell dishes, two shell celts, two celt-blanks of shell, five celt-hammers of shell, a lip-hammer, a plate-hammer, a shell face, six *Strombus* lips, a shell node, a *Strombus* plate, a water-worn piece of shell, and 47 coral fragments. Two European potsherds were also found in the pit. Bird, fish, human, hutia, iguana, and turtle bones have been identified. Among the shells are marine pelecypods and land and marine gastropods.

The European potsherds were obtained from the top level, and the pottery disks and stamps from the top two. The rest of the specimens seem to show no significant concentration in any one part of the pit.

The overwhelming predominance of Ostiones sherds at Calvache dates our pit in Period III. Both parts of that period appear to be represented, IIIa by the bottom two levels, where incised sherds are almost completely absent, and IIIb by levels 1-3, where they are common. The Cuevas sherds may have been a survival from the preceding period, and the Santa Elena specimens, trade objects. It is possible that the Capá sherds represent the beginning of a transition to Period IVa. The European sherds, on the other hand, are probably intrusive. They may have been deposited on the site by the modern inhabitants.

Coroso (Cabo Rojo 2)

The shell-heap of Coroso is situated in the extreme southwestern corner of Porto Rico, one kilometer north of the shore of Sucia Bay on the southern coast of the island and about the same distance in from the western shore (see folding map at end). It is part of the farm of Antonio Hernández in Barrio Boquerón of the municipality of Cabo Rojo, some four kilometers due north of the lighthouse on Cabo Rojo. There is no other site in the vicinity, the closest being Boquerón about seven kilometers to the north.

The site had not been studied before the arrival of the writer, who learned of it from his workers at the site of Boquerón. He first visited Coroso on July 28, 1937, and excavated a test pit the following day. The son of the owner of the land had stated that the site was one meter deep and that several pieces of plain pottery had appeared during cultivation, but neither of these statements was confirmed by our excavation.

Although the site is on the highest knoll in the vicinity, it is only five meters above the sea level. From it, a flat field slopes gradually down to a sandy beach on the shore of Sucia Bay, which is a deep indentation, well protected from the sea. This is savannah country, grassy and relatively arid, but the vicinity of the site is said to have been formerly cultivated in corn. At present, the water supply would seem to be insufficient for this purpose. (A slight shower during our stay at the site was said to have been the first in nine months.) Our workers stated, however, that the rainfall had previously been greater. Since there is no water supply in the vicinity, the Indians themselves must have relied upon rainfall, unless they carried water from a distance.

Coroso is a camp rather than a village site, for it consists of a single shell heap only 20 meters in diameter and 25 centimeters deep (FIGURE 6). Another small patch of shells 10 meters in diameter and surface deep, which is some 80 meters north of the main heap, may represent a second site. Shells were unusually common on the surface of the main heap, where they were imbedded in the brown, sandy soil. No bones appeared, either on the surface or in the excavation.

Four sections two meters square were staked out in the center of the main shell heap (FIGURE 6). The top 25-centimeter layer in these sections had the same composition as the surface of the site, except that sections

A1, A2, and B2 yielded ash at a depth of from 10 to 25 centimeters. There was no charcoal. A few crude artifacts of stone and shell, some of which may have been natural objects, were encountered, but no pottery or European artifacts.

At a maximum depth of 27 centimeters, the shell deposit ceased suddenly, giving way to sterile, white-brown sand. The transition here was much sharper than in the pottery-bearing sites excavated by the writer, and it indicates that the site was inhabited, if at all, for a very short period of time. Field stones were rare, both in this level and in the one above. At the bottom of the second level, we ceased excavation.

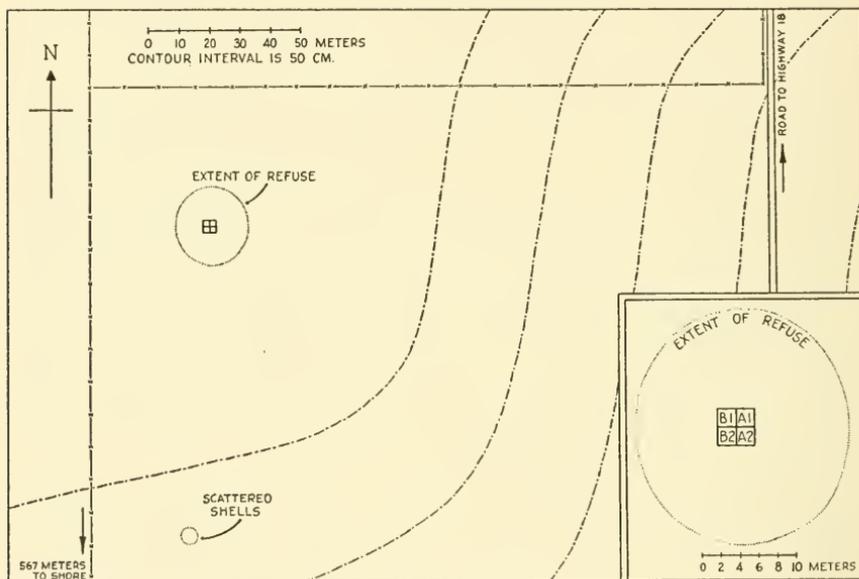


FIGURE 6. Plan of the site of Coroso.

The specimens collected from the Coroso pit include six possible stone hammers, eight stone chips, two stone slabs, a *Strombus* plate, three plain shell tips, one fractured shell tip, and a piece of coral. Marine gastropods and pelecypods are also represented.

The absence of pottery and of such traces of agriculture as griddles, suggests a dating in Period I. Before drawing this conclusion, however, one must consider the alternative possibility that Coroso was a place where the later Indians gathered shells. In favor of the latter hypothesis are the greater concentration of shells in Coroso than in most pottery-bearing sites, the lack of animal and fish bones, which should have been included in the diet of any inhabitants, and the absence of burials. The smallness and shallowness of the deposit and the lack of a nearby source of drinking water also suggest that Coroso was only a temporary site.

On the other hand, there are no indications either in the historical sources or in the archaeology of the ceramic sites that the Indians moved temporar-

ily to the shore for the purpose of obtaining shell fish. The meagre references in the sources are all to sedentary villages, like the one described above in connection with the landing of Columbus on the west coast, where the Indians appear to have been permanently established on the shore for the purpose of carrying on agriculture, fishing, and the gathering of shell food. In the archaeological sites, as is shown below, there is evidence that the Indians within traveling distance of the shore went there to obtain shell food, but that they carried them back to their own villages without stopping to open them on the shore, as would be necessary to produce a site like Coroso. The Indians who lived far in the interior apparently went without sea food, for even fish bones are rarely found in their sites.*

Moreover, the site of Coroso is poorly situated from the standpoint of shell gathering. It is not directly on the shore, where one would expect it to be if it had been deposited by people who came to Sucia Bay simply to obtain shell food. So far as is known, the immediate area contains no pottery-bearing sites from which the Indians might have come to gather shell fish. The inhabitants of the pottery sites to the north of Coroso probably collected their shell food at the closer and more easily accessible bays on the west coast of the island. Those to the northeast are likely either to have followed the rivers down to the west coast bays or else to have visited the bays around La Parguera to the south of them, which are likewise easier to reach (see folding map at end). There are pottery-bearing shell heaps of all sizes along the southern and western coasts of Porto Rico as well as inland, and it is difficult to imagine why they should contain pottery when Coroso does not, if both were inhabited by the same people. The presence of non-pottery deposits, supposedly comparable to those at Coroso, *beneath* pottery-bearing deposits in the Dominican Republic may also be cited in favor of the existence of a preceramic period in Porto Rico (see above, pp. 316-17).

The same arguments apply to the possibility that the Coroso shell heaps might have been deposited by the Spaniards since the conquest of Porto Rico. Coroso is not in the most convenient position for a party of shell-gatherers; nor does it contain European objects, which should have been left by such a party; nor is it close to the present settlements in the area. One would expect the Spanish fishermen to concentrate in the more easily accessible bays along the west coast, where they live to-day.

In either Hispaniola or Cuba, one other fact would enter into the argument: the existence in historic times of isolated groups of preceramic non-agricultural peoples, generally known as Ciboney, who are supposed to have survived from an earlier prepottery period on those two islands. This fact has been used, for example, in the Maniabón Hills of Cuba, to assign to Period I sites comparable to Coroso in every way except in some of their artifacts (Rouse, 1942: 30-31, 134). Since there is no historic record of any Ciboney-like Indians in Porto Rico, however, the case for dating Coroso in Period I is not so strong as it would be in Hispaniola or Cuba.

Nevertheless, it seems to the writer more likely that the Coroso site was

* For similar conclusions in regard to Hispaniola and Cuba, see Krieger (1930: 492) and Rouse (1942: 146-147).

inhabited in Period I than that it was the by-product of a later Indian or Spanish occupation. Further excavations must be undertaken before it can be definitely proved that there was a non-agricultural, preceramic population in Porto Rico, but for the present it will be tentatively assumed that such a population did exist.

Las Cucharas (Lajas 3)

Some eight kilometers inland from the south coast and ten kilometers from the west coast is one of the largest shell heaps in Porto Rico (see folding map at end). This site is known variously as Las Cucharas, Palmarejo, and Rayo. It is on a plantation of Chío Ramírez, bordering the Quebrada of Margara in Barrio Candelaria of the municipality of Lajas. Two kilometers east of the site is the town of Lajas itself. One kilometer to the south, on Highway 19, is the small settlement of Palmarejo.

Las Cucharas is well known. All of the island's collectors spoke of it and recommended it as a place to dig. In 1915-16, Lothrop visited the site, obtaining a number of specimens, partially by purchase and partially by excavation (Lothrop, ms.: 9; see also his field catalogue in the Harvard Peabody Museum). De Hostos dug at the site in 1917 (de Hostos, personal communication). The present writer surveyed it on August 12, 1937, and returned on August 16-18 for the excavation of a test trench.

Las Cucharas is in a region which used to be forested. Here, the land is obviously fertile, the rainfall is adequate, and there is a good water supply in the nearby stream. Presumably, the people followed this stream down through the valley of the Río Boquerón to the bay of the same name on the west coast in order to fish and gather shells (folding map). They may thus have had close contacts with the site of Boquerón, described above.

Although Las Cucharas consists of only a single shell deposit, its diameter of 200 meters and maximum depth of over two meters indicate that it was a village of considerable size rather than a camp. It completely covers a small hill rising gently for two meters above the eastern bank of the stream (FIGURE 7). A search of the top of this hill and of the western edge, where the stream had cut into the site, revealed a deposit varying in depth from 25 centimeters to more than a meter and containing a moderate amount of shells, together with a few scattered artifacts.

The major domo of the plantation requested that our excavation be made on the slope of the hill away from the stream, where a small area under the shade of a mango tree was not planted in sugar cane (FIGURE 7). He claimed that this was the richest part of the site. It was also attractive to the writer because of the possibility that refuse had washed down the hill, making it possible for a single pit to sample not only the deposit on the slope of the hill but also that on the top. In order to avoid cutting down the cane, it was necessary to stake out the four two-meter square sections in a series and to dig them in the form of a trench instead of the usual square (FIGURE 7).

Excavation of the trench was complicated by the fact that the ground not only sloped downhill across the trench, at an average angle of 25 de-

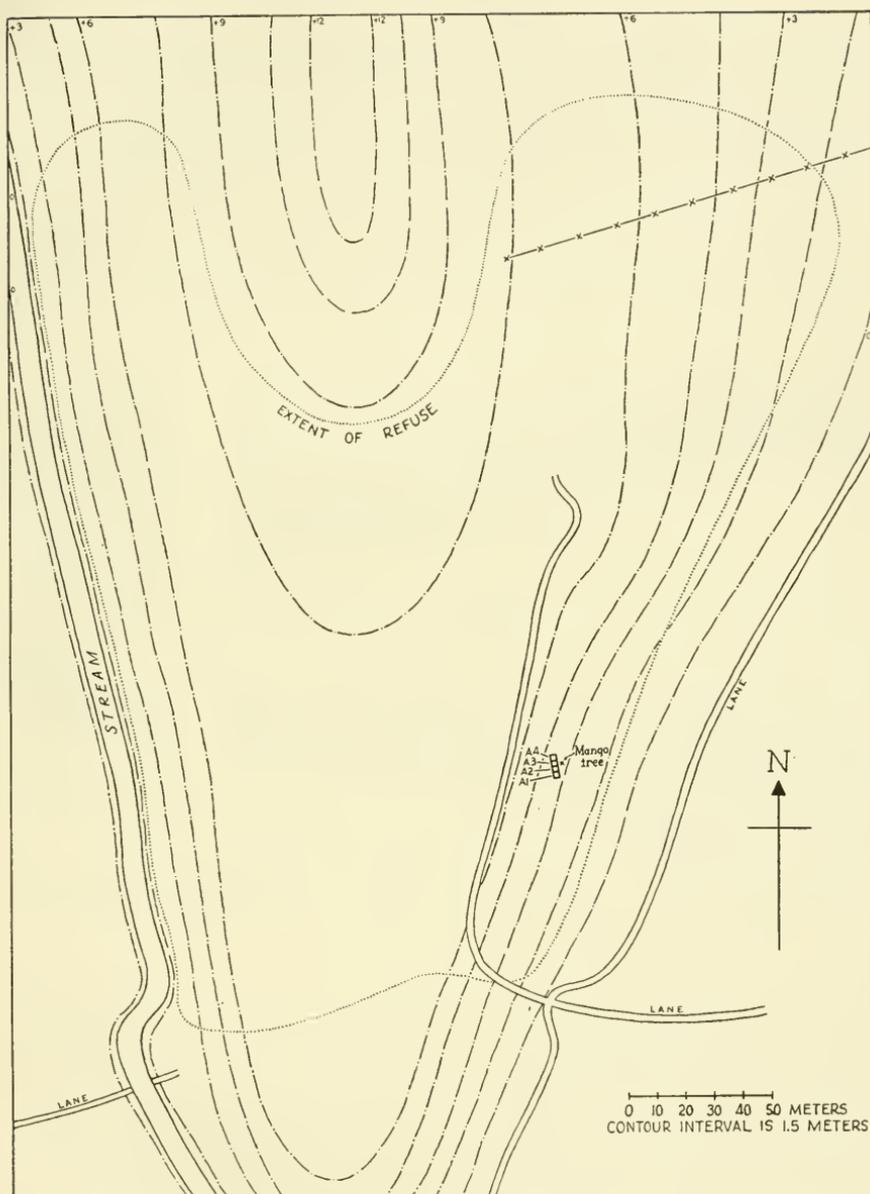


FIGURE 7. Plan of the site of Las Cucharas.

grees, but also sloped slightly along the trench from north to south (due, no doubt, to the fact that the trench could not be laid out exactly parallel to the contours of the hillside). This made it necessary to pay close attention to the depth of the excavation. Every 25-centimeter level in each of the four corners of each section was carefully measured from the surface,

regardless of the amount of distortion from the horizontal which this produced in the bottom of the trench and regardless also of any disconformity between the artificial 25-centimeter levels and the strata in the trench. Altogether, five levels were dug in section A1, seven in section A2, and nine in sections A3 and A4, where the deposit was considerably deeper than in the rest of the trench. The excavation revealed a most complicated stratigraphy, which may be summarized as follows (FIGURE 8):

Stratum 1. The upper part of the trench resembled in content the material observed on the surface. The soil was dark brown and slightly clayish. It lacked ash and charcoal but contained a moderate amount of

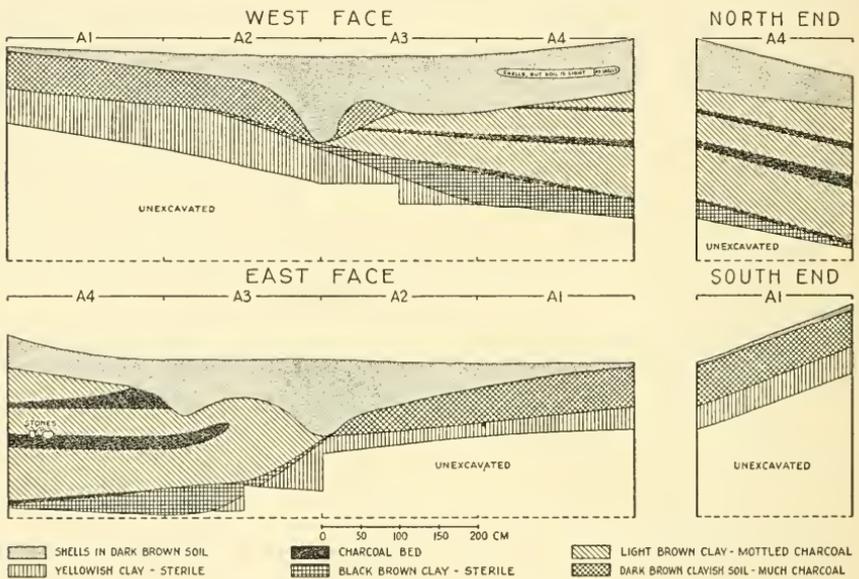


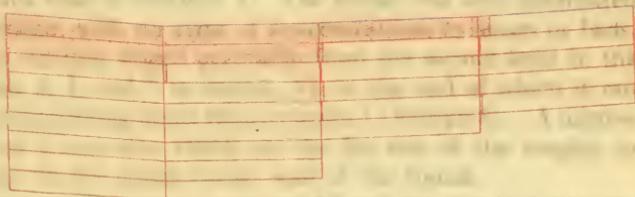
FIGURE 8. Walls of the trench at Las Cucharas.

shells, animal bones, potsherds, and other artifacts. The only enclosed structure was a lens of light earth 125 centimeters long and 11 centimeters thick, the northern fifth of which lacked shells. This was situated at the very bottom of the second level in section A4 (FIGURE 8).

Stratum 1 had a very irregular lower boundary which, however, showed clearly on both walls of the completed trench (FIGURE 8). On the upper (west) wall, this boundary sloped gradually downwards through level 1 in section A1 and level 2 in section A2; turned abruptly down into levels 3, 4, and 5 at the far end of the latter section; rose as abruptly into level 3 at the beginning of section A3; fell and rose again slightly in the middle of that section; and then remained in the third level throughout the rest of section A3 and in section A4. The boundary followed a similar course on the lower (east) wall of the trench, but it was closer to the surface, and

it fell more sharply in the center of section A3. From these facts, it may be inferred that stratum 1 was thinner at its east end of the trench than at the far end, and also that it received a greater thickness of the upper side of the trench than on the lower. In addition, it would appear that the refuse of stratum 1 extended to two levels down into the lower strata, as the border between sections A2 and A3 and the middle of section A3 (FIGURE 7).

Stratum 2. The uppermost stratum gave way to sections A2 and A3 to a surface in which the soil was also dark brown, and again showing that increased fire levels and had considerable amounts of charcoal. The ground beneath and adjacent to the layers had been trampled. They were also much more homogeneous than stratum 1. The stratum had an irregular thickness, the soil being thicker in the center of the trench (FIGURE 7).



Stratum 3. The soil in sections A3 and A4, the first stratum was composed of a heavy covering of light brown clay with few shells. It was composed of numerous big fragments of animal bones and artifacts. Charcoal was again present, but it was largely concentrated in three beds eight to nine centimeters thick, which sloped downwards across the stratum (FIGURE 8). The uppermost of these beds had an average depth of about one meter. It extended at its upper end to the boundary with stratum 1, as though cut by the latter. The second bed, a meter and a half deep, also extended to stratum 1 on the upper (west) wall of the trench, but on the other wall it terminated inside stratum 3 in an area of the light soil which was mottled with charcoal. The lower bed ran along the bottom of the stratum, extending through levels 6 and 7 in section A3 and levels 8 and 9 in section A4 (FIGURE 8). All three of the beds followed more closely the inclination of the bottom of the stratum than that of the top, a fact which suggests that they represent occupation levels. In section A4, the second bed was surmounted by two stones which may have been parts of a hearth (FIGURE 8).

Stratum 4. The bottom of the trench in sections A1, A2, and A3 consisted of a layer of sterile reddish-yellow clay, inclined sharply downwards so that it was underlain by section A3 and possibly also in section A4, by stratum 5.

Stratum 5. A layer of dark brown clay, also sterile except at its very top, underlying stratum 3 in sections A3 and A4 (FIGURE 8). This layer also sloped downwards towards the far end of the trench, but not so much as in stratum 4, which it partially underlay.

The distribution of artifacts and of animal remains among the three culture-bearing strata (numbers 1-3) is obscured by a mistake made in cataloguing the specimens. At the time of excavation, the material had been segregated not only according to 25-centimeter levels, but also, in so

regardless of the amount of distortion from the horizontal which this produced in the bottom of the trench and regardless also of any disconformity between the artificial 25-centimeter levels and the strata in the trench. Altogether, five levels were dug in section A1, seven in section A2, and nine in sections A3 and A4, where the deposit was considerably deeper than in the rest of the trench. The excavation revealed a most complicated stratigraphy, which may be summarized as follows (FIGURE 8):

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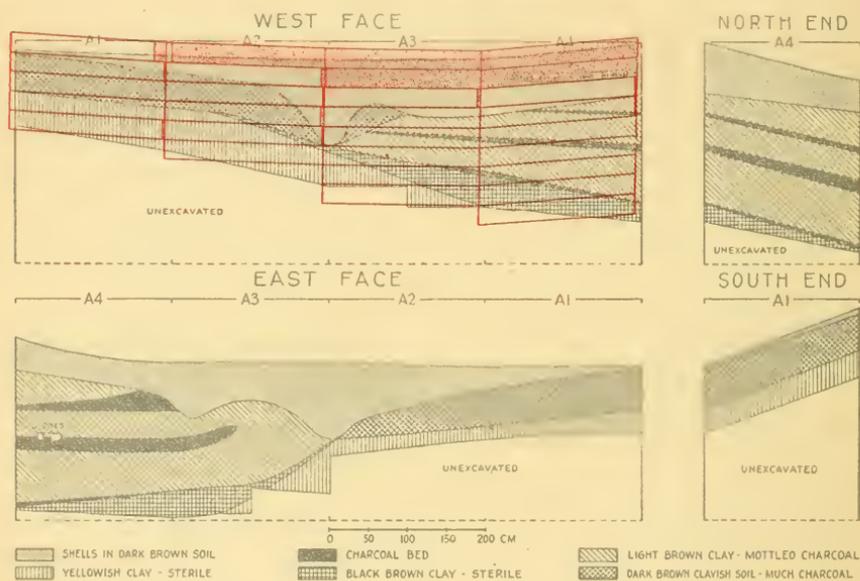


FIGURE 8. Walls of the trench at Las Cucharas.

shells, animal bones, potsherds, and other artifacts. The only enclosed structure was a lens of light earth 125 centimeters long and 11 centimeters thick, the northern fifth of which lacked shells. This was situated at the very bottom of the second level in section A4 (FIGURE 8).

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it fell more sharply in the center of section A3. From these facts, it may be inferred that stratum 1 was thinner at the near end of the trench than at the far end, and also that it reached a greater thickness on the upper side of the trench than on the lower. In addition, it would appear that the refuse of stratum 1 extended in two tongues down into the lower strata, on the border between sections A2 and A3 and in the middle of section A3 (FIGURE 8).

Stratum 2. The uppermost stratum gave way in sections A1 and A2 to another, in which the soil was also dark brown and slightly clayish but contained few shells and had considerable amounts of charcoal. The animal bones and artifacts were larger and less fragmentary. They were also much more numerous than in stratum 1. The refuse was well distributed throughout the stratum, with no signs of concentrations in lenses or beds. The bottom of this stratum sloped gradually from the second level in the first section to levels 3, 4, and 5 in section A2, at the end of which it ran into the long tongue projecting down from stratum 1 (FIGURE 8). A narrow extension of stratum 2 was also visible on the far side of the tongue, in section A3, but only on the upper (west) wall of the trench.

Stratum 3. Throughout the rest of sections A3 and A4, the first stratum was underlaid by a third, consisting of light brown clay with few shells but large numbers of relatively big fragments of animal bones and artifacts. Charcoal was again present, but it was largely concentrated in three beds eight to nine centimeters thick, which sloped downwards across the stratum (FIGURE 8). The uppermost of these beds had an average depth of about one meter. It extended at its upper end to the boundary with stratum 1, as though cut by the latter. The second bed, a meter and a half deep, also extended to stratum 1 on the upper (west) wall of the trench, but on the other wall it terminated inside stratum 3 in an area of the light soil which was mottled with charcoal. The lower bed ran along the bottom of the stratum, extending through levels 6 and 7 in section A3 and levels 8 and 9 in section A4 (FIGURE 8). All three of the beds followed more closely the inclination of the bottom of the stratum than that of the top, a fact which suggests that they represent occupation levels. In section A4, the second bed was surmounted by two stones which may have been parts of a hearth (FIGURE 8).

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The distribution of artifacts and of animal remains among the three culture-bearing strata (numbers 1-3) is obscured by a mistake made in cataloguing the specimens. At the time of excavation, the material had been segregated not only according to 25-centimeter levels, but also, in so

far as possible, according to strata. During the course of the cataloguing in the laboratory, the specimens became mixed, and they can now be segregated only according to level, not stratum. As a result, it is now possible to assign the specimens to strata only on the basis of a rough correspondence between the levels and the strata. The material from sections A2, A3, and A4 of level 1 and A3 and A4 of level 2 can be attributed to the first stratum. The second stratum is represented by the specimens from section A1 of level 1; sections A1 and A2 of levels 2 to 5; and section A2 of level 6. To the third stratum may be assigned the objects from sections A3 and A4 of levels 3 to 8 as well as section A4 of level 9. The transparent sheet on top of FIGURE 8 will show how closely the various sections and levels coincide with the strata.

TABLE 3 gives the distribution of the styles according to section and

TABLE 3
DISTRIBUTION OF CUEVAS AND OSTIONES POTSDHERDS AT LAS CUCARAS

	A1	A2	A3	A4	
1	121-10	3-116	0-100	0-106	Ostiones division
2	274-3	335-45	5-254	0-169	
3	226-0	244-2	142-18	89-1	Cuevas division
4	27-0	264-13	160-4	82-4	
5	11-1	61-1	420-0	218-0	
6	—	1-0	86-0	78-0	
7	—	—	57-0	137-0	
8	—	—	15-0	85-0	
9	—	—	—	48-0	

Explanation of Table. The vertical columns in this table represent sections; the horizontal lines, levels. Within each square, the numbers of potsdherds of the Cuevas and the Ostiones styles are given in succession. The line marks the boundary between the Cuevas and the Ostiones divisions. This table does not include two sherds which appear to be of a Lesser Antillean style, one in section A3 of level 6 and the other in section A4 of level 8.

level, and this is reproduced on the transparent sheet over FIGURE 8 to give some idea of the distribution of the styles according to strata. It will be noted that potsdherds of the Ostiones style are predominant in the sections and levels attributed to stratum 1 and that potsdherds of the Cuevas style are characteristic of the sections and levels falling into strata 2 and 3. It may also be significant that the mixture of Ostiones and Cuevas sherds extends beyond the sections and levels where it could have been caused by our failure to catalogue the artifacts according to strata. For example, Ostiones sherds were obtained from sections A2, A3, and A4 of level 4, entirely within strata 2 and 3. This suggests that, while the Ostiones sherds may have been largely limited to stratum 1 and the Cuevas sherds to strata 2 and 3, there was some overlapping into the other strata. Nevertheless, the sections and levels assigned above to stratum 1 can be considered an Ostiones division and the sections and levels assigned to strata 2 and 3, a Cuevas division.

The Cuevas division was the richer of the two. It yielded 1,608 sherds

from open bowls, 661 from constricted bowls, 109 from jars, and 978 from unidentifiable vessels. The associated artifacts include 89 fragmentary griddles, a clay smoother, a disk of clay, a clay patty, two fragmentary stone adzes, an adze-hammer of stone, a chipped stone ax, six broken stone celts, a stone celt-hammer, three hammers of stone, a stone polisher, an adze-shaped stone pendant, a stone cylinder, 56 stone chips, eight pieces of red and four of yellow ocher, four bone awls, a bone graver, a bone pick, a bone polisher, and 101 fragments of coral. Crab claws were unusually numerous, and bird, dog, fish, hutia, iguana, manatee, and turtle were also represented. Although shells were rare, they included both land and marine gastropods and marine pelecypods.

Three of the artifacts listed above, the clay disk, the stone cylinder, and the stone polisher, occurred at the very top of the Cuevas strata and therefore may have been intrusive from the Ostiones stratum. Two of the potsherds, both apparently Lesser Antillean in style, as noted on TABLE 3, may also be foreign. Otherwise, no significant differences have been noted in the distribution of the specimens from level to level within the Cuevas division.

From the Ostiones division we obtained 247 sherds of open bowls, 293 of constricted bowls, 21 of jars, and 191 which could not be identified as to type. There are also 24 fragmentary griddles, four broken, discoidal clay stamps, a stone earplug, 16 stone chips, a shell disk, and 58 coral fragments. Bird, fish, hutia, manatee, and turtle are represented among the bones. The shells include land and marine gastropods and marine pelecypods.

The shell sample cannot be allocated to the divisions. It contains the following artifacts: three dishes, four spoons, a celt-blank, a lip-hammer, two pendant-tinklers, a trumpet, three disks, a *Cassis* lip, seven *Strombus* lips, a node, a *Strombus* plate, and five fractured tips. It is likely that most, if not all, of these come from the Ostiones stratum.

From the deposit on top of the hill, we collected a single sherd of the Ostiones style. To this may be added Lothrop's collection, consisting of seven Cuevas sherds, 178 Ostiones, three Santa Elena, and one Capá. Lothrop also obtained five fragments of griddles, two discoidal clay stamps, a spherical clay bead, a clay disk, a clay patty, part of a milling stone, two stone adzes, part of a ground stone ax, six stone celts, three celt-hammers of stone, three stone hammers, a hammer-grinder, a net sinker, a stone polisher, a cylindrical stone bead, two discoidal stone beads, a stone disk, five stone cylinders, three stone chips, a miscellaneous worked piece of bone, a shell rectangle, and two pieces of Spanish tile. It is presumed that most of these specimens came from the hilltop.

It will be apparent that the Cuevas and Ostiones divisions differ markedly, with only the latter resembling the surface collections. The Cuevas division, which consists of strata 2 and 3, has yielded charcoal, many crab claws, few shells, and potsherds of the Cuevas style but no clay stamps. The Ostiones division, which was limited to stratum 1, lacked charcoal, crab jaws, and adzes; shells increased greatly in frequency; the potsherds were of Ostiones style; and there were several clay stamps. This is the

sharpest contrast between stratigraphic areas found anywhere in Porto Rico.

Before attempting to date the two divisions, it may be well to consider the manner of their formation. On a hillside such as that excavated, refuse might have accumulated in either of two ways: deposition by the people who inhabited the site, or erosion by natural agencies after those people had abandoned the site. There is little doubt that the former was the process of accumulation of stratum 3 in the Cuevas division. The great thickness of the stratum and the large size of the sherd and bone fragments suggest this, and it is corroborated by the presence of charcoal beds and a possible hearth where the people may have lived on the hillside. Stratum 2 in the Cuevas division is, on the other hand, more difficult to explain. The large size of the bone and pottery fragments and their similarity to the material in stratum 3 suggest deposition by the Indians. The absence of beds of charcoal, however, does not. It may be that the Indians lived only in the area of stratum 3 but cast some of their refuse into the area of stratum 2. Another possibility is that stratum 2 was washed into its present position by natural agencies, after having first been deposited elsewhere by the Indians, at the same time, of course, as stratum 3.

The irregularity of the top of the Cuevas division (including both stratum 2 and stratum 3) suggests that it was considerably eroded after its formation and before the beginning of deposition of the Ostiones division. This is also indicated by the overlap of the Cuevas sherds into the Ostiones division and vice versa, which would be expected to result from erosion; by the two tongues extending down from the Ostiones division, as if to fill gullies eroded into the Cuevas division; and by the cutting of the upper two charcoal beds in the Cuevas division by the line of juncture with the Ostiones division (FIGURE 8). It would seem that some time must have elapsed between the end of the deposition of the Cuevas division and the beginning of the accumulation of the Ostiones division.

Deposition of the Ostiones division, then, marks the third period in the history of the excavated portion of the site. It is not clear how this division was accumulated. The smallness of the potsherds, the rarity and worn nature of the animal bones, the lack of ash and charcoal, and the existence of a lens of light earth (a part of which is without shells) all suggest wash of the material from the hilltop. The similarity between the Ostiones material and the collections from the top of the hill, and the great variation in the thickness of the Ostiones stratum, might also be considered evidence of wash. There is an alternative possibility, however, that the Indians cast their refuse over the side from houses on top of the hill. Nothing in the material eliminates the latter possibility.

If the Ostiones stratum were thicker, it might be possible to solve this problem by determining whether the artifacts changed from level to level in a normal or a reverse manner. Unfortunately, this is impossible, and, until further digging is done, particularly upon the hilltop, we can only conclude that the accumulation of the refuse in our trench has required three periods: one for the deposition of the Cuevas division, a second for

erosion of the Cuevas division, and a third for the accumulation, in a manner as yet undetermined, of the Ostiones division. Our problem is to date these three periods in terms of the time scale.

The Cuevas division falls by definition into Period II and the Ostiones division into Period III. Presumably, deposition of the former extended through both the "a" and "b" parts of Period II. This is indicated by the thickness of the Cuevas strata, which is as great as any in Porto Rico, and also by the fact that white painting is absent (except for one sherd) from all of level 1 and from sections A3 and A4 of levels 2 and 3. This being so, the erosion of the Cuevas strata ought to have happened during the "a" part of Period III, with accumulation of the Ostiones stratum being deferred until the "b" part of that period. This, too, is corroborated, both by the relative thinness of the Ostiones stratum and by the fact that the sherds which it contains are heavily decorated with incised designs in all sections and levels but one. Typology combines with stratigraphy, therefore, to date the Cuevas division in Period IIa and b and the Ostiones division in Period IIIb.

To summarize, the sequence of events in the excavated part of the site of Las Cucharas seems to have been as follows. That part of the site was settled first during Period IIa, possibly at the time when agriculture and pottery were introduced into Porto Rico. The settlers continued to deposit their refuse (and perhaps also to live) on the slope of the hill throughout Period II. By the close of that period, they had built up the two thick, shell-free strata which comprised the Cuevas division. At the beginning of Period III, however, they abandoned the hillside, possibly in order to deposit their refuse on the hilltop beneath that which the writer observed there (FIGURE 7). This paved the way for erosion of the hillside during Period IIIa and for the consequent formation of the gullies observed in our trench. In the "b" part of the third period, the shell deposit which constituted the Ostiones division was laid down, either on the hilltop or on the hillside where we found it. If the former alternative is correct, it must be assumed that the material later washed down the hillside to its present location. In the latter event, the deposit would have been relatively untouched by subsequent erosion. In either case, the area around the pit seems to have been abandoned during Period IV, and, if the site was occupied at all during that time, the people must have lived some distance away from our digging.

Las Mesas (Mayagüez 1)

The largest site in the vicinity of Mayagüez, the present metropolis of the west coast, is that on the farm of Julio Freyes in Barrio Juan Alonso of the municipality of Mayagüez (see folding map at end). This site of Las Mesas crowns the summit of a large hill three kilometers southeast of the city on the road leading to the municipal tuberculosis sanatorium (which is only a short distance away). The site is 3.4 kilometers inland.

Because of its accessibility, Las Mesas has long been a favorite of the collectors. Llavat and Montalvo Guenard have been particularly active

at this site, and both de Hostos and Lothrop have also collected there (Morales Cabrera, 1932: 207, 292, 350; Montalvo Guenard, 1933: 383; de Hostos, 1941: 29; Lothrop, ms.: 10; Lovén, 1935: 285-286). The present writer surveyed the site on July 24, 1937, purchasing several specimens from the inhabitants, and returned the following day to excavate a test trench.

Las Mesas is unique among all of the coastal shell-heap sites visited by the writer in Porto Rico, in that it is situated on a hilltop 213 meters above sea level and could not, therefore, have been well suited to a fishing population. Since, however, the air is cool and free from insects, the ground is level and fertile, and there is a spring nearby on the side of the hill, the situation must have been favorable for an agricultural community.

A village site, Las Mesas occupies the eastern two-thirds of the hilltop covering an area about 350 meters long and 250 meters wide. It comprises a single, flat deposit of shells, animal remains, potsherds of the Ostiones style, and other artifacts, mixed with the dark red loam to an undetermined depth.

The richest area of the site seemed to be that towards the east. At the time of the writer's visit, this area was planted in sugar cane and could not be excavated. It was necessary to concentrate, therefore, upon the poorer western part of the site, in which were situated farm buildings and a small banana plantation. Four sections two meters square were staked out in the form of a trench at one end of a group of pig pens and between rows of the banana plants, it being impossible because of the positions of the plants to dig the usual square.

In our trench, the dark red, refuse-bearing loam observed on the surface continued to an average depth of 58 centimeters, with the number of shells, animal bones, and artifacts decreasing gradually as we dug downwards. No ash or charcoal was observed anywhere in this deposit. Below the depth of 58 centimeters, the soil, although still dark red, became gravelly and, since no more refuse was found, excavation was discontinued at the bottom of the third level.

The trench at Las Mesas was completely homogeneous. All of the potsherds, of which 431 were excavated, are Ostiones in style. Sixty-six of these sherds are from open bowls, 217 from constricted bowls, 22 from jars, and 127 from unidentifiable vessels. The associated artifacts include eight fragmentary griddles, a piece of a discoidal stamp of clay, five stone celts, five stone chips, a *Strombus* lip, and eleven pieces of coral. We also obtained a glass bead of European manufacture. Bird, fish, hutia, and turtle have been identified among the animal bones, and it is probable that a European mammal is represented. Most of the shells are marine pelecypods. They are accompanied by a few land and marine gastropods.

Our surface collection includes fifteen sherds of Ostiones pottery, four stone celts, two cylindrical stone beads, three discoidal stone beads, two ear plugs of stone, two anthropomorphic stone pendants, a bar-shaped stone pendant, a cylindrical stone pendant, half of a stone cylinder, and a bead of sheet copper, probably of Spanish extraction. To these may be added a tripod vessel obtained by de Hostos and a bat-headed lug of the Ostiones style collected by Lothrop.

Since the European artifacts and bones all come from the top level or from the surface, they may be considered intrusive, particularly in view of their proximity to the pig pens. The rest of the artifacts are placed in Period III by the fact that only potsherds of the Ostiones style have been found at the site. Both parts of that period are apparently represented, IIIa by levels 2-3 of our trench, which lack incision, and IIIb by level 1, where four incised sherds were encountered. There is no indication, either in our trench or elsewhere, of habitation of the site in other periods.

Llanos Tuna (Cabo Rojo 11)

The only ball court excavated in the west-coast area is that on the farm of Juan Alvarez in Barrio Llanos Tuna of the municipality of Cabo Rojo, about four kilometers southeast of the town of Cabo Rojo. This site of Llanos Tuna is on an unnamed stream, believed to flow northward and westward into the Río Guanajibo and the bay of Mayagüez (see folding map at end). The site had previously been explored by Montalvo Guenard, although it is not included on his map of the sites in the district (Montalvo Guenard, 1933: 402). Learning of it from de Hostos, the writer surveyed it on August 11, 1937, and collected several specimens from the surface. He returned on August 29 the following year to excavate a test pit.

Llanos Tuna is in fertile farming country some seven kilometers from the shore (folding map). The site itself occupies a level plateau four acres in extent, lying between the river valley and a low hill (FIGURE 9). On this plateau, parts of three plowed fields were strewn with a single oval deposit of shells and other refuse, mixed in the dark brown soil to a depth said to reach 75 centimeters. In the center of the deposit, a rectangular area measuring 23 meters by 15 meters contained very little refuse. According to the owner of the land, this area had originally been enclosed with a single line of large stone slabs, set on end. It was probably a ball court (FIGURE 9).

Shells and artifacts were unusually numerous in the heavy, dark brown clay around the ball court, but no ash, charcoal, or animal bones were observed in the furrows of the field. Potsherds of the Ostiones style were common.

At the time of the writer's second visit, the only part of the site not under cultivation was the small field south of the ball court. A pit four meters square and divided into four two-meter square sections was staked out in the corner of this field, which happened also to be the center of the southern end of the deposit. Excavation of this pit revealed a homogeneous deposit extending through the first three 25-centimeter levels and consisting, as on the surface, of dark brown clay mixed with shells, animal bones, and artifacts. Perhaps because the plow had not reached them, the shells were more tightly packed than on the surface, and a small amount of charcoal appeared.

At a depth of 75 to 85 centimeters in sections B1 and B2 of level 4, the soil suddenly became lighter and the shells, bones, and potsherds decreased in number. This line of junction between dark and light brown soil slanted downwards through level 4 from the outside corners of sections B1 and B2

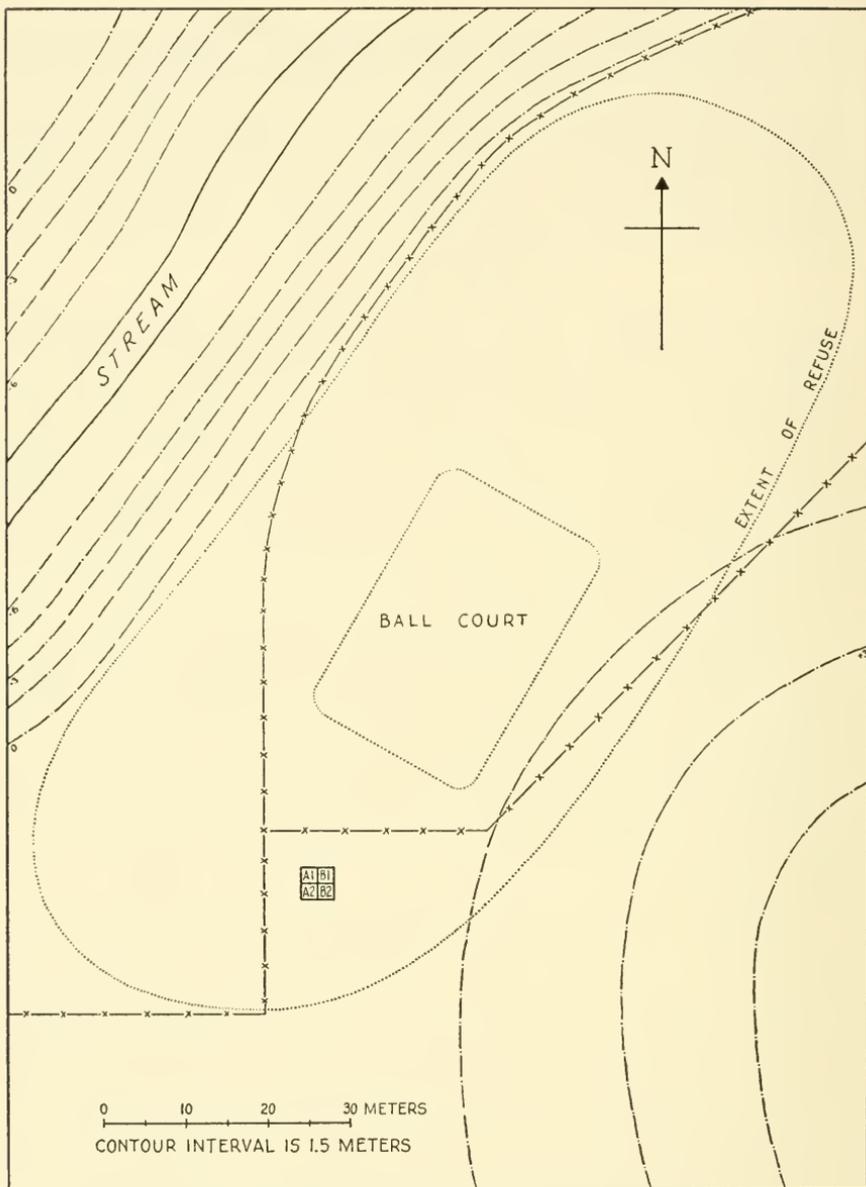


FIGURE 9. Plan of the site of Llanos Tuna.

in the direction of sections A1 and A2, and it is probable that the line would have been encountered in level 5 of the latter two sections if it had been dug.

Unfortunately, excavation had to be discontinued after the completion of level 4. Llanos Tuna was the last site to be dug before the writer's

final return to the United States and, its depth having been underestimated, time was not available to complete the additional levels necessary to reach its bottom. The petering out of the deposit in sections A1 and A2 of level 4 suggests that excavation of another level would have finished these sections, with perhaps two more needing to be dug in sections B1 and B2.

A skeleton of an adult was found in section B1 of level 2, apparently flexed and lying on its left side. This skeleton was much disintegrated partially because the shells were closely packed and partially because it had been penetrated by the roots of a tree. Only fragments of the skull, parts of the pelvis, and the long bones remained. The latter were inclined, some one way and some the other, as if they had been moved out of position. The burial was directly in the refuse, without associated artifacts.

Ostiones potsherds predominate in all sections and levels of the Calvache pit, numbering 785 of 790 specimens. The remaining five sherds, all from the top level, are of the Capá style. Consequently, the entire collection can be treated as a unit.

Eighty-five of the potsherds are from open bowls, 417 from constricted bowls, 32 from jars, one from a flat receptacle which resembles a brazier, and 256 from vessels too fragmentary to be identified. The associated artifacts include 18 broken griddles, part of a stamp of clay, two possible fragments of stone celts, a cylindrical stone pendant, seven stone chips, two quartz crystals, a bone bead, a shell dish, a lip-hammer of shell, a shell blade, a plain and a fractured shell tip, and 24 pieces of coral. Bird, crab, fish, hutia, and turtle are represented among the bones, and land gastropods, and marine pelecypods among the shells. No significant differences have been noted in the distribution of these specimens.

Our surface collection consists of 14 sherds, all of the Ostiones style. Two are from open bowls, four from constricted bowls, and four from jars, while the remaining four are unidentifiable. A shell celt is the only associated artifact.

The predominance in our pit of Ostiones potsherds indicates that deposition there took place during Period III. Both parts of the period are apparently represented, IIIa by levels 3-4, each of which has yielded only a single incised sherd, and IIIb by levels 1-2, which contain 14 such sherds. The few Capá sherds found in the top level may indicate a transition towards that style, or they may have been plowed into the area of the pit from another and later part of the site.

Ostiones (Cabo Rojo 8)

Perhaps the best known shell-heap site in Porto Rico is that on the tip of the point of Ostiones, some six kilometers west of the town of Cabo Rojo (see folding map at end). This site is part of the Hacienda Piñas, also known as Central Belvedere, in Barrio Miradero of the municipality of Cabo Rojo, and it has been variously termed Piñas, Belvedere, and Punta Ostiones, in addition to the name Ostiones, which will be used here.

As already noted, Samuel K. Lothrop and Adolfo de Hostos made the first stratigraphic excavations in Porto Rico at this site during the first

World War, the former finding red painted potsherds above unpainted sherds and the latter obtaining, in addition, incised specimens above sherds which lacked incision (Lothrop, 1927: 324-331; de Hostos, 1919: 383; de Hostos, 1941: 14, 91, 150; Lovén, 1935: 119, 278-287). Lothrop's collection, which has been studied by the writer at the Harvard Peabody Museum, is characterized by the Ostiones style, named after the site. If we are to judge from de Hostos's publications, the same is true of the material obtained by him.

In 1916, Herbert J. Spinden also dug extensively at Ostiones. A cursory survey of his collection, which is at the American Museum of Natural History, reveals that it, too, is largely composed of pottery of the Ostiones style. Theodoor de Booy visited the site in the same year, collecting predominantly potsherds of the Ostiones style for the Museum of the American Indian, Heye Foundation. Dr. J. L. Montalvo Guenard (1933: 389, map opp. p. 402) has also been active at Ostiones. Rainey examined the site in 1934 and purchased a number of specimens for the Yale Peabody Museum, but he decided against excavation because the site had been "too much dug over" (Rainey, 1941: 117-118; see also his field notes in the Yale Peabody Museum). This did not preclude the possibility of making test excavations, however, and, when the writer surveyed the site on July 30, 1937, he found many small areas which seemed to be undisturbed. Accordingly, he spent the last two days in July digging a pit in what appeared to be the thickest of the undisturbed deposits, also purchasing specimens from the inhabitants.

Unlike most other sites in the west coast area, Ostiones is directly on the shore, bordering a cove on the southern side of the point of Ostiones (FIGURE 10). Its location must have been ideal for a fishing people, for not only is the cove sheltered by the point from the prevailingly north-easterly winds, but also a series of reefs off shore protect its narrow sandy beach. The land itself, although sandy and only a meter above high tide, appears to be fertile and is now planted with coconut palms. A small fresh water stream, running into the sea 100 meters north of the site, could have provided drinking water for the aborigines, and there is also a spring on a low hill 250 meters to the south. The only drawback would seem to be that the site is bordered on two sides by a swamp, the insects from which made our digging most uncomfortable (FIGURE 10).

Ostiones is definitely a village rather than a camp site, even though its maximum diameter of 100 meters and depth of 1.75 meters are only half those at Las Cucharas. There are six shell heaps, each of which may represent a separate dwelling. Five of them are arranged in the form of a horseshoe, open towards the shore and enclosing the sixth midden within the prongs of the shoe (FIGURE 10). These five heaps have partially coalesced into a single deposit, comparable to that at Las Cucharas, but they still retain their separate summits. The entire center of the horseshoe is also strewn with refuse, and the latter extends for some distance to the southeast along a narrow strip of land between the beach and the swamp.

Upon the surface, the deposit consists of shells closely packed in dark sandy soil, without traces of either ash or charcoal. Potsherds of the

Ostiones style (named after this site) were frequent, but no other refuse was observed. All of the shell heaps seemed to be well pitted, except for the smallest one, in the northwestern part of the horseshoe (FIGURE 10). This midden bore a thicket and was said by the inhabitants to be untouched. Accordingly, we staked out four two-meter square sections in the form of a square in the very center of this midden and excavated to a depth of 1.75 meters. The following four strata were encountered (FIGURE 11):

Stratum 1. The first four levels contained shell refuse comparable to that on the surface, with the addition of animal bones and some ash and charcoal to the dark, sandy soil. Potsherds were entirely of the Ostiones style; at the top they were heavily decorated in application, modeling, incision,

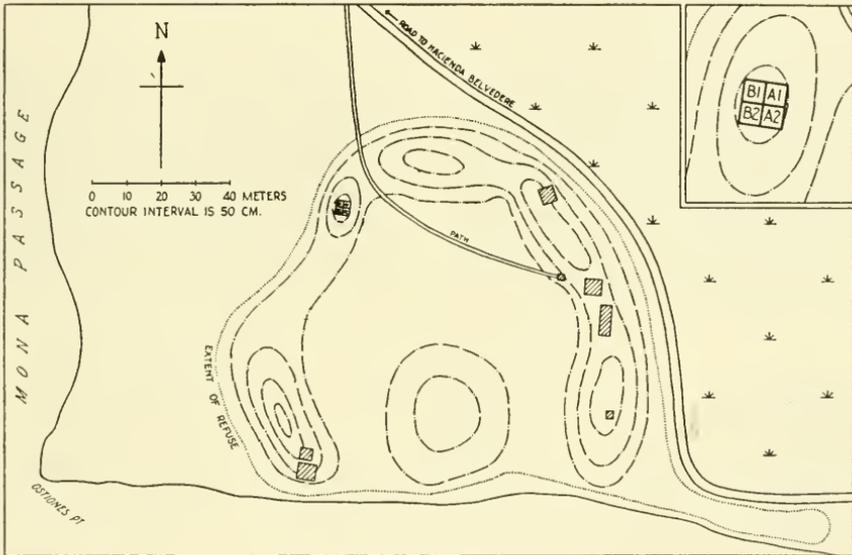


FIGURE 10. Plan of the site of Ostiones.

and punctuation, but these became rare as the digging proceeded and, by level 4, the last two had completely died out.

Stratum 2. In levels 5 and 6, the soil was greyer and more sandy, being speckled here and there with charcoal. Animal bones were rare. The potsherds were still of the Ostiones style, but they lacked incision and punctuation, and in level 6, application and modeling too.

Stratum 3. As digging began in the seventh and final level (1.50-1.75), the soil became dark reddish brown clay without charcoal but containing a few more shells than the overlying sand. The sherds were still Ostiones in style but, partially because affixation and painting were now the sole techniques of decoration, they began to show a strong resemblance to Cuevas sherds. They were still mixed with a few animal bones.

Stratum 4. Towards the bottom of level 7, the soil changed again to a hard, dark grey sand which was sterile and was assumed to mark the bottom of the site (FIGURE 11).

Despite the variation in strata, our pit seems to be stylistically homogeneous. All except two of the 2,673 sherds obtained in it are Ostiones in style. The two exceptions, both of which are of the Cuevas style, come from the middle levels (3 and 5 respectively).

Typologically, 518 of the sherds are from open bowls, 1,554 are from constricted bowls, six are miniature bowls, 74 are fragments of jars, and 521 cannot be identified. Accompanying them are 59 fragmentary griddles, a broken, discoidal stamp of clay, a clay patty, two broken celts of stone, half of a stone cylinder, five stone chips, five pieces of red and one of yellow ocher, a flake from a stalactite, a bone anvil-grinder, four possible bone picks,

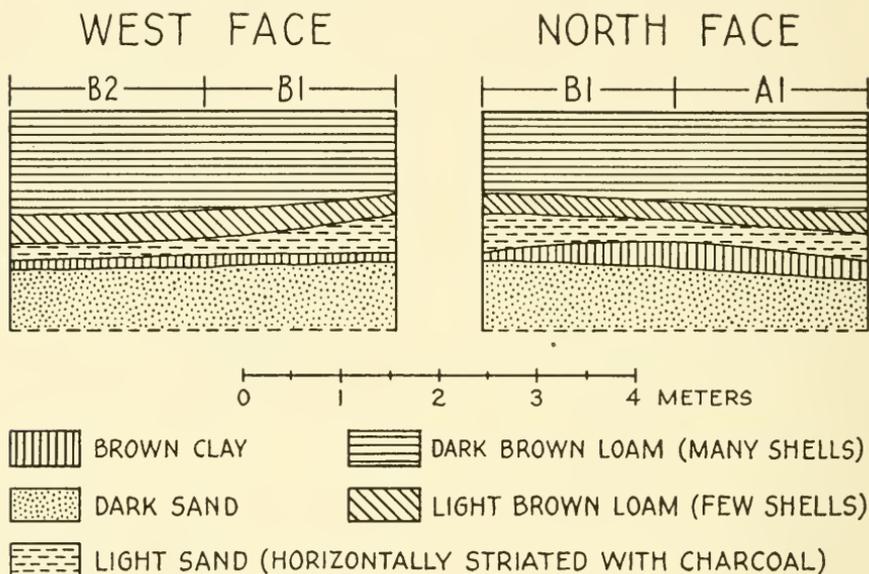


FIGURE 11. Walls of the pit at Ostiones.

a bone peg, a miscellaneous piece of worked bone, a broken shell celt, a *Strombus* lip, a shell node, a piece of water-worn shell, and 46 pieces of coral. Bird, crab, fish, hutia, man, manatee, and turtle have been identified among the bones. The shells include marine gastropods and pelecypods. No significant differences have been noted in the distribution of these specimens.

In addition to the material just listed, the Yale collections contain specimens obtained on the surface by Rainey and by the writer. In the course of studying this material, the writer has also examined the de Booy collection in the Museum of the American Indian and the Lothrop collection at Harvard. Since all appear to be stylistically homogeneous, they will be treated as a unit.*

The three collections contain 2,095 sherds of the Ostiones style, two of

* At the Museum of the American Indian, it was not possible to locate all the specimens, since some of them were attached to the exhibition cases in such a manner that their catalogue numbers could not be read. So far as the de Booy collection is concerned, therefore, the following numbers are incomplete.

the Cuevas, 13 of the Santa Elena, two of the Boca Chica, 21 of the Capá, and one of the Esperanza. Seven hundred and twenty-eight of these sherds are from open bowls, 510 are from constricted bowls, six are miniature bowls, 51 are fragments of jars, and 839 are typologically unidentifiable. The associated artifacts include 52 pieces of griddles, a cylindrical clay stamp, 33 discoidal stamps, a spherical clay bead, a clay three-pointer, a clay cylinder, two clay disks, two lumps of clay, a chipped stone ax, 14 stone celts, a chisel of stone, an edge grinder and an end grinder of stone, a stone hammer, four stone polishers, three stone cylinders, six stone chips, a shell dish, two shell celts, a celt-blank of shell, a chisel-blank, two lip-hammers of shell, two water-worn pieces of shell, a fragment of coral, and a Spanish potsherd.

Both the excavated material and the surface collections seem to date from Period III. So far as our pit is concerned, both halves of the period are represented, IIIa by levels 6-7, which lack incision, and IIIb by levels 1-5, which have it. The two Cuevas sherds, and the resemblances of the Ostiones sherds at the bottom of the pit to Cuevas pottery, probably signify a survival of Period II influences into Period III, rather than extension of the habitation of the site back into Period II.

The Cuevas sherds in the surface collections may have a similar significance. The Capá sherds, on the other hand, seem to indicate the beginning of a trend towards that Period IV style. It may be suggested that the Santa Elena, Esperanza, and Boca Chica specimens are trade objects, the first two from the east and the last from the west.

As Lothrop (ms.: 4) has pointed out, the arrangement of the middens at Ostiones is similar to the plan of the village at which Columbus landed in Porto Rico. This brings up the possibility that the site was inhabited until historic times. The rarity of Period IV potsherds, both in our collections and in those made by previous workers, precludes such a late dating, however, and the dissimilarity of the bay of Ostiones to the one described by Columbus is also against it. It seems likely that the Boca Chica, Capá, and Esperanza sherds listed above date from the close of Period III instead of from the fourth period.

Other Sites

No excavations were made by us in three of the sites dug by previous investigators. In order more completely to cover the west coast area, we append brief summaries of the findings at these places.

Ensenada (Rincón 1). This is the site in the municipality of Rincón at which we were refused permission to excavate. Located on the farm of Isidoro Fusa on Punta Ensenada in the barrio of the same name, it consists of a single shell deposit some two acres in area (see folding map at end). Lothrop made a brief excavation there in 1915 or 1916,* and the site has also been surveyed by Montalvo Guenard (1933: 385, 389).

In Lothrop's collection at the Harvard Peabody Museum, the Ostiones

* According to his field catalogue in the Harvard Peabody Museum. This excavation is not mentioned in the report of his survey (Lothrop, ms.: 11).

style is represented by 89 potsherds, the Cuevas and Santa Elena by one each, and the Capá by four. Thirty-one of the sherds are from open bowls, four are from constricted bowls, one is from a jar, and 59 are typologically unidentifiable. There are also six fragments of griddles, part of a discoidal clay stamp, two clay disks, a stone adze, a celt-hammer of stone, two stone polishers, a lip-hammer of shell, and two European potsherds.

Since the predominant Ostiones sherds are heavily incised, this collection probably dates from Period IIIb. It may be suggested that the Cuevas sherd is a survival from an earlier period, the Santa Elena sherd a trade object, and that the Spanish sherds are intrusive. The Capá specimens may represent the beginning of a trend towards that Period IV style. Assuming that these suggestions are correct, we may conclude that Ensenada is roughly equivalent in age to the neighboring site of Calvache.

Joyuda (Cabo Rojo 9). Just north of the village of Joyuda in Barrio Guanajibo, of the municipality of Cabo Rojo, there is a large shell heap (folding map). According to Lothrop (ms.: 4): "The sea is cutting into it and many objects have been found on the beach. This shell heap is shaped like the one at Ostiones. . . , but is not so deep. A few years ago several skeletons were dug up which were reburied in the Cabo Rojo cemetery." Lothrop excavated at the site in 1915,* de Booy in 1916, and de Hostos in 1917, and it has also been surveyed by Montalvo Guenard (Saville, 1919; de Hostos, 1919: 377, 379-380, 384;† de Hostos, 1941: 8, 10-11, 15;‡ Lovén, 1935: 278;‡ Montalvo Guenard, 1933, map opp. p. 402).

The writer made a small surface collection at Joyuda, and he has also studied de Booy's material in the Museum of the American Indian and Lothrop's specimens at Harvard. Since all appear to be stylistically homogeneous, they will be treated as a unit.‡

The majority of the sherds in all collections conform to the Ostiones style. There are 449 of them, and they are accompanied by three sherds of the Santa Elena style and 108 of the Capá. From a typological standpoint, 269 of the sherds are from open bowls, 160 are from constricted bowls, five are from jars, and 126 are unidentifiable. The associated artifacts include 39 fragments of griddles, 18 discoidal clay stamps, a cylindrical bead of clay, a clay lump, parts of two stone pestles, a stone adze, six stone celts, two end grinders of stone, two stone hammers, one polisher of stone, a cylindrical stone bead, an anthropomorphic stone pendant, a stone cylinder, a stone slab, two miscellaneous pieces of worked bone, three broken celts of shell, a longitudinal shell bead, a water-worn piece of shell, and two coral rasps.

The Joyuda site would seem, on the basis of the material listed, to date from Period IIIb. From the sherds of the Ostiones style, the writer received an impression that Joyuda was probably occupied later in the period than the neighboring site of Ostiones: incision was more common, for example; the pottery was thicker, cruder, and less often painted; and, instead

* According to his field catalogue in the Harvard Peabody Museum. The site is not mentioned in the report of his survey (Lothrop, ms.: 4).

† In these reports, read "Joyuda" in place of "Joyua."

‡ As in the case of the site of Ostiones (see note on p. 396), it has not been possible to locate all of de Booy's specimens. The following numbers, therefore, are incomplete.

of having resemblances to the Cuevas style, both the Ostiones and the Santa Elena sherds were difficult to distinguish from the Capá. The few Santa Elena specimens probably represent trade objects and the Capá sherds, a trend towards the latter style. The frequency of the Capá sherds is another reason for assuming that Joyuda is later than the site of Ostiones.

Minillas (San Germán 2). This site is the furthest inland of all those surveyed by the writer in the west coast area. A small shell heap, it lies in the valley of the Río Guanajibo halfway between the towns of San Germán and Sabana Grande, and is on the farm of Soto Almovodar in Barrio Minillas, of the municipality of San Germán (folding map). Both Lothrop (ms.: 13) and Mason (1941: 271) visited the site in 1915, the former making an excavation.*

Lothrop's collection at the Harvard Peabody Museum contains 96 potsherds of the Ostiones style and 90 of the Capá. Eighty of these sherds are from open bowls, 48 are from constricted bowls, one is part of a jar, and the remaining 57 are typologically unidentifiable. They are accompanied by 12 fragments of griddles, part of a milling stone, and ground stone ax, three stone celts, an end grinder, a hammer-grinder, five net sinkers of stone, four stone polishers, a cylindrical stone bead, an anthropomorphic stone pendant, an ax-shaped stone pendant, part of a slender stone collar, two large three pointers of stone (both broken), two stone cylinders, a stone rectangle, eleven stone chips, two miscellaneous pieces of worked stone, five shell celts, three celt-blanks of shell, and a cleat-shaped shell pendant. To this list may be added a large stone three-pointer collected by Mason which is now at the American Museum of Natural History.

In the absence of information to the contrary, it is assumed that all the material from Minillas forms a single chronological unit and that the Ostiones and Capá sherds were not collected from different parts of the site. If this is so, the site falls by definition into Period IIIb, for incision is common on the dominant Ostiones potsherds. As in studying the site of Joyuda (and for the same reasons), the writer received the impression that the Ostiones sherds are late and that they were made at the very close of Period III. This is confirmed by presence of so many examples of the Capá style. Presumably, the latter was just about to come into dominance. It seems likely that the site is the most recent of all those excavated in the west coast area.

Conclusions

Even without the excavations of previous workers, the pits dug by us provide a fairly adequate geographical coverage of the west coast area (see folding map at end). Chronologically, however, our work was less successful. As shown on TABLE 4, we seem to have dug only in refuse dating from the first three of the major periods on the time scale. Period I is represented in one of our pits, Period IIa in two, Period IIb in three, and Period IIIa in four, Period IIIb in five, but Periods IVa and IVb in none at all.

* According to his field catalogue in the Harvard Peabody Museum. The excavation is not mentioned in the report of his survey (Lothrop, ms.: 13).

TABLE 4 also shows the extent to which the sequence of periods is corroborated by stratigraphy. The position of Period I, it will be noted, is not. Refuse from Period II, however, underlay that of Period III in two pits. Moreover, sherds dating from Period IIa lay in two places beneath those of Period IIb, while in four of the pits sherds characteristic of Period IIIa were found below those typical of Period IIIb. Finally, the traces of a period of erosion at Las Cucharas confirm the existence in that excavation of the interval of time between Periods IIb and IIIb which is shown on TABLE 4.

TABLE 4
CHRONOLOGY OF THE PITS IN THE WEST COAST AREA

		<i>Boquerón</i>	<i>Borinquén</i>	<i>Calzache</i>	<i>Coroso</i>	<i>Las Cucharas</i>	<i>Las Mesas</i>	<i>Llanos Tuna</i>	<i>Ostiones</i>
Period IV	b	—	—	—	—	—	—	—	—
	a	—	—	—	—	—	—	—	—
Period III	b	1 (B1, B2) 2 (B1)	—	1-3	—	1 (A2, A3, A4) 2 (A3, A4)	1	1-2	1-5
	a	—	—	4-5	—	—	2-3	3-4	6-7
Period II	b	1 (A1, A2) 2 (A1, A2, B1) 3	1	—	—	1 (A1) 3 (A3, A4)	—	—	—
	a	—	2-5	—	—	2 (A1, A2) 3 (A1, A2) 4-9	—	—	—
Period I		—	—	—	1-2	—	—	—	—

Explanation of Table. The pits are listed across the top of this table, and the periods along the side. The arabic numerals refer to the successive 25-centimeter levels in each pit; the letters and numbers in parentheses, to the horizontal sections within each level. (For clarification of the relationships between the sections and levels, see TABLES 2 and 3.)

As already noted in the discussion of the excavation at Coroso, the existence of Period I is uncertain. The absence from our pits of material dating from Period IV tends to cast doubt on the validity of our definition of that period. It may be that the Ostiones style survived on the west coast from Period III into Period IV, taking the place of the Boca Chica, Capá, and Esperanza styles, which in the other areas seem to be characteristic of the fourth period. If this be true, the minority of Capá sherds in the predominantly Ostiones sites on the west coast can be considered trade objects rather than the products of a trend towards the Capá style, as suggested above. Also, the reason why proportionately more examples of the Capá style occur in Lothrop's collection from the Minillas site would not be that Minillas is later than the other sites, as concluded above, but that it is

closest to the central areas, in which the Capá style definitely constitutes a majority during Period IV.

On the other hand, as we have already noted in connection with Joyuda and Minillas, the more Capá sherds there are in our sites, the more recent the Ostiones pottery seems to be. Moreover, several sites which we failed to excavate seem to be characterized by the Capá style. Fifteen of the 19 sherds which Montalvo Guenard illustrates from the part of the site of Boquerón not located by us appear to be Capá in style (Montalvo Guenard, 1933: 376). Also, we collected only sherds of the Capá style at the site of Palma in the district of Monserrate, Barrio Cercado, of the municipality of Añasco, where they were associated with European artifacts (folding map).*

The finds at Boquerón and Palma are particularly significant because of the possibility of identifying them with villages mentioned in the historic sources. As already noted, Boquerón may have been the site of the town observed by Columbus when he first visited Porto Rico. The position of Palma corresponds well to that of the village of Urayoan, chief of the territory of Yagüeca during historic times (FIGURE 5: 1). It is also in the vicinity of the Spanish settlement of Sotomayor, and the latter may have been the source of the European objects found at Palma.

It is to be regretted that the site of Palma was not dug. In large part, this was due to the failure of the writer to recognize until after the field work had been completed that sherds of the Ostiones and Capá styles are different and mark separate periods on the time scale. Another site which would have repaid excavation is that of Machuca in Barrio Sabanetas, of the municipality of Mayagüez (folding map). As noted at the beginning of this section, de Hostos believes that this site, rather than Boquerón, was the place where Columbus landed in Porto Rico. If so, it too has the possibility of contributing to the solution of the problem as to whether the Capá style was dominant on the west coast during Period IV.

Two historical facts presented in the introduction to this section may also have some bearing on the problem. We have seen that the conquistadors fail to mention the existence of a chief in the southwestern corner of the island and also that Ponce de León by-passed this district in his two voyages of exploration and colonization, landing instead on the south coast, which was further away from his base in Hispaniola. These facts suggest that the southern part of the west coast area may have been largely depopulated at the time of historic contact. If so, our failure to dig in sites characterized by the Capá style may be due not to the absence of that style but to the scarcity of sites dating from the Capá period. Pending further work, we shall assume that this is the case, and that the Capá style was dominant during Period IV on the west coast as well as further east.

Trade objects which might strengthen the west coast sequence by relating it to sequences elsewhere were not common in our excavations. Two sherds possibly of a Lesser Antillean style were found in the Period IIa division at Las Cucharas. Our lack of knowledge concerning the chronology of Lesser Antillean pottery clouds the significance of these sherds, but they

* See also Lothrop (ms.: 1).

may be tentatively assigned to the Cedros style, which is characteristic of the earliest ceramic deposits in Trinidad (Rouse, 1947). As such, they correlated Period IIa in Porto Rico with the corresponding period in Trinidad, where the Cedros pottery includes white-on-red sherds comparable to those of the Cuevas style.

The collections made by previous investigators at Ensenada, Joyuda, Las Cucharas, and Ostiones contain a number of possible trade sherds of the Santa Elena style, which establish the contemporaneity of late Ostiones and Santa Elena pottery and thereby equate Period IIIb on the west coast area with the same period elsewhere on the island. In the same collections from Ostiones are two Boca Chica sherds and one Esperanza. These, too, may be the result of trade. If our time scale is correct, they were probably introduced into the area before the Boca Chica and Esperanza styles had become dominant elsewhere.

Assuming that the time scale is correct, we may conclude that the following sequence is represented on the west coast: Period IV: Capa style (?); Period III: Ostiones style; Period II: Cuevas style; Period I: no pottery. The virtual absence of the Santa Elena, Boca Chica, and Esperanza styles from this sequence constitutes the chief stylistic distinction of the west coast area.

EXCAVATIONS ON THE NORTH COAST

Setting

This section is concerned with the sites in the northern part of the main island of Porto Rico. It covers all of the lowlands which drain into the Atlantic Ocean, including some 150 kilometers of coastline and the adjacent terrain extending inland for an average distance of 15 kilometers (see folding map at end). Altogether, the area comprises 2,000 square kilometers. Next to the mountainous interior it is the largest in Porto Rico.

The boundary between the north coast area and the rest of the island has roughly the shape of an arc (folding map). Beginning in the west, on Punta Borinquén, it curves gradually inwards through the middle of the foothills and then turns outwards again until the end is reached on Cabo San Juan.

The rivers are the most important topographic feature of the area. From west to east they include the Guajataca, the Grande de Arcibo, the Manatí, the Cibuco, the de la Plata, the Bayamón, and the Grande de Loiza, the last of which is the largest on the island (folding map). These rivers, being relatively powerful, have established broad, alluvial plains along the shore. Belts of steep-sided, dome-shaped hills, honeycombed with caves, lie between the plains. They form a series of obstacles around which the traveler must wind endlessly in order to pass from plain to plain. Behind them are the foothills which mark the boundary with the mountainous interior. In front, extensive swamps may have prevented travel from plain to plain.

The Indians probably also had difficulty in traveling by sea. This is the windward side of the island, and it is subject to the full force of the Atlantic trade winds. Much of the coast is high, and the waves beat incessantly against rocky cliffs. Only the bay of San Juan at the mouth of the Río Bayamón provides extensive shelter for fishing and for the growth of shell fish (folding map).*

Since the north coast is fertile and, except at the western end, is well watered, it would seem to have been capable of supporting a large agricultural population. However, relatively few sites have been found in the area. To a certain extent, this is due to the scarcity of shell heaps, which makes it difficult to detect the presence of sites. It is also probable that the strong Atlantic winds, combined with the scarcity of beaches and of sheltered bays, discouraged fishing and shell gathering and caused the Indian population to concentrate in more favorable parts of the island.†

Notwithstanding the scarcity of sites, it is recorded that seven chiefs, all of them apparently Taino, lived in the area during the first years of Spanish colonization (Coll y Toste, 1907: 1, 45, 96-99). The westernmost was Mabodomaca, who ruled the valley of the Río Guajataca from a village of the same name (FIGURE 5: 3). The drainage of the Río Grande de Arcibo, and possibly also of the neighboring Río Manatí, was apparently under the con-

* This summary of the geography and topography of the north coast area is derived from Lobeck (1922), Ober (1899: 11-43), P.R.R.A. (1940: 324-332), Roberts (1942), and the topographic maps of the United States Geological Survey.

† This explanation is advanced by de Hostos, who points out that sites are also rare on the exposed north coasts of other Antillean islands (de Hostos, 1941: 51).

trol of a chief Arasibo, after whom the modern city of Arecibo is named (FIGURE 5: 4). A third chief, Guacabo, ruled the valley of the Río Cibuco (FIGURE 5: 5). Another, called Aramana, lived along the Río de la Plata in a village of Toa, not to be confused with the modern towns of Toa Alta and Toa Baja (FIGURE 5: 6). Chief Majagua was located in the valley of the Río Bayamón. Like the present city of Bayamón in that district, his village is supposed to have been named after the river (FIGURE 5: 7). Canóbana was the chief of the upper reaches of the Río Grande de Loiza. His village of Cayniabón may have been located on the tributary which now bears his name near the modern town of Canóvanas (FIGURE 5: 8). The name of the chief who controlled the lower part of the Río Grande de Loiza at the time of historic contact is not known. He died soon after and was succeeded by a woman, Loiza, after whom the river and a town are named (FIGURE 5: 9).

Although this is the largest number of chiefs recorded for any part of Porto Rico, it does not necessarily mean that there were more chiefs on the north coast during prehistoric times. The number is probably a reflection of the fact that the Spanish occupation centered in the area. The chiefs of the north coast were those best known to the colonists. In addition, it is possible that some of them had been brought in from other parts of the island to work on the Spanish plantations.

No Europeans visited the north coast until 1508, when Agüeybana, chief of the district on the south coast where Ponce de León landed during his first voyage of exploration, took him north into the Manatí and the Cibuco valleys to show him the sources of his gold (Oviedo y Valdes, 1851, 1: 467-468; Neumann Gandia, 1896: 170-171). Soon thereafter, the Spaniards set up mines in those valleys (Abbad y Lasierra, 1866: 25-26). During the winter of 1508-09, Ponce de León explored the north coast, looking for a favorable place near the mines for establishment of a permanent Spanish settlement. After spending a month at the mouth of what may have been the Río Manatí, he finally settled near the mouth of the Río Bayamón, establishing the town of Caparra on the south shore of San Juan Bay (de Hostos, 1938: 16-17). It was either at Caparra or at the mines that Ponce de León disputed control of the new Spanish colony of Porto Rico with Juan Cerón (Irving, 1850-51, 3: 265-267).

Because of the presence of Caparra and of the Spanish mines in the north coast area, the natives there probably suffered the most from the *repartimientos*, or distributions of the Indians among the Spaniards, which took place during the colonization of the island. In 1509, Chief Guacabo and his followers were assigned to the viceroy, Diego Colón, probably for work in the gold mines along the Río Cibuco (Coll y Toste, 1907: 242).* In 1510, Aramana and Loiza were similarly allotted to the king and were put to work on the former's land in Toa, which became a royal farm (Coll y Toste, 1907: 201-207).† During the same year, Ponce de León took possession of Chief Majagua, his lands, and his subjects, selling them at public auction for the sum of 100 pesos in gold, which he used to defray the expenses of coloniza-

* For an alternative version of the *repartimiento* of Guacabo see Zayas y Alfonso (1931, 1: 189, 2: 10).

† For another version of the *repartimiento* of Loiza, see Brau (1894: 142).

tion (Zayas y Alfonso, 1931, 2: 169). Canóbana and his followers also fell victim to the *repartimientos* in 1510. They became the property of a Spaniard named Miguel Días (Coll y Toste, 1907: 224).*

Only the most westernmost of the chiefs, Mabodamaca, is known to have participated in the rebellion of 1511 against the *repartimientos*. He was the leader of 600 Indians whom a band of Spaniards led by Diego Salazar surprised and defeated in the battle near Aymaco which preceded the final engagement at Yagüeca (Herrera y Tordesillas, 1729, 1: 226; Oviedo y Valdés, 1851, 1: 480-481).

At the opposite end of the area, both the Indians and the Spaniards suffered from raids by Carib warriors from Vieques Island and the Lesser Antilles. One of these raids resulted in the death of the chieftainess Loiza, who, leaving the royal farms at Toa, had married a Spaniard, Pedro Mexía, and had settled with him near the mouth of the Río Grande de Loiza. In 1514, Yaureibo, chief of Vieques, sacked their settlement, killing both Loiza and her husband. Becerrillo, a famous dog who had been brought from Hispaniola to help fight the Indians, met his death in another of the Carib raids (Castellanos, 1874: 66-67; Herrera y Tordesillas, 1729, 1: 281).

The north coast Indians are known to have suffered one more *repartimiento*. In 1515, chief Arazibo and 200 followers were assigned to Lope de Conchillo for use on his farms and in his mines. Thereafter, the only Indians in the area were probably those laboring for the Spaniards. As in the rest of Porto Rico, maltreatment and overwork gradually diminished the number of these Indians and few survived until the *repartimientos* were abolished in 1544. Most of these took refuge in the more remote parts of the island not yet inhabited by Europeans (Brau, 1894: 143-148, 363).

Since 1550, when the last Indians were released, the history of the north coast area has been one of gradual expansion of Spanish settlement. San Juan, the present capital, was founded about 1520 and Arecibo in 1556, the latter by a group of people which included several Indians. The remaining towns developed mainly during the eighteenth and nineteenth centuries (López de Velasco, 1894: 128-130; P.R.R.A., 1940: 173-174, 333-340).

The archaeological resources of the north coast area are fairly well known. A. L. Pinart (1893) and Augustín Stahl (1889: 90) examined a few sites in the 1880's; Cayetano Coll y Toste (1907: 40-41) visited several in the 1890's; Adolfo de Hostos (personal communication), S. K. Lothrop (ms.), and J. Alden Mason (1941: 289) surveyed a number in the 1910's; and R. L. Jungmanns, R. López Azua, and Pablo Morales Cabrera collected specimens from them in the 1920's and 1930's (Morales Cabrera, 1932: 51, 346 ff.). None of this work has been published in detail.

J. Walter Fewkes seems to have been the first to excavate on the north coast. In 1902, he worked at the Cueva de las Golondrinas near Manatí, obtaining a large collection of pottery, the remnants of which are now in the United States National Museum. His report (Fewkes, 1907: 86-89, 155-156, 181, 184) provides our first extended account of a Porto Rican site.

* For an alternative version, see Zayas y Alfonso (1931, 1: 56 and 185).

In 1917, de Hostos also dug at the Cueva de las Golondrinas and at two "secondary-burial" caves at Covachuelas in the municipality of Morovis. In 1923, he excavated further at a ball court on the Espiritu Santo River in Río Grande, and in 1940 at Monserrate in Luquillo. None of this work has yet been published (de Hostos, personal communication).

While initiating the Porto Rican research of Yale University in 1934, Froelich G. Rainey dug two north-coast sites, Coto and Monserrate, and he returned the following year for additional excavations at the latter (Rainey, 1940: 62-104). As already noted, Rainey encountered both of his cultures at the two sites, the Crab, characterized by pottery of our Cuevas style, and the Shell, mainly by pottery of the Ostiones style.

During the six months spent in Porto Rico from 1936 to 1938, the present writer made a survey of the sites on the north coast, basing it principally on the previous surveys of de Hostos and Lothrop. In addition, stratigraphic test pits were dug in five of the more promising sites. The discussion which follows is concerned with these five pits and with six others chosen from Rainey's excavations at Coto and Monserrate.

Carmona (Loiza 4)

On the western side of the Río Grande de Loiza, about five kilometers from the shore, is one of the clusters of low, dome-shaped hills of limestone which are characteristic of the north coast area. As usual, these hills are honeycombed with caves, many of which contain traces of Indian occupation. One of them, called Carmona because, at the time of the writer's visit, it was inhabited by a man named Juan Carmona, was chosen for excavation. It is located on the northern side of the range of hills in a small valley one kilometer west of the river and forms part of the Colonia Virginia of the Fajardo Development Company in Barrio Torrecillas Alta of the municipality of Loiza. Central Canóvanas is 1.4 kilometers southeast (see folding map at end).

So far as the writer is aware, this site had not been previously reported. Learning of it from workers at the central the writer surveyed it on August 19, 1936, and returned on September 13 of the same year for the excavation of a test pit (Rouse, 1937: 184-185).

The valley in which the site is located faces out over the cane fields towards the sea. Before the fields were drained, this was a swampy region, and it is unlikely that agriculture was possible except in the valley itself. The latter is wooded and has a gradual slope of about 30 degrees on either side. Halfway up its west side, at a height of 14 meters from the bottom, there is a rock shelter two meters wide, 1.5 meters tall, and the same distance in depth. This forms the entrance to a small cave one meter tall and 1.5 meters in diameter, which we have designated the Cueva de Carmona.

At the time of the writer's visit, the cave itself contained no remains, but it is possible that the man living in it had cleaned it out. In crevices in back of the rock shelter, the writer found a large griddle sherd and two sherds from the rims of pottery vessels, which were not identifiable as to style and type. Several smaller potsherds, also stylistically and typologically unrecog-

nizable, were observed on the dirt floor of the shelter. More traces of habitation were evident in a cleared area three meters square on the hillside six meters beneath the cave. Here, the writer encountered ash and he picked up 18 unidentifiable potsherds and 1 fragmentary griddle. No petroglyphs were observed in any part of the site.

It is probable that the present inhabitant of the cave has been using the cleared area on the hillside as a garden, although no plants were observed there during the writer's visit. Since this seemed to be the richest part of the site, the excavation was made there in an area four meters square divided into four sections two meters square. The first 25-centimeter level in these sections consisted, as on the surface, of dark brown loam containing traces of ash. A few artifacts were found, also several shells and fragments of animal bones. At a depth of about 25 centimeters, we encountered large boulders and, since these seemed to be sterile, discontinued the dig.

Potsherds of the Capá style predominated in all sections and levels at Carmona. They number 28, as compared with two Santa Elena sherds, the only other style represented. Seven of the potsherds are from open bowls, 13 are from constricted bowls, and 10 are from unidentifiable vessels. Three stone chips and seven pieces of coral are the only other possible artifacts. The animal bones are unrecognizable; the shells consist entirely of land gastropods.

There is no indication that Carmona was a ceremonial, rather than a dwelling site. Whether the Indians lived on the hillside in the area of our excavation, however, is not certain. It may be that the material we obtained was thrown out of the cave by the man now living there. This should make no difference in the dating of the site, however. The prevalence of Capá sherds and the absence of European objects make it possible to assign Carmona to Period IVa.

Coto (Isabela 1)

Coto is the largest and most important site yet discovered in the north-western part of Porto Rico. Comprising a number of small farms in the Tunis district of Barrio Coto, municipality of Isabela, it lies on the north coast some two kilometers inland and three kilometers west of the Guajataca River, near the boundary with the west-coast area (see folding map at end).

Coto has long been known to the local collectors in Porto Rico, and Lothrop includes it in his list of the sites on the island (Lothrop, ms.: 7). Rainey chose it as the place for two of his major excavations and discusses it in detail in the report of his work (Rainey, 1935: 13 and 1940: 62-75; see also his field notes in the Yale Peabody Museum). The following data are taken partially from Rainey's report and partially from observations of the writer, who surveyed the site on July 14, 1937, and has studied Rainey's collections at the American Museum of Natural History in New York (Rouse, 1937: 184).

The district of Tunis, in which Coto is located, is quite hilly. The site lies in a fertile valley among the hills, alongside an intermittent stream, of which only a water hole was left at the time of the writer's visit (FIGURE 12).

Since rainfall is adequate, the district was probably ideal for agriculture. Fishing, however, must have been difficult, as the shore is steep, rocky, and unprotected from the prevailing northwestern winds.

A village site, Coto occupies the top of a knoll one half a kilometer in diameter in the middle of the valley. There are no mounds, the entire top of the knoll being covered with a single deposit of terrestrial snail shells, a few marine shells, potsherds, and other broken artifacts to a depth of 25 to 50 centimeters. This deposit extends also down the western side of the knoll to the stream bed, where the depth of the refuse reaches 75 to 100 centimeters.

Rainey had difficulty obtaining permission to dig and was forced to confine his work to the deeper refuse on the western slope of the knoll. He made two excavations in this area, one composed of 25 sections four meters square and the other of 36 sections of the same size (FIGURE 12). In Excavation 1, the deposit "was primarily composed of blackened sandy soil through which were scattered numerous terrestrial gastropod shells, a few marine shells of various species, some land crab shells, charcoal and ashes, hutia, manati, fish and bird bones, potsherds, and implements of shell and stone. . . . No stratification of refuse could be determined in any section, although towards the bottom of the deposit the soil was less blackened with charcoal and organic decay. Also, artifacts appeared less commonly in the lowest 25 centimeters of deposit" (Rainey, 1940: 64). The composition of Excavation 2 was the same, except in the bottom 20 to 30 centimeters of sections A4, A5, B4, B5, C4, and C5, the only ones in which the deposit reached a depth of one meter. In these sections, the blackened soil gradually gave way to a deposit which "was yellow and contained only scattered terrestrial and marine shells. Land crab shells were found but in no great numbers. Ashes and charcoal were less abundant and artifacts were more rare than in the upper 75 centimeters of refuse." Neither excavation yielded fire pits, hearths, or other structures, but burials were common. Primary, flexed burials placed directly in the refuse predominated. In addition, there was one secondary child burial in the refuse and another in an urn. The only definitely identifiable grave objects were "clay vessels found in association with three skeletons" (Rainey, 1940: 68-69).

Rainey made a study of the vertical distributions of the artifacts in the Coto excavations but disregarded the horizontal distributions, not even tabulating separately the material from the two excavations. He was surprised to find that potsherds of what are here called the Cuevas and the Ostiones-Capá styles (his Crab and Shell cultures) were completely mixed from bottom to top of the site, although the former did occur more commonly in the lower levels and the latter predominated in the upper levels. This was contrary to the situation at the Cañas site, which Rainey had previously excavated, and it is also contrary to conditions in the pits dug by the writer. Rainey attributed it to a disturbance of the deposit, either by erosion down the hillside or by the digging of collectors (Rainey, 1940: 70-75).*

* No explanation is offered why the yellow soil at the bottom of the restricted area in Excavation 2 should have been distinct from the black soil of the rest of the deposit if it had been disturbed by the introduction of Ostiones sherds into the prevailing Cuevas material of the yellow soil, nor why none of the burials seemed to be disturbed.

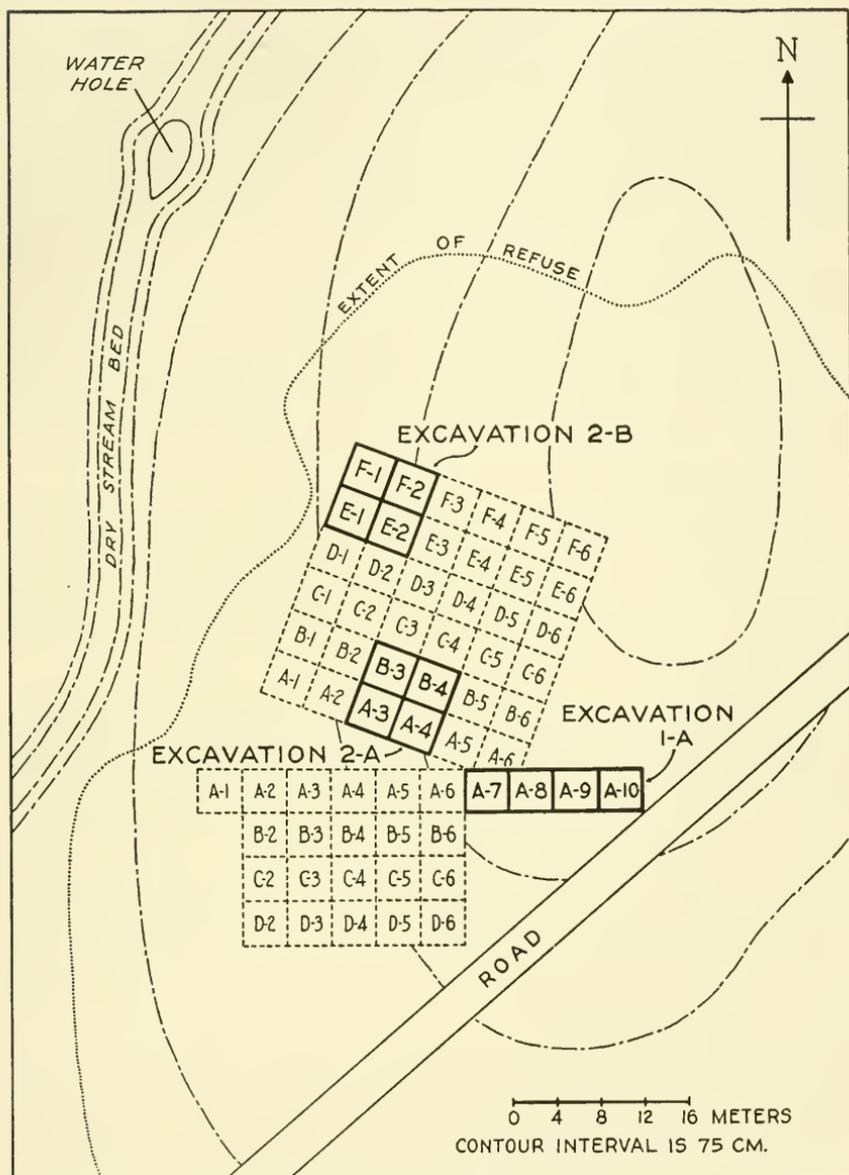


FIGURE 12. Plan of the site of Coto (after Rainey).

When the writer visited the Coto site, he could see no more evidence of erosion or of other disturbance of the deposit than at other Porto Rican sites. He did notice, however, that the sherds on the top of the knoll were heavily incised, whereas those on the western slope, where the bulk of Rainey's excavations were located, had little incised decoration. This sug-

gested that there was a horizontal as well as a vertical factor in the stratigraphy of the site—a fact which might have been inferred sooner from the limitation of the yellow soil to a restricted area in Excavation 2 and from Rainey's statement that "the sherds classed as Crab Level [Cuevas] types regularly appeared in groups and were not scattered at random through the upper levels of the refuse" (Rainey, 1940: 75). It may be that the Indians first deposited heaps of refuse, like those at the site of Ostiones in the west-coast area, and then filled in between them, thus making the materials in adjacent localities of different ages.

In order to test this possibility, the writer made a survey of the Coto collections from the standpoint of section as well as level. By arranging the material in this fashion, he obtained a more regular chronological sequence, and was able to make the distinction between the Ostiones and the Capá styles of pottery, a distinction which had hitherto been unrecognized because it was represented in the site primarily by a horizontal rather than a vertical stratigraphy.

Ideally, the whole site should have been restudied in detail from the standpoint of its combined horizontal and vertical stratigraphy.* This has been outside the scope of the present paper, however, and the writer has merely chosen representative sections in parts of the site which seem to have been inhabited at different times. It is to be hoped, however, that eventually the entire site may be reworked, as it is one of the most important in Porto Rico.

The sections chosen for study are A7, A8, A9, and A10 in Excavation 1; A3, A4, B3, and B4 in Excavation 2; and E1, E2, F1, and F2, also in Excavation 2 (FIGURE 12). Hereafter, these three groups of sections will be termed Pits 1, 2a, and 2b to correspond with the various pits dug by the writer. A summary of their contents follows.

Pit 1. The three styles, Cuevas, Ostiones, and Capá, are all well represented in Pit 1, and in addition there is one sherd of a foreign style, possibly Lesser Antillean (TABLE 5). Cuevas sherds predominate in section A10, level 4; Ostiones sherds, in sections A7 and A8, all levels; and Capá sherds, in section A9, levels 1 and 2, and section A10, levels 1 to 3. These three groups of sections and levels will be termed respectively the Cuevas, Ostiones, and Capá divisions.

None of the burials was encountered in the Cuevas division. Rainey's collection from this division includes only one sherd from an open bowl, a fragmentary griddle, the bit of a celt-hammer of stone, and a stone chip. There were probably some animal remains, but these have not been preserved and Rainey gives us no specific information concerning them.

The Ostiones division yielded three burials, two of adults and one of a child (Rainey, 1940: 191). All are single, primary, flexed, and without grave objects. Twenty-nine of the sherds from this division represent open bowls, 22 are from constricted bowls, and 14 are typologically unidentifiable. They are accompanied by four fragmentary griddles, five stone celts, a

* Vaillant's *Excavations at Zacatenco* (1930) could serve as a model for this, since at Zacatenco, as at Coto, the site lay on a hill, and its inhabitants seem to have moved several times from one part of the site to another.

chisel of stone, a quartz crystal, a bone pick, and a possible shell dish. There appear to be no significant differences in the distribution of the types within the division.

No burials occurred in the Capá division. The potsherds comprise 20 sherds from open bowls, 37 from constricted bowls, three from jars, and 18 from unidentifiable vessels. Six fragmentary griddles, two broken, discoidal stamps of clay, and two stone celts complete the collection from this division.

In accordance with our method of dating, the Cuevas division can be assigned to Period II, the Ostiones division to Period III, and the Capá division to Period IV. Since incised designs are present on the Ostiones potsherds, that division falls in the latter (b) half of Period III. The absence of European objects places the Capá division in Period IVa. The presence of sherds of the Capá style in the Ostiones division, and *vice versa*, may be

TABLE 5
DISTRIBUTIONS OF CUEVAS, OSTIONES, AND CAPÁ POTSHERDS IN PIT 1 AT COTO

	A7	A8	A9	A10	
1	0-21-0	0-10-3	0-3-25	0-3-12	Capá division
2	0-10-0	—	0-2-9	—	
3	0-3-0	0-3-0	2-6-6	0-3-11	
4	—	—	—	1-0-0	Cuevas division
		Ostiones division			

Explanation of Table. The vertical columns in this table represent sections; the horizontal columns, levels. Within each square, the number of potsherds of the Cuevas, Ostiones, and Capá styles are given in succession. The lines mark the boundaries between the Cuevas, Ostiones, and Capá divisions. An additional sherd from section A9, level 3, which may be of a Lesser Antillean style, is not included.

due to a transition from the latter to the former style rather than to mechanical mixture of the refuse of the two divisions. The one sherd of Lesser Antillean style, on the other hand, is probably intrusive. Its presence in the Ostiones division may be due to trade. If so, it should eventually prove valuable for cross dating.

Pit 2a. Only two of the styles present in Pit 1 are also represented in Pit 2a (TABLE 6). Sections A4, B3, and B4 of level 3 and all sections of level 4 have a majority of Cuevas sherds. All sections of levels 1 and 2, as well as section A3 of level 3, have a predominance of Ostiones sherds. These two groups of sections and levels form, respectively, a Cuevas and an Ostiones division.

The Cuevas division yielded two burials, one of an adult and the other of a small child (Rainey, 1940: 193). Both were primary and flexed. The former was accompanied by a paddle-shaped bone spatula, but the latter contained no possible grave objects. Other specimens from the Cuevas division include 32 sherds of open bowls, five of constricted bowls, three of jars, and three from unidentifiable vessels; two fragmentary griddles; the bit of an adze-hammer of stone; three pieces of stone celts; one of a hammer-grinder; a miscellaneous worked stone; a stone chip; and a stone slab.

No burials were encountered in the Ostiones division. Forty-eight of the sherds in this division are from open bowls, 15 from constricted bowls, three from jars, and seven from unidentifiable vessels. These are accompanied by a broken clay cylinder, a stone hammer-grinder, a fragmentary cylinder of stone, a quartz crystal, a bone pendant, a shell chisel, a pendant-tinkler of shell, a shell node, and a coral hammer.

The Cuevas division can be assigned to Period II, and the Ostiones division to Period III. The former dates from Period IIa, for the Cuevas sherds are decorated with white paint, while the latter belongs in Period IIIb, as indicated by the presence of incised designs on the Ostiones sherds. This suggests that the deposition of the refuse in the area of Pit 2a was temporarily abandoned during the latter half of Period II and the first half of Period III, which may be the explanation of the difference between the yellow soil of the Cuevas area and the black soil of the Ostiones area in sections A4 and B4 (see above, p. 408).

TABLE 6
DISTRIBUTION OF CUEVAS AND OSTIONES POTSDHERDS IN PIT 2A AT COTO

	A3	A4	B3	B4	
1	1-5	1-7	0-9	0-7	Ostiones division
2	0-10	0-8	3-9	0-4	
3	2-7	8-3	6-4	6-0	Cuevas division
4	8-1	6-0	1-0	—	

Explanation of Table. The vertical columns in this table represent sections; the horizontal lines, levels. Within each square, the numbers of potsherds of the Cuevas and Ostiones types are given in succession. The line marks the boundary between the Cuevas and Ostiones divisions.

Pit 2b. Turning now to Pit 2b, we find a homogeneous stylistic unit. Potsherds of the Cuevas style predominate in all sections and levels. There are 54 of them, as compared with nine Ostiones sherds, the only other style represented.

An adult burial is reported from this pit, flexed, primary, and without grave objects (Rainey, 1940: 193). There are 50 potsherds from open bowls, seven from constricted bowls, three from jars, and three from unidentifiable vessels. These are accompanied by six fragmentary celts of stone, four stone chips, a quartz crystal, a shell dish, a fragmentary shell disk, and a *Strombus* lip.

This material apparently dates from Period II and, since white paint is absent, was probably deposited during the "b" part of that period. It is unlikely that the Ostiones potsherds were mechanically introduced among the Cuevas, for they occur in all sections and levels. Instead, they may represent a transition at the end of Period II from the Cuevas to the Ostiones style.

General. We have found that part of the refuse in Pit 1 accumulated during Period II, part during Period IIIb, and part during Period IVa; that Pit 2a dates from Periods IIa and IIIb; and that Pit 2b is limited to

Period IIb. These datings confirm the hypothesis that different sections of the site of Coto were inhabited at different times. They also suggest that the inhabitants first spread their refuse all over the site but later concentrated in the area away from the stream, moving southeastward up the hill, so that they were occupying the hilltop at the close of the prehistoric period (FIGURE 12). A general analysis of the collections from all parts of the excavations at Coto would shed more light on this hypothesis.

It may be significant that the location of the site of Coto corresponds closely to that of the village of the chief Mabodomaca (FIGURE 5:3). There is a possibility that Mabodomaca lived at Coto in the area on top of the hill containing Capá pottery, and that this section of the site was inhabited until historic times. It is unfortunate that Rainey was unable to excavate more intensively on the hilltop, as additional work might have revealed the existence of trade objects in that area.

Cuevas (Trujillo Alto 4)

Some 11 kilometers up the Río Grande de Loiza from Carmona, as the crow flies, there is an important village site on the western bank of the river. Situated little more than a kilometer southwest of the town of Trujillo Alto, this site forms parts of the Finca Matiensa of the Central Victoria in Barrio Cuevas of the municipality of Trujillo Alto. It lies on the western banks of the river (see folding map at end).

Construction work on a cane railroad of the Central Victoria led to the discovery of the site. This railroad used to cross the river on a steel and concrete bridge about 100 meters above the site. When the bridge washed out several years ago, it was replaced by a temporary wooden bridge at the site itself. The engineers made a cut 4.5 meters deep through the site in order to reach the bridge, and, in so doing, they encountered numerous potsherds (FIGURE 13). This was reported to Benigno Fernández García, then Attorney General of Porto Rico, and he informed the writer. The site was surveyed on August 26, 1936, and the following three days were spent in excavating a test pit (Rouse, 1937: 183-184). So far as is known, no one else has worked at the site.

Cuevas is situated on the flood plain of the Río Grande de Loiza, little more than a kilometer below the point where the river flows out of the foothills. At the site, the plain is about five meters above the river. It appears to be very fertile, and must have been an ideal location for an Indian village. Only a few small potsherds are visible in the sugar cane which covers the site. There are many more on the banks of the railroad cut. No middens or ball courts were observed in the cane. If originally present, they have been destroyed by the extensive cultivation to which the site has been subjected.

In preparation for excavation, an area eight meters square on the upper (west) bank of the railroad cut was cleared of sugar cane and four two-meter square sections were staked out in the form of a square in this area (FIGURE 13). These sections were dug down through ten 25-centimeter levels—the most at any site in Porto Rico—revealing a succession of ten

layers (FIGURE 14, northern face). Five of the layers consisted of sandy light brown loam. Interspersed between them were four layers of dark brown loam, also sandy. At the bottom of the pit, the tenth layer was composed of yellowish clay (FIGURE 14, northern face).

The five light brown layers contained relatively little refuse. No ash or charcoal was observed in any of them. Shells and animal bones were extremely rare, and there were few artifacts. By contrast, the dark brown layers all contained traces of charcoal, and it may be that their darkness is the result of carbonization. Traces of ash were observed in the second dark layer from the top. Shells, animal bones, and artifacts were compara-

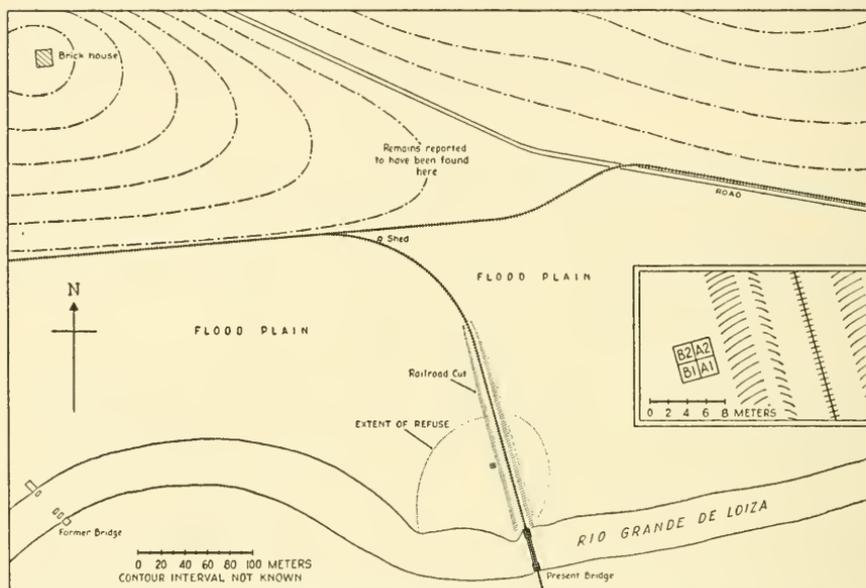


FIGURE 13. Plan of the site of Cuevas.

tively common in all of them. The stratum of yellowish clay at the bottom of the deposit, finally, was sterile.

On the western (upstream) face of the pit, the ten layers just described coalesced into eight, there being only four layers of light brown and three of dark brown loam (FIGURE 14, western face). On the northern and southern faces (parallel to the river), all ten layers sloped downwards from west to east in the direction of the flow of the river (FIGURE 14). The clay layer at the bottom was more highly inclined than the rest, and it was reached only in the western (upstream) part of our excavation. In sections A1 and A2 on the eastern side of the pit, digging had to be discontinued while still in the light brown soil at a depth of 250 centimeters because of the danger of a cave-in. It may be estimated from the slope of the clay in sections B1 and B2 that the loam continued downward for at least 50 centimeters below the bottom of the pit (FIGURE 14).

The inclination of the clay in the pit suggests that the site was originally established on the slope of a hill, and that this slope gradually disappeared as the refuse accumulated. One might speculate, too, that the strata of dark brown soil with much refuse represent habitation levels, while the strata of light brown soil with little refuse are the results of floods occurring before, between, and after the periods of habitation.

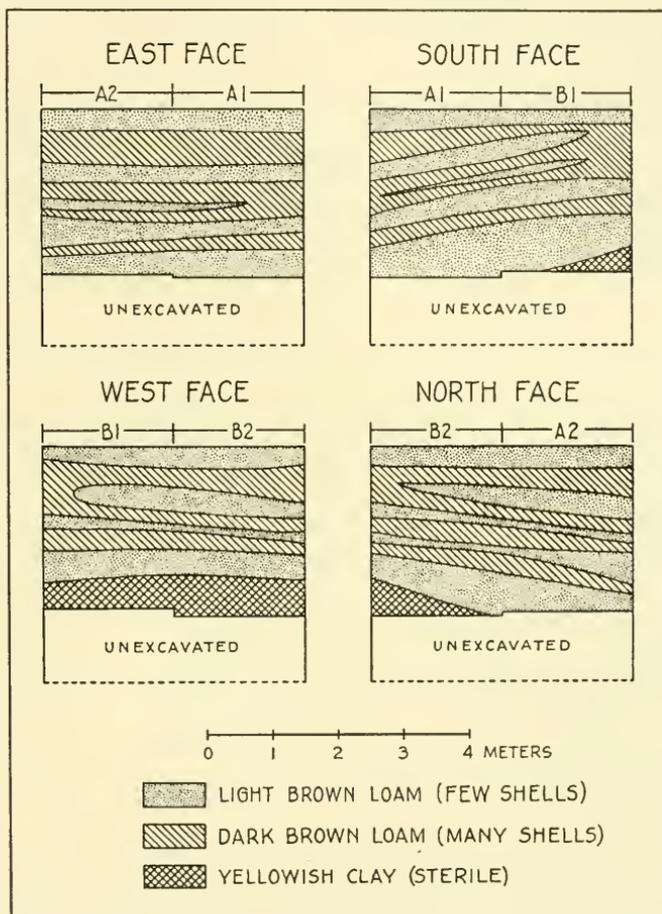


FIGURE 14. Walls of the pit at Cuevas.

A child's burial was encountered in section A2 of the seventh level (FIGURE 15, A). The body was flexed and faced N 60 W. Near it were a tibia and a femur which seemed to be extra, and, one meter away in the same level, we found a few fragments of an adult cranium and an adult tooth. These suggest that the child's body may have originally been accompanied by an adult's, as at the site of Santa Elena (FIGURE 15, B, C). There were no associated artifacts.

A single style, that named after the site, predominates in all sections

and levels of the pit. Potsherds of this Cuevas style number 2,974. They are accompanied by 287 Ostiones sherds, limited to the upper five levels, and by 13 Santa Elena sherds, all of which come from the top level.

From a typological standpoint, the pottery consists of 1,843 sherds from open bowls, 624 from constricted bowls, 78 from jars, and 729 from unidentifiable vessels. The associated artifacts include 51 fragmentary grid-

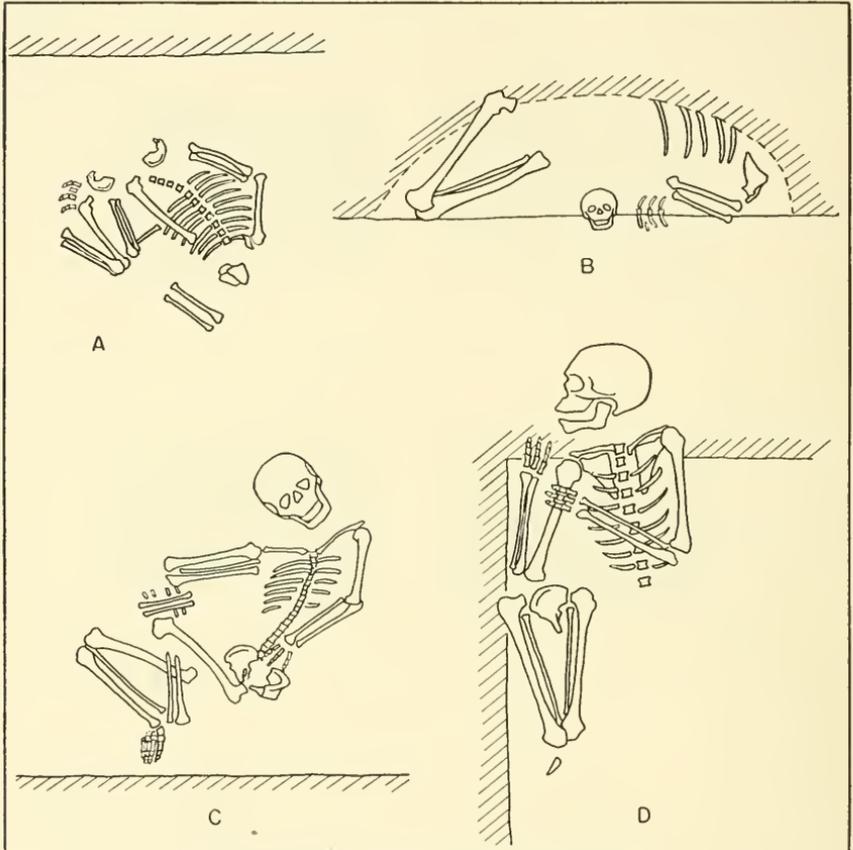


FIGURE 15. Burials at Cuevas (A) and Santa Elena (B-D).

dles, a clay smoother, 15 fragments of clay lumps, a chipped stone ax, two stone chisels, three stone hammers, three possible polishers of stone, a discoidal stone bead, two stone chips, a stone slab, a bone pick, a bone bead, a shell dish, four blunted clam shells, two *Strombus* lips, a *Strombus* plate, and 16 coral fragments. These are accompanied by the bones of bird, fish, hutia, iguana, manatee, and turtle, and by a few marine gastropods and pelecypods.

A complete stone celt was picked up on the surface, some distance away from the excavation. No remains of the crab were observed anywhere in the site, a fact which contradicts Rainey's conclusion that crabs are diagnostic of the culture associated with the Cuevas style (Rainey, 1940: 107).

All of the pit falls in Period II. The depth of the refuse suggests that both parts of this period are represented, and this is corroborated by the distribution of white-painted sherds. None was encountered in the top three levels. Only one, none, and two examples come respectively from the next three levels. The bottom three levels, however, have yielded 16, 23, and 29 sherds painted white. These figures suggest that the bottom four levels belong in Period IIa and the top five in Period IIb. The balance between these two is one reason for selecting Cuevas as the type site for its style.

The presence of Ostiones sherds as deep as 125 centimeters precludes the possibility that these sherds were plowed in from a later part of the site. Instead, they seem to represent a gradual transition in the area of our pit from the Cuevas towards the Ostiones style. The Santa Elena sherds, on the contrary, appear to be intrusive. Since they all come from the top level, they may have been plowed in. In any case, they seem to represent a foreign influence upon the Cuevas-Ostiones sequence.

Los Indios (Manatí 3)

The first site visited at the mouth of the Manatí river in the central part of the north coast area was the Cuevas de las Golondrinas, well known from a survey of Stahl (1889: 90) and from subsequent excavations by Fewkes (1907: 86-89, 155-156) and de Hostos (personal communication). The writer had hoped to dig a pit at this site, but the previous investigators were found to have cleared out the refuse. As a substitute, a nearby rock shelter known as the Cueva de los Indios was chosen for excavation, and the second and third of August, 1937, were spent in digging a test trench at that site.

Las Golondrinas, Los Indios, and two other inhabited caves are all situated in a small valley some 3.5 to 4.0 kilometers east of the Río Manatí (see folding map at end). This valley runs from east to west, parallel to the coast line. On the north, it is separated from the sea by a low range of hills, while on the south it is bordered by a steep cliff (FIGURE 16). At either end, small sheltered coves probably provided the Indians with access to the sea. The sites themselves are clustered around the western cove, which has a sandy beach.

Los Indios lies on the northern side of the valley, 100 meters east of the beach (FIGURE 16). At this point, the hill slopes gradually and is for the most part covered with sod. It is crowned with a large, overhanging ledge of rock, which forms an extensive rock shelter looking out over the floor of the valley towards the cliff on the other side. Although only two meters deep, this shelter is high enough to stand in and it opens onto a flat area 25 meters long and six meters wide. The fertility of the valley beneath, the proximity of the beach, and the presence of drinking water in basins along the rocky shore must have combined to make this an attractive place for the Indians to live.

At the time of the writer's first visit, the only visible specimens were a few scattered potsherds beneath the ledge, on the small plateau in front of it, and on the slope of the hill beneath. No shells, ash, or charcoal were

observed, nor were there any pictographs here, as in the Cuevas de las Golondrinas. On the surface, the site seemed to be a poor one.

It was a surprise, therefore, when digging revealed Los Indios to be richer in pottery than any other site yet visited by the writer in the West Indies. A trench composed of four sections, each two meters square, was laid out on the plateau in front of the rock shelter, and this was dug down to bed rock, three 25-centimeter levels deep in the first two sections and six levels deep in the third and fourth (FIGURE 16). Throughout, the deposit consisted of dark brown loam tinted with ash. Potsherds were almost too numerous to handle, but bones and shells were rare. Rocks began to appear

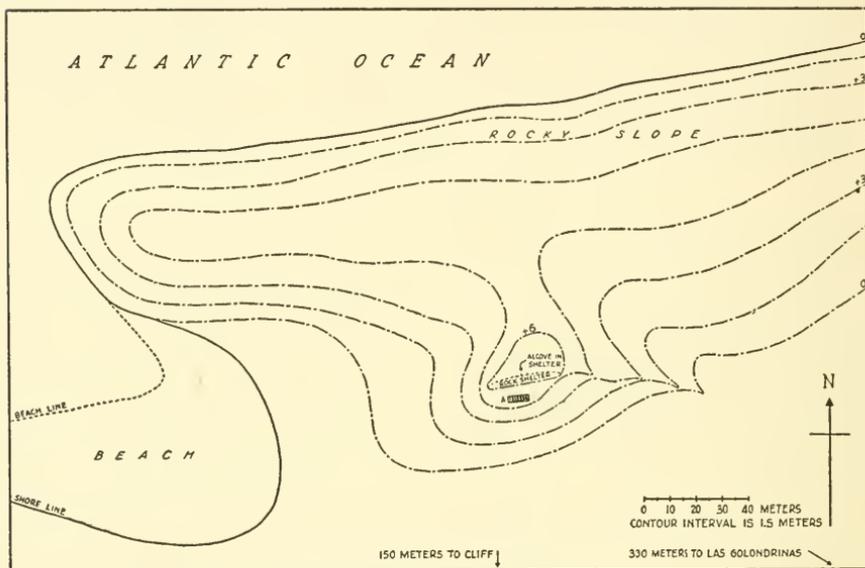


FIGURE 16. Plan of the site of Los Indios.

towards the bottom of each section. In the crevices of the bed rock itself, the loam was replaced with beach sand.

Potsherds of the Santa Elena style predominate in all sections and levels at Los Indios. They number 4,155, and are accompanied by 41 sherds of the Ostiones style plus seven of the Capá. The Ostiones sherds are well distributed throughout, but the Capá sherds come only from the top three levels.

Six hundred and seventy-two of the potsherds are from open bowls, 2,530 are from constricted bowls, six are possibly from jars, and 996 cannot be identified as to type. The associated artifacts include three fragmentary griddles, three parts of stone celts, four stone chips, a shell spoon, a shell hammer, a blunted clam shell, two perforated clam shells which may have been natural, a node of shell, a plain shell tip, nine fractured shell tips, a coral rasp, and 20 other pieces of coral. Crab, man, and manatee are represented among the bones. The shells include marine pelecypods and land and marine gastropods.

The predominance of Santa Elena sherds dates our trench in Period IIIb, and this dating is confirmed by the presence of incision on one of the Ostiones sherds. The latter are finely made and well polished, thus differing markedly from the rough, coarse sherds of the Santa Elena style. They may be trade objects, possibly from the western part of the island. The Capá sherds, on the other hand, are more difficult to distinguish from the Santa Elena. They may represent the beginning of a trend towards the Capá style, particularly since they occur only in the top levels.

Monserrate (Luquillo 1)

This is the easternmost of the sites investigated in the north coast area, and is one of the largest in Porto Rico. It lies at the mouth of a small lagoon on Punta Embarcadero in Barrio Mameyes of the municipality of Luquillo (see folding map at end). Although the site consists of a series of individually owned farms, it takes its name from the Colonia Monserrate, which is 1.2 kilometers to the northwest. The closest town is Luquillo, some two kilometers to the southeast.

The site of Monserrate is a discovery of Rainey's, having been known previously only to the local inhabitants. Rainey made his third major excavation there during August, 1934, and returned again in August, 1935 for further work (Rainey, 1935: 13 and 1940: 75-98;* see also his field notes in the Yale Peabody Museum). The present writer surveyed the site on August 21, 1936, and has also studied the part of Rainey's collection which is deposited in the Yale Peabody Museum, comprising a representative sample of the material obtained during 1934 (Rouse, 1937: 181, 184).† The following account is based almost entirely upon Rainey's work.

A barrier reef extending along the shore in front of the site provides relief from the unfavorable environment which is elsewhere characteristic of the north-coast area. This reef encloses a shallow bay, protecting it from the force of the Atlantic Ocean and forming relatively calm water in which shell fish are able to grow. The lagoon empties into this bay just east of the site and is, in turn, fed by a fresh water stream from which the Indians could have obtained drinking water (FIGURE 17). Just west of the site is a long sandy beach, one of the best in Porto Rico.

The area of the site is low, flat, and sandy. Apparently it has never been plowed, although it is now planted in coconut palms. Marine shells, potsherds, and other refuse are scattered over an area extending for 300 meters along the shore and 200 meters inland, in which five shell heaps rise from 1.0 to 1.5 meters above the surrounding terrain (FIGURE 17). One of these heaps has been partially eroded by the water but the rest are well preserved.

During 1934, Rainey excavated trenches through three of the shell heaps, A, B, and E (FIGURE 17). In 1935, he continued the excavation in Midden A and also dug a trench in Midden D. These trenches were all divided into sections four meters square, and the refuse was removed in 25 centimeter

* In place of "Barrio Monserrate" in these reports, read "Colonia Monserrate" (Roberts, 1942, folding map).

† As already noted, the rest of Rainey's specimens are at the University of Porto Rico, where they have been unavailable for study.

levels. It will be convenient to consider separately each of the middens dug during 1934.

Midden A. The 1934 excavation in Midden A was eight sections long, two sections wide, and seven levels deep (FIGURE 17). For the most part, it contained a deposit of black sandy soil, ash, charcoal, shells, animal bones, and artifacts. However, the center of the deposit varied somewhat from this composition. "The first 50 to 60 centimeters contained a greater percentage of shells than the lower levels, and also more ash, charcoal, bones, and artifacts. In the next 40 to 50 centimeters, shells were less abundant and the number of artifacts decreased perceptibly. The last 40 centimeters

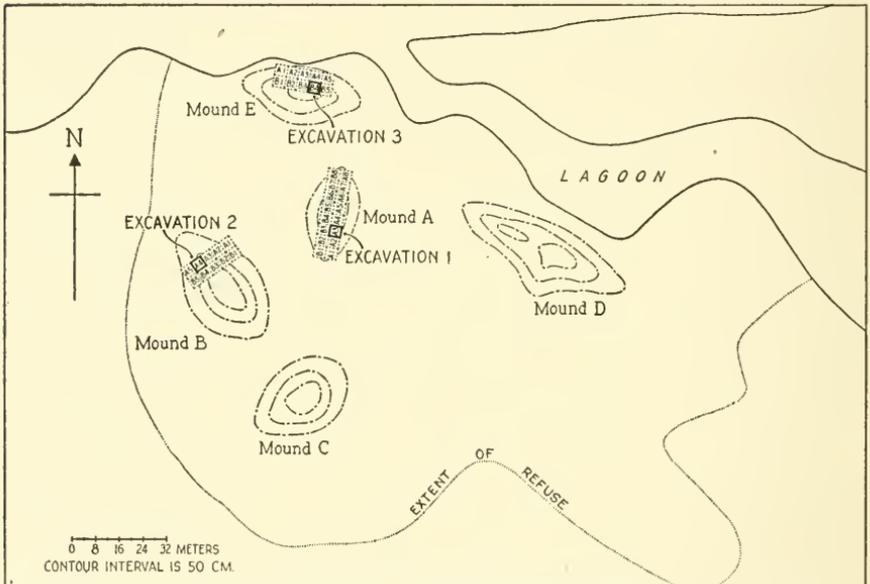


FIGURE 17. Plan of the site of Monserrate (after Rainey).

of deposit contained few shells and artifacts, and was generally gray in color, with small quantities of ash and charcoal mixed with yellow sand. Below this was clear sand at sea level . . . in which the sections . . . rapidly filled with water" (Rainey, 1940: 76).

"No burials were found in the first 50 centimeters of deposit, which contained the greatest number of shells and artifacts." Below that depth were numerous primary flexed burials, with the bodies lying on the face, on the back, or on the side, and, in addition, burial urns containing the bones of small children. Both types of burial were without grave objects (except for the urns). They were most numerous in the 50 centimeters at the bottom of the midden, "often lying so close together that one skeleton could be distinguished only with difficulty from another." Some were also found in the clear sand beneath the refuse (Rainey, 1940: 76-78).*

* According to Rainey, the urn burials were limited to the middle 50 centimeters of deposit, but this is not confirmed by the list of burials given in his appendix (Rainey, 1940: 194-197).

The present writer has chosen section A3 of Rainey's excavation for further study, terming it "Pit 1" (FIGURE 17). This pit is situated at the edge of the central part of the midden, where Rainey observed the variation in the composition of the refuse. It has yielded a primary flexed burial of an adult, which lay in the refuse at a depth of 1.0 meters, and also the primary urn burial of a baby, situated in clear sand beneath the refuse at a depth of 1.6 meters (Rainey, 1940: 194).

The predominant style in Pit 1 is the Ostiones, represented by 115 examples. Two Cuevas and 34 Santa Elena sherds are also present, the latter being limited to the top two of the five levels. Sixty-eight of the potsherds are from open bowls, 29 are from constricted bowls, one is a miniature bowl, 17 are from jars, and 37 are typologically unidentifiable. In addition, the Yale collection contains seven fragments of griddles, a clay pipe, four clay disks, half of a chipped stone ax, seven broken stone celts, six fragments of celt-hammers of stone, part of a stone chisel, two stone hammers, a net-sinker of stone, an anvil-grinder of bone, a bone awl, a bone rectangle, a shell dish, a shell celt, two celt-blanks of shell, a shell chisel, a lip-hammer of shell, a shell cylinder, a shell disk, a *Strombus* lip, and a coral rasp. There are also several marine gastropods in the collection.

The predominance of Ostiones potsherds places Pit 1 in Period III. Both parts of that period are apparently represented, "a" by levels 4 to 5, which lack incision, and "b" by levels 1 to 3, from which there are 12 examples. The Cuevas sherds probably represent a survival from Period II and the Santa Elena sherds, which are limited to Period IIIb, a trend towards the latter style.

Midden B. The presence of a house and a garden plot on Midden B made it necessary for Rainey to limit his excavation to the northern end of the midden. He dug a trench five sections long, two sections wide, and seven levels deep across this end of the midden (FIGURE 17), encountering in the top 20 to 75 centimeters a deposit similar to that in the upper part of Midden A: black sandy soil, ashes, charcoal, marine shells, bones, potsherds of the Ostiones and Santa Elena styles, and other artifacts. This deposit was underlaid in sections A1, A2, B1, and B2 by another consisting of yellowish to grey sand, scattered marine shells, Cuevas and Ostiones potsherds, and associated artifacts, extending down to the water level and beyond. Towards the other side of the midden, in sections A3 to A5 and B3 to B5, a different sub-stratum was distinguished beneath the mass of marine shells. This consisted of yellowish to gray sand mixed with crab remains, some ash and charcoal, potsherds of the Cuevas style, and the usual associated artifacts. This "crab deposit" extended to a depth of 1.5 meters and lay on sterile sand. Its line of junction with the shell layer above was indistinct in sections A3, A4, B3, and B4, but was clearly defined in sections A5 and B5.

Only three burials were encountered in Midden B, two in the shell deposit near the top of the midden and the third in the clear sand beneath the refuse. All were fragmentary, but it could be determined that they were of adults and that one of them had been flexed and primary. No urns nor other grave objects were present (Rainey, 1940: 78-81, 197).

Rainey's section A4 has been chosen for further study and will be termed "Pit 2." This pit is located near the northwestern edge of Midden B, in the area where the line between the shell and crab strata was relatively indistinct. It contained no burials.

The following is a tabulation according to style of the potsherds preserved from Pit 2:

	<i>Level 1</i>	<i>Level 2</i>	<i>Level 3</i>	<i>Level 4</i>	<i>Level 5</i>
Cuevas sherds	0	2	0	2	2
Ostiones sherds	4	8	14	2	0
Santa Elena sherds	5	0	0	0	0

It will be apparent that the situation is ambiguous, not only because of the small number of sherds but also because, in level 4, the Cuevas and Ostiones styles are equally represented. Nevertheless, for the sake of conformity with the other pits, we have arbitrarily grouped levels 4 and 5 as a Cuevas division, levels 2 and 3 as an Ostiones division, and level 1 as a Santa Elena division. This causes the Cuevas division to coincide with Rainey's crab stratum and makes the Ostiones and Santa Elena divisions equivalent to his shell stratum.

Four of the potsherds in the Cuevas division are from open bowls, one is part of a constricted bowl, and one cannot be typologically identified. They are accompanied by a chipped stone ax, four stone celts, a shell dish, a celt-blank of shell, a pendant tinkler of shell, a shell cylinder, and a shell disk. Several turtle bones are also included in the Cuevas collection.

The Ostiones division has yielded 15 sherds from open bowls, five from constricted bowls, and four which are typologically unidentifiable. They are associated with part of a clay disk, a celt-hammer of stone, and a celt-blank of shell. No unworked bones or shells are included in the collection from this division.

The Santa Elena division has yielded two sherds from open bowls, three parts of constricted bowls, a miniature bowl, and three typologically unidentifiable potsherds. In addition, the Yale collection from this division contains a fragmentary griddle of clay, two clay disks, a chipped stone ax, the butt of a stone celt, a complete shell celt, and several fish bones.

Since white painting is absent, the Cuevas division can be assigned to Period IIb. The Ostiones division falls into the subsequent period, IIIa, for it has yielded no examples of incision. This leaves Period IIIb for the Santa Elena division and provides a continuous sequence of the three divisions, suggesting that there was a transition from the Cuevas through the Ostiones to the Santa Elena style in the area of Pit 2. In the latter respect, it is consistent with our suggestion that there was a trend towards the Santa Elena style in the top level of Pit 1.

Midden E. This is the midden which had been partially eroded by the water of the bay. A trench five sections long and two sections wide was dug to a maximum depth of five levels along the edge of the eroded area (FIGURE 17). The composition of the refuse in this trench "was considerably different from that found in Mounds A and B. The surface 25

to 35 centimeters removed contained scattered marine shells, some ash and charcoal, gray sand and a few scattered potsherds. Below this and extending down to sterile sand, marine shells were still more rare, land crab shells appeared in increasing numbers to the bottom of the deposit, the sand was yellow in general appearance, ashes and charcoal were scarce, and potsherds were more numerous although not so plentiful as in the upper levels of mounds A and B.

"In clear sand and partly below sea level a deposit of conch shells was found. No artifacts, bones, ashes, or other culture refuse were found with them. The conch shells were complete and it is probable that they were a natural deposition since they lay at the water's edge" (Rainey, 1940: 82).

Four burials were found in the refuse of Midden E. All were of adults. In three cases, it was possible to determine that they were primary and that the bodies, having been flexed, had been laid on the side. One of the burials was accompanied by four bowls of the Ostiones style, one of which lay inverted over the skull. A shell disk and a shell spatula were also found near the skeleton.

Section B4, which is near the center of Midden E, has been chosen for further study and will be termed "Pit 3" (FIGURE 17). This section has yielded no burials, but it was close to the burial with grave objects described in the previous paragraph.

Fifty-seven of the sherds preserved from Pit 3 are Cuevas in style. The only other one is Santa Elena. From a typological standpoint, 36 of these specimens are from open bowls, 11 are from constricted bowls, two are parts of jars, and nine are unidentifiable. Three pieces of griddles, three ax-blanks of stone, and a stone hammer complete the collection.

It would appear that the entire volume of Pit 3 was deposited during Period II. There are only five examples of white painting, but they are limited to the first and third levels and, since these two fall by our method of dating in the first half of Period II, the other three levels will have to be put there too. The presence of a Santa Elena sherd in this pit is surprising, in view of the occurrence of that style in Period IIIb elsewhere in the site. The sherd may represent a trade object, or it may have been introduced into the deposit during the digging of the burial in the neighboring section. As Rainey (1940: 83) has pointed out, this burial was probably intrusive, its grave objects of the Ostiones style being apparently the only examples of that style found in Midden E. Presumably, it was dug during Period III, at which time the Santa Elena sherd may also have been deposited.

Surface. A small surface collection, mentioned because it has not been published by Rainey, contains six Ostiones and two Santa Elena sherds, five of them from open bowls, one from a constricted bowl, and two from unidentifiable vessels. In addition, there are a fragment of a griddle, five broken stone celts, a celt-hammer of stone, a stone hammer, a section of a massive stone collar, a longitudinal shell bead, and a set of shell teeth. Presumably, this collection dates from Period III, and probably from the first half of that period, for incision is not present.

Summary. It is apparent that the Monserrate middens accumulated

at different times. Within the limitations of our pits, Midden E seems to date from Period IIa, the lower part of Midden B from Period IIb, the lower half of Midden A and the central part of Midden B from Period IIIa, and the upper parts of Middens A and B from Period IIIb. Only the final period, IV, is lacking to complete the sequence, which is characterized by the Cuevas, Ostiones, and Santa Elena styles.

Puerta de Tierra (San Juan 1)

This is the only extensive site known from the area around the mouth of the Río Bayamón. It is situated on San Juan Island and lies just outside the gates of the ancient fortifications of the city of San Juan, in the section of the city now known as Puerta de Tierra (see folding map at end). The land is a military reservation and, at the time of the writer's work, it was occupied by the service company of the 65th Infantry. Adolfo de Hostos is the only archaeologist known to have explored the site previously. He supplied information of it to the writer, who dug a test pit on August 2 and 3, 1936 (Rouse, 1937: 184).

The eastern end of the island of San Juan, on which the site of Puerta de Tierra is located, is comparatively flat and fertile. According to de Hostos, there used to be several natural cisterns just east of the site, which the early Spanish settlers used as a source of drinking water and which the Indians may have used before them. In fact, it may be because of these cisterns that the site is located on the northern, windward side of San Juan Island rather than to the south, where the Indians could have taken advantage of the sheltered waters of San Juan Bay (folding map).

According to officers of the service company, the area of the site originally consisted, on the west, of a swamp and, on the east, of higher land covered by a shell heap. During the latter part of the nineteenth century, the swamp was filled in with material from the eastern half of the shell heap, and stables were erected on the fill. Barracks and garages were subsequently built around the remainder of the shell heap, but the latter seems to have been left intact, first as a courtyard and later as a garden. This is corroborated by the distribution of the shells at the site. They are scattered in the area of the stables but appear more common in the garden to the west.

An area four meters square was staked out in the garden where the refuse appeared to be deepest. This pit was the first one dug in Porto Rico and it departed from the pattern subsequently established by being divided only into two sections, each measuring two meters by four meters. The top 25-centimeter level in these sections consisted of dark brown loam containing no ash, charcoal, or bones and only scattered shells and artifacts. Beneath it was a brick pavement, resting on wood and covered in spots with cement, through which we were able to cut only with difficulty. For the next 30 centimeters, the deposit consisted of dark gray loam streaked with ash containing both bones and charcoal. Shells were numerous and were so closely packed that digging was almost as difficult as in the pavement. There were more artifacts too. At an average depth of 60 centimeters, the loam gave way to a light brown sandy sub-soil in which were found only a

few shells and artifacts which seemed to have sifted down from the refuse above. Excavation was discontinued at a depth of 80 centimeters.

It seems probable that the lower stratum of compacted shells was undisturbed. The overlying pavement may have been built during the last century in connection with the stables. The soil above must consist of fill taken from another part of the site, perhaps during construction of the road around the garden. Thus, the stratigraphy at the site is mainly artificial.

Five of the six styles are represented in the collection from Puerto de Tierra as follows:

	<i>Cuevas</i>	<i>Ostiones</i>	<i>Santa Elena</i>	<i>Capá</i>	<i>Esperanza</i>
Level 1	67	23	9	0	1
Level 2	153	199	6	1	0
Level 3	141	59	0	0	0
Level 4	2	0	0	0	0

The Cuevas style predominates in all sections of levels 1, 3, and 4; the Ostiones style, in both sections of level 2. These will be treated, respectively, as Cuevas and Ostiones divisions.

Of the sherds in the Cuevas division, 132 are from open bowls, 90 from constricted bowls, four from jars, and 77 from unidentifiable vessels. They are accompanied by four fragments of griddles, a lump of clay, the shank of a stone adze, a celt-blank of shell, a chisel-blank of shell, a shell disk, two *Strombus* lips, three coral rasps, and two other pieces of coral. Fish and turtle have been identified among the animal remains.

The Ostiones division has yielded 134 sherds from open bowls, 135 from constricted bowls, two from jars, and 88 which cannot be typologically identified. We also obtained from this division six pieces of griddles, the bit of a stone adze, a dish-blank of shell, a celt-blank of shell, three *Strombus* lips, a water-worn piece of shell, four fragments of coral, a piece of charcoal, a European potsherd, and a cognac seal dated 1795. The animal remains include fish, hutia, and turtle bones.

The shell sample, which cannot be allocated to the divisions, contains a blunted clam shell, a node, and marine gastropods and pelecypods. In addition, we have recorded the presence of crab, probably also in both divisions.

Since only one of the sherds is white painted, we can date the Cuevas division in Period IIb. The absence of incision from the Ostiones sherds places that division in Period IIIa. Thus, we have a continuous sequence of the two styles, which is consistent with the fact that the former seems to develop into the latter, it being often difficult to distinguish the two. The Santa Elena, Capá, and Esperanza sherds, on the other hand, appear intrusive. It is possible that they were dropped on the site at a later date.

The pit provides a good example of reverse stratigraphy. The succession of Cuevas and Ostiones refuse in the three levels beneath the pavement appears normal, suggesting that these levels were undisturbed. On the other hand, the Cuevas refuse above the pavement in level 1 has obviously been brought in from another part of the site, reversing the sequence so

that level 1, instead of resembling level 2, is stylistically the same as levels 3 and 4.

The existence of reverse stratigraphy was to be expected from the amount of leveling reported to have taken place at the site (see above, p. 424). It is further corroborated by the fact that the only two European objects were found beneath the pavement in the Ostiones deposit. These two specimens are not trade objects, since the area is known to have been uninhabited at the time of historic contact (de Hostos, personal communication). The cognac seal provides a minimum date of 1795 for the construction of the pavement. The subsequent piling of Cuevas refuse onto the pavement probably took place during the latter part of the nineteenth century.

Santa Elena (Toa Baja 2)

Highway 52, which runs up the eastern side of the Río de la Plata from the town of Toa Baja, passes just west of a large village site (see folding map at end). This site is situated where the tracks of a cane railroad cross the valley of the La Plata, about 1.5 kilometers above Toa Baja and 5.0 kilometers from the sea. The site forms part of the Finca Santa Elena, belonging to Heraldo Funajera, and is in Barrio Media Luna, of the municipality of Toa Baja.

Although this site does not seem to have been investigated scientifically before the arrival of the writer, its existence was well known to the local inhabitants. Señor Funajera, the owner, has accumulated a small collection, which includes potsherds of the Santa Elena style, named after this site, a stone adze, several stone celts, two ground stone axes, mortars and pestles, stone side grinders (one of which is grooved), and a number of stone balls. In addition, his collection contains a hollow adorno of clay which may be a trade object from the Lesser Antilles. Most of these objects are said to have been found during the cultivation of sugar cane at the site. The writer learned of it from workers in the cane fields and commenced excavation of a pit on August 30, 1937. This was the last dig of the 1937 season, and after a day's work it became apparent that the deposit was too deep to reach the bottom during the time available before the writer's departure for the United States. Accordingly, the pit was filled in after the excavation of two 25-centimeter levels had been completed, and its location was carefully marked so that it could be found again the following year. On August 24 to 26, 1938, the writer returned and completed the excavation.

The site of Santa Elena covers a semicircular area of about five acres along the edge of a bench 4.5 meters above the flood plain of the river (FIGURE 18). There is a cut through its center, by means of which the railroad passes down to the flood plain. Potsherds, shells, and animal bones were common in the sides of this cut, but there were only scattered sherds in the sugar cane which covered the surface of the site. Accordingly, an area on the north side of the cut, as close as possible to the edge of the flood plain, was chosen for excavation and four sections, each two meters square, were laid out there in the form of a square (FIGURE 18).

In the first two 25-centimeter levels of the excavation, we encountered dark brown loam containing charcoal, animal bones, and artifacts, but very few shells. This deposit continued unbroken to a depth of 49 centimeters in the southwestern corner of the pit and to 102 centimeters in the northwestern corner (FIGURE 19). At these points, there began to appear a series of three irregular shell strata, which in places were joined together and elsewhere were separated by areas containing few shells (FIGURE 19). Charcoal, animal bones, and artifacts were more frequent in these shell strata than in the relatively shell-free areas, but the soil in both was the same dark brown loam. At a depth varying from 110 to 180 centimeters, the shell layers disappeared, leaving only the loam, with relatively few

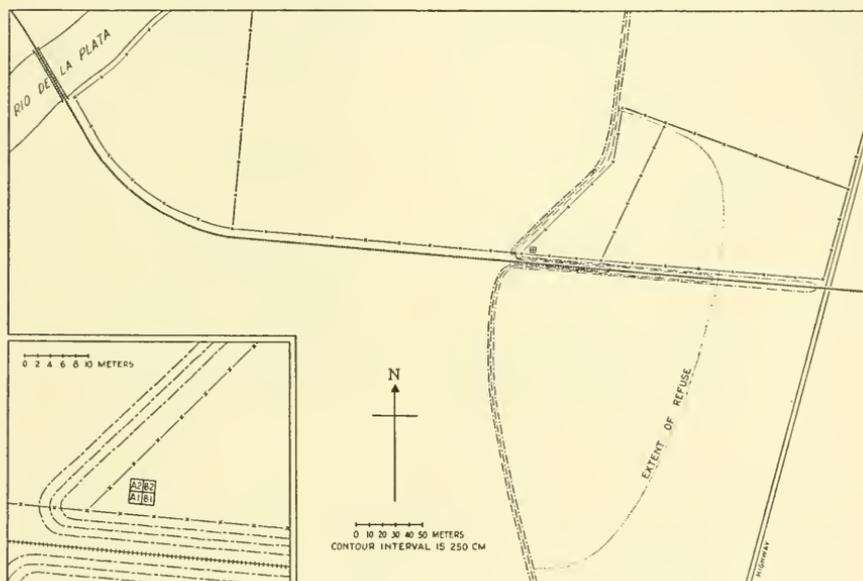


FIGURE 18. Plan of the site of Santa Elena.

traces of charcoal, shells, animal bones, and artifacts (FIGURE 19). This loam in turn gave way, at an average depth of 185 centimeters, to very dark clay. The charcoal, shells, animal bones, and artifacts continued as before to a depth of 200 centimeters, where they began to die out. By 225 centimeters, the clay had become sterile, and excavation was therefore discontinued (FIGURE 19).

A study of the configuration of the shell strata reveals the existence of three pits, projecting downwards from the bottoms of those strata. One was in section A2 at a depth of 75 centimeters, a second in section B2 at the same depth, and the third in section B1 at a depth of 150 centimeters (FIGURE 19). All three consist of the same sort of material as that of the shell strata themselves, and it is therefore possible that they were dug by the Indians as refuse pits.

A layer of small, water-worn pebbles was encountered in the southwestern

corner of the excavation at a depth of 80 centimeters (FIGURE 19). This layer, of which our pit cut through a section 160 centimeters long, 15 centimeters wide, and three centimeters thick, contained more than the usual amount of charcoal. It may have been the floor of a hearth.

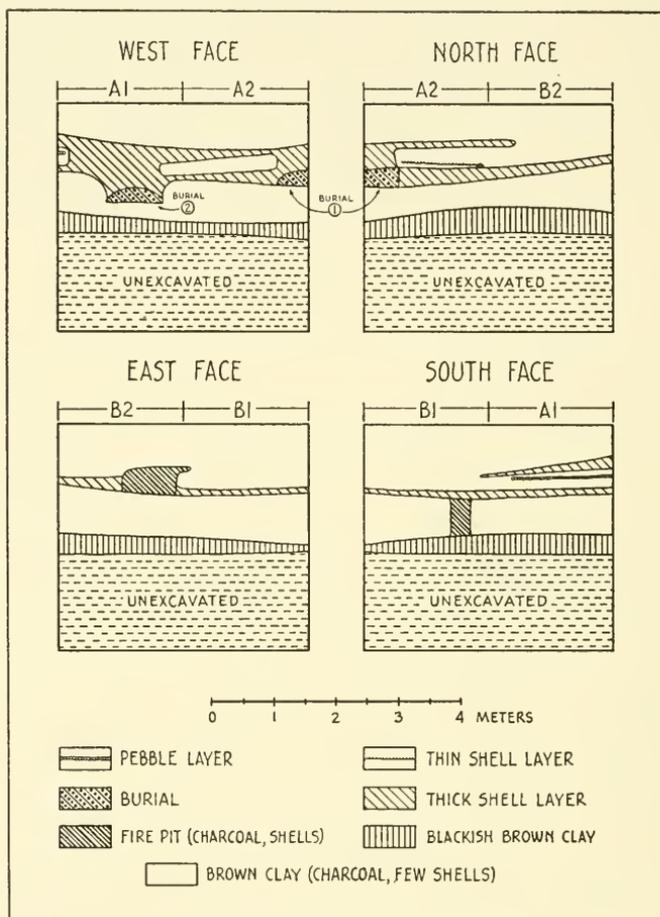


FIGURE 19. Walls of the pit at Santa Elena.

Three burials occurred in the pit. The first appeared at the very bottom of the lowest shell stratum in the northwestern corner of section A2, at an average depth of 118 centimeters (FIGURE 19). It consisted of the skeleton of a girl, probably in her teens, flexed and lying on its right side (FIGURE 15, D). The skeleton was level, and its long axis lay approximately north-south, with the head extending beyond the edge of the pit, so that it became necessary to hollow out the north wall to reach it. The bones were in good condition with the exception of the pelvis and the leg which lay beneath it, both of which had been disturbed by roots. There were no grave objects.

The second burial was encountered in section A1, at a depth of from 136

to 160 centimeters (FIGURE 19). Although the bones were beneath all three shell strata, they were surrounded by shells, which indicate that this burial was intrusive from the lowest of the shell layers (FIGURE 19). Only the edge of the burial lay inside the pit, and it was necessary to hollow out the west wall in order to reach most of it. The first bones found were from an infant, lying on its right side in a flexed position (FIGURE 15, B). They were badly decomposed, and only the skull, vertebrae, ribs, and a few long bones could be recognized. Too late, it was discovered that this infant lay between the legs and arms of an adult. If this had been realized sooner, the entire burial would have been left undisturbed, for most of the adult skeleton was too far beyond the edge of the pit to be excavated. Enough was uncovered, however, to show that the adult skeleton lay on its left side in a flexed position (FIGURE 15, B). No grave objects were encountered in association with burial 2.

TABLE 7

DISTRIBUTION OF OSTIONES, SANTA ELENA, CAPÁ, AND EUROPEAN POTSDHERDS AT SANTA ELENA

	A1	A2	B1	B2	Capá division
1	0-14-26-3	3-24-31-3	0-29-47-3	0-14-12-1	
2	0-28-23-0	0-31-20-0	0-50-21-0	0-16- 7-1	
3	0-60-26-0	1-70- 8-0	0-48- 9-0	0-87-13-0	
4	0-39- 3-0	0-23- 5-0	0-22- 0-0	0-30- 3-0	Santa Elena division
5	4-89- 8-0	9-69- 5-0	4-52- 3-0	0-52- 0-0	
6	0-25- 0-0	3-13- 0-0	0-11- 0-0	0-15- 0-0	
7	0-21- 0-0	0-22- 0-0	0- 3- 0-0	0- 3- 0-0	
8	0- 9- 0-0	0-17- 0-0	2- 7- 0-0	0- 3- 0-0	
9	0- 7- 0-0	0- 5- 0-0	0- 0- 0-0	0- 2- 0-0	

Explanation of Table. The vertical columns in this table represent sections; the horizontal lines, levels. The numbers of Ostiones, Santa Elena, Capá, and European potsherds are given in succession. The lines mark the boundary between the Santa Elena and Capá divisions.

Burial 3 lay beneath the one just described, 21 centimeters further down in the loam and entirely within the pit (FIGURE 19). There were almost no shells in its vicinity. Like burial 2, this one consisted of an infant lying between the arms and legs of an adult (FIGURE 15, C). The bones of the infant were badly decomposed, and only the tibias and fibulas could be recognized. The adult skeleton seemed to be a male. It was flexed and on the right side, with the head slightly above the rest of the body. The skull, scapulas, clavicles, and pelvis were in good condition, but the rest of the bones had reached various stages of decay. There were no associated artifacts.

From a stylistic standpoint, the Santa Elena pit may be divided into two parts (TABLE 7). In sections A1, A2, and B1 of level 1, most of the potsherds are of the Capá style, and those sections will therefore be termed the Capá division. The rest of the pit constitutes a Santa Elena division, in which potsherds of that style are everywhere predominant. Both divisions also contain a few Ostiones sherds, as shown on TABLE 7.

The pits, hearth, and burials described above come from the Santa Elena division. Two hundred and sixty-three of the potsherds in this division are from open bowls, 765 are from constricted bowls, one is from a miniature bowl, three are from jars, and 251 are unidentifiable as to type. The associated artifacts include 68 fragmentary griddles, four clay disks, two net sinkers of stone, five stone chips, a fragment of a stalactite, a bone awl, a bone pick, a bone point, two fragments from plain bone spatulas, a bone disk, a bone peg, a possible fragment from a shell dish, a lip-hammer of shell, 14 blunted clam shells, a *Strombus* lip, a *Strombus* plate, three plain shell tips, a fractured shell tip, three water-worn pieces of shell, and 10 fragments of coral. Bird, fish, hutia, manatee, and turtle are represented among the bones. The shells include land and marine gastropods, and marine pelecypods. In addition, we obtained two European potsherds and a bone from an unidentifiable European mammal in the top two levels of this division.

From the Capá division come 29 sherds of open bowls, 130 of constricted bowls, and 38 which cannot be identified. The associated artifacts include three pieces of griddles, two stone chips, and two fragments of coral. Bird, fish, and hutia bones, and several shells from marine pelecypods are the only animal remains. Nine European potsherds complete the collection from this division.*

The Santa Elena division of our pit falls by definition into Period IIIb. The thickness of the division is unusually great for such a relatively small period of time, but the dating is corroborated by the fact that one of the two Ostiones potsherds found near the bottom of the deposit is incised. The Ostiones sherds are very different from the Santa Elena and may be considered trade objects, possibly from the western part of the island. The Capá sherds, on the other hand, probably mark a transition from the Santa Elena to the Capá style. This is indicated both by their position—they do not begin to appear until level 5 and then gradually increase in numbers towards the top of the site (TABLE 7)—and by the fact that the Santa Elena sherds become more Capá-like as one proceeds from the bottom of the site to the top. In the upper levels, it is often very difficult to distinguish between the Santa Elena and the Capá sherds, since each seems to have acquired some of the characteristics of the other.

The two European sherds and the mammal bone from the Santa Elena division do not, as one might expect, appear to be intrusive. The bone and one of the sherds come from the second level and, like the rest of the specimens there, are relatively large and unworn. It is inferred that, instead of being brought in by the plow, they were deposited with the Indian artifacts. This suggests that the Santa Elena style survived into Period IVa and was not, as elsewhere, limited to Period IIIb.

It is further concluded that the Capá division dates only from the second half of Period IV and not, as elsewhere, also from the first half. This is

* The foregoing figures include not only the material excavated from the first two levels in 1937, but also a few specimens found during reexcavation of those levels in 1938. This makes for a discrepancy between the numbers of potsherds listed above and those enumerated in TABLE 7, where only the specimens originally excavated are included.

substantiated by the presence of European sherds in all of the Capá sections and levels (TABLE 7). Since these sherds are as heavily worn as the Indian specimens with which they were found, there can be little doubt that the two were deposited together. The Ostiones and Santa Elena sherds in the Capá division probably represent a survival from the earlier period.

Both in location and in size, Santa Elena qualifies as the site of the residence of chief Aramana, who ruled the Toa district at the time of first historic contact (FIGURE 6:5). It may also be identified as part of the royal farm of Toa, to which Aramaná and his subjects were assigned in the *repartimiento* of 1510.

Other Sites

The only sites dug by previous investigators at which we did not also excavate are the two Covachuelas burial caves and the Espiritu Santo ball court where de Hostos worked, and the Cueva de las Golondrinas near Manatí (see folding map at end). No information on the former sites is available. For the sake of completeness, we append a report on the latter place, which has been surveyed by Stahl and excavated by Fewkes and de Hostos (Stahl, 1889: 90; Fewkes, 1903a: 450-451, 453-454; Fewkes, 1903b: 114; Fewkes, 1907: 87-89, 155-156, 181, 184; Fewkes, 1922: 237, 268; de Hostos, personal communication).*

Las Golondrinas (Manatí 1). This site, which lies some 500 meters east of the rock shelter of Los Indios where we dug, is on land of Miguel Mena in Barrio Tierras Nuevas Poniente of the municipality of Manatí (FIGURE 16). It is more a cave than a rock shelter, and its walls are decorated with a number of petroglyphs (Fewkes, 1903a, Plate 46, Figures 15-22; Fewkes, 1907, Plate 60, Pt. 2, q-w). According to Fewkes, the cave originally contained a refuse deposit three meters (ten feet) deep, but this had been completely removed by the time of the present writer's visit.

Fewkes reported finding in the cave "over two cart-loads of fragments of pottery," a stone ax, several stone celts, worked pieces of bone, and two "cut-shell objects" (Fewkes, 1903: 450 and 1907: 88-89).† Of these, the writer was able to find in the Fewkes collection at the United States National Museum only 180 potsherds. The Ostiones and the Santa Elena styles predominate, there being 125 examples of the former and 39 of the latter. All of the other styles are also represented, the Cuevas by one sherd, the Boca Chica by three, the Capá by five, and the Esperanza by six, and, in addition, one specimen appears to be Lesser Antillean. Five of the sherds are from open bowls, seven are from constricted bowls, two are from jars, and the rest are typologically unidentifiable. Since de Hostos's collection is unavailable, these are the only artifacts from Las Golondrinas which the writer has been able to locate.

Assuming that the specimens constitute a representative sample of the sherds obtained by Fewkes, we may date the site in Period III. Pre-

* Fewkes' work is also discussed by Lothrop (ms.: 10), Lovén (1935: 121, 128, 278, 281-282, 285), Morales Cabrera (1932: 51), and Rainey (1940: 116-117).

† The shell objects appear from Fewkes' illustration (Fewkes, 1907; Plate 87, B) to be merely water-worn fragments.

sumably, it should be assigned to the latter part of the period, not only because of the presence of the Boca Chica, Capá, and Esperanza sherds but also because incision is common on the Ostiones specimens. The Cuevas sherd may represent a survival from an earlier period, and the Santa Elena pottery, influence from other settlements.

If this dating is correct, it makes the Ostiones style predominant at Las Golondrinas during the same sub-period in which the Santa Elena style seems to have been characteristic of Los Indios, 500 meters away. Such a situation is not unique. It is duplicated at Monserrate, where we have assigned the Ostiones deposit in the upper part of Pit 1 to the same sub-period as the Santa Elena division of Pit 2 (see above, p. 424).

Conclusions

From a geographical standpoint, the seven sites excavated by us do not satisfactorily cover the north coast area. We were able to dig pits in only five of the seven great river basins of the area. Despite special efforts to locate new sites, none worth excavating was found in the valleys of the Río Grande de Arecibo and the Río Cibuco (see folding map at end). This was particularly disappointing in the case of the Arecibo river, for its broad valley provides access to much of the interior of the island and it is likely to have supported a heavy population during prehistoric times.

Chronologically, our pits provide a better coverage. We dug no sites dating from Period I, but none have been located on the north coast and, in view of the unfavorable nature of the environment, it is unlikely that any exist. The remaining three periods were encountered respectively in seven, seven, and three pits, both halves of Periods II, III, and IV being well represented (TABLE 8).

Four sites are particularly significant stratigraphically (TABLE 8). The pits chosen from Rainey's excavations at Coto confirm the sequence of Periods II, III, and IV. In addition, our Cuevas pit demonstrates clearly the shift from Period IIa to IIb. The Puerta de Tierra pit extends from Period IIb to IIIa, and at Santa Elena we obtained one of the best examples of the succession of Periods IIIb, IVa, and IVb. Part of the evidence at Puerta de Tierra is in the form of reverse stratigraphy, caused by recent construction in the city of San Juan.

The sites of Coto and Santa Elena are also important as a means of linking the archaeological sequence with the historic sources. On geographical grounds, we have concluded that Coto was the place of residence of Mabodomaca, the chief encountered by the Spaniards in that vicinity, and that Santa Elena was inhabited by Aramana, the chief of the district of Toa at the time of historic contact (FIGURE 5: 3, 6). The latter correlation is confirmed by our excavation, which also makes it possible to identify Santa Elena as part of the royal farm of Toa, established soon after the conquest.

A single foreign sherd has come to light as the result of our work on the north coast. This is a specimen of Lesser Antillean pottery from a part of the site of Coto which we have assigned to Period IIIb. Contrary to the two Lesser Antillean sherds previously discussed (in the conclusions

to the west coast section), this specimen seems to be related to the pottery of the Palo Seco style in Trinidad. Its date of Period IIIb is slightly later than the position of the Palo Seco style, which we have estimated to have extended from Period IIb through IIIa (Rouse, 1947), but this discrepancy is not too great to be the result of some kind of local variation within the Lesser Antilles.

From the standpoint of the local styles, the north coast area is divisible

TABLE 8
CHRONOLOGY OF THE PITS IN THE NORTH COAST AREA

		<i>Carmona</i>	<i>Colo 1</i>	<i>Colo 2a</i>	<i>Colo 2b</i>	<i>Cuevas</i>	<i>Los Indios</i>	<i>Monserate 1</i>	<i>Monserate 2</i>	<i>Monserate 3</i>	<i>Puerta de Tierra</i>	<i>Santa Elena</i>
Period IV	b	—	—	—	—	—	—	—	—	—	—	1 (A1, A2, B1)
	a	1 (A9, A10) 2 (A9, A10) 3 (A10)	—	—	—	—	—	—	—	—	—	1 (B2) 2-9
Period III	b	—	1 (A7, A8) 2 (A7, A8) 3 (A7, A8, A9)	1 2 3 (A3)	—	—	1-5 1-3 1	—	—	—	—	—
	a	—	—	—	—	—	—	4-5 2-3	—	—	—	—
Period II	b	—	—	—	1-3 1-5	—	—	4-5	—	—	1 3-4	—
	a	—	4 (A10)	3 (A4, B3, B4) 4	—	6-9	—	—	—	1-5	—	—
Period I	—	—	—	—	—	—	—	—	—	—	—	—

Explanation of the Table. The pits are listed across the top of this table and the periods along the side. The arabic numerals under each name refer to successive 25-centimeter levels in the pit. The letters and numbers in parentheses refer to the sections within each level. (For clarification of the relationships between sections and levels, see TABLES 5 to 7.)

into three parts: western, central, and eastern. Only one site, Coto, was excavated in the western part of the area, but it has produced a complete sequence of styles, the Cuevas dating from Period II, the Ostiones from Period III, and the Capá from Period IV. This sequence is the same as that on the west coast, of which it is probably an extension.

In the central part of the area, the Cuevas style seems again to have been preponderant during Period II, as indicated by our excavations at Puerta de Tierra. Period III, however, was apparently characterized not only by Ostiones but also by Santa Elena pottery, the former being predominant at Puerta de Tierra and in Fewkes's collection from the Cueva de las Golondrinas, the latter in our pits at Los Indios and Santa Elena.

There are reasons for thinking that the Ostiones style spanned the entire period. Our collection from Puerta de Tierra contains evidence of a development from the Cuevas into the Ostiones style of Period IIIa, while, in Fewkes's collection from the Cueva de las Golondrinas, the development seems to have proceeded into the latter part of the period. The Santa Elena style, on the other hand, apparently did not come into existence until Period IIIb, for both at Los Indios and Santa Elena there are trade sherds indicating contemporaneity with the Ostiones deposits dating from Period IIIb and, in addition, the Santa Elena pit has yielded a shift from the Santa Elena style to the Capá. If our dating is correct, this shift did not take place until the end of Period IVa. We may conclude, therefore, that, in the central part of the north coast area, the Cuevas style was characteristic of Period II, the Ostiones style of Periods IIIa and IIIb, the Santa Elena style of Periods IIIb and IVa, and the Capá style of Period IVb.

The sequence in the eastern part of the area is similar in most respects. The Period II deposits at Cuevas and Monserrate are characterized by the Cuevas style, with a trend in the upper levels towards to Ostiones style. The latter is predominant in both of the Monserrate units dating from Period IIIa and in one of the two units dating from Period IIIb. In the other such unit, however, it is replaced as the dominant style by the Santa Elena. At Carmona, finally, the Capá style is preponderant in a pit apparently dating from Period IVa.

In summary, the following are suggested as the sequences of styles on the north coast:

	<i>Western part</i>	<i>Central part</i>	<i>Eastern part</i>
Period IVb:	—	Capá	—
Period IVa:	Capá	Santa Elena	Capá
Period IIIb:	Ostiones	Ostiones (?), Santa Elena	Ostiones, Santa Elena
Period IIIa:	Ostiones	Ostiones	Ostiones
Period II:	Cuevas	Cuevas	Cuevas
Period I:	—	—	—

The absence of a Period I occupation and the presence of the Santa Elena style during Periods IIIb and IVa distinguishes these sequences from the one established for the west coast area.

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PLATES

PLATE 1. Views of sites.

Upper left: looking north from the excavation at Carmen. Upper right: Ball Court 1 at Villón. Lower left: excavation 2 at Ensenada Honda. Lower right: wall of the excavation at Cuevas.

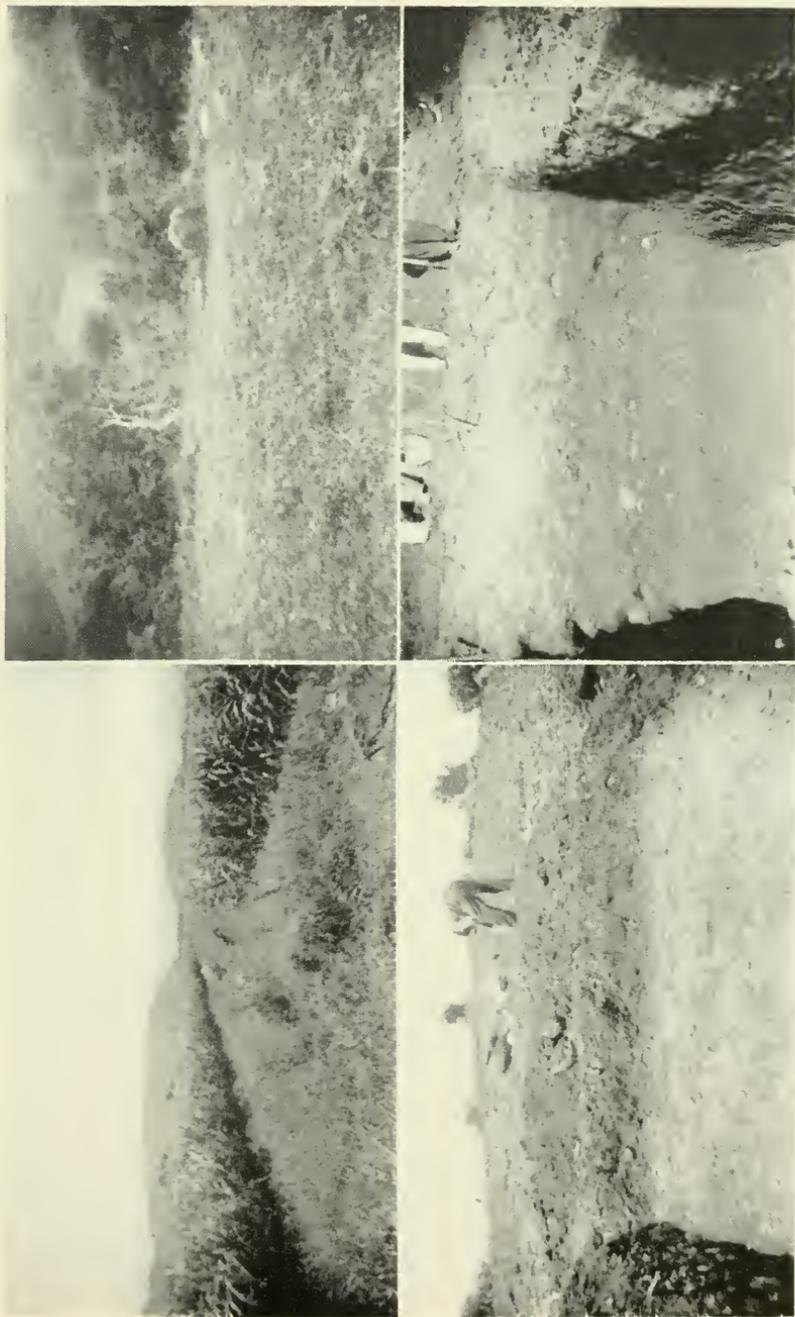


PLATE 2. Potsherds of the Cuevas style.

A—flat base with interior of base painted red, Cuevas. B—sherd with keel and shoulder, the outer surface of the latter polished, Las Cucharas. C—flaring side, rim thickened and beveled inwards, rectangular lug, red paint on rim and inside of lug, Monserrate. D—body, keel, concave shoulder, rim flat and tapered, amorphous lug, perforation of lug, Cañas. E—flaring side, rim thickened and rounded inwards, rim elevation, red paint on top of elevation, faint traces of a red painted design on inner surface, Las Cucharas. F—flaring side, rim tapered and rounded inwards, bevel inside rim, red painted design consisting of irregular vertical bands, Collores. G—concave shoulder bearing a black-painted design, Las Cucharas. H—body, keel, concave shoulder, rim thickened and beveled inwards, red paint on outer surface of shoulder, white-painted design on the red, hour-glass motive, Cuevas. I—flaring side, rim thickened and beveled inwards, semicircular lug, red paint on rim and lug, modeled face design on lug, Las Cucharas. J—rectangular lug, peg lug on lug, incised design consisting of cross-hatched bands, Cañas. K—crude ware, keel, vertical shoulder, rim tapered and rounded upwards, D-shaped handle, peg lug on top of handle, Las Cucharas. L—fine ware, inturned shoulder, rim tapered and flat, red paint on outer surface, incised design including the ovoid, spiral, horizontal line, and triangular motives, white paint used to fill incisions and in the triangular areas, Cañas. M—concave shoulder, rim thickened and flat, red paint on outer surface of shoulder and on rim, white-painted design on the red including the spiral, hour glass, and vertical and horizontal line motives, Cañas.

(A—63975; B—86108; C—36513; D—32233; E—85584; F—98061; G—86760; H—63890; I—85218; J—31533; K—85033; L—32089; M—32433.)



PLATE 3. Potsherds of the Ostiones style.

A—boat-shaped bowl, vertical side, rim thickened and rounded upwards, rectangular lug, perforation through lug, red paint over all surfaces, Collores. B—vertical side, rim tapered and rounded upwards, twisted rim, high surface polish, Collores. C—boat-shaped bowl, keel, vertical shoulder, rim flat and unchanged in thickness, loop handle, red paint on outer surface of shoulder, Calvache. D—crude ware, rim thickened and beveled outwards, bevel inside the rim, Las Cucharas. E—keel, vertical shoulder, rim tapered and rounded upwards, red paint and polish over all surfaces, Ostiones. F—flaring side, rim elevation, red paint on top of elevation, Toita. G—flaring side, rim thickened and beveled inwards, black paint on inner surface of body, red paint on rim, Toita. H—vertical side, rim flat and tapered, red-painted design consisting of a single vertical band, Ostiones. I—keel, inturned shoulder, rim tapered and flat, sigmoid design applied to shoulder, red paint on outer surface of shoulder, Ostiones. J—flaring side, rim thickened and beveled in, zigzag design incised on rim, red paint on rim and inner surface, Ostiones. K—keel, outturned shoulder, rim tapered and flat, rectangular lug bearing a face design, perforation beneath lug, red paint and polish outside surface (not shown), Ostiones. L—kidney-shaped body, keel, vertical shoulder, rim tapered and rounded upwards, cylindrical lug incised with U-shaped design, Ostiones. M—flaring side, rim tapered and rounded inwards, ovoid lug, bat-head and limb designs, red paint and polish all over, Cañas. N—flaring side, rim tapered and rounded inwards, bevel inside rim, ovoid design incised on bevel, polish all over, Collores. O—loop handle, wedge-shaped lugs on handle, incised, red paint all over, Ostiones.

(A—98019; B—97268; C—77752; D—83152; E—81368; F—66156; G—66407; H—82213; I—81348; J—81074; K—80989; L—81132; M—34563; N—97722; O—80231.)



PLATE 4. Potsherds of the Santa Elena style.

A—body sherd with spiral design, painted negatively in red on the inner surface, Monserrate. B—fragment of a cylindrical coil from the rim, Santa Elena. C—vertical side, rim thickened and rounded upwards, bat-head lug, vertical parallel line design incised on rim, Cayito. D—vertical side, rim thickened and rounded inwards, amorphous lug incised perpendicularly, Santa Elena. E—flaring side, rim tapered and rounded inwards, bevel inside the rim, horizontal parallel lines incised on the bevel, Los Indios. F—flaring side, rim thickened and beveled inwards, red paint on rim, traces of red painted design on inner surface of body, Collores. G—vertical side, rim thickened and rounded outwards, vestigial handle, vertical parallel line design incised on handle, Santa Elena. H—vertical side, rim thickened and rounded inwards, snouted animal modeled on outside, Toita. I—inturned side, rim flat and unchanged in thickness, crest lug on rim, Monserrate. J—flaring side, rim point, rim flat on one side of point and rounded upwards on the other side, ridge inside the rim, vertical ridge design, Monserrate.

(A—35452; B—88219; C—70050; D—88358; E—74913; F—96501; G—88167; H—66328; I—35903; J—35896.)



PLATE 5. Potsherds of the Boca Chica style.

A—keel, shoulder, rim tapered and rounded outwards, incised and punctated design on shoulder including circular, horizontal-line, semicircular and vertical-line motives, Sardinero. B—bottle sherd decorated by means of application, incision, and punctation, lines ending in dots, Sardinero. C—keel, shoulder, convex neck, rim flat and unchanged in thickness, ridge inside the rim, incised design on shoulder consisting of alternating oblique parallel lines, Sardinero. D—keel, shoulder, rim tapered and rounded inwards, shoulder incised with horizontal parallel line design, red slip, Sardinero. E—inturned side, rim ordinary thickness and rounded inwards, ridge outside rim, shoulder incised with maze design, Cayito. F—keel, shoulder, rim thickened and rounded inwards, shoulder incised and punctated with horizontal-line, ovoid, semicircular, and vertical-line motives, high polish all over, Sardinero. G—keel, shoulder, rim ordinary thickness and rounded upwards, ridge outside rim, shoulder incised with horizontal line, ovoid, and oblique-line motives, Sardinero. H—rim of a bottle, ridge outside the rim, Sardinero. I—keel, shoulder, rim tapered and rounded outwards, shoulder incised and punctated with horizontal-line and ovoid motives, lines ending in dots, Sardinero. J—vertical side, rim tapered and rounded upwards, ridge lug incised with an ovoid design, Sardinero. K—boat-shaped body, flaring side, rim thickened and rounded upwards, rectangular lug, spirals incised negatively on the lug, Sardinero. L—keel, shoulder, rim tapered and flat, everted rim, ridge outside rim, vertical and ovoid ridges applied to shoulder, ovoid design incised on shoulder, high polish all over, Cayito. M—vertical side, rim thickened and flat, prismatic lug on outside, bat-head design, Cayito. N—prismatic lug modeled and incised with bat-head design, Sardinero. O—keel, shoulder, convex neck, rim tapered and rounded inwards, ridge inside rim, semicircular design applied to shoulder and neck, vertical parallel line design incised and punctated on shoulder, lines ending in dots, Sardinero.

(A—91615; B—91532; C—91340; D—91464; E—69895; F—91318; G—91728; H—91762; I—91376; J—91746; K—91344; L—70013; M—69951; N—91482; O—91281.)

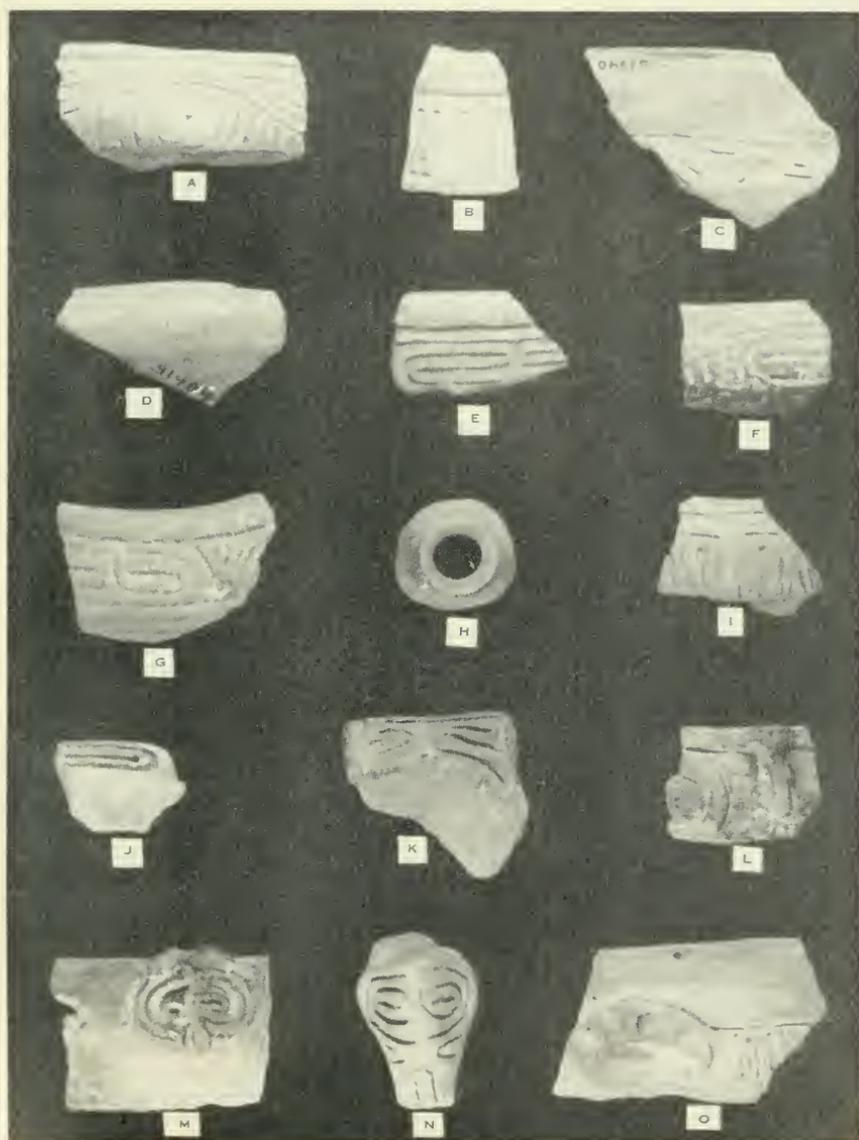


PLATE 6. Potsherds of the Capá style.

A—inturned shoulder, rim tapered and flat, eversion of rim, incised and punctated design or shoulder including the circular, horizontal-line, oblique-line, and vertical-line motives, La Zama. B—flaring side, rim flat and tapered, eversion of rim, bevel inside rim, horizontal parallel line design incised on bevel, Cerro Hueco. C—inturned shoulder, rim tapered and rounded inwards, incised and punctated design on shoulder consisting of horizontal-line and ovoid motives, Los Indios. D—keel, inturned shoulder, rim tapered and rounded inwards, incised and punctated design on shoulder consisting of circular, horizontal line, semicircular, and vertical-line motives, Santa Elena. E—keel, inturned shoulder, rim tapered and rounded inwards, eversion of rim, ridge outside the rim and incised transversely, incised design on shoulder consisting of oblique lines, Cerro Hueco. F—inturned shoulder, rim rounded inwards and unchanged in thickness, cylindrical lug incised vertically, incised design on shoulder consisting of horizontal-line and spiral motives, Santa Elena. G—inturned shoulder, rim tapered and rounded inwards, limb design applied to shoulder and incised transversely, Toita. H—inturned shoulder, rim tapered and rounded inwards, eversion of rim, incised design on shoulder consisting of horizontal-line and spiral motives, Los Indios. I—keel, inturned shoulder, rim tapered and flat, modeled lump on shoulder incised with ovoid design and surrounded with horizontal and semicircular incised lines, Quebrada Grande. J—inturned shoulder, rim tapering and flat, ridge outside the rim incised transversely, vertical applied strips on the shoulder also incised transversely, Sabana. K—keel, inturned shoulder, ridge lug on inturn, incised design on shoulder consisting of semicircular and vertical-line motives, Toita. L—ovoid lug with circular projections on either side, bat-head design modeled on lug, circular design incised and punctated on projections, Los Indios. M—keel, inturned side, rim tapered and rounded inwards, eversion of rim, incised and punctated design on shoulder consisting of circular, horizontal-line, oblique-line, and semicircular motives, Pellejas. N—keel, inturned side, rim tapered and rounded inwards, eversion of rim, vertical ridge applied to shoulder and incised transversely, incised design on shoulder, consisting of horizontal-line and semicircular motives, Santa Elena. O—inturned shoulder, rim tapered and rounded inwards, amorphous lug on shoulder modeled in the form of a face and limb, incised lines on shoulder, Toita. P—keel, inturned shoulder, rim tapered and rounded inwards, eversion of rim, incised and punctated design on shoulder consisting of horizontal-line, semicircular, and vertical-line motives, La Zama. Q—boat-shaped body, keel, inturned shoulder, rim tapered and rounded inwards, eversion of rim, amorphous lug modeled in the form of a snouted animal's head, wedge lugs on inturn, incised vertically, incised design on shoulder consisting of horizontal and vertical parallel line motives, Toita.

(A—89287; B—92883; C—74186; D—87779; E—93052; F—87870; G—66324; H—74914; I—96943; J—91903; K—87860; L—75631; M—87355; N—88455; O—66157; P—89234; Q—87988.)

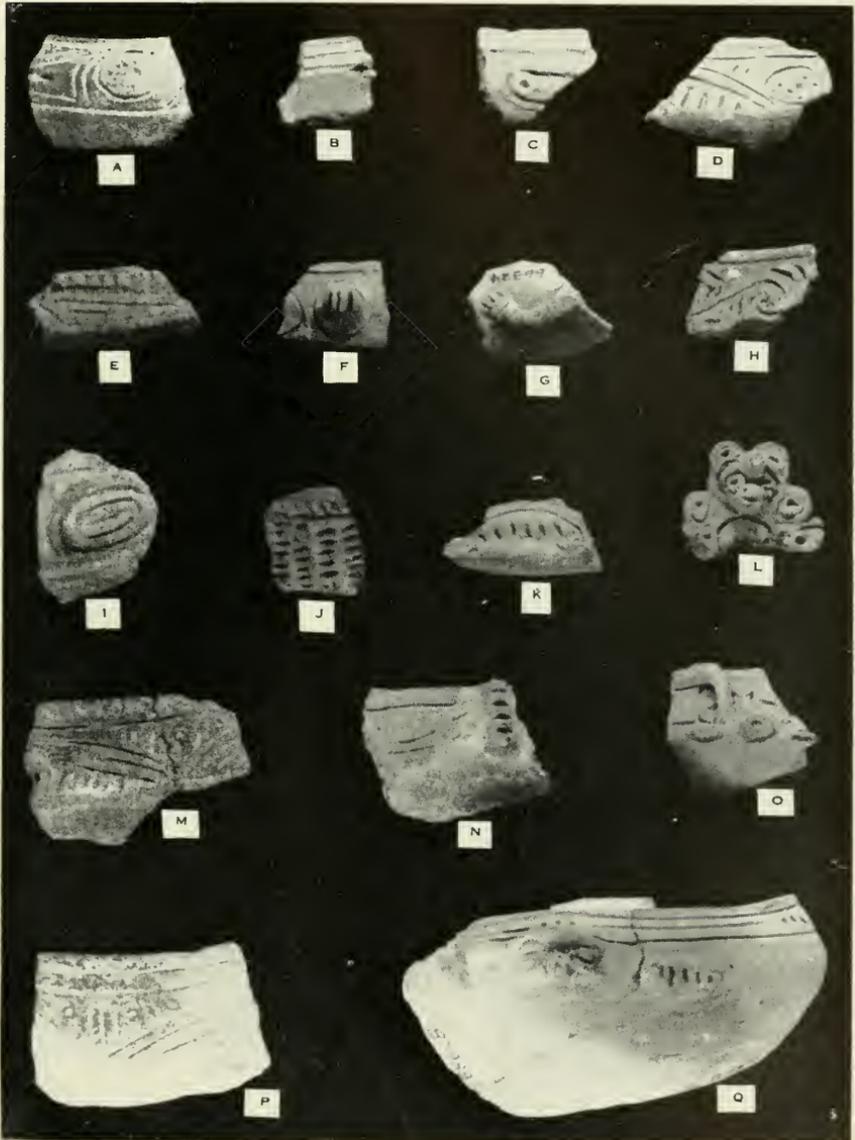


PLATE 7. Potsherds of the Esperanza style.

A—flaring side, rim rounded outwards and unchanged in thickness, rim point, Esperanza. B—inturned side, rim tapered and rounded inwards, incised design on shoulder consisting of horizontal-line and semicircular motives, Esperanza. C—vertical side, rim tapered and rounded outwards, ridge inside the rim, incised design on outer side consisting of horizontal and vertical-line motives, Esperanza. D—vertical side, rim tapered and rounded inwards, horizontal line incised on outer side just beneath rim, Esperanza. E—fragment of a coil from the rim, Ensenada Honda. F—keel, inturned side, rim tapered and rounded inwards, feather design applied and incised on shoulder, Santiago. G—keel, vertical shoulder, rim rounded outwards and unchanged in thickness, ridge inside the rim, Esperanza. H—inturned side, rim tapered and rounded inwards, incised and punctated design on shoulder consisting of horizontal-line and oblique-line motives, Toita. I—inturned shoulder, rim tapered and rounded inwards, ridge applied just above the inturn and incised longitudinally, pair of cylindrical, punctated eyes above rim, incision and punctation on shoulder, Villón. J—keel, inturned shoulder, rim tapered and rounded inwards, incised design on shoulder consisting of horizontal- and oblique-line motives, Esperanza. K—flaring side, rim thickened and rounded outwards, rectangular lug, incised design on lug consisting of rectangular and V-shaped motives, Ensenada Honda. L—flaring side, rim thickened and rounded inwards, ovoid lug bearing an incised, applied, and punctated face design, Villón. M—keel, inturned side, vertical ridge applied to shoulder and incised transversely, incised lines on shoulder, Esperanza. N—inturned side, rim tapered and rounded inwards, amorphous lug incised, modeled, and punctated, design unidentifiable, Esperanza. O—flaring side, rim tapered and rounded inwards, ridge inside the rim, ovoid lug modeled and punctated to form a bat-head design, a pair of limb designs applied to the outer side and extending from the lug to the rim, Esperanza. P—flaring side, rim thickened and rounded inwards, flat lug consisting of two incised and punctated semicircular projections, Esperanza.

(A—90898; B—90776; C—90955; D—90774; E—67625; F—93152; G—90713; H—66072; I—67148; J—90785; K—67949; L—67065; M—90680; N—90810; O—90809; P—90970.)

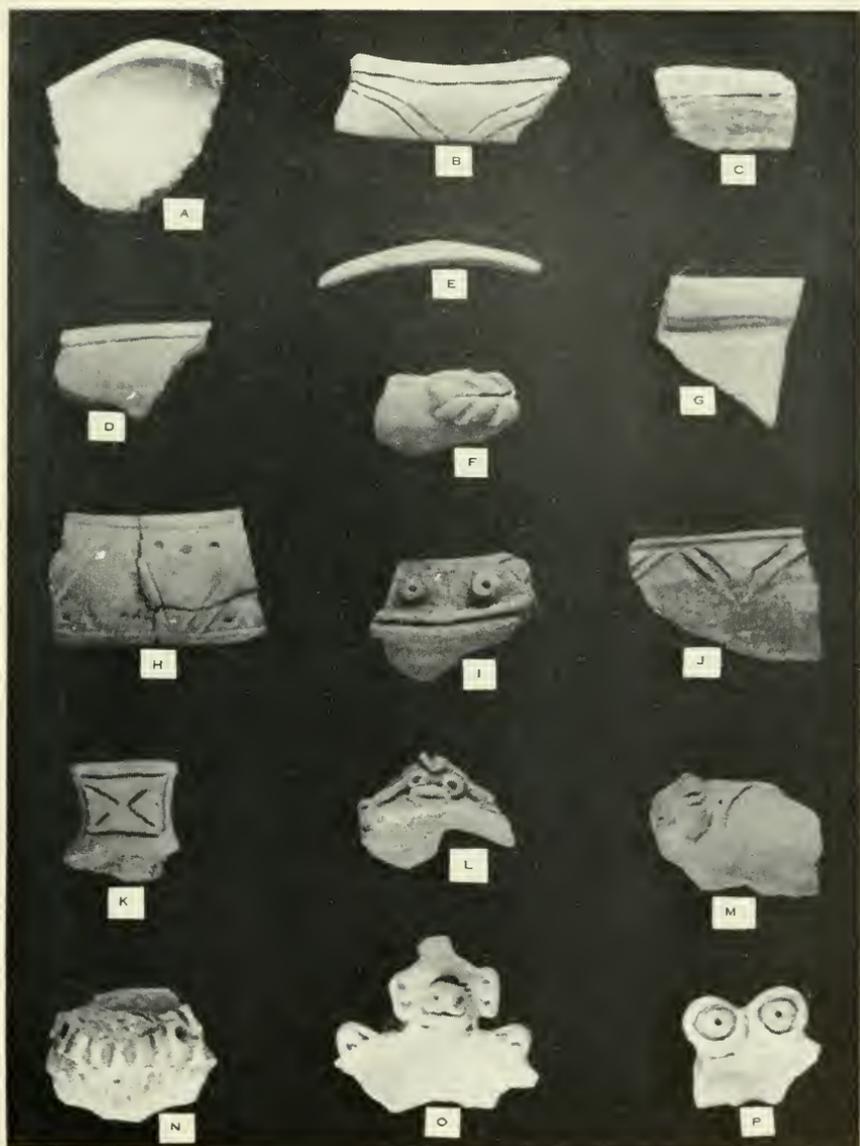


PLATE 8. Artifacts (?) of types first appearing in the supposed Coroso culture ($\frac{1}{3}$).*

A—flint chip, Coroso. B—fractured shell tip, Playa Blanca. C—plain shell tip, Abra. D—Strombus shell plate, Las Cucharas. E—blunted clam shell, Toita. F—coral fragment, Cuevas. G—hammerstone, Martínó. H—stone grinder, Cerro Hueco. I—shell node, Santiago. J—stone slab, Cuevas.

(A—80139; B—67471; C—98733; D—98752; E—98726; F—62504; G—90071; H—93083; I—93257; J—63659.)

* These specimens have been selected to illustrate the types rather than because they appear in the sites of the culture. Most of the types are common to two or more of the cultures, and it has been inconvenient to limit the examples to any one of them.

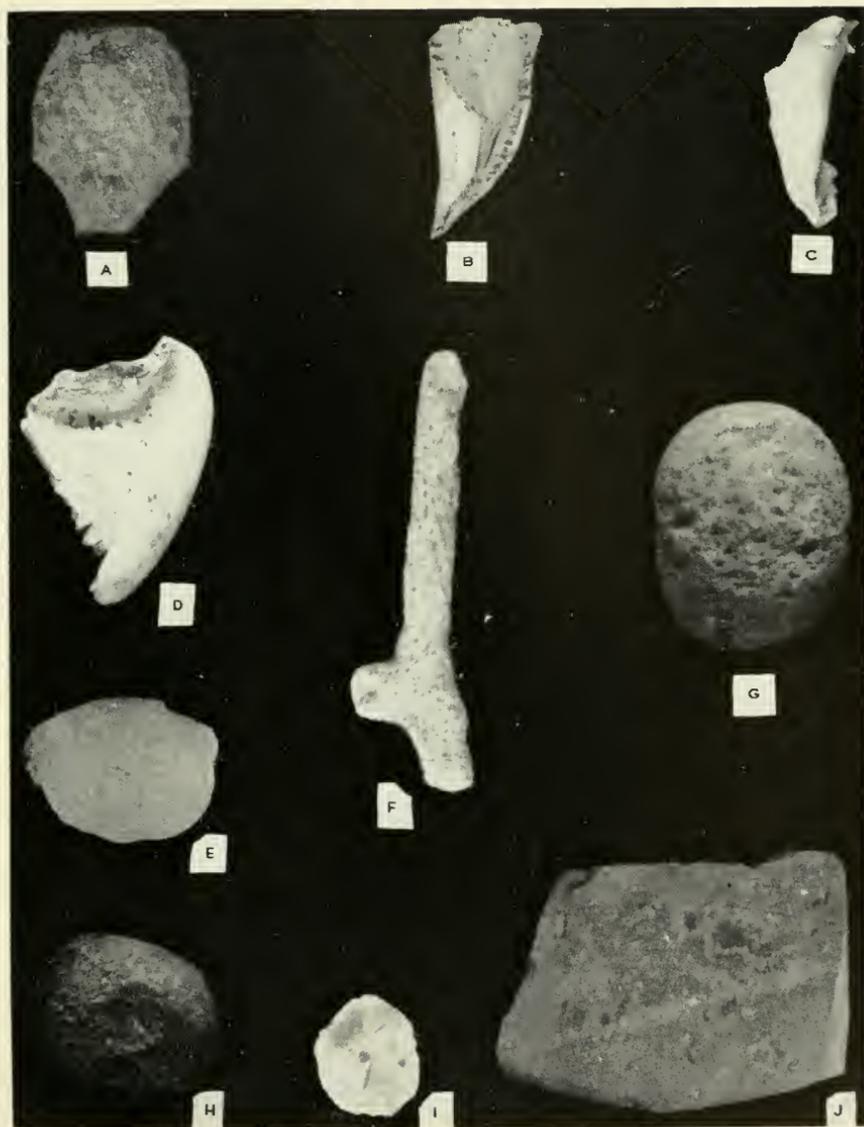


PLATE 9. Artifacts of types first appearing in the Igneri culture (3).*

A—rectangular stone adze, Buenos Aires; B—stone celt-hammer, Monserrate. C—bone awl, Santa Elena. D—petaloid stone celt, Buenos Aires. E—stone ear plug, Las Cucharas. F—discoidal stone bead, Diego Hernández. G—oliva shell pendant, Borinquén. H—shell spoon, Monserrate. I—shell dish, Borinquén. J—fragment of a clay griddle, Monserrate. K—polishing stone, Calvache. L—adze-shaped pendant of stone, Las Cucharas. M—chipped stone ax, Toita.

(A—95557; B—36091; C—88651; D—95561; E—84449; F—71949; G—98785; H—36337; I—98759; J—35507; K—77814; L—87296; M—67022.)

* See footnote on p. 454.

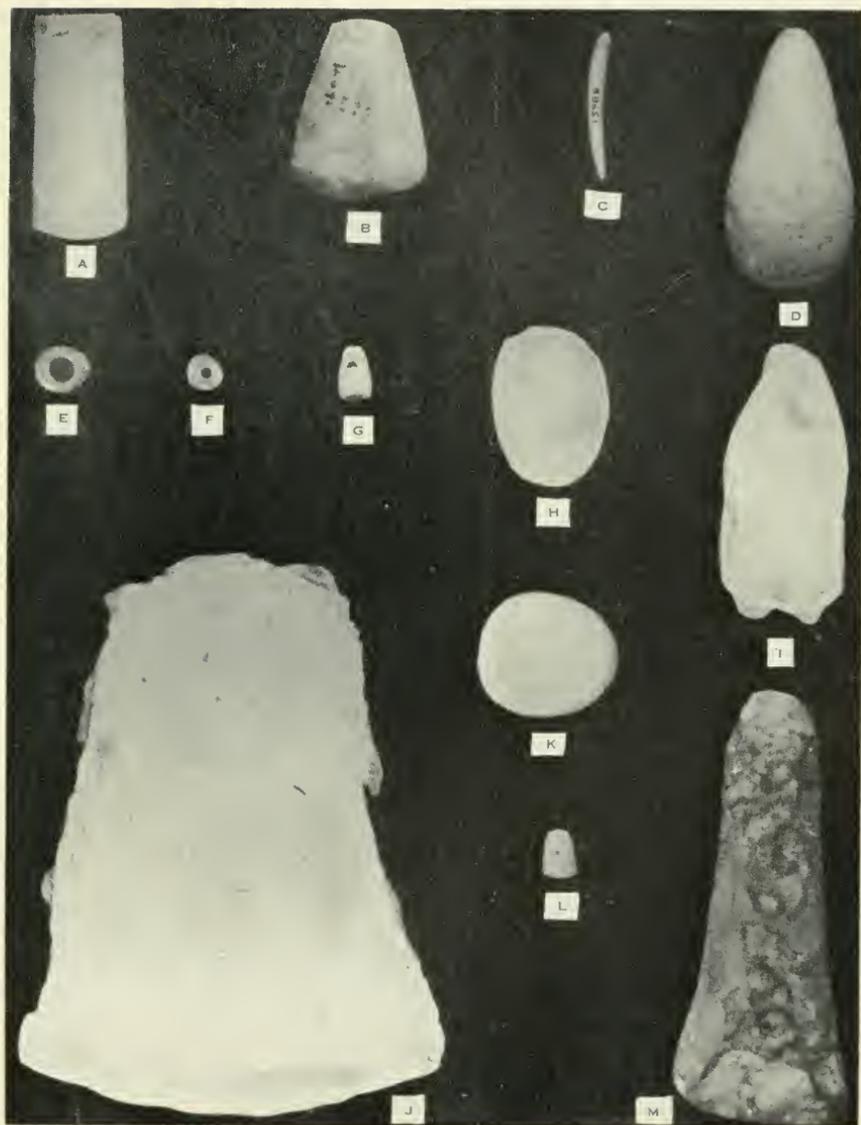
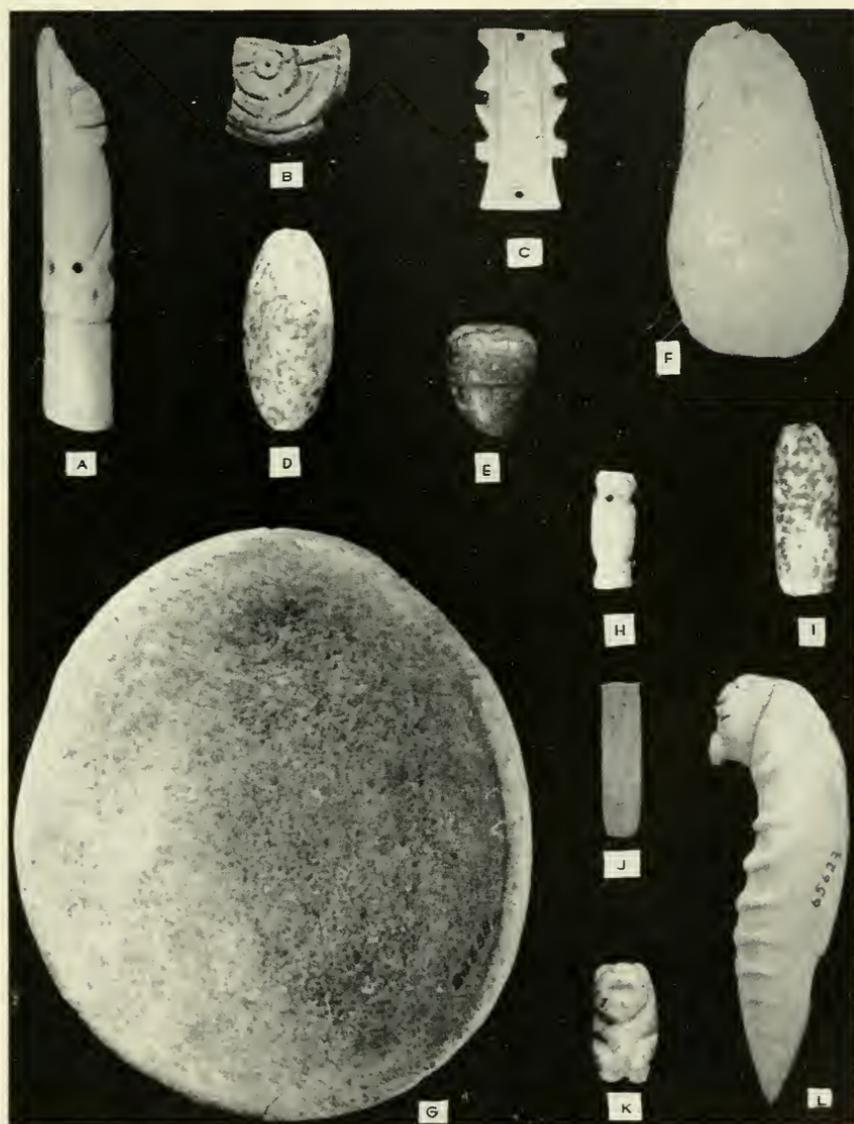


PLATE 10. Artifacts of types first appearing in the Taino culture ($\frac{1}{3}$).*

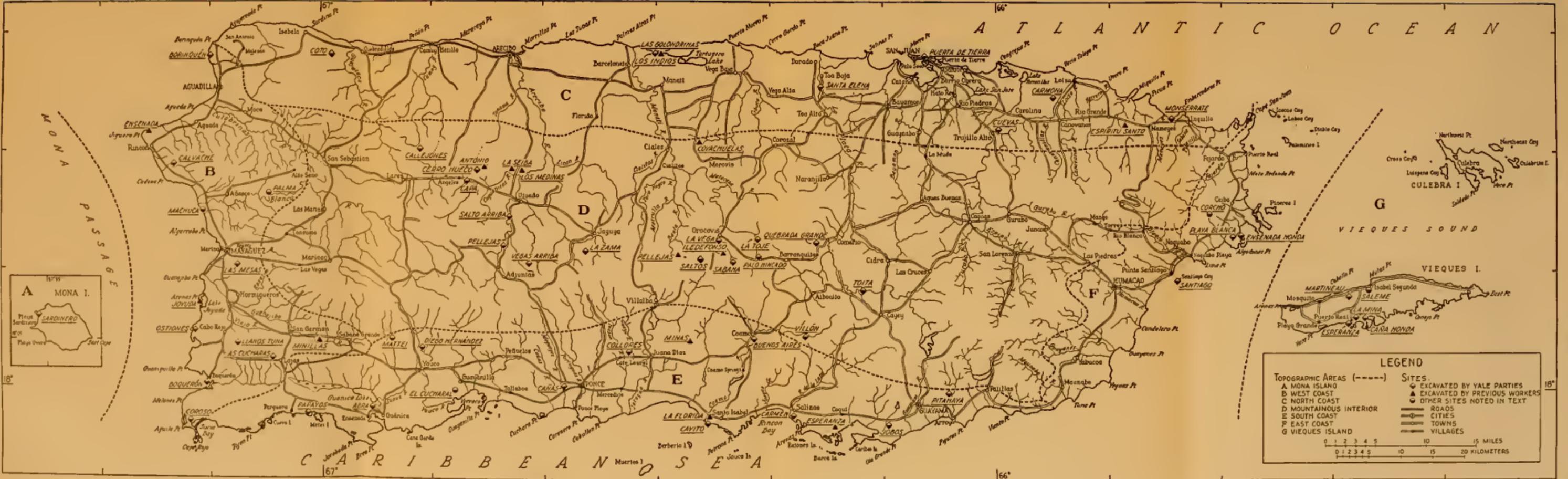
A—carved bone tube, Abra. B—fragment of a clay stamp, Llanos Tuna. C—carved shell pendant, Abra. D—three-pointed stone without carving, Diego Hernández. E—stone peg, Villón. F—shell celt, Buenos Aires. G—stone bowl, Salto Arriba. H—cylindrical stone bead, drilled transversely, Toita. I—stone cylinder, Monserrate. J—bone spatula, Abra. K—anthropomorphic stone pendant, La Mina. L—shell chisel, Pita Aya.

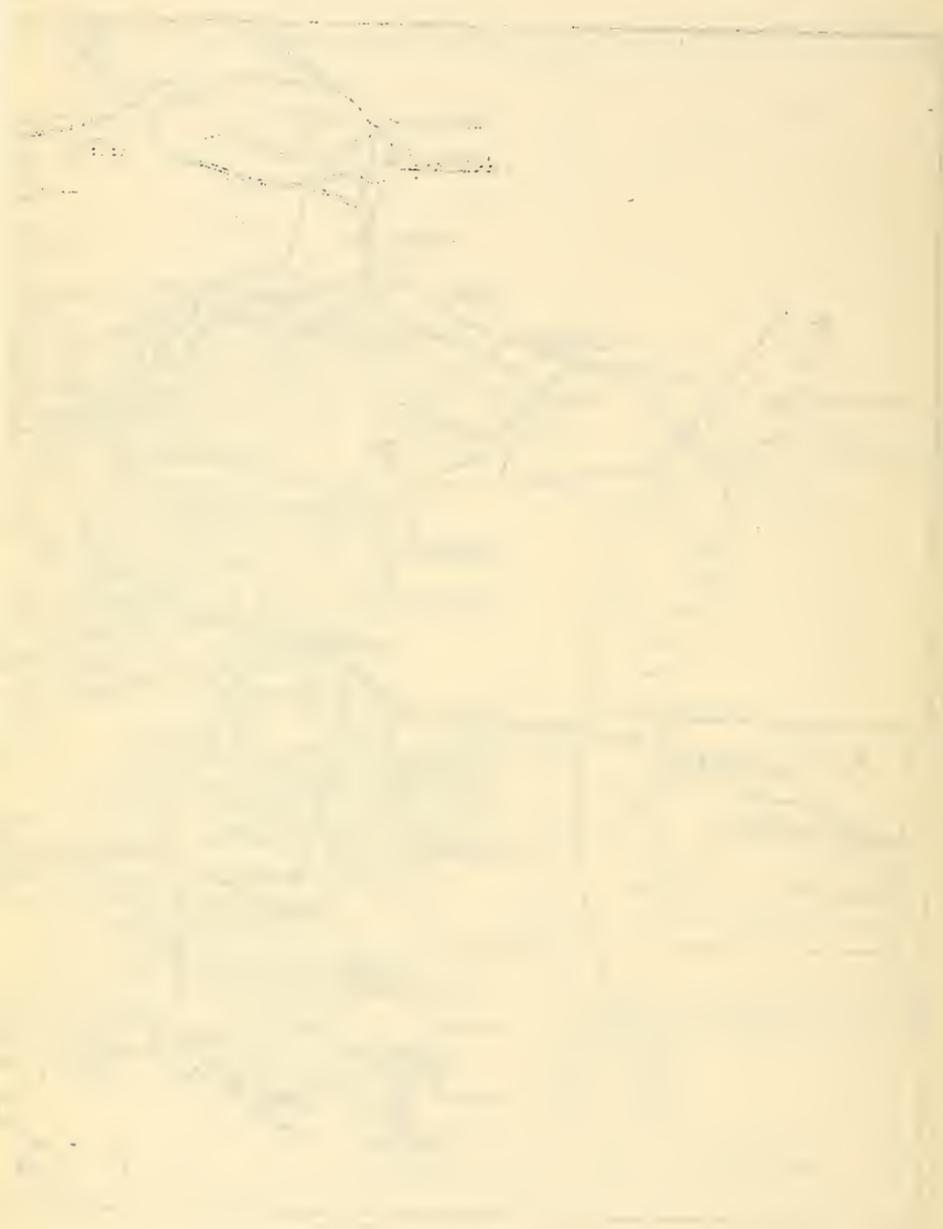
(A—79789; B—75700; C—98742; D—71947; E—67469; F—94367; G—92698; H—66173; I—31693; J—79816; K—91200; L—65623.)

* See footnote on p. 454.



Map of Porto Rico, showing the areas and the locations of the sites excavated.





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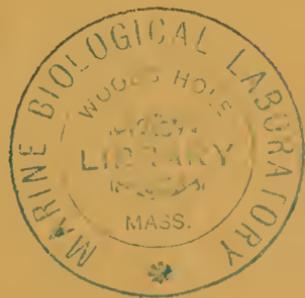
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VOLUME XVIII—Part 4

Porto Rican Prehistory: Excavations in the Interior,
South and East; Chronological Implications

Irving Rouse

Second and final part of a monograph awarded an A. Cressy Morrison Prize in
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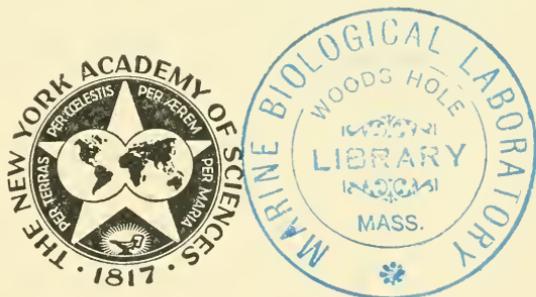
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Editor

ROY WALDO MINER

Associate Editor

JAMES A. GOODE

SCIENTIFIC SURVEY OF PORTO RICO AND THE
VIRGIN ISLANDS

This natural history survey of Porto Rico and the Virgin Islands, conducted by the New York Academy of Sciences, was established in 1913. Continuous publication of the results of this survey is made possible through contributions from the Department of Agriculture and Commerce of Porto Rico, and the University of Porto Rico.

PREFACE

This is the second of a series of reports on archaeological research undertaken in Porto Rico during the summers of 1936, 1937, and 1938 as a part of the Caribbean Anthropological Program of the Yale Peabody Museum. The research was under the joint sponsorship of Yale University and the University of Porto Rico.

The first report* contained a general introduction to the work, a summary of the results obtained, and descriptions of the excavations on Mona Island as well as on the west and north coasts of Porto Rico itself (FIGURE 1). The present paper continues the accounts of excavations area by area and also discusses the chronological implications of this work. It is to be followed by other reports defining the elements of culture encountered and tracing their distribution.

As with the first report, I have not attempted to incorporate any developments since finally revising this paper in 1946. It is perhaps worth noting, however, that Ricardo E. Alegria, of the University of Porto Rico, subsequently excavated further in the sites of Capá (pp. 474-8 below) and Cañas (pp. 522-8). He has published an account of his work at the former site in *American Antiquity* (16: 348-352).

Irving Rouse

Yale University, 1952

* This series, Volume XVIII, Part 3.

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EXCAVATIONS IN THE MOUNTAINOUS INTERIOR

Setting

The entire mountainous interior of Porto Rico is discussed in this section. Roughly rectangular in shape, it measures some 150 kilometers from west to east and 40 kilometers from north to south (see folding map at end). Its size is approximately 6,000 square kilometers, over half that of the island as a whole. This makes it the largest of the Porto Rican areas, with a size four times that of the north-coast area, the next largest.

On all four sides, the mountainous area of the interior is bounded by the foothills which fringe the coastal plains. These approach the sea in several places, notably in the northeastern and southeastern corners of the island. Elsewhere, however, they are from 10 to 20 kilometers distant. In general, the mountainous interior is closer to the west and south coasts of the island than to the north and east coasts (folding map).

There are three mountain ranges. The Cordillera Central, running eastwards through the western and central parts of the island, is the largest and tallest of these. It reaches a maximum height of some 1200 meters near Jayuya in the center of the island. To the east, it forks. One branch, the Sierra de Luquillo, extends into the northeastern corner of the island, while the other branch, the Sierra de Cayey, turns southeast into the other corner. The tallest peak in this part of the island is El Yunque, just over 1000 meters high, near the eastern end of the Sierra de Luquillo.

The three mountain ranges form a Y-shaped divide, located some distance south of the central axis of the island. North of this divide, the land slopes gradually over a long distance, but to the south there is an abrupt descent. As a result, most of the interior drains northwards. North of the divide, the numerous small mountain streams merge into a few great rivers, but, to the south, they flow directly into the sea. The larger rivers have already been mentioned in connection with the areas previously discussed. They include the Río Grande de Arecibo, the Río Manatí, the Río de la Plata, and the Río Grande de Loiza, all of which flow northwards into the Atlantic Ocean (folding map).

Both north and south of the divide, the rivers and streams have dissected the terrain into a series of sharp ridges and narrow, steeply walled valleys. These make for difficult traveling, for one must either wind endlessly up and down the valleys through countless turns and branches or laboriously cross the ridges from valley to valley. It is not uncommon to have to climb 500 meters up or down a steep slope in order to reach an archaeological site.

Flat areas capable of supporting a large population are not common in the interior, and they occur only at irregular intervals. Most of them nestle deep in the valleys, where the rivers have been able to carve out narrow flood plains. Others are perched high above, where the mountain ridges broaden into small plateaus. Most lie north of the divide and, being far apart, are relatively isolated. The modern population of central Porto

Rico tends to concentrate in these flat areas, and they probably also served as foci for the aboriginal population. It was in them that we located most of the archaeological sites.

Except for their small size and relative isolation, the flat areas must have been well suited for Indian habitation. The soil is fertile and there are few outcrops of rock. Rain falls abundantly, and the mountains must have been heavily wooded during prehistoric times. Traces of a dense tropical forest of hardwood and palm trees are still to be found on the slopes of El Yunque in the Sierra de Luquillo, although elsewhere the mountains have long been deforested and even the hillsides are now under cultivation.*



FIGURE 1. Map of the West Indies.

A large number of sites have been located in the interior, but they are irregularly distributed. Most of them seem to be concentrated among the sources of the Río Grande de Arcibo and the Río Manatí in the heart of the mountains (folding map). Elsewhere, we had difficulty in finding traces of Indian habitation.

At least four chieftainships, all of them apparently Taino, were in existence at the time of historic contact (Coll y Toste, 1907: 1, 45, 96-99). The drainage of the Río Grande de Arcibo in the west-central part of the island, a part of which is still known by its Indian name of Utuado (formerly Otua), was under the control of a chief named Guarionex (FIGURE 2:10). Another chief, Orocobix, ruled in the drainage of the Río Manatí at the geographical center of the island (FIGURE 2:11). His district was known at the time of historic contact as Jatibonico, but the greater part of it has

* These data on the geography and topography of the mountainous interior were obtained from Coll y Toste (1907: 18-27), Lobeck (1922), P.R.R.A. (1940), and Roberts (1942).

recently been given the name Orocovix (formerly Barros) after the chief himself. A third chief, Mabó, probably lived along the Río de la Plata in the east-central part of the island. His territory seems to have been called Guaynabo, a term now applied to a river and town near the north coast (FIGURE 2:12). The fourth chief, Caguax, controlled the valley of the Río Grande de Loiza further east (FIGURE 2:13). This happens to be the largest valley in the mountains, and it now contains the only interior city of any size, named Caguas after the Indian chief.

Ponce de León visited parts of the mountainous interior during his first voyage of exploration, when he was inspecting the places where the Indians obtained their gold (Neumann Gandía, 1896: 170-171). His is the only name mentioned in connection with the occupation of the interior. During



FIGURE 2. Locations of the villages of the Porto Rican chiefs: (1) Yagüeca (chief Urayoan); (2) Aymaco (chief Aymamon); (3) Guajataca (chief Mabodamaca); (4) Abacoa (chief Arasibo); (5) Sibuco (chief Guacabo); (6) Toa (chief Aramana); (7) Bayamon (chief Majagua); (8) Cayniabón (chief Canóbana); (9) Jaymanio (chieftainess Yuisa); (10) Otoao (chief Guarionex); (11) Jatibonico (chief Orocobix); (12) Guaynabo (chief Mabó); (13) Turabo (chief Caguax); (14) Guaynia (chiefs Agueybana 1 and 2); (15) Abey (chief Abey); (16) Guayama (chief Guamani); (17) Guayaney (chief Guaraca); (18) Macao (chief Humacao); and (19) Daguao (chief Daguao). (See p. 334 for the sources of this map.)

the *repartimientos* of 1509-10, he obtained control of chiefs Caguax, Mabó, Orocobix, and their followers. It is said that he set up plantations in the territories of Caguax and Mabó, eventually selling the second of these to pay the expenses of the colonization of Porto Rico (P.R.R.A., 1940: 278; Coll y Toste, 1907: 267; Zayas y Alfonso, 1931, 2: 227).

The subsequent history of the Indians in the mountainous interior is better known than in the other areas. Both Caguax and Guarionex, chief of Otuaó, apparently took part in the rebellion of 1511 against the system of *repartimientos* (Fewkes, 1907: 39; Brau, 1907: 156-157). Guarionex served as the leader of the 3,000 men who, as already noted, destroyed the Spanish town of Sotomayor on the west coast. Both chiefs probably also participated in the subsequent defeats at Coayuco on the south coast, near Aymaco on the west coast, and in the final battle of Yagüeca, which took place on the west coast late in 1511. After this battle, Ponce de León offered to pardon the survivors who would lay down their arms. Caguax and another chief from the Otuaó district, possibly Guarionex or a successor, did so. They and their followers received permission to return to their

homes in the mountains, apparently without being subject for the time being to a *repartimiento*. The other rebels, however, were forced into immediate slavery on the Spanish farms and in the mines (Herrera y Tordesillas, 1729, 1: 225-226; Brau, 1904: 40-43).

Caguax died soon after this and was replaced by his daughter, Bagaaname, baptized under the name of María. At a later *repartimiento* (1529), she and her subjects were claimed by two Spaniards, Antonio de Sedeño and Blas de Villasente, each of whom wished to use her subjects as laborers on his farm in Otuaó. Their dispute was finally settled by assigning the Indians to the royal farm at Toa on the north coast, where María Bagaaname eventually married the king's major domo.

The Otuaó chief who submitted to the Spaniards was also baptized. He took the name of Don Alonso. He and his followers lived for many years in the mountains east of the modern town of Utuaó, where a barrio still bears his name. There was a brief revolt in this district in 1514 in protest against the sending of 16 Indian leaders to Hispaniola, but Don Alonso does not seem to have taken part. Instead, he is said to have been of great assistance to the Spaniards in keeping the Indians quiet. When he died in 1521, he left behind a large quantity of gold, from which the sum of 4,000 pesos was paid to the king as an inheritance tax (Brau, 1907: 157, 301; Brau, 1904: 47).

Although the system of *repartimientos* was officially abandoned in 1544, some Indians were still being illegally retained by their masters in 1550. These included not only the natives of Porto Rico but also Carib from the Lesser Antilles and Indians from other parts of the Americas who had been brought to Porto Rico as slaves. After they were set free, most of them moved into unoccupied parts of the interior, where they set up villages of their own (Abbad y Lasierra, 1866: 142; Fewkes, 1907: 25; Brau, 1907: 413).

We possess only fragmentary information concerning these villages. One of them, called Antías, is mentioned in a document of 1582, which does not give its location (Zayas y Alfonso, 1931, 1: 43).* Two others, without names, are said to have been located in the western part of the Cordillera Central as late as 1710 or 1720 (Brau, 1894: 368). In 1774, Bishop Manuel Jiménez Pérez mentioned four Indian settlements in a report to the king: Casonay, Cumanacoa, Curataquiche, and Guaira (Zayas y Alfonso, 1931, 1: 174, 229, 233; 2: 25). Presumably, these were also located in the western part of the Cordillera Central, for a district east of the town of Maricao in this area has acquired the name of Indiera, and many of its present inhabitants, although otherwise indistinguishable from the rest of the population, still have traces of Indian blood (Fewkes, 1907: 25).

The first Spanish settlement in the mountainous interior, that of Utuaó, was founded in 1533 as a way station on the route between the capitol at San Juan and the other Spanish settlement near Añasco on the west coast. Others followed gradually, but they were small, and none of them received the status of a municipality until the eighteenth century. It was probably

* This document is contradicted by another of the same date, which states that no Indians remained except for a few in the Spanish settlements (Abbad y Lasierra, 1866: 142).

not until then that habitation by the Spaniards became widespread in the mountainous interior (Brau, 1907: 391-392; Abbad y Lasierra, 1866: 295-296).

Archaeologists have paid special attention to the mountainous interior. The list of those who have surveyed sites in this area includes A. L. Pinart (1893) and Austín Stahl (1889: 181-182) in the 1880's; Cayetano Coll y Toste (1907: 19-20, 39-41) in the 1890's; J. Walter Fewkes (1907: 82-83) in 1902-3; S. K. Lothrop (ms.), J. Alden Mason (1941: 264-269), Dr. J. L. Montalvo Guenard (personal communication), and Herbert J. Spinden (personal communication) in the 1910's; Benigno Fernández García (personal communication), Adolfo de Hostos (personal communication), and Pablo Morales Cabrera (1932: 114-115) in the 1920's; and Froelich G. Rainey (1940: 3) in 1934-35. These people have located an unusually large number of sites.

The first excavation in the mountainous interior was made by Fewkes in 1903 at the site of Salto Arriba near Utuado (Fewkes, 1903b: 112-116 and 1907: 82-83). Although not published in detail, this work has attracted considerable interest because of the discovery of what Fewkes thought were burial mounds. The specimens obtained are now at the United States National Museum in Washington.

In 1914-15, an expedition from the New York Academy of Sciences worked under the direction of Franz Boas at five sites near Utuado. Three of these sites, the Cueva de Antonio and the ball courts of Cerro Hueco and Capá, were excavated jointly by Mason (1919, 1941) and Robert T. Aitken (1917, 1918). Simultaneously, Hermann K. Haeberlin (1917) dug the Cueva de la Seiba and the ball court of Los Medinas in Barrio Río Arriba de Arcibo. At Mason's request, the present writer has made a study of the specimens from these five sites, which are now at the American Museum of Natural History in New York, and has been able to assign them all to Rainey's Shell culture (Rouse, 1941a).

About 1930, Benigno Fernández García made a series of excavations at the site of Toita near Cayey. Only a brief reference to this work has appeared in print, but it is noteworthy because it demonstrates that the ball courts of the interior were used for the habitation as well as for the games and ceremonies (Morales Cabrera, 1932: 55).

In 1935, Rainey and Arturo Morales Carrión excavated briefly in four ball courts near the town of Orocovis. Rainey has published only a preliminary report on this work. His specimens are now at the University of Porto Rico (Rainey, 1940: 97-104).

While in Porto Rico during the summers of 1936-38, the writer made a survey of the mountainous interior and dug 23 test pits in 15 of the most promising sites. The following is an account of these excavations.

Callejones (Lares 2)

There is a ball court on the farm of Fundador Pagán in Barrio Callejones of the municipality of Lares, six kilometers northeast of the town of Lares (see folding map at end). A number of people, including Lothrop (ms.: 9),

have visited this site. They have, the inhabitants say, removed from the wall of the court several stones bearing pictographs. The owner himself is reported to have found a stone collar and other artifacts near the southeastern corner of the court. The writer first examined this site on July 11, 1937, collecting several specimens from the surface. He returned on July 19 and excavated two test pits.

At the time of the writer's visit, the Callejones ball court was situated in a coffee grove on a small plateau elevated 7.5 meters above an unnamed tributary of the Río Camuy (FIGURE 3). To the north, east, and south, the land sloped downwards towards the stream, while to the west there was a slight rise. A spring on the hillside 100 meters south of the site may have supplied drinking water to the inhabitants.

Most Porto Rican ball courts are rectangular in shape, but this one, conforming to the contours of the plateau, is rhomboidal. It consists of a level, flat area roughly 20 meters on a side. The two sides of the court, to the east and west, are lined with walls of earth and stone. The two ends, however, are open (FIGURE 3). Little remains of the eastern wall except some scattered round stones and a slight rise in the ground, which may consist of material thrown up during the leveling of the court. The western wall is better preserved. Here, the Indians apparently had to cut away the hillside to a depth of two meters, and they terraced the resultant embankment with two rows of stones. These two rows, standing one above the other in a manner reminiscent of a grandstand, are both composed of large thin slabs nearly two meters tall. They are set for half of their length into the ground. None bears pictographs, but it is from among these slabs that previous visitors to the site are said to have carried off rock carvings.

On the northwestern side of the court, erosion has begun to eat away the edge of the plateau. Apparently as a check upon this erosion, a crude wall of small, river stones has been erected in this area; whether by the Indians or by the modern inhabitants it is impossible to say. This wall recalls the terraces at the site of Cerro Hueco, described below.

Potsherds are scattered over the surface of the ground to the north and the east of the court. Since they are particularly common just outside the northeastern and southeastern corners, we chose to excavate there (FIGURE 3). One pit, composed of four two meter-square sections arranged in the form of a square, was staked out to the northeast. In the first 25-centimeter level of this pit, the soil consisted of rather dark clay, containing fragments of limestone, both large and small, some charcoal, and a moderate amount of potsherds. Below 25 centimeters, the soil became lighter and the fragments of limestone more numerous and the only refuse encountered were ten plain potsherds (which we discarded, according to our practice). These seemed to disappear at the bottom of the second level, and accordingly, we discontinued excavation at a depth of 50 centimeters.

Sherds had been rather scarce in the first pit. Therefore, we decided to dig another, near the southeastern corner of the site (FIGURE 3). The soil here was so rocky that the men had difficulty excavating. In the first

15 centimeters, they encountered small amounts of charcoal, shells, animal bones, and potsherds in the dark brown clay. Below that depth, no refuse

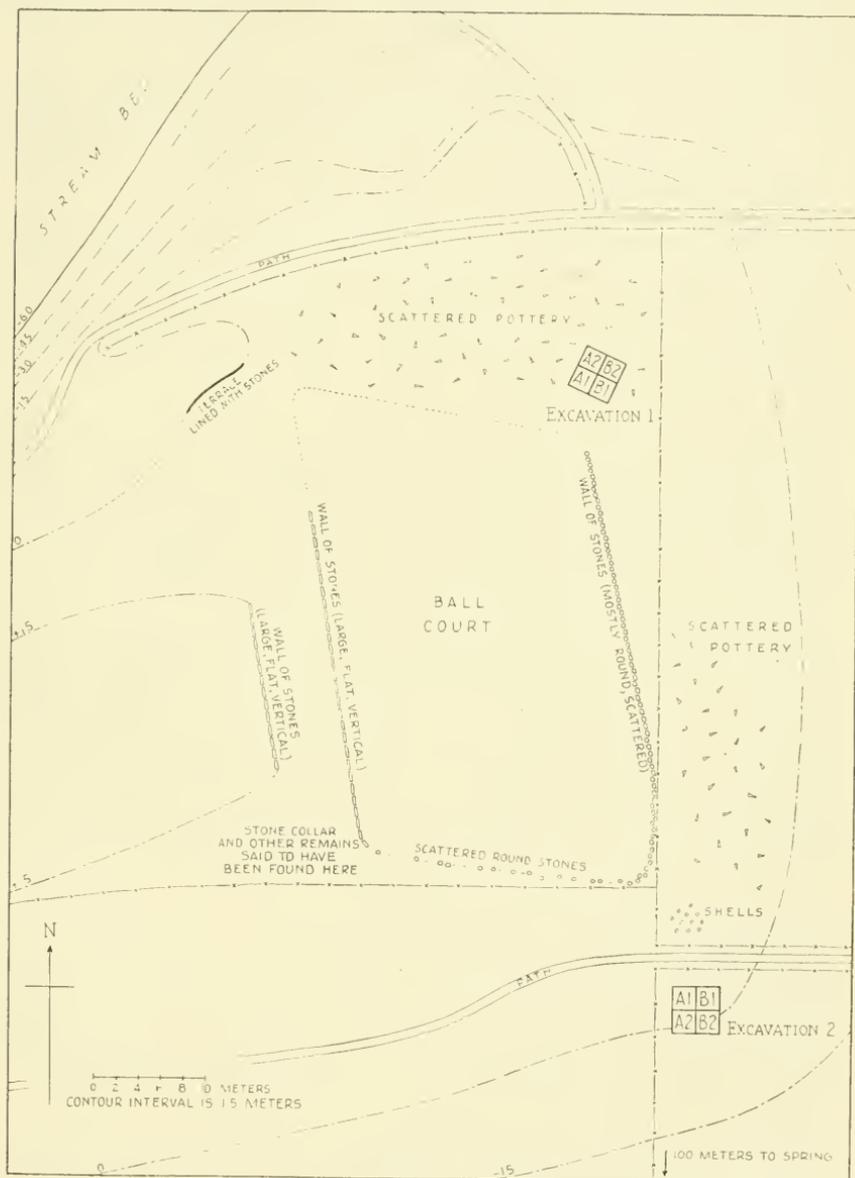


FIGURE 3. Plan of the site of Callejones.

appeared, and excavation was therefore discontinued after the first 25-centimeter level had been completed.

Potsherds of the Capá style form the majority in all sections and levels at

Callejones. There are 106 of them from Pit 1, accompanied by five Ostiones sherds, and 44 from Pit 2, accompanied by one specimen of the Ostiones style. This makes it possible to treat the entire site, including the specimens collected on the surface, as a single unit.

Only 26 of the potsherds are from open bowls, as compared with 75 from constricted bowls and 55 which are unidentifiable. The associated artifacts include a fragment of a griddle, a stone celt, a celt-hammer, 24 flint chips, two broken stalactites, and one piece of coral. A fragment of charcoal and several land gastropods complete the collection.

This site may be dated in Period IVa, on the assumption that the mixture of Ostiones and Capá sherds which it yielded represents the end of a transition from the former style to the latter. The presence of a ball court suggests that the site was ceremonial. It probably also served as a place of habitation, for the same material was found in it as in the ordinary village sites. The large number of pieces of flint is a puzzling feature.

Capá (Utuaado 7)

Mason's and Aitken's 1915 excavations at this site have made it the best known in the mountainous interior. The only other work there has been by the writer, who surveyed the site on July 15, 1938, purchasing a collection from the inhabitants, and returned the next day to excavate two pits. The following account is based partially on the reports by Mason (1917 and 1941)* and partially upon the writer's observations.

The site, which is at present owned by Ramón Díaz Roman, is situated in Barrio Caguana, of the municipality of Utuaado (see folding map at end). It lies between the Utuaado-Lares highway (No. 17) and the Río Tanamá, about halfway from one town to the other. As Mason (1941: 212-213) has pointed out, this region is on the northern edge of the mountainous interior, near the limestone foothills which fringe the north coast area. The Río Tanamá flows northward from the site into the foothills, eventually joining the Río Grande de Arecibo near the north coast. It must have provided the Indians with a easy, although somewhat distant, access to the coast (folding map).

The site may also have recommended itself to the Indians because of its possibilities for defense. A flat, triangular plateau, it measures some 400 meters on a side and is elevated about 25 meters above the river. The land falls steeply on all sides, to the river on the west and into a pair of ravines on the north and south. Only to the east, where the apex of the triangle consists of a narrow neck between the two ravines, can one easily approach the plateau.†

The plateau slopes gently from east to west. Its soil, consisting of reddish brown clay overlaid by humus, is naturally fertile and free from stones. Mason and Aitken found it freshly abandoned after use as a coffee plantation. At the time of the present writer's visit, it was a cane field.

When Mason and Aitken worked at Capá, the site contained the greatest

* See also Lovén (1935: 87-88), Rainey (1941: 114), and Rouse (1941a: 279-285).

† See the map in Mason (1941, Figure 2, opposite p. 216).

concentration of megalithic stonework yet discovered in the West Indies. The two archaeologists spent all of their time in clearing, mapping, and describing the stone structures. They obtained only a few artifacts, which have been described elsewhere (Rouse, 1941a: 279-285). In their time, the site was dominated by a great central plaza, nearly square in shape (Mason, 1941: 217-223; Figure 2, A). This was sunk into the ground where necessary to eliminate the slope of the plateau. On two sides, it was bounded by a walk paved with flat stones and seeds, on the third by igneous boulders, and on the fourth by a line of limestone slabs. Many of the slabs bore petroglyphs, consisting of human faces and "other designs." Several had been drilled with circular holes. Around the edges of the plaza, Mason noted layers of charcoal, "evidently the result of a fire, possibly from the destruction of a bower or some other wooden structure. . ." (Mason, 1941: 218).

Seven ball courts were scattered irregularly around the plaza, with their long axes following the contours of the plateau (Mason, 1941: 223-233, 247-248, 252-260; Figure 2, B, E, H-L). Each had a rectangular shape and a level surface, formed by excavating on the uphill side. The earth removed by the Indians during this process was found piled around the edge of the courts in the form of embankments or mounds. The sides of each court were lined with stone slabs set on end and often capped with horizontal slabs. The ends of six courts were open and semicircular. The seventh had a rectangular and a semicircular end, each lined with paving stones and walls of slabs. As usual in such courts, the floors were free from refuse, but charcoal, small stones, pottery, probably of the Ostiones and Capá styles (the latter named after this site), a stone celt, and an anthropomorphic stone pendant were found around the edges. Just outside one court, the excavators encountered traces of house-posts and of stakes. A fire pit occurred at either end of another court. One is described as a depression 4.6 by 3.7 by 0.6 meters filled with ash, charcoal, burned stones, and potsherds and also containing traces of "small stakes driven into the earth." Several other holes of problematical function were found alongside two of the courts, and, in addition, one petroglyph is mentioned.

A flat, oval space in the center of the plateau, just northwest of the main plaza, may have been a dance ground (Mason, 1941: 241-244, Figures 2-3). This space was higher than the rest of the site, and had probably been built up by the Indians with earth excavated from the adjacent courts and the plaza. On three sides it was enclosed in a ring of limestone slabs set on end. The fourth side was formed by the wall of the plaza. In its center, a large unworked boulder may have served as a seat or altar. Refuse was common in the fill beneath the ground. It consisted of charcoal, loose stones, potsherds probably of the Ostiones and Capá styles, stone celts, and "portions of a stone 'collar.'" Beneath the fill, the excavators encountered a number of cylindrical shafts, which may or may not have resulted from the digging of posts. On the south side, a solid bed of charcoal perforated with post holes and underlaid by burnt clay may represent a house abandoned before the dance ground was built.

A low mound lay to the east of the dance ground (Mason, 1941: 248-249; Figure 2, G). Like the latter, it seemed to be composed of earth removed from the adjacent features during their construction. Its sides were gently sloping and its height was not much over a meter. The interior yielded no trace of a superstructure, but the excavators did obtain charcoal, potsherds, probably of the Ostiones and Capá styles, and stone chips. Beneath the mound, they located two shafts, one containing traces of a post and the other charcoal, potsherds, and stones.

House sites were encountered in the areas north and south of the dance ground (Mason, 1941: 233-241, 244-247; Figures 2-3). These areas were unmarked by walls and embankments, except where bordered by other structures. The areas contained large quantities of ash, charcoal, and loose stones, together with palm seeds, animal bones, and artifacts. These generally occurred in concentrations marked also by pavements of clay and seeds, by posts, by fire pits, by hearths of stone, and by refuse pits. The pavements and posts formed no definite patterns, but each probably was part of a house built on the surface. A large, oval depression, measuring 3.7 by 2.4 meters and having a depth of over 3 meters, may have been a subterranean house. A series of stone steps extended down one side into it. Potsherds, probably of the Ostiones and Capá styles, were numerous in the house areas and are said to have been more highly decorated than elsewhere. In addition, the excavators collected a stone celt, several stone balls, stone chips, three carved stone *zemis* (one representing a turtle), a limestone slab with a "cup-shaped depression on its under surface," and a piece of coral. One Spanish potsherd and a fragment of iron were found relatively deep in the ground.

Two other structures at the site, unnamed by Mason, appear to the present writer to have been "roads" or streets, comparable to the one described below for the site of Palo Hincado (Mason, 1941: 249-252, 260; Figure 2, G, M; Figure 4). One consisted simply of two parallel lines of paving stones near the southeastern edge of the plateau, extending towards the ravine on that side of the site. Since the side of the ravine is not so steep here, this road may have served as an entrance and exit to the site. The other road comprised a long, narrow rectangle connecting the central structures of the site with the two lowest ball courts on the southwest. A stone stairway led down from the central structures to this road. The sides of the road were lined with stone slabs comparable to those of the ball courts. At its far end, another stairway or terrace led down into the lower ball courts. At this end, a raised pavement, supported on upright slabs and paved with horizontal stones, appeared in the middle of the road. Charcoal, carbonized seeds, and a fragment of a stone collar were found here.

At the time of Mason's and Aitken's work, then, the site of Capá contained 14 principal features: a central plaza, seven ball courts, a dance ground, a mound, two house areas, and two roads. Of the artifacts encountered, 23 Ostiones sherds, 84 Capá sherds (including one complete pot), an anthropomorphic stone pendant, a stone chip, two bone disks, and

two European potsherds are still preserved in the American Museum of Natural History in New York (Rouse, 1941a: 279*).

Only two of the features found by Mason and Aitken, the central plaza and the largest of the ball courts (northwest of the plaza), were visible at the time of the present writer's visit. Apparently as a result of cultivation, the others had been reduced to scattered stones, which occurred at intervals throughout the plateau. None bore petroglyphs.

In order to avoid the areas excavated by Mason, we chose to dig our pits near the edge of the plateau south of the main plaza. This was just outside the cane field, which at that time covered most of the site, in an area cleared for use as a garden. Examination of the soil of the garden revealed potsherds of the Ostiones and Capá styles mixed with the humus in several concentrations which may represent house sites.

We located our first pit in one of the sherd concentrations at the northwestern corner of the garden, and later dug a second pit two meters further west. Both pits were composed of four two-meter square sections staked out in the form of a square. The first 25-centimeter level in each of them was composed of humus, containing a small number of potsherds but no traces of occupation. In the second level, the humus gave way to reddish brown clay, and potsherds gradually ceased to appear. Accordingly, excavation was discontinued at a depth of 50 centimeters in each pit.

It is difficult to identify the sherds, for they are few in number and have disintegrated badly. In Pit 1, the Ostiones style seems to be represented by four sherds and the Capá style by 53. In Pit 2, on the other hand, 25 of the sherds are of the Ostiones style and only nine are of the Capá. The two pits therefore comprise separate stylistic divisions.

In the Ostiones division (Pit 2), 11 of the sherds are from open bowls, eight are from constricted bowls, and 15 are unidentifiable. We also obtained two fragmentary griddles and two other lumps of clay from this division. The Capá division (Pit 1) yielded seven sherds from open bowls, 25 from constricted bowls, two from jars, and 23 which are unidentifiable as to type. The associated artifacts include three broken griddles, a clay lump, and a stone polisher. A number of unworked stones were also encountered in this division.

The material purchased and collected on the surface cannot be allocated to the divisions. Two sherds come from Ostiones open bowls, two from Ostiones vessels which are typologically unidentifiable, and two from Capá restricted bowls. In addition, we obtained two complete and three fragmentary celts of stone, a piece of a massive stone collar, and two sections of slender stone collars.

A continuous sequence is apparently represented in our excavations, Pit 2 dating from Period IIIb and Pit 1 from Period IVa. This is indicated not only by the mixture of Ostiones and Capá sherds in the two pits but also by the presence of four examples of incision among the Ostiones sherds. Since we found no European objects, it is unlikely that occupation continued

* In this report, read "Ostiones style" in place of "type B" and "Capá style" in place of "type C."

in the area of our pits until Period IVb. In the region of Mason's and Aitken's excavations, however, the deposit may have continued to accumulate during the latter period.

Mason is probably correct in concluding that Capá was "the ceremonial center of the people led by the chief Guarionex" (Mason, 1941: 264). The present writer disagrees, however, with his further conclusion that "the site had a ceremonial-religious purpose and was not a village" (Mason, 1919: 223). The material we collected at Capá is identical (as far as it goes) with that obtained from village sites. Our griddles, in particular, suggest that the site had a utilitarian as well as a ceremonial significance. It seems to us that the situation at Capá was probably similar to that in Hispaniola, where, according to the conquistadors, the ordinary villages were accompanied by multiple ball courts and dance grounds (Oviedo y Valdes, 1851, 1: 163).

Cerro Hueco (Utuaado 14)

Three kilometers northeast of Capá are the burial cave of Antonio and the terraces of Cerro Hueco, at which Mason and Aitken also worked (Aitken, 1917: 227 and 1918: 307-309).^{*} Like Capá, these two sites are in Barrio Caguana of the municipality of Utuaado. They lie three kilometers east of the Río Tanamá on land of a man named Antonio Cuevas (see folding map at each end). The town of Utuaado is eight kilometers to the southeast.[†]

The present writer visited Cerro Hueco (which is sometimes used as a name for the cave as well as the terraces) on July 18, 1938. He found that the Cueva de Antonio had been completely cleared out but that the terraces were still well preserved. Accordingly, he returned the next day and dug a test pit alongside the terraces.

As one travels northeast from Capá towards Cerro Hueco, one leaves the igneous country characteristic of the mountainous interior and enters a limestone region composed, as in the north coast area, of countless small valleys and of steep-sided, dome-shaped hills, honeycombed with caves. The Cerro Hueco terraces lie at the bottom of one of these valleys, with the Cueva de Antonio in the hillside directly above it. Many of the surrounding valleys also contain traces of Indian occupation. In fact, the entire region from Capá to Cerro Hueco is practically one continuous series of sites (Morales Cabrera, 1932: 172, 258[‡]).

The valley containing the terraces has an area of about 25 square kilometers. It is bowl-shaped and has a slight rise in the center, where a spring may have provided the Indians with drinking water (FIGURE 4). The terraces lie at the northeastern end of the valley near the top of a 20 degree slope. The land on the upper side of the slope has been excavated to a depth of 60 centimeters and has been lined with a retaining wall of small, weathered, limestone boulders. On the other side, some 15 meters downhill, the land had been filled in, perhaps with the dirt excavated on the

^{*} See also Lothrop (ms.: 14), Lovén (1935: 124, 551), Mason (1941: 210-211, 265), Rainey (1940: 115-116), and Rouse, (1941a: 273-275, 286).

[†] Not, as Aitken (1915: 297) states, ten miles to the east.

[‡] Contrary to a statement in this report, none of the sites was observed to contain shell deposits.

upper side, and a second retaining wall, 1.2 meters high, has been set up to hold the fill in place. The result is a flat terrace 36 meters long, lined on either side with slightly curving walls and open at the ends (FIGURE 4).*

At the northern end of the lower retaining wall is a large rock, nearly five meters in diameter (FIGURE 4). Beyond this rock, another retaining wall extends for 21 meters to the end of the slope. This forms a second terrace which, unlike the first one, is walled only on the downhill side.

In Mason's and Aitken's time, several other retaining walls were scattered irregularly over the northeastern end of the valley, and, in addition, there were two low mounds, one at the base of the central boulder and the other

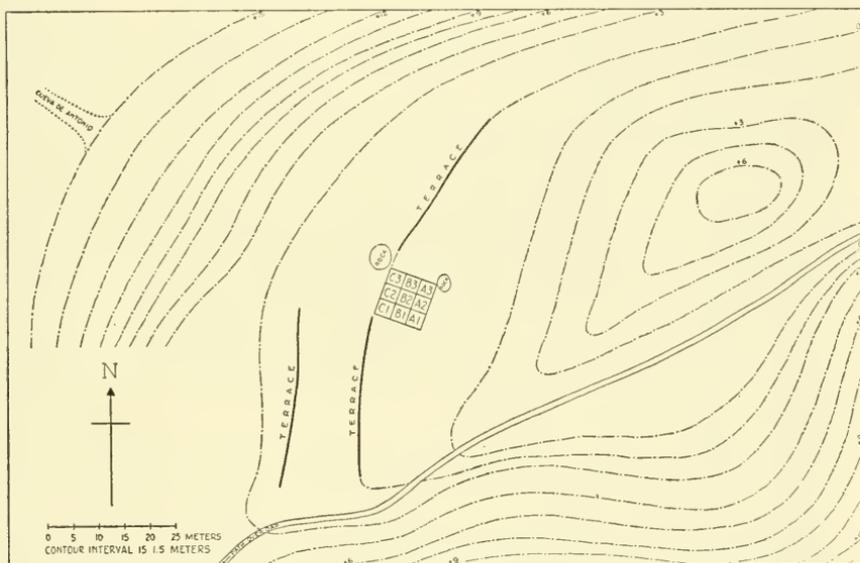


FIGURE 4. Plan of the site of Cerro Hueco.

at the far end of the second terrace (Aitken, 1918: 308, Figure 27). These have since disappeared.

Mason and Aitken found the site covered with coffee shrubs, which made it impossible to excavate anywhere except in the two mounds alongside the terraces. The first mound, near Terrace 1, measured some 120 centimeters long and 60 centimeters in height. It was found to be a heap of earth containing only a few sherds and several pebbles. The second mound, somewhat larger than the first, yielded nothing but earth. Several additional sherds and pebbles were found in the crevices of the retaining walls, and a stone hammer was picked up nearby. This hammer, 63 sherds of the Capá style, and two fragments of griddles are now deposited in the American Museum of Natural History (Aitken, 1918: 309, Figure 28; Rouse, 1941a: 286†).

* For another plan of the site, see Aitken (1918: 308, Fig. 27). Aitken places the terrace on the downhill side of the lower retaining wall, whereas the writer observed it on the uphill side.

† In the latter report, read "Capá style" in place of "type C."

The site was not under cultivation at the time of the present writer's visit, and it was possible to dig anywhere. Scattered potsherds were observed on the surfaces of both terraces and in the immediate neighborhood. They appeared most numerous at the base of the large boulder between the two terraces (FIGURE 4), where they were accompanied by snail shells. Accordingly, a square pit composed of four two-meter square sections was staked out in this area. The first 25-centimeter level yielded pebbles, shells, some charcoal, and a number of animal bones, mixed with the humus. In the next level, the soil changed to light brown loam and the deposit gradually disappeared. Excavation was therefore discontinued at a depth of 50 centimeters.

Two attempts were next made to dig pits in Terrace 1, but both were unsuccessful, since no remains were found. A fourth pit was dug at the bottom of the slope, but again without finding anything. We returned, therefore, to the first pit and extended it to the north and east, digging five more sections, each two meters square and 50 centimeters deep, with results similar to those originally obtained (FIGURE 4).

The Capá style predominates in the Cerro Hueco pit, being represented by 194 sherds, as compared with one Ostiones and 13 Santa Elena potsherds. Twenty-seven of the potsherds are from open bowls, 127 are from constricted bowls, three are from jars, and 51 are unidentifiable as to type. The associated artifacts include 13 fragmentary griddles, a possible lump of clay, two stone celts (one of them, a surface find), a stone side grinder (also a surface find), four stone hammers, a fossil animal, three stone chips, six quartz crystals, and a stone slab. One marine gastropod and a number of land pelecypods were also collected.

Since potsherds of the Capá style predominate in all collections and there are no European objects, the entire system of terraces can be dated in Period IVa. The significance of the Ostiones and Santa Elena sherds obtained by us is obscure, but, in view of the situation at Capá, it seems likely that the latter are the result of outside influence and that the former mark the end of a transition from the Period III style of this region.

In Aitken's reports and in all subsequent accounts, the terraces of Cerro Hueco are called "ball courts," apparently as a result of Aitken's belief that the term "ball court" is "applied generally in Porto Rico to the remains of prehistoric villages and settlements of all sorts" (Aitken, 1918: 307). This is not true. The term is ordinarily used only for structures like those at Capá which are likely to have served as ball grounds or ceremonial enclosures. The terraces at Cerro Hueco cannot be considered such structures, for their walls are too irregular and they seem to have served to retain the earth rather than to line courts. In particular, the lower walls are beneath surfaces of the terraces instead of above them, as in the ball courts. For these reasons, we have avoided using the term "ball court" in our account of Cerro Hueco.

Aitken himself (1918: 309) has suggested that the terraces were built for the practical purpose of serving as substructures for houses. Our failure to find artifacts in Terrace 1, however, is not consistent with this

theory. It may be that the terraces were erected for agricultural purposes and that the people lived alongside them, for example, in the area of our pit.

The significance of the two mounds excavated by Mason and Aitken is not clear. The first one, which contained artifacts, may have been a refuse heap. On the other hand, both of these mounds may have been composed of material removed when leveling the terraces.

La Toje (Barranquitas 2)

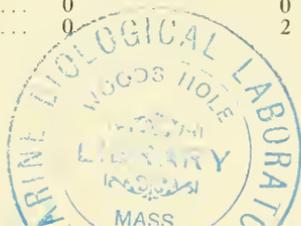
This site is one of a number of ball courts in the rugged, mountainous section at the headwaters of the Río Manatí (see folding map at end). It lies some two kilometers north of Highway 15, about halfway between the towns of Barranquitas and Orocovis. The site belongs to Carlos Aya and is in Barrio Cañabon of the municipality of Barranquitas. Montalvo Guenard (personal communication) seems to have been the first to work there. He collected a slab marked with a petroglyph from the ball court. The writer surveyed at La Toje on August 22, 1938, and excavated a pair of test pits six days later.

The site is situated on a low ridge in the midst of a deep valley. It consists of a single, rectangular ball court measuring 21 by 17 meters. The long axis of the court extends roughly from north to south and is parallel to that of the ridge. To level the surface, the Indians seem to have taken earth from the center of the court and piled it in the form of a low embankment on either side. The present inhabitants say that both the sides and the ends were originally lined with stone slabs set on end. These have long since been removed, and the embankment has been reduced by cultivation. At present, the only traces of the walls are a group of rough, flat stone slabs, approximately one meter long and 30 centimeters wide, which are piled up on one side of the ridge. No petroglyphs were observed.

At the time of the writer's visits, the entire ridge was under cultivation. Charcoal and potsherds were observed not only on all sides of the ball court, but also within the enclosure, where they had probably been carried by the plow. A collection was made of this material, the specimens from around the ball court being kept separate from those obtained on the eastern and western slopes of the ridge. In addition, we dug two pits, the first just south of the court and the second just north. Each consisted of four two-meter square sections, arranged in the form of a square, and each was dug through two 25-centimeter levels. In both pits, the soil consisted of reddish brown clay, mixed in the first level with charcoal and a few artifacts. The second level in each pit was sterile.

The following is a stylistic classification of the potsherds obtained from La Toje:

	<i>Santa Elena style</i>	<i>Capá style</i>
Around ball court.....	46	28
East slope of ridge.....	0	6
West slope of ridge.....	0	2
Pit 1.....	0	0
Pit 2.....	0	2



It will be noted that only the material picked up around the ball court is numerous enough for stylistic identification. In the absence of better data we shall assume that the Santa Elena style, which predominates there, is also characteristic of the rest of the site. This makes it possible to treat the entire site as a unit.

From a typological standpoint, six of the sherds represent open bowls, 59 represent constricted bowls, and 19 are unidentifiable. Two fragmentary griddles, four broken and one complete celts of stone, four stone chips, a piece of yellow ocher, and several land gastropods complete the collection.

This material would seem to date from Period IIIb. Although the Santa Elena style is preponderant, there is evidently a trend towards the Capá. One may speculate that the site consisted of a central court surrounded by dwellings. In other words, it may have had a utilitarian as well as a ceremonial function.

La Vega (Orocovis 18)

This is another of the ball courts near the headwaters of the Río Manatí. It is situated on the southern edge of the town of Orocovis, between Highway 10 and Río Orocovis and on the land of Suc. P. Guitérrez in Barrio Orocovis, of the municipality of the same name (see folding map at end). Lothrop (ms.: 3) seems to have discovered this court. It has been excavated by Rainey and Morales Carrión (Rainey, 1940: 98-99). The present writer surveyed the site on August 28, 1938, and excavated a test pit the following day.

The court is situated on a gentle slope alongside the river, with its long axis running almost directly north and south. It consists of a rectangular depression, 40 meters long, 30 meters wide, and 60 centimeters deep. This may be natural, or it may have been excavated by the Indians. On each side of the depression is an embankment 50 centimeters high. The ends are open.* Originally, the inner side of each embankment seems to have been faced with stone slabs, but only a part of the downhill wall remained in position at the time of the writer's visit. It is composed of stones from the river, 60 centimeters long and 30 centimeters wide. None bear petroglyphs.

Rainey dug trenches and test pits across the court, through the bordering embankments, and in the surrounding soil, finding "a few scattered sherds in otherwise sterile soil." Some 14 meters south of the ball court, he also struck a fire pit, "which produced abundant charcoal, ashes, and potsherds, but no shell or bone refuse. This pit was shaped like an inverted cone and was 1.5 meters in diameter 25 centimeters below the surface, tapering down to a point at a depth of 1.5 meters" (Rainey, 1940: 99). Some 900 potsherds, a stone celt, and a segment of a stone collar were collected from the pit. From Rainey's brief description of the pottery, it would seem to be Ostiones in style.

At the time of the present writer's visit, the fields around the ball court were under cultivation, revealing a few bits of charcoal and of pottery, particularly just outside the eastern side and the southern end of the court.

* Rainey (1940: 99) states that the court is "surrounded" by embankments, but this does not agree with the present writer's observations.

A collection was made of the potsherds, and they were segregated according to the side of the court on which they occurred. In addition, a square test pit, divided into four two-meter square sections, was dug 14 meters east of the court. The soil in this pit consisted of brown clay, containing a few bits of charcoal and of pottery. This pit was carried to a depth of 85 centimeters, when difficulties with the owner of the site caused a cessation of the excavation. At that depth, no potsherds were appearing, but there were still traces of charcoal.

Two fire pits, comparable to that described by Rainey, were encountered in our excavation. Both consisted of irregular areas marked by concentrated charcoal, one in section A1 and the other in section B2. The former was 15 centimeters in diameter and extended from the surface to a depth of 50 centimeters. The latter had a diameter of 50 centimeters and extended from 20 to 50 centimeters beneath the surface. Potsherds were unusually common in both pits.

Stylistically, our pottery does not correspond to Rainey's description of his finds, for Santa Elena rather than Ostiones potsherds are preponderant in our collection. Altogether, we obtained 36 sherds of the Santa Elena style and only 17 of the Capá. The former predominated in all sections and levels of our pit except one, where the numbers involved seem too small to be significant. Eight of the sherds come from open bowls, 35 are from constricted bowls, and 10 are typologically unidentifiable. The only other artifacts are 19 fragments of griddles and 10 European potsherds.

The predominance of Santa Elena sherds dates our pit in Period IIIb, the few Capá sherds apparently representing the beginning of a transition to that Period IV style. The European sherds are probably intrusive. Except for one specimen in the top level of the pit, all come from a small area northwest of the pit which is not very far from a modern house. The discrepancy in style between the Indian sherds collected by Rainey and by us is more difficult to explain. It may be that, since Rainey was citing only the resemblances between his pottery and the Shell culture (which for him was characterized by the Ostiones style), he has given us a false picture of his material. On the other hand, he may have dug in an earlier part of the site than we did, collecting Ostiones sherds characteristic of Period IIIa. The presence of fire pits both in his excavations and in ours indicates that the site was used for habitation as well as for games and ceremonies.

La Zama (Jayuya 5)

This site, which is another ball court, is located in the mountains just north of the peak of Los Picachos, the highest in Porto Rico, halfway from that peak to the town of Jayuya (see folding map at end). The Río Zama, an eastern tributary of the Río Grande de Arecibo, passes just west of the site. The land belongs to Heronimo Reyes Delgado and is in Barrio Jayuya Abajo, of the municipality of Jayuya. Both Stahl (1889: 182) and Fewkes (1903: 457) mention a ball court in this region, but the only specific reference to the site is by Lothrop (ms.: 7), who visited it during his survey. The writer inspected the site on July 24, 1938, and dug two trenches and a test pit the following day.

Unlike the ball courts previously described, La Zama is situated on a hogback between two hills. The top of the hogback is long, narrow, and flat, and on either side the land slopes sharply into mountain valleys. The Río Zama, in the valley to the west, is 25 meters below the level of the site. Alongside this river is a large boulder marked with a petroglyph of a human face (FIGURE 6, A), which may have some connection with the site.

Lothrop (ms.: 7) refers to two ball courts at La Zama. At the time of present writer's visit, there was only one. It consisted of a flat, rectangular area, measuring 64 by 21 meters, which seemed unexcavated and was without the embankments usually found around ball courts. The two long sides of the court, extending S 30 E parallel to the edges of the hogback, had originally been lined with flat stones set on end. Cultivation has reduced these walls to lengths of 42 and 7.5 meters, respectively. The walls are composed of flat river stones 1.0 to 1.5 meters high and 60 to 90 centimeters wide. None bears petroglyphs.

An occasional potsherd was observed on the surface among the coffee trees surrounding the ball court. These were most numerous just outside the eastern wall of the site, and accordingly two test trenches, each composed of two sections two meters square, were dug in that area. In both trenches, the first two 25-centimeter levels consisted of dark brown humus containing a few stones, traces of charcoal, and artifacts. Most of these traces of occupation occurred on the eastern side of each trench, at the base of the wall of the court. Near the bottom of the second level, the soil changed to light brown, hard-packed clay and, since this was sterile, we discontinued excavation at a depth of 50 centimeters.

An oblong pit was next laid out perpendicular to the court on the opposite side, where a clearing in the coffee trees made it possible to dig eight sections, each two meters square and 50 centimeters deep. This excavation produced the same result as in the previous trenches, except that potsherds were rarer and the clay sub-soil appeared at a depth of only 25 centimeters. Test digging in other places around the court failed to reveal any artifacts, and therefore the work was stopped.

Capá potsherds predominate in all sections and levels at La Zama. They number 28, as compared with one specimen of the Santa Elena style. Two of the potsherds are from open bowls, 20 are from constricted bowls, and seven are typologically unidentifiable. They are accompanied by eleven fragmentary griddles and nine stone chips.

The La Zama court may be dated in Period IVa. Since it yielded less traces of habitation than the courts previously described, it is not as likely to have served as a dwelling site. One might speculate that it was primarily a place of worship, possibly of a *zemi* represented by the petroglyph alongside the river beneath the court.

Palo Hincado (Barranquitas 1)

Some 4.6 kilometers west of the town of Barranquitas, Highway 15 cuts through the southern edge of an extensive system of embankments. These are on land of Ramón Ortiz in Barrio Palo Hincado, of the munic-

pality of Barranquitas. They lie just north of an unnamed stream near the headwaters of the Río de Manatí (see folding map at end).

Palo Hincado is well known to the collectors of the island, a number of whom have visited it in an attempt to obtain petroglyphs. One of these petroglyphs now stands in the plaza at Barranquitas. De Hostos (personal communication), Lothrop (ms.: 2-3), and Rainey (personal communication) have surveyed the site, and the latter particularly recommended it. The writer surveyed Palo Hincado on September 25, 1936, and excavated a test pit the following day (Rouse, 1937: 184-185).

The site occupies a broad, flat area on a ridge at the base of a mountain peak. Most of this area was wooded at the time of the writer's visit, and therefore our map of it is only approximate (FIGURE 5). On three sides the area is bordered by gentle slopes which fall for five meters to the stream on the south and to a pair of tributaries on the east and west. To the north, the ridge becomes narrower and rises for 25 meters at a gradually increasing rate to within 20 meters of the top of the peak.

Palo Hincado is second only to Capá in the complexity of its structures. There are a central plaza, a ball court, and in addition three roads radiate from the plaza, two down off the ridge into the streams and the other up the ridge onto the mountainside (FIGURE 5).

The plaza is situated at the rear of the flat space on the lower end of the ridge. Measuring 72 by 52 meters, it is rectangular in shape, and its long axis extends from east to west parallel to the crosswise contours of the ridge. It has been lowered, apparently by excavation, on its northern side and its eastern end, and, in addition, a broad terrace or bench, from 6 to 12 meters wide, has been cut into the high ground on those two sides of the plaza. The earth thus removed seems to have been heaped up in the form of embankments 1.5 meters high at the ends of the enclosure and along the western half of its northern side, where the land is low. The southern side, however, is without earthworks except for a low mound near its western end (FIGURE 5).

Originally, all four sides of the plaza were probably lined with stone slabs. Most of these have disappeared, but enough remained at the time of the writer's visit to suggest their original location and composition. On the northern side and the eastern end of the plaza, there may have been two rows of stones, one upright and the other lying horizontally on the edge of each bench, as in some of the ball courts at Capá. The remaining two sides each seem to have been lined with only a single row of upright slabs. The row across the western end of the plaza was not directly against the embankment, as is usual in these structures. Instead, what remains of it stands some 17 meters inside the enclosure, at the end of the bench along the northern side of the plaza (FIGURE 5). None of the stones still present at the time of the writer's visit bore petroglyphs, with the exception of one drawing of a face which did not seem to be aboriginal.

The ball court is also on the ridge, 45 meters north of the plaza and five meters higher up the mountainside. Like the plaza, it is rectangular in shape and it extends across the ridge, having a length of 33 meters and a

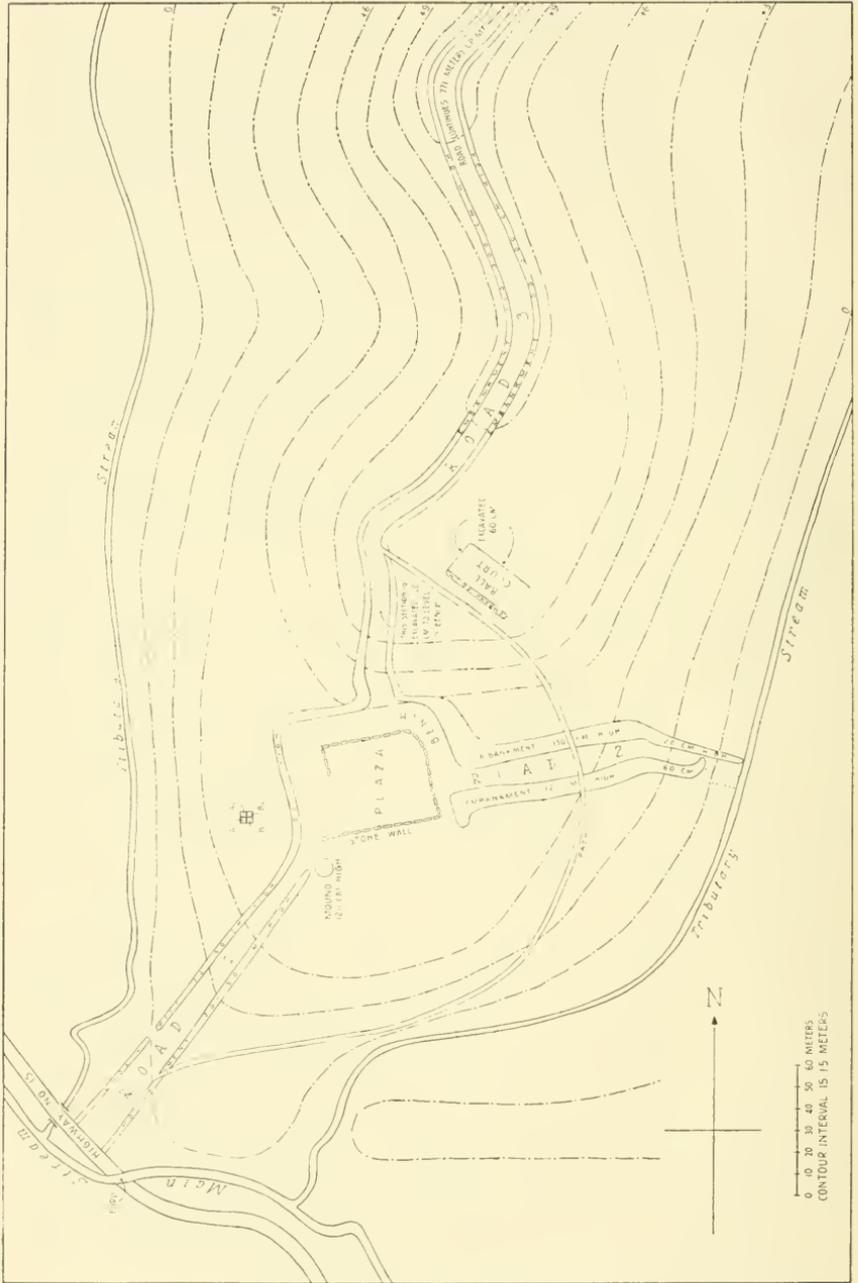


FIGURE 5. Plan of the site of Palo Hincado.

width of 15. On its upper side, it has been excavated 60 centimeters. There is an embankment of the same height on the lower side. A similar embankment extends along the western end, but the eastern end is open. A few upright stone slabs, unmarked with petroglyphs, still line the embankments.

Road 1 extends northeast from the main stream to the southwestern corner of the ball court (FIGURE 5). Although perfectly straight, it becomes narrower as it climbs the ridge, from a width of 15 meters at the stream to only 6 meters at the ball court. On either side, it is lined with an embankment 173 meters long and 1.2 to 1.5 meters high. These are well preserved, except where crossed by the highway at the lower end and for a break three meters long in the middle of the western side. The floor of the road is U-shaped rather than flat. It ends in the area between the western end of the plaza and the row of stones inside the end. On the western side, its embankment joins that along the end of the plaza, but on the east it stops just short of the mound at the side of the plaza (FIGURE 5).

The second road is on the opposite flank of the ridge, extending from one of the tributary streams to the eastern end of the plaza (FIGURE 5). It is in two sections. The lower part, which is perpendicular to the stream, measures 37 by 5 meters and is lined with embankments 60 centimeters high on the left and twice that height on the right. Only the upper half of the left embankment remains, and part of this curves around to the right, blocking the road in its center. Whether it originally had this curve, or extended straight down the hillside to the stream, could not be determined.

The upper section of Road 2 is more regular. It consists of two straight walls of earth 82 meters long, 1.2 to 1.5 meters high, and 12 meters apart. These are perpendicular to the plaza and merge into its eastern embankment. Through a gap in the latter, one can pass from the road onto the bench at the end of the plaza and thence down into the plaza itself.

The third road begins at the middle of the bench on the northern side of the plaza where it has been excavated 1.2 meters to the level of the bench (FIGURE 5). From the bench, parallel banks of earth extend up the ridge to its very end on the mountainside. These embankments are well preserved. They vary in height from 30 centimeters to 3 meters and enclose a roadbed averaging 10 meters in width. Altogether, Road 3 has a length of 1133 meters, over three-quarters of a mile. It is open only on the ends and, although it passes close to the ball court, it is not attached to the court. In fact, the open end of the court faces away from the road (FIGURE 5).

The preservation of the roads is apparently due to the fact that the ridge has never been plowed. There has been some erosion, however, and it may be for this reason that the beds of the roads are concave rather than flat. No slabs were noted in any of them, in the form of either walls or pavements.

The owner of the site claimed to have found potsherds throughout the site, but never in large amounts. Because of the undergrowth, we observed no specimens on the surface, but noted a few in a charcoal pit dug by the owner just west of the plaza. Accordingly, we located our pit in this

section, digging four two-meter square sections in the form of a square (FIGURE 5).

All three levels in our pit consisted of heavy brown clay, mottled with charcoal. The latter was also observed in a more concentrated form in two shapeless areas, each having a volume of about 25 cubic centimeters, which may have been small fire pits. Potsherds and other artifacts were scarce. By the bottom of the third level, they had almost completely died out, and therefore we ceased excavation at a depth of 80 centimeters, although charcoal was still appearing in the soil at that depth.

TABLE 1 gives the distribution according to style of the potsherds in the pit. Because of the scarcity of specimens, this table is not reliable. It suggests, however, that sections A2, B1, and B2 of level 3 form a Santa Elena division, and the rest of the pit, a Capá division.

From the Santa Elena division come three sherds of open bowls, three fragments of constricted bowls, two unidentifiable sherds, and a stone pestle. The Capá division has yielded 29 sherds from open bowls, 90 pieces

TABLE 1
DISTRIBUTION OF SANTA ELENA, CAPÁ, AND EUROPEAN POTSDHERDS AT PALO HINCADO

	A1	A2	B1	B2	
1	24-26-4	8-10-5	9-12-18	4-5-7	Capá division
2	2-2-0	2-11-0	3-4-0	2-3-1	
3	6-7-0	3-1-0	3-0-0	1-0-0	Santa Elena division

Explanation of Table. The vertical columns represent sections; the horizontal lines, levels. The numbers of Santa Elena, Capá, and European sherds are given in succession. The line marks the boundary between the Santa Elena and Capá divisions.

of constricted bowls, 19 unidentifiable sherds, three fragmentary griddles, the butt of a stone celt, three possible polishers of stone, two stone balls, two stone chips, one piece of red ocher, and two fragments of yellow ocher. In addition, we obtained from the two top levels three specimens of brick, two of glass, two of iron, and 35 of Spanish pottery. Hutia, cow, and pig also seem to be represented in the Capá division.

A small shell sample from the pit cannot be allocated to the divisions. It includes five coral fragments, part of a *Strombus* lip, 31 land gastropods, and five marine gastropods—the latter despite the position of this site in the center of the island.

The mixture of styles in our pit suggests a transition from the Santa Elena to the Capá style. The Santa Elena division can be placed in Period IIIb and the lower levels of the Capá division, in Period IVa. The number and variety of European objects, most of which are from the top level (TABLE 1), indicate that that level was deposited during Period IVb. In fact, Palo Hincado may have been the residence of chief Orocobix, the historic ruler of the district of Jatibonico. It corresponds well to the position usually given for his village (FIGURE 2:11).

The extent and complexity of the earthworks mark Palo Hincado as an important ceremonial site. Roads 1 and 2 call to mind the roadway ob-

served by Columbus, as discussed in the first part of this report. They may have functioned in connection with the worship of streams, which seems to have been widespread in Porto Rico (Fewkes, 1903: 463). The long road up the mountainside is even more difficult to explain, for there is nothing at its upper end—not even rocks. One may speculate that it was connected with the worship of mountains.

Pellejas (Adjuntas 1)

Between Adjuntas and Utuado, Highway 6 follows the valley of the Río Grande de Arecibo, providing access to a series of ball courts and petroglyphs (see folding map at end). The writer had planned to excavate in the southernmost of these courts, just north of Adjuntas (Fewkes, 1907: 82; Lothrop, ms.: 1), but this has passed from existence and it proved impossible to locate any remains. Attention was then turned to the next court, Pellejas, some nine kilometers further north (folding map). This one lay between the highway and the river on a farm of Pepe Gonzalez in Barrio Pellejas of the municipality of Adjuntas. It had previously been visited by Montalvo Guenard, from whom the writer learned of it. We surveyed it and excavated a test pit on August 29, 1937.

The site of Pellejas is located on the floor of the valley just southeast of, and three meters above, the river. The site is under cultivation, and only the eastern corner of the court still remained at the time of the writer's visit. This consisted of two rows of upright stones, forming an obtuse angle. Some of the stones were flat and extended 25 to 50 centimeters above the ground. The rest were found and almost level with the surface. One of the flat stones bore a pictograph, facing out from the court towards the river. This consisted of a human face, deeply incised and well defined (FIGURE 6, H). No excavations or embankments were observed.

Scattered potsherds lay on the surface throughout the area of the site, particularly at its northeastern and southwestern ends. A pit was staked out in the former area just outside the corner of the court. This consisted of four sections two meters square arranged in the form of a square. To a depth of 50 centimeters, it yielded dark brown loam, mixed with charcoal and other refuse. Then, the soil changed abruptly to sterile, light brown sand. Excavation was terminated at the bottom of the second level.

Potsherds of the Ostiones style predominate in all sections and levels from Pellejas. They number 65, in contrast to four Santa Elena sherds and 19 of the Capá style. Seventeen of the sherds are from open bowls, 46 are from constricted bowls, and 25 are typologically unidentifiable. The associated artifacts include three fragmentary griddles, part of a stone celt, a celt-hammer of stone, a stone side grinder, a stone polisher, and a stone chip. No specimens of bone or shell were encountered.

The Pellejas pit may be assigned to Period IIIa, for incision is not present on the dominant Ostiones potsherds. The Santa Elena and Capá sherds may have been introduced from another and later part of the site as a result of the extensive plowing. Presumably, this is another site with combined utilitarian and ceremonial significance.

Quebrada Grande (Barranquitas 7)

Stahl (1889: 182) and Lothrop (ms.: 2) report a ball court between the towns of Barranquitas and Comerio. The site lies on the edge of the

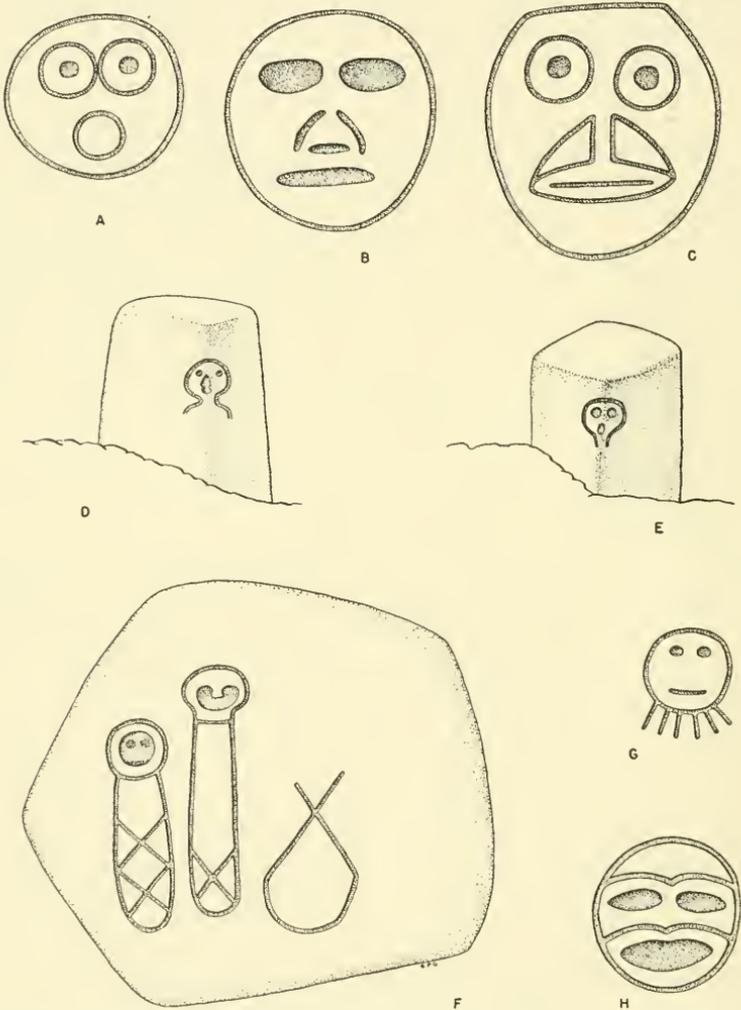


FIGURE 6. Petroglyphs at La Zama (A), Salto Arriba (B, C), Vegas Arriba (D, E), Ensenada Honda (F G), and Pellejas (H).

Porto Rican Reconstruction Administration's Finca Río Hondo in Barrio Quebrada Grande, of the municipality of Barranquitas (see folding map at end). It is about two kilometers south of the Río Hondo and twice that distance west southwest of Comerio. The writer surveyed the site on August 22, 1938, and excavated a test pit five days later.

The site occupies a small plateau on the mountainside high above the

river. A stream to the west of this plateau (the Quebrada Grande) may have provided the Indians with water. The ball court consists of a rectangular depression, measuring 35 by 17 meters, near the outer edge of the plateau. Its long axis runs from east to west perpendicular to the stream. On three sides, the court has been excavated to a maximum depth of 1.2 meters to compensate for the slope of the plateau, and only the eastern end is open. There are no walls or embankments. If originally present, these have been destroyed by the intensive plowing to which the site has been subjected. Several of the inhabitants did remember removing stone slabs from the site.

Potsherds were more common and more widespread at Quebrada Grande than in most ball courts. They were observed in the plowed soil over the entire plateau, covering an area of a square kilometer. A collection was made of these sherds, and they were segregated according to the three fields into which the site is divided. In addition, we dug a pair of test pits 37 meters apart southwest of the ball court. Both consisted of four sections two meters square, arranged in the form of a square, and both were dug to a depth of 50 centimeters. In each, the top 15 centimeters of deposit consisted of dark brown clay, and there was reddish brown clay beneath. Charcoal and artifacts occurred to a depth of 25 centimeters in Pit 1 and 30 centimeters in Pit 2.

Potsherds of the Capá style predominate in all sections and levels at Quebrada Grande, and in all the surface collections. Accordingly, the entire site will be treated as a unit. We obtained 199 Capá sherds and 55 of the Santa Elena style. Twenty-nine of these specimens are from open bowls, 132 from constricted bowls, and 94 are typologically unidentifiable. They are accompanied by nine pieces of griddles, a clay figurine, a fragment from a possible stone adze, one broken and two complete celts of stone, a stone hammer, and two stone chips.

The entire site seems to date from Period IVa. The mixture of Santa Elena and Capá sherds probably marks a transition from the former to the latter style. There is abundant evidence of habitation as well as ceremonial activity.

Sabana (Orocovis 2)

This is one of the ball courts excavated by Rainey and Morales Carrión. They call it "Barrio Sabana, Court No. 2" (Rainey, 1940: 100-101). Lothrop (ms.: 3) also mentions the site. It is located on land of Francisco Meléndez in Barrio Sabana, of the municipality of Orocovis, some five kilometers southeast of the town of Orocovis and at the headwaters of the Río Manatí (see folding map at end).

The Sabana ball court occupies the top of a small plateau, some 25 meters above an unnamed stream (FIGURE 7). It consists of a rectangular depression 90 meters long, 45 meters wide, and 60 centimeters deep, with its long axis running northeast parallel to the contours of the hill. Unlike the other ball courts, this one lies completely beneath the surface of the ground. It is drained by a narrow ditch extending from its northeastern corner to the hillside (FIGURE 7).

A cross section through the center of the court reveals that it is higher on its northeastern than on its southwestern side (FIGURE 8). The cross

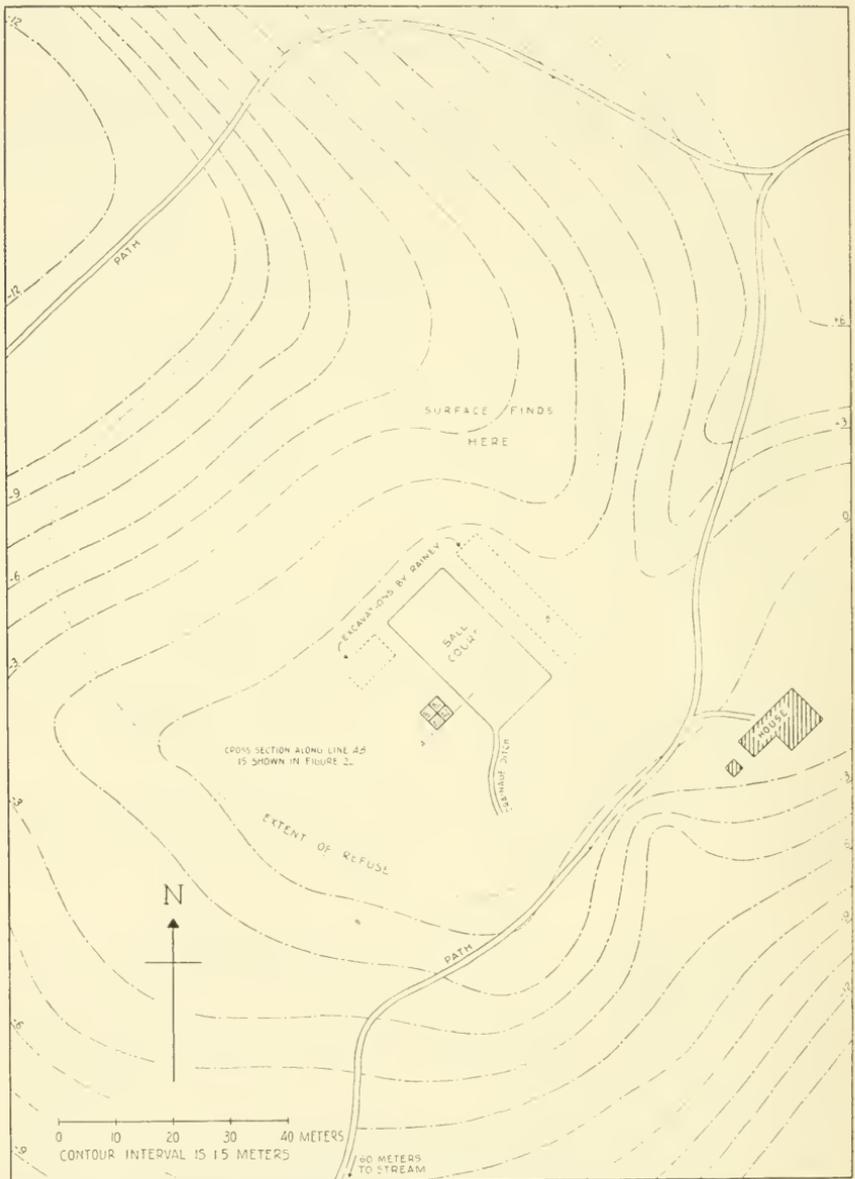


FIGURE 7. Plan of the site of Sabana.

section also suggests that the earth removed from the enclosure was piled up along its sides, whence much of it seems since to have washed down into the court. Although the bottom of the court is now flat, its sides

are sloping, and this may be due to erosion since the court was abandoned (FIGURE 8).

No earthworks or stone walls were observed around the court, but several stone slabs buried in the sloping walls of the enclosure and piled outside may be from walls. These are river stones, 60 to 90 centimeters long and 30 to 60 centimeters wide. None bear petroglyphs, but the inhabitants state that several petroglyphs have been removed from the site by collectors.

Rainey (1940: 100-101) reports that "trenches and pits . . . cut through and around the court all produced scattered sherds which were not associated with other refuse of occupation. The potsherds, which were found at a depth never greater than 25 centimeters, were much more numerous than at the other three courts [dug by him], numbering approximately 2400." Rainey's description suggests that these sherds were primarily, if not entirely, of the Capá type.

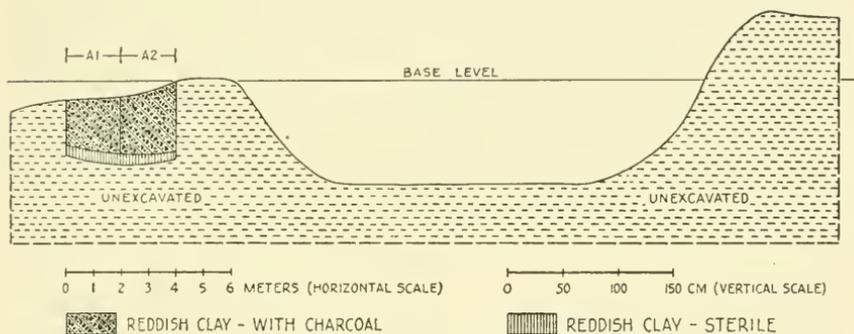


FIGURE 8. Cross section through the Sabana ball court.

At the time of the writer's visit, the plateau on which the court is located was overgrown with grass, and no artifacts were visible. The slope north and west of the court was under cultivation, however, and here we were able to collect a number of specimens. We located our pit on the southwestern side of the court, near one of Rainey's excavations (FIGURE 7). Here, in the customary four two-meter square sections arranged in the form of a square, we encountered reddish brown clay mottled with charcoal and containing some potsherds and other artifacts. This deposit continued to a maximum depth of 65 centimeters, when the clay became sterile (FIGURE 8). Excavation was therefore discontinued at a depth of 75 centimeters.

Two holes were observed in the refuse. One occurred at a depth of 35 centimeters in section A1, just beneath a fragment of conch shell. It consisted of a hollow space 9 centimeters in diameter and 31 centimeters deep. The soil for 7 to 10 inches around this hole was heavily impregnated with charcoal. The second hole, at about the same depth in Section B2, lacked the concentration of charcoal. It was 14 centimeters long, three centimeters in diameter, and inclined towards the ball court at an angle of 45 degrees. Both holes were cylindrical, and may have been the remains of posts.

There was one other unusual feature in the pit. Several large rocks appeared in section B1 at a depth of about 40 centimeters. These were not worked, and they did not seem to have been affected by fire. The soil around them contained no more charcoal than usual, and therefore it is unlikely that the rocks had served as a fireplace.

The majority of the potsherds obtained on the surface and in each part of the pit are of the Capá style, and consequently the entire collection will be considered as a unit. Altogether, the Capá sherds number 167, and there are also 19 sherds of the Santa Elena style. Thirteen of these specimens are from open bowls, 134 are from constricted bowls, and 39 are typologically unidentifiable. The associated artifacts include six fragmentary griddles, three complete stone celts and three broken ones, 28 stone chips, a quartz crystal, and one fragment of coral. We also collected one marine gastropod.

The presence of charcoal, of griddle sherds, of stone tools, and of a marine shell suggests that the site was used for habitation as well as for ceremonies. This is contrary to the opinion of Rainey (1940: 100-101), who, however, found no such remains.

Since Capá sherds appear to predominate in Rainey's collection as well as ours and there are no European objects, it is probable that the entire site dates from Period IVa. The few Santa Elena sherds in our collection may represent the end of a transition from that style to the Capá.

Salto Arriba (Utuaado 1)

About four kilometers south of the town of Utuaado, the highway to Adjuntas (No. 10) passes through a large refuse deposit just to the west of the remains of one of the many ball courts in the upper part of the Río Grande de Arecibo (see folding map at end). This refuse deposit and ball court are on land of Salvador Vives in Barrio Salto Arriba, of the municipality of Utuaado. Fewkes excavated here, and Lothrop also has examined the site (Fewkes, 1903a: 113, 114, 118, 125; Fewkes, 1907: 82, 83, 178, 184, Plate 77, *c*; Fewkes, 1922: 237; Lothrop, ms.: 14).* The writer surveyed it on August 29, 1937, and excavated a test pit on July 19 of the following year.

The site occupies a long, narrow plateau 70 meters east of the Río Grande and three meters above the river. A tributary flows along the northern edge of the plateau; to the east, the land rises into the mountains; and, to the south, there is another stream. Highway 10 runs from north to south through the middle of the plateau and a lesser road extends from the highway, bisecting the plateau transversely. At the time of the writer's visits, the rest of the plateau was completely covered with sugar cane, houses, and sheds.

Fewkes has not recorded a description of the site, but he implies that its ball court was a rectangular area, slightly depressed beneath the surrounding plateau and bounded by a series of flat stones set on edge. He was told that a pillar stone (idol) had formerly stood on a raised platform on one

* See also Lovén (1935: 88-90, 564) and Rainey (1907 113-114).

side of the enclosure. It was said to be about 120 centimeters high "and represented a female with head and bust well carved in relief" (Fewkes, 1903a: 462 and 1907: 178).

Several small mounds lay just south of the enclosure. Fewkes noted that the highway had cut through the edge of one of these mounds, "revealing, a few feet below the surface, a layer of soil containing fragments of pottery, a few broken celts, and the long bones of an adult." This discovery induced Fewkes "to extend a trench diametrically through the mound, parallel with the side of the enclosure. The depth of this trench, at the middle of the mound, was about nine feet. The excavation revealed that the mound rested on a hard gravel base, and was composed of soil so rich that some of it was carried away by the neighboring farmers for use as fertilizer. This earth was very moist and ill-adapted to the preservation of bones or other fibrous material. Nevertheless, we found ten skeletons of adults and infants, with mortuary objects so distributed as to indicate that they had been placed there as offerings. One of the best preserved of these skeletons was found in a sitting position, with the legs drawn to the chest, and with ceramic objects lying at one side. The frontal bones of the skulls were abnormally flattened . . ." (Fewkes, 1903a: 457 and 1907: 82-83).

Twenty-five of the potsherds obtained by Fewkes are still preserved in the United States National Museum, and all are Ostiones in style. One of the mortuary vessels, which is also Ostiones in style, has been illustrated by Fewkes (1907: 184, Plate 77, *c*; 1903b: 114; 1922: 237).^{*} In addition to the broken celts, Fewkes also mentions a stone face and a bone cylinder from the mound (Fewkes, 1903a: 458; 1903b: 125, 118; 1907: 83).

On the eastern bank of the river just west of the site, there is a large boulder on which Fewkes observes "eight or nine" petroglyphs. These covered the entire upper face of the boulder, a flat surface about 4.5 meters above the base. They include carvings of human-like bodies and heads, of faces, and of geometric designs, several of which suggest the sun and the moon (Fewkes, 1903a: 444-447, Plate 45, *1-8*; 1907: 151-153, Plate 60, pt. 1, *a-h*).[†] Presumably, they were made by the same people who built the court.

Our own work at Salto Arriba adds little to the descriptive details furnished by Fewkes. The ball court has long since been destroyed. According to the inhabitants, it was located on the inner side of the plateau, east of the highway and north of the side road. In a level area here, we observed several flat river stones which may have originally formed part of the walls of the enclosure. None bore petroglyphs.

The mounds, too, had been destroyed by the time of our visits. The inhabitants claimed that Fewkes's mound excavation had been made just beyond the northern end of the court, but this does not agree with Fewkes's statement that the mounds were to the south. The land just south of the

^{*} The first of these references has been misquoted by Lovén (1935: 546), who attributes to Salte Arriba the pot illustrated on Plate 77, *a*, instead of that on Plate 77, *c*. The former, which enclosed a necklace of stone and shell, is actually from a cave near Utuado.

[†] In his 1907 report, Fewkes erroneously attributes the petroglyph illustrated as Plate 60, pt. 1, *h* to a different site. This error has been repeated by Morales Cabrera, who also assigns the rest of the petroglyphs to the other site. See also Lothrop (ms.: 14).

position of the ball court is unusually high. In part, the rise appears to be natural, but it is also partially due to the accumulation of refuse, perhaps from the mounds. Here, we observed potsherds in the banks along the side road to a depth of 75 centimeters. Other sherds were scattered through the cane fields over an area of several acres. They appeared to be more numerous east of the road in the vicinity of the ball court than to the west.

The writer also examined the petroglyphs on the bank of the Río Grande west of the site. According to our observations, the rock is only half the size given by Fewkes (as quoted above) but bears about 20 petroglyphs—twice the number counted by him.* Most of the additional carvings are of faces. Two are illustrated in FIGURE 6 (B, C).

At the request of the owner of the site, who wished to avoid the destruction of sugar cane, we dug our test pit in a barnyard just southeast of the junction of the side road and the highway, in the same general area in which Fewkes is supposed to have worked. Here, we staked out four two-meter

TABLE 2
DISTRIBUTION OF CUEVAS, OSTIONES, SANTA ELENA, AND CAPÁ SHERDS AT SALTO ARRIBA

	<i>A1</i>	<i>A2</i>	<i>B1</i>	<i>B2</i>	
1	2-4-0-7	1-3-1-5	3-3-0-4	1-2-0-6	Capá division
2	10-26-1-8	13-28-3-1	2-12-1-1	7-17-0-0	Ostiones division
3	9-28-4-0	16-2-0-0	6-14-0-0	8-7-0-0	Cuevas division
4	4-7-1-0	7-3-0-0	5-2-0-0	1-0-0-0	

Explanation of Table. The vertical columns represent sections; the horizontal lines, levels. The number of potsherds of the Cuevas, Ostiones, Santa Elena, and Capá styles are given in succession. The lines mark the boundaries between the Cuevas, Ostiones, and Capá divisions.

square sections in the form of a square. Our first two levels consisted of hard packed, dark brown loam, containing bits of charcoal and a few small potsherds. In the next two levels, the soil was loose, sandy, and black in color. Both charcoal and potsherds were more common. The soil became light brown in color toward the bottom of the fourth level and, since it seemed to be sterile, excavation was discontinued at a depth of 110 centimeters.

Four styles are represented in the pit: Cuevas, Ostiones, Santa Elena, and Capá. As shown in TABLE 2, the numbers of examples of each are too small for reliable classification. Nevertheless, we shall assume that level 1 is a Capá division, that level 2, sections A1 and B1 of level 3, and section A1 of level 4 constitute an Ostiones division, and that the rest of the pit forms a Cuevas division.

Twenty of the sherds in the Ostiones division are from open bowls, 19 are from constricted bowls, one is from a jar, and 12 are unidentifiable. One piece of a griddle was also found in this division. In the Ostiones division, we obtained 65 sherds from open bowls, 82 from constricted bowls, two from jars, and 55 which are unidentifiable. Ten fragments of griddles,

* According to Lothrop (ms.: 14), the petroglyphs number 50 or 60.

a clay disk, a discoidal stone bead, and two stone chips also come from this division. The Capá division yielded 15 sherds from open bowls, 14 from constricted bowls, 12 unidentifiable sherds, four fragments of griddles, a stone polisher, and a piece of tile. In addition, a stone bowl, a stone mortar, and a stone hammer were purchased from the inhabitants, and there is a stone end grinder from the site in Lothrop's collection at the Harvard Peabody Museum.

Although the Salto Arriba pit was relatively shallow, three of our four periods seem to be represented there, Period II by the Cuevas division, Period III by the Ostiones division, and Period IV by the Capá division. The Cuevas division can be assigned to Period IIb, for only a single sherd is white painted; the Ostiones division to Period IIIa, since none of the Ostiones sherds are incised; and the Capá division to Period IVa, it being assumed that the piece of tile is intrusive. This leaves a gap between the deposition of the Ostiones and Capá divisions, corresponding to Period IIIb, during which time the Indians may have deposited their refuse in another part of the site.

It is believed that the few Santa Elena sherds are the result of influences from the east. The fact that, with one exception, they are confined to the Ostiones division may be significant for cross dating.

Fewkes did not consider the possibility that Salto Arriba might be a village site. Instead, he concluded that the ball court had been used for graves and for mortuary dances held in connection with the burials in the adjacent mounds (Fewkes, 1903a: 457-458; 1903b: 113; 1907: 82-83). This conclusion has led several subsequent writers to assert that burial mounds were erected by the Indians of Porto Rico (Gower, 1927: 13-14; Joyce, 1916: 206; Lovén, 1935: 88, 546-549). In the writer's opinion, these assertions are incorrect. The data of Fewkes and of the writer both indicate that the mounds were piles of refuse. If they were closer to a coast, where shell fish were available, they would probably be shell heaps. Each may represent a different house site, as at Ostiones and the other shell midden sites dug by us. This being so, the skeletons in them can be attributed to the typical Antillean custom of burying in refuse. They bear no resemblance to the artificial burial mounds of the southeastern United States.

Our conclusion, then, is that Salto Arriba was a village site, accompanied by a ball court. The people probably lived in the area surrounding the court, buried their dead in the refuse deposited in that area, and conducted their games, dances, and ceremonies within the court (if not also at the petroglyphs on the bank of the river). The only unusual feature is that the inhabitants piled up their refuse instead of spreading it out as at the ball courts previously described. The mounds encountered elsewhere consist of earth removed from the court instead of refuse. It may be that at Salto Arriba the inhabitants deposited their refuse in the area of the court before it was built and then removed this deposit during excavation of the court. This would explain the nature of the mounds, and it would also provide a clue as to the age of the ball court, but it is likely to have resulted in reverse stratigraphy, and this is not consistent with the situation in our pit.

Salto (Orocovis 4)

There is a ball court on the farm of Pedro Uvero in Barrio Saltos of the municipality of Orocovis, some four kilometers southeast of the town of Orocovis (see folding map at end). The Quebrada Mala, a source of the Río Manatí, passes a short distance to the west. Learning of the site from the inhabitants of the vicinity, the writer surveyed it on August 17, 1938, and excavated a pair of test pits three days later.

At the ball court of Saltos, one has the feeling of standing on top of the world, for the site is perched upon the summit of a narrow mountain ridge at an estimated height of 800 meters above sea level. On both sides of the court, the land falls sharply 60 meters down into valleys. At either end, the ridge narrows until there is scarcely room for two people to pass abreast.

Except for three meters on the western side and half that distance on the east, the ball court occupies the entire width of the plateau. Its shape, conforming to that of the plateau, is trapezoidal rather than rectangular, and its orientation is from north to south in the same direction as the ridge. In size, it is one of the smallest courts encountered in Porto Rico, measuring only 23 meters in length and 15 in maximum width.

The court consists of a level, flat area, produced by excavating to a depth of 60 to 90 centimeters at either end where the land is high. The sides are lined with embankments 30 to 60 centimeters high, which may consist of soil from the excavated areas. These embankments are apparently intended to complement the banks on the ends of the enclosure. No stones were observed, except for a slab-shaped river boulder completely buried in the soil at one edge of the site, nor was there a drainage ditch, as at Sabana.

When the writer visited the site, the ground was covered with sod and no refuse was observable. Two test pits were dug in the only available areas outside the enclosure, one at either end. Each consisted of the usual four sections two meters square arranged in the form of a square. Both were in heavy clay, dark brown for the first 15 centimeters, light brown for 15 centimeters more, and reddish brown below the latter depth. Specks of charcoal and an occasional artifact were encountered in the brown soil, but the reddish clay seemed to be sterile. Accordingly, excavation was discontinued at the bottom of the second 25-centimeter level in each pit.

Only Capá sherds were obtained from Saltos, and they number merely 12 specimens. Eleven of them are from constricted bowls. The other is typologically unidentifiable. One fragment of a griddle, the butt of a stone celt, a stone ball, two stone chips, and an unidentifiable fragment of bone, complete the collection.

This site certainly dates from Period IVa. In fact, it is the only place where the Capá style was completely isolated. Its court probably served for ceremonies rather than for ball games, the playing of which would have been difficult on the mountaintop. It cannot have been well suited to habitation either. Nevertheless, the contents of our pits do not differ essentially from those in dwelling sites. The animal bone, in particular, suggests that Indians may have lived at Saltos, if only temporarily.

Toita (Cidra I)

There is another large village site, enclosing a ball court, on the east bank of the Río de la Plata, just across the river from the section of Highway 1 between Cayey and Aibonito (see folding map at end). The name of this site is Toita, and it is on Farm 9 of the Porto Rican Reconstruction Administration in Barrio Toita, of the municipality of Cidra. In recent excavations at this site, Fernández-García obtained potsherds, objects of polished stone, and a carved bone spatula (Morales Cabrera, 1932: 50, 142, 143, 172, 209, 210, 258). In addition, he encountered two adult burials and one of a child, one of the former being flexed and the latter having its forehead covered with a clay vessel. The writer surveyed the site on August 30, 1936, and excavated a test pit from September 4 to 6 of the same year (Rouse, 1936: 183-185).

At Toita, the Río de la Plata makes a deep bend, enclosing a broad, gently sloping plateau. The site lies on this plateau, some 1.5 meters above a narrow flood plain at the edge of the river. Formerly, the plateau was a tobacco plantation, but, at the time of the writer's visit, the Porto Rican Reconstruction Administration was dividing it into a series of truck farms, each with its own dwelling.

Despite its distance inland, Toita may be considered a shell deposit. Charcoal, potsherds, a few animal bones, and shells were observed on the surface of the side of the plateau towards the river, covering an area some 190 meters long and 95 meters wide except for an open space in the center. This central space, measuring roughly 31 by 27 meters, contained 15 to 20 stones from the river, most of them flat. The inhabitants stated that, before the plateau was subjected to plowing, these stones had enclosed a ball court. They were not in a regular arrangement at the time of the writer's visit, however, nor were any of them marked with petroglyphs. The supposed area of the ball court did not seem to be depressed. The only sign of its existence was the absence of refuse.

Our test pit, a square composed of four two-meter square sections, was laid out near the edge of the plateau in the southeastern part of the site, where the shells seemed to be thickest. Excavation here was carried through ten levels to a depth of 250 centimeters (FIGURE 9). The first 30 centimeters in sections A1 and A2 (towards the river) and the first 90 in sections B1 and B2 (away from the river) consisted of dark brown humus mixed, as on the surface, with shell refuse. Below those depths, the shell refuse occurred only in a tongue 35 centimeters wide which extended diagonally down from sections B1 and B2 to an average depth of 200 centimeters in sections A1 and A2. Near the top of this tongue, we encountered a horizontal lense of charcoal. At its bottom was a pit of the shell refuse 40 centimeters deep and one meter in diameter. Otherwise, this entire section of the excavation consisted of sandy, light brown loam containing some animal bones and artifacts. There were few shells in this deposit. The only possible indication of the presence of charcoal was a slight darkening of the soil above the layer of charcoal. So far as could be determined, the

light brown, sandy soil continued downwards indefinitely, but no artifacts were encountered below a depth of 225 centimeters.

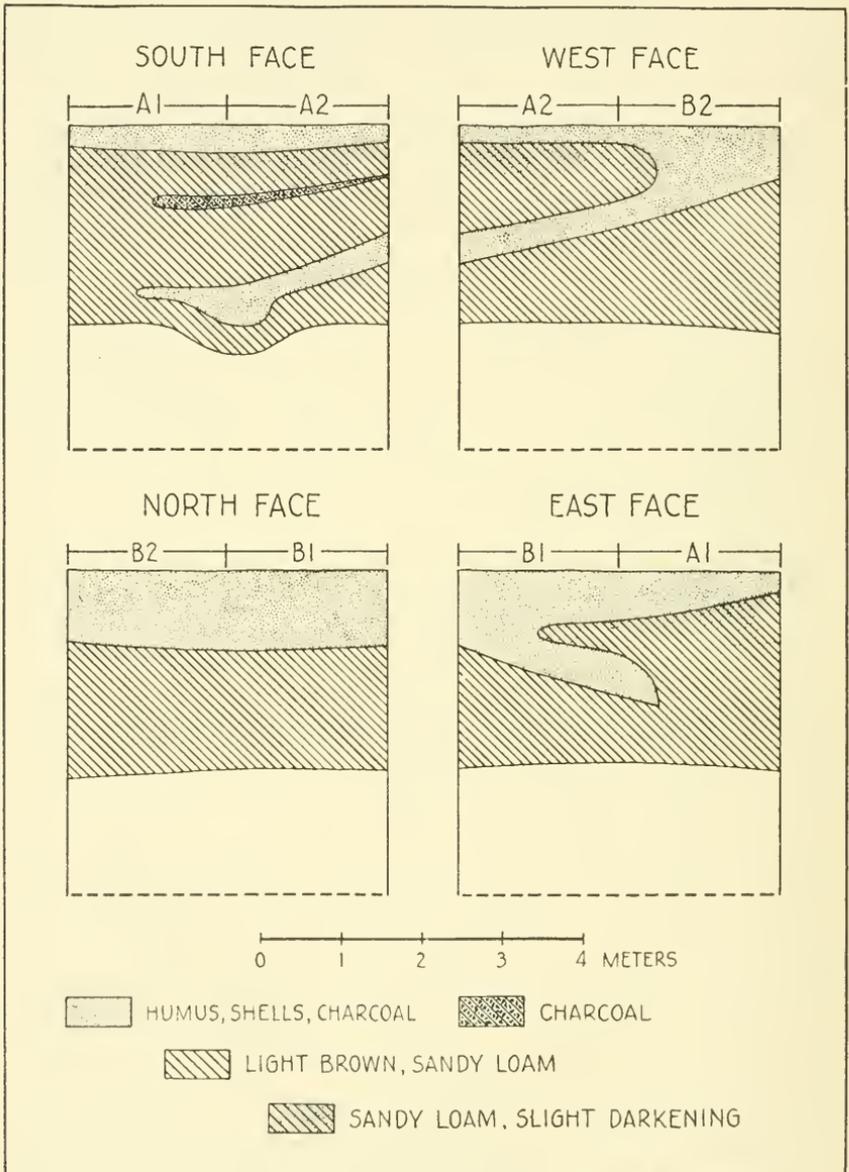


FIGURE 9. Walls of the pit at Toita.

It is difficult to interpret the stratigraphy of the Toita pit. One possibility is that there were four periods of deposition, a first in which the lower part of the shell-free deposit accumulated, a second in which the tongue

of shell came in, perhaps as the result of erosion down a hillside, a third in which this hillside was filled up with the shell-free refuse, and a fourth marked by the deposition of the horizontal layer of shell refuse at the top of the excavation. The shell pit at the bottom of the excavation and the lens of charcoal near the top may have been deliberately constructed. Although no stones were present, the latter could have been a hearth.

The remnants of a child's burial appeared in section B2 of level 3. The bones were badly disintegrated, and only fragments of the mandible, the ribs, and the long bones could be recognized. There were no grave objects, nor could the position of the bones be determined.

Five of our six styles are represented in the Toita pit, as follows:

	<i>Cuevas</i>	<i>Ostiones</i>	<i>Santa Elena</i>	<i>Capá</i>	<i>Esperanza</i>
Level 1	0	90	29	7	68
Level 2	0	63	9	1	17
Level 3	1	92	20	1	12
Level 4	0	20	8	0	2
Level 5	16	74	19	0	0
Level 6	7	84	21	1	1
Level 7	2	45	35	0	0
Level 8	0	39	17	0	0
Level 9	0	15	7	0	0
Level 10	0	14	3	0	0

As these figures indicate, the *Ostiones* style is the most common, followed by the *Esperanza* style in the top two levels and by the *Santa Elena* in the bottom eight. *Ostiones* potsherds predominate in all sections and levels except three, where the numbers involved seem too small to be significant. Consequently, the entire pit, together with a few specimens collected on the surface, will be treated as a unit.

Two hundred and seventy-eight of the sherds are from open bowls, 391 are from constricted bowls, 16 are from jars, and 159 are typologically unidentifiable. The associated artifacts include 69 griddle sherds, two clay disks, a stone anvil, a chipped stone ax, the butt of a stone celt, part of a chisel of stone, two stone hammers, two net sinkers of stone, three stone polishers, a cylindrical stone bead, an anthropomorphic stone pendant, a stone cylinder, two stone chips, three bone beads, a discoidal shell bead, a flat shell pendant, a pendant-tinkler of shell, a miscellaneous piece of worked shell, a blunted clam shell, a *Strombus* lip, a fractured shell tip, and 17 coral fragments. Fish, man, hutia, and turtle are represented among the bones, and land gastropods, marine gastropods, and marine pelecypods among the shells. There are no European objects, with the possible exception of a cut mammal bone from the top level, which we have classed as human.

All of the above material apparently dates from Period III. Although the *Ostiones* sherds are not incised, the presence of so many examples of the *Santa Elena*, *Capá*, and *Esperanza* styles suggests that the material may have been deposited during the latter half of the period. The great depth of the deposit might seem to contradict this interpretation, but not if we assume that a large part of the refuse has accumulated as the result of erosion.

Unfortunately for the theory of erosion, we have been unable to make any correlation between the various styles and the strata in the pits, with the possible exception that the Cuevas sherds coincide very roughly with the tongue of shells which extends downwards from sections B1 and B2 into A1 and A2. These Cuevas sherds may have been washed in from another part of the site dating from Period IIIa or even from Period IIb.

The variety of other styles may be due to the position of the site on the edge of the areas of distribution of the Santa Elena and Capá styles to the northwest and of the Ostiones and Esperanza styles to the south and southeast. If our pit had extended from Period III into Period IV, it is likely that the Ostiones would have been succeeded as the dominant style by the Esperanza. In fact, that sequence may be present in another part of the site.

Toita provides one of the best examples of the combination of habitation with a ball court. As Morales Cabrera (1932: 50, 142, 143) has pointed out, there is little doubt that a village was located on the plateau. Probably it had a ball court or dance ground in the center of it. During the latter part of the existence of this village, its inhabitants must either have traveled widely or have had broad trading contacts, for the nearest source of the shells found at the site is Salinas on the south coast, 25 kilometers away through difficult country (folding map).

Vegas Arriba (Adjuntas 6)

On the second mountain ridge east of the town of Adjuntas are the remains of a ball court to which has been given the name of Vegas Arriba (see folding map at end). This site is owned by Pasqual Pithias. It is in Barrio Vegas Arriba of the municipality of Adjuntas. Montalvo Guenard had been there before the writer, who surveyed the site on July 11, 1938, and excavated five test pits on the same day.

The site lies on the western edge of a small plateau, from which the land falls sharply for 122 meters into the valley of a tributary of the Río Grande de Arecibo. This is the greatest elevation in the vicinity. Its height above sea level is said to be 1,006 meters, or twice that of the surrounding towns. A nearby spring may have been used by the Indians as a source of drinking water.

At the time of the writer's visit, the land was covered with brush, through which it was possible definitely to trace only one side of the court. This consisted of an embankment 30 meters long and 60 centimeters high, the inside of which was lined with a series of upright stone slabs, each about 90 centimeters high and 60 centimeters wide. A natural bank 7.6 meters away from this structure and roughly parallel to it may have formed the other wall of the court, although only a single stone was imbedded in it. The direction of both walls was roughly from north to south at an angle to the edge of the plateau. Presumably, the ends of the court were open.

One of the stones in the built-up wall on the western side of the court was marked with petroglyphs (FIGURE 6, D, E). Facing in towards the center of the court were the head and shoulders of a human being. On the oppo-

site side, looking out over the embankment, was a drawing of the face of a man. As usual, the lines were wide and deeply carved. Their depth averaged four and their width ten millimeters.

No refuse was observed anywhere in the site. Nevertheless, five trenches were dug. The first, which consisted of four two-meter square sections, was situated on the edge of the plateau near the end of the western wall of the court. A second trench of the same size was excavated inside the first, closer to the wall. Then, a single section was laid out at the very base of the wall. Trench 4, composed of three sections, was located at the southern end of the court, with the two sections of Trench 5 nearby. All sections were dug 25 centimeters except the second and third sections in Trench 2, in which a slight rise necessitated extension of the depth to 50 centimeters. This carried all sections through a black layer of humus into light brown loam beneath. The only charcoal was observed at the surface, where it appeared to be intrusive. All trenches except the third one (at the base of the wall of the court), however, yielded potsherds and other artifacts in small numbers. These were in the humus. The subsoil seemed to be sterile.

Potsherds of the Capá style predominate in all sections and levels at Vega Arriba. There are 20 of them, accompanied by five sherds of the Santa Elena style. Two of the sherds are from open bowls, 17 are from constricted bowls, and six are typologically unidentifiable. Four pieces of griddles, two stone chips, and a fragment of petrified shell complete the collection.

All of this material apparently dates from Period IVa, with the Santa Elena sherds representing the end of a transition from Period III. If this site was ever inhabited, it must have been only for a short time, for its deposit is one of the shallowest encountered in Porto Rico. Because of its position on a mountaintop, it is not likely that it served as a ball court either. Instead, it may have been a dance ground.

Villón (Coamo 1)

The position of this site is ambiguous. Since it is in the southern foothills, it might have been included in the south-coast area. It lies closer to the mountains than to the coastal plain, however, and therefore it is considered part of the mountainous interior. On property of Julio Gonzales, it is in Barrio Cuyón of the municipality of Coamo, about six kilometers south southwest of the town of Aibonito (see folding map at end). Montalvo Guenard had collected petroglyphs at the site. The writer surveyed it on September 7, 1936, and excavated two test pits the following day (Rouse, 1936: 184-185).

From the standpoint of the Indians, Villón must have been well situated, for it is near the headwaters of three streams, one flowing north into the Río de la Plata in the vicinity of the site of Toita and the other two draining south into the Caribbean Sea at Salinas and Santa Isabel, respectively (folding map). It may be by way of these rivers that the inhabitants of Toita obtained the shells observed by us at their site. The closest of them to Villón is the Río Cuyón, which flows just west of the site, eventually

joining the Río de Coamo and emptying into the Caribbean at the site of Cayito near Santa Isabel.

A creek joins the Río Cuyón at the site of Villón, enclosing a broad, flat-topped ridge elevated some 30 meters above the river (FIGURE 10). At the northern corner of the ridge, a slight, rocky elevation lies at the junction of the two streams. The southern corner is marked by a steep hill. Between them, where the land is relatively level, there are a plaza, two ball courts, and five shell heaps, all partially destroyed by cultivation. The site thus ranks with Capá and Palo Hincado as one of the most elaborate in Porto Rico.

The plaza occupies the center of the ridge (FIGURE 10). Square in shape, it has the same orientation as the ridge and its four corners are roughly in the cardinal directions. It consists of a level, flat area, measuring approximately 30 meters on a side. At the time of the writer's visit, all four sides were lined with a low embankment 25 centimeters high, but there were no traces of excavation. Originally, the inhabitants said, the plaza had been completely surrounded by a wall of stone slabs.* A few of these were near the plaza. None bore petroglyphs.

The two ball courts lined the side of the ridge southwest of the central plaza and near the base of the hill at the southern corner of the ridge (FIGURE 10). All that remained of the first court was a line of upright stone slabs along the edge of the ridge. This wall was 23 meters long and had an average height of 50 centimeters. The inhabitants were unable to say whether it had formed the side or the end of the court. Two petroglyphs, both representing human faces, occurred on the inner side of the wall. One of them was removed by the writer and is now in the Yale Peabody Museum.

Enough remained of Ball Court 2 to indicate that it had been rectangular in shape (FIGURE 10). It measured 30 by 24 meters and extended S 55 W. Unlike the ball courts observed elsewhere, its long axis was perpendicular to the edge of the ridge and to the contours of the hillside. Except at the northeastern end, it was entirely surrounded by an embankment varying from 90 to 150 centimeters in height. On the eastern (uphill) side, this bank seemed to be the result of excavation, but elsewhere the earth had apparently been piled up. The inhabitants stated that Court 2 had never been lined with stones, and that its embankment was originally higher. A small mound 150 centimeters high lay just south of this court.

The five shell heaps were situated along the edges of the ridge, three of them northeast of the central plaza and two south and west (FIGURE 10). All were small and shallow. The largest measured 41 meters long, 8 meters wide, and only 30 centimeters in height. They all appeared to consist of black humus containing charcoal, a few animal bones, and moderate amounts of shells and artifacts. Four specimens were collected from their surface: a sherd from an Esperanza constricted bowl, a stone peg, and two pieces of water worn shell.

According to the inhabitants, several human bones have been found on the elevation at the northern corner of the ridge, where a house is now

* They also claimed that the plaza used to be circular in shape.

located (FIGURE 10). This part of the site was not under cultivation at the time of the writer's visit, and it was impossible to observe the nature of its soil.

Two test pits were dug at Villón, one in the middle shell heap northeast of the plaza and the other in the midden west of the plaza (FIGURE 10).

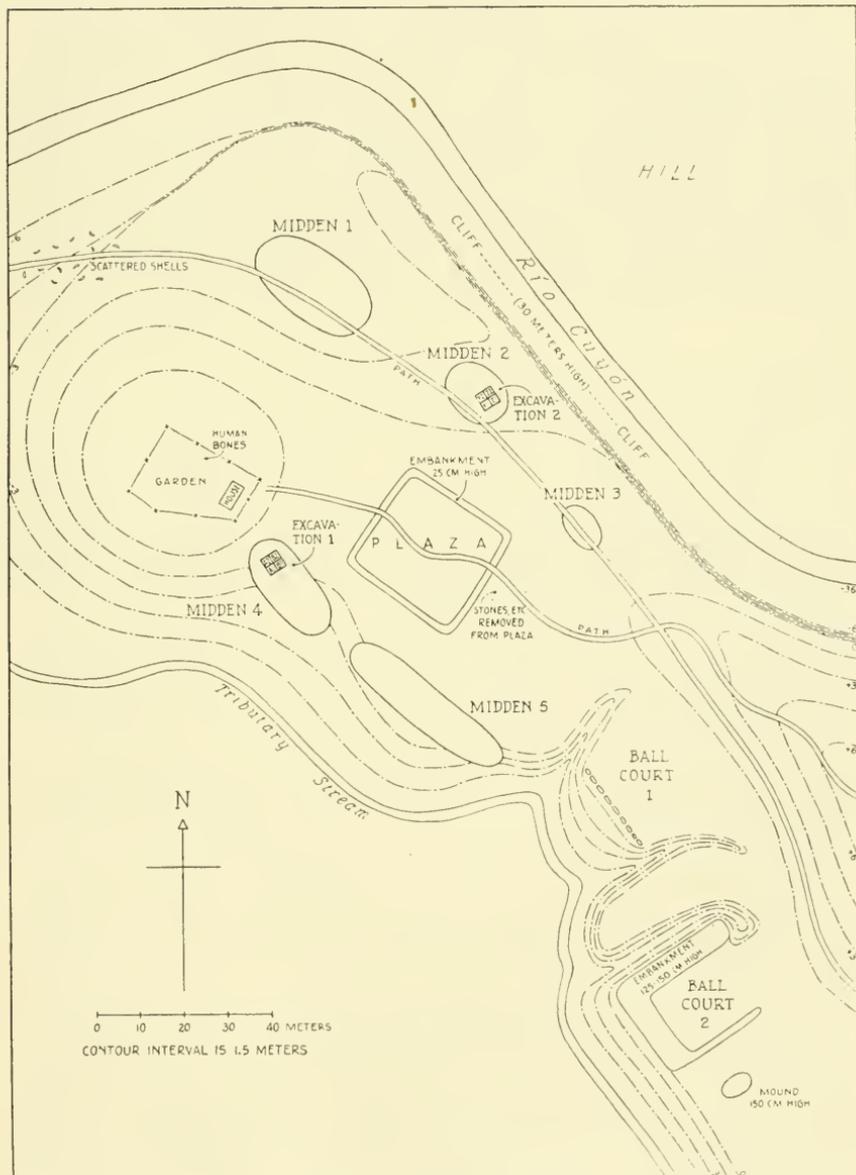


FIGURE 10. Plan of the site at Villón.

Both consisted of four two-meter square sections arranged in the form of a square, and both were excavated to a depth of 50 centimeters. The first 30 centimeters contained a deposit like that observed on the surface, with the addition of a small amount of ash in Pit 2. Below 30 centimeters in each pit, we encountered sterile, light brown clay, which in Pit 1 was quite stony.

Pit 1 is characterized by the Boca Chica style, of which 70 examples were obtained. These specimens predominate in all sections and levels. They are accompanied by two Ostiones, 32 Santa Elena, one Capá, and 38 Esperanza potsherds. Two of the sherds may be from bottles, 24 are from open bowls, 97 are from constricted bowls, and 21 are typologically unidentifiable. The associated artifacts include 12 pieces of griddles, two stone polishers, a stone sharpener, eight stone chips, a *Strombus* lip, and a plain shell tip. Bird, man, and hutia are represented among the bones and land gastropods, marine gastropods, and marine pelecypods among the shells.

Pit 2 is characterized not by the Boca Chica but by the Ostiones and Santa

TABLE 3
DISTRIBUTION OF OSTIONES, SANTA ELENA, AND ESPERANZA POTSHERDS IN PIT 2 AT VILLÓN

	Y1	Y2	Z1	Z2	
1	23-33-7	12-20-9	14-10-1	11-19-0	Santa Elena division
2	8-6-0	4-1-0	0-0-0	5-4-0	Ostiones division

Explanation of Table. The vertical columns represent sections; the horizontal lines levels. The number of potsherds of the Cuevas, Ostiones, Santa Elena, and Capá styles are given in succession. The line marks the boundary between the Ostiones and Santa Elena divisions. No other styles are represented.

Elena styles. As shown in TABLE 3, potsherds of the Ostiones style predominate in section Z1 of level 1 and in all of level 2. The Santa Elena sherds predominate in the rest of the pit. Specimens of the Esperanza style form a minority in both divisions.

From the Ostiones division of Pit 2 come 17 sherds from open bowls, 29 from constricted bowls, and seven which are typologically unidentifiable. These are accompanied by four broken griddles, three stone chips, two pieces of coral, and bones of the hutia. The Santa Elena division yielded 45 sherds from open bowls, 75 from constricted bowls, and 18 which are unidentifiable, as well as four pieces of griddles, three stone chips, a *Strombus* lip, and several hutia bones. The shell sample cannot be separated according to division. It consists of land gastropods, marine gastropods, and marine pelecypods.

It will be apparent that the two pits form a chronological sequence, Pit 2 dating from Period III and Pit 1 from the first half of Period IV. Only one of the Ostiones potsherds in Pit 2 is incised, and therefore that division probably falls into Period IIIa. This being so, it seems logical to place the Santa Elena division in Period IIIb as follows: Period IVa—Pit 1 (Boca Chica); Period IIIb—Santa Elena division, Pit 2; Period IIIa—Ostiones division, Pit 2.

As shown below, the sequence of Ostiones and Santa Elena styles also occurs in the sites of the south-coast area adjacent to Villón. The Boca Chica pottery is another link with the south coast, for the only other place on the main island of Porto Rico where we found that style was at Cayito, near the mouth of the Río Coamo (folding map). These facts confirm our suggestion that the Indians of Toita, as well as of Villón, obtained their sea shells via the Cuyón and Coamo rivers.

The presence of the Esperanza style as a minority trait at Villón recalls the situation at Toita. Although Villón is further west, it is likely to have been subjected to the same influence from the eastern part of the south-coast area to which we have attributed the Esperanza sherds found at Toita.

The shell heaps at Villón recall the "mounds" at Salto Arriba, except that they are much smaller. Both appear to be the result of habitation and again, therefore, we must restate our belief that the Indians lived at sites like this one. Even though the plaza was a place for ceremonies and dances and the courts were used for games, the rest of the site probably constituted an Indian village.

Other Sites

Five sites which were dug by previous investigators were not also excavated by us. The following is a brief summary of the findings at these sites.

Antonio (Utuaedo 13). This cave in the hillside above the terraces of Cerro Hueco has already been mentioned in connection with our excavations at the latter site (FIGURE 4). Like the latter, it is on land of Antonio Cuevas in Barrio Caguana, of the municipality of Utuaedo (see folding map at end). It, too, is sometimes called Cerro Hueco, although the term "Cueva de Antonio" which we use here is more common. It was excavated by Aitken and Mason in 1915. Reports on it have been published by the former (1917, 1918) and by the present writer (1941a: 273-275).*

Unlike the sites excavated by us, the Cueva de Antonio appears to have been used exclusively for burial purposes. In it, Aitken and Mason encountered 20 burials, 18 of them single and the other two each consisting of an adult and a child.† All, except four which had been disturbed by subsequent burial, were flexed. The one skull described is said to have been brachycephalic and undeformed.

No grave objects were found with the burials, but a few broken artifacts appeared in the floor of the cave. These include 12 potsherds, only three of which have any recognizable attributes of shape and decoration. In terms of the classifications used in the present paper, all three of these sherds are Capá in style. Two come from open bowls and the third is from a constricted bowl. Accompanying them were two flint chips, a European potsherd, and a glass bead.

In a previous discussion of the cave (Rouse, 1941a: 293), the writer assigned it to Period III, at the same time placing the nearby terraces of Cerro Hueco in Period IV. Our reanalysis in terms of the present sequence

* See also Lovén (1935: 124), Mason (1941: 211, 265), and Rainey (1940: 115-116).

† This makes 22 individuals and not, as stated by Rainey (1940: 115), 39.

of styles indicates that the cave, like the terraces, dates from Period IVa. Thus, it seems likely that both the cave and the terraces were used by the same people. The two European specimens are assumed to be intrusive, for none has been found in the terraces.

Iledefonso (Orocovis 8). Among the ball courts in the municipality of Orocovis is one some two kilometers north of the site of Sabana where we dug (folding maps). Montalvo Guenard visited this court about 1930 and removed several stones bearing petroglyphs. In 1935, it was excavated by Arturo Morales Carrión under the supervision of Froelich G. Rainey (Rainey, 1940: 100). The writer visited it in 1938, but because of the scarcity of remains decided not to excavate.

Rainey refers to the site in his report as "Barrio Sabana, Court No. 1." In accordance with the procedure followed in this paper, we have renamed it after the owner, Juan Iledefonso. It consists of a rectangular, flat area lacking embankments or excavations of any kind. As reported by Rainey (1940: 100): "Many of the stones which outlined the structure within the memory of the natives of the barrio, remain piled up in the vicinity of the court, but its original size and form can no longer be determined. . . . Test pits and trenches dug in and around the remains of the structure disclosed scattered sherds to a depth not greater than 50 centimeters, but no shells, bones, charcoal, or other culture refuse was found."

The specimens obtained at the site, consisting of 120 potsherds and part of a stone celt, are now at the University of Porto Rico, where they have been unavailable for study. Rainey's description of the sherds suggests that they are of the Santa Elena style. If so, the site belongs in Period IIIb and is earlier than the other ball court Rainey excavated in Barrio Sabana.

La Seiba. In 1915, Hermann K. Haerberlin excavated the Cueva de la Seiba in the municipality of Utuado (Haerberlin, 1917: 220-238).^{*} There is some doubt as to the exact position of this site, for Haerberlin located it only in reference to the site of Los Medinos, and, as explained below in the discussion of the latter site, the writer was unable to find either of them. It is known that La Seiba is on the Hacienda Jobo, 1.6 kilometers west of Los Medinos. For the reasons stated below, we assume that both sites lie within Barrio Río Abajo and that they are about five kilometers north of the town of Utuado (folding map).

La Seiba is one of many deep caves which occur throughout the limestone country north of Utuado. A number of human faces are carved on its walls. At the time of Haerberlin's work, its floor was covered with a thick deposit of refuse averaging approximately one meter in depth (Haerberlin, 1917: 221-225, Figure 13). Large numbers of land gastropods, as well as the bones of birds, crabs, hutias, and turtles were found in the refuse.

The collection from the site, which is now at the American Museum of Natural History, contains 380 potsherds of the Ostiones style, and four of the Capá (Rouse, 1941a: 275-276, Pl. 16†). They are accompanied by 18

^{*} See also Lovén (1935: 102, 121, 124, 278, 283, 285, 606), Mason (1941: 210), Rainey (1940: 115), and Rouse (1941a: 275-279). In place of "Ceiba" in Rainey's report, read "Seiba."

† In this report, read "Ostiones style" in place of "type B."

griddle sherds, two stone hammers, a flat shell pendant, and a coral rasp. According to the catalogue of the collection, there should also be a fragment of a stone celt, which the writer was unable to find.

Since none of the Ostiones sherds is incised, the site probably dates from Period IIIa. The four Capá sherds may be intrusive, or they may represent the beginning of a trend towards that style.

Los Medinas. Although Haeberlin, who also excavated this site in 1915, gives its location in great detail, the writer has been unable to find it. It is said to be on the Hacienda Jobo, belonging to Blas Gau, in Barrio Río Arriba de Arecibo on the road to Barrio Santa Rosa, "several miles" northwest of the town of Utuado (Haeberlin, 1917: 214 ff.).* No Hacienda Jobo appears on the maps available to the writer, however, nor is the Barrio Río Arriba in the position indicated. (It lies ten kilometers to the northeast of Utuado and has no direct connection by road with Barrio Santa Rosa.) A more likely location for the site is in Barrio Río Abajo of the municipality of Utuado, five kilometers north of the town of the same name and, as stated by Haeberlin, near a brook called Los Medinas, which flows into the Río Grande de Arecibo from the west (folding map).

Los Medinas consisted at the time of Haeberlin's work of a single, rectangular ball court, depressed slightly and lined on the sides with stone slabs (Haeberlin, 1917: 215-216, Figure 10). Both ends were open. Near the side of one of them was a low mound of earth flanked by a smaller depression. Nothing was found in the mound, but a number of artifacts were scattered over the original surface of the court.

As preserved in the American Museum of Natural History, the artifacts consist of 116 Capá sherds, a fragment of a griddle, a stone hammer, and a stone ball. The museum catalogue also lists 100 additional sherds and three stone celts, which the writer was unable to find (Rouse, 1941a: 287†). At the Museum of the American Indian, an end grinder of stone, two fragments of slender stone collars, and a miscellaneous worked piece of stone, all of which are marked simply "ballground near Jobo," may also be from Los Medinas.

Since all of the potsherds studied by the writer are of the Capá style and there are no European objects, the site can be dated in Period IVa. It is one of the few stylistically pure sites known from that period.

Pellejas (Orocovis 23). There is a pair of ball courts on land of Ezequiel Guterrez in Barrio Pellejas, of the municipality of Orocovis (folding map). Rainey and Morales Carrión dug test trenches across these courts in 1935, and they were surveyed by the writer in 1938 (Rainey, 1940: 99-100).‡

The two courts lie on a terrace about 30 meters below the top of a mountain. Both consist of rectangular depressions, one being lined with "embankments and rows of oblong stones along both sides and one end." The other "is marked by a low embankment on three sides; there are no stones" (Rainey, 1940: 99-100). Near the first court is a small mound of earth.

* See also Lovén (1935: 87, 93, 278, 281), Mason (1941: 210, 266), Rainey (1940: 114-115), and Rouse (1941a: 286-288).

† In place of "type C" in this discussion, read "Capá style."

‡ Read "Pellajas" in place of "Pelleja" in this report.

The only traces of refuse found in the site were about 500 small potsherds. As in the case of the site of Iledefonso, these sherds are now at the University of Porto Rico, where they have been unavailable to the writer. It is impossible to tell from Rainey's description whether they are of the Ostiones or Santa Elena style. In either case, the site would fall into Period IIIb, for there are said to be a number of examples of incision.

Conclusions

Although we dug more sites in the mountainous interior than in any other part of Porto Rico, we were unable to cover the area thoroughly. As indicated on the folding map, no sites worth excavating were discovered in the extreme western or eastern parts of the area. This is to be regretted, as it was in the west that the Indians survived longest, and we had hoped to locate a recent site there. In the east, the valley of the Río Grande de Loiza is the largest in the mountainous interior. A dense aboriginal population must have existed in this valley, particularly in the vicinity of the modern city of Caguas, but we were unable to find any traces of refuse there. It may be that most of the sites have been destroyed, for the valley is a center of the modern population.

In the rest of the interior, our efforts met with more success. None of the pits dates from Period I or Period IIa, but it is unlikely that the Indians penetrated the relatively inaccessible mountainous terrain until after that time. As shown in TABLE 4, Period IIb is represented at one site, Period IIIa at three, Period IIIb at six, Period IVa at eleven, and Period IVb at one.

Three sites are important stratigraphically. At Salto Arriba, Period IIb refuse was overlaid by Period IIIa material and the latter in turn by specimens dating from Period IVa (TABLE 4). Villón yielded specimens from Period IIIa beneath a deposit dating from Period IIIb. At Palo Hincado, refuse of Period IIIb lay beneath material from Period IVa, which in turn was under refuse from Period IVb. Surprisingly, however, the deepest site of Toita was unstratified.

Correlations with the historic sources are possible at Capá and Palo Hincado. The former is likely to have been the residence of chief Guarionex and the latter of Orocobix (FIGURE 2: 10, 11).

No foreign trade sherds were encountered in the mountainous interior, but the variety of local styles is greater than in the areas previously discussed. In fact, each of the Porto Rican styles is predominant in at least one of the pits excavated. Four different stylistic sequences can be distinguished, as follows:

	<i>West Central Part</i>	<i>East Central Part</i>	<i>Site of Villón</i>	<i>Site of Toita</i>
Period IVb:	Capá (?)	Capá	—	—
Period IVa:	Capá	Capá	Boca Chica	Esperanza (?)
Period IIIb:	Ostiones	Santa Elena	Santa Elena	Ostiones
Period IIIa:	Ostiones	—	Ostiones	Ostiones (?)
Period IIb:	Cuevas	—	—	Cuevas (?)
Period IIa:	—	—	—	—
Period I:	—	—	—	—

The first of these sequences, which is similar to that on the west coast, appears to be characteristic of the west central part of the interior, including particularly the sites in the drainage of the Río Grande de Arecibo. The

TABLE 4
CHRONOLOGY OF THE PITS IN THE MOUNTAINOUS INTERIOR

		<i>Callejones 1</i>	<i>Callejones 2</i>	<i>Capá 1</i>	<i>Capá 2</i>	<i>Cerro Huteo</i>	<i>La Toje 1-2</i>	<i>Le Vega</i>	<i>La Zama 1-2</i>	<i>La Zama 3</i>	<i>Palo Hincado</i>
Period IV	b	—	—	—	—	—	—	—	—	—	1
	a	1-2	1	1-2	—	1-2	—	—	1-2	1	2 3 (A1)
Period III	b	—	—	—	1-2	—	1-2	1-4	—	—	3 (A2, B1, B2)
	a	—	—	—	—	—	—	—	—	—	—

		<i>Pellejas</i>	<i>Quebrada Grande 1-2</i>	<i>Subana</i>	<i>Salto Arriba</i>	<i>Salto 1-2</i>	<i>Toita</i>	<i>Vegas Arriba</i>	<i>Villón 1</i>	<i>Villón 2</i>
Period IV	b	—	—	—	—	—	—	—	—	—
	a	—	1-2	1-3	1	1-2	—	1	1-2	—
Period III	b	—	—	—	—	—	1-10	—	—	1 (Y1, Y2 Z2)
	a	1-2	—	—	2 3 (A1, B1) 4 (A1)	—	—	—	—	1 (Z1) 2
Period II	b	—	—	—	3 (A2, B2) 4 (A2, B1, B2)	—	—	—	—	—
	a	—	—	—	—	—	—	—	—	—

Explanation of Table. The pits are listed across the top of this table and the periods along the side. The arabic numerals refer to the successive 25-centimeter levels in each pit; the letters and numbers in parentheses, to the horizontal sections within each level. (For clarification of the relationships between sections and levels, see TABLES 1 to 3.)

second sequence occurs in all except two of the sites in the east central part of the area, comprising the drainages of the Río Manatí and the Río de la Plata. The remaining sequences are present in the other two sites, both of which are on the southern edge of the area, where they have probably been subject to varying degrees of influence from the central and eastern parts of the south coast area. The entire Villón sequence is represented in the pits dug at that site. At Toita, however, the Ostiones style predomi-

nates throughout our pit, and we have had to infer the dominance of the Cuevas and the Esperanza styles in other sections of the site.

It is perhaps worth noting that both Salto Arriba and Toita, the only two sites of which the Cuevas style seems characteristic, are located in the largest river valleys in their respective parts of the area, the Río Grande de Arecibo and the Río de la Plata, where the original inhabitants of the interior are likely to have settled. With the possible exception of these two sites, occupation of the mountainous area of the interior seems to have been limited to the latter half of the time scale.

EXCAVATIONS ON THE SOUTH COAST

Setting

This is a long, narrow region, comprising all of the lowlands of the main island which drain into the Caribbean Sea (see folding map at end). It contains some 140 kilometers of shore line, together with the coastal plains and the lower half of the foothills, extending inland for an average distance of 10 kilometers. In size, its 1,400 square kilometers make it the third largest of our areas.

The southern edge of the area, along the Caribbean Sea, is relatively straight (folding map). Its northern boundary, on the other hand, has the shape of an arc. Beginning in the west on Cabo Rojo, this boundary swings gradually inwards along the line of the foothills to a maximum distance inland of 18 kilometers near Villaba and then, reversing itself, moves outwards until it reaches the shore at Cabo Mala Pascua just west of Maunabo.

The western third of the south-coast area, from Guánica almost to the city of Ponce, is plateau country, strongly dissected by the many small rivers which drain the southern slopes of the mountains. The rest of the area, from Ponce eastwards to the city of Guayama and beyond, consists of a single, great alluvial plain, merging gradually into the foothills of the north. It is the flattest part of the island, for there are no hills, swampy areas are few, and the small streams have had little effect upon the topography. The plain is extremely fertile, and today it is agriculturally the most productive part of the island. Along the coast, many small bays provide shelter for fishing.

The winds are an important factor in the environment of the south-coast area. Since they blow prevailingly from the northeast, they cross the mountains and precipitate their moisture before reaching the southern plains. The result is that the southern part of the island is dry, and most of its streams flow only intermittently. At present, irrigation is necessary for the growth of sugar cane in the area. This dryness must have been a handicap to the Indians, although in compensation it may have caused a thinning of the tropical forests. In addition, the direction of the winds make the south coast a lee shore, which the Indians probably found favorable for deep sea fishing.*

On the whole, the south-coast area was probably capable of supporting a large Indian population. Many sites have, in fact, been located in the area, particularly in the region around Santa Isabel and Salinas near the middle of the coastal plain (Lothrop, ms.: 12-13). As already noted, this region ranks with the hilly country in the southern part of the west-coast area as a center of Indian remains. Other sites are scattered throughout the rest of the area, usually along the courses of its many streams.

So far as is known, the south coast was entirely Taino at the time of historic contact. Agüeybana, the leading chief of the island, lived in the area. His village of Guaynia (Guaybaná) is said to have been located in the upper

* These data on the geography and topography of the mountainous interior were obtained from Lobeck, (1922), Ober (1899: 11-43), P.R.R.A. (1940: 314-324), and Roberts (1942).

part of the valley of the river of the same name (now called the Guayanilla, FIGURE 2: 14; Coll y Toste, 1907: 1, 96, 196, 197, 251, 252).^{*} The other chiefs of the island deferred to Agüeybana, but whether he had formal authority over them is now known. His own territory apparently included the entire western half of the south-coast area. In the east was another chief, Guamaní, whose name is still used for the river upon which he lived, near the present city of Guayama (FIGURE 2: 16; Coll y Toste, 1907: 1, 96, 244).

In view of the large number of sites in the central part of the south-coast area, it is surprising that no chief is known for that section. A chief called Abey (or Yavey) is mentioned in a document of 1519, but the location of his domain is not given. Since a tributary of the Río de la Lapa near Salinas in the central part of the south coast has the same name, we assume that Abey was chief of that area (FIGURE 2: 15; Torres de Mendoza, 1880, 34: 391, 443; Zayas y Alfonso, 1931, 1: 5).[†]

Columbus sailed along the south coast of Porto Rico during his second voyage, but he did not land, nor does he mention observing any Indian settlements (de Hostos, 1937: 118-120). The first landing was made by Ponce de León in the territory of chief Agüeybana on August 12, 1508 (Torres de Mendoza, 1880, 34: 483).[‡] He was received hospitably and, following the Indian custom, he exchanged names with Agüeybana and his relatives. As already noted, the chief took the Spaniards into the mountains and showed them the island's sources of gold. Then Ponce went back to Hispaniola to report to the Spanish officials, leaving some of his men in the care of Agüeybana. Upon his return, he stopped to pick up these men before going to found the settlement of Caparra on the north coast (Gomara, 1749: 34; Las Casas, 1927, 2: 291; Neumann Gandia, 1896: 169-170).

About this time, the village of Agüeybana was destroyed in a raid by the Carib. The chief himself died and was succeeded by his brother, Guaybaná, often called Agüeybana II. This man, with 300 of his followers, was assigned in the *repartimiento* of 1509 to Cristóbal de Sotomayor, who also took the chief's sister as his concubine (Morales Cabrera, 1932: 260; Zayas y Alfonso, 1931, 1: 17-19).[§] As already noted, Sotomayor settled first at Guánica. Leaving his Indians on a plantation there, he moved later to a site near Añasco where the mosquitos were less troublesome and more gold was available. At this place, he founded the town which bore his name. Simultaneously, Abey and Guamaní, the other chiefs in the south-coast area, became the property of Ponce de León, the latter subsequently being transferred by order of the king to Juan Cerón (Brau, 1907: 121-122; Zayas y Alfonso, 1931, 1: 5, 2: 32).

Guaybaná led the rebellion of 1511 against the system of *repartimientos*. The *arieto*, or ceremonial dance at which the Indians prepared for this rebellion, probably took place on the banks of the Río Coayuco (now the Yauco) within the chieftainship of Guaybaná. Sotomayor and several of

^{*} For another version of the location of this town, see Brau (1904: 35-37).

[†] Coll y Toste, whose version of the chieftainships we are otherwise following, does not mention this man.

[‡] For another version of the landing place, see Brau (1907: 106-107).

[§] For variations upon this account, see Bachiller y Morales (1883: 190-191) and Brau (1904: 27-28).

his companions passed near this place soon afterwards on their way from the farms at Guánica to the settlement near Añasco, and all but one of them were killed by Guayabaná and his followers (Castellanos, 1874: 55-56; Las Casas, 1927, 2: 323-325). Later, Ponce de León avenged their death by defeating more than 5,000 of the Indians in a second battle in the same valley of Coayuco, catching them by surprise just after they had celebrated another *arieto*. Guaybaná himself survived that defeat but he is believed to have died in the subsequent battle of Aymaco on the west coast (Herrera y Tordesillas, 1729, 1: 226; Oviedo y Valdés, 1851, 1: 479-480). It is said that he was assisted at the end by Carib from the Lesser Antilles (Castellanos, 1874: 58, 61-63).

It is not known whether Abey and Guamaní, the other chiefs in the south-coast area, also took part in the rebellion of 1511. The Spaniards established several plantations on the land of Guamaní near the present city of Guayama. Other farms grew up on the banks of the Río Guayanilla near Guánica, where Miguel del Toro, a lieutenant of Ponce, founded the town of San Germán in 1512 (Laet, 1630: 4; López de Velasco, 1894: 126, 129).*

Throughout the sixteenth century, the Spanish colonists suffered heavily from attacks by the Carib and by French pirates. The town of San Germán was plundered and burned several times, finally being moved in 1570 to its present, less exposed position in the southern part of the west-coast area. The attacks also caused the abandonment of the plantations near Guayama. Their inhabitants may have shifted to the vicinities of Coamo and Juana Díaz, for we hear of farms there in 1582. The town of Coamo itself dates back to 1580, but the other municipalities in the area did not develop until the eighteenth and nineteenth centuries (Latorre, 1919: 39, 41; P.R.R.A., 1940: 45, 316-323, 388; Zayas y Alfonso, 1931, 1: 204-205, 2: 16, 72, 301).

Archaeologically, the south-coast area has probably been more thoroughly surveyed than any other part of Porto Rico. The work of Montalvo Guenard and of Lothrop is particularly important in this respect. During the past three decades, the former has been to practically all of the sites of any importance in the area, and the latter also examined a large number of them, particularly around Salinas, Santa Isabel, and Guayama, during his three field trips in the years 1915 and 1916 (Montalvo Guenard, 1933: 383-389; Lothrop, ms.). Lesser surveys have been undertaken by Padre Nazario (1893: 137-139, 159-162) in the 1880's; by Fewkes (1907: 86-87) in 1904; by Britton (1930: 167), Mason (1941: 269-270), R. S. Prescott (Lothrop, ms.: 12), and Spinden (personal communication) in the 1910's; and by Rainey (1940: 112, 113) in 1934.

The first excavation in Porto Rico took place on the south coast about 1875, when a Dr. Souquet dug the larger part of a shell heap at the site of Cayito near Santa Isabel (Rainey, 1940: 112-113). Augustín Navarrete and Fewkes also made collections at this site, the latter's being now at the United States National Museum.

In 1915, Lothrop dug at the shell heap of Esperanza near Salinas and, in

* For another version of the founding of San Germán, see de Hostos (1938: 162).

1916, at La Florida southwest of Santa Isabel (Lothrop, ms.: 12-13; also his field catalogue at the Harvard Peabody Museum). His collections from these sites, which are now in the Harvard Peabody Museum, contain the most complete series extant of potsherds of the Santa Elena and Esperanza styles. They would be well worth detailed study and publication.

In 1916, Herbert J. Spinden (personal communication) excavated the site of Carmen in Salinas. The material obtained, which is also unpublished, is at the American Museum of Natural History in New York. Unlike the other early collections, it offers the possibility of chronological study, for Spinden dug according to level (although not according to section).

In 1923, Adolfo de Hostos (personal communication) dug in a ball court at Minas near Juana Díaz. The results of his work have not been published, nor have we been able to study the specimens, since they are in Porto Rico.

The only other known excavations in the south-coast area are those of Rainey at the sites of Cañas and Collores, which have already been discussed. It was at Cañas that Rainey, assisted by Montalvo Guenard, first obtained in stratigraphical sequence his Crab and Shell cultures, characterized by our Cuevas and Ostiones pottery (Rainey, 1940: 7-62*). The unpublished Collores material, also at the Yale Peabody Museum, has a similar composition.

The present writer made a survey of the sites in the south-coast area during 1936-38 and excavated nine test pits in eight of the sites. Together with four pits dug by Rainey in the sites of Cañas and Collores, these are discussed in the following pages.

Abra (Guánica I)

There is a village site in front of the cemetery of the town of Guánica (see folding map at end). This site, which is variously known as "Abra," "El Cementerio," and "Los Indios," is on land belonging to the municipality of Guánica in the barrio of Cañas, 1.4 kilometers northwest of the town of Guánica. Montalvo Guenard (1933: 388) and Rainey (field notes in the Yale Peabody Museum) had previously collected specimens there. The writer surveyed the site on August 7, 1937, and excavated a test pit on the 20th and 21st of that month.

The site is situated at the base of the Peñon de Abra, a steep rocky hill just back of the Bahía de Guánica (folding map). On the landward side of the hill, it overlooks the Cañon de los Negros, the stream which connects the Laguna de Guánica with the bay. This is a strategic and unusually favorable location, for not only is the Bahía de Guánica the most completely landlocked bay in Porto Rico but also the Laguna de Guánica lies at the eastern end of the valley of the Río Boquerón, providing easy access to the cluster of sites in the southern part of the west-coast area (folding map). Although relatively dry, this region is enormously fertile and is today occupied by the largest sugar company in Porto Rico.

The site consists of five shell middens varying in height from 1.0 to 1.5 meters (FIGURE 11). Three of these middens lie in a row part of the way

* In this report, read "Cañas" in place of "Canas."

up the gradual slope at the base of the hill, and the other two are at the bottom of the slope. The midden directly in front of the cemetery bears

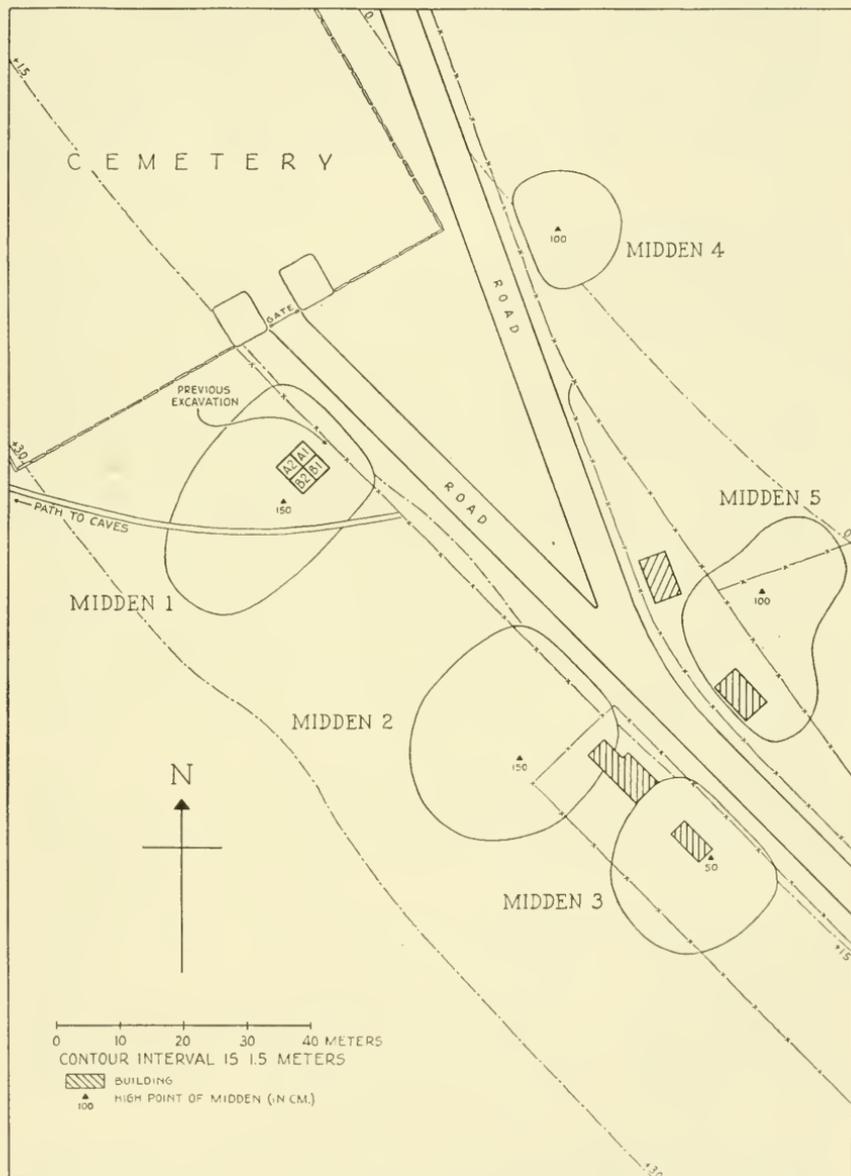


FIGURE 11. Plan of the site of Abra.

traces of excavation by a previous investigator. In addition, all five of the middens have been partially cut by the roads in front of the cemetery, revealing concentrated deposits of shells, ash, bones, and potsherds varying

in depth from 1.0 to 1.5 meters. An area of several acres around the midden is also covered with a scattering of refuse.

The deepest midden, in which there were the traces of previous work, was chosen for excavation. An area four meters square and divided into four two-meter square sections, was staked out on the undisturbed part of this midden and six 25-centimeter levels were dug. They revealed a homogeneous deposit composed of finely textured brown loam, ash and charcoal, many shells, and moderate amounts of bones and artifacts. The loam gave way at a depth of 125 to 135 centimeters to brown clay, only the top 10 centimeters of which contained refuse. There were many large stones in the clay beneath the refuse.

Scattered human bones were found in several parts of the excavation. These include an adult's long bone in level 1, section B2; the ribs of a baby, together with an adult's clavicle and scapula, in level 4, section A1; and a baby's ribs, fragments of its skull, and parts of its leg bones in sections A1 and A2 of level 5. The positions of the latter were typical. They were irregularly distributed over an area three meters in diameter.

In addition, one regular burial was encountered at the very bottom of the shell deposit in section B1. Examination of the wall of the trench at this point revealed that the sterile clay beneath the deposit had been removed to a depth of 14 centimeters in preparation for the burial. Since only the edge of it came within the area of our pit, it was left undisturbed. The arrangement of the bones is not known.

Potsherds of the Ostiones style predominate in all sections and levels at Abra, and also in the surface collection made by Rainey. There are 1,548 of them, as compared with 6 Cuevas sherds and 1 Santa Elena, the only other styles represented. Consequently all the material from the site will be treated as a unit.

Typologically, 421 of the sherds are from open bowls, 550 are from constricted bowls, one is a fragment of a miniature bowl, 20 come from jars, and 574 cannot be identified. The associated artifacts include 53 pieces of griddles, two clay disks, a stone celt, five hammers of stone, a stone polisher, eleven stone chips, an anvil-grinder of bone, two bone awls, three bone picks, the bit of a plain bone spatula, half of a plain bone tube, a miscellaneous piece of worked bone, three fragmentary celts of shell, a piece of a celt-blank, a part of a lip-hammer of shell, a flat shell pendant, a miscellaneous piece of worked shell, four *Strombus* shell lips, two *Cassis* shell plates, four *Strombus* shell plates, seven plain shell tips, 35 fractured shell tips, four coral rasps, and 64 other pieces of coral. In addition to humans, bird, crab, fish, hutia, manatee, and turtle are represented among the bones. The shells include land and marine gastropods and marine pelecypods.

Incision is rare at this site. There are only two possible examples in level 1, one in level 2, and one in level 4. This suggests that our pit dates from the first half of Period III, when the absence of incision was characteristic of the Ostiones style. The Cuevas sherds may be survivals from an earlier period, and the Santa Elena specimen, a trade object.

Buenos Aires (Coamo 3)

There is a large village site at the southern edge of the present town of Coamo (see folding map at end). The name of this site is Buenos Aires and it is in Barrio Palmarejo of the municipality of Coamo. Montalvo Guenard (personal communication) has collected numerous potsherds and stone celts here, and he reports that a skeleton was encountered during street repairs in 1936. It was in his company that the writer first visited the site on July 10, 1938. Two test pits were dug later, on August 12 of the same year.

The site of Buenos Aires occupies the southeastern corner of a broad plateau, which is elevated some 10 meters above the Río de Coamo. The northern third of the site is within the town but the rest of it consisted, at the time of the writer's visit, of a plowed field. The site comprises a single continuous deposit covering an area of some four acres to a depth of 75 centimeters.

Examination of the surface of the site suggested an arbitrary division of the deposit into three parts: (1) the northern third, which is within the town of Coamo; (2) the central section, occupying the northern half of the field outside the town itself; and (3) the southern third, which comprises the other half of the plowed field. It will be convenient to discuss the surface finds and the excavated material in terms of these three divisions.

Northern Section. This is the part of the site in which, according to Montalvo Guenard, a burial had been encountered. Shells were numerous here, and many potsherds were also observed on top of the brown, loamy soil, particularly in the streets. The sherds were predominantly thick, red, and unpainted. They were so fragmentary that no other attributes could be distinguished. The inhabitants offered for sale two bat-head lugs said to have been found in this part of the site, one of which seemed to be Ostiones in style and the other Lesser Antillean. We purchased these, and also secured a part of a stone adze, ten stone celts, three celt-hammers of stone, and a stone hammer, all of which were also said to have been found within the limits of the town. No excavation was possible in this part of the site because it was so well built up.

Central Section. As we moved southwards beyond the limits of the town, shells became less common, but there were still an appreciable number in the central part of the site. Sherds were also common. They appeared to be thinner and better made than within the town. We collected two examples of the Ostiones style, both of them from open bowls. In addition, we picked up from the surface of this part of the site a fragment of a stone adze, a chipped stone ax, three celts of stone, two celt-hammers, a stone cylinder, and two celts of shell.

A pit four meters square and divided into four two-meter square sections was staked out in this part of the site and was dug through three 25-centimeter levels. The first two layers contained a deposit like that observed on the surface, with the addition of ash and a few animal bones. At a depth of 30 centimeters, the ash and shells began to decrease in frequency; below

50 centimeters, they were completely absent. Bones and artifacts continued to appear for 10 centimeters more, and then the light brown loam became completely sterile.

The entire collection from Pit 1 can be grouped within a single Ostiones division, for that style was predominant everywhere. We obtained 797 examples, in addition to 5 sherds of the Cuevas style which were limited to the bottom level, and 13 of the Santa Elena, all of which are from the top level. One hundred and fifty-three of these potsherds are from open bowls, 344 are from constricted bowls, eight are fragments of jars, and 311 are typologically unidentifiable. The associated artifacts include 21 pieces of griddles, a clay earplug, a disk of clay, a fragment of a celt or some other highly polished stone artifact, a stone chip, two quartz crystals, a shell saucer, three shell celts, one shell chisel, a fragmentary chisel-blank of shell, two miscellaneous pieces of worked shell, two shell nodes, a water-worn shell fragment, a coral rasp, two other pieces of coral, and eight Spanish potsherds (which are probably intrusive). Bird, crab, fish, hutia, man, manatee, and turtle are represented among the animal bones, and land gastropods, marine gastropods, and marine pelecypods among the shells.

Pit 1, if not the entire central section of the site, can be assigned to Period III. Since there are only three examples of incision, and two of these are doubtful, the pit probably falls in the first half of the period. The limitation of the Cuevas style to the bottom level and of the Santa Elena style to the top level suggests a trend from the former towards the latter within the area of our pit—a suggestion which is consistent with the Ostiones-Santa Elena sequence already described for the site of Villón further up the drainage of the Río de Coamo. The existence of many sea shells at both Buenos Aires and Villón is another indication of relationship between the two sites. As already noted, these were probably brought from Cayito at the mouth of the Río de Coamo (folding map).

Southern Section. Shells were rarer in the southern half of the field outside the town, and, in general, the sherds seemed to be thinner and better made. In this part of the site, we picked up 16 pieces of Cuevas pottery and another which seemed to be Lesser Antillean in style. One of the former was decorated with white paint. Seven of these sherds are from open bowls, two are from constricted bowls, one is from a jar, and seven are typologically unidentifiable. In addition, we collected from the surface two fragmentary stone adzes, part of a stone chisel, and a sherd of Spanish pottery.

A second pit, having the same dimensions as the first, was excavated near the center of this part of the site. The brown loam encountered here was not tinged with ash as in Pit 1, nor were there as many shells. Bones and artifacts, however, were relatively common. The shells ceased to appear at a depth of 50 centimeters, but the bones and artifacts continued to 70 centimeters, below which the loam was sterile.

As shown in TABLE 5, Pit 2 is divisible stylistically into two parts, Ostiones pottery being predominant in level 1 and in section C1 of level 2, while Cuevas pottery is characteristic of the rest of the pit. As in Pit 1, potsherds of the Santa Elena style are also present. They are limited to the top level, however, and therefore fall entirely within the Ostiones division.

From a typological standpoint, 88 of the sherds in the Cuevas division are from open bowls, 43 are from constricted bowls, four are from jars, and 76 are unidentifiable. Nine fragments of griddles were the only other artifacts obtained from this division. Bird, crab, fish, hutia, man, and turtle have been identified among the animal bones, and land gastropods and land and marine pelecypods among the shells.

The collection from the Ostiones division includes 136 potsherds from open bowls, 148 from constricted bowls, eight from jars, and 200 which are typologically unidentifiable. These are accompanied by seven pieces of griddles, a stone chip, a fragment of a shell celt and another of a chisel of shell, a *Strombus* shell lip, a shell node, three fractured shell tips, a coral rasp, three other pieces of coral, and a fragment of glass. Crab, fish, hutia, and turtle are represented among the bones, and land gastropods and land and marine pelecypods among the shells. The crab remains were less common in this division than in the Cuevas. In fact, they showed a steady decrease in frequency from the top to the bottom of the site.

TABLE 5

DISTRIBUTION OF CUEVAS, OSTIONES, AND SANTA ELENA SHERDS IN PIT 2 AT BUENOS AIRES

	<i>C1</i>	<i>C2</i>	<i>D1</i>	<i>D2</i>	
1	9-112-1	5-68-6	10-79-4	20-80-4	Ostiones division
2	33-61-0	17-13-0	67-5-0	56-0-0	Cuevas division
3	8-1-0	8-1-0	18-0-0	17-0-0	

Explanation of Table. The vertical columns represent sections; the horizontal lines, levels. The number of potsherds of the Cuevas, Ostiones, and Santa Elena styles are given in succession. The line marks the boundary between the Cuevas and Ostiones divisions.

The Cuevas division of Pit 2 apparently dates from the second half of Period II, for white painting is absent, and the Ostiones division from Period IIIa, since incision, too, is lacking. This provides a continuous sequence. As in Pit 1, the presence of Santa Elena pottery in the top level suggests the beginning of a trend towards that style.

General. We have seen that Pit 2, in the southern part of the site, dates from Periods IIb and IIIa, and that Pit 1, in the central section, can also be assigned to Period IIIa. No pit having been dug in the northern part of the site, that area cannot be dated. The tendency, however, seems to have been for the inhabitants of the site to move from south to north, and therefore it is likely that the northern section was the most recent, dating from Period IIIb or possibly even Period IVa. The thickness and lack of paint on the specimens observed in that area are both attributes of Santa Elena pottery. Moreover, as we have seen, there is some stratigraphical evidence of a trend in that direction. A change in the northern part of the site from the Ostiones to the Santa Elena style, as at Villón, is therefore within the bounds of possibility.

Cañas (Ponce 2)

Cañas is the principal site excavated by Rainey and the place where he discovered his Crab-Shell sequence (Rainey, 1935: 12-13 and 1940: 7-62*). It lies on the east bank of the Río Cañas just above its fork with the Río Pastillas, and forms part of Colonia Miramar of the Guánica Central in Barrio Cañas of the municipality of Ponce (see folding map at end). The Caribbean Sea is three kilometers to the south, and the city of Ponce is two kilometers to the east.

The existence of the site has been known for some time. Lothrop (ms.: 10) collected a stone edge-grinder there. As already noted, Montalvo Guenard (1935: 90) obtained there the first sherds of white-on-red pottery (our Cuevas style) found in Porto Rico. He assisted Rainey in his excavation and was also present at the time of the writer's survey on September 15, 1936 (Rouse, 1937: 181, 184, 185).

The site, covering several acres of the fertile coastal plain, is cut in two by a dirt road. To the east of this road, in a cane field which was under cultivation at the time of the present writer's visit, the ground is strewn with a shallow deposit of refuse. To the west, in an unplowed stretch of land between the road and the Río Cañas, a number of large shell middens lie in the midst of another shallow deposit of refuse. As at Buenos Aires, it will be convenient to discuss these two parts of the site separately.

Eastern Section. According to Rainey, this section of the site is known as the "sitio de caracoles" or "place of shells." For many years, people have been taking "objects of prehistoric manufacture from this field as each year of cultivation uncovered more of the refuse deposit. At the present time, marine shells are scattered over an area of several acres. In sections where the shells are thickest, low mounds can be seen, suggesting that the refuse was originally deposited in mounds of considerable size which have been reduced and leveled off during the last four centuries of constant cultivation" (Rainey, 1940: 7).

The refuse in this part of the site consists "essentially of marine shells and potsherds," with the addition of a few artifacts of other kinds (Rainey, 1940: 7). It was here that Montalvo Guenard made the original discovery of potsherds of the Cuevas style. Both Rainey and the writer have also collected from this part of the site. Unfortunately, Rainey failed to distinguish in the cataloguing of his material between the specimens known to have been collected here and those without a definite allocation. As a result, it seems advisable to treat his collection separately from the writer's specimens, all of which were personally found in the eastern section of the site.

Rainey's collection includes 15 sherds of the Cuevas style, nine of the Ostiones, and one which appears to be Lesser Antillean. Nine of these specimens are from open bowls, four are from constricted bowls, and 12 are typologically unidentifiable. They are accompanied by two broken stone adzes, three fragmentary celts of stone, three celt-hammers of stone, a stone hammer, two shell celts, four celt-blanks of shell, a shell pendant-tinkler, a miscellaneous piece of worked shell, and two water-worn fragments of shell.

* In place of "Canas" in these reports, read "Cañas" (Gannett, 1901: 20).

The writer obtained 15 sherds of the Cuevas style and one of the Ostiones, ten of them from open bowls, one from a constricted bowl, and five from unidentifiable vessels. A fragment of a stone adze and a celt-hammer of stone complete this collection. There are no bones in either collection, nor did the writer observe any in the freshly plowed soil, despite the fact that he was particularly looking for crab remains.

It will be apparent that, despite the difference in the method of collection, the specimens obtained by Rainey and by the writer are essentially similar. In both cases, Cuevas pottery predominates, and in both cases it is white painted, there being four such sherds in each collection. These facts suggest that the eastern section of the site, or at least a part of it, dates from Period IIa.

This is a surprising conclusion, for the eastern part of the site is a shell deposit and Rainey categorically disassociates his Crab culture (marked by our Cuevas pottery of Period II) from the remains of shells. Rainey does not discuss the collection from the eastern part of the site in his publications,* and he fails to provide an explanation for this association of Cuevas pottery with shells. A possible reason is that the potsherds have become mixed through plowing with the shells of a later deposit. This does not seem likely, however, for it should be accompanied by a greater amount of Ostiones pottery than is indicated by our collection. In the opinion of the writer, the shells were deposited in this part of the site at the same time as the Cuevas potsherds.

Western Section: General. Both Rainey and the writer found the half of the site west of the road overgrown with brush and trees, which made it difficult to observe the number and location of the middens. Both of us, therefore, confined our observations to the largest group of middens, which is shown on the map (FIGURE 12). These are four in number, arranged in the form of an "L," and they seem to constitute a unit, since they are connected by lesser deposits. The largest of them, Midden A, lies on the bank of the river and has been partially cut away by the water. It has a height of two meters, while the other middens vary from 1.0 to 2.5 meters. On the surface, all of them consist of brown loam containing large numbers of marine shells and potsherds of the Ostiones style.

Neither Rainey nor the writer collected any specimens from the surface of this part of the site. Rainey's surface collection, however, includes one specimen from a test excavation in Midden B which is perhaps worth mentioning because it was not published by him. It is a bar-shaped pendant of stone.

Except for test trenches in Middens B and C, from which we possess no material except the pendant, Rainey's digging was entirely confined to Midden A, where two large excavations were made (FIGURE 12). Excavation 1, situated in the northeastern half of the midden, consisted of 58 sections two meters square and varying from 25 to 225 centimeters in depth. It yielded a homogeneous deposit of "sand, blackened earth, ash, charcoal, and bone refuse" mixed with marine shells, potsherds of the Ostiones style, and other

* Unless a reference to "Red and white painted sherds . . . found along an irrigation ditch in a field about .5 kilometers from mound A" applies to this part of the site (Rainey, 1940: 14).

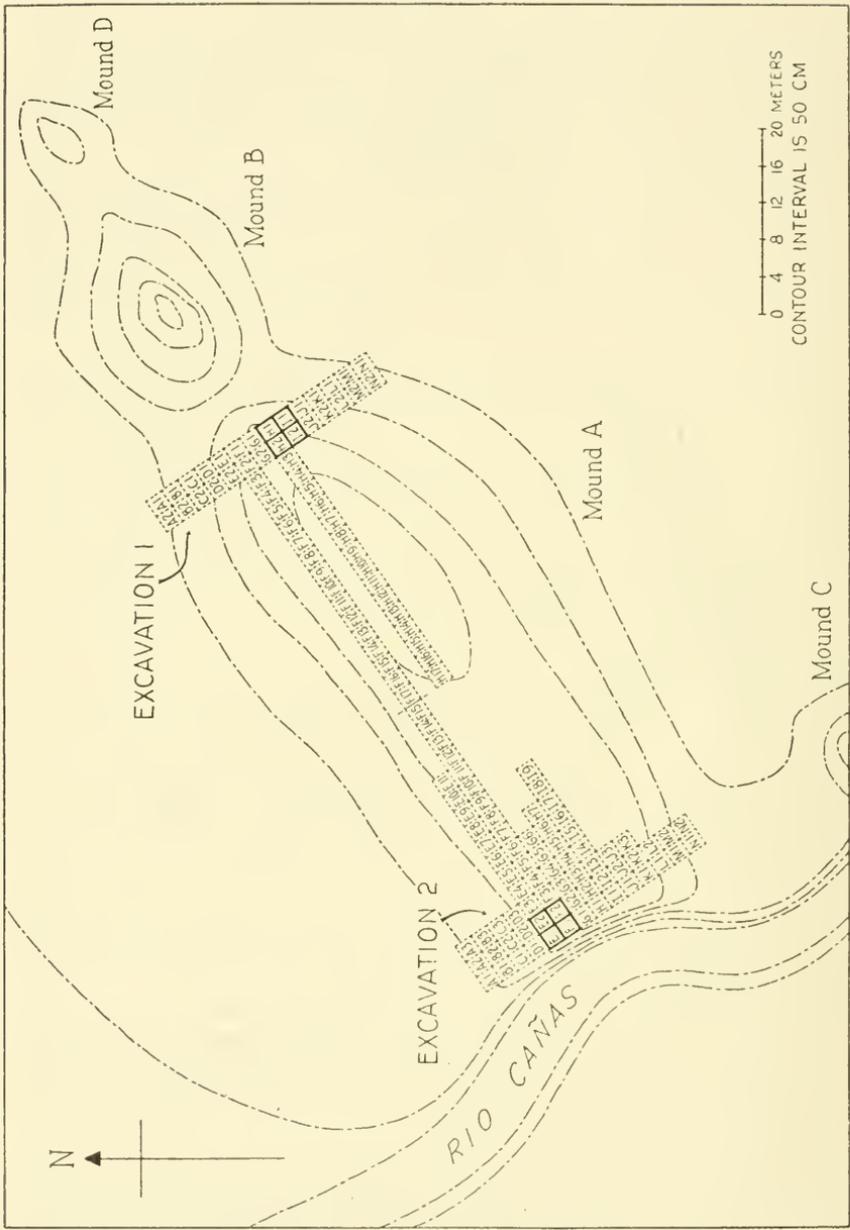


FIGURE 12. Plan of the site of Cañas (after Rainey).

artifacts. "Near the surface, usually to a depth of approximately 25 centimeters, there was a greater amount of humus, and the shells were broken into smaller pieces, but below this most shells were intact and the soil intermixed was loose and powdery. . . . In limited sections there were concentrations of one or two types of marine shells, earth, or ash and charcoal, but no well-defined strata and no distinct fire pits or hearths." In the western half of the excavation, however, the upper levels of the deposit contained primarily large marine shells and the lower levels were characterized by small marine shells. No other differences were noted between these two groups of levels (Rainey, 1940: 8-11, field notes in the Yale Peabody Museum).

Excavation 2 was situated alongside the river in the southwestern half of Midden A (FIGURE 12). It consisted of 72 sections and was dug to a maximum depth of nine 25-centimeter levels. In its upper levels, it comprised an extension of the deposit encountered in Excavation 1: marine shells, loose sandy soil tinted grey with ash, charcoal, bones, potsherds of the *Ostiones* style, and other artifacts. In the lower levels, however, the shells were replaced by crab remains and the *Ostiones* pottery by sherds of the *Cuevas* style. In addition, the lower stratum was more tightly packed, the soil was yellow rather than grey, there were smaller amounts of ash and charcoal, and the associated artifacts also differed in several respects. Only in animal bones were the two deposits completely identical (Rainey, 1935: 12-13 and 1940: 11-12).

In the southwestern half of Midden A, then, the same shell layer which had occurred alone in the northeastern part of the midden was underlaid by a crab stratum. The latter was sharply distinct and it showed no mixture with the former. In fact, the crab stratum is said to have been sterile at its top. Rainey tells us that it varied in thickness from 40 to 60 centimeters (the shell layer had a maximum depth of 200 centimeters), and he provides a cross section through the two of them (Rainey, 1940: 13). Unfortunately, this section is not detailed enough to reveal the shape of the line of juncture between the two strata. It cannot be determined, for example, whether the crab stratum consisted of one or of several smaller middens within the larger accumulation, and whether it had been eroded with gulleys, as at the site of Las Cucharas in the west-coast area. We can conclude only that the crab stratum was deposited before the shell, and that it was much less extensive.

The only structural remains encountered in Midden A were a series of possible post holes in the shell refuse of Excavation 1 and a similar hole in the crab stratum of Excavation 2. According to Rainey, the former consisted of "cylindrical cavities approximately the size of fence post holes. . . . No alignment of such cavities was found which might have indicated the size and shape of house structures. One of the cavities, globular in shape and 75 centimeters in depth, may indicate a disintegrated storage basket" (Rainey, 1940: 10, 12, 190).

Seventeen burials were found in the shell refuse of Midden A, and seven in the crab stratum. None was associated with mortuary objects. In regard to the burials in the shell layer, Rainey notes that "Some of the bones

probably represent secondary burial of skeletons after the flesh had been removed while others are certainly primary burials of the entire body. In most of these primary burials the bones were interred in a flexed position either on the left side, the right side, or upon the back. At least one, however, was placed on the back in an extended position, and some may have been deposited in a sitting posture." As for the burials in the crab stratum, it was possible in only three cases to determine their nature "but in these cases it was clear [that the interments were primary and] that the bodies had been placed in an extended position, two lying on the face and one lying on the back" (Rainey, 1940: 10, 12, 190).

Two groups of four sections, one in Excavation 1 and the other in Excavation 2, were chosen by the present writer for detailed study (FIGURE 12). While not in the highest parts of the midden, these groups of sections are the ones best represented in the collections now at the Yale Peabody Museum.* They will be called, respectively, "Pit 1" and "Pit 2."

Western Section: Pit 1. The first pit, consisting of sections H1, H2, I1, and I2, was situated at the northeastern end of Midden A (FIGURE 12). Its depth was apparently 175 centimeters. It contained a homogeneous deposit of shell refuse, as well as two child burials, about which it is known only that one was primary (Rainey, 1940: 190).

The collection at the Yale Peabody Museum includes 233 potsherds from Pit 1, all but four of which conform to the Ostiones style. Of these four sherds, three are Cuevas and come from the bottom two levels, while the other is Santa Elena and was found in the second level from the top. Typologically, 53 of the sherds are from open bowls, 127 are from constricted bowls, two are fragments of jars, and 58 cannot be identified. They are accompanied by 15 pieces of griddles, a hammer of stone, a stone polisher, two possible fragments of bone picks, half of a shell celt, two chisel-blanks of shell, and two *Cassis* lips. There are no unworked bones or shells in the collection.

It will be apparent that Pit 1 falls entirely within Period III. Both halves of the period are represented, IIIa by levels 2-7, from which there are only two incised sherds (they occur in levels 2 and 3, respectively) and Period IIIb, by level 1, which has yielded three examples of incision. The Cuevas sherds obtained in the lower half of this pit may have survived from Period II. The Santa Elena specimen is probably a trade object.

Western Section: Pit 2. The second pit, comprising sections E1, E2, F1, and F2, was situated on the bank of the Río Cañas at the southwestern end of Midden A. It had been dug through both the shell and the crab layers to a depth of 150 centimeters. No burials were encountered in this pit.

TABLE 6 gives the distribution according to style of the potsherds from Pit 2 which were available for study. It will be noted that the pit is divisible into two parts, levels 1 and 2 and sections E2 and F2 of level 3 forming an Ostiones division, while the rest of the pit constitutes a Cuevas division.

* As already noted, Rainey brought to the United States only the better potsherds from Cañas, leaving the majority of the specimens at the University of Puerto Rico for deposition in the anthropological museum planned for that university. Apparently as a result, many of the units of section and level are not represented in the Yale collection.

Presumably, these two divisions coincide respectively with the shell and crab strata.

In the collection from the Cuevas division, 32 of the sherds are from open bowls, five are from constricted bowls, and eight are typologically unidentifiable. The associated artifacts include three fragments of griddles, an unworked nodule of flint, a chisel-blank of shell, and a piece of coral. Bird, crab, fish, hutia, and turtle are also represented.

The Ostiones division has yielded 20 sherds from open bowls, 37 from constricted bowls, four from jars, and 17 which are typologically unidentifiable. In addition, there are three fragments of griddles, part of a possible ax-hammer of stone, a stone celt, a shell celt, parts of two celt-blanks of shell, a broken shell chisel-blank, a lip-hammer of shell, and a *Strombus* lip. No unworked bones or shells are included in the collection from this division.

The Cuevas division can be assigned to Period IIa, for six of the sherds are white painted, and the Ostiones division to Period IIIb, for there are

TABLE 6
DISTRIBUTION OF CUEVAS AND OSTIONES POTSDHERDS IN PIT 2 AT CAÑAS

	E1	E2	F1	F2	
1	0-5	0-1	0-12	0-4	Ostiones division
2	0-8	3-9	2-7	0-19	
3	4-2	1-2	6-5	0-4	Cuevas division
4	0-0	5-0	3-0	7-0	
5	1-0	1-0	5-0	3-0	
6	0-0	0-0	0-0	3-0	

Explanation of Table. The vertical columns represent sections; the horizontal lines levels. The number of potsherds of the Cuevas and Ostiones styles are given in succession. The line marks the boundary between the Cuevas and Ostiones divisions.

seven examples of incision. This leaves a gap corresponding to Periods IIB and IIIa, during which the sterile soil at the top of the crab stratum may have accumulated. Presumably, the presence of Ostiones sherds in the Cuevas stratum, and *vice versa*, is due to the failure of Rainey's artificial levels to coincide exactly with the crab-shell stratigraphy. It must be noted, however, that three Cuevas sherds were found in the level of section E2 above the one in which the dividing line between the crab and shell layers probably fell (TABLE 6). Whether these sherds represent a survival from Period II, or are the result of a narrow upward projection of the crab stratum into the shell, cannot be determined.

General. In a previous publication (Rouse, 1937: 185), the writer suggested that the half of the site of Cañas along the river was the first to be settled, that the inhabitants subsequently moved east to the part of the site now on the opposite side of the road, and that they finally returned to the western section where the middens are situated. The datings reached in the present paper do not entirely support this hypothesis. As we have seen, both the lower stratum in Pit 2 and the deposit on the other side of the road probably date from Period IIa, the lower part of Pit 1 from Period IIIa, and

the upper levels in Pits 1 and 2 from Period IIIb. Deposits from Period IIb, however, are lacking. In other words, a widespread early occupation seems to have been followed by a period during which the parts of the site excavated by us were not in use and, later still, by a more limited occupation.

There are several ways of explaining the absence from our collections of material dating from Period IIb. Rainey (1940:60-61, 107-109, 182-183) suggests that Porto Rico was uninhabited during this time, which lies between the supposed periods of migration of his Crab and Shell people from South America. This hypothesis must be discarded, however, for many deposits dating from Period IIb have now been identified, one of the best being at the site of Collores dug by Rainey himself but not studied by him. A more likely explanation is that the inhabitants moved to a neighboring site during the intervening period. Alternatively, they may have remained at Cañas, depositing their refuse on another midden, as seems to have been done at the site of Monserrate on the north coast. Further excavation is needed at Cañas and in the vicinity to test these two possibilities.

Carmen (Salinas 1)

The most important site in the municipality of Salinas, "if not in Porto Rico," is that of Esperanza, which was dug by Lothrop (ms.:12) in 1915. The writer had intended to excavate at Esperanza but, because it was planted in sugar cane, he was unable to obtain permission. The site of Carmen, some five kilometers to the west, was chosen as a substitute.

Carmen lies on the east bank of the Río Salinas, about 300 meters from the point where that river flows into the Bahía de Rincón (see folding map at end). It forms part of Colonia Carmen of the Central Aguirre Sugar Company and is in Barrio Aguirre of the municipality of Salinas. The town of Salinas is one kilometer to the northeast.

The nature of the previous work at the site is obscured by an error of Fewkes, who (as explained below, p. 530) placed the site of Cayito in the municipality of Salinas rather than Santa Isabel (Fewkes, 1907:86). Since Carmen occupies roughly the same position in respect to Salinas that Cayito does to Santa Isabel, Lothrop (ms.:12) hesitantly concluded that the two were the same, and attributed the work at Cayito to Carmen. It has been necessary, therefore, to eliminate Lothrop's data concerning Cayito from the following discussion.

Fewkes himself apparently never visited Carmen, but in 1904 he purchased a small collection there, consisting largely of Ostiones potsherds (Fewkes, 1904:172 and 1907:117, 119, 183, Plate 77). In 1915-16, Lothrop obtained at the site additional material characterized by the Ostiones and Santa Elena styles (Lothrop, ms.:12). In 1916, too, Spinden dug at Carmen, obtaining a mixture of Ostiones and Santa Elena sherds in his upper levels but only Ostiones specimens in the lower part of the excavation.* The writer surveyed the site and excavated a test pit on September 17-18, 1936 (Rouse, 1937:184).

* The above statements are based upon a cursory survey of Spinden's collection, which is now in the American Museum of Natural History. See also Rainey (1940:113), where it is erroneously stated that Spinden worked at La Florida in Santa Isabel instead of at Carmen.

The Carmen deposit, consisting of shell refuse, covers several acres of the coastal plain on the east bank of the Río Salinas. Originally, there were probably several middens, but successive plowings have reduced these until, at the time of the writer's visit, only a single shell heap, which was apparently too steep to be plowed, lay in the midst of the sugar cane. Measuring some 80 meters long, only six meters wide, and 1.5 meters high, this heap had been badly pitted by previous investigators, and it was difficult to find a place to dig.

Four sections two meters square were eventually staked out on the northern end of the heap, where the refuse seemed to be the least disturbed, and these sections were dug through seven 25-centimeter levels. For the first three levels, the deposit was similar to that on the surface, consisting of dark brown loam, ash, shells, bones, and broken artifacts. In the fourth level, the soil became light brown and sandy, the shells decreased in number, and there seemed to be more remains of crab. The other artifacts, however, continued as before, until sterile soil, consisting of the same sandy loam, was reached at an average depth of 140 centimeters.

A human skull cap and several long bones were encountered in level 3. These were in a group, and it is assumed that they constituted a secondary burial. No artifacts were found in association with them.

Ostiones potsherds, of which there are 1,370 examples, predominated in all sections and levels at Carmen. Ten Cuevas sherds, 68 Santa Elena, and one Esperanza were also obtained. The Cuevas specimens occurred in all levels except one, but the Santa Elena specimens were limited to the top two levels, there being 3 in level 2 and 65 in level 1. The Esperanza sherd was also found in the top level.

Typologically, 506 of the sherds are from open bowls, 558 are from constricted bowls, one is a miniature bowl, 21 are fragments of jars, and 350 are from unidentifiable vessels. We also obtained 56 pieces of griddles, two clay disks, a stone hammer, five bone picks, a point of bone, a miscellaneous worked piece of bone, a dish-blank of shell, a shell saucer, a shell celt, two celt-blanks of shell, two chisel-blanks of shell, a shell disk, a blunted clam shell, three *Cassis* lips, two *Strombus* lips, a fractured shell tip, a water-worn piece of shell, and 47 coral fragments. Bones were unusually plentiful at this site. They include bird, crab, fish, hutia, manatee, and turtle. Marine gastropods and pelecypods are represented among the shells.

The writer purchased a small collection of pottery lugs at Carmen, which may be considered in connection with the specimens previously obtained by Fewkes and Lothrop, since all three are poorly allocated. Altogether, the three collections contain two Cuevas, 28 Ostiones, 11 Santa Elena, and two Boca Chica sherds, as well as a complete vessel of the Esperanza style and a possible trade sherd from the Lesser Antilles. A stone celt, a stone hammer, a stone polisher, three large stone three-pointers, and a flat shell pendant are also included, although it is not certain whether the three-pointers are from the site itself or from its vicinity.

It will be apparent that there is a close correspondence between the material excavated and purchased by us and that obtained by the previous

workers, both of which indicate that Carmen was inhabited during Period III and that it contains a trend from the Ostiones towards the Santa Elena style. So far as our pit is concerned, it may be suggested that the bottom four levels, none of which has yielded more than two examples of incision, date from Period IIIa and that the top two levels, which contain, respectively, three and eleven incised sherds, were deposited during Period IIIb. The Cuevas specimens probably constitute a survival from Period II, and the Esperanza sherd may have been plowed in from a later part of the site.

Cayito (Santa Isabel 1)

On Punta Cayito, two kilometers west southwest of the town of Santa Isabel, is a large shell deposit (see folding map at end). Lying largely on public domain, this site is at the western end of the Playa of Santa Isabel and a short distance east of the mouth of the Río Coamo. The name of its barrio is Playa, and its municipality is Santa Isabel.

The nature of the previous work at this site is again obscured by Fewkes's error in locating Cayito in the municipality of Salinas rather than Santa Isabel, thereby making it appear that Carmen and Cayito are the same site (Fewkes, 1907: 86-87; Lothrop, ms.: 12). No place name of Cayito has come to light in Salinas. Moreover, the site of Cayito, as described by Fewkes, is on the shore and is partially covered with houses, conditions which are present at the site under discussion, but not, as we have seen, at Carmen in Salinas. Finally, the potsherds collected by Fewkes at Cayito and deposited by him in the United States National Museum, are predominantly of the Boca Chica style, which is characteristic of the present site but has never been found, so far as is known, at Carmen. For these reasons, and in spite of the fact that Fewkes, having visited Cayito, was in a position to locate it accurately, we shall attribute his remarks to the present site.*

According to Fewkes (1907: 86), Dr. Souquet was the first to work at Cayito, excavating "the larger part" of the shell deposit about 1875 and obtaining 600 pottery lugs, which he carried to Europe. The place was again visited in the 1890's by Augustin Navarette and Zeno Gandia, who collected potsherds from the shell heap and found parts of a human skeleton in the vicinity. Fewkes (1907: 86) was at the site in 1904, and he also obtained sherds which, as we have seen, are largely of the Boca Chica style. Lothrop, too, collected mainly examples of the Boca Chica style when he surveyed the site in 1916-17 (Lothrop, ms.: 13). Other probable visitors were Montalvo Guenard (1933: 383) and Morales Cabrera (1932: 172).

In 1934, Rainey visited Cayito and also the site of La Florida, some 500 meters inland. Although he discusses both sites in his published report (Rainey, 1940: 112-113), he mentions only his visit to La Florida, ascribing to that site the pottery lugs which, according to his field notes, he purchased at Cayito.† Rainey notes that these lugs have resemblances with the Dominican Republic, thereby implicitly recognizing that they are of the Boca Chica style, which is more characteristic of the Dominican Republic than

* This error of Fewkes was originally noted by Rainey (1940: 86), who explains it by implying that Salinas and Santa Isabel formed a single unit at the time of Fewkes's visit. On the contrary, the two had been constituted separate municipalities fifty years before (P.R.R.A., 1940: 319).

† The field notes are in the Yale Peabody Museum.

of Porto Rico. Our survey of the sites of Cayito and La Florida was made in the company of Montalvo Guenard on September 16, 1936. Choosing the former for excavation, we dug a test pit there two days later (Rouse, 1937: 184).

At the time of the writer's visit, the modern village of Playa covered the entire site, making it impossible to determine the extent and contours of the refuse. Potsherds and shells were scattered over some six acres of the flat coastal plain, but the only thick deposits appeared to be on the point of Cayito itself. In a cut made by the sea on the south side of this point, the deposit was 60 centimeters deep. The site is bordered on the west by a sheltered beach and on the south by a ditch or stream. The mouth of the Río Coamo is across a small bay from these.*

No separate middens could be distinguished at the site. We located our pit, the usual square divided into four sections two meters square, in a back-

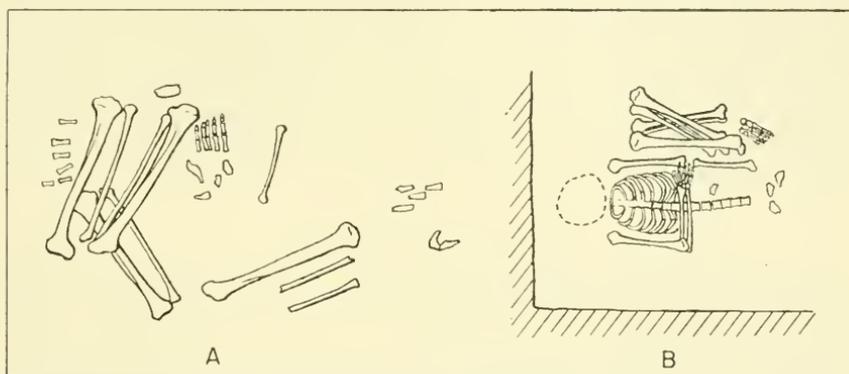


FIGURE 13. Burials at Cayito (A) and Diego Hernández (B).

yard within the village, where the shells appeared to be most numerous and there were less signs of disturbance. The pit was dug through three 25-centimeter levels, yielding brown loam without traces of ash. Pieces of charcoal, shells, bones, and artifacts were relatively common in the first level, but gradually decreased in number until, at the bottom of the third level, the soil became sterile.

A pile of human bones, consisting of four pairs of tibias and fibulas, numerous tarsals, metatarsals, and phalanges, two fragments of a mandible, and several pieces of ribs, were encountered in level 2 (FIGURE 13, A). It is assumed that these bones represent a secondary burial of parts of two or more individuals. There were no grave objects.

All 265 potsherds excavated at Cayito are of the Boca Chica style. Forty-three of them come from open bowls, 177 are from constricted bowls, one appears to be part of a bottle, and 44 are unidentifiable. Our collection also includes 17 fragments of griddles, part of a disk of clay, a stone cylinder, a disk of bone, a bone peg, four blunted clam shells, and nine fragments of

* Previous writers seem to have confused the ditch with the river. The site does not, as they say it does, extend to the river (Fewkes, 1907: 86; Rainey, 1940: 112).

coral. Bird, crab, fish, hutia, man, manatee, and turtle are represented among the animal bones, and, in addition, a number of cow, pig, and unidentifiable mammal bones were found in the upper two levels. The shells consist of marine gastropods and pelecypods.

Supplementing the excavated material are the specimens collected on the surface by Fewkes, Lothrop, and Rainey. These include 13 *Ostiones* sherds, four Santa Elena, 95 Boca Chica, two Capá, and one Esperanza. In addition, Lothrop obtained a stone celt and two stone polishers.

The Boca Chica sherds place our pit in Period IV. Level 3 definitely belongs in the first half of that period, since it yielded no foreign objects. The position of levels 1 and 2, from which we obtained the bones of European mammals, is doubtful. The absence of Spanish sherds, the lack of a reference in the sources to Cayito, and the proximity of the modern settlement, all suggest that the bones are intrusive. On the other hand, it must be noted that the bones are as bleached as the rest of the animal remains, that several have been cut for the extraction of marrow, as is common in the Indian sites, and that many are below the depth to which modern artifacts usually penetrate. Since they were spread through three of the four sections into which the pit was divided, it does not seem likely that they could have been buried. For these reasons, we hesitantly assign levels 1 and 2 to Period IVb.

Collores (Juana Díaz I)

This is the site of Rainey's first excavation in Porto Rico and of the only part of his work about which he has not published a report. Located in the foothills 1.6 kilometers west northwest of the town of Juana Díaz, it is in almost the exact center of the south-coast area (see folding map at end). The name "Collores" comes from a road which runs across the southeastern edge of the site and up the valley of the Río Guayo toward the barrio of Collores eight kilometers to the north (FIGURE 14). The site is known locally as Caracoles, and it is in Barrio Jacaguas of the municipality of Juana Díaz, forming part of the Colonia Ponceña of Sucesores Seralles y Compañía. Accompanied by Montalvo Guenard, the writer surveyed the site on September 15, 1936. The following account is based upon the observations made then and upon Rainey's field notes and collections, which are now at the Yale Peabody Museum.*

Like Buenos Aires, Collores is situated in the foothills north of the coastal plain. Its shell refuse covers about half an acre of gently sloping cane land on a terrace overlooking the flood plain of the Río Guayo (FIGURE 14). Although this land has been plowed many times, two large middens, each 50 centimeters high, can still be distinguished along the edge of the plateau. The larger of them, Midden A, is cut through its center by an old road bed and through its lower end by the present Camino Collores, in both of which the refuse has been exposed to an apparent depth of one meter. Midden B, further north, is intact. Charcoal, shells, animal bones, and potsherds,

* Although the site has not previously been mentioned in print, its name was used in a preliminary paper (Rouse, 1940) to refer to the style here called *Ostiones*.

probably of the Ostiones style, were observed in the black loam of both middens.

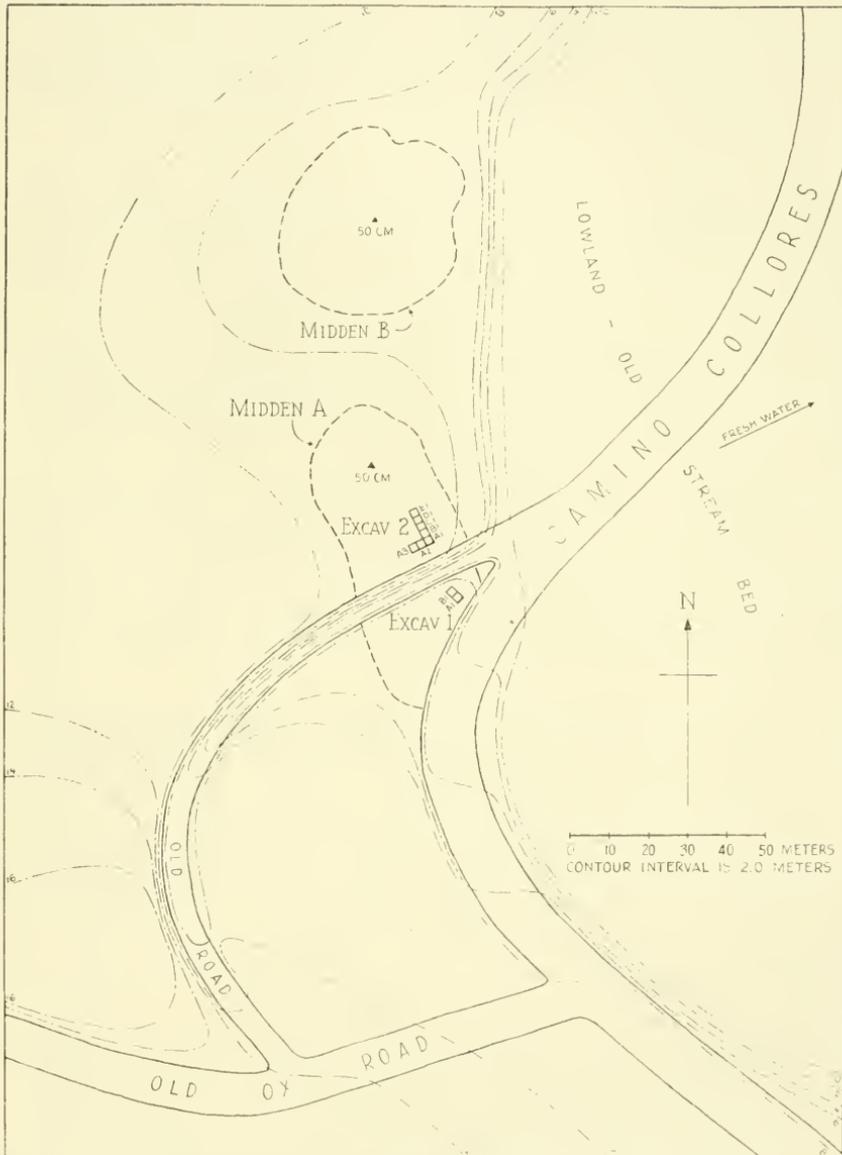


FIGURE 14. Plan of the site of Collores (after Rainey).

Rainey worked only in Midden A, making one excavation in the area between the two roads and another just north of the old road bed (FIGURE 14). Excavation 1, a trench which extended from one road to the other, was com-

posed of two sections each two meters square. Excavation 2 was L-shaped and contained seven sections of similar size. Both excavations were dug to the bottom of the refuse, six 25-centimeter levels deep in the case of Excavation 1 and eight levels deep in Excavation 2.

Excavation 1. In the first two levels of the first excavation, the deposit "was hard packed and potsherds were smashed to pieces by plowing." This is the only comment in Rainey's field notes concerning the nature of the deposit encountered there.

Rainey's collection from Excavation 1 includes 178 potsherds, 15 of which have been disregarded because they are completely plain. Twenty of the remaining sherds are of the Cuevas style, 111 are of the Ostiones, and 32 are of the Santa Elena. These three styles are evenly distributed throughout the excavation, with the Ostiones sherds predominating in all sections except one, where the numbers involved are too small to be significant.

Sixty-seven of the potsherds are from open bowls, 55 are from constricted bowls, six are fragments of jars, and 35 are typologically unidentifiable. They are accompanied by 14 pieces of griddles, two broken celts of stone, a stone polisher, a flint chip, a stone slab, a bone bead, a bone peg, a water-worn piece of shell, and numerous fish bones.

The mixture of styles in this excavation is unusual. It suggests that the deposit may have been disturbed, either by erosion or, as is more likely, by the throwing up of soil in connection with the making of the roads. Subject to this qualification, the deposit can be dated in the latter part of Period III on the basis of the predominance of Ostiones sherds and the presence of 17 incised specimens, constituting at least five per cent of the potsherds in each level.

Excavation 2. Rainey notes the existence of five strata in this excavation (FIGURE 15). The upper 60 to 100 centimeters of deposit consisted of black loam, apparently containing shells, bones, and artifacts comparable to those observed on the surface. A lens of ashes some three meters long and 10 centimeters deep was situated in the middle of this deposit.

In sections A1, A2, and A3, and again in sections D1 and E1, the black loam was underlaid by yellow clay. In the A sections, this clay varied in thickness from 10 to 50 centimeters. Its bottom ten centimeters were in part sterile, but the rest contained some shells and a few potsherds. In sections D1 and E1, the clay stratum was only 10 centimeters thick and it yielded a few potsherds.

A second stratum of black loam lay beneath the yellow clay. In the A sections, this loam was 30 to 50 centimeters thick and contained "abundant refuse," as well as fire pits (which are not described), and a small lens of "clear shell and ashes." In the rest of the excavation, the layer was only ten centimeters thick and it is said to have been heavily impregnated with charcoal.

A well-defined layer of "red culture material" appeared next in the excavation. It occupied the bottom 40 to 130 centimeters of the deposit. Although Rainey does not describe the composition of this stratum, he implies that it consisted of hard clay, shells, and other refuse. It was underlaid at a depth of two meters by hard yellow clay, which was entirely sterile.

Two burials were encountered in the lowest, "red culture" layer (FIGURE 15). The first, which lay at a depth of 150 centimeters in section D1, consisted of an adult female skeleton lying flexed on its left side. Little more than a meter away, and at a slightly lower depth, were the remains of a baby, too badly disintegrated to determine the position of the body. Rainey notes that the layer of charcoal above these burials was undisturbed, demonstrating that they were not intrusive from the upper parts of the deposit.

The number of potsherds collected from Excavation 2 is given in TABLE 7

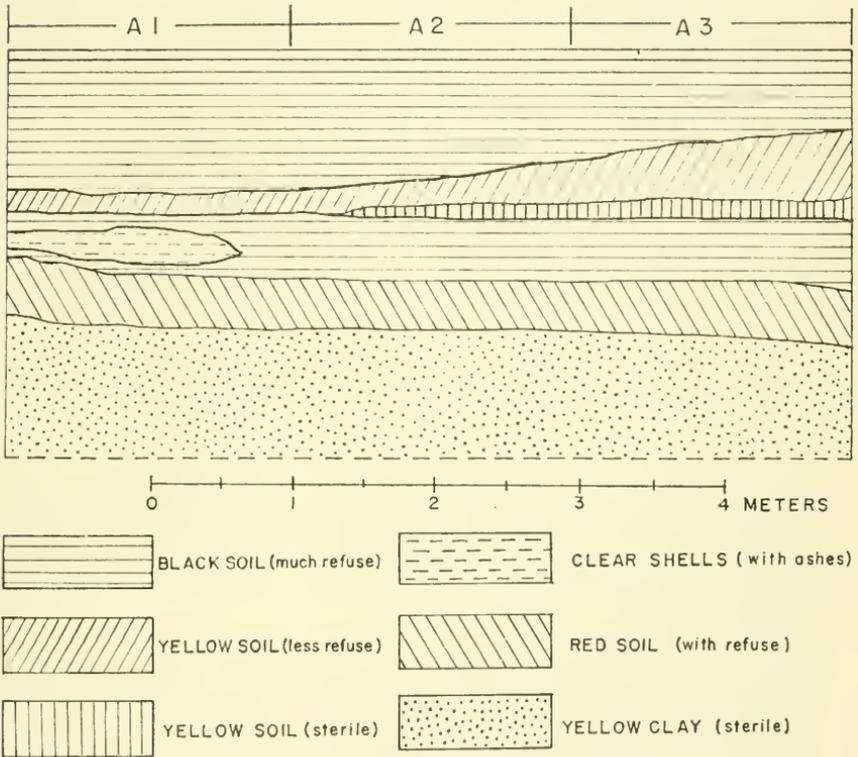


FIGURE 15. Southwest wall of Rainey's excavation 2 at Collores.

according to section, level, and style. Upon the basis of this table, the collection has been separated into two parts, a Cuevas division, consisting of the material from Sections C1 to E1 in levels 4 to 6 and sections B1 to E1 in levels 7 to 8, and an Ostiones division, comprising the material from the rest of the excavation. It will be noted that a third style, the Santa Elena, is represented by sherds from the upper part of the Ostiones division.

As may be seen by comparing TABLE 7 with FIGURE 15, the Cuevas division falls entirely within the "red culture" layer. In sections A1, A2, and A3, however, the latter is included within the Ostiones division. In other words, the stylistic divisions do not coincide with the stratigraphy, a fact which is consistent with Rainey's observation (in his field notes) that "no distinction could be noted in [the] material from low and high [layers]. . . ."

Both of the burials fit in the Cuevas division. Of the potsherds in this division, 193 are from open bowls, 118 are from constricted bowls, eight are fragments of jars, and 80 are typologically unidentifiable. The associated artifacts include 28 pieces of griddles, four disks of clay, three stone celts, one celt-hammer of stone, two stone hammers, two shell chisels, a chisel-blank of shell, a shell chisel-hammer, a flat shell pendant, a shell disk, a cone of shell, and a piece of water-worn shell. In addition, there are bird, crab, fish, human, hutia, manatee, and turtle bones.

From the Ostiones division come the "fire pits," lenses of ash, and layer of charcoal described above. The pottery in this division consists of 246 sherds from open bowls, 372 fragments of constricted bowls, eight parts of jars, and 181 unidentifiable sherds. These are accompanied by 47 pieces of griddles, 14 clay disks, two stone celts, two celt-hammers of stone, five stone hammers, a stone polisher, a stone cylinder, one miscellaneous piece of

TABLE 7
DISTRIBUTION OF CUEVAS, OSTIONES, AND SANTA ELENA POTSDHERDS IN EXCAVATION 2
AT COLLORES

	A1	A2	A3	B1	C1	D1	E1	
1-2	1-35-8	—	0-26-4	8-12-6	9-26-1	1-28-0	1-57-1	Ostiones division
3	0-11-0	0-23-8	0-10-3	0-17-3	1-57-3	2-47-0	14-22-0	
4	0-16-0	0-26-0	0-32-3	0-13-0	12-9-0	31-8-0	24-7-0	Cuevas division
5	0-9-0	0-29-0	—	0-16-0	22-14-0	21-3-0	66-0-0	
6	0-29-0	0-31-2	0-26-0	26-27-0	14-11-0	27-0-0	20-0-0	
7	—	—	2-27-0	25-17-0	13-1-0	19-4-0	11-0-0	
8	0-15-0	—	3-47-0	5-0-0	7-0-0	5-0-0	3-0-0	

Explanation of Table. The vertical columns represent sections; the horizontal lines, levels. (Rainey combined his material from levels 1 and 2 because it seemed to have been mixed by the plow.) The numbers of potsherds of the Cuevas, Ostiones, and Santa Elena styles are given in succession. The line marks the boundary between the Cuevas and Ostiones divisions.

worked stone, a fragment of stalactite, two stone slabs, a bone awl, a possible bead of bone, the tip of a bone spatula, half of a dish of shell, a shell celt, two celt-blanks of shell, a shell chisel, a chisel-blank of shell, two shell disks, a *Cassia* lip, and a shell node. One of Rainey's workmen found the torso of a European figurine in section A2 of level 4. So far as could be determined it was not intrusive. Bones of all of the animals listed above for the Cuevas division occur also in this one. An iguana bone and several marine pelecypods complete the collection.

Since only two examples of white painting are present (both in level 7), the Cuevas division can be assigned to Period IIb. Levels 6-8 of the Ostiones division probably date from Period IIIa, and levels 1-5 from Period IIIb, the two containing, respectively, two and 30 incised sherds. These datings place all except two of the Santa Elena sherds in Period IIIb and suggest the presence of a trend towards the Santa Elena style during that period.

As may be seen by comparing TABLE 7 with FIGURE 15, all of Rainey's "red culture" stratum falls into Period IIb and IIIa on the basis of the above

datings, and his black and yellow strata fit into Period IIIb, thereby suggesting a logical explanation for the difference between the two. It is possible that the red layer was deposited *in situ*, and that the rest of the material eroded down the hillside at a later date—perhaps even during historic times, if we are to accept the evidence of the European figurine. On the other hand, the “fire pits,” lenses of ash, and layer of charcoal are more likely to have resulted directly from Indian action than from erosion.

General. We have found that the Cuevas division of Excavation 2 dates from Period IIb, the lower part of its Ostiones division from Period IIIa, the upper part of its Ostiones division from Period IIIb, and all of Excavation 1 also from Period IIIb. In terms of our theory of erosion, this suggests that refuse was deposited on the upper (northwestern) half of Midden A during Periods IIb, IIIa, and IIIb, and that the most recent part of this refuse subsequently washed down the hillside to form the lower (southeastern) half of the midden. If the hypothesis of primary accumulation be accepted instead, the datings indicate that the Indians gradually shifted in depositing their refuse from the northwestern to the southeastern end of the midden. What took place in the other midden, B, cannot be determined without excavation.

Diego Hernández (Yauco 1)

In his field notes, Rainey records a visit to a ball court of Mattei in the hills about 7 kilometers northwest of the town of Yauco, and the purchase there of a collection which includes one Ostiones and 18 Capá sherds. The present writer had intended to excavate at that site, but, not being able to locate it, he worked instead at a somewhat similar place five kilometers east southeast. This substitute site is named Diego Hernández, and it lies on the farm of a Señora Torres four kilometers north of the town of Yauco in Barrio Diego Hernández, municipality of Yauco (see folding map at end). Highway 16 and the Río Yauco pass west of the site at distances of 500 and 200 meters, respectively.

Diego Hernández is reputedly the richest site for stone objects in Porto Rico, and it has been visited many times by people seeking the greenish stone beads and pendants which are plowed out of its soil during the cultivation of sugar cane. There are, however, no reports of excavation. The writer was taken to the site by Montalvo Guenard on August 17, 1937, and returned on the ninth and the tenth of that month for the digging of a test pit.

As at Mattei, foothills rather than the coastal plain provide the setting for this site. Occupying the whole of a low, flat hilltop, it is oval in shape, some two acres in area, and elevated nearly ten meters above the river and a tributary stream which flows by on the east. In its soil, which consists of heavy brown clay, were observed charcoal, bones, and a scattering of shells and potsherds. These were rare at the center of the hilltop, suggesting that a ball court may have existed there before the site was plowed. None of the inhabitants, however, could recall the removal of stone slabs from the area.

The usual test pit, four meters square and divided into four sections, was laid out on the western side of the site, where the shells appeared thickest and the most stone objects were said to have been found. In the first 25-centimeter level, this pit yielded the same kind of deposit previously observed on the surface. In the second level, the refuse gradually died out, and the soil became lighter. Accordingly, excavation was terminated at the bottom of that level.

An adult burial was found in the upper half of level 2 (FIGURE 13, B). The body had been flexed and laid on the left side at an angle of 20 degrees from the horizontal, with the head only a short distance beneath the surface. The skull appeared to have been destroyed by the plow, all that was found of it being an area of pulverized bones. There were no grave objects.

Specimens were purchased from the workers at the site to supplement the excavated material. Since both collections are stylistically the same, they will be treated as a unit. All 235 of the potsherds are Ostiones in style, 37 being fragments of open bowls, 99 of constricted bowls, three of jars, and 97 of unidentifiable vessels. In addition, there are four pieces of griddles, two stone celts, two hammers of stone, two discoidal stone beads (one of which is only partially worked), an ear plug of stone, a small stone three-pointer, a stone cylinder, a stone disk, a chip of stone, a bone disk, a shell rectangle, a miscellaneous piece of worked shell, a *Cassis* lip, two *Strombus* lips, and six pieces of coral. The animal bones, which are particularly numerous, include bird, crab, fish, hutia, manatee, and turtle. Among the shells are land and marine gastropods and marine pelecypods.

Since only one of the Ostiones sherds is incised, our collection can be dated in Period IIIa. The abundance of stone artifacts suggests that the inhabitants of the site may have specialized in stonework, resembling in this respect the occupants of Las Mesas in the west-coast area. Following Montalvo Guenard (personal communication), it had been thought possible that Diego Hernández was a residence of Agüeybana, the chief of southwestern Porto Rico. Our dating, however, does not allow this possibility. Mattei, the site from which Rainey collected Capá sherds of Period IV, is more likely to have been the village of Agüeybana.

Jobos (Guayama 3)

In the modern village of Jobos, 1.3 kilometers northeast of the bay of the same name, five small shell heaps are distributed irregularly over the flat coastal plain (see folding map at end). Since these heaps are an average distance of 100 meters from each other, it is assumed that they represent separate sites. Surveying them on September 18, 1936, the writer observed several Indian sherds on the surface of one heap but concluded that the rest were without pottery. To test this conclusion, a pit was dug in the central heap on the following day (Rouse, 1937: 182, 184). The excavated heap, which will be called Jobos, was chosen because it was the most clearly defined and did not appear to have been cultivated. It lies beneath the house and in the yard of Philippe Rivera, some 50 meters north of Highway 3. Like the neighboring sites, it is in Barrio Jobos of the municipality of Guayama (folding map).

Roughly circular in shape, the heap has a diameter of 15 meters and a maximum height of 50 centimeters. It is composed of black loam, which is much darker in color than the surrounding soil. A search of the surface revealed large quantities of charcoal and shells but no artifacts or bones of any kind.

Four two-meter square sections arranged in the form of a square were laid out in the center of the heap and were dug through two 25-centimeter levels. The first level contained much charcoal and many shells, as on the surface, several bones and possible artifacts also being found in the black loam. At a depth of from 15 to 34 centimeters, this deposit gave way to very hard, light colored clay, which was sterile.

The collection from Jobos consists of two possible grinders of stone, a number of partially burned twigs, three pieces of brick, three Spanish potsherds, a dog bone, land and marine gastropods, and marine pelecypods. Very small clam shells are particularly numerous at this site.

Like the non-pottery site of Coroso previously described, Jobos is of dubious significance. It is situated too far from the shore to be a place where shells were gathered. On the other hand, there are no clear evidences of habitation. The modern people have no recollection of forming the heap, although they may have dropped on it the Spanish objects and the bone listed above. Moreover, the shells are as well bleached as in Indian sites, and the heap has an appearance of antiquity. The presence of Indian pottery in one of the neighboring heaps suggests that this one, too, is prehistoric. It will be tentatively assigned to Period I, pending further work at the nonceramic sites.

Papayos (Lajas 10)

The small modern settlement of Papayos is situated on the south coast of Porto Rico between La Parguera and Montalva in Barrio Parguera, of the municipality of Lajas (see folding map at end). The writer visited this village on August 11, 1937, and located 18 hitherto unreported shell heaps, all apparently without pottery, along the mud flats northwest of a small bay. The following day, a test trench was dug in one of these heaps, which will be called Papayos.

The shell heaps occupy slight rises of land at the edge of an extensive mud flat. None of them is on the flat itself or on the high ground behind, where the present houses are located. The heap chosen for excavation is near the center of the group, being sheltered from the sea by a large hill but easily accessible to the bay some 350 meters southwest. The road through Papayos lies directly behind this heap. In fact, it may have cut into it, as there are some shells on the high ground on the opposite site of the road from the heap. At present, however, the heap is only 14 meters in diameter and measures 73 centimeters above the floor of the surrounding mud flat. Upon its surface, it consists of greyish brown soil mixed with small fragments of shell and differing greatly from the dark brown earth of the mud flats.

In order to avoid a fence which bisects the shell heap, it was necessary to dig the four two-meter square sections in the form of a trench rather than a square. It was also necessary to locate the trench somewhat north of the

deepest part of the deposit. All sections were dug through two levels to a depth of 50 centimeters. Sections A1 and A2 contained relatively few shells and those extended only to a depth of 20 centimeters. Sections A3 and A4, however, yielded large numbers of shells down to a depth of over 30 centimeters, before giving way to the sterile dark brown soil of the mud flats. A number of pieces of charcoal were encountered among the shells, and ash also seemed to be present, but there were no animal bones. A few pebbles and field stones had apparently reached the mud flat through human agency, in addition to several crude artifacts of stone and shell.

The specimens excavated at Papayos include eleven stone chips, a stone slab, a blunted clam shell, a plain shell tip, a fractured shell tip, and two pieces of coral. Marine gastropods and pelecypods were also collected. In addition, we encountered an iron bolt and a European potsherd, which are assumed to be intrusive. The bolt was near the surface and the potsherd, although in the second level, was close to a fence post, where it may have been deposited during the digging of the post hole.

The absence of Indian potsherds and of traces of agriculture in the Papayos pit suggests a dating in Period I. As in the case of the non-pottery sites at Coroso and Papayos, there is an alternative possibility that the site was a place where the later Indian or Spanish populations gathered shells. Further excavation must be undertaken before this possibility can be eliminated.

Pitahaya (Arroyo 1)

The easternmost site in the south-coast area is Pitahaya, a large shell heap four kilometers north of the town of Arroyo on land of the Central Lafayette in Barrio Pitahaya, of the municipality of Arroyo (see folding map at end). This heap, which is on the west bank of the Río Arroyo opposite the village of Pitahalla, had previously been explored by Montalvo Guenard (personal communication). Learning of it from him, the writer surveyed it on September 23, 1936, and excavated a pit the same day (Rouse, 1937: 184).

A flat hilltop eight to ten meters high, the site is bordered on the southeast by a river and on the east and north by a tributary. At the time of the writer's visit, the hilltop was covered with grass, and only a few scattered shells could be observed on the surface. Judging from these shells, which were observed only on the northern half of the hilltop, the site consists of a single, circular deposit about 100 meters in diameter. It is bisected by a road, on the banks of which shells can be observed to an average depth of 50 centimeters.

Our pit, a square divided into four sections two meters on a side, was located just west of the road in the south central part of the site, where the deposit appeared to be deepest. In it, we encountered heavy brown clay containing shells, charcoal, and artifacts. These were rare in the first and third 25-centimeter levels, but, in the second, they occurred in large numbers. Midway through level 3, the refuse gave way to sterile clay, and excavation was therefore discontinued at the bottom of that level.

Potsherds of the Santa Elena style predominate in all sections and levels

at Pitahaya. They number 337 and are accompanied by 13 Ostiones and 65 Esperanza sherds. The former are limited to the bottom two levels, while the latter occur in the following amounts from levels 3 to 1: 2, 18, and 45.

From a typological standpoint, 118 of the sherds are parts of open bowls, 223 are from constricted bowls, two are fragments of jars, and 70 are from unidentifiable vessels. The associated artifacts include 22 pieces of griddles, a clay smoother, a clay disk, a chip from a stone celt, a celt-hammer of stone, two stone hammers, six net sinkers of stone, a stone polisher, a quartz crystal, a stone slab, two bone disks, a celt-blank of shell, a celt-hammer of shell, two shell chisels, a chisel-blank of shell, a shell rectangle, four *Cassis* lips, twelve *Strombus* lips, three shell nodes, a *Cassis* plate, two *Strombus* plates, a plain shell tip, a fractured shell tip, three water-worn pieces of shell, and 51 pieces of coral. Bird, fish, hutia, and manatee are represented among the bones and marine gastropods and pelecypods among the shells.

This site certainly dates from Period III and, in view of the presence of an appreciable number of Esperanza sherds, probably from Sub-period IIIb. The Ostiones sherds may be trade objects from further west. The Esperanza specimens, on the other hand, probably represent the beginning of a trend towards that style.

Other Sites

No discussion of south-coast archaeology would be complete without some mention of Lothrop's excavations at Esperanza and La Florida. In the number of artifacts collected, Lothrop's work at these two sites is equivalent to that of Rainey at Cañas and Collores. Stylistically and chronologically, Lothrop's sites are important because they complement Rainey's, apparently extending his Cañas sequence to historic times.*

Esperanza (Salinas 2). This site, which is sometimes also called "Salich," is on the Hacienda Esperanza of the Central Aguirre Sugar Company in Barrio Aguirre, of the municipality of Salinas (see folding map at end). Lothrop dug here in 1915 (Lothrop, ms.: 12; field notes in the Harvard Peabody Museum). As already noted, we were unable to obtain permission to excavate and worked instead at Carmen.

Esperanza consists of one large shell heap with several smaller middens along its southern and western edges. According to Lothrop (ms.: 12): "The [main] heap is irregularly shaped and has two depressions in the deposit of shells which were once apparently courts surrounded by houses. One of these probably contained a dance ground which was destroyed a few years ago when grading for irrigation. Several stones similar to those found in dance grounds may still be seen nearby. . . . A skeleton was found in one of [the smaller heaps] a few years ago."

Lothrop's collection in the Harvard Peabody Museum contains not only the material excavated by him but also specimens obtained during plowing by R. S. Prescott. The only distinction made in the catalogue is between

* Rainey does not discuss Lothrop's excavations in his summary of the previous work in Porto Rico (Rainey, 1940: 111-120).

objects from the Esperanza and Salich fields. No significant differences having been noted between the two, we shall treat the entire collection as a unit.

The Ostiones, Santa Elena, and Esperanza styles, which are represented respectively by 105, 342, and 111 sherds, seem to be the most characteristic of the site. They are accompanied by one Cuevas, 90 Boca Chica, and one Capá sherds.

Typologically, 167 of the sherds are from open bowls, 354 are from constricted bowls, four are from jars, and 125 are unidentifiable. The associated artifacts include 48 pieces of griddles, a discoidal clay stamp, eleven disks of clay, one lump of clay, a stone anvil, part of a stone bowl, six stone pestles, a stone adze, three ground stone axes, an ax-hammer of stone, 36 stone celts, 38 celt-hammers of stone, two stone chisels, four edge grinders of stone, seven end grinders, two side grinders, fourteen stone hammers, five net sinkers of stone, three stone polishers, two fragments of stone elbows, five massive stone collars (three broken, one complete, and one partially made), seven sections from slender stone collars, a stone face, two fragments of stone seats, three large stone three-pointers, one small stone three-pointer, a stone ball, a miscellaneous worked piece of stone, a fossil animal, a quartz crystal, a bone anvil, the point of a bone pick, a bone face, twelve shell celts, eight celt-blanks of shell, a shell chisel, a shell chisel-blank, a shell rectangle, a miscellaneous worked piece of shell, a *Cassis* lip, a water-worn fragment of shell, a piece of coral, and a nugget of copper.

From a chronological standpoint, this collection seems to be late. The Ostiones sherds are heavily incised, and it is quite possible that they represent a minority style present during Period IIIB, when the Santa Elena pottery was probably dominant. It may be further speculated that the site was also inhabited during Period IVA and was then characterized by the Esperanza style, with the Boca Chica forming an appreciable minority. Despite the absence of European pottery, the copper nugget suggests the possibility of an historic occupation.

La Florida (Santa Isabel 2). This site, which is also called "Indios," is on Hacienda Florida of the Central Aguirre Sugar Company in Barrio Playa, of the municipality of Santa Isabel, only a short distance inland from the site of Cayito which was worked by us (folding map). Lothrop (ms.: 13, field notes) excavated here in 1915, and, in addition, it has been surveyed by Montalvo Guenard (1933: 384), Rainey (1940: 113), and the writer.*

The site consists of a very large shell heap, covering some ten acres. At the time of Lothrop's work, part of it had "been removed to make an embankment for the railroad. A great many objects have been found in this site in the past but it still continues to yield many specimens whenever it is plowed" (Lothrop, ms.: 13).

As in the case of Esperanza, the catalogue of the Harvard Peabody Museum makes no distinction between the specimens which Lothrop excavated and those which he collected on the surface. Accordingly, the entire collection will be treated as a unit. It is characterized by the Santa Elena and

* The statement in Rainey's report that Spinden also excavated at the site is apparently not true. Spinden worked instead at Carmen in Salinas.

Boca Chica styles, there being 93 examples of the former and 133 of the latter. In addition, the Cuevas style is represented by one sherd, the Ostiones by 23, and the Capá by 24.

From a typological standpoint, three of the sherds are from bottles, 77 are from open bowls, 131 are from constricted bowls, and 63 are unidentifiable. The associated artifacts include thirteen fragments of griddles, two discoidal clay stamps, a disk of clay, twelve stone celts, a net sinker of stone, four stone polishers, two possible fragments of slender stone collars, a celt-blank of shell, a flat shell pendant, two *Cassia* lips, five pieces of water-worn shell, and a sherd of Spanish pottery. To these may be added three fragmentary celts and a celt-hammer of stone which were collected by Rainey when he visited the site (Rainey, 1940: 113*).

As at Esperanza, the Ostiones sherds are heavily incised, and they suggest occupation during the Period IIIb, when the Santa Elena style may have been dominant at the site. This occupation is likely to have persisted into Period IVa, at which time the Boca Chica style was probably the most popular, as at the neighboring site of Cayito. The secondary style during Period IVa would then be the Capá, with the Esperanza style, which is so characteristic of the site of Esperanza, entirely absent. The European sherd may indicate an historic date as well. On the other hand it may have been deposited by the modern inhabitants of the workmen's quarters, which are near the site.

Conclusions

Even without excavation at Lothrop's sites of Esperanza and La Florida, we covered the south coast fairly well. So many sites are known in the area that it was possible to dig in all parts, east as well as west, and in the foothills as well as on the coastal plains (see folding map at end). Chronologically, too, our pits seem to provide adequate coverage. As shown in TABLE 8, all parts of the time scale are represented, Period I by two pits, Period IIa by one, Period IIb by two, Period IIIa by eight, Period IIIb by five, Period IVa by one, and Period IVb also by one.

From the standpoint of stratigraphy, the excavations were not so successful. The Period I deposits were not in stratigraphical sequence. Refuse from Period II underlay that of Period III in three pits, that of Period IIIa occurred beneath that of Period IIIb in three pits, and that of Period IVa underlay that of IVb in one pit (TABLE 8). In addition, the presence of sterile soil between the crab and shell strata in Pit 2 at Cañas confirms the existence of a gap in the deposition at that place, corresponding to our Periods IIb and IIIa.

It has not proved possible definitely to correlate any of our pits with the historic sources. To be sure, we have assigned the upper part of the Cayito deposit to the historic period (IVb), but there is no reference in the sources to a settlement in that vicinity. It is to be regretted that the site of Mattei was not located for excavation, since it is likely to have been the ball court where Guaybaná organized the rebellion against the Spaniards. The site

* As already noted, the potsherds attributed in this report to La Florida are instead from Cayito

of El Cucharal near Guayanilla might also have repaid excavation. According to Nazario y Causel (1893: 137-139), it is the place where Agüeybana received Ponce de León during the latter's first trip to Porto Rico.

Four supposed Indian trade sherds are present in our collections, two from Buenos Aires, one from Cañas, and one from Carmen. All four appear to be Lesser Antillean in origin. Since these sherds were purchased from

TABLE 8
CHRONOLOGY OF THE PITS IN THE SOUTH-COAST AREA

		<i>Abra</i>	<i>Buenos Aires 1</i>	<i>Buenos Aires 2</i>	<i>Cañas 1</i>	<i>Cañas 2</i>	<i>Carmen</i>	<i>Cayito</i>	<i>Collares 1</i>	<i>Collares 2</i>	<i>Diego Hernández</i>	<i>Jobos</i>	<i>Papayos</i>	<i>Pitahaya</i>
Period IV	b	—	—	—	—	—	—	1-2	—	—	—	—	—	—
	a	—	—	—	—	—	—	3	—	—	—	—	—	—
Period III	b	—	—	—	1	1-2 3(E2, F2)	1-2	—	—	1-3 4-5(A1- A3, B1)	—	—	—	1-3
	a	1-6	1-6	1 2(C1)	2-7	—	3-6	—	1-6	6(A1-A3, B1) 7-8(A1- A3)	1-2	—	—	—
Period II	b	—	—	2(C2, D1, D2) 3	—	—	—	—	—	4-6(C1- E1) 7-8(B1, C1, D1, E1)	—	—	—	—
	a	—	—	—	—	3(E1, F1) 4-6	—	—	—	—	—	—	—	—
Period I		—	—	—	—	—	—	—	—	—	—	1-2	1-2	—

Explanation of Table. The pits are listed across the top of this table and the periods along the side. The arabic numbers refer to the successive 25-centimeter levels in each pit; the letters and numbers in parentheses to the horizontal sections within each level. (For clarification of the relationships between the sections and levels, see TABLES 5 to 7.)

natives, they are chronologically unreliable, but they seem to date, respectively, from Periods IIIb, IIa, IIa, and IIIb. The first three sherds can be correlated with the Cedros style in Trinidad and the fourth with the Palo Seco style (Rouse, 1947). The first does not provide the proper correlation, since the Cedros style is supposed to date from Period IIa rather than IIIb, but the remaining three confirm our findings elsewhere in Porto Rico.

Like the north coast and the mountainous interior, the south-coast area is stylistically heterogeneous. All of our local styles occur there and, while the evidence is unsatisfactory in many respects, it seems likely that there

are at least three sequences, as follows:

	<i>Western Part</i>	<i>Central Part</i>	<i>Eastern Part</i>
Period IVb:	Capá (?)	Boca Chica	Esperanza (?)
Period IV:	Capá (?)	Boca Chica	Esperanza (?)
Period IIIb:	Ostiones	Ostiones, Santa Elena (?)	Santa Elena
Period IIIa:	Ostiones	Ostiones	Ostiones (?)
Period II:	Cuevas	Cuevas	?
Period I:	No pottery	?	No pottery

The first of these sequences is well illustrated by our excavations in the western part of the area, except that, because of the failure to locate the site of Mattei, we did not dig a pit containing predominantly sherds of the Capá style. In addition to our pits in the central part of the area, we have had to use Lothrop's material from La Florida as the basis for the second sequence. The third sequence, similarly, is based upon the collection obtained by Lothrop at Esperanza, as well as upon our excavations at Jobos and Pitahaya. It is perhaps worth noting that the above table gives only the dominant styles. To have added those present in a minority during Periods IIIb and IVa would have produced an even more complicated picture.



EXCAVATIONS ON THE EAST COAST

Setting

This section is concerned with the eastern part of the main island of Porto Rico and includes all of the lowlands draining into Vieques Passage (see folding map at end). The region covered is approximately 55 kilometers long and has an average width of eight kilometers. It is the smallest in size of all the areas on the main island, measuring only 400 square kilometers.

The shape of the area is irregular. On the east, the coastline is strongly indented, while on the west the boundary with the rest of the island, twists and turns through the central part of the foothills, following the outlines of the river valleys (folding map). The area extends from Cabo Mala Pascua on the south to Cabo San Juan on the north.

Topographically, the area can be divided into three parts. On the south are the relatively small but fertile valleys of the Ríos Maunabo and Guayanés, separated from each other by the Pandura range of hills (folding map). Although most of the shoreline in this region is steep and barren, sheltered beaches at the mouths of the two rivers may have served the Indians as a means of approach to the valleys.

Moving north from the Guayanés valley, one crosses another range of hills and enters a great central section of fertile plains and of low, rolling foothills (folding map). This section is drained by a number of rivers, of which the Humacao and the Blanco are the largest. Its shoreline is low, and it is fringed on the east with marshy land and with beaches. On the west, only a low divide separates the Humacao and Blanco valleys from that of Caguas in the mountainous interior, providing the easiest access to the interior anywhere on the island.

In contrast to this central section of lowlands, the northern part of the east-coast area is relatively rugged. Here, the foothills of the Sierra de Luquillo extend down almost to the coast, the only extensive plain being that of the Río Fajardo in the north (folding map). The region is fertile and, like the rest of the east-coast area, is provided with a moderate amount of rainfall. One of the best natural harbors in Porto Rico, the Ensenada Honda, is located in this region just opposite the island of Vieques. In aboriginal times, as today, this harbor may have served as the main port for boats going to Vieques.

A number of small islands lie just off the central and northern parts of the east coast (folding map). These help to shelter parts of the shore line. They were apparently used by the Indians as places of habitation, for most of the known refuse sites are located on them. It is possible that they served as fishing stations.*

At the time of historic contact, the east coast was apparently inhabited by Taino Indians and had not come under the control of the Carib. This is indicated by the presence of strong chieftainships, which the Carib did not

* The above information concerning the geography, topography, and climate of the east coast is taken from Lobeck (1922), Ober (1899: 11-43), P.R.R.A. (1940: 310-316), and Roberts (1942).

have, by the peaceable manner in which the east-coast natives, contrary to Carib custom, received the Spaniards, and by the fact that during the colonial period the natives suffered as much as the Spaniards from Carib raids. According to Martyr, the Carib had an agreement with the local Indians permitting them to secure wood for their canoes on the east coast of Porto Rico, but they had not settled in the area (Martyr d'Anghera, 1912, 1: 259).*

Contrary to this conclusion, Fewkes (1907: 28) has suggested "that the inhabitants of eastern Porto Rico when discovered were partially Carib. . . ." Noting that there is no statement to this effect in the historical sources, he bases his opinion on the existence of place names "of Carib derivation." The present writer is not competent to judge Fewkes's derivation of place names, but it may be noted that the only term cited is Guarabo, which actually appears in the sources as the name of a river in the realm of Urayoan, an admittedly Taino chief who lived on the west coast of the island (Oviedo, 1851, 1: 479).†

From the historical records, it can be deduced that each of the natural regions on the east coast constituted a chieftainship (Coll y Toste, 1907: 1, 96, 236, 237, 248, 250, 266, 267). An Indian variously named Guaraca, Guaraca del Guayaney, and Guayaney is said to have ruled the southern part of the Río Guayanés (FIGURE 2: 17). The central chief, called Humacao or Macao, probably lived along the river and in the vicinity of the modern city which still bears his name (FIGURE 2: 18). In the north, a third chief, called Yukibo or Luquillo by Coll y Toste and Daguao by other writers, may have had his village of Daguao in the present barrio of the same name, which is part of the municipality of Ceiba (FIGURE 2: 19).

Ponce de León and his followers were the first Spaniards to visit the east coast when, in 1508, they were taken by Agüeybana into the valley of the Río Mantuabón (now the Maunabo) during their tour of the island's sources of gold. In the *repartimientos* of 1509, Ponce reserved for himself this area and its inhabitants, including the chief Guaraca. From it, he probably obtained much of the money later used to finance his trips to Florida (Torres de Mendoza, 1880, 34: 406, 409).

The other two chiefs, with their followers, apparently escaped the *repartimientos*, nor did they, so far as is known, take part in the rebellion of 1511. Their land remained unmolested by the Spaniards until 1514 when, by order of the viceroy Diego Colón, a group of colonists founded a settlement on the Río Daguao near Ensenada Honda. This settlement, called Santiago del Daguao, was soon destroyed by Carib from the Lesser Antilles, but its name has survived in reference to a small island off shore where one of our excavations took place (Oviedo y Valdés, 1851, 1: 486-487).

Neither of the local chiefs, Humacao or Yukibo-Daguao, opposed the formation of the settlement of Santiago. When, however, Ponce de León impressed ten of the followers of Humacao into a fleet which he sent to Guadeloupe to punish the Carib for their attack, the two chiefs rose in revolt, burning their villages, taking to the mountains, and engaging in several skirmishes before they agreed to peace. Yukibo, the chief of Daguao,

* For a comparison of Arawak and Carib customs, see Rouse (1948).

† For a more detailed refutation of Fewkes's opinion, see Lovén (1935: 53-58).

particularly distinguished himself in these skirmishes, and, as a result, the Sierra de Luquillo in the northeastern corner of the island has been named after him (Coll y Toste, 1907: 236, 237, 266).*

With the coming of peace in the Sierra de Luquillo, the Spaniards were able to explore its mineral potentialities and, in 1515, they discovered a vein of gold, from which it is said that metal worth 25,000 pesos was taken during the first two months alone. It is probable that the Indians of Daguao served as the laborers on this project, although no specific statement to that effect has been found in the sources (Brau, 1907: 266).

Other mines and farms were set up in the district of Humacao and they too were staffed with Indian labor. Both they and the Daguao establishments were attacked by the Carib, the former in 1520 and the latter in 1530. These raids resulted in the death of a number of Spaniards, Indians, and, in the case of the settlements at Daguao, also of several Negro slaves, who had been introduced by 1530 to supplement the Indian workers. It is said that the Carib carried off 25 of the Negroes and Indians in order to eat them, as was their custom (Abbad y Lasierra, 1866: 149-151).

The attacks of the Carib apparently prevented any permanent Spanish settlement during the early colonial period. In a report of 1574, we hear that a sugar factory had been founded along either the Río Humacao or the Guayanés, but that this establishment, too, had been wrecked by the Carib, leaving the east coast unpopulated (López de Velasco, 1894: 131). Fajardo, the first of the modern towns, was not set up until 1774, with the rest of them following soon afterward (P.R.R.A., 1940: 310-316).

From an archaeological standpoint, the east-coast area has been badly neglected. No excavations had been undertaken prior to the work of the present writer, and there had been only three attempts at survey, by Pinart (1893) in the 1880's, Lothrop (ms.: 4-6) in the 1910's, and Montalvo Guenard (personal communication) in the 1920's. Since none of these men had devoted much effort to the area, few sites were known when the writer began his work. Only three of those visited seemed to be worth excavating. The four pits dug in these three sites are discussed on the following pages.

Ensenada Honda (Ceiba 2)

On the western side of the harbor of Ensenada Honda is a long, narrow inlet known locally as the Caño de los Indios because of the traces of Indian occupation which have been found there (see folding map at end). This inlet, which is in Barrio Guayaacán of the municipality of Ceiba, is lined with mangrove swamps. A village site lies on a small island at its mouth, two groups of petroglyphs face each other across the inlet 800 meters from the mouth, and a kilometer further on near the back of the inlet are three small camp sites. Pinart (1983[†]) had previously visited the northern group of petroglyphs, but to the writer's knowledge the rest of the sites were unknown. The writer surveyed the village site, which will be called Ensenada

* For other versions of the revolt, based on the assumption that Yukibo and Daguao were separate chiefs, see Brau (1907: 232-235) and Acosta y Calbo in Abbad y Lasierra (1866: 66, 111).

† Quoted in Mallery (1893: 137), which in turn is cited in Fewkes (1907: 149), Fewkes (1903a: 442), and Lothrop (ms: 4).

Honda, on September 12, 1936, and excavated two test pits there on the same day (Rouse, 1937: 184-185).

The islet bearing the village site is part of the public domain and is situated at the edge of the mangrove swamp on the southern side of the inlet (folding map). Shaped like a tear-drop in reverse, it consists at its outer (eastern) end of a small hill 15 meters high, in its center of a low, flat field, and at its inner end of a sandspit (FIGURE 16). The hill and the field were overgrown with grass at the time of the writer's visit and were without shade trees. No spring was found from which the Indians could have obtained drinking water. Nevertheless, the location at the mouth of the inlet must

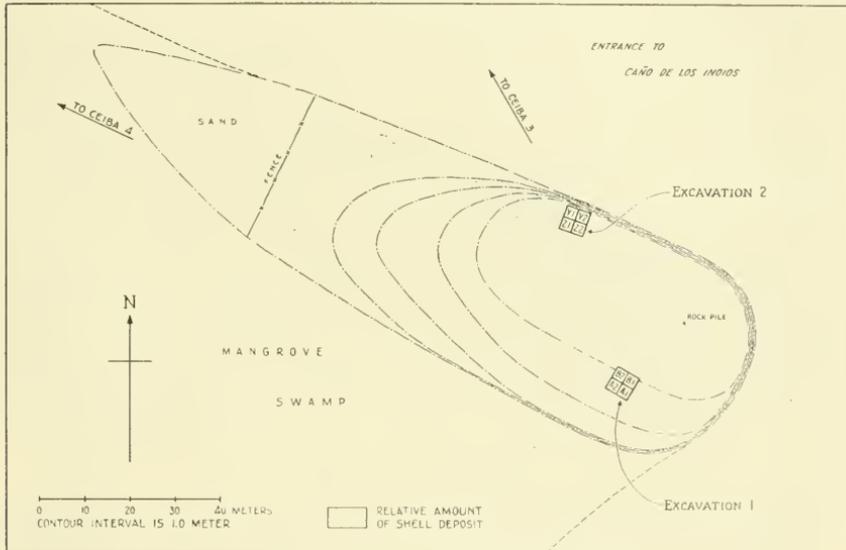


FIGURE 16. Plan of the site of Ensenada Honda.

have been ideal for a fishing population, and the sandspit probably facilitated landings.

Both the hill and the field beneath it were almost entirely covered with shells and with other traces of Indian occupation. The deposit appeared to be quite shallow and to lack middens or ceremonial structures. Presumably, the hill and the field were simply places of habitation.

From the sandspit, the two groups of petroglyphs (Ceiba 4 and 3) were visible to the west and northwest respectively, and it is likely that they had some connection with the village site. Both were situated on piles of rocks, the southern group just off the shore of a second small island and the northern one on the edge of the mangrove swamp across the inlet. The southern group, which was on a vertical surface facing the village site, consisted of a single representation of a human face with six lines radiating from the chin (FIGURE 6, G). The northern group, also on a vertical surface but looking out over the inlet in the direction south southwest, was composed

of two heavily conventionalized human figures and part of a third (FIGURE 6, F). In both groups, the lines were only lightly engraved, but the surrounding surfaces had become so dark from weathering that the drawings were unusually distinct. The island adjacent to the southern petroglyphs was apparently without refuse.

At the village site, the greatest concentrations of refuse were noted on either side of the hill, and accordingly we dug our pits on those slopes (FIGURE 16). Each pit consisted of the usual four sections two meters square and arranged in the form of a square, and each was dug through two 25-centimeter levels. In both, the shell deposit, appearing to coincide with the dark brown humus, was only 25 centimeters deep and was underlaid with lighter brown loam, mixed with stones in the case of Pit 2.

Potsherds of the Santa Elena style form the majority in all sections and levels at Ensenada Honda. There are 175 of them from Pit 1, accompanied by 23 Cuevas and 17 Esperanza sherds. In Pit 2, they number 219, and are accompanied by eight Cuevas and 30 Esperanza sherds. The surface collection consists respectively of four, one, and one sherds of these three styles. In view of the proportional similarity of the figures, the entire site will be treated as a single stylistic unit.

From a typological standpoint, 146 of the sherds are from open bowls, 234 are from constricted bowls, one is a miniature bowl, and the remaining 106 are unidentifiable. The associated artifacts include 34 fragments of griddles, a figurine of clay, four clay disks, two stone hammers, a stone polisher, a stone chip, a bone pick, two pieces of a plain bone spatula, two broken dish-blanks of shell, three shell celts, a part of a celt-blank of shell, a shell chisel, a longitudinal shell bead, a cylindrical shell pendant, a fractured shell tip, a piece of water-worn shell, and eleven coral fragments. Bird, fish, hutia, manatee, and turtle are represented among the bones, and land and marine gastropods and marine pelecypods among the shells.

The Santa Elena sherds date this site in Period IIIb, with the Esperanza specimens suggesting a trend towards that Period IV style. The Cuevas pottery, which lacks white paint, might be considered a survival from Period IIb. This being so, however, one would expect also to find at the site some Ostiones sherds dating from Period IIIa. The absence of these sherds is inconsistent with our sequence.

Playa Blanca (Ceiba 1)

The three camp sites which lie near the inner end of the Caño de los Indios are all on the main island north of the inlet and are separated from open water by one of the mangrove swamps (see folding map at end). The district in which they are located is known as Playa Blanca and it forms part of Colonia Esperanza of the Fajardo Sugar Company. Two of the sites are small shell heaps apparently (with the exception of one sherd) without pottery. The third is a pottery deposit, in which very few shells were observed. Having surveyed these sites on September 10 and 11, 1936, the writer dug a trench in the more westerly shell heap on the latter day (Rouse, 1937: 182).

The excavated site, which will be called Playa Blanca, is on the edge of the swamp. Very few shells appeared on the surface and, were it not for the accident that a road had been cut through the southern edge, the site would probably not have been noticed. Its exact boundary could not be determined, but it was probably a single, circular heap some ten meters in diameter and 50 centimeters high.

A trench consisting of four sections each two meters square was laid out between the road and a bordering fence, and was dug through two 25-centimeter levels. In sharp contrast to the light brown clay of the surrounding soil, this trench contained black loam streaked with ash. Shells were more tightly packed than in any of the other sites excavated in Porto Rico, but there were few bones and artifacts. The deposit died out at an average depth of 40 centimeters, giving way to clayey soil like that in the surrounding fields.

One Indian potsherd, which is both stylistically and typologically unidentifiable, was encountered in the top level near the surface. The only other possible artifacts are a stone chip, four blunted clam shells, three shell nodes, four plain shell tips, seven fractured shell tips, and two pieces of coral. In addition, we obtained crab, fish, hutia, and manatee bones and collected land and marine gastropods and marine pelecypods.

The virtual absence of pottery and of traces of agriculture at Playa Blanca is particularly striking because of the presence nearby of a ceramic deposit. As in the case of the non-pottery sites on the south and west coasts, we can make a tentative dating in Period I, subject to further work in these small shell heaps.

Santiago (Humacao 1)

About 400 meters off the Humacao beach and almost directly opposite Vieques Island, there is a small island known as the Cayo de Santiago (see folding map at end). This island, which is in Barrio Puente de Santiago, of the municipality of Humacao, has been leased by the School of Tropical Medicine of the University of Puerto Rico as a laboratory of primate psychology. At the time of the writer's visit on August 1, 1938, no apes had yet been brought to the island, and it was still possible to obtain permission to excavate. A single test pit was dug the following day in the hitherto unreported site on the island.

The Cayo de Santiago consists of two hills separated by a flat sandy area covered with palm trees. There is no spring, and drinking water has to be brought from Porto Rico proper. Nevertheless, a medium-sized shell heap, 50 meters in diameter and 75 centimeters deep, is situated in the middle of the palm grove, with traces of occupation clearly evident on the surface.

Our pit, in this case a rectangle consisting of six sections each two meters square, was laid out in the center of the shell heap. In it, the soil consisted of dark brown sandy loam mixed with shells, bones, and artifacts. Shells were common only in the first 25-centimeter level, but the bones and artifacts continued to appear in numbers to an average depth of 70 centimeters, where the loam changed to coarse grey sand and water began to

seep into the pit. Excavation was terminated at the bottom of the third level.

Potsherds of the Santa Elena style predominated in all sections and levels at Santiago. We obtained 587 of them (including one surface find), as well as 28 Cuevas, 11 Ostiones, 63 Esperanza, and one Lesser Antillean sherd. Two hundred and thirteen of the sherds are from open bowls, 312 are from constricted bowls, and 168 are typologically unidentifiable. They are accompanied by 39 fragments of griddles, six clay disks, a petaloid stone celt, part of a bone pick, a piece of a dish blank of shell, two shell celts, seven celt-blanks of shell, two chisel-blanks of shell, a shell lip-hammer, a shell blade, 19 *Cassia* lips, 11 *Strombus* lips, two shell nodes, two *Cassia* plates, three *Strombus* plates, six fractured shell tips, nine water-worn

TABLE 9
CHRONOLOGY OF THE PITS IN THE EAST-COAST AREA

		<i>Ensenada Honda 1</i>	<i>Ensenada Honda 2</i>	<i>Playa Blanca</i>	<i>Santiago</i>
Period IV	b	—	—	—	—
	a	—	—	—	—
Period III	b	1	1	—	1-3
	a	—	—	—	—
Period II	b	—	—	—	—
	a	—	—	—	—
Period I		—	—	1-2	—

Explanation of Table. The pits are listed across the top of this table and the periods along the side. The arabic numerals within the table refer to the successive 25-centimeter levels in each pit.

pieces of shell, and 22 coral fragments. Fish and manatee have been identified among the bones and marine gastropods and pelecypods among the shells.

Like Ensenada Honda, this site can be dated in Period IIIb, and it contains evidence of a trend towards the Esperanza style of Period IVa. The Cuevas and Ostiones sherds are possibly survivals from earlier periods and the Lesser Antillean sherd, a trade object.

Conclusions

Our coverage of the east coast area is the poorest of any part of Porto Rico. From a geographical standpoint, we were able to locate sites worth excavating in only two of the three principal topographic divisions of the area, and even in those two—the central and the northern—the sites are not well spaced (see folding map at end). Chronologically, our pits exemplify only two of the four main periods, I and III, with the material from the latter limited to the second half of the period (TABLE 9).

Perhaps largely because of the shallowness of our pits, we obtained no stratigraphic sequences, nor have we been able, in the absence of pits dating from Period IV, to make correlations with the historic period. Lothrop (ms.: 4) has reported a shell heap at Corcho in Barrio Daguao of the municipality of Ceiba which may have been the place of residence of the chief Yukibo, but, unfortunately, we were unable to find the site.

A single foreign trade sherd of Lesser Antillean origin was obtained in our pit at Santiago. This sherd appears to correlate with either the Cedros or the early Palo Seco style in Trinidad, a correlation which is not consistent with its Period IIIb date in Porto Rico (Rouse, 1947). The sherd is very heavily worn, however, as if it had been preserved in some family for generations, and this may account for its late date in Porto Rico.

As for local stylistic trends, we may suggest the following sequence: Period IV—Esperanza (?); Period IIIb—Santa Elena; Period IIIa—Ostiones (?); Period II—Cuevas (?); Period I—no pottery. This sequence is consistent with those in the easternmost sites of the mountainous interior and of the south coast, but it can only be considered tentative until sites in which the Cuevas, Ostiones, and Esperanza styles predominate are located on the east coast.

EXCAVATIONS ON VIEQUES ISLAND

Setting

The small islands of Vieques and Culebra, both of which lie off the east coast of Porto Rico and are within its jurisdiction, remain to be discussed. No data on Culebra are available, for the writer did not visit it and he has been unable to find ethnological or archaeological references to it. Accordingly, the following discussion will deal entirely with Vieques.

Vieques Island, called Bieque or Boyqui in the early sources, is situated some 12 kilometers southeast of Ensenada Honda, the nearest point on the main island of Porto Rico, and is 32 kilometers southwest of St. Thomas, the closest of the Virgin Islands (FIGURE 1). It forms the southern boundary of a partially enclosed body of water known as Vieques Sound, on the northern edge of which are the Cordillera Reefs and Culebra Island, 15 to 20 kilometers away (see folding map at end). On the west, Vieques Island is separated from Porto Rico proper by the relatively shallow passage of Vieques. To the northeast, the Virgin Passage lies between Vieques and St. Thomas. To the southeast, an arm of the Caribbean Sea separates it from St. Croix.

Except for St. Croix, Vieques is the largest island between Porto Rico and the Leeward Group in the Lesser Antilles (FIGURE 1). Even so, it is less than 34 kilometers long and 10 kilometers wide, its area of approximately 148 square kilometers being only one-third that of the east coast region, the smallest in Porto Rico proper.

A chain of low hills, rarely more than 100 meters high, extends from west to east almost the entire length of the island. Since this chain is somewhat north of the main axis of the island, most of the flat land lies to the south. The south coast is also the most indented and is the best sheltered from the prevailing northeastern winds. As a result, one might expect to find the majority of the Indian sites there, and in fact, nine of the twelve sites located by us were south of the divide.

The island is quite dry, but it is by no means barren. Until recently, the hills were covered with forests, but these have been removed and most of the land is now under cultivation or is used for pasture. Mangrove swamps still fringe the shore in many places, and there are a number of sandy beaches which may have served the Indians as landing places.*

Vieques is the one part of Porto Rico for which the sources are known to provide a specific statement of ethnic history. According to Bishop Alessandro Geraldini, who visited the island in 1522, "haec insula olim culta a piis et bonis gentibus erat. mox Anthropophagi eam cepere, et omni cive in crudeli convivio eorum devorato ad longa tempora tenuere, et postremo metu Hispanorum eam deseruere" (Geraldini, 1631: 191 and 1893: 297). From this, it would appear that the island was originally inhabited by a pious and agricultural people—the Arawak—and was seized at a later date by cannibals—presumably the Carib. Other sources specifically apply the

* These data on the geography, topography, and climate of Vieques Island were obtained from Lobeck (1922: 373-374), Ober (1899: 20-23), P.R.R.A. (1940: 8, 371-377), and Roberts (1942: 3-4, 223).

latter name to the Indians of historic times, also stating that the inhabitants were raiders and traveled in pirogues—the Carib form of canoe (Castellanos, 1874: 66–68; Herrera y Tordesillas, 1729, 1: 281–282; Oviedo y Valdés, 1851, 1: 484).

Since the Carib do not seem to have settled in Porto Rico proper, we may conclude that Vieques was the farthest point reached by them in their conquest of the Lesser Antilles from the Arawak. From their history elsewhere, it is inferred that they arrived on the island no more than a generation before the discovery of America (Lovén, 1935: 51–57; Brinton, 1871: 435–436). In early colonial times, the chief was a man named Cacimar. He appears to have had control over the entire island. The location of his village is not known (Herrera y Tordesillas, 1729, 1: 282; Oviedo y Valdés, 1851, 1: 484).

Columbus discovered Vieques while sailing from the Virgin Islands to Porto Rico during his second voyage in 1493. Passing along its southern side, he did not land, nor did he, so far as is known, observe traces of Indian occupation. He was so impressed with the verdure of the island that he named it “Gratiosa,” after the mother of a friend, the Bishop Geraldini mentioned above (Geraldini, 1893: 296–297; Morison, 1942, 2: 88–89).

We do not hear of the island again until 1513 or 1514, when Cacimar met his death in a raid on the Spanish settlement at the mouth of the Río Grande de Loiza. His brother, Yaureibo, succeeded to the chieftainship and, in reprisal, conducted another raid on the settlement, causing the death of the local chieftainess, Loiza, and her Spanish husband, Juan Mexía, as already noted. Yaureibo was less successful in a subsequent attack, although his party did kill Becerrillo, a famous dog whom the Spaniards had brought to Hispaniola to help fight the Indians (Castellanos, 1874: 66–68; Herrera y Tordesillas, 1: 281).^{*} Aroused by these attacks, Cristóbal de Mendoza, then the governor of Porto Rico, led an expedition to Vieques Island in 1514, killing Yaureibo and many of his followers and taking others to Porto Rico for service as slaves (Oviedo y Valdés, 1851, 1: 484).

Mendoza’s expedition put an end to permanent occupation of Vieques by the Carib. It is believed that the few Indians who survived took refuge among their compatriots in the Lesser Antilles, whence the raids on Porto Rico continued. When Bishop Geraldini visited Vieques in 1522 in order to inspect the island which had been named after his mother, he found it unoccupied. Later, it became overrun with wild cattle, and the Spaniards used it as a hunting preserve until the danger of Carib raids caused the authorities in San Juan to prohibit access to the island (Brau, 1904: 49; Geraldini, 1893: 297, 299; Latorre, 1919: 60).

While seizing control of the Lesser Antilles from the Carib in the seventeenth century, the British and French became interested in Vieques. In 1647, John Pinard took possession of the island on behalf of the British, holding it until the Porto Ricans forced him out. Soon a French expedition also had to be dispossessed. In 1718 and in 1753, the Porto Ricans again

^{*} For somewhat different interpretations of these sources, see Brau (1907: 215–220) and Van Middeldyk (1903: 279–280).

ousted British colonials. Spain constructed a fort on Puerto Real on the south coast in 1816-17. The first permanent settlers arrived about that time and, as a free port, the island was frequented by British and French from the Virgin Islands. Isabel II, the principal town, came into existence in 1843. Twelve years later, Vieques officially became part of Porto Rico (Abbad y Lasierra, 1866: 229-230; P.R.R.A., 1940: 372, 375, 376).

So far as is known, the writer was the first to undertake archaeological research on Vieques. Montalvo Guenard (1933: 357, 386) had previously published brief references to two sites, however, one of which he considered to be Carib. In addition, Lovén (1935: 278, Plate 9, 1) had illustrated a pottery lug of the Esperanza style in the Danish National Museum, noting its similarity to Porto Rican ceramics and implying that it was made by the Arawakan predecessors of the Carib.* During a week spent on the island in 1938, the writer visited the two sites mentioned by Montalvo Guenard, located ten others, and excavated in four of them. The following is an account of the excavations.

Caña Honda (Vieques 10)

Along an eight-kilometer stretch of the south coast east of Puerto Real, the writer located five sites, each consisting of one or two small shell heaps (see folding map at end). One of these sites contained Indian pottery, one had European sherds, and the other three appeared to be entirely lacking in ceramics. On July 31, 1938, a test pit was dug in the central non-pottery site, which is on land of the Eastern Sugar Associates in Barrio Puerto Real, of the municipality of Vieques.

The site dug is situated at the top of a slight rise between two mud flats, 70 meters northwest of the Puerto Mosquito (folding map). It consists of a single shell heap 39 meters long, eight meters wide, and about 25 centimeters deep, lying in the middle of an otherwise empty pasture. The usual test pit, four meters square and divided into four two-meter square sections, was laid out near the southern end of the heap, where the shells appeared to be most numerous, and was dug through two 25-centimeter levels. In the first level, we encountered dark brown humus, tinged with ash and containing large amounts of shell. This gave way at a depth of 15 to 30 centimeters to sterile yellow sand. Rocks were common in parts of both strata. There was no sign of charcoal or of bones.

The only possible artifacts were a stone hammer, a *Strombus* lip, two nodes of shell, five plain shell tips, eight fractured shell tips, and two pieces of coral. The shells included marine gastropods and pelecypods.

If a genuine place of habitation, the site probably dates from Period I. Its difference from the neighboring Indian and Spanish shell heaps which contain pottery, is marked. In particular, the shells in it are more bleached than at the Spanish site. Since the factors causing bleaching appear to be the same at both sites, Caña Honda is almost certainly older than the Spanish heap. In fact, we doubt that there has been enough time during the rela-

* As noted below, there is also a small collection from Vieques in the American Museum of Natural History in New York.

tively short period of Spanish habitation of Vieques for the amount of bleaching present at Caña Honda. While it is not likely that the heap is Spanish, however, there still remains the possibility of its production by the ceramic Indians at a time, as during shell gathering, when they may have left their pottery elsewhere.

Esperanza (Vieques 3)

Also on the south coast of the island are a group of three shell heaps at the site of the former Central Esperanza, now used only for loading lighters with sugar cane for shipment to Porto Rico (see folding map at end). These shell heaps, which belong to the Eastern Sugar Associates, are in Barrio Puerto Real of the municipality of Vieques. Our workmen reported that a stone collar* and several burials had been found in them during the construction of the central's railroad. In addition, the lug pictured by Lovén (1935, Plate 9, 1) and a small collection of Vieques pottery which is now at the American Museum of Natural History may come from the site, for they are of the Esperanza style, which we have named after the place.† The writer surveyed it on July 29, 1938, and excavated a test pit there on the following day.

Esperanza should not be confused with the shell heaps of the same name on the south coast of Porto Rico proper, where Lothrop excavated (folding map). Although somewhat similar in content, the two sites differ considerably in appearance. All three of the Vieques middens are relatively large, and they are arranged haphazardly instead of around a court or plaza (FIGURE 17). They lie along the sandy shore of the Puerto Real in what may have originally been a palm grove but is now a railroad yard. Twelve meters is their maximum diameter and 50 centimeters is their greatest depth. They appear to consist almost entirely of earth, shells, and potsherds. We collected one example of the Esperanza style, unidentifiable type, from the surface.

The central heap, situated in the space between two railroad lines, was chosen for excavation (FIGURE 17). There were two houses on this heap, and we obtained permission to dig in the garden behind one of them. Four sections two meters square and arranged in the form of a square were staked out in the garden and were dug through two 25-centimeter levels. In the first level, we encountered charcoal, bones, many shells, and a considerable number of artifacts mixed with the dark brown loam. This deposit extended to a depth of 30 centimeters, where it gave way to sterile sand.

Fifteen sherds of the Santa Elena style, one of the Capá, and 332 of the Esperanza comprise the ceramic collection from our pit. Seventy-one of these sherds are from open bowls, 191 are from constricted bowls, one is part of a miniature bowl, and 85 are typologically unidentifiable. They are accompanied by 12 griddle sherds, a clay smoother, part of a spindle whorl

* The writer cannot recall whether, at the time he recorded this information, he was aware that the same word is used in Spanish for "collar" and "necklace." It is possible that the workmen were referring to a necklace of stone beads.

† Lovén's lug and 22 of the sherds in the American Museum of Natural History conform to the Esperanza style. Also in the American Museum collection are four sherds of the Santa Elena style and four clay disks.

of clay, four fragmentary disks of clay, a stone chip, the bit of a shell celt, a celt-blank of shell, a chisel-blank of shell, a shell net sinker, a shell trumpet, a shell disk, three fractured shell tips, two water-worn pieces of shell, two coral rasps, and four other pieces of coral. Bird, fish, hutia, and turtle have been identified among the animal bones, and marine gastropods and pelecypods among the shells.

The site apparently dates from Period IVa, with the few Santa Elena sherds representing a survival from Period IIIb. The inhabitants were obviously Arawak rather than Carib, for all of our material is similar to that obtained in Porto Rico proper. As Lovén has implied in his discussion

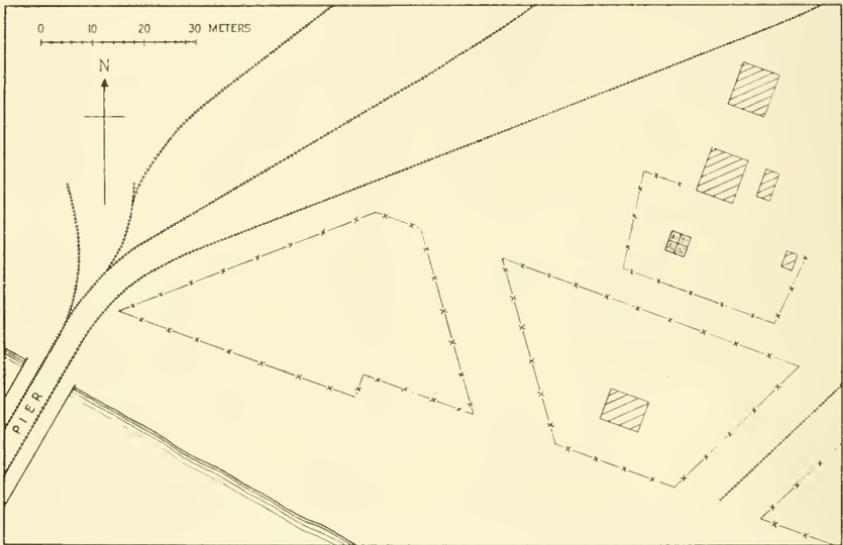


FIGURE 17. Plan of the site of Esperanza on Vieques Island.

of the sherd which we think is from Esperanza (Lovén, 1935: 278), we seem to be dealing here with the period just before the arrival of the Carib.

La Mina (Vieques 4)

Some 500 meters north of the site of Esperanza, there is another group of three shell heaps on the La Mina property of the Eastern Sugar Associates, also in Barrio Puerto Real of the municipality of Vieques (see folding map at end). Highway 69 and a small stream, which may have served as the source of drinking water for both La Mina and Esperanza, pass just to the west. Two side roads run through the site itself. The writer first visited the place on July 29, 1938, returning two days later to excavate a test pit.

The three middens lie side by side on the level coastal plain. The largest one, which is in the center, has apparently resulted from the coalescence of three or four smaller heaps. It has a maximum width of nearly 60 meters and a depth of 50 centimeters. In contrast, the smallest of the middens is

only 12 meters in diameter and 25 centimeters deep. Shells and pottery are visible on the surfaces of all three.

Although formerly a cane field, the site is now a pasture and permission to excavate was therefore easy to obtain. A pit four meters square, composed of the usual four two-meter square sections, was laid out in the middle of the largest heap and was dug through two 25-centimeter levels. In the top level, the dark brown humus was spotted with ash, and it also contained large numbers of shells and artifacts. Bones, however, were rare. This deposit gradually gave way in the second level to sandy, sterile light brown soil.

Potsherds of the Santa Elena style predominated in the pit. They number 216, and are accompanied by two examples of the Ostiones style. Sixty-three of the sherds are from open bowls, 78 are from constricted bowls, one is part of a miniature bowl, and the remaining 76 are typologically unidentifiable. The associated artifacts include nine fragments of griddles, an anthropomorphic stone pendant, a possible fragment of a bone pick, two shell celts, a celt-blank of shell, a shell trumpet, two coral rasps, and a plain piece of coral. We also obtained crab, fish, hutia, and iguana bones; marine gastropods; and marine pelecypods.

The prevalence of Santa Elena pottery places this site in Period IIIb. The Ostiones sherds are probably a survival from the preceding sub-period. Although we obtained no Esperanza sherds, it is possible that La Mina was the predecessor of the site of Esperanza, and that the inhabitants of the former place moved to the latter at the beginning of Period IV.

Martineau (Vieques 2)

The final excavation was made on the opposite side of the island, almost due north of Esperanza and La Mina (see folding map at end). It lies 50 meters above sea level on a hill overlooking Vieques Sound, and is about 300 meters inland from the Punta Martineau, after which it has been named. Previously a cane field, it now forms part of the Barracón Resettlement Farm of the Puerto Rican Reconstruction Administration, located in Barrio Florida of the municipality of Vieques.

The discoverer of the site is said to be Marcial Santana, a native of Vieques (Montalvo Guenard, 1933: 357*). The inhabitants had previously dug a small pit there, finding many animal bones, shells, and artifacts, including a sherd from an Esperanza constricted bowl and five fragments of stone celts, which they gave to us. The writer surveyed the place on Friday, July 20, and excavated a test pit on the same day.

There are two shell heaps at Martineau, a smaller one on top of the hill, and another, some 55 meters long and 15 meters wide, just beneath the crest. They are alongside a dry stream bed which, in the days when the island was forested, may have provided drinking water for the inhabitants. In a road cut through the smaller midden and a pit in the larger one, we observed ash, shells, bones, and potsherds to a depth of 75 centimeters.

Our own pit, a four-meter square divided into four sections, was staked

* In place of "Martínó" in this report, read "Martineau."

out in the larger midden alongside the pit previously made by the inhabitants, and was dug through four 25-centimeter levels. It revealed a succession of strata inclined downwards from north to south, apparently in the direction of the original slope of the hillside. The top stratum, varying in depth from 25 to 70 centimeters, consisted of dark brown loam mixed with large amounts of ash, shells, and artifacts, as well as more animal bones than were observed in any other site in Porto Rico. The middle layer, 10 to 25 centimeters thick, contained few shells, but there were pieces of charcoal, a few animal bones, and some artifacts in the brown loam. Beneath this layer, at a depth ranging from 48 to 80 centimeters, we encountered sterile yellow clay.

Several boulders, unworked and irregular in shape, appeared in the top stratum on the north side of the pit. These must have been present at the

TABLE 10
CHRONOLOGY OF THE PITS ON VIEQUES ISLAND

		<i>Caña Honda</i>	<i>Esperanza</i>	<i>La Mina</i>	<i>Marlineau</i>
Period IV	b	—	—	—	—
	a	—	1-2	—	—
Period III	b	—	—	1-2	1-4
	a	—	—	—	—
Period II	b	—	—	—	—
	a	—	—	—	—
Period I		1-2	—	—	—

Explanation of Table. The pits are listed across the top of this table and the periods along the side. The arabic numerals within the table refer to the successive 25-centimeter levels in each pit.

time of Indian habitation, but there was no evidence that they had been used in any fashion. A number of small, unworked stones were also encountered on the opposite side of the pit near the bottom of the deposit.

Santa Elena potsherds, of which there were 1,144, predominated in all sections and levels. We also obtained 12 *Ostiones* and 13 Santa Elena sherds. Although the former occurred in all levels, the latter were limited to the top of the heap, one sherd coming from level 2 and the other 12 from level 1.

Typologically, 347 of the sherds are from open bowls, 503 are from constricted bowls, eight are fragments of jars, and 316 are unidentifiable. Accompanying them are 90 fragments of griddles, part of a clay figurine, a disk of clay, five fragmentary stone celts, a celt-hammer of stone, two stone hammers, two fragments of red ocher, a bone anvil-grinder, a bone awl, two possible fragments of bone picks, two shell celts, two celt-blanks of shell, a shell chisel, part of a pendant tinkler of shell, a blunted clam shell, a *Cassis* lip, a *Strombus* plate, a fractured shell tip, three pieces of water-worn shell, and ten coral fragments. Bird, crab, fish, hutia, manatee,

and turtle are represented among the bones. Land gastropods, marine gastropods, and marine pelecypods are among the shells.

This site apparently dates from Period IIIb and is contemporaneous with La Mina. The Ostiones sherds may be survivals from Period IIIa. The Esperanza specimens almost certainly represent a trend towards that Period IV style. As at Esperanza and La Mina, all of the remains can be attributed to the Arawak. Again, therefore, we seem to be dealing with a period before the Carib arrived in Vieques.

Conclusions

Since the four sites just discussed are all in the middle of the island, they do not provide an adequate geographic coverage (see folding map at end). We surveyed several sites further west but did not excavate because none of them seemed to be particularly distinctive. At the eastern end of the island, no sites were located, although they probably exist, since that section is the closest to Culebra and St. Thomas, with which the Vieques Indians were undoubtedly in close contact during prehistoric times (FIGURE 1).

Chronologically, too, the coverage of our pits is inadequate. As shown in TABLE 10, we obtained material dating only from Periods I, IIIb, and IVa. It is possible that, because of the island's small size in comparison with Porto Rico proper, it was uninhabited during Periods IIa, IIb, and IIIa, but this does not seem likely, since sites dating from those periods exist on even smaller islands in the Virgin group.*

Only one site, Martineau, was deep enough for stratigraphical study. In it, we obtained evidence of a trend from the Santa Elena towards the Esperanza style. We have not been able to correlate the sites with any of the historic data, for they all appear to be pre-Carib.

It was a disappointment that we did not find any traces of the Carib in the excavations. In part, this may be due to the fact that we worked mainly on the southern side of the island. As already noted, Columbus apparently observed no signs of occupation when he sailed along the south coast. This suggests that the Carib may have concentrated on the northern side of the island. We would have liked to excavate in the Saleme site on the north coast, which Montalvo Guenard (1933: 357, 386) has attributed to the Carib,† but this site, being in the town of Isabel II, is almost completely destroyed.

One possible trade sherd of the Capá style appeared in our excavation at Esperanza. This sherd permits synchronization of Period IV on Vieques Island with that on Porto Rico proper. In connection with the local styles, we suggest the following sequence: Period IVa—Esperanza; Period IIIb—Santa Elena; Period IIIa—Ostiones (?); Period II—Cuevas (?); Period I—no pottery.

The existence of separate periods characterized by the Cuevas and Ostiones styles is postulated only on the basis of analogies in the Virgin Islands and Porto Rico proper. The rest of the sequence, however, is well illustrated by our pits. It will be noted that this sequence, if correct, is identical with that which is believed to exist on the east coast of Porto Rico proper.

* In particular, the Coral Bay and Little Cruz Bay sites on St. John (Hatt, 1924: 31; Rouse, 1948: 512).

† In this site, V. Reyes Fitzpatrick, a Viequan school teacher, is said to have found a "Carib grave."

CHRONOLOGICAL IMPLICATIONS

Validity of the Periods

The evidence presented in the foregoing pages indicates the existence in Porto Rico of four periods. Although, as shown in TABLE 11, these periods vary in content from place to place, they appear to be well defined. The first is characterized by an absence of pottery. Following it is a period of which the Cuevas style is diagnostic, white paint being common during the first half of the period but virtually absent during the second. The third period, too, can be divided into two halves, the first characterized by Ostiones pottery without incision and the second by Ostiones pottery with incision, by Santa Elena pottery, or by both. The Boca Chica, Capá, or Esperanza styles, occurring side by side in some cases, are diagnostic of Period IV. They are accompanied in the second half of the period by European objects. In addition, the Santa Elena style seems to have survived into the first half of the fourth period at one site on the north coast.

This reconstruction of the periods suffers to some extent from limitations in the amount of data which we were able to obtain. The first period is the least certain, since there are few, if any, artifacts in the sites assigned to it. The earlier part of the ceramic sequence on the east coast and Vieques Island is also doubtful, because of our failure to locate sites in those areas dating from Periods IIa, IIb, and IIIa. It is possible, for example, that the Santa Elena style was present in the eastern areas during Period IIIa as well as IIIb, although this does not seem consistent either with the situation in central Porto Rico or with that in the Virgin Islands. Another weak spot is Period IVa on the west coast, for which we also failed to excavate sites. It is not impossible that the Ostiones style persisted longer on the west coast than elsewhere, in which case some of the deposits which we have assigned to Period IIIb may belong instead in Period IVa. Period IVb, finally, is well defined only on Mona Island and in the central part of Porto Rico proper, those being the only places where we succeeded in excavating historic sites.

Except for these weak spots, the periods seem to be well founded in fact. The facts, however, are no more reliable than the methods used to interpret them: stratigraphical analysis wherever possible and, failing that, seriation of the deposits. The degree of reliance placed upon each of these approaches has been summarized in the tables accompanying the conclusions about each area and, therefore, will not be discussed here.

In connection with the seriation, we have been able to correlate a number of the sites with statements in the historic sources. As a further check upon the validity of the sequence, we have examined the relationships of all known trade sherds to the chronologies in their presumed places of origin, both elsewhere in Porto Rico and in other parts of the West Indies. As noted in the conclusions about the various areas, these trade sherds, with few exceptions, confirm the local Porto Rican sequence.

From a conceptual standpoint, the sequence is based upon the assumption

TABLE 11
DEFINITION OF THE PERIODS

	<i>Mona Island</i>	<i>West coast</i>	<i>North coast, mountainous interior, and south coast</i>		<i>East coast and Vieques Island</i>
			<i>Western third</i>	<i>Central third</i>	<i>Eastern third</i>
Period IV	b	Boca Chica (with European objects)	Capá (with European objects)	Boca Chica or Capá (with European objects)	Esperanza (with European objects)
	a	Boca Chica (without European objects)	Capá (without European objects)	Boca Chica, Capá, or Santa Elena (without European objects)	Capá or Esperanza (without European objects)
Period III	b		Ostiones (with incision)	Ostiones (with incision) or Santa Elena	Santa Elena
	a			Ostiones (without incision)	
Period II	b				Cuevas (without white paint)
	a				Cuevas (with white paint)
Period I					no pottery (?)

that the styles did not overlap from period to period. Both the presence of the Santa Elena style on the north coast during Period IVa and the possible survival of the Ostiones style on the west coast during the same period are considered exceptions. There are undoubtedly others. For example, some of the Ostiones sites in the mountainous interior which lack incision may belong in Period IIIb rather than IIIa. Our method of dating, however, is not precise enough to detect further cases.

Duration of the Periods

Assuming that the periods are reasonably well founded, not only in fact but also methodologically and conceptually, we will proceed to consider their duration. Although a calendar, dendrochronology, or other exact

TABLE 12
DURATION OF THE PERIODS

		<i>Number of pits</i>	<i>Number of levels</i>	<i>Levels per period</i>	<i>Years at 40 per level</i>	<i>Estimated dates</i>
Period IV	b	5	6	1.2	48	1509-1584
	a	26	46	1.8	72	1437-1509
Period III	b	29	86	3.0	120	1317-1437
	a	18	55	3.1	124	1193-1317
Period II	b	11	29	2.6	104	1089-1193
	a	7	28	4.0	160	929-1089
Period I		5	10	2.0	80	849-929

Explanation of Table. This table is concerned with the number of pits, not sites. Fractions of levels are counted as whole ones, and levels which may belong in either of the periods are arbitrarily divided between them.

method of dating is lacking, some idea of the length of the periods may be obtained by examining the depths of the deposits assigned to each. For this purpose, we have compiled in TABLE 12 the number of pits assigned to each period, the total number of levels in each, and the average number of levels per pit.

The validity of TABLE 12 as an indicator of time depends upon two factors: (1) the rates at which the Indians deposited their refuse and (2) the extent to which they moved from place to place. If the refuse accumulated at the same rate in all the pits, and if they were all utilized throughout the periods or sub-periods to which they have been assigned, then TABLE 12 provides an accurate measure of the relative length of the periods. This is not likely, but it is hoped that the number of pits is great enough to eliminate the effects of differences in the rate of accumulation. As for the movements from site to site (and from one part of a site to another), we can only hope that they were relatively as common in all periods, so that they cancel each other's effects. This is probably not true of the first period, when the Indians are

believed to have been hunters and fishermen, but it may be true of the three agricultural periods which follow.

Assuming that it is true, we may use the average depths of deposit as the basis for estimating the relative lengths of the periods (TABLE 12). The subdivisions of Period II and III appear to have lasted longer than those of Period IV, and possibly also than Period I. Period IVb seems to have been the shortest, while, if TABLE 12 is correct, Period IIa had the greatest duration.

An estimate may also be made of the absolute length of the periods. According to the sources previously quoted, the Indians at Sardinero on Mona Island first came under the control of the Spaniards in 1508, continuing in contact with them until 1584, soon after which they became extinct. This means that Period IVb lasted for at least 76 years on Mona Island.

On the main island, the period was apparently shorter. We have seen that the first *repartimiento*, or distribution of the Indians among the Spaniards, took place in 1509 and that the system was not abolished until 1544. This gives a duration of 35 years for Period IVb, upon the assumption that, before 1509, the Indians had little or no opportunity to obtain trade goods and that, after 1544, they moved to less accessible places to avoid the Spaniards.

The average duration in the five historic pits of Period IVb is 51.4 years. Applying this figure to the average depth of deposit during the period, we estimate that it took, in round numbers, 40 years for the accumulation of one level of deposit. Assuming that this rate holds true for all the periods, we obtain the figures shown in the last two columns of TABLE 12. It is estimated that the periods varied in length from 48 years for IVb to 160 for IIa. The entire sequence would then have lasted for 735 years, beginning in 849 A.D. and ending with the apparent abandonment of Mona Island in 1584.

A partial check on the dates is made possible by the evidence in the sources that the Carib arrived on Vieques Island only about a generation before the Spaniards. Period IVa was apparently more than half over when this took place, for Esperanza, the latest Arawak site on Vieques, dates from that period. Allowing 30 years for the one generation of Carib occupation and 48 years for the deposition of the 30 centimeters of deposit at Esperanza, we obtain a total of 78 years for Period IVa, which agrees well with the previous estimate of 72 years for that period.

At 40 years per level, the rate of deposition is .006 meters per year. It is perhaps worth mentioning that this is only half of the rate calculated for the eastern part of Cuba (Rouse, 1942: 151-152), for it will give some idea of the possible margin of error in our figures.

To summarize, if our figures are correct, Porto Rico was first settled about 850 A.D. by the preceramic people of Period I. Agriculture and pottery came into use about 930 A.D., when the second period began. Periods III and IV started about 1200 and 1440, respectively. During the first half of the latter period—about 1480—the Carib arrived on Vieques Island. We place the beginning of historic times—Period IVb—at 1509,

when the first *repartimiento* took place. Except on Mona Island, the historic period is ended in 1544 with the abolishment of the *repartimientos*, which made it possible for the Indians to move away from the Spanish settlements. The site on Mona Island is known to have been inhabited until 1584 and there were Indians in the more remote parts of Porto Rico for several centuries thereafter.

Population Movements

The datings presented in the foregoing sections also make it possible to draw several conclusions about population movements. For this purpose, we have compiled in TABLE 13 the numbers of sites in each area which we

TABLE 13
DISTRIBUTION OF THE EXCAVATED SITES IN SPACE AND TIME

		<i>Mona Island</i>	<i>West coast</i>	<i>North coast</i>	<i>Mountainous interior</i>	<i>South coast</i>	<i>East coast</i>	<i>Vieques Island</i>	<i>Total</i>
Period IV	b	1	0	1	1	1	0	0	4
	a	1	0	3	13	3	0	1	21
Period III	b	0	9	4	8	6	2	2	31
	a	0	4	1	4	6	0	0	15
Period II	b	0	3	4	1	2	0	0	10
	a	0	2	3	0	1	0	0	6
Period I		0	1	0	0	2	1	1	5

Explanation of Table. This table gives the numbers of excavated sites (not pits) in each area which we have been able to assign to the various periods or sub-periods.

have been able, on the basis of our excavations and those of the previous workers, to place in each period.

If the sites had been selected at random, TABLE 13 would provide an accurate record of the distribution of the Indian population from area to area and from period to period. Unfortunately, our sites, upon which the table is primarily based, were selected more rationally. As explained in the section on field procedures, we chose to excavate at the places which seemed to be the most representative of the archaeology, either culturally or from the standpoint of distribution. At best, therefore, our sites constitute a "purposeful" sample, and their value for population study depends upon the judgment of the writer in selecting them (Smith and Duncan, 1945: 256). By basing the selection on a thorough site survey, we have attempted to compensate for this weakness, but we have not eliminated it.

TABLE 13 would be more convincing if we were able to add to it the sites

surveyed but not excavated. Unfortunately, as already noted, it proved possible to date only a few of the surveyed sites, and the collections from these are so small that they seem better omitted. We can only state it as our opinion, unsupported by reliable evidence, that TABLE 13 is representative of the conditions encountered during the survey.

The table also suffers from the fact that relatively little archaeological work has been done on Mona Island, the east coast of Porto Rico, and Vieques Island. So few sites are known from these areas that our possibilities of choice were limited.

The table is likewise subject to the deficiencies we have noted above in connection with the definition of the periods. If it should be true, for example, that the Ostiones style survived into Period IVa on the west coast area, the table is biased against that period.

Another weakness is that the table does not provide any indication of the relative length of the periods. Since Period IIa, for example, was apparently twice as long as Period IVa, a great proportion of its sites may have been occupied successively rather than simultaneously. If so, the figures should be biased against Period IVa.

Perhaps the greatest weakness of TABLE 13 for population study is that it presents only the number of sites, without taking into account variations in size. This, too, is unavoidable, for, even if we were able to calculate and to compare the cubic content of the refuse in each site, we could still not be sure that all of it had been deposited during the period or periods to which the site has been assigned. It is certain only that the sites dating from Period I are smaller than those of the later periods. In addition, the writer is under the impression that the Period IV sites average smaller than those of Periods II and III. If so, the figures in TABLES 11 and 12 are biased in favor of Periods I and IV.

Taking into consideration all of these possible biases, we think it probable that the population during Period I was relatively smaller in comparison with the rest of the periods than is indicated on TABLE 13. Otherwise, the biases should tend to cancel each other's effect.

In this belief, we shall attempt to reconstruct the history of the aboriginal population on the basis of the table. If, as is by no means certain, the Indians arrived in Porto Rico during Period I, they apparently settled only in the most favorable and the more easily accessible parts of the west coast, the south coast, and Vieques Island. During Period IIa, they seem to have spread throughout the rest of the coastal areas, excepting only Mona Island. (Although we located no sites from Period IIa on the east coast or on Vieques Island, we assume that they exist.) Then, in Period IIb, the Indians began to penetrate the mountainous interior, settling in the larger river valleys which were the most easily accessible. Period IIIa shows no further expansion of settlement, but in Period IIIb the people apparently spread into the rest of the mountainous interior. Finally, during Period IVa, they seem to have occupied Mona Island for the first time.

Utilizing the conclusions concerning the styles and cultures which were

summarized in the first of these reports* and which will be discussed more fully in subsequent ones, we may fill in some of the details of this picture. The preceramic (Coroso) Indians of Period I—if they existed at all—were probably hunters and fishermen, like the Ciboney Indians of Hispaniola and Cuba. They can be assumed to have entered Porto Rico from Hispaniola, settling only in the parts of the coastal area in which conditions were best suited to their mode of life.

From Period IIa on, the Indians were probably Arawak rather than Ciboney. They apparently entered Porto Rico from the Lesser Antilles, introducing pottery of the Cuevas style and the practice of agriculture. With the assistance of the latter, they were able to spread into areas like the north coast, which were not suitable to the economy of their predecessors. On the other hand, perhaps because of their adaptation to maritime life in the smaller islands of the Lesser Antilles, they failed to penetrate any distance into the mountainous interior.

There is some indication that the immigration of the agricultural Indians into Porto Rico ceased during Period IIb, the shift at the close of that period from the Cuevas to the Ostiones style of pottery being a local, rather than an intrusive, development. At the same time, however, some movement seems to have taken place from Porto Rico to Hispaniola. By draining off the surplus population in Porto Rico, this movement may have further delayed penetration of the mountainous interior, thereby providing an explanation for the restriction, noted above, of the Period IIb and IIIa sites to the larger river valleys.

During Period IIIb, the shift of population from Porto Rico to Hispaniola apparently gave way to a second movement of Arawak Indians from the Virgin Islands to Porto Rico, which was in turn responsible for the appearance of the Santa Elena style in the eastern part of the island. This movement seems further to have caused an expansion of the population in Porto Rico, permitting occupation of the major part of the mountainous interior, as is noted above. In this connection, it is perhaps worth mentioning that the Santa Elena style is more widespread in the mountainous interior of Porto Rico than in the coastal areas, a fact which suggests that the newcomers moved primarily into the unsettled areas of the interior, possibly by way of the broad valleys at the eastern end of the island which provide the easiest access, instead of attempting to conquer the coastal areas from the previous Ostiones inhabitants.

At the beginning of Period IVa, the Ostiones people seem to have developed the Capá style and the Santa Elena people, the Esperanza. At the same time, the Boca Chica style made its appearance, presumably as the result of a migration from Hispaniola. That is, Mona Island and the site of Cayito on the south coast were probably settled by Boca Chica people from Hispaniola rather than by Porto Rican Indians. Somewhat later, but still within Period IVa, the Carib seized Vieques, while during the Period IVb the Spaniards took over the whole country.

* This series, Volume XVIII, Part 3.

One other event should be mentioned for its possible correlation with the population changes—the shift during Period IIIb from the earlier Igneri culture of the Arawak to the later Taino. It is believed that this shift was a local development, not directly connected with the population changes. As will be shown in the subsequent report, the local Ostiones people, rather than the intrusive Santa Elena, seem to have been primarily responsible for it.

The totals in TABLE 13 provide a check upon the foregoing conclusions. They indicate that the population of Porto Rico increased markedly during the first part of the sequence. In fact, judging from our figures and taking into consideration the fact that the Period I sites are less than half the size of the later ones, we think it probable that the population doubled during Period I, again during Period IIa, and once again in Period IIb. According to TABLE 13, the rate of increase declined during Period IIIa, and then rose sharply again during Period IIIb. Finally, the table indicates an absolute decrease in the population during Periods IVa and IVb.

Although these figures are inconclusive, they tend to confirm our reconstruction. The sharp rise in the population during Periods I, IIa, and IIb, coincides with the time when we believe the Indians were moving into Porto Rico. The fall in the rate of increase between Periods IIb and IIIa was to be expected if a movement to Hispaniola took place about that time. The sharp rise during Period IIIb can be attributed to the assumed migration from the Virgin Islands, and the decline during Period IVb to the actions of the Spaniards.

Only the decrease in population during Period IVa clashes with our reconstruction, for we have been led to assume that movements from Hispaniola caused an increase during that period. The observed decrease seems too great to be ascribed to chance. Moreover, it cannot be attributed to the biases listed above. As we have seen, the biases tend to cancel each other. It is possible that the population of Porto Rico had reached its optimum during Period IIIb and had then begun to fall off of its own accord. This, however, could hardly have caused such a strong reversal of the trend.

The arrival of the Carib may have caused this change. As we have seen, the Carib conquered the Lesser Antilles, probably at the beginning of Period IVa, and seized Vieques Island during the middle of that period. According to the early sources, they raided Porto Rico constantly, carrying away "many people" (Jane, 1930: 38–40). When Columbus visited Guadeloupe, nine Arawak, whom the Carib had obtained in raids on Porto Rico, took refuge on his ships (F. Columbus, 1732: 527–528). Such raids must have been a constant drain on the population of Porto Rico.

In this connection, it may be significant that TABLE 13 indicates a shift in the population during Period IVa from the coastal areas to the interior. Although a majority of the sites assigned to the previous periods lie on the coast, most of those placed in Period IVa are situated in the interior. As partial confirmation of this shift, we may note (1) the failure of Columbus and his companions to mention observing traces of Indian occupation while

sailing along the southern shore of Porto Rico,* and (2) the apparent tendency for the historic chiefs to locate their villages in the interior or on the north coast, which was protected from raids by the scarcity of good landing places (FIGURE 2).

Geographic and cultural factors probably had something to do with the shift from the coast to the interior. The latter is larger than all of the coastal areas combined and therefore, despite its ruggedness, probably provided an outlet for surplus population. This would be particularly true if, as time went by, the Indians came to place more emphasis on agriculture and less on sea food. Nevertheless, so great a proportion of the population would probably not have left the coastal areas, with their advantages of easy communication, more level land, and opportunities for fishing, unless impelled by some outside factor.

The Carib may have supplied this factor. It is possible that the coastal Indians moved into the interior in order to avoid Carib raids, just as the Spanish inhabitants of San Germán did several centuries later.† Lacking fortifications with which to protect their villages, the local Indians may have preferred to conceal themselves in the mountainous terrain of the interior.

According to the sources, Porto Rico was heavily populated at the time of historic contact (López de Velasco, 1890: 127-128; Oviedo y Valdés, 1851, 1: 478-479). Estimates of the population range from 16,000 by Brau (1904: 305-319) to 600,000 by Abbad y Lasierra (1866: 280).‡ Accepting the former estimate, we have a density of 1.8 people per square kilometer, which is relatively high as compared, for example, with the density of 1.3 in Hispaniola, 0.1 in Cuba as a whole, and 1.6 in the Maniabón district of Cuba.§ During Period IIIb in Porto Rico, when the population seems to have been larger and more widespread, the density may have been even greater, although it probably never reached the figure of 5.4 people per square kilometer which has been estimated, probably with exaggeration, for Jamaica.||

In summary, our reconstruction assumes that Porto Rico was settled during Period I by Ciboney Indians from Hispaniola, whose sites we find only in the most favorable places for fishing along the west, east, and south coasts and on Vieques Island. At the beginning of Period IIa, Arawak Indians moved in from the Lesser Antilles, probably occupying all of the coastal areas. Multiplying rapidly, they began during Period IIb to penetrate the larger mountain valleys of the interior. This movement was apparently checked, and the rate of population increase was slowed, towards the close of Period IIb and in IIIa, by emigration from Porto Rico into Hispaniola, resulting in the first Arawak occupation of the latter island. During Period

* Having examined all known accounts of Columbus's second voyage, we can find no reference to Indian occupation before the arrival at Boquerón on the west coast. For a list of these sources, see Morison (1939: 9-15).

† See the introduction to the discussion of our west coast excavations, this series, Volume XVIII, Part 3.

‡ The latter is apparently based upon an estimate of Las Casas, which we have been unable to find.

§ The first two figures are based upon the lowest population estimates given in Rouse (1948: 522, 542). The third has been calculated from the number of archaeological sites (Rouse, 1942: 154).

|| This figure has been calculated from Ober's estimate of the total population of Jamaica (Ober, 1895: 280-281).

IIIb, this emigration ceased, and in its place another emigration of Arawak from the Virgin Islands caused the population to increase to a peak density of possibly 2.5 people per square kilometer. It was at this time that the Indians spread into the greater part of the mountainous interior. At the beginning of Period IVa, groups of Arawak from Hispaniola settled on Mona Island and at Cayito on the south coast of Porto Rico. Soon afterwards, the Carib seized Vieques Island and began to raid the Arawak on the main island of Porto Rico, causing a sharp decline in the population to its historic density of approximately 1.8 people per square kilometer and forcing many of the people to move into the interior in order to escape being killed or carried off by the raiders. The coming of the Spaniards during Period IVb merely accelerated the previous rate of decrease.

Processes of Population Change

While the reconstruction of population changes just presented is not, and probably never will be, proven, it is perhaps well enough founded on fact to be used to test the theories about the peopling of the West Indies which have been developed by previous writers. In so doing, we shall confine ourselves to the Arawak, since the presence of the Ciboney on Porto Rico is uncertain and the manner of the Carib migration is well known from the historic sources.

Since the time of Brinton (1871), it has been generally agreed that the Arawak moved into the West Indies from the mainland of South America. Opinion as to the manner in which they immigrated, however, differs. Fewkes (1922: 268) assumes the existence of two migrations, first of cave dwellers and then of Arawak living in the open, with the latter driving the former into the less favorable terrain on the peripheries of the Greater Antilles.* Lovén (1935: 24-26, 42-51), on the other hand, postulates a single mass migration of all the Arawak with the exception of one small group, the Ciguayo, who may have come directly from South America to the Dominican Republic at a later date. Rainey, as we have seen, adheres to the theory of a double migration, suggesting that a second group of Arawak Indians replaced the first group in some undetermined manner (Rainey, 1935: 13; 1940: 107, 108, 182, 183).†

Our reconstruction supports Lovén's hypothesis of a single mass migration rather than the dual theory of Fewkes and Rainey. We have found no evidence in Porto Rico of a second great movement from South America following the arrival of the first Arawak, but only of minor shifts to and from the neighboring islands.

In the other two regions of the Antilles where extensive historical work has been done, Haiti and Cuba, the results also support Lovén's theory. In the former country, there is no indication of any large immigration of

* Since Fewkes is not explicit, his remarks are difficult to comprehend. For another interpretation, see Rainey (1940: 180).

† Rainey himself correlated only his later group with the Arawak. We have added the identification of the earlier group for the sake of comparison with Fewkes and Lovén.

Arawak after their first arrival (Rouse, 1939: 134-137). On the latter island, the only known movement was a local one, whereby Arawak from Haiti settled the eastern tip of Cuba about 50 years before the conquest (Harrington, 1921, 2: 414; Rouse, 1942: 164).

It is possible that both Fewkes and Rainey were influenced in their conceptions of the Arawak migrations by the manner in which the Carib and the Spaniards moved into the Antilles. Being warlike peoples and accustomed to travel long distances by boat, both the Carib and the Spaniards were able to seize entire islands with little difficulty, subjugating or exterminating the previous Arawak occupants. The latter, on the other hand, were relatively peaceable, and it is difficult to imagine one group of them being able suddenly to take over whole islands from another group. Moreover, while the Arawak did engage in trading voyages, they apparently lacked the cultural equipment for moving their families over long distances (Jane, 1930: 40-41; Martyr d'Anglera, 1912, 1: 76-77). It is not likely that they could have reached so many of the islands as quickly as the Carib and the Spanish. Furthermore, the conditions which they faced upon arriving in the Antilles probably did not require them to do so. Except for a few Ciboney Indians in the Greater Antilles, who must have been easily swept aside, the Arawak had no previous population with which to contend. Enough resources must have been available upon each island reached so that they need not have moved on with the speed of either the Carib or the Spanish.

For these reasons, and in view of the situation in Porto Rico, Haiti, and Cuba, we believe that the process of Arawak migration differed from that of the Carib and the Spaniards. We suggest that the Arawak peopled the Antilles gradually by means of a continuous series of short waves. Moving from South America, they probably settled first in the most favorable terrain, perhaps in Trinidad. As they outgrew this terrain, some of them moved on to the next island in order to obtain better land than that still available around the original settlements. By slowly repeating this process, they may have reached all of the islands of the Antilles before completely occupying any one of them. Then, as the population increased further, it became necessary to move into the less favorable terrain. This probably led to some readjustments, as on Porto Rico, with the people of the thickly settled islands moving to the neighboring places, where more land was available. It is supposed, however, that distant movements were few, both because of the abundance of nearby land and on account of the lack of cultural equipment for extensive migrations. It is suggested that the population of each island remained substantially the same as long as the Arawak inhabited it.

Judging from the situation in Porto Rico, we believe that the readjustments of population were relatively peaceable, the newcomers settling down among the residents without too much friction. Some of the Indians may have been pushed aside into the less favorable terrain, but we doubt the existence of mass conquest or assimilation in the manner of the Carib and Spaniards.

We do not mean to imply, however, that no cultural change took place during the course of the process. On the contrary, because of the slowness of the migration and the consequent opportunities for diffusion and invention, one would expect the Arawak to have arrived in the more remote parts of the Antilles with a very different culture than that with which they started. The change from the Igneri to the Taino culture, which has been briefly discussed in the first of these reports,* is a case in point. It is hoped that the entire process will eventually be tested by excavation in other parts of the Antilles.

* This series, Volume XVIII, Part 3.

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(*Folding map.*) Porto Rico, showing the topographic areas and the locations of the sites excavated.





PARTS ISSUED

VOLUME I (complete in four parts, with index):

- Part 1. History of the Survey, by N. L. Britton.
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