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OF
PORTO RICO and the VIRGIN ISLANDS

VOLUME XVIII—Part 3
Porto Rican Prehistory: Introduction; Excavations in the West and North

Irving Rouse

Awarded an A. Cressy Morrison Prize in Natural Science in 1948 by The New York Academy of Sciences

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Scientific Survey of Porto Rico and the Virgin Islands

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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 Fernandez Garcia, 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. Gilda 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.

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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(Folding map at end.) Porto Rico, showing the topographic areas and the locations of the sites excavated.
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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, as 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 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, undescrbed 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 ochre 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, Loven 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 (Loven, 1935: 89).

Until Loven'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 Loven 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 Canas 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 Canas 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 Canas did not show a gradual transition in

* In place of Cañas in these reports, read "Canas" (Gannett, 1901: 30).
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 Díaz 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.
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. 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 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" (Rainey, 1940: 109).

Incised as well as modeled elements of ornamentation increase in frequency from bottom to top of the Shell strata at Canas 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. Haeberlin, 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
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 Iñeri Indians and the Shell culture to the Taíno? 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 Caribs 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.*

* Similar to Mason's excavations at Capí (Mason, 1941).

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
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 Cegood (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 repre-
sented 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 Loven, 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 Capa, 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 sherd 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

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* The works consulted include Bachiller y Morales (1883), Brau (1904), Brau (1907), Coll y Toste (1907), Fewkes (1907), Morales Cabrera (1932), Nazario y Causel (1891), Stahl (1899), Torres de Mendoza (1880), 34: 336-515, and Zayas y Alfonso (1911).
‡ 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 (1949).
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 (Ignari) 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 constrasts 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).
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
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 IIIa and IIIb. 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 and IIIb, and in the Dominican Republic, during Periods IIb and possibly IIIa (Table 1).

**Table 1**

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<thead>
<tr>
<th>Ceramic styles</th>
<th>Cultures</th>
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<tr>
<td><strong>Dominican Republic</strong></td>
<td><strong>Western Porto Rico</strong></td>
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<tr>
<td>IV</td>
<td>Boca Chica</td>
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<td>III</td>
<td>Anadel pottery</td>
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<td>II</td>
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*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
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(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, crackling 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 outslipping 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, outslipping 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 punctation 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 Aradel 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: 98-162). 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 in-
wards, the beveled surface of which is strongly convex, in contrast to the
flatness of Ostiones bevels (figure 2, P). The convexity is more pro-
nounced 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 non-
existent. Everted rims are likewise rare.

Decoration. Somewhat less than half of the Santa Elena sherds are deco-
rated. For the most part, the decoration is simple and obvious. Artis-
tically, 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 appliqued or modeled, with incision and puncta-
tion 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 rims 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-
elude 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); Cristóbal Colón, near San Pedro de Macorís (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 un-
doubtedly had something to do with this later spread of incision, as ex-
plained 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, to-
gether 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 sand-
paper (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 (1930: 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 (1938: 517).
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, outsloping 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 appliquing and modeling, with incision and punctuation 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 Taíno 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 suggest 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, hammer-stones, 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 zonis, 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 3: 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 seafood 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 contracted 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 celts (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 xxviii, 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 fl.). The historical data upon which the identification as zemis is based are summarized in Rouse (1918: 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, 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 Lasiera, 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 Lasiera, 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 Lasiera, 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 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 Lasiera, 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 northerly 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 1)*

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

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* This designation is erroneous, as Mona Island is actually part of the municipality of Mayagüez.
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 sherd 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 Guernard (1931, 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 Aguadilla and Aguadilla. Nevertheless, few traces of Indian remains have been found. Several dwelling sites near Rincon on the southern edge of the region and one on Punta Borinquen 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 village (Coll y Toste, 1907: 1, 97, 204, 220). In the valley of Anasco, 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 Culbrinas in the hilly northwestern part of the island constituted the chieftainship of Aymamon, ruled by a chief called Aymamon 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

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* This information concerning the geography, topography, and climate of the west coast of Puerto Rico, was obtained from Lobeck (1922), Ober (1939: 11–13), F.R.R.A. (1946: 324–332), Roberts (1947), 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 Yanez 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 Guanica (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

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* 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 Yagüeica, 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 Urayoán, chief of the district of Yagüeica, 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 Yagüeica. 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; Lopéz 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; Lópex 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-
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 I)**

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 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 Rauzy 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.

Table 2

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*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.
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 cel t, one stone polisher, 27 chips of stone, one bone bead, three shell dishes, two shell cel ts, two cel t-blanks of shell, five cel t-hammers of shell, a lip-hammer, a platehammer, 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.

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 Maníabón 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; 1925) 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 Chio 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-
degrees, 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 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 course of section A1. From these data, it may be inferred that stratum 1 was deeper on the west than at the far end, and the fact that it extended a greater distance in the upper part of the trench than on the east. In addition to material found at the base of the trench, A4, I discovered in the upper part of the three beds a light soil which underlay stratum 1 in the middle between sections A2 and A3 and bore several pieces of bone. The uppermost stratum gave way in places to bent clay with few shelly remains of animal bones and artifacts. Chaff was again sparse, but it was largely concentrated in three beds eight to ten 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 yellowish clay, inclined sharply downwards so that it was deeper on the west than on the east and possibly also in section A1 by stratum 5. Stratum 4 was underlain by a sterile layer of brown clay, followed by a sterile layer of brown soil which may have been part of a hearth or of an animal bed (figure 8). The layer also sloped down more closely the inclination of the bottom of the stratum than that of the top, a fact which is obscured by a mistake made in cataloguing the material. At the time of excavation, the material had been segregated not only according to 25-centimeter levels, but also in 25-centimeter levels, but also in 25-centimeter levels, but also in 25-centimeter levels.
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 J. 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 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 I 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 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 second, 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).

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 in 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, underlay 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
far as possible, according to strata. During the course of the cataloguing
in the laboratory, the specimens became mixed, and they can now be segre-
gated 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 coin-
cide with the strata.

Table 3 gives the distribution of the styles according to section and

<table>
<thead>
<tr>
<th></th>
<th>AI</th>
<th>A2</th>
<th>A3</th>
<th>A4</th>
<th>Ostiones</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>121-10</td>
<td>3-116</td>
<td>0-100</td>
<td>0-106</td>
<td>division</td>
</tr>
<tr>
<td>2</td>
<td>274-3</td>
<td>335-45</td>
<td>5-254</td>
<td>0-169</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>226-0</td>
<td>244-2</td>
<td>142-18</td>
<td>89-1</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>27-0</td>
<td>264-13</td>
<td>160-4</td>
<td>82-4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>11-1</td>
<td>61-1</td>
<td>420-0</td>
<td>218-0</td>
<td></td>
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<tr>
<td>6</td>
<td>—</td>
<td>1-0</td>
<td>86-0</td>
<td>78-0</td>
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</tr>
<tr>
<td>7</td>
<td>—</td>
<td>—</td>
<td>57-0</td>
<td>137-0</td>
<td></td>
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<td>—</td>
<td>—</td>
<td>15-0</td>
<td>85-0</td>
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<tr>
<td>9</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>48-0</td>
<td></td>
</tr>
</tbody>
</table>

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 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 sec-
tion 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 potsherds of the Ostiones style are predominant in the
sections and levels attributed to stratum 1 and that potsherds 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. Never-
theless, the sections and levels assigned above to stratum 1 can be con-
sidered 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 sherd 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)

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 Mayagués (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.
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
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 prevailing 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, 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, 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

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* 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 I). 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 "Joyua" in place of "Joyuna."
‡ 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 specimen. 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 German 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 IIIa lay in two places beneath those of Period IIIb, 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 IIIb and IIIIB which is shown on Table 4.

Table 4
Chronology of the Pits in the West Coast Area

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<th>Boquerón</th>
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<th>Cabo Rojo</th>
<th>Coro</th>
<th>Las Cucharas</th>
<th>Los Muros</th>
<th>Llanos Tane</th>
<th>Ostiones</th>
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<td>Period IV</td>
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<td>Period III</td>
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</table>

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 Coro, 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 Yagüeeca 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 IIIa 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 Arecibo, 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 Arecibo, 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).
control 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). Canóban was the chief of the upper reaches of the Río Grande de Loiza. His village of Caynabon may have been located on the tributary which now bears his name near the modern town of Canovanas (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 Manati 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 Manati, 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: 180, 2: 10).
† For another version of the repartimiento of Loiza, see Rius (1894: 132).
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 Yaguéca (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 Augustin 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. Jungthauns, R. López Azua, and Pablo Morales Cabrera collected specimens from them in the 1920's and 1930's (Morales Cabrera, 1932: 51, 346 fl.). 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 Manati, 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 Cueva 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 unidentified 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 northwestern 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-Capa 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 Canas 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 prevalingly Cuevas material of the yellow soil, nor why none of the burials seemed to be disturbed.
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, 33, 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 sherd 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**

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<td>2</td>
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<td>4</td>
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<td>1-0-0  Cuevas division</td>
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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 1 have a majority of Cuevas sherd. All sections of levels 1 and 2, as well as section A3 of level 3, have a predominance of Ostiones sherd. 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 vision include 32 sherd 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 Ila, 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**

<table>
<thead>
<tr>
<th></th>
<th>A4</th>
<th>B3</th>
<th>B4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1-5</td>
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</tr>
<tr>
<td>2</td>
<td>0-10</td>
<td>0-8</td>
<td>0-4</td>
</tr>
<tr>
<td>3</td>
<td>2-7</td>
<td>8-3</td>
<td>6-4</td>
</tr>
<tr>
<td>4</td>
<td>8-1</td>
<td>6-0</td>
<td>1-0</td>
</tr>
</tbody>
</table>

*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 cells 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 Ila 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 sheds 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 Rio Grande de Loiza from Garmona, 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 part of the Finca Matienza 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 comparatively 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.

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-dies, 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 Ila and the top five in Period lib. 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 (Manati 3)

The first site visited at the mouth of the Manati 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 Rio Manati (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 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 I)

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...
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 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 celts-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 celts, 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 grey 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:

<table>
<thead>
<tr>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
<th>Level 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cuevas sherds</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Ostiones sherds</td>
<td>4</td>
<td>8</td>
<td>14</td>
<td>2</td>
</tr>
<tr>
<td>Santa Elena sherds</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

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 tinker 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 I)**

This is the only extensive site known from the area around the mouth of the Rio 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:

<table>
<thead>
<tr>
<th>Level</th>
<th>Cuevas</th>
<th>Ostiones</th>
<th>Santa Elena</th>
<th>Capá</th>
<th>Esperanza</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>67</td>
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<td>0</td>
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</tbody>
</table>

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 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 chisel-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 IIa. 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 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.

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 Potsherds at Santa Elena*

<table>
<thead>
<tr>
<th></th>
<th>A1</th>
<th>A2</th>
<th>B1</th>
<th>B2</th>
<th>Capá division</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0-14-26-3</td>
<td>3-24-31-3</td>
<td>0-29-47-3</td>
<td>0-14-12-1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>0-28-25-0</td>
<td>0-31-20-0</td>
<td>0-50-21-0</td>
<td>0-16-7-1</td>
<td>Santa Elena</td>
</tr>
<tr>
<td>3</td>
<td>0-60-26-0</td>
<td>1-70-8-0</td>
<td>0-48-9-0</td>
<td>0-87-13-0</td>
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<td>0-23-3-0</td>
<td>0-22-0-0</td>
<td>0-30-3-0</td>
<td></td>
</tr>
<tr>
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<td></td>
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<td>0-11-0-0</td>
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<td>0-2-0-0</td>
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</tr>
</tbody>
</table>

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 historical 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 Espíritu 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-

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* Fewkes' work is also discussed by Lothrop (ms.: 10), Lovén (1935: 121, 125, 278, 281-282, 285), Meñiques 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 Goto 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 Goto 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 Goto was the place of residence of Mabodoma, 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 IIIb 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 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 Cuevas de las Golondrinas, the latter in our pits at Los Indios and Santa Elena.

### Table 8

<table>
<thead>
<tr>
<th></th>
<th>Coto 1</th>
<th>Coto 2a</th>
<th>Coto 2b</th>
<th>Los Indios</th>
<th>Puerto de Tierra</th>
<th>Santa Elena</th>
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<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>b</td>
<td>1 (A7, A8)</td>
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<td>1 51-3 1</td>
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<tr>
<td>a</td>
<td>1 (A7, A8)</td>
<td>2</td>
<td>(A3)</td>
<td>2</td>
<td>5-3 2 3-2</td>
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<td>b</td>
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<td>3 (A4, B3)</td>
<td>6 9</td>
<td>- 1 5</td>
<td>1 5</td>
<td></td>
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</table>

**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.)
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 the 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:

<table>
<thead>
<tr>
<th>Western part</th>
<th>Central part</th>
<th>Eastern part</th>
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<tbody>
<tr>
<td>Period IVb:</td>
<td>—</td>
<td>Capá</td>
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<tr>
<td>Period IVa:</td>
<td>Capá</td>
<td>Santa Elena</td>
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<tr>
<td>Period IIIb:</td>
<td>Ostiones</td>
<td>Ostiones</td>
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<tr>
<td></td>
<td>(?) Santa</td>
<td>Elena</td>
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<td>Period I:</td>
<td>—</td>
<td>—</td>
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</tbody>
</table>

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 Cuevás.
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, hourglass, and vertical and horizontal line motives. Cañas.

(A—63975; B—86108; C—36513; D—32233; E—85584; F—98061; G—86760; H—63800; I—85218; J—31533; K—85033; L—32089; M—32433.)

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—66407; G—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, hat-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—74486; D—87779; E—93052; F—87870; G—66324; H—74914; I—96993; J—91903; K—87860; L—75031; 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, Villon. 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, Villon. 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 flint 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—90853; D—90752; E—96625; F—98152; G—90713; H—60672; I—67148; J—90783; K—97949; L—67163; M—90680; N—90810; O—90809; P—90970.)
Plate 8. Artifacts (?) of types first appearing in the supposed Coroso culture (I),.*


(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 (†). *


(A— 95557; B— 36091; C— 88651; D— 95561; E— 84449; F— 71949; G— 98785; H— 36337; I— 98750; J— 35507; K— 77814; L— 87206; M— 67022.)

* See footnote on p. 454.
Plate 10. Artifacts of types first appearing in the Taino culture (I), *


(A—79789; B—75700; C—98742; D—71947; E—67169; F—94367; G—92698; H—66173; I—31693; J—79816; K—91200; L—65023.)

* See footnote on p. 454.
Map of Porto Rico, showing the areas and the locations of the sites excavated.
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