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CULTURAL SETTLEMENT ALONG THE MOIST CARIBBEAN SLOPES OF EASTERN PANAMA

University of Illinois at Urbana-Champaign PH.D. 1980

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CULTURAL SETTLEMENT ALONG THE MOIST CARIBBEAN SLOPES OF EASTERN PANAMA

BY

ROBERT PATRICK DROLET

B.A., California State University, 1968
A.M., University of Illinois, 1975

THESIS

Submitted in partial fulfillment of the requirements
for the degree of Doctor of Philosophy in Anthropology
in the Graduate College of the
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THE DEGREE OF Doctor of Philosophy

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Local Black and Choco residents of the Costa Arriba area deserve special mention here, although a complete list of names of those people who helped me complete my fieldwork would be endless. Most special, of course, are the residents in the village of Playa Chequita where I lived for eighteen months. The kindness and cooperation I received in Playa Chiquita was also given to me in the rest of the Costa Arriba villages. Equally deserving of my gratitude are the upriver Choco of Rio Cuango and Rio Culebra. Without the instruction, friendship, and "confianza" given to me by the Choco and costeños, my archaeological work would have been impossible.

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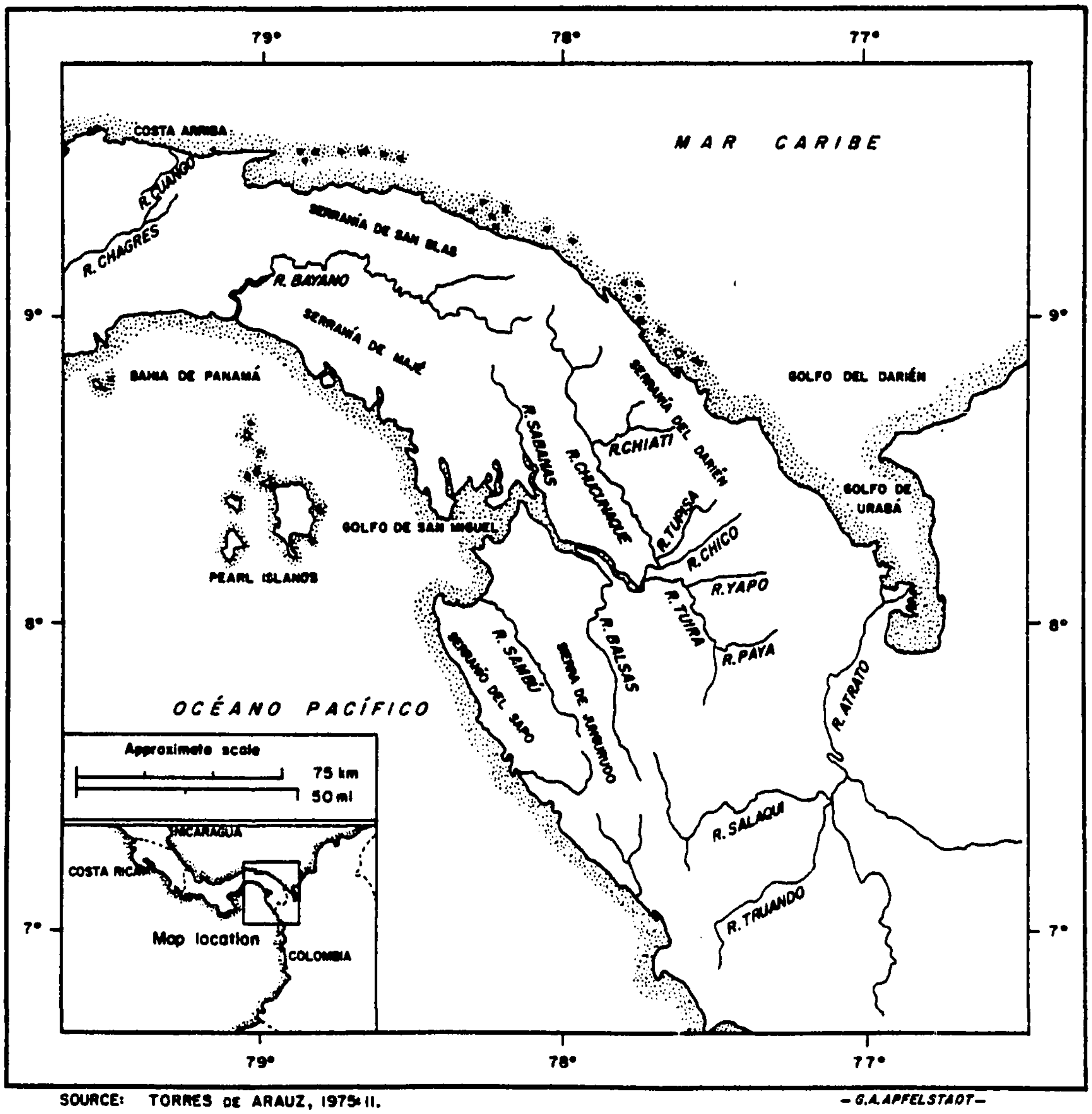
CHAPTER 1

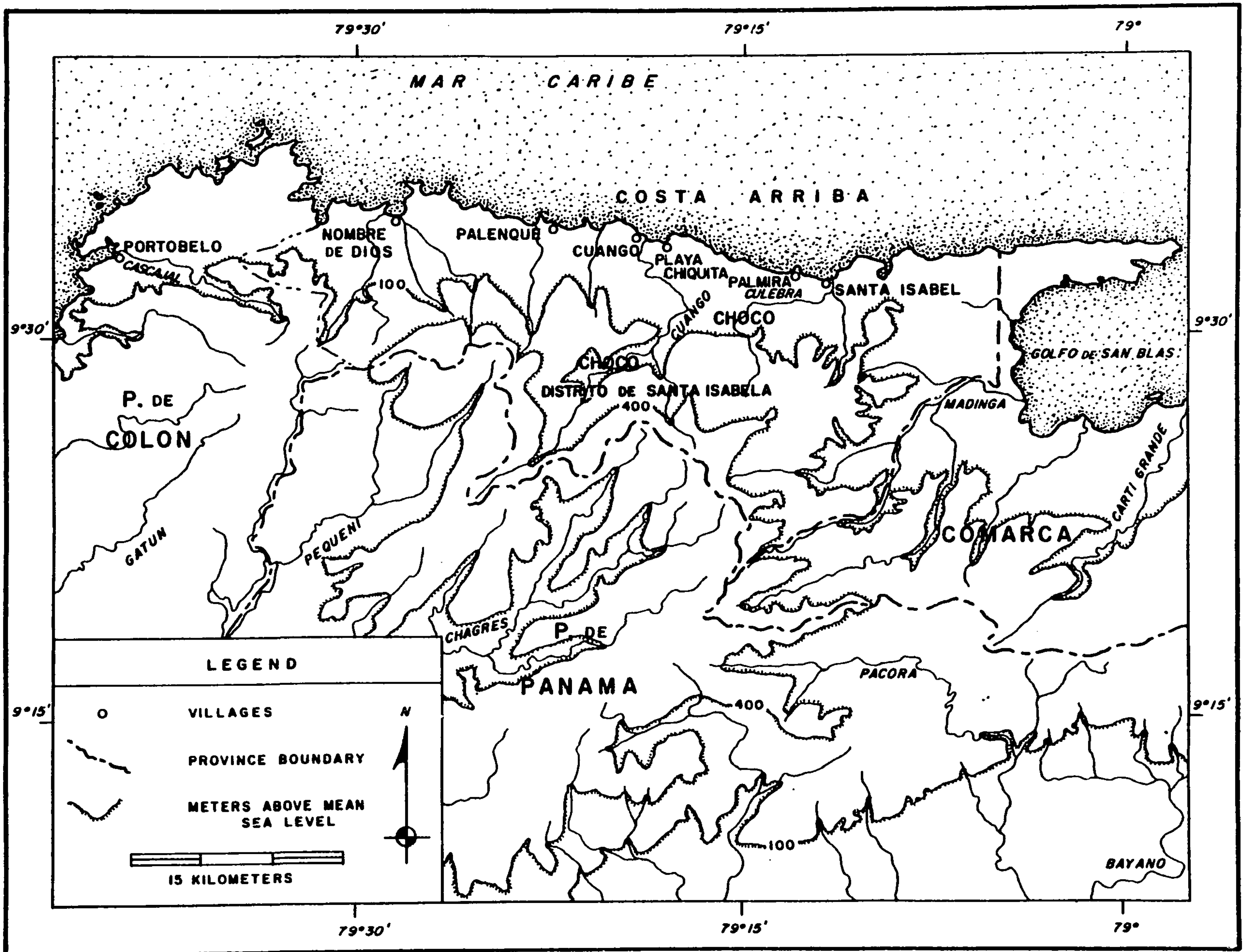
INTRODUCTION

Area in which Research was Conducted

This dissertation represents the first archaeological investigation of the Atlantic sector of eastern Panama (see Map I), an area rarely visited by outsiders. Rugged, wet forests and the absence of roads has resulted in only a sparse local population dispersed throughout the area. The sector of the Atlantic coast in which archaeological investigations were conducted is locally known as Costa Arriba. Costa Arriba is located between the city of Colon and the Comarca de San Blas, covering the eastern portion of the province of Colon and the entire district of Santa Isabel (Map II). Local residents consist of Spanish-speaking Blacks inhabiting seven small coastal villages, and Nomaná-speaking Choco, living in dispersed household settlements along interior riverine areas. The coastline of Costa Arriba runs some thirty-five kilometers in length, starting just east of the village of Portobello and ending just west of the Cuna Indian village of Provenir in the Comarca de San Blas. Within this approximately three hundred and fifty square kilometer area, eighteen months were spent (December 1976 to August 1978) living with local residents, conducting survey and archaeological site testing in the dense evergreen forests, and traveling the often hazardous ocean up and down the coast between eight major rivers that drain the Costa Arriba area (Drolet 1978).



Map I. Eastern Panama.



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Map II. District of Santa Isabela, Panama.

Purpose of the Project

Initially, the project was designed to locate Formative period occupation. Survey was conducted in protected terrace locations where these deposits would have been located, yet no sites were found. Possibly, the cultural materials associated with this early occupation were missed, being deeply buried by soil and forest overburden. Such occupation may be rare here because of the relatively small areas of good agricultural soils. Using such environmental constraints to explain the rarity of Formative period occupations seems insufficient. Judging from the much greater extent of rich agricultural soils in the Pacific sector of eastern Panama, these early agricultural settlements may have a more concentrated distribution in the Pacific riverine lowland area. The Atrato, Chucunaque, Tuira, and Bayano river systems of eastern Panama and Darien represented inland waterways draining a wide area of lowlands. Floodplains associated with these rivers are comparable to the Magdelena, Sinú, and Cauca drainages of northern Colombia where the earliest evidence of Neolithic settlement has been documented (Lathrap 1974: 139-145; Reichel-Dolmatoff 1965: 61-75). Penetration by these early farming communities from northern Colombia into attractive and ecologically similar floodplain zones of the large Pacific drainage waterways seems likely, based on similar movements of Formative period complexes known elsewhere in northern South America dating between 3,000 B.C. and 500 B.C. (Lathrap 1974). Unfortunately, no systematic investigations have been conducted in the Pacific lowlands of eastern Panama to locate Formative period settlement. Along the Atlantic watershed of Costa Arriba, a small sample of sherds from one site does seem to represent a Formative component. This Formative-like sample shares similarities to northern Colombian and eastern Costa Rican ceramic wares dating to this time period, suggesting a wide Caribbean distribution and northern expansion of related neolithic tropical forest communities.

The vast majority of ceramics recovered from the surfaces of archaeological sites in the Costa Arriba area indicate agricultural occupation subsequent to 1 A.D. (Drolet 1978). The major component at all sites encountered belongs to single homogeneous cultural traditions and thus my systematic analysis is focused on this relatively late segment of time.

The survey concentrated on the location of these later period sites and the special relationship of features within these sites. Eight major rivers, along with numerous tributaries, drain inland valleys throughout the district of Santa Isabel. Terraces associated with these agriculturally rich riverine zones were surveyed for archaeological sites. After completing the site survey of terrace areas and locating numerous sites over the inland riverine areas of the district, I decided to focus on how site features were associated with adaptive patterns and activity areas within this wet tropical zone. Detailed and objective documentation of activities from archaeological features have rarely received mention from excavated tropical lowland sites throughout Lower Central America and northern South America. Logically, adaptations to the moist American tropics involve activities such as forest clearing, fishing, hunting, cultivation, and woodworking that are closely associated with agricultural settlement (Gross 1973; Helms 1979; Helms and Loveland 1976; Lathrap 1970; Linares 1976; Linares and Ranere 1971; Linares, Sheets, and Rosenthal 1975; Reichel-Dolmatoff 1965, 1971; Stark and Voorhies

1978). I wanted to recover socioeconomic patterns associated with the small agricultural settlements located on survey from investigating remaining site structures and features (Flannery 1978: Ch. 2), but due to disasters of preservation, I was lucky to find even a few activity areas. During the initial phase of the project, two lithic workshops were noted at two surveyed sites. Given the rarity of this kind of information for the New World tropics, I decided to concentrate on a thorough investigation of these features at one site (PC 001).

The goals of the archaeological project thus centered on determining the distribution, chronology, and ecological basis for these early agricultural settlements located along the Atlantic slopes of eastern Panama. Hopefully, this information would provide some understanding of local forest adaptation. I have placed particular emphasis on the reconstruction of the varied and seasonal adaptation to the wide range of microecological zones. My intention was to go beyond simple identification of economic pursuits associated with settlement patterns. Merely identifying subsistence activities, such as swidden agriculture, fishing, and hunting, is, I think, insufficient.

Archaeological evidence obtained from survey and excavations conducted in the Costa Arriba area was used to infer the presence of economic activities associated with riverine settlement. A second level of inference, derived mainly from a lithic assemblage recovered from the lithic workshop area at site PC 001, pointed to the seasonal importance of these economic activities and their scheduling cycle. For example, the construction of dugout canoes had an important influence on resource movement. Fishing was an important subsistence activity in these small settlements. Manufactured notched weights found in the excavated deposit at PC 001 indicate seasonal wet season bay and open-sea fishing with dugouts, using line and sinker. Woodworking tools found at the same PC 001 lithic workshop point to the local manufacturing of dugouts, indicating upriver harvesting of hardwood timbers.

The associated activities of fishing, timber harvesting, and dugout construction was influenced by cyclical weather patterns. Heavy rains, swollen rivers, and calm waters characterize one part of the year, while dry conditions, stable rivers, and rough ocean waters characterize the other part of the year. Upriver travel to distant forest zones for harvesting tall canopy hardwood timbers had to be scheduled during dry months so that the cut wood could properly cure before being shaped.

Dugouts were necessary for movement of economic products into the dispersed terrace settlements. Archaeological evidence points to the movement of harvested agricultural crops, palm products, riverine fish, and a diverse variety of hunted forest fauna into these settlements. These resources were obtained from floodplain, slope, pantano, and deep forest locations and carried to riverine settlements for processing and consumption. During rainy months the calm ocean conditions permitted bay and open-sea fishing. During dryer months timbering, resource transport, and dugout construction occurred. The distribution of archaeological sites along the middle courses of the major rivers tends to reflect this seasonal resource scheduling since the sites are centrally placed in near proximity to rich agricultural soils, useful timbers, terrestrial fauna, and marine food resources. The dugout was the principle vehicle for coordinating dry season movement throughout the various lowland zones and it also provided for rainy season marine fishing at a time when the forest was flooded and its resources were difficult to reach or unavailable by riverine travel.

I hope to place subsistence activities and their seasonal scheduling within a broader-based economic network and a technological system. The distribution of sites and the social patterning associated with settlement were clearly factors affected by economic activities of these Caribbean-based groups. As we procede, the question will arise whether such networks are local or regional. The focus I am presenting permits processual analysis of prehistoric settlement in the Costa Arriba area and represents a model for local and/or regional tropical forest adaptation.

Some recent ecological and demographic analyses have focused on river valleys or other finite and bounded zones as isolated and self-sufficient areas (Mangus 1978; Zubrow 1971: 127-138). The archaeological investigations I conducted along the Atlantic slopes of eastern Panama brought into focus the question of whether cultural settlement represents a local evolutionary process or a more regional expansion of large polities out of northern Colombia. Clearly, a safer approach would be to treat the limited archaeological data I recovered in terms of local boundaries, yet this would neglect information from northern South America, pointing to an earlier antiquity of cultural movement from lowland zones into more distant locations. The eastern Panama lowlands, more specifically the Atlantic watershed area, is the zone that offers nearly 1,500 years of precontact archaeological evidence for choosing between the two alternative models of cultural settlement.

Archaeological investigations along the Magdelena, Cauca, and Sinú lowlands of northern Colombia indicate productive root and tree-fruit crop-based groups were farming the adjacent floodplain zones by at least the third millenium B.C. (Lathrap 1970, 1973b; Reichel-Dolmatoff 1965, 1971). Constant movement and expansion of these northern South American lowland peoples and food producing complexes into more northern and western areas of the Caribbean lowlands have been argued by numerous authors (Bronson 1973; Grove 1971; Lathrap 1970, 1973a, 1974; Lathrap and Foster 1973; Myers 1978). Along the Atlantic watershed of Costa Rica, recent excavations have indicated a similar root and tree-fruit crop-based tropical forest complex as early as 1000 B.C. (Snarskis 1978: 63-128). La Montaña phase ware from this early complex appears to relate to northern Colombian tecomate and incised-punctate stylistic wares dated prior to 2800 B.C. from Magdelena floodplain area site deposits (Bischof 1966: 484-491; Reichel-Dolmatoff 1965: 56-60). Further north another Formative period complex has been recently defined from the southern Maya frontier of the Sula Valley in eastern Honduras (Kennedy 1978). This riverine lowland complex shares the same tropical forest agricultural orientation as those described from the Atlantic watershed of Costa Rica and northern Colombia. The ceramic complex associated with Formative period occupation of eastern Honduras includes stylistic wares linking it to Barra Phase Guatemalan sites dating to 1600 B.C. (Green and Lowe 1967; Coe 1961; Lowe and Mason 1965) and northern Colombian Formative sites ranging in date from 3000 B.C. to 1500 B.C. In the Costa Arriba area of eastern Panama, a punctate decorated, restricted wall bowl category of wares which I have christened as Rio Cuango Punctate may be linked with early tecomate ceramic wares and Formative period complexes now known from scattered Carribbean-lowland areas. This distinctive ware, excavated from one Costa Arriba site (PC 001), was found in association with a later dated 1 A.D. to 500 A.D. component, suggesting a long period of occupation in this eastern Panama area.

All of these three Caribbean Formative ceramic complexes appear to be related and offer support to the hypothesis of South American cultural traits penetrating Mesoamerica and Lower Central America during the Formative period. Cautious assessment must be maintained on this issue since only scanty archaeological work has been conducted, especially in the intervening area of Lower Central America. Important traits are, however, shared between these distant tropical forest, Caribbean occupations. First, ceramic similarities can be seen in both stylistic decoration and vessel forms. Red slip, linear incision, grooving, fingernail stamping, shell stamping, and punctate rows along vessel shoulders are decorative modes shared between all three ceramic complexes mentioned above. Next, the principal vessel forms are restricted wall bowls, called tecomates when appearing with comma-shaped lip forms, or called inward curved wall bowls when appearing without lip treatment. Collared ollas, outcurving wall bowls, and budares are also vessel forms predominant in all three complexes. Economic orientations to riverine resources are similar, with horticulture (manioc), tree-fruit harvesting (Palm), and fishing being major activities. If the small sample of sherds from the one Costa Arriba site represents a Formative period occupation, it is likely it shares important relationships with early riverine communities in northern Colombia, eastern Costa Rica, and eastern Honduras. Confirmation of this, which eventually seems likely, will necessitate realignment of present sequences for the Intermediate area as well as a reassessment of the long-believed notion that Lower Central America is a "backwater" area of prehistoric cultural development. Fifteen years ago Reichel-Dolmatoff argued for the movement of these and other traits from Mesoamerica into the site of Momil (Reichel-Dolmatoff 1965: 78-79). Unfortunately, to date, only two archaeological projects from the Caribbean lowlands have been completed and reported on in the past fifteen years that marshall the data to test this hypothesis (Kennedy 1978; Snarskis 1978). Formative period materials associated with firmly dated deposits from eastern Costa Rica and eastern Honduras do point to a northern spread of early cultural complexes out of northern Colombia into these Caribbean areas. My archaeological work completed in Costa Arriba, eastern Panama, offers more support for the idea of south to north movement of Formative period complexes (Lathrap 1966; Myers 1978). Until more serious commitment is made to conduct and complete investigations over this rugged lowland zone, early Neolithic period settlement and movement in the New World tropics will remain inadequately documented and unjustifiably assessed.

The major component identified at all archaeological sites in the Costa Arriba area represents dispersed settlement of slope and valley bottoms by maize-oriented groups. The cultural sequences from northern Colombia and Venezuela indicate that subsequent to the Formative period occupation, maize farming rapidly spread over the lowlands and into elevated interior highland valleys (Reichel-Dolmatoff 1965: 80-116; Zucchi 1967; 1973: 182-190). Dates from the Llanos of Venezuela indicate a flint-flour maize complex, originating around 1000 B.C. and moving north replacing manioc based systems in the Magdelena, Cauca, and Sinú valleys of northern Colombia by 500 B.C. Recent archaeological evidence from eastern Costa Rica indicates a similar ecological replacement by maize farming groups associated with Momil II-like ceramic wares (Snarskis 1978: 168-170; 1976: 342-351). Penetration of maize-oriented farming groups along the moist slopes of the Caribbean side of Lower Central America from the south is a distinct possibility, and points again to northern South America as being a crucial area associated with the spread of intensive maize farming. Ceramic wares and radiocarbon dates associated with maize-oriented settlements of eastern Panama indicate widespread occupation by at least 1 A.D. The progression of dates and direction of movement associated with intensive maize farming place Costa Arriba in a crucial geographical location for investigating this cultural complex and the related socioeconomic aspects affecting both local and regional settlement.

Recent studies have shown that the ecology of any group largely depends on impinging pressures placed on it by another group (Barth 1969; Chagnon 1968a; Dumond 1972: 268-310; Peterson 1978). The spread of intensive maize agriculture over lowland zones of northern Colombia and eastern Panama by 1 A.D. permitted the development of state-level polities that integrated diverse slope and valley settlements. Ethnohistorical information of the sixteenth century describes the unification of eastern Panama, Darien, and northern Colombia into a single cultural unit. Economic and political networks operated over the entire area, leaving few, if any, single refuge areas inside this lowland, maize-oriented settlement complex. At the time of Spanish exploration and settlement, Caribbean communities were organized into over thirty territorial chiefdoms, individually under the control of one political authority or chief. Collectively, the Spanish called these polities Cueva, Arawakan, and Coiba polities occupying neighboring areas in northwestern Colombia, northeastern Venezuela, and the western Pacific, respectively. The Cuevan chiefdoms controlled wide areas of rich agricultural lands, stretching from the Atrato river west to the middle of the Isthmus. Some of the polities maintained coast-to-coast settlements, controlling a wide diversity of Atlantic and Pacific ecological zones. Each polity had a sizable dispersed farming population. Thus, the socio-political implications of intensive maize farming in the eastern Panama area had important economic consequences on settlement.

The economic basis of these Cuevan polities was maize agriculture, an intensive farming orientation begun 1,500 years before Spanish contact. The necessity for sufficient agricultural farmland and the need for control of valuable forest resources quickly developed a situation of heavy competition between chiefdom groups. Territorial warfare, regional alliances, and the division of the population into social classes and territorial sectors under the authority of one political chief institutionalized control of dispersed valley groups and permitted organized conquest campaigns into neighboring frontiers. By the time of Colombus' 1502 skirting of the Costa Arriba area, indigenous groups here were closely linked to interior Bayano-Chucunaque polities, as was the case along the Caribbean slope zone of eastern Panama. Earlier settlement in the Costa Arriba area, as evidenced by site survey investigations I conducted, points to a single cultural tradition over 1,500 years before Spanish contact, representing long Cuevan chiefdom integration in this area. The ethnohistorical information of the sixteenth century allows reconstruction of alternate economic and political structures relating to earlier prehistoric settlement. There is a distinct possibility the Costa Arriba zone was incorporated rapidly as northern Colombia kingdoms expanded into eastern Panama, a process reminiscent of northern South American cultural expansions documented for the Omagua, Tupinamba, and Carib polities (Lathrap 1970: 136-170). The northern Colombian-based Cuevan polities may be the only unit in the Costa Arriba zone from early times on, and the archaeological data forces the issue of movement of kingdoms and maize-associated food complexes from south to north.

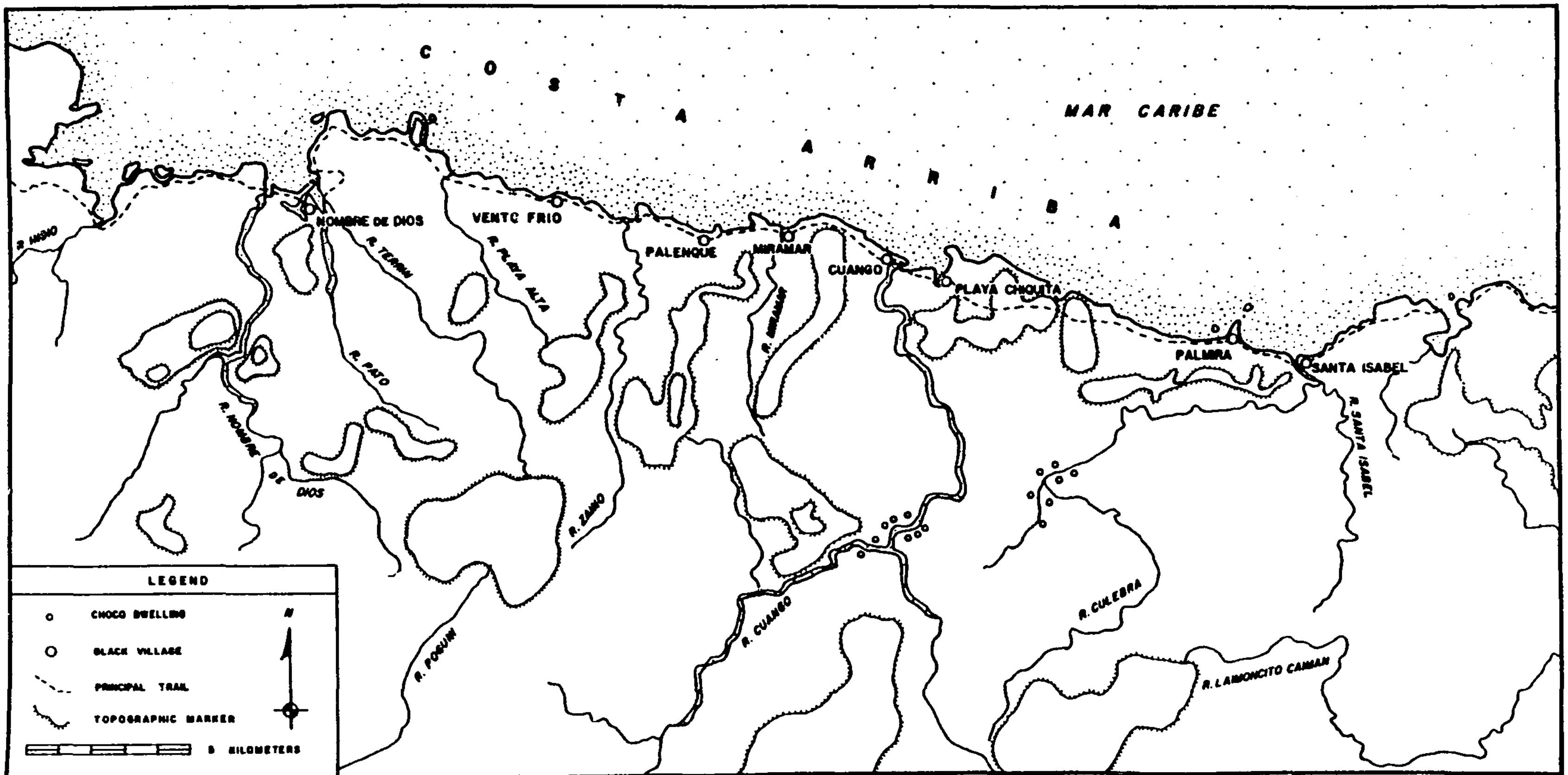
The archaeological focus of fieldwork in the Costa Arriba area thus concentrated on prehistoric occupation dating to the time period of approximately 1 A.D. to Spanish contact. During this time range slope and valley zone settlements around the major waterways consisted of intensive maize farming communities. Adaptive patterns of settlement were investigated through site features and activity areas in order to show seasonal exploitation of forest and marine zones. Archaeological evidence for subsistence orientation and patterns of dispersed settlement forces discussion of whether larger economic and political networks were impinging on local communities in the Costa Arriba area or whether these communities represented an isolated refuge zone.

A direct historical approach is used in organizing the archaeological data for the Costa Arriba area. Ethnohistorical information from eastern Panama provides a framework for reconstructing networks of regional integration and social order associated with a long prehistoric sequence of settlement. The direct historical approach, therefore, permits a discussion of the history of Cuevan occupation and makes it possible to trace regional relationships over a wide lowland area from contact times to earlier prehistoric times.

Ethnographic analogy is also employed as a methodological approach for inferring archaeological data. Modern residents of the area have provided me with a useful model for tropical forest adaptation that allows me to reconstruct cultural activities associated with archaeological occupation of the same area. Archaeologically, I found evidence for a subsistence system similar to that used by modern residents of the area, and the use of ethnographic analogy as a method, therefore, permits inferring a range of activities associated with fishing, farming, and forest exploitation. The ethnographic information I was able to collect and my deeply charged experiences among local residents of this area has given me more direct and visceral knowledge of the potential and hazards of human settlement here. Possibly, this latter information offered the most valuable level of understanding the ecological basis of prehistoric settlement in this Caribbean zone.

Field Facilities, Local Residents, and Jungle Archaeology

While conducting both survey and excavations in the Costa Arriba area, I resided the entire eighteen months of the project in the small village of Playa Chiquita, which is centrally located along the coast, near the mouth of Río Cuango (Map III). Playa Chiquita is the smallest of eight Black farming villages along the coast, consisting of approximately twenty-four households. Here my wife and I lived in a small plank house and ate all our meals with a neighboring family. There was no choice in the matter since it was impossible to rely on the once-a-week coconut boat to bring in purchased food. The boat was always broken down or



SOURCE: R. OROLET, AND DISTRITO DE SANTA ISABEL, 1960, INSTITUTO CARTOGRAFICO, PANAMA.

Map III. Areas of Contemporary Habitation, Costa Arriba, Panama.

docked in Colón due to bad ocean conditions. The living arrangements in Playa Chiquita were beneficial to the archaeological project since living in a tiny coastal community as simply a resident neighbor provided the basis for close relationships with all the families and good understanding of economic activities. As a member of the village and as a male, I was expected to cooperate in agricultural and fishing activities, both requiring considerable time. But the benefits of participating in these activities on a household and village level guaranteed a daily meal most of the time and a good understanding of local food resources. There were periods of the year when the village would lack food; household supplies of harvested rice would be depleted, the ocean would be too rough to obtain fish, and no hunted meat was available. These periods would extend sometimes for two to three weeks and a variety of starvation food would be eaten. These included small birds like toucans and doves, but more frequently chitons and a shellfish called bulgao (Cittarium pica), were collected daily off nearby reefs for meals. On occasion, these mollusks were eaten by all, but with repeated consumption they tasted like eating gum-sized pellets of saltwater-soaked rubber. During these periods there would continually grow a sense of frustration because of hunger and real distaste for these foods. It was a time when village tensions grew to their maximum with household members fighting among themselves and between households of related kin, accusing individuals of everything wrong under the sun. The first time through these lean periods, I lost twenty-five pounds and felt everyone in the village hated me. It soon became apparent everyone was reacting to lack of food and dislike of eating chitons for two weeks straight. The second year of these starvation periods, I found myself as grumpy and accusative as each other village individual, and did not lose nearly as much weight since I ate my fair share of distasteful food instead of politely refusing it.

Food thus had a major influence on the survey and archaeological work. The periods of depleted food supply in the village were always during the dry season when land survey and excavations could most efficiently be done. As a result, it was necessary to schedule my inland trips carefully according to my energy level and estimated food supply. I found myself depending heavily upon wild fruit of the forest during the upriver surveys which supplemented food I was able to bring from the village.

The rest of the year was very productive for the project since fish were abundant from the ocean and cultivated crops, such as rice, bananas, manioc, and avocado, were part of the daily meals. After May, however, the forest would get increasingly wet because of an increase in rainfall. At this time of year it was necessary to schedule survey and excavation activities around this heavy rainfall cycle. Two of the months, July and October, had to be almost completely eliminated from the work schedule since heavy daily rains flooded most of the lowlands and made the narrow, fast-moving rivers swollen and dangerous to travel by dugout. During these months, the wetness becomes so severe that a green film of mildew grew on everything, even creeping into the inside of the camera lenses and covering household furniture and clothing. Mosquitos, biting insects, and vampire bats were most noticeable during these months and required special protection to prevent getting bitten. The vampires were especially bothersome since they would fly in and out of the houses at night, frequently biting people in the village. Dogs, chickens, and pigs were continually bitten by these bats and many would die.

Besides the necessity to be constantly concerned with scheduling survey and excavation activities according to weather patterns and food supply, it was always necessary to be concerned with health, sickness, and accidents. From Playa Chiquita to Portobello, where the road began, was a six-hour boat ride, followed by a six-hour bus ride into Panama City. Being so far away from medical facilities required careful living and working. I learned most of my carefulness from living in Playa Chiquita where everyone was concerned with health and safety, yet during the course of residency and conducting archaeological work numerous accidents happened. Fortunately, I recovered from these because of the curing experiences of local people and the instruction they continually gave me about dealing with dangerous incidents of sickness and accident. One accident occurred while I and another resident from Playa Chiquita were clearing an archaeological site of vegetation. Since I had often participated in clearing activities with local residents preparing forest garden plots, I became rather good at using a machete. Yet this day while cutting secondary growth around a large Chunga palm (Astrocaryum), one of the leaves fell from the upper part of the palm six feet above me. The leaves and trunk of this palm have spikes the size of knitting needles clustered densely together. The leaf with these spikes fell directly on my right shoulder, causing hundreds of these spikes to deeply penetrate my skin. The pain was severe and my arm became paralyzed. My friend, who was clearing another part of the site, accompanied me back to Playa Chiquita, some four kilometers. A person in town tried pulling out as many spikes as she could and then rubbed the area down with animal fat. The sea was too rough to attempt a trip into Panama City and I was given numerous drinks of rum and put to bed. For months the imbedded spikes slowly worked themselves out and I was only partially able to use my right arm for heavy work. This accident is not rare and happens to various individuals during the forest-clearing period while preparing gardent plots. Other forest trees are of similar danger and require special skill to carefully cut them down to avoid injury.

Every two months or so, it would be necessary to make a trip into Panama City to obtain supplies for the project, medicine, or sometimes food for the village. These trips had to be scheduled carefully because of the unpredictability of the ocean. Most of the year these trips involved adventures with a reasonable probability of fatal outcome. From December to March the ocean is turbulent with ten-foot high swells that crash along the reefs. The ocean's roughness is caused by strong northeasterly trade winds that rip across the water. The trips into Panama City were made in native dugouts about ten-feet long. When carrying three to four passengers and an array of garden crops, chickens, and other luggage destined to relatives of Playa Chiquita who lived in Colón, the canoes offered minimum freeboard. My old outboard engine barely seemed to move the boat and the water would constantly gush into the boat from breaking swells. The return trip would be worse with more passengers, more cargo, and usually rougher seas. Once on a return trip, my wife and I were traveling alone in extremely rough seas when the propellor pin broke on the outboard. Winds blew us onto a reef, but fortunately we were able to maneuver the boat off the reef before being hit by smashing waves. This occurred at night and somehow we were able to row into the small village of Miramar, located just west of Playa Chiquita, avoiding the dangerous reef that surrounds the front of this settlement. Another time a large wave crashed into the boat while entering Río Santa Isabel, capsizing the boat and resulting in the loss of my camera equipment. Luckily, in these two accidents no one was hurt, but on all these trips in and out of the Costa Arriba area, it took a great amount of skill to successfully complete them, requiring good knowledge of winds, waves, depths, and distances. Black villagers were constantly instructing me about the ocean and how to handle a dugout with an outboard. Without this patient instruction, the archaeological research in the area would not have been possible.

Orientating myself to the dense forest environment was the most difficult part of the archaeological work. I had aerial photographs of the district; however, these were useless since they only showed the uniform canopy cover over the landscape. I also had topographical maps from various sources, yet these were grossly inaccurate. As a result, I spent approximately nine of the eighteen months in the field traveling with local farmers and hunters into upriver areas in order to learn locations of terraces, directional courses of the major rivers, and overall distributions of forest resources such as agricultural soils, valuable timbers, game animals, and geologically important features. From the coastal villages, small foot trails led upriver one to two kilometers to the individual garden plots cleared by the Black residents. During the first few months of the project I accompanied village farmers of Playa Chiquita and the other seven towns to their gardens, participating in clearing, planting, cleaning, and harvesting, therby learning local geography. The Black villagers selected riverbank areas and protected slope locations for their garden plots, making it possible to map floodplain and terrace sections along the lower and middle sections of the major rivers. The terraces were surveyed for archaeological sites, some of which were cleared and under cultivation, making it possible to find and collect prehistoric surface materials that would otherwise have been buried under forest floor debris. Along terraces with dense vegetation and surface cover, army ants exposed considerable areas of the forest floor making survey of these terraces easier by simply following their excavated trails which often contained well-displayed ceramic sherd debris.

By combining archaeological survey along these terraces where numerous prehistoric sites were found with participation in local agricultural activities I developed a more intimate knowledge of tropical forest settlement and setting. The archaeological sites I located on these terrace areas were early agricultural settlements oriented in the same rich lowland soils used by the Black village farmers. The distribution of prehistoric settlements near the rich agricultural soils suggests a farming pattern not dissimilar to modern Black swiddenists. After learning locations of the trails and the garden plots behind the coastal villages, I was able to move to adjacent areas of uncleared forest and survey the terraces in these areas for similar archaeological deposits. The search was not easy, however. I frequently ended up lost and spent hours cutting through dense secondary growth. On other occasions, I would estimate the time of day inaccurately and be forced to spend the night sleeping in the forest. Under the canopy of the jungle, darkness is oppressive even in daytime. When the sun goes down, total obscurity prevents travel and it is dangerous to try to exit.

The upriver surveys in the Río Cuango and Río Culebra area (Map III) were facilitated by Choco Indian families residing in the area. While trying to orient myself to the geography of these zones, I resided with these families and accompanied hunting and fishing parties into the interior zones. Orientation and geography drills continued over a three- to four-month period. Although I was able to locate and survey numerous terrace areas on these trips, I found little evidence of archaeological deposits. The forest cover in these upriver zones has an unbroken upper canopy with few areas of secondary growth so travel along the open forest floor is easy. The results of the survey are, I feel, reliable.

The Choco trained me in more than geographical orientation. My enculturation as a Choco forester eventually led to strong fear of upriver forest zones, subsequently limiting project activities to areas of disturbed forest further downstream. My terror of the forest was not idiosyncratic but related to a religion of the tropical forest held by the Choco and shared by many lowland indigenous groups of South America (Harner 1968: 28-33, 60-61; Reichel-Dolmatoff 1975: 307-318). The Choco, while hunting, fishing, and sitting around their houses with me, would talk constantly of the dangers of the forest, especially of the power certain forest animals have over humans and the injury they can inflict. These discussions were based on belief in the supernatural nature of part of the local fauna. The forest animals most dangerous to Choco woodsmen are vipor snakes (Bushmaster, Fer-de-lance), jaguars, and howler monkeys. These three major fauna head a family of spiritually powered forest fauna forming the basis for a shaman's control over natural resources and human well-being. Choco shamans are the only people in the area who can control the actions of these animals. All illness among the Choco was ultimately derived from spiritual attacks by these creatures and the shaman was the only person who could cure. Shamans are also responsible for the abundance of frequently hunted forest animals, such as deer (Mazama), tapir (Tapierella), peccary (Tayassu), paca (Cuniculus), and iguana (Iguana). Ceremonies devoted to recalling these selected fauna are directed by shaman once a year. The cycle linking the shaman with abundance, spiritual power, and food potential of this fauna population is a critical network of social and economic control in Choco society.

I absorbed these aspects of Choco life very piecemeal while residing among them. Although I was very intersested in their cosmological view of the forest, I did not elicit discussions about it. Religious conversations in Spanish and Choco frequently occurred in my presence while I participated in both formal and informal gatherings. I felt as a young child would in these conversations, subconsciously keeping these new and confusing beliefs in the back of my brain. The full force of this enculturation hit me suddenly in the forest one day when bathing alone in a small stream during survey of an upriver zone. I was frightened by a pack of howler monkeys who angrily began their loud, boisterous yells fifteen feet above me in the lower tree canopy. Instead of grabbing my camera to take pictures, I panicked, put on my clothes, and ran two kilometers down stream to the house of the local Choco shaman. When I told him what happened, he angrily criticized me for not talking to him before I left for the forest and was upset about me entering an area of the forest which was dangerous for this type of attack. The reason it was dangerous is because the shaman had prohibited hunting in this area of forest, and consequently, my behavior was viewed as neglectful even though I was not hunting. My entrance into this restricted zone was revenged by a dangerous "Master" animal, the howler monkey. Isolating certain forest zones by Choco shaman was occasionally done to protect the quantity and concentration of certain game animals. This Choco pattern of shamanistic control of game, isolating forest reserves and curing or directing illness caused by neglect of rules, represents a close cosmological model to that known from ethnographic groups occupying tropical forest zones of eastern Colombia (Reichel-Dolmatoff 1971; 1975: 307-318) and eastern Ecuador (Whitten 1976: 141-163). This shared tropical forest religion between the Choco and tropical forest groups of northern South America points to similar ecological systems of resource control and social ordering. Illness, defined in these religious systems, is directly the result of human neglect of these ecological controls managed by the shaman. My failure to conform to these rules, although unintentional, required formal healing. After contact with the howler monkey and after returning to the Choco shaman house, I spent the rest of the day and night in a formal ceremony officiated by the shaman and attended by most of the nearby Choco families. Subsequent to my accident, a similar accident occurred to a Choco woman who according to the same shaman was attacked by the same howler monkey. The woman was given a three day curing ceremony during which she was totally delirious for two of the three days. I attended this ceremony by invitation of the shaman and participated in the ritual curing with selected Choco women and men in a special curing house.

These episodes and an increasing awareness of the Choco forest cosmology prevented me from conducting further rigorous survey in the upriver zones. I still accompanied hunting and fishing parties, which always were given permission by the shaman to enter selected areas of the forest. By receiving this permission both the rest of the party and I were immune from animal attacks like I had experienced with the howler monkey. During these subsequent travels upriver I rarely ventured off by myself and I was able to do only general surface observations of the terrace areas crossed. The fear of the forest was real since the Choco had deliberately trained me to act and react certain ways, to make observations of particular forest features, and to interpret forest sounds as either helpful or harmful. The archaeological investigation of these upriver zones was incomplete because of my Choco training, yet I was rewarded with a rich cosmological model of Choco life.

My involvement with the Choco offers additional confirmation of the complexity of tropical forest cosmologies. Recent ethnographic studies have shown how native cosmological systems like the Choco's directly influence wide areas of tropical forest settlement (Reichel-Dolmatoff 1975: 309-318; 1971; 1973). In the eastern Panama area, this present-day Choco religious complex can be traced to the sixteenth-century Cuevan polities in which shamanistic control of natural resources established specific rules of economic and social conduct (Helms 1979). A closely related cosmological system is also known prehistorically for ancient western Panama. At the site of Sitio Conte, select faunal representations on finely made polychrome wares have been argued to display the spiritual hierarchy and ecological relationship between certain mammalian, amphibian, and reptilian forms (Linares 1977). The association of these select creatures with ceremonialism and shamanistic power seems convincing. This early cosmological complex is closely related to Choco religion and points to an ancient belief system that has never become extinct, surviving in variant forms over a wide area of the tropics (Carneiro 1964: 6-11; Dole 1964: 53-62; Harner 1972; 1962; Metraux 1949; Murphy 1969; Weiss 1973: 40-47). No direct evidence of a similar religious complex was found archaeologically in the Costa Arriba area, yet this is not surprising. Choco religious paraphernalia associated with their belief system is most abundant linguistically with only a few sacred instruments of wood and bone used by shaman for curing. My slow realization of the complexity of Choco cosmology clearly was without any artifactual association, consisting almost entirely of a mental process. One of the most powerful Choco shaman in the Río Cuango area worked with an eight-foot long Bushmaster snake, the only symbolic association of his position. Curing, special ceremonies, and witchcraft were performed with this snake, having free roam around the shaman's house. No other instruments were used by this shaman and his household furniture and dwelling design were identical to other Choco family settlements. He would however, carry the snake with him in a small basket when he traveled. When approaching his house, it was necessary to greet with a loud voice from a long distance so the shaman could command the snake to obey and not to disturb visitors. Through this symbol alone, the shaman created fear and received the highest respect as a priest of Choco religion, especially in his presence at his house where the snake visably moved at will. The implications of an entire belief system being symbolized by a snake without other material associations have dramatic archaeological significance. Ecological relationships among communities in the American tropics have been greatly influenced by cosmological models whose artifacts are mental systems that only occasionally get expressed on pottery and stone sculpture (Reichel-Dolmatoff 1975: 318).

The use of a large, deadly snake by the Choco shaman brings this mental process directly into focus, but for many archaeologists convincing would require a deductive process of sitting close to both the shaman and the snake.

Thus, there were special physical and social restraints placed on my work over this eighteen month "straightforward" aracheological project. The weather, food supply, my health, and my concern for avoiding serious accidents influenced the length and direction of survey activities. Learning the geography of the area in order to locate early riverine terrace settlements took nearly half of the project time. Frequently I felt weak and lacked sufficient energy to maintain constantly the hard and long physical exercise survey and excavation require. My scheduling of work output was simply insufficient when balanced against my food intake. Thompson's book Living Poor (Thompson 1968), beautifully describes this energy budget for the tropics of western Ecuador in which the scheduling and output of work activities among local swidden agricultural groups are largely determined by the number of bananas eaten that day. It takes a long time to adjust to reality in the tropics! Many of my problems at the beginning of the project were not due to lack of food, but rather to scheduling my physical activities in excess of what I ate.

Apart from physical restraints on the project, social ones were the most challenging. Residing with the Black village farmers and fishermen on the coast required constant participation in cooperative work activities for obtaining food. At least two days a week I fished with six or seven village fishermen in Playa Chiquita to obtain food for the village. Most of the year this involved rowing out into the bay in small dugouts with two to three people in each boat. Other times of the year, when turtle was netted in distant off-shore shallows, I accompanied the same fishermen. In the dry season, during rough sea conditions, fishing activities were restricted to the reefs. At night I would walk these areas with other village men to collect octopus, lobster, crab, chitons, and bulgao. Only occasional nightly trips resulted in large catches since the rough sea waters prevented total access to the reefs. Chitons and bulgao were always available during these periods, and as I already mentioned, they were reluctantly collected as starvation foods during periods when nothing else was available.

At other times of the year I accompanied hunting parties from both Black and Choco groups who would penetrate a wide area of forest in search of deer, agouti, paca, tapir, peccary, and iguana. On numerous occasions I traveled with Choco fishing parties, traveling to upstream locations along Río Cuango where fish such as Boca Chica were captured with long Chonta spears. As a resident in both the Black and Choco communities, I cooperated in forest clearing, planting, and harvesting ventures, giving me a full spectrum experience on how each of these groups scheduled their exploitative activities in the diverse forest and aquatic zones.

Besides the food quests, my participation was expected in social functions. Failure to meet these requirements, as with the food quest activities, would have meant hunger and ostracism. A ritual dance season called the Congo prevailed during the months of December and January in all eight Black villages of Costa Arriba. The Congo represented a festive time when food was scarce. The ritual functioned to redistribute available household food supplies throughout the entire area by Congo parties, consisting of most of the inhabitants of one village who traveled to neighboring villages for all night fiestas. Over an eight-week period, the food that was available in each of the towns was nearly depleted by the end of the festive season, permitting everyone to get through this lean period. The Congo also functioned to reestablish social relationships over all the eight villages, bringing together closely related kin whose contacts are minimal or impossible the rest of the year (Drolet 1978). Most of the residents of any one village are related to residents in the other seven villages, making the Congo the most important social event of the year. I fully participated in the Congo in all the villages by getting drunk, dancing, and occasionally being dressed up and painted as one of the Congo tricksters. On occasions, these Congos become ritually intense with masked devils carrying whips, costume dancers dressed like and acting like dangerous animals of the forest, and a chorus of costumed women seeking sexual and alcoholic pleasures. The most intense Congo activity occurs on the last day of the season when ritual activities peak. People receive cuts and bruises from being whipped by the numerous devils. Others receive more body injuries by running away from and being roughed up by the various Congo tricksters. One such Congo trickster was the "vampire bat" who would catch people in the audience and continually bite them. I quickly came to the realization it was much better to be a Congo personage than a member of the audience and, as a result, fully participated.

Botas, or ten to fifteen member male groups, would frequently form to help a village resident cut down and carry out a dugout from the distant interior forest. I participated in a number of these. They required four-hour walking and dugout poling up river to the location of a selected hardwood tree. Normally, the tree would be located one to two kilometers away from the river, along a small secondary stream. The cutting down of the tree and roughing out the dugout took nearly a month. Pushing and carrying of the roughed-out dugout through the forest to the river and down to the village required numerous daily trips back and forth. This concentrated physical exercise over a two to three week period would cause muscle pains for days. The ten to fifteen men parties participating in the botas would confine themselves to their houses and beds afterwards in almost complete exhaustion. I was never an exception, although it would always take me longer to recuperate. The botas, like the Congo, consisted of cooperative ventures among village and intervillage friends and relatives of the boat owner. The boat owner would be responsible for feeding the bota members, as well as providing rum that was drunk to maximize one's physical effort. Chanting, led by one bota member, along with drinks of rum, coordinated the movement of the heavy roughed-out dugout through the jungle. At the end of one lyric in a chant, everyone would push the dugout while collectively singing the end portion of the chant and exerting maximum force. Between chants, everyone would take a small shot of rum and the labor process would continue in well-coordinated fashion. Since each person of the bota eventually needed to replace his dugout, and the dugout was the single most important possession of a household in Costa Arriba, all able village males fully cooperated in this activity.

"Talk" sessions, which occurred nightly in each of the villages among the males of the community, were both the most significant and the most rewarding part of my time budget. Among the Choco, these discussions would occur frequently at people's houses or on fishing and hunting treks. Conversations would last for one or two hours, covering the major events of the day and week, or special technical and/or religious problems concerning forest clearing, ocean fishing, hunting, or woodworking projects. As tropical forest "seminars" these conversations offered great insight into my understanding of both ethnographic and prehistoric settlement in the Costa Arriba area.

The Spanish-speaking Black population of Costa Arriba has maintained settlements here for over four centuries as swidden agriculturalists, and my residency with them over the eighteen months of the project, and an earlier two year residency as a Peace Corps Volunteer (1969-1971), taught me a great deal about tropical forest settlement. I was able to apply this knowledge to the archaeological investigations of the area to locate sites and detect site features. Ecological strategies of land and water exploitation used by Black villagers represent adaptive patterns to this local zone that allow for ethnographic inference in analyzing the recovered archaeological evidence.

Towards the end of the last century, Black population settlements were inland, along the protected riverine terraces where the floodplains and lower slopes were cultivated with maize, manioc, and rice. This agricultural riverine settlement and economic pattern of the nineteenth century can be traced back to early colonial times when escaped slaves from the Spanish settlements at Nombre de Dios and Portobello (Map II) eastablished <u>cimarrón</u> camps, the earliest of which date to around 1514 to 1516. Some of these early settlements were located in the archaeological survey of the area (p. 136). The movement of the Black settlements to the coast has been relatively recent, and although they are not related culturally to the prehistoric population of this area, their long settlement in Costa Arriba and their dependence on agricultural and marine resources provide an important model for understanding earlier tropical forest settlement.

Similarly, my residence with the Noanamá-speaking Choco of the upriver areas of Río Cuango and Río Culebra (Map II) provided more complete understanding of human ecology in the wet forest of the Atlantic slope area. The Choco are new immigrants to this area. The Río Cuango families have travelled up from the Río Jaqué area in Pacific Darien over the last fifteen years. The Río Culebra families have travelled up from linguistically similar Choco settlements along the lower Bayano river over the last ten years. This gradual western expansion has continued from around the end of the seventeenth century, out of lowland riverine zones of northern Colombia (Romoli 1978; Torres de Araúz 1969) into more westerly agricultural lowlands along the Jaqué, Tuira, Bayano, and Chucunaque rivers (Map I). The most recent expansion further west has been in ecologically similar zones along the Río Chagres, Río Pequení and down the Atlantic slopes into the rich floodplains of Río Culebra and Río Cuango. Thus, the Choco have a long history of lowland riverine settlement in the eastern Panama and northern Colombia area.

Besides being efficient swidden agriculturalists, cultivating diversified crops such as maize, bananas, rice, and a variety of tree fruits, they are very able hunters and riverine fishermen. Their various agricultural lands are limited to the alluvial rich soils of the floodplain. The Choco clear garden plots close to their large, open, rectangular, stilt houses located along high terraces along the river bank. In the Río Cuango area, their settlements extend five to six kilometers along the river within the agriculturally rich zone of Bajo Grande valley. As of August 1978, there were a total of fifteen families residing here with each of the households dispersed a few hundred meters from one another along the river. The settlement along Río Culebra is identical; however, there are about twice as many families spread out in individual households along the river terraces, some of which also occur along the banks of smaller tributaries. This Choco settlement distribution and site size is very close to that found archaeologically and known ethnohistorically among Cuevan communities, indicating a long period of dispersed riverine settlement in the Costa Arriba area.

There is a considerable movement between these two Choco settlements, although each is autonomous with no special name associated with either settlement. In both areas, household units are related to one another. Along Río Cuango, the fifteen Choco houses represent four different families, all of which cooperate with each other in economic as well as social activities. The prehistoric sites located in similar valley regions of Costa Arriba all share dispersed riverine orientations and uniform cultural materials, possibly pointing to related family-based units as noted ethnographically among the Choco.

Each of the Choco groups has a tremendous knowledge of the forest and is keenly aware of the ecological aspects of it, including the different biotic zones, the behavior of faunal populations, and the seasonal character of the rivers and streams they constantly travel in dugouts. Their overall familiarity with the large forest zone is very much related to their economic exploitation of it, depending heavily on the widely scattered food and timber resources. As pointed out earlier, to the Choco, the jungle or forest represents their cosmological world as well as their economic world, and they structure their agricultural, hunting, and fishing activities carefully around the supernatural significance of the tropical forest. Learning the details of this cosmological system while residing with the Choco and conducting survey and excavation in their territory significantly contributed to my understanding of prehistoric settlement in this area.

Field investigations of prehistoric settlement in this moist Atlantic slope zone of eastern Panama were conducted in an environmental zone where traditional survey methods of site location and collection sampling were impossible. A total of twenty-one prehistoric sites were located along the major drainages in the district, as well as numerous other historic sites. The quantitative sample seems low for eighteen months of work. Because of the amount of dense vegetation and forest floor debris covering the terraces, there was a considerable difference in the size of surface samples collected from each site. My eventual fear of the upriver zones contributed to the biased survey of sites in this zone. Nevertheless, shovel testing, hoe clearings of forest floor debris, and observing exposed portions of the terrace sites made possible by local farmers and leaf cutter ants resulted in adequate methods of finding and collecting these terrace site deposits. By using these methods, it was possible to compare the cultural deposits between sites to determine their relative size, variety of cultural materials associated, and their locational distribution in respect to the riverine lowlands. I feel a reliable site survey of the area was completed given the conditions under which fieldwork was conducted. More intensive investigations in the Río Cuango area were conducted later, including site mapping, archaeological testing, and recording lithic-manufacturing mound features. This work provided controlled investigation of the spatial and vertical distribution of cultural materials associated with the dispersed riverine settlement over the larger district area. However, despite the rather straightforward description of the survey and archaeological work, it was conducted under rather remote and rugged environmental conditions within a unique social context of village life and forest treks with Black and Choco residents. This background necessitated working out a system of jungle archaeology that undoubtedly will produce shivers among some ardent "new archaeologists," but hoepfully it will be instructive to others who understand the value of conducting archaeology under such rich, undistrubed conditions.

Dissertation Framework

I have organized the dissertation into chapters presenting a domain of data which allows me to place the archaeology within a framework and to choose within the alternatives I have developed.

Chapter 2 presents the environmental background of the Costa Arriba sector of eastern Panama, describing the various biotic zones within the lush evergreen tropical forest and the tremendous diversity of both forest and ocean resources available to the prehistoric population.

Chapter 3 provides an ethnohistorical description of early Spanish exploration and settlement and their contact with the large Cuevan polities occupying both the Pacific and Atlantic lowlands of eastern Panama, Darien, and northern Colombia. Along the Costa Arriba sector of these lowlands at Contact, the river basins were densely occupied. Extensive areas of slope forests were cleared and under maize cultivation. I hope to demonstrate that these populations represented a territorial branch of the powerful, lowland riverine chiefdoms.

Chapter 4 discusses the site survey and the routines for locating the largest number of archaeological sites. The way the project was conducted is outlined. Each of the recorded sites is described and the surface collections recovered from sites in the river areas are discussed.

In Chapter 5, the excavated ceramic materials from site PC 001 are discussed in terms of a geographical provenance and a chronological unit relating to the Cuevan polities described in Chapter 3.

Although Chapter 6 deals with the excavation of cultural material from this above-mentioned site, I have separated it because of the importance of the lithic materials recovered. This assemblage provides the basis for documenting a multifaceted, adaptive pattern associated with the Caribbean-oriented offshoot of these Cuevan populations. The excavated cobble tool assemblage recovered from this Río Cuango site clearly shows the importance of agricultural activities, marine resource exploitation, and woodworking specialization associated with riverine settlement in this Atlantic sector.

Chapter 7 presents a model for economic adaptation of the prehistoric population in the Costa Arriba area. The discussion focuses on the lithic workshop as a specialized site feature associated with manufacturing tools. I hope to demonstrate that the variety of workshop tools is closely related to a well-developed woodworking industry and points to a productive and diversified subsistence base. A seasonal cycle of scheduling is offered for these various economic activities, showing selective resource procurement within the different forest and marine zones.

Conclusions are offered in Chapter 7 directing discussion on the success of achieving the proposed goals of field research and on the verification of the hypotheses presented.

CHAPTER 2

EASTERN PANAMA: LAND AND SEA

Introduction

Eastern Panama is a large lowland tropical forest zone connecting Lower Central America with northern South America. It constitutes nearly one-half of Panama's Isthmus land area, extending nearly one hundred and twenty kilometers from east to west and varies in width from nineteen kilometers to sixty-eight kilometers. This part of the Isthmus is oriented along an east-west axis, with the eastern section dropping gradually southward into northern Colombia. The Caribbean or Atlantic Ocean provides the northern land boundary, and the Pacific Ocean the southern boundary, while the whole region is divided up into numerous subregions (Map I).

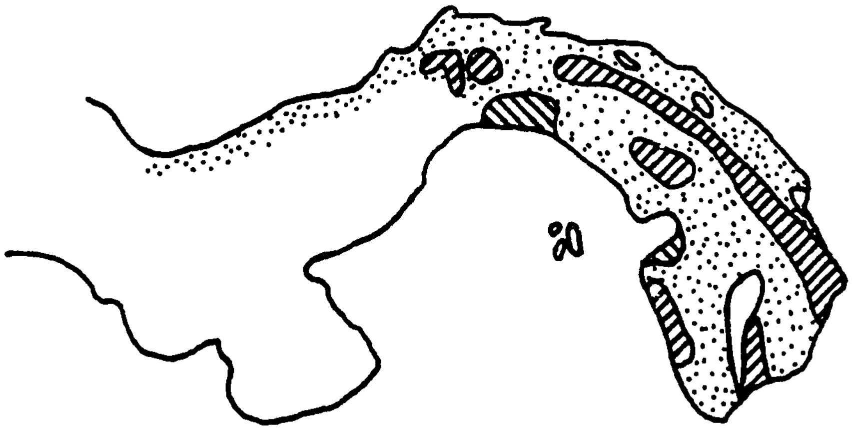
Very few environmental studies have been done over this wide eastern Panama region, making it difficult to present more than a description of the general physiographic features of the various subregions. Only the Costa Arriba sector of this region was studied while conducting archaeological investigations; however, the environmental features of this Atlantic watershed area continue over a much broader region of the eastern Panama riverine lowlands. The concern of this chapter, therefore, is, first, to deal with eastern Panama as a regional geographical unit, and second, to focus on the smaller subregion of Costa Arriba, discussing its specific tropical forest environment. This focus is intended to provide an understanding of the natural resources and environmental zones available to the pre-Colombian population of both the region and the smaller Costa Arriba zone.

The Caribbean and Pacific area lowlands in this section of Lower Central America share important environmental features that permitted culturally related groups to expand over a wide riverine zone and maintain a general uniformity of ecological orientations. Despite the fact these extensive lowlands today lie within the political boundary of Panama, they represent an extension of the rich tropical forest environment of northern South America. West of the Bay of Panama, along the Pacific watershed, more arid conditions and higher mountain altitudes, along with the lack of large drainage systems, provide physiographic conditions which are culturally significant. The cultural complexes defined for the central provinces of Panama, the highlands, and the coastal areas running further west into the northern sections of Pacific Lower Central America share very little similarity to the ceramic industries, subsistence adaptations, and settlement patterns seen in the moister tropics of eastern Panama, Darien, and northern South America. This physiographic difference between the wet tropics and more arid lands has been argued to form a cultural boundary (Cooke 1973: 398) with each division showing clear archaeological evidence for separate traditions. Thus, the regional environment which is considered here has no meaning in terms of present political boundaries, and must be understood as a northern South America tropical forest zone where people with culturally related backgrounds have expanded into various subregions, demonstrating similar ecological orientations.

In one subregion of these northern South American lowlands, the Costa Arriba area of Caribbean eastern Panama, archaeological evidence collected during fieldwork investigations demonstrates how the conditions of this wet tropical zone affected settlement. Here the major geographical features important to early prehistoric populations were three: the rivers, the diversified forest, and the ocean. The rivers functioned as avenues of movement, as a source of aquatic food, and as a source of basalt cobbles for tool manufacturing. The various forest zones (see Map IV) were important for their economically valuable resources such as timber, palm products, and, of course, their rich alluvial soils. These two environmental features, common throughout the entire regional lowlands of northern South America, have attracted early farming populations and facilitated the movement of food-producing complexes. Besides these two major environmental features available to early agriculturally oriented groups, along the Atlantic watershed area there was another--the ocean. The archaeological evidence collected from occupational sites during fieldwork in the Costa Arriba area clearly indicates the early adaptation of riverine-based groups included the exploitation of marine resources. This multi-faceted exploitation of diversified forest and ocean procurement necessitated human scheduling due to a seasonal cycle of weather patterns that affected availability of these resources. Thus, the following environmental description focuses on these three environmentally important features which together formed the ecological basis of early agricultural settlement in this Atlantic sector of eastern Panama.

Geography of Eastern Panama

The eastern Panama region is divided by the Serranía de San Blas and the Serranía de Darien, a continuous mountain chain that runs



Upland and Mountain Forests

a. Zone east of Río Chagres. A predominantly upland forest with peaks of 984 meters (Cerro Bruja) and another of 1,006 meters (Cerro Azul).

b. Serrania de San Blas and Serranía de Darien: a 300-400 meter highland forest chain with the highest peak located at Cerro Tacaruna (1,875 meters) along the Colombian frontier.

c. Maje highlands. Mature highland forest ranging between 300 and 500 meters, with Cerro Majé peaking at 1,440 meters.

d. Jaqué highlands. A 300 to 500 meter forest highland with Cerro Jaque measuring 1,585 meters.

Tropical Moist Forest

a. Includes the mixed and evergreen forest along the Atlantic slopes and the Rio Chagres valley.

b. The deciduous forest through the Canal Zone and throughout the eastern Panama Pacific lowlands.

Tropical Dry Forest

a. Savanna grasslands of the lower Bayano river and in the southeast portion of the Gulf of San Miguel.

Subtropical Wet Forests

a. Rio Chagres valley, portions of the forest slopes of the Comarca de San Blas and Portobello coast. Another located in the eastern lowlands near the Colombian frontier.

Source: Bennett 1968b; Ranere 1972.

Map IV. Forest Zones of Eastern Panama

parallel to the north coast, dividing eastern Panama into Atlantic and Pacific sectors. The central divide is a relatively low range of between 300 and 400 meters, with some heights above 500 meters, increasing gradually in the eastern part to peaks of between 600 and 700 meters (Bennett 1963). It lays closest to the north coast, forming a moist belt of slope forest along the Atlantic, varying in width from six to twelve kilometers. A wider coastal lowland zone with varied forest formations occurs along the Pacific side due to the more northern location of the central divide. The Caribbean slopes thus contain more deeply formed valleys, smaller rivers, and smaller alluvial plains than the Pacific lowlands. Due to the geographical orientation of the central divide and its resultant variance in gradient, the Pacific sector lowlands have the largest drainage basins, separated from one another by various upland zones.

These mountain regions occurring in Pacific eastern Panama branch out in a southerly direction from the main divide. In the provinces of eastern Panama and Darien, there is a low divide called the Serranía de Canazas with western extensions rising 400 to 500 meters called the Serranía de Majé. Further east in the southeastern Darien province, there is the coastal range of Serranía de Sapo with peaks reaching 550 meters. Another separate mountain region in this area is the Sierra Pirre, running northwest from the Colombian border. All of these mountain forests are low ranges compared to the higher chains to the west and east and form the basins of the large drainage systems. The only Atlantic area upland range occurs between the city of Colon and Portobello, consisting of a low, steep-sided slope zone with few areas of developed valleys.

The largest rivers within this tropical forest region of eastern Panama occur within the basins formed by these various mountain chains. The first and most impressive of these is the Chucunaque-Tuira riverine basin that occupies three quarters of Darien province. Each of these rivers flow over 150 kilometers in length, draining the interior lowlands from their headwaters in the highlands to the Gulf of San Miguel, where they merge and drain into the Pacific. Numerous large tributaries connect with each of these rivers, wandering through the lower slope zones and lush alluvial plains of the Darien forest (Bennett 1959; Breder 1946; Guzman 1956; Martini 1960). Further west, across the upland divide formed by the Serranía de Majé, are the headwaters of the second largest river, the Bayano. This river drains an equally impressive 3,500 square kilometer area of lowlands over its 160 kilometer stretch (Kluge 1926; Olephant 1865). The middle and upper courses of this river contain wide areas of agriculturally rich floodplain soils like those located in the Chucunaque-Tuira lowlands (Martini 1960; Reverte 1961). Approximately 250 rivers empty into the Pacific eastern Panama lowlands, most of which are associated with these two large drainage networks, making this area a rich riverine environment in which distant sections of the interior forest can be reached by watercraft moving along these numerous waterways.

The third largest river of Panama is Río Chagres, an Atlantic drainage with headwaters in the highlands of Pacora that flows through a large basin to the west. The river travels over 100 kilometers before reaching the Caribbean waters west of the city of Colon (Minter 1948). This is the only river of this size along the Atlantic coast north of the Atrato basin in the Gulf of Urubá due to the steep slopes along the long Atlantic strip, created by the central divide running parallel and near the coast. Along the rest of the Atlantic watershed area, only small to moderate in size, six to twelve kilometers, rivers occur. In the Costa Arriba sector, these streams are the best developed, draining a lower, gently rolling slope and are associated with larger valley formations and floodplain channels. In comparison to the Pacific lowlands, however, the entire Atlantic watershed area is much smaller, with an absence of oxbow lakes and heavy meander scarring typical of the larger river systems of the Pacific sector.

Rainfall variation along with altitudinal differences over the eastern Panama area have resulted in diversified forest formations. Rainfall over the eastern Panama lowlands is affected by moisture-bearing northeasterly winds blowing off of the Caribbean, resulting in heavier preciptation along the Atlantic slopes than on the Pacific side of the central divide. Southwesterly winds also contribute to the rains in October and November over most of the region. The highest annual rainfall measures between 3000 and 3500 mm, divided into seasonal periods of wet and dry months. From May to November, all of eastern Panama receives close to 90 percent of its total rainfall. Along the Pacific side this amounts to over 2000 mm and along the Atlantic slopes it amounts to over 3000 mm, with the remainder of the rainfall being more ore less equally distributed from December to April, the so-called "dry season" (Clayton 1927; Holdridge and Budowski 1956; Lamb 1953). Thus, as one moves south across the central divide, the rainfall amounts decline, yet the whole region shares the same seasonal cycle of wet and dry periods (Table 1).

Forest formations in eastern Panama vary according to altitude and amount of rainfall (Kluge 1926; Lamb 1953). The Caribbean slopes support a true tropical rainforest with tall, broadleaf evergreen trees

Table 1

Average Monthly Rainfall Totals for Selected Sites, Eastern Panama

	Ancon (16 years)	%	Alhajuela (14 years)	Colon (42 years)	%
January	26	1.4	33	101	3.1
February	22	1.2	4	37	1.1
March	20	1.1	16	42	1.3
April	70	4.9	100	104	3.2
May	227	12.4	287	315	9.6
June	207	11.5	262	339	10.3
July	207	11.6	365	416	12.6
August	191	10.6	324	381	11.6
September	189	10.4	306	318	9.7
October	278	25.3	377	363	11.0
November	265	14.7	410	555	16.9
December	106	5.9	167	313	9.6
	1,808	100.0	2,651	3,184	100.0

Note: Rainfall measurements are in millimeters. Alhajuela station measurements comes from the upper Chagres river (Hann 1914: 526).

forming a canopy over the landscape. Lower-tier tree vegetation creates a two to three-layered canopy structure, permitting little undergrowth on the forest floor. On the southern side of the divide, deciduous species dominate the forest formations in both the upland and lowland zones. These transition forest zones of the Pacific change to more arid grasslands along the coast. Starting on the banks of the lower Bayano river and running west along the coast, there is an area of predominately savanna growth interspersed with palm forests. Another similar grassland stand occurs on the southeastern edge of the Gulf of San Miguel. Each of these areas receives less than the 2000 mm annual rainfall for the surrounding lowlands and are affected by a longer dry season (Bennett 1968b: 94). Quantitative records for rainfall are lacking over most of the eastern Panama zone (Table 1), yet the distribution of vegetational zones is a clear indicator of relative precipitation. Most importantly, the deciduous and mixed forest vegetation over most of the Pacific lowlands contrasts with the predominately evergreen forests of the Atlantic slopes, vegetational complexes which show transitional features of rainfall amounts and altitude.

These forest formations contain a variety of economically important resources that were available to prehistoric human populations. There is a diversified fauna population of terrestrial, arboreal, and aquatic forms largely concentrated in the lowland riverine areas where secondary forest growth provides an abundance of food (Mendez 1970). Mineral deposits occur in various subregions, including gold in the southeastern highlands and magnesium along the Atlantic slopes (Sauer 1969: 167-168; Wassen 1938: 131). A rich outcropping of jaspar, a lithic source rare in lowland tropical regions, is located along the upper and middle courses of the Chagres river (Bird and Cooke 1977; Sander 1964). Jaspar tools, found as important items in numerous Pacific and Atlantic area sites of eastern and western Panama, suggest an important lithic industry in the Río Chagres area. Clovis-like fluted points have been recovered in this area (Bird and Cooke 1977), indicating a very early use of these jaspar sources. Later-dated ceramic bearing complexes are also known from this area, associated with jaspar and basalt workshops dating to around 1 A.D. (Cooke 1978: personal communication). This later flake and blade industry appears to have been controlled by agriculturally based groups in the Río Chagres area, involving the exportation of manufactured tools over a widespread area. Unfortunately, nothing has been published relating to these later archaeological complexes, making it difficult to fully describe this important forest tool industry.

The high canopy forests of eastern Panama provide valuable timber sources of hardwoods, generously scattered throughout the fifteen to forty-five meter moist slopes in both the Atlantic and Pacific sectors. The rich alluvial soils of the riverine lowlands provide one of the most extensive areas for agricultural activities in all of Lower Central America, similar in kind to the Magdelena and Atrato floodplains of northern Colombia.

The moist riverine forest lowlands of eastern Panama are connected to marine zones of the Pacific and Atlantic coasts. Along the Pacific coast, a variety of different coastal formations occur, including large open bays, like the Gulf of Panama; estuary lagoons, like the Gulf of San Miguel; and large offshore islands, like the Pearl Islands, Taboga, and Tabogilla islands (Map I). Each of these areas contain rich marine faunal resources of fish, shellfish, and turtle that are present most of the year. A quite different situation occurs along the Atlantic coast of eastern Panama.

Here, coral reef formations dominate the coastal zones with their maximum formation occurring in the Comarca de San Blas, where over 400 coral atolls are distributed along a twenty-mile offshore zone. The coral formations along the Atlantic contain a large species diversity of marine fauna; however, because of high velocity northeast trade winds causing turbulence in the offshore waters from December to April, there is considerable movement of these species during this time of year. The marine zones of eastern Panama thus contain a diversity of economically important resources and are part of the forest lowland zones through the riverine waterways geographically linking these two areas.

Natural Environment of the Costa Arriba Subregion

Costa Arriba is a lush lowland slope forest, well-drained by numerous waterways and bordered on the north by a reef-line beach zone. From the city of Colon to the Comarca de San Blas this Atlantic coastal strip is divided into various political districts, one of which is Santa Isabel. The district of Santa Isabel is located along the furthest eastern stretch of Colon province stretching from Río Mandinga on the east to Río Indio on the west (Map II). Here the coastline stretches some thirty-five kilometers and the lowland slope forest behind the coast slowly ascends ten to fifteen kilometers inland before reaching the southern highland divide of Serranía de San Blas. The coastline in the district of Santa Isabel is oriented almost directly east and west, broken only by small, open bays and numerous coral reef formations. No large estuary or lagoon zones are present on the coast here, as they are further east and west, and there are no offshore islands, except for a few coral outcroppings close to shore. The marine zone, like the tropical forest, is a major ecological zone of this area, and together these two form an important subregion to which early agricultural groups have been attracted.

The northern slope forest here most closely resembles the lowland riverine subregions of the Río Bayano valley, the Chucunaque-Tuira valleys, and the Río Chagres valley. Each of these areas contain a dense canopy forest cover, rich soil formations along their riverine networks, and seasonal periods of heavy precipitation; a combination of environmental factors linking all of these areas together as agriculturally rich zones. Although the rivers along the Atlantic slopes of Costa Arriba are smaller and shallower than those on the Pacific side, their middle and upper courses contain flat, lowland floodplains and gently sloping hills with agriculturally rich soils. Besides the similarity of the lowland riverine environments of Costa Arriba and the Pacific side subregions, all these areas contain off-river forest zones with rich timber species, fruit-bearing palms, and wildlife fauna populations representing economically important resources available to human groups. The combination of these ecological factors, present in Costa Arriba and in other similar Pacific subregions of eastern Panama, makes these subregions favorable areas of agricultural settlement. The amount of forest disturbance along the slope forests in the Pacific and Atlantic lowlands of eastern Panama clearly indicate long human occupation here (Bennett 1968b). There appears to be a clear relationship between the extent of secondary, mixed forest vegetation and the length of agricultural clearings in all these areas, arguing for a considerable antiquity to swidden cultivation throughout these riverine zones. Along the Atlantic coast, forest clearing along the lower slopes and floodplains for swiddening activity still persists in the Costa Arriba area, indicating a continuous 450 year period for this activity since contact times. Archaeological investigations in the same area during the eighteen-month fieldwork project indicate agricultural activities associated with settlement here as far back as 1 A.D., pointing to extended forest disturbance by human groups within the agriculturally rich forest zones for nearly 2,000 years.

Marine Zone

The marine zone in the district of Santa Isabel contains long, wide sandy beaches, coral reef formations running parallel to the beach, small bays, and open-sea shallows. The sandy beaches extend anywhere from one meter inland, where they meet beachfront forest slopes and low cliffs, to ten to twenty meter wide in areas of relatively flat plain. Their length varies, however. Typically, these beaches are long and gently curve inward between two projecting coral and igneous rock points, forming a series of small bays from one end of the coast to the other. Low, crawling-vine vegetation, along with higher stands of sea grape (Coccoba unifera), cover the higher protecting beach areas. Each small bay has a major freshwater river draining into it, discharging quantities of mud, sand, and forest debris when these waterways are swollen during heavy rains. Much of this debris is deposited on the beaches, resulting in sizable pile-ups of logs, branches, and decaying organic matter. Until recently this ocean-soaked woody-beach debris has provided local Black villagers their salt supply. This was obtained by a process of burning the wood and separating the salt from the ashes. Because salt is an important chemical in preserving meat, this process of extracting salt from ocean logs may have been an important activity prehistorically among the riverine-based groups.

Along the moister sections of the beach, sand crabs (Ocybode) reside in their shallow, excavated holes, and along with larger hermit crabs using old Cittarium shells, these two forms dominate the activities of the unvegetated parts of the beaches. Both crab species are collected by local fishermen from nearby villages and used as bait for fishing in the nearby bays. During most of the year stinging gnats and mosquitos, hover around the beach sands, being constantly hunted by a diversity of lizards of many sizes and colors. Probably the most important mean animal found along this beach zone is the sea turtle (Chelonia mydas) which seasonally bury eggs here. Both the turtle and the eggs are highly prized food sources for modern coastal residents. Finally, shorebirds travel the beach, feeding on the terrestrial and aquatic insects, crabs, and small fish. The most frequently seen birds along the beach include pelicans, gulls, terns, herons, and egrets (Table 2). Many of these beachcombers feed on small fish present in the bays and their movements from the beach to the sea signal the locations of large fish schools.

Beyond the beach, most of the coastline is protected by reef formations (Map V). The most notable occur in three areas: one called Visagara located between Río Indio and Río Nombre de Dios; another called Quiungong, located between Playa Chiquita and Palmira; and another called Escribanos, located between Santa Isabel and Porvenir. In each of these areas, the reefs are characterized by solid, mostly flat, rocky formations with occasional pool separations and large underwater caves. A variety of coral species predominate, including fan and brain coral. The reef extends out from the beach, in some places as far as ten meters. During storm and lunar tidal climaxes, one to two meters of

Table 2

Distribution of Marine Fauna

I. Coral Reef

1. Pargo (*Lutjanus*)
2. Pejecochino (*Balistes*)
3. Sardinas (*Harengula, Jenkinsia*)
4. Tiburón
5. Cojinua
6. Mero (*Serranidae*)
7. Blue fish (*Acanthurus*)
8. Mojarra (*Egerres*)
9. Chopa (*Kyphasus*)
10. Picua (*Sphyraena*)
11. Stingray (*Stoasodon*)
12. Mantaray (*Manta*)
13. Cabrilla (*Petrometopon, Cephalopholis, Epinepholus*)
14. Lora (*Sparisoma*)
15. Pes de Dios (*Platophrys*)
16. Pulpo (*Octopus vulgarus*)
17. Langosta (*Panulirus*)
18. Cuchara (*Chiton*)
19. Bulgao (*Cittarium*)
20. Cangreja (*Colinectes*)
21. Eel (*Enehelycare*)
22. Cambombia (*Strombus, Tegula*)
23. Vieja (*Iridio*)
24. Sarajuelo (*Holocentrus*)
25. Caballito (*Hippocampus*)
26. Huahuanche (*Aulostomus*)
27. Catarnica (*Argyreiosus*)
28. Pámpano (*Trachinotus*)
29. Tamborín de espina (*Diodon*)

II. Bay fish

1. Cojinua
2. Jural (*Caranx*)
3. Herrero
4. Pargo (*Lutjanus*)
5. Catfish
6. Picua (*Sphyraena*)
7. Serrucho (*Acanthocybium*)
8. Sierra (*Scomberamorus*)
9. Macaví (*Synodus*)
10. Aujeta (*Strongylura*)
11. Boquipendula
12. Tiburón (*Sphyrna, Carcharias, Galeocerdo, Isurus*)
13. Sawfish (*Pristis*)
14. Porpoise (*Cetacea*)
15. Bonito (*Seriola*)

Table 2 (Continued)

16. Corvina (*Umbrina*)
17. Gato
18. Sábalo (*Tarpon atlanticus*)
19. Ronco (*Haemulun*)
20. Snook (*Ablennes*)
21. Gar (*Hemiramphus*)

III. Open-sea shallows

1. Pargo (*Lutjanus*)
2. Tiburón (*Sphyrna, Carcharias, Galeocerdo, Isurus*)
3. Serrucho (*Acanthocybium*)
4. Cojinua
5. Bonito (*Seriola*)
6. Sartona (*Ocyurus*)
7. Picua (*Sphyraena*)
8. Mero (*Serranidae*)
9. Carey (*Eretmochelys imbricata*)
10. Tortuga verde (*Chelonia mydas*)
11. Tortuga blanca (*Careta careta*)
12. Sea grass (*Zostera, Thallasia*)
13. Pes volorador (*Halocypselus*)
14. Pega-pega (*Remora*)

IV. Beach

1. Sand crab (*Ocybode*)
2. Hermit crab
3. Mosquito
4. Sand fleas
5. Tortuga (*Eretmochelys, Chelonia, Careta*)
6. Pellicans (*Pelecanus*)
7. Gulls (*Lapus*)
8. Terns (*Sterna*)
9. Herons (*Cochlearnus*)
10. Egrets (*Egretta*)
11. Sea grape (*Coccoba unifera*)
12. Mangrove (*Rhizophora*)

Source: Beebe and Tee-Van 1966; Meek and Hilderbrand 1923-1928; Randell 1968.

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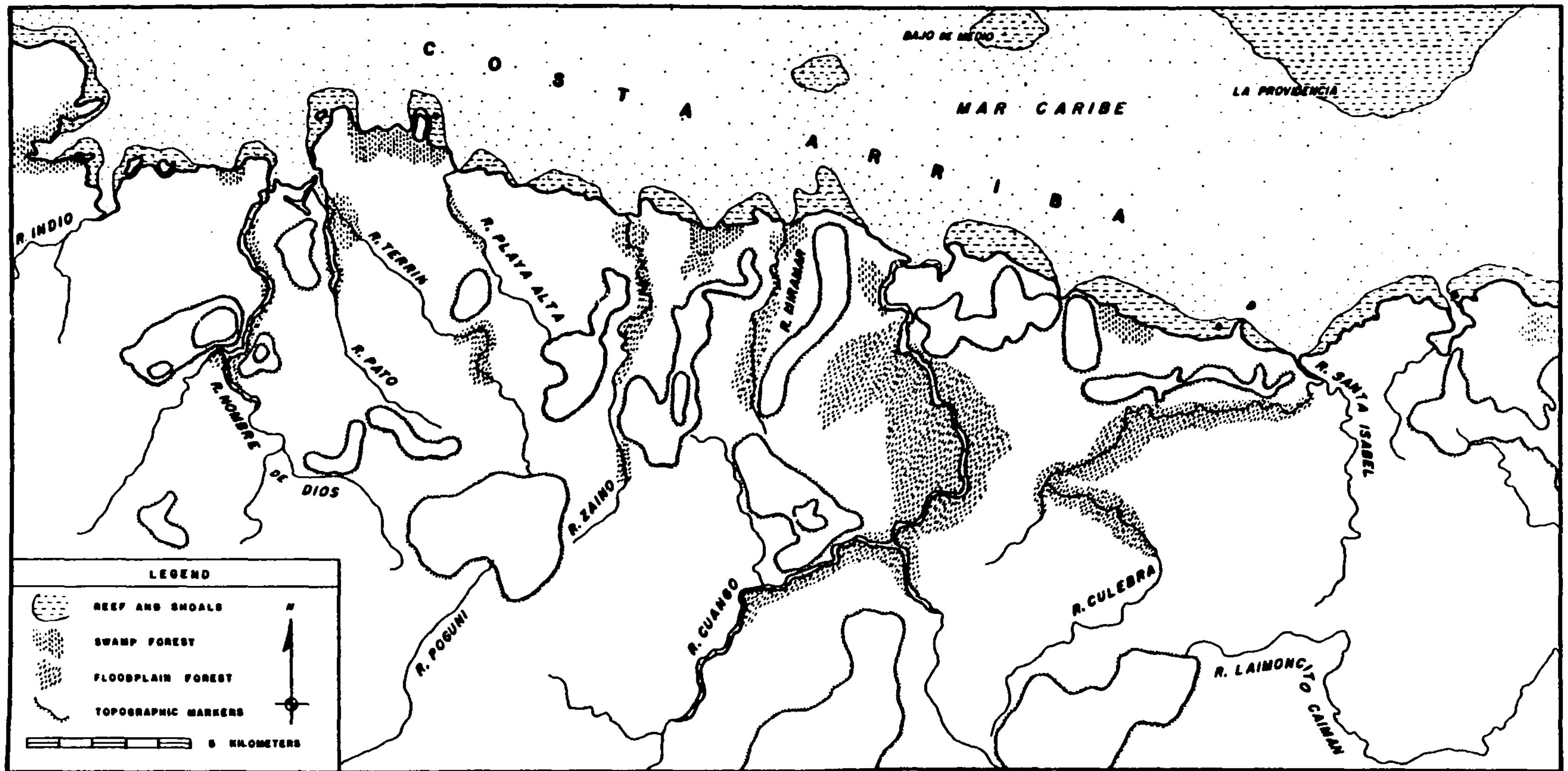


SOURCE: R. DROLET; AND DISTRITO DE SANTA ISABEL, 1960, INSTITUTO CARTOGRAFICO, PANAMÁ.

Map V. Forest and Marine Formations of Costa Arriba.

water cover the reef. The water level slowly lowers during calm conditions, exposing most of the reef.

The coral formation continues below water in most areas, dwindling out at depths of about six to ten meters where the ocean floor changes to a flat, sandy surface. Coral formations reoccur in the open sea, rising to shallows of three to four meters deep. These shallows occur along a long-established trough system running parallel to the coast, three to five kilometers from the beach. The largest of these shallows are Bajo de Medio, located north of Playa Chiquita, and La Providencia, located north of the villages of Palmira and Santa Isabel (Map V). Smaller formations occur to the west, north of the villages of Miramar and Nombre de Dios.

From Río Indio to Río Mandinga, the coral formations along the beaches and the more distant open-sea shallows contain a diversity of food sources (Table 2). These populations are most abundant from May to October when sea conditions remain relatively calm. The reef provides a dark, rich environment for lobster (*Panulirus*), octopus (*Octopus vulgaris*) and crab (*Colinectes*). These later forms travel the flat, upper reef on dark, moonless nights in large numbers, feeding on smaller reef-dwelling organisms. Important mollusk species occur in the shallow reef zones, including *Cittarium*, *Strombus*, and *Tegula*, all of which are abundant in these areas. Because of the limited mangrove vegetation, the lack of estuary formations, and the small tidal variations, there is a low species diversity of mollusks along the coast. The species occurring are warm water, splash-zone dwellers which feed off drifting plankton and related saltwater organisms.

The coral reef formations contain numerous large caves, providing protected habitats for various genera of fish, including mojarra (*Egerres*), sartona (Ocyurus), chopa (Kyphasus), vieja (Iridio), and various species of shark. Some of these fish attain considerable size, such as snapper (Lutjanus) and grouper (Serranidae). Local Black village fishermen frequent these reef zones to capture these various species using hook and line, either fishing from the reef or in dugouts. During these six months from May to October, water conditions are calm and clear with concentrated populations of these reef-dwelling marine fauna, collectively providing a rich supply of protein food sources.

The bays and open-sea shallows are the most important marine zone for concentration of economically important fish species during this seasonal period. Some of these species are surface dwellers feeding off sardine populations. These include cojinua, bonito (Seriola dumerili), jack (Caranx), mackerel (Scomberomorus), kingfish (Acanthocybium), covina (Umbrina), and barracuda (Sphyraena). Porpoise travel in small groups up and down the coast between the bays and reef zones. Bottom-dwelling bay species are numerous including herrero, ronco (Haemulun), gato, marine catfish, and sawfish (Pristis). Snapper (Lutjanus) and sartona (Ocyurus) also leave the reef areas and feed along the sandy bay floors.

One important large surface fish species present during these months is the tarpon (Megalops). This fish attains enormous size and weight, averaging around eighty to one hundred pounds and growing four to five feet in length. Large schools of this species collect in the bays in shallow waters near the mouths of freshwater streams where they feed on the quantities of sardines concentrated here. They swim along the surface of the water, attacking the sardine schools, often jumping into the air during the attack. This is one of the largest fish species along the coast, having very few bones and smooth-textured meat, similar to the jack (Caranx) and barracuda (Sphyaena).

An important seasonal meat animal available in the Caribbean waters is turtle. Along the north coast of Costa Arriba, three species occur (Table 2), all of which are fished by local Black fishermen, using their dugout canoes and large-mesh nets along with long Chonta (Astrocaryum) spears, tipped with metal-barbed points. During the months from May to October, large egg-bearing females travel the rock bottom shallows, feeding on lush beds of grasses (Zostera and Thallasia), moving slowly towards the beaches to bury their eggs. Chelonia mydas is the largest turtle species, reaching weights of between 100 and 150 pounds, and is the most frequent turtle species seen in the Costa Arriba waters. The traveling cycle and annual movement of these turtles are seasonal. From June to September, they travel calm waters, moving into the Costa Arriba area from the east where they apparently nest in the more windy months of the dry season. This cycle of movement is somewhat similar to that described by Nietchmann for Chelonia along the Misquito coast of Nicaragua, although along the north Panamanian coast these movements are limited to only a four to five month season because of strong dry season winds and the limited nesting areas locally available (Nietschmann 1973: 125-127). The ethnographic details of capturing these large marine turtles by coastal residents of Costa Arriba is similar to that described for the Tasbapauni Mosquito, indicating the importance of turtle fishing throughout these Caribbean waters. These three species of marine turtle have predictable movements in the Costa Arriba waters during seasonal periods when concentrations of other fish species dominate the open-sea shallows, bays, and reef zones, collectively forming a rich biomass of locally available food.

It is certain the prehistoric inhabitants of the Santa Isabel district fished the marine zone for these various mollusk, fish, and turtle species. Some shell remains of Cittarium were found on the surfaces of a number of archaeological sites (p. 123) indicating the prehistoric collection of this reef-dwelling mollusk, a shellfish species which is abundant here and is an important dry season food still collected by local costeños. Numerous excavated fishing weights found at a site along Río Cuango (PC 001) clearly show many of the bottom-dwelling species in the bays, open-sea shallows, and reef zones were being captured similar to present-day local methods using dugouts and droplines. Seasonal turtle fishing may also have been an important prehistoric activity throughout the local Costa Arriba zone. Fishing equipment related to turtling was recovered archaeologically at the excavated site of PC 001 (p. 134), including large twelve-ounce manufactured cobble weights and tools used to manufacture dugouts. The archaeological evidence, therefore, suggests a long antiquity of fishing activity in this coastal zone.

The reefs, bays, and open-sea shallows contain large populations of diverse marine fauna. Seasonal concentrations of these fish, turtle, and reef-dwelling mollusks and crustanceans represent economically important food resources available to human groups in the Costa Arriba area. The ocean and its diverse zones become rough and hazardous after October when strong northeasterly winds cause large, breaking swells and powerful, crashing waves. The best description of the rough weather and sea conditions during this period was written by Christopher Colombus while visiting the Costa Arriba area in November of 1501:

> In a harbor [Portobello] I sheltered for ten days from the great violence of sea and wind . . . I departed to continue my voyage, in rain. I reached the harbor of Bastamientos [Nombre de Dios] where I entered and not of my free will; the storm and a great current kept me in it for fourteen days. When I had gone fifteen leagues with difficulty, the wind and current with fury drove me back. Returning to the harbor whence I set out I found on the way el Retrete [Escribanos] where I put in with great danger and distress and being myself, and the ships and the people, very worn out. I stayed there for fifteen days, compelled to do so by the cruel weather, and when I believed that it was ended, I found that it was beginning.
>
> When I had gone four leagues, the storm returned and so wearied me that I knew not what to do . . . For nine days I was lost, without hope of life; eyes never saw the sea so high, so rough, so covered with foam. The wind did not allow us to go forward, nor did it permit us to run under any headland. There was I held, in a sea turned to blood, boiling as a cauldron on a mighty fire. Never did the heavens appear more terrible. For a day and a night they blazed like a furnace, and the lightning darted forth in such flashes that I wondered every moment while the water from heaven never ceased, and it cannot be said that it rained, but rather that there was a second universal deluge. (Jane 1933: 85-86)

Only occasional calm returns during this six month period (October to April), exposing the reefs and permitting small fish swarms to return to the bays and reefs to feed. However, these periods of dry season calm seldom last more than two to three days in each month.

The Forest Zone

The lush evergreen forest of Costa Arriba covers a predominately hilly, low coastal belt which slowly ascends from the Atlantic coast to the Cordillera Central. Most of this zone is below one hundred meters, consisting of gently sloping terraces and level floodplains along the major rivers of Mandinga, Culebra, Cuango, Miramar (Río Escondido), Zaino, Pato, Nombre de Dios, and Río Indio (Map V). Beyond the beach, pantano forests occur, consisting of poorly drained swamps with predominately palm species stands. Further back from these swamp forests, forty to eighty meter high terraces support thick vegetational forest growth in various stages of regrowth back to primary forest, while the lower river bank vegetation is low and moist, seldom over six or seven meters high. The secondary growth along the terraces is on generally poor red laterite soil. Because of the elevated positions of these terraces above the floodplain, they are the only protected areas for settlement locations along the river, being unaffected by seasonal floodings. Higher slope elevations support tall canopy tree stands, a zone of deep forest that continues up over the central divide and onto the Pacific side of the Isthmus. Each of these forest zones along the Atlantic slopes contain a variety of different resources and individually represent different microenvironments of the Coast Arriba subregion.

Three major forest formations are distinguished by local Black and Choco residents: (a) the <u>pantano</u> forest; (b) the secondary forests covering the lower slopes around the many rivers and streams; and (c) the primary forest, consisting of a taller canopy tree forest with several tiers of vegetational growth. These forests contain very few deciduous species. The secondary and primary forests are dominated by broadleaf evergreen growth, with highly dispersed multi-species formations, while the <u>pantano</u> forest consists of mostly single species palm stands.

<u>Pantano forest</u>. Immediately in back of the sandy beaches there occur low, flat areas of poorly drained soils dominated by stands of single species Corozo palm (<u>Elaeis olifera</u>). These swamps are known as pantano forests and cover much of the area around the lower courses of the rivers. The Corozo palm grows to a height of about three meters and has wide, branching leaves radiating off a thick, straight trunk. The palm produces

numerous large clumps of cherry-sized fruit turning bright red when mature. Each clump weighs sixty to seventy pounds when ripe. The nuts contain a fleshy, rich pulp and an oil-filled inner seed. It is a valuable, nutritional food, and large quantities of this edible fruit are available in the dry season months when these swamp forests can be transversed.

Mixed with these Corozo palms are two other important palm species of *Manicaria* and *Astrocaryum*. *Manicaria*, locally known as *Guágara*, is represented by fairly dense stands in these *pantano* forests. It is taller than the Corozo palm, ranging from four to five meters high with thickly packed, five to six meter long leaves. The leaves are strong and extremely weather resistant, making them valuable thatching material for roofing. The other species of palm represenced in the Corozo forest is the *Chunga* palm (*Astrocaryum*), similar to the Corozo palm with low, branching, long-leaf structure. The pole-like trunk of this palm is densely covered with ten to fifteen centimeter long spikes which deeply penetrate the skin when touched, much like the needles of the sea urchin. The *Chunga* palm produces small edible nuts, however, in less quantity and size as the Corozo, and has, like the other two *pantano* forest palms, has long, weather-resistant leaves. Only the *Guárgara* palm is limited to these wet *pantano* forests. Both the *Chunga* and *Corozo* have wider distributions, occurring further inland along the forty to eighty meter high slopes and terraces, below high canopy forest and secondary growth formations. Individual trees of *Chunga* are distributed much farther apart from each other than the *Corozo* palms. Because of the much wider distribution and more sizable fruit-production of the *Corozo* palm than the other fruit-bearing swamp palm species, it has major importance as a food resource plant.

Palms are poorly understood in the American tropics. This is largely because of confusing descriptions and multiple genus identifications of the same palm species. Along the Atlantic coast of eastern Panama, no botanical studies have been done, making the identifications of the palm varieties present even more difficult. Local native classifications clearly distinguish between palm varieties appearing to correspond to more regional botanical groupings. The following discussion of palms will be based on these local identifications along with an effort to suggest genus or species names. The palm varieties are an important forest resource which prehistorically were intensively utilized, judging from the archaeological site evidence collected on the project in the Costa Arriba area. These palms and their various products are still highly valued by local residents of the area, and hence, their association with long cultural settlement deserves careful discussion.

In the Costa Arriba area as many as ten to fifteen genera of palms occur throughout the jungle. Individuals of each species are well dispersed from one another except in the pantano forest where Corozo (Elaeis), Chunga (Astrocaryum), and Guágara (Manicaria) palms form single species stands as mentioned above. The other palm species present in the area are located at higher elevations, some on the floodplain and others along the slopes, higher terraces, and ridges, occurring as understory growth. Their distribution is most abundant below 100 meters, occurring over a wide area of the Atlantic slopes. Palms, such as Maquenque (Oenocarpus), Chonta (Bactris), Palma royal (Attalea and

Roystonia), Bangay, as well as those already mentioned of Corozo (Elaeis olifera) and Chunga (Astrocaryum), occur throughout these lowland forest zones and are used as construction material for a variety of manufactured wood products. These palms have long, weather-resistant petiole leaves, used by local Choco and Black residents as thatching material for roofing houses. Guágara (Manicaria), the one species restricted to the pantano forest, is considered one of the best palms for roofing thatch because of its most durable, long-lasting leaves. The fibrous leaf stems of Maquenque (Oenecarpus) are useful as cordage and weaving material and the trunk of this palm, as well as that of Chunga (Astrocaryum) and Chonta (Bactris), grows ten to fifteen meters high in the forest understory, forming long, straight hardwood poles, useful in house construction and in manufacturing smaller hardwood utensils.

These latter two palms, Chunga and Chonta, are closely related species and are considered valuable hardwood sources by local residents. Another palm closely related to each of these is Pejibaye, classified botanically under a variety of genus names (Bactris, Guiliema) (Covalcante 1977: 97), and even sometimes as Astrocaryum (Allen 1965: 53). Pejibaye, which will be referred to as Bactris to avoid confusion, is a cultivated palm, unlike its two other close relatives that are wild, forest trees. Pejibaye is most often seen around the margins of coastal villages in the Costa Arriba area, along trails, or as house garden plants around Choco dwellings. Each of these three palms has extremely fine-grained and flexible hardwood, useful for bow and spear construction, tools which are still made from these palms by local residents of Costa Arriba for hunting and fishing.

Other palms have root and bark characteristics, making them useful as food processing materials and woodworking manufacturing materials.

Jira (Iriartea) is a deep forest palm with stilt roots projecting one to two meters down from the end of the trunk. One variety of this palm distinguished by local residents of Costa Arriba has long, straight roots with a dense clustering of small, stubby thorns projecting from the surface of the bark (Socratea ?) (Allen 1965: 61). These palm roots are locally used as graters to process a variety of fruits. Both palm varieties appear to be closely related species and occur as straight, eight to fourteen meter high, understory hardwood trees. The bark on the trunk of one of these palms (Iriartea ?) is used by local Choco groups for the floor of their stilt houses. This bark is rolled off the long, slender trunk and split vertically into eight to ten centimeter-wide pieces. When these long, narrow pieces are placed on the floor of the raised Choco houses, the floor appears slatted. Although it is somewhat flexible when walked on, its hard, weather-resistant qualities make it a strong, durable wood for flooring.

In addition to the timber, root, and leaf resources of these tropical palms, many produce large fruit bunches, rich in protein, fat, and oil. These fruits contain a varied amount of these nutritional elements and together provide seasonal supplements and substitutes to available meat sources. It is significant that the normal flowering and fruiting cycle of the major fruit-bearing palms occurs during the dry season when forest penetration is most efficient for both man and forest mammals. Corozo (Elaeis olifera), already described, is clearly the most important palm fruit because of its wide distribution, heavy fruit bunch, and high nutritional qualities. This palm fruit is a major food for herbivorus jungle mammals, such as peccary, tapir, and agouti, competing with human groups of the Costa Arriba area for this fruit. These and other forest fauna are attracted to the forest zones where this fruit is available, making the pantano and nearby slope zones excellent hunting grounds in the dry season.

The identification of this Corozo palm in the literature is confusing. The local residents of Costa Arriba call this palm Corozo, and distinguish it from a smaller variety of palm tree with a similar distribution. This latter palm is called Corocito. Corozo appears to have a wide distribution throughout the Pacific and Caribbean lowlands and it is closely related to what is often referred to as the African oil palm (Elaeis) (Allen 1965: 125-126). Both are native to the tropics of northern South America and the lower Amazon and appear identical except that Corozo is slightly smaller and grows straight with a wide diameter trunk. Elaeis, with age, tends to bend away from its original location and gently curves upward to eventually form a straight three to four meter high trunk. The latter palm variety is exclusively found in the Costa Arriba area, despite its being called Corozo, and is often confused with the former palm known as Corozo unifera. The confusion of the identification and relationship between these two palm varieties requires more careful study.

Other palms bearing economically important fruit in the Costa Arriba area are Maquenque (Oenocarpus), Pejibaye (Guilielma), Palma royal (Attalea or Roystonea), Tagua (Phytelephas), and two other species locally called Bangay and Chunga (Astrocaryum). Few nutritional studies have been done on these fruit-bearing palms; however, studies conducted on similar tropical forest palm fruits indicate the mesocarps of these fruits contain protein, fat, and carbohydrate percentages equal in value to that of animal meat or eggs (Brecherman 1977: 151-153; Duke 1968: 61). Nutritional values are available for Astrocaryum, which indicate high amounts of vitamin A, B_1, and C (Cavalcante 1977: 92). Three other local palm species of Chonta, Chunga, and Pejibaye, closely related to Astrocaryum, contain fruit which must also be of proportional vitamin value. Considering the abundance of these and other fruit-bearing palms, collectively they have to be considered economically important food sources of the forest zone that were available to early prehistoric groups of this area. More quantitative data is needed on fruit production and nutritional breakdown of these various fruits to better understand the direct importance of this food source on local human communities. It is possible, given the importance of these palms, that their distribution and propagation, in some instances, is because of human activity. Archaeological remains of pestles and mortars found in the Costa Arriba area were associated with habitational deposits, pointing to the processing of some palm fruits for the extraction of the kernal oil. During the sixteenth century Cuevan groups inhabiting the eastern Panama lowlands utilized many of these palm fruits for the production of wines, as well as harvesting the timber for manufacturing wooden products, indicating a long history of palm exploitation for obtaining a variety of different products. These same patterns persist along the coast today by Black villagers and Choco woodsmen, demonstrating the importance of continued palm production exploitation in this tropical zone.

Returning to the pantano forest, there is another single-species stand of Caña Blanca (Gynerium sagitatum) occurring in this forest formation. The distribution of these stands is associated with disturbed areas of the lower courses of the rivers and, more normally, in poorly drained swamps bordering the *Corozo* palm forests. They appear to have been long protected by local human groups, which today continually harvest the long, straight, woody cane poles for use as house walls and fences. This plant appears to be a semi-domesticated form (Table 3).

Another important product of the *pantano* forest is the land crab (*Cordisima*) which inhabits this zone in considerable numbers and can be trapped or taken by hand at various times of the year. They are most easily captured after the first rains in May when they begin moving to more drier locations. These crabs get quite large in size and are a high protein food. Two varieties are distinguished by local people of Costa Arriba, one called Cangrejo Azul (*Cardisoma crassum*), and another called Cangrejo Blanco (*Cardisoma sp.*). Each are locally eaten, although the former is preferred. Both crabs travel along the edges of the mangrove stands and other bank vegetation as well as across the *pantano* forest floor, excavating deep holes in the ground. A predator of the crab, the raccoon (*Procyon lotor*), travels through this wet forest zone, feeding also on palm fruit and bank-side fish.

These *pantano* forest resources are abundant during the dry season; however, in the rainy season months from May to October, the forest floor is usually innundated, making it difficult to penetrate. Crabs abandon the low floor and burrow holes in higher ground. The *Corozo* and *Chunga* fruits only mature in March during the dry season and harvesting the leaves and wood of these palms must be done in the dry season because of the standing water and soft soils present in the rainy months. Therefore, the resources of the *pantano* forest are only seasonally available.

Table 3

Swamp Forest

I. Tree Species

1. Corozo (*Elaeis olifera*)
2. Guágara (*Manicaria*)
3. Chunga (*Astrocaryum*)
4. Guadúa (*Guadua*)
5. Bangay
6. Caña Blanca (*Gynerium*)
7. Majagua (*Hibiscus tiliaceus*)
8. Corteza (*Apeiba*)

II. Floor Animals

1. Crab (*Cordisima*)
2. Raccoon (*Procyon*)

Source: Mendez 1970; Standley 1928.

Secondary forest. The secondary forests support pioneer species on their way back to full mature forest. These formations are principally disturbed, primary forest zones cut back by man for agricultural purposes. They go through a cycle of regrowth from grassy, woody shrub to tree cover (Richards 1952). Most of the forest along the Costa Arriba coast, extending from the _pantano_ forests to four or five kilometers inland, is of this densely-packed, tangled forest formation (Map V). As already mentioned, swidden agriculture has been practiced along the north coastal zone for a considerable period of time. Black villagers have cleared these lower slopes for over 450 years, making _rozas_ covering areas of approximately one to two hectares each. The _rozas_ are cut out with machetes and axes, the dried vegetation burned, and rice is planted. After harvesting, the _roza_ will be abandoned and a new one cleared. These agricultural plots are left fallow for ten to twelve years before they are recleared. Other _rozas_ are cleared along this lower slope forest zone for planting a multicrop vegetable complex of Manioc (_Manihot esculentus_), Otoe (_Xanthosoma violaceum_), Ñame (_Dioscorea sp._), Ñampí (_Dioscorea trifida_), and Plátano (_Musa paradisiaca_). Each household clears two _rosas_ annually.

Primary slope and forest disturbance from swidden agriculture has been continuous over many centuries in Costa Arriba. Prior to the Blacks, swidden activities here by indigenous Cuevan groups were extensive, judging from the reports written by Fernando Colon in 1501, describing large areas of the lowland slopes planted in corn (Colon 1947: Ch. 93). Certainly, the antiquity of this agricultural clearing of the lower slopes in Costa Arriba must be as early as 1 A.D., since the archaeological investigations conducted here have confirmed early occupation by agriculturally oriented groups by at least this time period. The variety and extent of secondary growth formations occurring along the lower slopes reflect the nearly 2,000 year period that the forest zone has been disturbed.

A diversity of fauna species inhabit these secondary forest zones, feeding on the grasses, fruits, and other available foods (Table 4). Black villagers normally hunt these forests, tracking a number of terrestrial forms traveling between here, the rivers, and the _pantano_ forests. Collared peccary (_Tayassu tajacu_), foraging in small family packs, are frequently shot in the secondary forests. Gato solo (_Nasua nasua_) is a solitary traveler in this dense evergreen forest, occasionally caught by dogs accompanying farmers into the jungle to their _rozas_. Each of the meat animals, along with the Brocket deer (_Mazama americana_) and Paca (_Cuniculus paca_), enter agricultural plots along the lower slopes, feeding on buried Manioc (_Manihot_) tubers and lush green growth. This feeding pattern destroys a considerable amount of food within the _rozas_; however, local farmers frequently carry rifles when they clean these plots and shoot these foraging animals for additional food. Smaller mammals also are hunted by local Blacks in these garden plots, including cottontails (_Sylvilagus sp._) and squirrel (_Sciurus sp._). This pattern of "garden hunting" has recently been described by Linares for the tropical forest slopes along the Atlantic coast further west in the province of Bocas del Toro (Linares 2974; 1976) and appears to be very similar to the Costa Arriba area both ethnographically and archaeologically. Other authors have noted this same pattern of hunting game animals within

Table 4

Riverine and Secondary Forest

I. Arboreal Forms

1. Hummingbirds
2. Flycatcher (*Mylodynastes, Pyrocephalus*)
3. Tanager (*Thraupis, Piranga*)
4. Woodcreepers (*Dendrocolaptes*)
5. Kingfisher (*Chloroceryle*)
6. Manakin (*Chiroxiphia, Manacus, Pipra*)
7. Warbler (*Vermivora, Basileuterus*)
8. Great Kiskadee (*Pitangus*)
9. Tyrannulet (*Ornithion*)
10. Wren
11. Vireo
12. Bananaquit (*Coereba*)
13. Chlorophonia (*Chlorophonia*)
14. Giant Cowbird (*Scaphidura oryzivora*)
15. Cacique (*Amblycercus*)
16. Grosbeak (*Pheucticus*)
17. Euphonia (*Euphonia*)
18. Sparrow
19. Parrot (*Pionus, Amazonas*)
20. Parrotlet (*Touit*)
21. Parakeet (*Aratinga*)
22. Nightjar (*Caprimulgas*)
23. Scarlet Macaw (*Ara macao*)
24. Heron (*Agamia, Tigrisoma, Cochlearius*)
25. Owl (*Pulsatrix, Ciccaba, Aegolis, Otus*)
26. Falcon (*Accipiter*)
27. Eagle (*Harpia*)
28. Vulture (*Cathartes*)
29. Wood partridge (*Dendrortyx*)
30. Dove
31. Quetzal (*Rharomachrus*)
32. Gecko (*Thecadactylus*)
33. Iguana (*Iguana iguana*)
34. Tree frog

II. Aboreal and Ground Animals

1. Coati (Gatosolo) *Nasua nasua*
2. Ocelot (Tigrillo) *Felis pardalis*
3. Jaguar (Tigre) *Felis onca centralis*
4. Opposum (Zorra) *Didelphis marsupialis*
5. Squirrel (Ardilla) *Sciurus variegatoldes*
6. Crested Guan (Pavon) *Penelope purpurascens*
7. Chachalaca (Paisana) *Ortalis*
8. Antbird
9. Leaf-cutter ant (*Atta*)
10. Ground spider

Table 4 (Continued)

11. Stinging ant (*Wasmannia auropunctata*)
12. Butterflies

III. Forest Floor Animals

1. Baird's Tapir (Macho del Monte) *Tapirella bairdii*
2. Brocket deer (Venado) *Mazama americana*
3. Collard Peccary (Zaino) *Tayassu tajacu*
4. Rabbit (Muleto) *Sylvilagus gabbi*
5. Rat (Raton)
6. Paca (Conejo Pintado) *Cuniculus paca*
7. Giant Anteater (Oso de Caballo) *Mymecophaga tridactyla*
8. White Lipped Peccary (Puerco del Monte) *Tayassu peccari*
9. Agouti (Ñeque) *Dasyprocta punctata*
10. Great Tinamou (*Crypturellus*)
11. Wood Quail (*Odontophorua*)
12. Wood Rail (*Aramides*)
13. Great Curassow (*Crax*)
14. Fer-de-lance (Equis) *Bothrops*
15. Bushmaster (*Lachesis muta*)
16. Coral snake (Coral) *Micrurus*
17. Toad (Sapo) *Bufo marinus*
18. Pseudoscorpions, mites, earthworms, sowbugs
19. Cockroach
20. Mosquito

IV. Aquatic Species

1. Boca Chica (*Caracidae*)
2. Saboleta or Sardina
3. Ronco (Ojorro- Choco) *Haemulun*
4. Robalo (*Centropomus*)
5. Mojarra (Lucango- Choco) *Egerres*
6. Havina (Bocon- Choco)
7. Juacuco (Choco)
8. Snapper (Pargo) *Lutjanus*
9. Barracuda (Picua) *Sphyraena*
10. Jack (Jural) *Caranx*
11. Lisa (*Mugil*)
12. Titi
13. Shrimp (Camaron)
14. Crab (Cangrejo) *Calinectes*
15. Caiman (Largato) *Caiman sp.*
16. Lizards (Chorotega)
17. Otter (Lobo) *Lutra*

V. Vegetation Species

1. Platanillo *Heliconia*
2. Mangrove *Rhizaphora mangle*

Table 4 (Continued)

3. Balsa *Ochroma*
4. Corozo *Elaeis olifera*
5. Corocito
6. Bambu *Bambusa*
7. Chunga *Astrocaryum*
8. Maquenque *Oenocapus*
9. Palma Royal *Attalea*
10. Manzanillo *Hippomane mancinella*
11. Pinuela *Annas magdalenae*
12. Pita *Annas sp.*
13. Piro *Bromelin*
14. Palma amarga
15. Coquito
16. Totuma *Crescentia cujete*

Source: Carpenter 1934; Clark 1941; Enders 1935; Goldman 1920; Mendez 1970; Ridgely 1976; Shelford 1974; Standley 1928.

milpas in the lowland Maya area (Lange 1971: 624; Reina 1967: 16-17). This rather widespread lowland Caribbean practice of using prepared forest farmlands as hunting grounds demonstrates the importance of the secondary forest for both agricultural and hunting activities.

The low, lush vegetation of the secondary forests contain a diversified avifauna population, many of which provide important dry season food for local residents (Table 4). Curassows (Crax sp.), Tinamous (Crypturellus sp.), Toucans (Ramphastus tocard), doves, ducks, and hawks are frequently shot by local hunters and farmers during this time. Some bird species nesting in the secondary forest are taken while very young and brought back as household pets. Chacalaca (Crax sp.) are often raised in this way and become close household animals, roaming the small villages with chickens for their food. Parrots (Amazonas sp.) and Pericos (Brotogeris jugularis) are found during forest clearing along the low slopes by Black village farmers. Four to five member litters are brought back and raised in the house. Similar raising of young peccaries (Tayasa tajacu) is done; however, village dogs usually attack and kill these tamable animals before they reach maturity.

Besides the vertebrate forms residing in the secondary forest, insect populations abound here. Leaf cutter ants travel long distances through the zone along well-kept trails, marching their cut leaves back to their fertile colonies. These ants are a menace to the crops planted in the rozas, being capable of chopping down wide sections of vine, stalk, and grassy plants in a few days. Choco women of the upriver zones collect the fertile soils of the ant colonies and prepare planter containers for young seedlings of fruit, vegetable, and herb plants, later transplanted around the vicinity of the house. This is a pattern of household gardening which is very productive and known over a wide area of lowland eastern Panama and northern South America (Bennett 1962; 1968; Covich and Nickerson 1966; Lathrap 1974).

Some insects nest in the secondary growth, including a variety of biting flies, bees, and wasps attacking local farmers while they cut out their agricultural plots, sometimes causing serious illness. It is not unusual for two or three men of a twelve-man forest-clearing group to return home early because of insect attacks, the most frequent being nesting wasps, locally feared because of their painful stings. Another colony of insects feeding on forest vegetation in the secondary forest is termites (Nasutifermes). They build large, round daub-like houses that hang from the trunks and larger branches of taller trees. Local Black residents fish for shrimp and crayfish in the secondary streams with cut-off sections of these termite houses, placing them in woven conical fish traps made from forest vines.

Forest clearing, along the moist slopes of the Atlantic Costa Arriba area, has reduced the size of the primary canopy forest yet created biota formations useful to local human groups. The secondary forests along the lower slopes and riverine zones have permitted a diversity of fauna to reside here, many of which are meat animals hunted by local groups. Today, especially among local Black villagers, hunting is directly related to agricultural activities, since forest clearing is done in secondary vegetation zones where these animals reside. Furthermore, the cultivation plots provide concentrated foods for these terrestrial and arboreal mammals, making the gardens important hunting grounds. The antiquity of the disturbed forest zone along the Atlantic slopes clearly suggests hunting and agricultural activities have been concentrated in this area for a long time.

Clearing the forest along these slopes requires specific knowledge of plant complexes. The relative age of a forest stand is indicated by the individual plants growing here. This will indicate the length of time the land has been left fallow since it was last cleared. Different sections of the slope forests are selected for tuber planting and for grain planting by Black farmers who intimately know the vegetational growth cycles and soil fertility of this zone. Primary forest is seldom selected for either garden plot, instead zones of maturing secondary forests, supporting low, woody shrub and scattered, taller ten meter trees, are selected. The smaller vegetation is chopped down with machetes and axes and left to dry for a six to eight week period. The larger trees are left to cut down last. For rice cultivation, forest clearing begins in

February and planting does not take place until late April or May, after the hot, sunny, relatively rainless days of these dry season months sufficiently dry the fallen debris for burning. Tuber farm plots are cut down in a similar way during December and are continued for one or two years on the same slope soils.

The cycle and techniques used by present-day swiddenists in the Costa Arriba area seem to be closely related to earlier prehistoric patterns. Food processing tools, recovered from one excavated deposit at a site along Río Cuango, indicate crop cultivation and collection of wild palm products. This evidence, plus the descriptions of sixteenth-century Cuevan food products locally grown and collected, suggest considerable antiquity to the modern-day plant complex in the Costa Arriba area. Some of these crops, such as rice, bananas, and yams, have been introduced since Spanish contact; however, maize, root crops, and many tree fruit crops form a crop complex of considerable time depth here and throughout the Caribbean lowlands (Table 5). Techniques described above of forest clearing used by local residents of the zone offer some indication of the prehistoric pattern of cultivation associated with this crop complex.

Canopy forest. Outside the disturbed forest, the tall canopy forest begins, containing thirty to forty meter high trees, a lower story of predominately palm species, and a low, open floor vegetation dominated by fern species. As one continues from the lower slopes into the deep forest, wetter and wetter conditions are encountered. The division of secondary forest and the taller, primary forest is noticeable along the higher slopes, clearly outlines by areas of lower forest that have been cleared yet not regrown to climax formation. All higher terraces support

Table 5

Garden Complex of Vegetable and Tree Crops Cultivated by Modern Residents of the Costa Arriba Area

I. Tree Crops

1. Coco (*Coco nucifero*)
2. Plátano (*Musa paradisiaca*)
3. Guineo (*Musa sapientum*)
4. Cacao (*Therobroma cacao*)*
5. Caña de Azucar (*Sacharum officinalis*)
6. Ají (*Capsicum*)*
7. Pejibaye (*Guilielma gasipaes*)*
8. Marañon (*Anacardium occidental*)*
9. Aguacate (*Persea americana*)*
10. Mango (*Mangiforn indica*)
11. Naranja (*Citrus sinensis*)
12. Toronja (*Citrus paradisi*)
13. Achiote (*Bixa orellana*)*
14. Limon (*Citrus aurantiifolia*)
15. Guanábana (*Annona murica*)*
16. Fruta de Pan (*Artocarpus altilis*)
17. Mamey (*Calocarpum mammosum*)*
18. Guava (*Inga edulis*)*
19. Caimito (*Chrysophyllum*)*
20. Almendra (*Terminalia*)
21. Camote (*Ipomoca batatas*)
22. Cándia
23. Anon (*Annona reticula*)*
24. Guayaba (*Psidium guajara*)*
25. Totuma (*Crescentia cujete*)*
26. Jobo (*Spondias lutea*)*
27. Zapote (*Matisia cordata*)*
28. Café (*Coffea arabiga*)
29. Papaya (*Carica papaya*)*

II. Vegetable Crops

1. Yuca (*Manihot esculentus*)*
2. Otoe (*Xanthosoma violaceum*)*
3. Ñame (*Dioscorea*)
4. Ñampí (*Dioscorea*)
5. Piña (*Annas comosus*)*
6. Frijóles (*Phaseolus vulgaris*)

III. Seed Crops

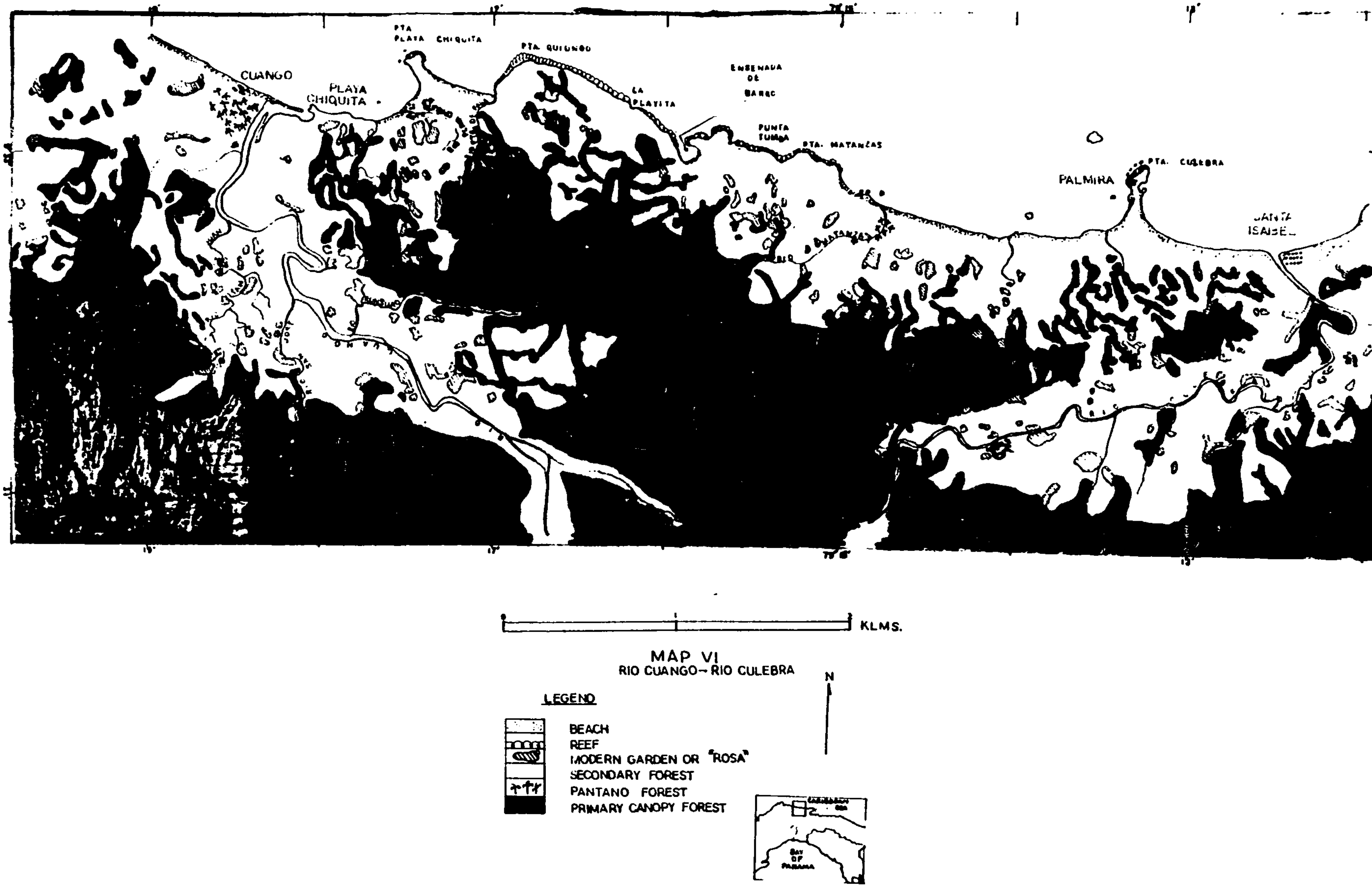
1. Maize (*Zea mays*)*
2. Rice (*Oriza sativa*)

*Plants cultivated at the time of Spanish contact by indigenous Cuevan groups (Oviedo y Valdes 1950; 1855, Lib. 29).

this tall canopy forest and are the only zones along the middle to lower riverine courses where the forest remains undisturbed (Maps V and VI). As one moves further inland along the terraces, however, the disturbed forest is restricted only to small, cut-out areas of high canopy forest, The latter completely dominating the landscape as one continuous, unbroken forest stretching over the central divide and down into the watershed basins of the Pacific side.

The high canopy forest contains numerous valuable timber species of soft and hardwoods. These timbers provide important resource woods for human use in addition to the palm species already mentioned. The ethnographic literature available for the tropical forest lowlands of Mesoamerica and South America has clearly shown the very selective exploitation of certain forest timber by indigenous groups for the construction of tools, weapons, watercraft, utensils, and houses (Chagnon 1968; Goldman 1963; Harner 1971; Nietschmann 1973). Archaeological literature of the American tropics has also demonstrated the antiquity of such woodworking industries (Linares de Sapir and Ranere 1971: 348; Ranere 1972; 1975), especially in the moist forests of Panama where the distribution of these valuable timbers is abundant. Eastern Panama contains the most abundant distribution of these timber species, located primarily in the upland zones above 100 meters and associated with transitional forest vegetation or between the upper moist and lower subtropical belts (Holdridge and Budowski 1956: 98-99). In the Costa Arriba area, their distribution is similar, although the elevational range appears to be somewhat lower.

The valuable hardwoods are well scattered throughout the forest with individuals of any one species being widely separated from one



Map VI. Río Cuango--Río Culebra.

another. The most common genera include Caimito (Chrysophyllum), Espavé (Anacardium), Cedro (Bombacopsis and Cedrela), Algarroba (Hyemanea), and Nuno (Sisyrinchium). These timbers reach twenty-five to thirty meters tall and up to three meters in diameter. Since they are canopy forest trees, they normally have long, straight trunks. Espavé (Anacardium) and Cedro (Bombacopsis and Cedrela) are excellent boat timbers because of their long trunk size and wide diameters. They have fine-grained, water-resistant wood of the highest quality for making watercraft and durable household utensils. Nuno (Sisyrinchium) is somewhat softer, but an equally durable, timber wood as is Algarroba (Hyemanea). Throughout the eastern Panama lowlands, native groups consistently select these timbers for construction of river canoes and larger ocean-traveling dugouts, as well as a variety of domestic vessels, utensils, and tools (Bennett 1968: 30; Suarez 1968; Torres de Arauz 1975: 198, 193, 238, 246, 269-270).

A number of softer timbers are abundant throughout the high canopy forest of eastern Panama and Costa Arriba. The most important genera include Balsa (Ochroma) and Cavanillesia. These medium-sized trees contain light-weight wood that is easily carved. Each of these trees has other economically important features. Ochroma produces a floss in its black seed pod, similar in texture to cotton. This tree also has thin, but very flexible and durable, bark shapeable into large, round storage containers. Cavanillesia also produces this cotton-like floss, as does Ceiba, a relative of both Ochroma and Cavanillesia. The easily worked, light wood of these three tall-growing trees is excellent for shaping rafts, floats, and a variety of water-related products because of their buoyancy ability.

Níspero (<u>Mimusops</u> and <u>Achras</u>), a tall tree reaching up to fifty meters high, is of major economic importance because of its gummy sap widely known as <u>chicle</u>. These timbers have red, fine-grained woods valuable for manufacturing wood products; however, their occurrence on the north coast of Panama is limited to the uplands around Escribanos and to the east. They also occur in the Río Chagres valley and along the lower slopes west of Portobello.

Many of these timbers were used prehistorically as the basis of a local woodworking industry. Judging from cobblestone flake tools recovered from sites in the Río Cuango area (Map VI), a variety of wood products were made by the early prehistoric groups here. These wood-working cobble tools suggest timbers were harvested from their deep forest locations, in addition to the scattered palm woods already discussed, and collectively used to construct dugouts, food processing utensils, weaponry, and houses (p. 182). A similar lithic industry is known from contact times among local Cuevan riverine groups along the eastern Atlantic watershed (Colon 1947: Ch. 93; Las Casas 1951, Lib. II, Ch. XXII: 283; Martyr 1912, Tomo VI, Dec. 11, Bk.111: 219; Dec. 111, Bk. 11: 301; Oviedo y Valdes 1853, Lib. 29, Ch. 29: 141; Ch. 28: 132; Ch. 26: 129). This sixteenth-century basalt flake tool industry was used to manufacture similar woodworking products from local hardwood forest timbers. The archaeological and ethnohistorical evidence for this local woodworking industry in the Costa Arriba area thus indicates considerable antiquity to the harvesting of these deep forest woods. Present-day Black villagers and upriver Choco groups of the local area both manufacture similar wooden products from the forest timbers, continuing this industry in much the same fashion as their earlier counterparts, although metal tools have replaced stone tools. Clearly, the tall, upriver canopy forest contains valuable timber resources which have been selectively harvested in the Costa Arriba area for a long time and have served as the basis of a well-established woodworking industry still persisting here today.

The fauna population of the deep forest is mostly arboreal, inhabiting the lush canopy high above the forest floor (Table 6). A variety of primates roam in groups that can be heard from distant locations because of their noisy calls. The howlers (Alouatta) have a wide range within the forest, traveling in large groups, feeding on the moist leaves and fruits of the canopy. Their distinctive, far-reaching howls signal rain and the presence of predators. Spider monkeys (Ateles sp.) are represented by both the red and black varieties, rarely known cohabitational occurrence. These forms travel together and apparently interbreed. They are hunted and eaten by the local Choco groups of Río Cuango yet occasionally the Choco capture young members to be raised as household pets. White-faced Capuchins (Cebus capucinus) range between the various tiers of canopy and are frequently seen beside disturbed forest zones in the visable canopy, screeching short nervous calls. They travel in sizeable numbers, ranging from ten to twenty-member packs.

Because of the relative absence of vegetation on the forest floor and the concentration of food-bearing species in the canopy, few terrestrial mammals inhabit the deep forest. Choco hunters frequently track large jaguar (Felis onca) and smaller feline (F. pardalis) species into

Table 6

Canopy Forest

I. Tree Species

1. Níspero (*Mimusops* and *Achras*)
2. Jagua (*Genipa americana*)
3. Barrigon (*Bombox barrigon*)
4. Cabbage Bark (*Andira mermis*)
5. Wild fig (*Ficus*)
6. Membrillo (*Gustavia superba*)
7. *Iriartea exorrniza*
8. *Virela panamensis*
9. *Platypodium maxonianaum*
10. *Zanthroxylum panam;nses*
11. *Hura crepitans*
12. *Spondias mombin*
13. *Bombacopsis fendleri*
14. *Sterculia apetala*
15. *Symphonia globulifera*
16. *Grias fendleri*
17. *Terminalia amazonia*
18. *Jacaranda copaia*
19. *Tabebuia pentaphylla* and *T. guayacan*
20. Guarumo ((*Cecropia*)
21. Jira (*Irartes exorrhiza*)
22. Espavé (*Anacardium excelsum*)
23. Cedro espinoso (*Bombacopsis quinatum*)
24. Cedro amargo (*Cedrela mexicana*)
25. Cedro Cebolla (*Cedrela sp.*)
26. Algarroba (*Hyemanea courbaril*)
27. Bongo (*Ceiba pentundra*)
28. Chonta (*Astrocaryum*)
29. Nuno (*Sisyrinchium nuno*)
30. Starapple (*Chrysophyllum*)
31. Zapote (*Matissia chordata*)
32. Cativo (*Prioria*)
33. Tree firn
34. Wild Cacao (*Therobroma pupureum*)
35. Vines (*Strychnos*)
36. Aeroids, orchids, bromeliads, mosses, lichens, and liverworts.

II. Animal Constituents

1. Howler monkey (Mono Prieto) *Alouatta*
2. Spider monkey (Mono Colorado, Mono Negro) *Ateles*
3. Mono Carilla (Capuchin) *Cebus*
4. Mono Tití (Squirrel Marmoset) *Saguinus geoffroyi*
5. Vampire Bat (Murcielago) *Desmodus rotundus*
6. Fishing Bat (Murcielago) *Noctillio leporinus*
7. Fruit Bat (Murcielago)
8. Toucan (Pico Feo) *Ramphastus sulfuratus*
9. Trogons (Trogon)

Table 6 (Continued)

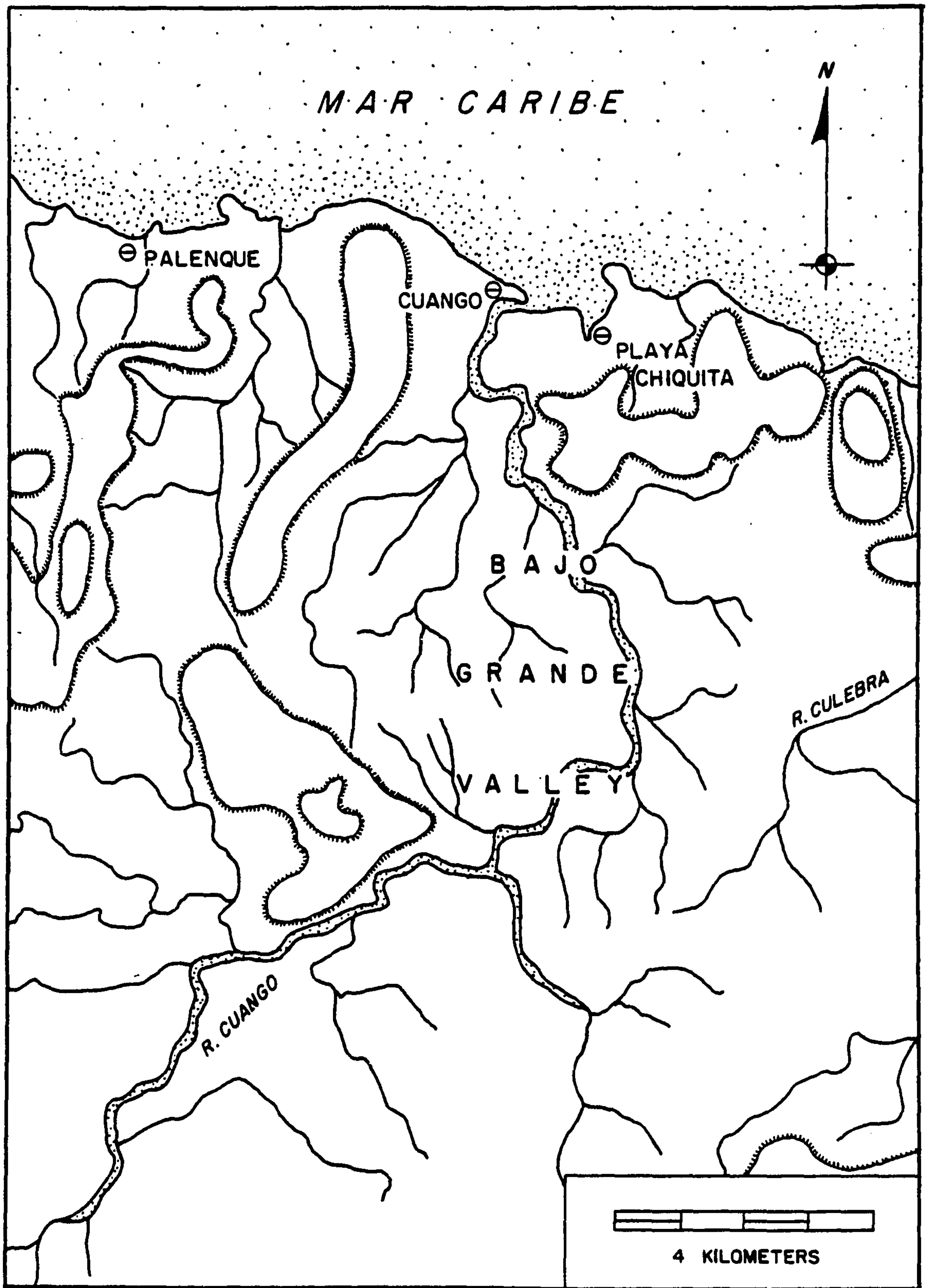
10. Parrot (*Pionus, Amazonas*)
11. Woodpeckers (Carpintero) *Campephilus*
12. Lesser Kiskadee (*Pitangus lictor*)
13. Aztec ant (*Azteca trigona*)
14. Termites (*Nasutitermes*)

Source: Mendez 1970; Ridgely 1976; Shelford 1974; Standley 1928.

this area; however, these forest cats more frequently nest and feed in secondary forest zones where they feed on other terrestrial mammals. A traveler penetrating the forest in the early morning hours can detect the presence of these felines by their distinctive, odorous urine smell, making them easy to track at this time of day. Pelts of these cats are currently bringing high prices in Panama City and Colon, seriously endangering the feline populations in Costa Arriba and throughout the eastern Panama lowlands.

Riverine. The rivers along the north Atlantic slopes of Costa Arriba travel north, down from their headwaters in the central divide. Their size varies considerably during the year according to the amount of seasonal rainfall.

From the headwaters of the major rivers, the floodplains begin as narrow, flat areas paralleling the upper courses and gradually broaden out along the middle to lower courses. Fertile soil zones are present along many of the larger tributaries of the major rivers, offering a chain of lower valley agricultural lands separated from each other by a connected series of terraces outlining each of the watershed basins. One of the largest active floodplains is in the Bajo Grande valley, located along the middle to lower course of Rio Cuango (Map VII). This rich lowland



SOURCE: R. DROLET, AND DISTRITO DE SANTA ISABEL, 1960, INSTITUTO CARTOGRAFICO, PANAMÁ. -G.A.APFELSTADT-

Map VII. Bajo Grande Valley, Río Cuango.

valley comprises nearly thirty-five square kilometers in size, providing a wide extensive area of alluvial soils. Periodic innundation occurs annually during the rainy months. The moist, low vegetation cover is dominated by grasses, and taller, broadleafed, banana-like plants, locally known as Platanillo (*Heliconia*), as well as wild, cane-like stands. Smaller, but similarly fertile, valleys exist along the other ten rivers from Rio Mandinga to Río Indio.

The major rivers in the district of Santa Isabel contain cobble beds and large gravel deposits along the courses of the river. During the rainy season, quantities of sonte are carried downstream and deposited in large, wide areas along the bank. Some of the largest of these deposits occur along the midcourse of Río Cuango. Here, in the *Bajo Grande* Valley, some deposits measure over 300 square meters, some occurring in long pileups paralleling the river and others occurring in major bends in the river, covering broad, wide areas. The river-worn gravels are deposited in different sizes, some with fine sand gravels, and others with larger cobble-sized deposits. This stone material consists of igneous basalts and anasites, washed downriver from large stone outcroppings at the headwater zones. The riverine cobble, pebble, and sand deposits were important resources of the forest zone during prehistoric occupation here, serving as the lithic material used in the tool industry associated with woodworking and food processing activities. Surface collections made on archaeological sites in the district contained locally made ceramic debris tempered with small-particle riverine gravels, indicating the collection of river sands for vessel manufacturing.

The riverine zone contains a variety of aquatic, terrestrial, and arboreal fauna. Tapir (*Tapirella sp.*) inhabit both the deep pools of the rivers and back water streams and travel the low forest zone, feeding on various fish inhabiting these cool waters. Caiman (Caiman sp.) are occasionally seen along the banks of the larger rivers; however, over the last ten years they have been largely killed off by local Black villagers. Iguanas (Iguana sp.) maintain mostly an arboreal life, perching motionless for hours on vertical, sunlit branches of tall, bank-side trees. Iguanas are important dry season meat animals which grow up to twenty pounds. Both local Choco and Black residents of Costa Arriba vigorously hunt them as food sources. Female iguanas lay quantities of eggs during this season that are continually collected by these local groups. This meat-and-egg package is an important protein combination. A host of other reptilian forms make their homes close to the river bank, including a variety of vipor and constrictor snakes and small lizards (Table 4). At night, large bats (Noctillio) skim the waters for surface-swimming fish, while in the daytime a large diversity of avifauna travel the river courses, some feeding in the shallow waters near the banks and others catching fish in flight along midstream.

Compared to the fish populations present in the ocean reefs and bays, the freshwater rivers and streams contain less abundant fish resources. Those occurring are typically small and have limited ranges over the long courses of these drainage systems. The fish occupying the riverine waters tend to concentrate in one of two areas: (a) either along the lower courses in small lagoon-like section containing lush, bank vegetation and muds with brackish waters or (b) along middle to upper courses of the river in three to six meter deep pools, where they travel in shallow rapids, from pool to pool, feeding on nutrients being carried downriver.

Along the lower courses, freshwater fish species, as well as some ocean species, travel throughout the brackish water. One of the richest lagoon-like ponds in the Costa Arriba area is at the mouth of Río Cuango. Here the river broadens and deepens, resembling a small lake, before draining into the ocean. The banks contain lush grassy vegetation which continues underwater into the muddy bed. Most of the time this water is brackish because of the high tide seawater mixing. Considerable quantities of fish enter here from the ocean, such as Snapper (Lutjanus), Barracuda (Sphyraena), and Jack (Caranx), and feed on the smaller sardine-sized fish in the vegetational bank zone. Along one bank in this lower mouth region of Río Cuango, there is a stand of mangrove (Rhizophera mangle) with stilt-like roots penetrating the three meter deep water. This dark, entangled bank zone houses large schools of Robalo (Centropomus), Lisa (Mugil), and a variety of other locally known varieties (Table 4). Similar lower course ponds occur along Rio Santa Isabel, Río Miramar, Río Zaino, Río Pato, Río Nombre de Dios, and Río Indio.

In the upper courses of the same rivers, small, deep pools occur, located approximately one-half kilometer apart and separated by shallow rapids. Here the most abundant species are Boca Chica (Caracidae) and Robalo (Centropomus) traveling in schools along the shallow rapids and deeper pools. All of the major rivers have these same fish species.

One very abundant freshwater fish species, locally called Tití, occurs in the dry season months of February and March. This fish is about the size of a guppy and large schools of it cover the river during this time, traveling to downriver locations. Hundreds can be easily scopped out of the shallow sections of the river at one time. Local

Black villagers seasonally collect <u>Tití</u> and prepare them by simply frying a cake of them in coconut oil, without gutting or scaling. Shrimp and crayfish are also abundant in the rivers and smaller streams. Each of these aquatic forms occur in the dry season when the rivers stabilize, hiding and feeding in the shallow bank areas covered with leaf and woody debris. In addition, in Río Cuango, one unidentified bivalve mollusk occurs, inhabiting the upriver rapids where it nestles between the large cobbles forming the bed of the river. One species of marine crab (<u>Calinectes</u>) occurs in the upriver areas, occasionally found in the rocky outcrops of the deeper pools.

When one penetrates the forest along these riverine waterways, there is a continual transition of forest and aquatic formations. At the mouth of the river, the ocean determines the amount of discharge since the surf is continually remodeling the size and location of the sand bar around the mouth. This situation results in constant fluctuation of the size of the brackish ponds along the lower river courses, reaching their maximum height in the wet season and their lowest in the dry season. The relatively open pond areas along the lower course of the river quickly change, as one moves up river, into the flat <u>pantano</u> forests dominated by palm species (Table 7). Further upriver, the banks begin to get higher, covered with more woody, secondary growth and rolling hills with sections of low, flat floodplain. Towards the middle course of the river, deeper pools occur at bends in the river and the vegetation becomes more grassy with a great diversity of broadleafed, succulant species. No landscape can be seen through the thick vegetation growth, but it is here that the wide area of floodplain occurs, as in the <u>Bajo Grande</u> Valley of Río Cuango. Although the banks may reach ten meters high

Table 7

Palm Species of Costa Arriba, Panama

1. Maquenque (*Oenocarpus*)
2. Pejibaye (*Guilielna*)
3. Palma Royal (*Attalea*)
4. Tagua (*Phytelephas*)
5. Bangay
6. Chunga (*Astrocaryum*)
7. Chonta (*Bactris*)
8. Jira (*Iriartea* and *Socratea*)
9. Corozo (*Elaeis olifera*)
10. Coquito
11. Palma Amarga
12. Palma Enena
13. Guadua (*Guadua angustifola*)
14. Guágara (*Manicaria*)
15. Corocito

along the river, the fresh cuts made here by the river during the previous rainy season indicate the soils are alluvial, quite different from the leached, red laterite soils downstream. Further upriver the floodplain begins to narrow and the river begins to be covered over with tall, thirty meter high trees that form a canopy over the water. The large gravel deposits along the banks still occur far upriver; however, as one continues towards the headwaters, the deep forest predominates and soon large basalt outcroppings occur along the banks, some reaching thirty to forty meters high. Below the tall-tree canopy, there is a lower canopy formed by tall fern trees and pole-like palms. The upriver areas are completely dominated by the tall canopy forest and high, quickly ascending, slope terraces.

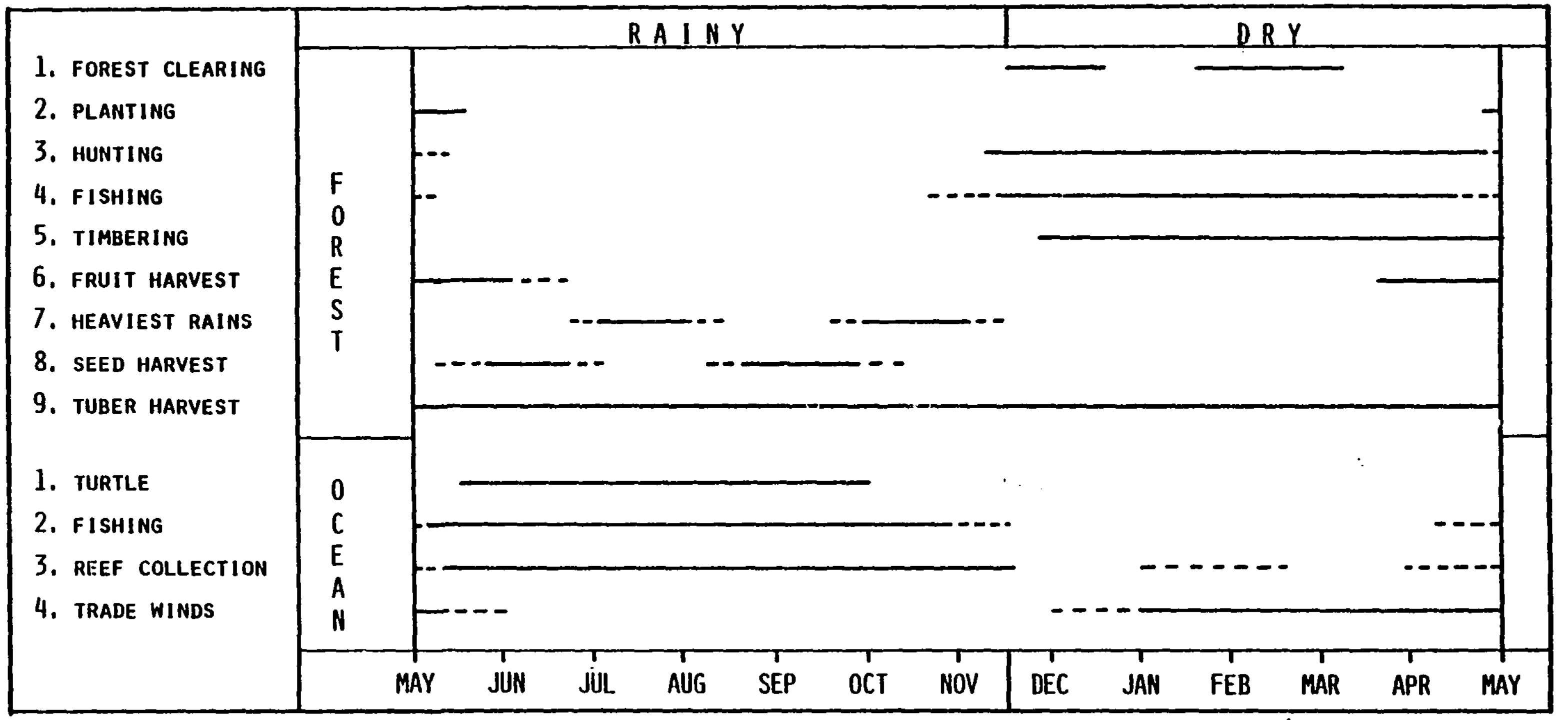
Seasonal Cycle

The availabilities of forest and marine resources are affected by seasonal rainfall (Table 8). Heavy rains begin in May and continue through November, reaching their peak in the months of July and October. During these two months, heavy daily rains fall in sheets for long durations two and three times in a twenty-four hour period, accompanied by tremendous lightening bolts and thunder blasts. In these two months alone, over 30 percent of the annual rainfall occurs, averaging fifty mm per day. The rest of the rainy season closely match this total; however, the intensity and frequency of rainfall generally lessens.

The intensive rains of the wet season force forest terrestrial mammals of the lowlands into more protected areas and restrict their movements in the lower riverine zones and pantano forest because of frequent flooding of these areas. Flooding is periodic, becoming heaviest

Table 7

Seasonal Cycle



in July and October but the rest of the year it is unpredictable. Similar innundation occurs throughout the lowlands in all of the wet season months. This climatic pattern tends to disperse forest fauna, such as brocket deer, paca, tapir, iguana, and crab, inhabiting the lower secondary forest, interrupting their dry season feeding schedules and making their movements in the forest more unpredictable. The primates of the tall, forest canopy frequently can be heard signaling the coming of rain, especially the howler packs whose long, loud group calls echo through the forest like the sounds of heavy earth-moving machinery.

During this period, the pantano forests are continually innundated because of the poor drainage. The pantano and lower forest palm fruits of Corozo, Chunga, and Pejibaye have fallen from the trees and the trees will not bear fruit again until late March.

During the heavy rains, the rivers become swollen, often rising as much as sixteen meters. Increased rainfall causes innundation of the floodplains and an uprooting of forest bank vegetation. Large trees and forest floor debris are swept up, pushed down river, and deposited on the lower, flat alluvial fans of the river bank, making a rich formation of muds and other organic debris providing fertile agricultural soils workable during the drier months. The mouths of the rivers expand and discharge most of this forest debris in the ocean where it is eventually forced onto the beach to dry out and decay. River fishing is nearly impossible during these months. The strong current and cluttered debris filling the waters make them dangerous to travel in watercraft. The noise of falling trees, gushing waters, and large amounts of cobbles, rolling and hitting each other in the river current, is typical during the heavy rains and the terraces provide the only protected dry areas during this time.

While the forest resources are inaccessible or unavailable during much of the rainy months, the ocean resources are abundant. During these months reefs, bays, and open-sea shallows contain an enormous biomass of fish species, easily caught in the relatively calm waters. Sea turtles swim the waters at this time, making their way to the beaches to bury quantities of eggs. Eggs and turtle meat provide two protein-rich food sources of the marine zone during these months. Interestingly, the upriver Choco who reside along the bank locations of Río Cuango and Río Culebra vacate their homes during this period and live most of the rainy months in the Black villages along the coast, subsisting mainly on marine fish and turtle. The rest of the year, these Choco inhabit the riverine terraces, subsisting on forest resources, a situation indicating both the degree of restricted forest resources available during the rainy months and the advantages of inhabiting and procuring resources of the marine zone during the same period.

The rains sharply diminish in December, the beginning of the dry season, and continue in this pattern of low intensity through April. Rainfall during these months occurs perhaps once a week and is of short duration, dropping like a sprinkle compared to the wet season downpours. This creates a drying effect throughout the forest, stabilizing the rivers to shallow, gently-moving waterways with widely exposed banks and large unvegetated gravel deposits. Forest fruits gradually mature and fall to the forest floor, providing excellent feeding grounds for the mammalian forms of the forest. Most of these fruits are palm nuts of the lower pantano forest; however, a variety of secondary and primary forest trees also bear fruit, many falling into the rivers, providing food sources for browsing, herbaceous animals, like paca and peccary, as well as riverine fish population. Cultivated fruits, such as cacao, avocado, marañon, and guave, are important and abundant food sources during these months. Both Black villagers and riverine Choco have maintained an orchard system of tree cropping which appears to represent an ancient tree-fruit complex of local importance. The diversity of both wild, forest fruit and cultivated varieties in the Costa Arriba zone during the dry season months is an important nutritional package documented among tropical forest groups of the eastern Panama lowlands and may be associated with the earliest agricultural complexes in this wide lowland area.

During these dry months strong northeasterly winds contribute to the drying of the evergreen forest, but more importantly, cause extremely turbulant conditions in the ocean. Large swells and breaking waves fill the bays and crash into the reefs and beaches making the ocean difficult to travel in watercraft. Few days of calm return during this five month period, resulting in the absence of fish in the marine zones, except for some reef mollusks that can be occasionally caught, including Cittarium, Strombus, and Chiton. The ocean at this time is unpredictable and feared by local people because of its constantly changing conditions. As a result, ocean activities, such as fishing and traveling, are minimized and the forest zone is the focal point of human activity, including hunting, collecting, riverine fishing, and cultivation.

Because of the lower amount of rainfall, local farmers intensively clear the secondary forests at this time, preparing their rozas for both seed and tuber plantings. Floodplains are prepared for a variety of quick-growing crops, such as corn, plátano, beans, and vegetables. The latter plants can be harvested in three months, well before the early May rains that swell the rivers and uproot the floodplain growth. The agricultural activities of thelow slope forests are conducted in the area of wandering terrestrial mammals, slowly attracted to the garden plots and easily hunted.

This cycle of rains thus influences the scheduling of activities associated with forest and marine biota. Local agricultural groups have adapted to this cycle in their exploitive activities and in many ways reflect the same kind of scheduling which earlier agriculturally oriented groups adapted to the zone. Archaeological and ethnohistorical evidence points to the persistance of this same scheduling over a long period of time, placing the ethnographic groups in an important model situation for interpreting a long sequence of tropical adaptation in the Costa Arriba zone.

Besides the environmental conditions influencing settlement and resource availability along the eastern Panama Atlantic slopes, there were social conditions influencing prehistoric settlement here. The ethnographic descriptions of tropical forest groups in northern South America clearly indicate adaptation is a process shaped by various social constraints. Chagnon has demonstrated the extent to which warfare and alliances among the Yanamamo determine settlement, agricultural productivity, and population movements (Chagnon 1968a; 1968b). Similar social determinates of settlement and economic activities have been pointed out among the Jivaro (Harner 1972), the Akwe-Shavante (Maybury-Lewis 1967), and the Cubeo (Goldman 1963). The ethnohistorical information available for the sixteenth-century Cuevan chiefdoms of eastern Panama shows the extent which socio-political networks influenced the ecological basis of these dense territorial populations. Warfare and expanding social boundaries for the control of rich agricultural lands were major factors in the distribution and density of settlement among these competing Cuevan polities. This competition required lowland populations to be incorporated in alliances and to selectively exploit certain resources. The economic and political structure of the sixteenth-century Cuevan polities of eastern Panama provides the basis for reconstructing the social context of earlier settlement in the Costa Arriba area. Along the Atlantic slopes, there is a rich diversity of economically important resouces that were available to prehistoric populations here, yet the selective choice of these resources allows hypothesizing about an early subsistance system that was part of a larger regional network associated with these early Cuevan chiefdoms. Although it is customary to associate these Cuevan polities with sixteenth-century time period, their existence in lowland eastern Panama and northern Colombia is of considerably longer antiquity.

CHAPTER 3

ETHNOHISTORICAL SETTLEMENT IN THE LOWLANDS OF EASTERN PANAMA

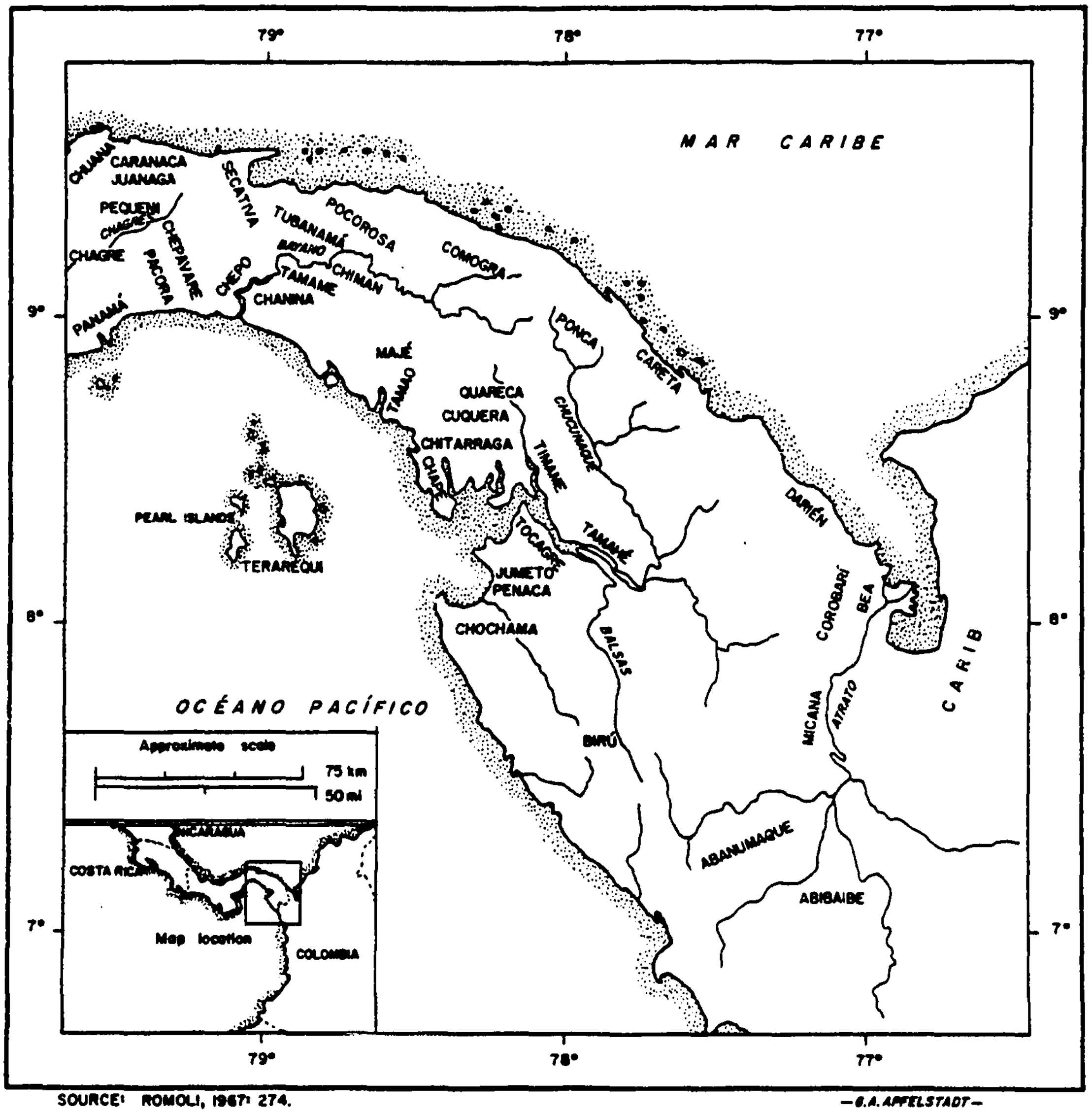
Introduction

When the Spanish arrived along the Caribbean coast of eastern Panama in the early 1500s, they found well-established chiefdom polities occupying the entire lowland region, controlling riverine zones from the Pacific to the Atlantic coasts. These numerous groups were collectively known as Cueva, each sharing similar agricultural orientations and Chibchan linguistic dialects. The ecological and social basis of this settlement clearly demonstrates a long occupation of the eastern Panama lowlands by these groups. From knowledge of Cuevan kingdoms, the earlier periods of indigenous settlement here can be better understood within this social context. The archaeological evidence of settlement in the Costa Arriba area collected during the eighteen month project indicates the Atlantic watershed area was incorporated into larger regional polities of these growing chiefdoms by 1 A.D.

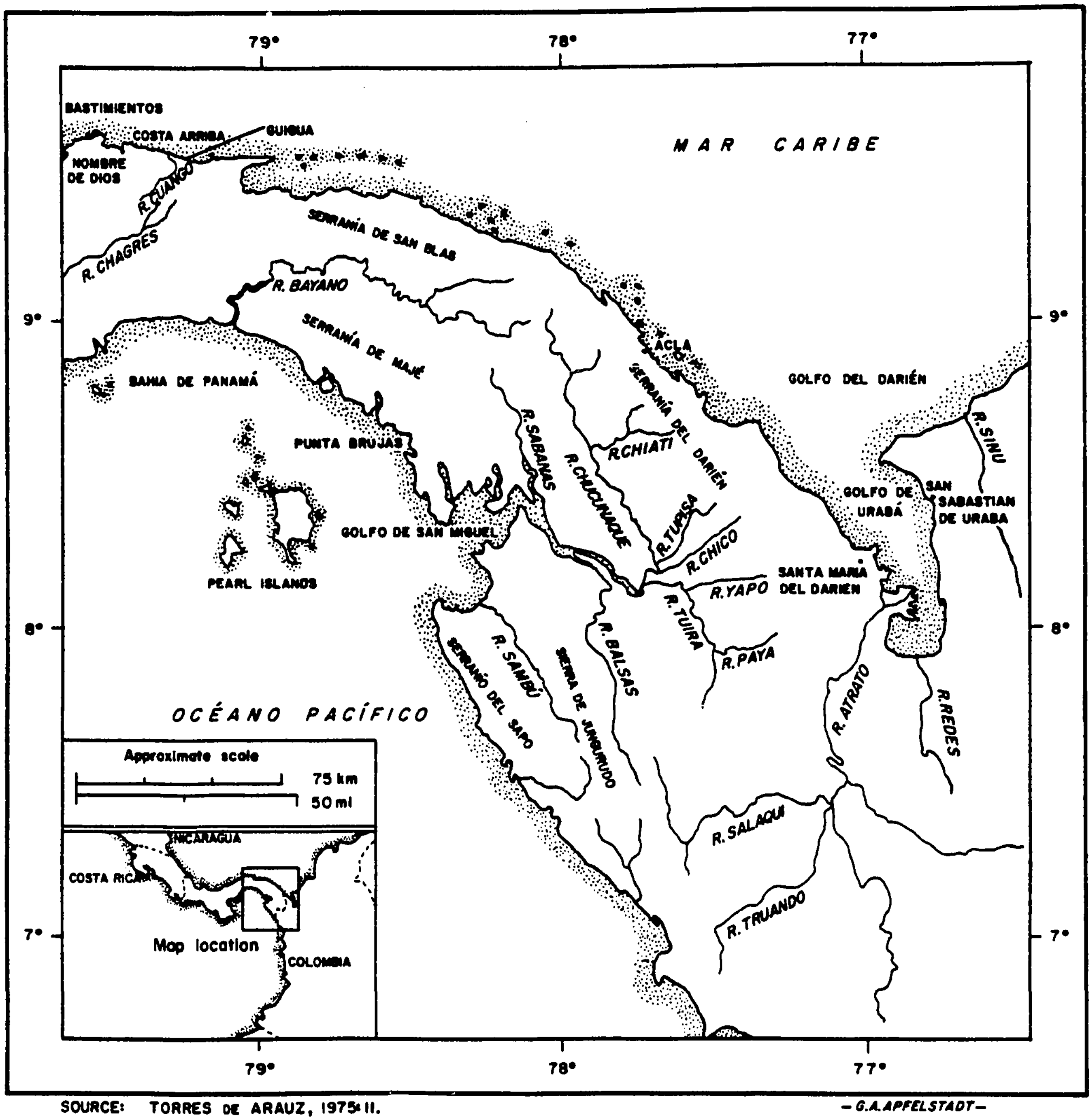
The Cuevan groups referred to here are those indigenous populations encountered by early Spanish explorers who conducted expeditions west of the Atrato river in the eastern Panama and Darien lowlands. More than thirty Cuevan provinces were present at this early contact period, each distinguished from each other by a different name and each possessing different territorial boundaries. Some were larger than others, controlling large sections of riverine lands as well as marine coastal zones (Map VIII). Early sixteenth-century sources report on these provinces and emphasize that they were all linguistically related, and as such, the word Cueva was used to differentiate this speech community from unrelated linguistic groups in western Pacific Panama and Carib groups around the eastern sector of the Gulf of Urubá. Individually, the location and geographical extent of each Cuevan province is approximately known principally from the early Spanish explorations into eastern Panama during the years from 1511 to 1513, a three year period in which Vasco Nuñez de Balboa conducted his famous travels into the interior and ultimately onto the Pacific coast. Historical and demographic studies, as well as the mapping of these sixteenth-century Cuevan provinces, have been done by recent authors (Altolaquirre y Davale 1914; Helms 1979; Romoli 1953; Sauer 1969).

Ethnohistorical Sources

Exploration and colonization of eastern Panama (Map IX) occurred between 1501 and 1515, making this area of the American continent one of the earliest penetrated and settled and from which expeditions were organized for the conquest of both Mesoamerica and South America. The early Spanish explorers and colonists left important descriptions of the indigenous inhabitants who occupied the lowland forest zone of eastern Panama during this time; however, by 1515 most of the indigenous life had been destroyed in the frequent battles with Spanish military. Thus, the most important documents relating to indigenous settlement during the



Map VIII. Sixteenth-Century Cuevan Provinces.



Map IX. Exploration and Early Settlement in Eastern Panama.

contact period date to this period and consist mainly of exploratory accounts and descriptions of initial settlement by the Spanish along the Atlantic coast in the colonies of Santa Maria del Darien, Acla, and Nombre de Dios.

The most intensive contact between the Cuevan chiefdoms and the Spanish occurred between the years from 1511 and 1513. During these three years, Vasco Nuñez de Balboa led expeditions into many of the lowland indigenous provinces, but unfortunately, only a small portion of the original documents relating to these explorations has been saved. Balboa's correspondence sent to the King of Spain during these three years was, however, collected by Piétro Martire d'Anghiera, an official of the Spanish court at the time. He used Balboa's documents and official correspondence, as well as interviews with officials participating in these early explorations, as the basis of his writings. Martire produced a running account of discoveries and situations of the New World from 1493 to his death in 1526 (Martire 1964: Dec. I, II, III).

Another account of these important years concerning indigenous settlement and distribution was written by Fernández de Oviedo y Váldes in his História Natural y General de las Indias (1851-1855). In 1514, Oviedo arrived at Santa Maria del Darien, the original Spanish colony located in the Gulf of Urubá. He was an official of the new governor Pedrarias Dávila, who arrived in the same year to replace Balboa. Oviedo's História... and earlier work, titled Sumario de la História Natúral de las Indias, provide important geographical and ethnographic notes concerning the various chiefdoms throughout lowland Panama. Since he had direct knowledge of these groups and received much firsthand information from interviews with colonists at Santa Maria, his account is quite valuable.

He was in direct communication with Balboa for two years at Santa Maria and had access to official documents and correspondence relating to the initial settlement of that colony as well as Balboa's diary of his three major inland explorations.

Pascual Andagoya arrived in Santa Maria in 1514 with Oviedo and Dávila. Andagoya wrote a valuable account of Cuevan tribal distributions and settlement patterns in his Relacion de los Sucesos de Pedrarias Dávila ... (Andagoya in Navarette 1945, Vol. III: 393-456). He lived as a colonist in Santa Maria where he was employed by Balboa in 1514 to carry brigantines across the Isthmus. This project oriented him well to the interior lowlands of eastern Panama and he continued similar ventures. In 1516 he went on an unsuccessful expedition down the Bayano River with Gonzalo de Badajos. Another expedition was directed by Andagoya in 1522 to the little-known province of Birú, lying west of the Gulf of San Miguel along the Pacific eastern Panama coast. During this eight year period, Andagoya witnessed a tremendous transition in the indigenous population of eastern Panama, although his writings rarely mention this. By 1522, when he was appointed Inspector General of the Indians of the Isthmus, most of the indigenous population of eastern Panama and Darien was depopulated and scattered.

Another source for this time period is Bartolomé de las Casas. Las Casas arrived on the island of Espanola in 1502 with his father and uncle and participated in various military marches through this country and Cuba over a ten year period. He became familiar with indigenous groups of the islands and began writing a history of the Spanish occupation of the New World from the earliest explorations to 1520, the three volumes of which took him forty years to write. Las Casas had available to him original documents pertaining to the early period of exploration of the eastern Panama area, and as such, is considered a major Caribbean chronicler for this time period.

Another important account is contained in an early chronicle written by Fernando Colon, the son of Cristobal Colon (Colon 1947). At thirteen years of age, Fernando accompanied his father on the 1502 exploration of the Caribbean coast of Lower Central America. Fernando described numerous Cuevan settlements in the Costa Arriba area, observing features of forest clearing, agricultural planting, dispersed household settlement, dress, and manufactured articles associated with the various groups encountered while anchored in four different harbors along the coast. This account is the only document existing which discusses the settlement locations and ethnographic characteristics of indigenous groups occupying the eastern Panama area of Costa Arriba. This valuable account indicates the sizable Cuevan occupation here in 1502 was related to the other Cuevan provinces of the surrounding lowlands, providing important data for understanding the earlier prehistoric occupation of the Costa Arriba zone.

Enciso's Suma de Geografía (Enciso 1948), another early account of the Atlantic coastal zone, is an important chronicle since he was an early visitor to this area, arriving to the Gulf of Urubá in 1509 and staying until 1511. Enciso was familiar with the eastern Panama coast and his account provides collaborating data for the extent of Cuevan settlement and provincial boundaries during these early years. However, Enciso's account is brief and his contact with indigenous groups of this area was short and primarily based upon skirmishes and coastal encounters along the Colombian north coast and the Gulf of Urubá during the years from 1509 to 1511.

Thus, these sixteenth-century Spanish sources provide the only descriptions known of the large Cuevan chiefdoms occupying the eastern Panama lowlands during the fourteen years of Spanish exploration, colonization, and conquest. From 1501 to 1515, many of the descriptions of the various Cuevan provinces were based upon personal accounts, observations, and exploratory ventures directly conducted by the authors of the chronicles. Other accounts from the period were written by government officials having direct access to original documents, correspondence, and participants of explorations conducted in the area.

For the Costa Arriba area where archaeological investigations were conducted, the ethnohistorical information is not as rich as for the areas further east where colonial settlement and initial inland explorations were conducted. Nevertheless, the 1502 account written by Fernando Colon of the indigenous occupation of Costa Arriba is one of the earliest documents for the entire lowland zone and clearly shows Cuevan groups were well established here as they were in the surrounding areas of the lowlands.

Early Spanish Expeditions to the Atlantic Coast

The earliest of the explorations along the Atlantic coast were conducted by experienced navigators who skirted the shores and traded with local indigenous groups. Because of bad weather, rotting ships, and frequent hunger, these initial explorers were forced to spend considerable time in protected harbors. As a result, the eastern coast was mapped early and the locations of the indigenous settlements were well known.

More complete information on cultural aspects of these indigenous groups was obtained during initial Spanish settlement and foot expeditions which led into the Atlantic forest zones and eventually over to the Pacific side. Names such as Bastidas, Colon, Nicuesa, Balboa, Andagoya, and Oviedo y Váldes are associated with this early exploration of eastern Panama. From the descriptions and accounts they left, early sixteenth-century indigenous settlement can be discussed and related to the prehistoric settlement of the same area. Cuevan settlement in eastern Panama represents both an ethnohistorical and archaeological cultural complex.

<u>Bastidas Expedition: 1501</u>

Rodrigo de Bastidas led an expedition to the Caribbean coast in 1501, reaching the western mainland of Venezuela near the Goajira Peninsula in April of that year. From here the two ships of the expedition traveled southwest along the coast to the bay of Cartagena and the shores of the Gulf of Urubá. Finally, the group sailed west along the eastern coast of the Isthmus to the small harbor of Retrete, now known as Escribanos, located approximately ten kilometers east of the present village of Santa Isabel. Then the party traveled nearly due north, making their way to Jamaica, Hispañola, Haiti, and eventually back to Spain in 1502. Navigation during this voyage was skillfully done by Juan de la Cosa, a pilot with previous knowledge of the Venezuelan and Colombian coast.

During the expedition, most of the time was spent along the Colombian coast between Santa Marta and the Gulf of Urubá, trading with indigenous groups for pearls and gold ornaments. Romoli notes seven months were spent along this portion of the Caribbean coast (Romoli 1953: 41). The remainder of the trip was spent along the Darien coast where native products were obtained, including textiles, gold, and pearls; however, there is no specific reference to ports entered or locations of native settlements. There is even disagreement about how far west along the Darien coast the expedition traveled before sailing to the West Indies, although it is known they reached Hispañola by January of 1502 (Romoli 1953: 412), making the total time spent along the Darien shores a little over a month. Unfortunately, little is known about the movements of Bastidas during this final month of the expedition.

Columbus Expedition: 1502

Christopher Columbus led his fourth expedition into Caribbean waters in 1502, approaching eastern Panama from the opposite direction than Bastidas, traveling south and east along the Central American coast from the Bay of Honduras to Retrete. In fact, in 1502 the Bastidas expedition made contact with the Columbus expedition on the island of Santa Domingo where, historians have noted, Columbus observed the charts of Bastidas outlining the recently traveled coast of eastern Panama (Sauer 1969: 122).

Columbus started his skirting of the Central American coast in late July of 1502, slowly moving south and west towards the Isthmus, entering various bays along this coast to sleep, obtain provisions, and trade with native groups. The expedition arrived at the Laguna de Chiriqui along the west coast of the Isthmus in October of 1502, and traveled eastward along the rugged coast, noting the locations of indigenous settlements back from the coast along the major rivers, and observing the identifications of these settlements with various tribal or provincial names. The largest of these was Veragua, which stretched from Almirante Bay to just east of Río Indio. From Veragua, the expedition entered eastern Panama on November 1, 1502, where they set anchor in the Bay of Portobello. Almost two complete months (November 2 to January 1) were spent along the eastern coast of the Isthmus where the expedition entered four harbors, attracting nearby riverine native groups that boated down the rivers with a variety of goods to trade with the Spaniards.

Hojeda-Nicuesa Expedition: 1509

An expedition was commissioned by King Ferdinand of Spain in 1508 for the purpose of establishing new colonies in Tierra Firme. The project divided the newly explored lands into two large territories, one stretching from the western coast of Venezuela to the Gulf of Urubá under the governmental direction of Alonso de Hojeda, and the other from the Gulf to northern Honduras under the direction of Diego de Nicuesa. Both Hojeda and Nicuesa were required to build two forts in their territories that would be permanent colonies for settlement. Hojeda's territory was termed "Urubá" and Nicuesa's was termed "Veragua." The earliest account of the 1509 Spanish expeditions to the coasts of northern Colombia and Panama is by Pietro Martire, written in 1514, with other independent accounts by Oviedo y Valdes, and Las Casas (Martire 1964: Dec. II, Bk. I and II: 209-227).

Each expedition left Spain in September of 1509, Nicuesa taking six to seven ships and Hojeda taking two to three. The combined fleet spent numerous months in Hispañola preparing supplies and crews before actually sailing for their prospective territories. Hojeda's crew totaled

220 men while Nicuesa carried over 750 men on his voyage. Hojeda, with his experienced navigator, Juan de la Cosa, reached the coast of Cartagena by mid-December and immediately tried to establish a fort. The expedition was prepared for war with the indigenous Caribs of Urubá, since many Spaniards had already been slain near the area of Cartagena and the neighboring coast (Sauer 1969: Ch. 5). Upon reaching the coast near Cartagena, Hojeda's party attacked two Carib villages equipped with a variety of weaponry, including bows and arrows, fire-hardened, pointed shafts, some tipped with bone points, wooden swords, and wooden shields. The tips of the arrows were covered with a powerful paralyzing poison which killed many Spanish. Hojeda's party lost seventy men in this battle, along with the ship's pilot Juan de la Cosa, and was desperately saved by the coincidental arrival of Nicuesa's five ships and 785 men.

The expeditions separated in February of 1510 after the Cartagena skirmish, with Hojeda's party traveling to the east coast of the Gulf of Urubá where they attempted to set up another fort called San Sabastian de Urubá. Attempts were made to gather food by raiding Carib villages in the interior; however, these raids only served to reduce the party to sixty starving, ill people and eventually caused the death of Hojeda himself, who deteriorated from being shot by one of the Caribs' poison arrows.

The expedition sent a ship back to Hispañola for more supplies; however, by May no supplies had arrived. In July the fort was abandoned, giving this initial Spanish settlement a duration of only seven months. The remaining party divided themselves between the two ships with the objective of returning to Hispañola. One was shipwrecked off the coast of Cuba. The other ship, under the direction of Francisco Pizarro, met two supply ships, captained by Martin Fernandez de Enciso, carrying 152 new settlers for Urubá.

Enciso took over command of the remaining colonists and the entire fleet traveled back to San Sabastian de Urubá, only to find it burned to the ground and looted. It was decided in September to abandon this ruined fort once again and establish a new one on the opposite side of the Gulf. Vasco Nunez de Balboa, a stowaway on Enciso's ship, was instrumental in this decision since he was familiar with the eastern Gulf coast from sailing on the earlier Bastidas expedition. The site of the new colony was inland from the mouth of Río Darien where Enciso's party managed to outbattle a Cuevan village and take possession of the settlement and nearby farmlands. This occurred in November of 1510 and the colony was named Santa Maria del Darien.

Nicuesa meanwhile had similar misfortunes. The expedition split up and was separated in a heavy storm. One group under the direction of Lope de Olano anchored at the mouth of Río Belen where Columbus previously tried to establish a base camp in 1502. Good maps were available for both the coast and interior having been made during Columbus's expedition. At least four veterans of this earlier voyage were with Olano's group. Olano took an expedition up Río Veragua to locate and, in doing so, secured a garrison at a large, circular settlement in the province of Quibian.

Soon afterwards Nicuesa's separated party returned to the Belen colony from their nearly fatal episode of shipwreck and hunger. Nicuesa ordered his now diminished expedition out of San Sabastian de Belen. He decided to move the colony further east to Portobelo; however, because of stiff resistance by local native groups, the meager party was forced once again to sea where they ended up in the bay of Nombre de Dios in December of 1510. Here a fort was constructed by Nicuesa's men. However, the poorly led expedition suffered even more defeat as Governor Nicuesa was soon denied of his power by the colonists and elected officials of Veragua territory. Only a small garrison remained at Nombre de Dios, with the rest of the colonists joining the colony further east at Santa Maria del Darien. In March of 1511, Nicuesa was forced to sail back to the Indies and presumably died on this voyage since he never reached the islands.

Thus, in 1510 the Spanish had established two important permanent settlements along the eastern Panama coast, representing the first colonies on the mainland of the New World, Santa Maria del Darien and Nombre de Dios. Until this time there was no penetration upriver into the large Cuevan provinces as there was further west in the province of Veragua during the Colombus expedition. The colony at Santa Maria was now under the direction of Vasco Nuñez de Balboa and had close to 200 settlers, numerous houses, and extensive areas of cultivated land. It is at this point that Balboa organized a number of expeditions inland to form alliances with the indigenous groups and, of course, to obtain gold. It is from these subsequent expeditions that much of our knowledge about sixteenth-century indigenous life of eastern Panama is known.

The 1509 expedition led by Hojeda and Enci o provides excellent data concerning the distribution of Carib groups neighboring the eastern

Panama lowlands. Carib expansion out of the lowlands of northern South America into coastal and Antillean areas of settled Arawakan tribal zones was occurring at the time of Columbus's 1502 voyage and appears to have gathered strength by the time of the 1509 expedition of Hojeda and Nicuesa. This expansion is difficult to trace further west of Río Atrato into eastern Panama; however, early documents do report a few Carib enclaves and attacks by Carib groups into Cuevan and Cuna provinces along the Atlantic and Pacific coasts of eastern Panama. One such colony was located on the eastern banks of Río Atrato near the delta area, running west up the coast. Two tribal name designations are given for residents of this area by Oviedo y Valdes, Bea and Corobari. Romoli argues these tribal names are linguistically Carib (Romoli 1953: 129-130), although she states they were culturally Cuevan-like in their lack of poisoned arrows and bitter manioc and in their apparent intermixed residence with Cuna groups of the same area. If this represents an expansion of Carib groups into the agriculturally rich delta area of Río Atrato previously controlled by Cuna groups, it is typical of Carib warfare, well known from the Venezuelan and Antillean areas where groups of male Carib warriors attacked Arawakan villages, killing male residents and taking the women as wives (Rouse 1963: 14). A similar situation may have occurred along the Atrato river, offering an explanation for the confusion of the correct cultural identification of these two delta groups. According to archaeological data from the more regional northern South American area, eastern Panama was the precise direction the Carib expansion was moving at the early part of the sixteenth-century (Lathrap 1970: 164-170). The various Cuevan provinces to the west of Río

Atrato controlling the lowland areas of eastern Panama apparently had clear knowledge of the distribution of Carib-speaking groups to the east. In 1511, when Vasco Nuñez de Balboa led his expedition to the province of Comogra, located between the Caribbean coast southward across the divide to the Bayano river, he was informed by the chief of this province of the location of allied Carib provinces to the east, from which trade networks were established for obtaining necklaces and pottery in exchange for food crops and slaves (Martire 1964:, Dec. II, Bk. III: 235). Thus, although the distribution of Carib settlement was principally east of the Atrato river during the period of these early sixteenth-century explorations, there is evidence that by the time of colonial settlement in Darien, a few Carib groups had expanded into the eastern Panama area and there was already established trade and periodic warfare occurring between them and the Cuevan provinces.

Balboa Expeditions: 1511-1513

Vasco Nuñez de Balboa first arrived in Tierra Firme as a crew member of the Bastidas 1501 expedition. After this voyage he returned to live in Hispañola where he accumulated numerous debts preventing him from participating in similar exploratory ventures. In 1509 Balboa managed to smuggle himself onto a ship leaving for the Gulf of Urubá, captained by Martin Fernandez de Enciso, carrying supplies to Hojeda's expedition. Because of his previous knowledge of this area, he was instrumental in establishing the permanent colony at Santa Maria del Darien in 1510 and was elected mayor of the settlement in 1511.

Through his popularity with the colonists and success as a leader, Balboa was able to organize large-scale expeditions throughout the neighboring territory with the cooperation of the residents of Santa Maria. In three years, from 1511 to 1513, Balboa traveled extensively throughout most of the eastern Panama lowlands and the Atrato Basin which at the time were densely populated by powerful Cuevan chiefdom groups.

The first expedition led by Balboa was conducted shortly before the wet season rains in April of 1511, when Balboa marched his group west along the coast and south across the Caribbean slopes into the foothills of the Pacific lowlands. The first Cuevan province visited was Careta, located along the coast twenty leagues west of Santa Maria. This province extended inland along the Caribbean slopes to the central divide of the Serranía de Darien. Balboa continued through this indigenous province to a neighboring one, Ponca, located along the upper course of the Chucunaque. From here Balboa led his expedition northwest across the low divide of the Serranía de Maje to the upper course of the Bayano River where he came in contact with the next powerful provincial group and territorial unit, the Comogra. This province extended down the moist slopes to the Caribbean coast.

Balboa's first expedition lasted approximately six months. The Spanish must have been impressed after witnessing the sizable but dispersed settlements associated with each province, the extensive cultivated fields, and the diversity of food products and manufactured items in each of the settlements visited. Balboa secured alliances with these groups on this expedition, resulting in guarantees of food provisions from each of these provinces for the colonists at Santa Maria.

In this six month period, the Balboa expedition succeeded in locating the major Cuevan provinces to the west and learned both the internal organization of these groups and their comparative relationships. These provinces controlled sections of rich agricultural lands along the Caribbean slopes and the upland riverine zones of the Bayano and Chucunaque, each politically organized under a chief whose power extended over the economic and military affairs of his province. At the period of Balboa's expedition, there were alliances between some of these provinces while others were conducting war, such as Careta and Ponca. By learning the economic and political activities of these similar chiefdom groups, Balboa and his men successfully established initial contact, although it marked the beginning of total destruction for these Cuevan groups.

The second expedition led by Balboa was in 1512. This included a reconnaissance of Río Atrato and Río Redes, two large riverine systems draining a wide area of lowlands south of the Gulf of Urubá. Here the expedition, divided into two parties led by Balboa and Rodrigo de Colmenares, traveled over 150 miles inland reaching the foothills of the Sierra Nevada, passing through numerous Cuevan provinces with a diversity of settlement arrangements. Settlements ranged from dispersed households, like the Cuevan provinces visited to the west of Santa Maria, to tree-house villages along the higher, protected banks. Balboa was given information by Cuevan groups of Carib settlements further inland, controlling the middle courses of the riverine zone, and of gold-manufacturing workshops to the east controlled by a powerful Cuevan chief from which most of the lowland settlements received their worked gold products. This expedition was the deepest the Spanish had penetrated into the surrounding lowland areas around Santa Maria. As in the previous expedition to the west, the Spanish, led by Balboa, successfully made initial contacts with the large Atrato Cuevan provinces learning their distributions and similar cultural features.

In these two expeditions to the west and up the Atrato, Balboa was informed of similar Cuevan provinces located over a wide lowland area to the south of Santa Maria. These were the Pacific lowland chiefdoms centered mainly along the middle to lower courses of the Río Bayano and Río Chucunaque and along the coast near the Bay of San Miguel (Maps VIII and IX). Balboa's main interests, of course, were the apparent accumulation of gold in these provinces and the fascination with the existence of another ocean, which if he was the first to claim it for Spain, would bring him political and economic benefits.

Balboa was eager to organize another expedition to the Pacific lowlands and coastal area. In January 1513, he wrote to the King of Spain requesting 1000 men and numerous supplies; however, this request was rejected because of political disagreement over the way Balboa had claimed governorship of Darien. Sensing problems before receiving a reply from the King, Balboa organized the expedition to the Pacific, using approximately eighty colonists from Santa Maria and over 700 Indians from the western provinces. His exploration two years earlier of the territory to the west provided the basis for his initial leg of the journey. From here he decided to enter unknown territory from the Ponca province along the upper Chucunaque. The expedition was prepared to begin at the end of the rainy season and to be conducted almost entirely on foot.

On September 1, 1513, the expedition left Santa Maria and traveled in watercraft down the coast twenty leagues to the port of Careta. From here, the expedition marched through the slopes of Careta province and over the Serranía to the upper Chucunaque. The group stayed twenty days with the Ponca while Balboa, talking with tribesmen about reaching the Pacific, carefully planned his course. With guides, the expedition continued on a southwesterly course, reaching the province of Quareca near the headwaters of the Río Sabanas. The group proceeded south to the province of Proque, located along the northwest portion of the Bay of San Miguel, near the lower course estuary of Río Sabanas. Along a high ridge in this province Balboa first had a view of the Pacific Ocean on September 27, 1513.

Two months were spent traveling between the various provinces located along the western side of the Bay of San Miguel and marching west up the coast past Punta Brujas to the province of Thevaca (Chiman) and then inland or north into the province of Pacra. On December 1, Balboa's expedition corssed the Serranía de Maje and descended down to the interior of the Bayano valley where they reached Pocorosa province, located in the lowlands, some eight days later. The group traveled a short distance downriver to the province of Tubanama in an effort to locate gold mines which Balboa had been told existed in this area; however, none were found. The expedition reversed course and traveled up the Bayano river, passing once again through Pocorosa province, reaching Comogra province on January 1, 1514. The expedition continued overland across the Serrania de Maje to the upper Chucunaque, entering Ponca province and down the Caribbean slopes to Careta province. The expedition arrived back at Santa Maria on January 19, 1514.

This expedition and the two previous ones conducted by Balboa represent the most valuable exploration of the eastern Panama lowlands conducted during the colonial period. It provides a wealth of information concerning the location of the different Cuevan provinces, as well as their internal structures, economic orientations, and outside relationships centering on trade, alliances, and warfare. The demographic situation of these Cuevan provinces quickly changed after the year of 1513, as did the productive agricultural and fishing activities conducted in each of these provinces. By 1515, most of these provinces had been depopulated, principally because of the new governorship of Pedrarias Dávila. Thus, the first fourteen years of Spanish contact, from 1501 to 1515, are the period containing the most valuable records of indigenous settlement in eastern Panama useful in understanding the nature of earlier prehistoric occupation of the area. The pattern of Cuevan settlement, and the degree of agricultural intensity and political control within the various provinces, as witnessed by the early sixteenth-century Spanish explorers, imply a long cultural occupation in this area.

Cuevan Provinces of Eastern Panama

The early Caribbean sources discuss the distribution and cultural characteristics associated with the various Cuevan chiefdoms of lowland eastern Panama. It would appear, from the archaeological record of this wide region, an overall cultural continuity can be argued between these various sixteenth-century chiefdom groups and earlier occupational complexes known from both the Pacific and Caribbean sectors (Biese 1964). My archaeological investigations conducted in the Costa Arriba area and reported here offer new data on understanding the sequence of cultural adaptation in this tropical zone. Early indigenous settlement in Costa Arriba is directly related to archaeological complexes known from the upper Chagres river (Cooke and Bird 1978), the lower Bayano river

(Cooke 1976b; Miranda 1974), and the Pacific coastal zone (Biese 1964). Movement into the rich lowlands by Chibchan-speaking Cuevan groups from the large riverine lowlands of northern Colombia is clearly associated with the early spread of maize agriculture and riverine-orientated settlement. By the beginning of the sixteenth century, the occupation of eastern Panama had developed into a series of highly competitive tribal provinces, seeking control over rich agricultural lands as well as forest and aquatic resources.

Although the principal focus of this thesis is on the early farming occupation of the eastern Caribbean coast of Panama, a discussion of the distribution and structure of the sixteenth-century Cuevan chiefdoms will provide a basis for interpreting the earlier occupational complexes of the area. The archaeological investigations conducted in the sector of Costa Arriba indicate farming communities occupying the lowland riverine areas 1,500 years before the Spanish came in contact with the Cuevan groups. There is evidence that indicates these earlier groups were Cuevan, having similar settlement orientations and similar productive maize-based economies.

Three important aspects of the Cuevan chiefdoms of eastern Panama at the period of Spanish contact were their dispersed settlements along the major riverine zones, their agricultural systems involving extensive forest clearing for cultivation of maize, orchard crops, and root crops, and their sociopolitical structure consisting of various social groupings uader the control of a chief. In addition, there were competitive relationships between the various chiefdom provinces which fluctuated territorial boundaries and set up specific relationships through alliance and warfare. The areas of concentrated Cuevan settlement at the period of Spanish contact were the lowland zones of the Bayano river, Chucunaque river, the Bay of San Miguel, the Caribbean slopes, and along the lowland basin of the Atrato river.

Cuevan Provinces Along the Caribbean Slopes

Along the eastern Atlantic coast of Panama, documents concerning the initial explorations between 1501 and 1515 indicate the large and powerful chiefdom provinces were Ponca, Careta, Comogra, Pocorsa, Tumanama, and Secativa, along with numerous other smaller provinces neighboring the larger ones and apparently allied to them politically. Collectively these provinces extended along the coast from Acla on the west to Portobelo on the east, and inland across the central divide from the upper Chucunaque west along the middle and upper Bayano river, to the middle Chagres river on the east (Map VIII).

Settlements along the coast of Costa Arriba. Along the Atlantic slopes of Costa Arriba there were numerous dispersed settlements located along the major river drainages and in the rich fertile valleys. These Atlantic-side populations were agricultural and fishing orientated groups that appear to have formed a territorial sector of the larger Careta polity. During Colon's 1507 voyage along the Costa Arriba coast, he spent considerable time in four ports between Portobello and Retrete (Escribanos). His son Fernando kept accurate accounts of the indigenous groups in each port. Colon spent a total of thirty-two days in these four harbors. The expedition arrived at Protobello on November 2, 1502, and stayed there one week, taking advantage of the well-protected harbor during the heavy rains which were occurring. Fernando noted the countryside behind the harbor was well populated and surrounded by extensively cultivated fields (Colon 1947: Ch. 93). Most of this food was apparently cultivated fruit, although the fields which Colon refers to were clearly areas of cleared forest planted with maize. Colon's observations of the settled countryside around Portobello were made from the bay, looking south along the elevated slopes above Río Cascajal entering the bay on this side. Along these slopes, Colon noted the location of houses well dispersed from one another. Native travel from the individual settlements along Río Cascajal to the bay was in dugouts. During the week stay here by Colon, a variety of food and cotton cloth was brought downriver to be traded (Colon 1947: Ch. 92).

Martire's account of this voyage adds more interesting information about the indigenous settlement here. He writes that men wore only a penis sheath made of a seashell (Strombus ?) and women wore wraparound, cotton waist cloths (Martire 1964: Dec. III, Bk. IV: 323). In addition, the expedition apparently met the cacique, decorated in black paint (Jagua) and with a gold nose ring. The cacique was present with seven principals also wearing gold nose rings, but they were painted red. Common people were not painted nor did they have nose rings. The mention of a cacique with seven principals in interesting, Martire appears to be referring to the Quevi (cacique) with his people of hierarchical authority, including Sacos, Kabras, Espaves, and Tequinas, a political structure well described for the Cuevan provinces of the eastern Pacific lowlands along Río Bayano and Río Chucunaque (Andagoya 1945: 393; Martire 1964: Dec. III, Bk. IV: 320; Oviedo y Valdes 1853, Tomo III: Ch. 26, 126).

Colon continued east along the coast to an area with offshore islands and protected reef which he termed Bastimientos, the present location of IsLa Grande and Guayra. He anchored on the ninth of November and stayed fourteen days. A similar indigenous settlement situation was noted here as in Portobelo by Colon with most of the countryside cultivated with maize (Colon 1947: Ch. 93). Like the group encountered at Portobello the Spanish were met by native boatsmen in their dugouts ready to trade. Because of the amount of cleared fields observable along the island and lower slopes of the mainland, Colon termed the area Bastimientos, implying rather extensive and diversified agricultural cultivation here.

The next stop along the coast was a few miles east of Bastimientos at a small harbor Colon termed Guigua. The expedition reached here on November 23 and stayed three days. This small harbor has been identified by Morrison as the bay area near Río Culebra (Río Santa Isabel); however, it is unclear just where Colon anchored (Morrison 1974). It may have been just west of Río Culebra along the eastern side of Punta de Culebra, near the present village of Palmira, since this is the most favorable nearby area for protected anchoring (Map IX). A sizable group of 300 natives met the Spanish fleet ready to trade with foodstuffs (Colon 1947: Ch. 93: 338). It was observed by Colon that some individuals of the group had gold earrings and nose rings like those observed among the cacique and his principals in Portobello, indicating the presence of similar authority here (Colon 1947: Ch. 93: 338).

This is the stretch of coast and riverine zone in which most intensive archaeological survey during my field research was performed.

Some dispersed household-sized sites located along Río Cuango, Río Zaino, and Río Culebra may have been occupied at the time of this 1502 visit by Colon, although none of these sites can be firmly dated to this early contact period. A number of sites, located along the lower slopes behind the present village of Palenque, contain indigenous undecorated ceramic wares mixed with early sixteenth-century Mayolica ware; however, it seems these colonial wares were brought into this site by cimarrón inhabitants around 1520, after the reoccupation of Nombre de Dios in 1519. Whatever the case, Colon's stop along this coastal area, where archaeological investigations were conducted, indicates a sizable Cuevan occupation here. Because of the very brief ethnohistorical descriptions left by Colon, it is impossible to tell whether some of the sites located in this area are the actual settlements of the 1502 groups.

Colon reached his furthest eastern penetration along the Costa Arriba coast at the small harbor of Retrete on November 26. He stayed nine days during bad storms. Brief descriptions are provided for this coastal port, apparently located in the small bay of Escribanos, just east of the present village of Santa Isabel. Colon notes some trade was made with native groups here and the land was covered with short grass and few trees (Colon 1947: Ch. 93). This last observation indicates most of the coastal plain forest was cut down for purposes of cultivation. The Escribanos area is lower and flatter than the coastal zones to the west. It appears the forest disturbance here was the result of previous farming activities by the groups Colon came in contact with.

Pocorosa. The province of Pocorosa was located just east of the riverine settlements along the Costa Arriba sector. It was first visited in 1513 by Balboa in his crossing of the Isthmus (Martire 1964: Dec. III, Bk. III: 309-315; Oviedo y Valdes 1853, Lib. 29, Ch. 5: 19). The major settlement of this province was located in the highlands, along the middle to upper courses of the Bayano river, and contained wide areas of cleared agricultural land (Balboa in Navarette 1945: Vol. III: 363). In addition to the interior settlements, Pocorosa had Atlantic coast settlements which, according to Balboa, provided fish for the interior groups (Balboa in Navarette 1945, Vol. III: 363). One gets the impression reading Balboa's description of this province the denser settlements were along the Bayano river rather than along the Atlantic slopes. Dense interior settlement was necessary because of persistent warfare between this province and Comogra to the east. Both chiefdom groups were in competition for control of the rich valley lands along the upper and middle courses of the Bayano. Balboa mentions each of these provinces was heavily populated (Balboa in Navarette 1945, Vol. III: 366) and the dense settlement was concentrated in the valley and floodplain areas.

Comogra. The territorial boundary between Pocorosa and Comogra is not clearly described by these early sources; however, the major Comogra settlements seem to have been along the upper courses of the Bayano river and its major upstream tributaries (Map VIII). From this interior location, settlements extended down the Atlantic slopes and included two important coastal ports leading up to the interior settlements. Balboa first visited this province in 1511 on his initial exploratory venture of indigenous lands neighboring the Spanish colony of Santa Maria. He reported the major settlement was located twelve leagues inland from their Atlantic port near the present port of Puerto Perdido (Balboa in Navarette 1945, Vol. III: 363).

Andagoya, visiting this settlement in 1514, describes it as well populated and located in a flat, open valley (Andagoya in Navarette 1945: 391). Warfare, being conducted between Comogra and Pocorosa for control of valley and floodplain lands along the Bayano river, was an eminent concern of the Comogra groups at the time of Balboa's visit. Balboa witnessed the Comogra chief, his various war captains, headmen, and numerous warriors prepared for organized battle (Balboa in Navarette 1945, Vol. III: 363; Romoli 1953: 121). Oviedo reported the province contained three thousand warriors and ten thousand people, indicating a sizable population in this upper Bayano area prior to 1515 (Oviedo y Valdes 1853, Lib. 29, Ch. 3: 9).

The major Bayano river settlement of Comogra, visited by Balboa in 1511, was the residence of Comogre, the cacique of the province. There were dispersed settlements extending throughout a twelve-league long, relatively flat valley, most of which was under cultivation (Martire 1964: Dec. III, Bk. III: 313) and apparently divided into various divisions, each under the control of political authorities commanded by the cacique Comogre (Andagoya in Navarette 1945: 391). Comogre's house was located in a small terrace in the valley and was an enormous multiroom structure, well stocked with cultivated and preserved food, stored to feed the large number of warriors and local residents involved in the attacks upon the neighboring Pocorosa. Martire wrote a detailed description of Comogre's house based upon correspondence he received from Balboa and interviews with various men with Balboa's party in this 1511 expedition. The house was 150 paces long by 80 paces wide and constructed with carpentered beams cut from local hardwood trees and fastened well togehter, architecturally very similar to modern Choco houses of eastern Panama and Darien (Bennett 1968; Martire 1964: Dec. II, Bk. III: 233). Although Martire does not list the different kinds of food stored in one large storeroom section of the building, he does mention a cellar stocked with large ceramic and wooden vessels, filled with different kinds of wine made from manioc, maize, and palm fruit (Martire 1964: Dec. II, Bk. III: 233). The quantity and diversity of provisions was stored for redistribution throughout the Comogra province and for sustaining the warfare campaigns on the neighboring Pocorosa. The observations made by Balboa and his men, as described by Martire, provide valuable data about the political control over the provincial population by the cacique Comogre and confirms other aspects of internal class structure, intensive agricultural productivity, and populational expansion associated with this important Cuevan group in eastern Panama.

Martire describes another room of Comogre's house as containing mummified corpses of Comogre's ancestral chiefs, each positioned in order according to rank occupied in life (Martire 1964: Dec. II, Bk. III: 233-234). The cotton cloth robes and golden masks over the faces of each of these deceased caciques reflect the public manner in which Comogre defended his hereditary position as chief and indicates succession to this important position was achieved through defined lineage rules. Two years after Balboa's initial visit to this area he returned in 1513, and found Comogre had died and his eldest son Panquiaco had succeeded him to the cacique position (Martire 1964: Dec. III, Bk. III: 313). Succession to the position of cacique by the eldest son was common throughout each of the Cuevan provinces, although there were alternative methods for selection in the case a chief had no sons (Helms 1976: 29-31). It is interesting that the mausoleum containing these deceased caciques was built as part of Comogre's house, suggesting a powerful religious base for his control over surplus food and his administrative authority.

The Comogra chiefdom of 1511-1512 appears to be one of the major ethnographic sources early Caribbean chroniclers used to discuss the general Cuevan population of eastern Panama and Darien. Oviedo and Las Casas wrote lengthy descriptions of cultural aspects concerning Cuevan groups; however, much of this data does not directly identify the Cuevan province or settlement involved. Since the Spanish settlement during the 1510-1515 period was in the Caribbean coastal zone neighboring the powerful chiefdom groups of Careta, Comogra, and Pocorosa, it seems apparent many generalizations were based on offical documents, witnesses, and military officials who were in contact with these groups. Balboa's initial 1511 visit to each of these provinces resulted in alliances between him and each of these groups, thereby providing Spanish easy entry into these lands without danger. Colonists at Santa Maria were provided with a slave and transient population of Indians from these provinces. Under these circumstances of cohabitation and frequent contact, the Spanish learned a great deal about these three neighboring Cuevan chiefdoms, especially considering that in these five years, Spanish colonists, including Balboa, had learned to speak their Cuevan dialect quite fluently and those Cuevan people inhabiting Santa Maria learned Spanish equally well. Although caution and careful reading of these early documents and chronicles is necessary, recent claims rejecting much of this source information on the basis of its unidentifiable generalizations about social and political organization is unjustified

(Howe 1974). Spanish experiences in these lowland Atlantic chiefdoms greatly influenced what was written about the linguistically related Cuevan groups. Clearly then, by carefully reading these early sources, it is apparent that their descriptions of general Cuevan characteristics are largely based on the expeditions to Careta, Comogra, and Pocorosa provinces between 1511 and 1515 by Balboa and others. The smaller, autonomous Cuevan provinces, mainly those along the frontier zones east of the Bayano river on the Pacific side and those west of Portobelo on the Atlantic side, appear to have been outside the centralized, competing chiefdom states and, therefore, were not direct participants in the alliance-warfare activities operating in the eastern Panama-Darien region at this time. If this is true, it would follow that complicated religious, social organization, settlement, and economic activities discussed by Oviedo and Las Casas, were activities primarily associated with these larger, very competitive Careta, Comogra, and Pocorosa chiefdoms and the more remote frontier provinces probably did not reflect this rigid social pattern.

The Comogra chiefdom of the upper Bayano was typical of the various centralized Cuevan groups whose political and economic structures reflected an intensive competition for territory and forest resources. Each chiefdom controlled a different sized province. In the case of Comogra, this was the fertile lands of the upper Bayano region. The señor principal, or chief of the Comogra carried the title of Tiba or Quevi, a title signifying his principal authority over the political activities of the province (Andagoya in Navarette 1945: 312; Enciso 1948: 224; Oviedo y Valdes 1853, Lib. 29, Ch. 28: 131). Comogre's large multi-room house with food storerooms and a mausoleum, housing mummified ancestral chiefs, reflected authority over redistribution of food resources and power as a political leader. Comogre's seven sons and various wives lived with him in this house (Martire 1964: Dec. II, Bk. III: 133) and were collectively included in the rank of Jura, or members of the reigning family. Beyond Comogre's household, the province was divided into administrative districts or settlement zones, each being under the control of a Saco who lived in these territories and politically administered their affairs (Oviedo y Valdes 1853 Lib. 29, Ch. 16: 126; Martire 1964: Dec. II, Bk. III: 223). Within these territories, people were required to perform service to the Tiba, mainly through agricultural labor and/or military service (Andagoya in Navarette 1945: 392). There were special settlement territories designated for cultivation of corn, manioc, fruit, and other crops; settlement territories designated for hunting wild game; and still others for fishing (Oviedo y Valdes 1853 Lib. 29, Ch. 27: 133). Andagoya's description of Comogra province characterized by "caciques close together with smaller territories" (Andagoya in Navarette 1945: 391) clearly is reference to these internal territorial settlement divisions within the province, each under the authority of a Saco. These Comogra territorial sections extended from the upper Bayano region north to the shores of the Caribbean.

At the time of Balboa's 1511 expedition, Comogra was at war with the neighboring Cuevan province to the west, Pocorosa. It seems clear this warfare was associated with expansion and control of agricultural lands along the middle course of the Bayano river. The concentration of settlement in both provinces along the Bayano at this time implies a population buildup because of warfare activities, with each chiefdom commanding sizable amounts of food surplus, warriors, rural farming groups, and captive slaves. In Comogra province, the major settlement was associated with the house of the Tiba. From this location, Comogre, the Tiba, based his warfare campaign against the neighboring Pocorosa. Comogre's house and surrounding houses served as the principal location of the stored food provisions for Comogre's organized army of three thousand warriors. It seems this settlement was well established and had been the so-called "capital" of the province for a considerable period of time. The dense settlement reported in this zone during Balboa's 1511 visit appears associated with Comogre's army, assembled from the various territories and housed in his vicinity. Assemblying numerous warriors in a central place where they could be housed and fed during war campaigns was typical among these warring chiefdoms. In the province of Tumanama, neighboring Pocorosa province on the southwest, two large houses were observed by Balboa in 1513, both 220 feet long by 50 feet wide, constructed to house the army of the Tiba of this province (Martire 1964: Dec. III, Bk. III: 310). This indicates the Tiba's settlement zone was, besides other things already mentioned, an important military camp where large groups of warriors were housed and fed. Unfortunately, little information is available on the military strategies of the Pocorosa, who were in battle with both of their neighboring chiefdoms, the Comogra and the Tubanama; however, it appears the Pocorosa were being slowly pushed off their middle Bayano river settlements into the smaller river valleys along the Atlantic coast.

In Comogra province, as well as in other neighboring Cuevan provinces, the military groups had an organized hierarchical structure, indicating a long history of territorial warfare in the eastern Panama area. Cabras were war leaders or captains, a position earned in bravery of war with the title bestowed upon individuals by the Tiba (Oviedo y Valdes 1853: Vol. III, Ch. 16: 130). Cabras were politically powerful people, hierarchically below the authority of the Tiba and Sacos, and were provided with houses and leadership over members of the military service (Andagoya in Navarette 1945: 392). Interestingly, when Balboa entered the upper Chucunaque zone of Careta province in 1511, he discovered a Spaniard the Careta had appointed as war captain or Cabra leading army forces in the campaign against the Pocorosa. The Spaniard, along with two other countrymen, had been deserted by Nicuesa's expedition to the Veragua coast in 1510 and had lived with the Careta for 18 months (Martire 1964: Dec. II, Bk. III: 231). Unfortunately, the name of only one of the Spaniards is known, that of Juan Alonso, the Cabra. Although he and his two companions returned with Balboa to Santa María in 1511, it is unclear what happened to them afterwards. One suspects they may have been major informants for Oviedo, although the author does not mention this.

The Comogra chiefdom of the early sixteenth century of eastern Panama thus represents a typical Cuevan group whose political structure and economic organization were well adapted to territorial expansion through activities of warfare. The rich agricultural lands of the interior valleys of the upper and middle Bayano river were essential for the cultivation of maize, manioc, and the numerous other root and tree-fruit crops planted in cleared swidden plots. The division of Comogra province, like the other neighboring Cuevan provinces, into territorial sectors for collection and cultivation of various available food sources reflects the density of population within the province and the political control over widely dispersed settlement. Obviously, the control of these relatively small, productive, cultivational riverine zones was highly prized and could only be obtained by the most politically and economically powerful groups.

Careta and Ponca provinces. Three other riverine zones of eastern Panama and Darien supported similar provincial territories of competing chiefdom groups in the early sixteenth century. The best known are the Careta and Ponca provinces, located along the upper courses of the Chucunaque river, just east of the Comogra province, along the Bayano river (Map VIII). These provinces were the first contacted by Balboa in 1511. Because of their neighboring location to the Spanish colony at Santa Maria, they experienced continual contact with the Spanish after initial contact. In the early years of Santa Maria, between 1510 and 1512, Balboa and his group received most of their cultivated food provisions from Careta province. A large portion of the indigenous population worked as slaves for the colonists at Santa Maria, so that within only a couple of years after Balboa's contact with these two groups, the political and economic structure of both had largely dissolved and there was a great reduction in native settlement within both provinces. Documents describing the early contact with these two groups offer valuable information relating to settlement, socio-political organization, and economic orientation, showing similar patterns to other contemporary Cuevan groups inhabiting the neighboring lowlands of eastern Panama.

The Chucunaque river, like the Bayano river, is a major riverine drainage of the central interior zone of eastern Panama and, like the Bayano, is an important lowland zone containing rich alluvial soils attractive to agriculturally orientated groups. The extent of each of the indigenous provinces of Careta and Ponca is not clear, although each controlled a major upstream section of the Chucunaque and adjacent slopes of the Caribbean coast (Anadagoya in Navarette 1945: 390; Romoli 1953: 121), with their respective settlements orientated along the interior riverine zone, close to available agricultural lands. It seems, previous to Balboa's 1511 visit to these two provinces, they had been under the control of one chief and, shortly before his arrival here, two brothers divided the territory. When Balboa arrived in each of the provinces, these two Tiba brothers were battling for each other's land. One of the principal reasons Balboa led an expedition to the west of Santa Maria in 1511 was to obtain food provisions from Chima, the cacique or Tiba of the Careta. However, because of the destruction of Careta's cultivated fields by the Ponca army, the Spanish were without a food source and the Careta were being pushed off their riverine location (Martire 1964: Dec. II, Bk. III: 232, Bk. IV: 237-238; Andagoya in Navarette 1945: 390). The territorial warfare witnessed between these two groups by the Spanish in 1511 was similar to that observed somewhat later in the previously discussed provinces of Comogra and Pocorosa. The two thousand warriors assembled by the Tiba Chima in his upriver settlement were similar to the large warrior groups assembled for battle witnessed by the Spanish in the provinces of Comogra. In both cases, the objective of the battles was the seizure of agricultural lands and the expansion into new territories.

The weaponry associated with Careta, Ponca, and the Chucunaque Cuevan chiefdoms was similar, with warriors using long wooden swords called Macanas, pointed fire-hardened lances, and bone-tipped javelins (Martire 1964: Dec. II, Bk. III: 232; Dec. III, Bk. II: 303-304; Andagoya in Navarette 1945: 395-396). Oviedo describes these spears as made of hardwood palms, such as Chonta (Astrocaryum) and Jira (Iriartea), with some tipped with points made from animal and fish bones. During battle, both men and women participated. During battle warriors were painted in black and red designs. Paint was obtained from the Jagua (Genipa) tree and the Achiote (Bixa) plant. Ear and nose ornaments of gold were also worn. Warriors also blew large conch shells (Strombus) and sounded small drums (Oviedo y Valdes 1853: Lib. 29, Ch. 28: 138).

A vivid battle scene fought against Colon's 1503 expedition by Cuevan-speaking groups of the Río Belen area further west along the Atlantic coast was described by Mendez, a participant of the battle (Mendez 1847: 204-234). This account indicates a typical wafare system used throughout the Cuevan provinces, fought with forest-made weaponry.

The results of warfare among these lowland chiefdoms were the establishment of alliances. Less is known about the structure of the alliance systems than the warfare systems operating among the lowland eastern Panama chiefdoms at the time of contact; however, it appears they involved both the redistribution of goods and people between the major profinces. Oviedo mentions that, when not at war, the various Cuevan provinces conducted trade over the different lowlands regions (Oviedo y Valdes 1853: Lib. 29, Ch. 28: 140). Overland caravans carried a variety of merchandise, including salt, corn, mantas, hammocks, cotton, salted fish, and gold (Oviedo y Valdes 1853: Lib. 29, Ch. 28: 140). Ponca, one of the large Atlantic chiefdoms on the upper Chucunaque, was allied with various Pacific lowland provinces and apparently conducted organized caravan trade to these downriver groups. Las Casas notes Ponca participated in long-distance trade with maritime groups who boated up from the southwest along the Pacific Ocean as far away as Peru (Las Casas 1951: Lib. III, Ch. XLI; Balboa in Navarette 1945: 369). It is also known that Careta had an established alliance with Comogra in 1511, when Balboa first entered these provinces; however, nothing is known of the nature of this alliance. The items most frequently listed in the early documents relating to trade between the Cuevan provinces include agricultural crops, aquatic and terrestrial foods, and manufactured gold ornaments, wood products, and shell items. It appears these exchange items were important resources of each province and were distributed over wide areas of territorial settlements, apparently through these caravan trading ventures.

Another important trade item appears to have been slaves and women (Oviedo y Valdes 1853: Lib. 29, Ch. 28: 140). Early sources describe the accumulation of slaves obtained as prisoners of war and gifts of tribute within each of the provinces. In fact, slaves were one of the primary items offered to the first Spanish expeditions by the various Cuevan provinces along with gold ornaments. Oviedo mentions, in the organized trade caravans led between provinces, some people would sell young children and women (Oviedo y Valdes 1853: Lib. 29, Ch. 28: 140). This statement indicates a major aspect of alliance between these warring provinces, the exchange of women. Chima, the Tiba of

Careta, after making an alliance with Balboa, gave him one of his daughters, indicating this exchange was a major symbol of their social relationship and assured peaceful alliance between them. Martire reports when Balboa entered the province of Tumanana, located southwest of Pocorosa province, the Tiba's village contained eighty women and two men from Pcorosa province taken in battle (Martire 1964: Dec. III, Bk. III: 310). Martire's interpretation may not be totally correct. Some of these women may have been exchanged as the result of various alliances between these neighboring chiefdoms. The exchange of women between provinces for the purpose of establishing alliances, thus appears to have been an important activity.

Systems of women exchange are known ethnographically for other tropical forest lowland riverine groups of South America (Chagnon 1968a; 1968b; Levi-Strauss 1963: 120-131; 1969). Among Panamanian Choco, spouse exchange occurs between riverine settlement sectors providing important social links between separated household units (Faron 1961: 18). Choco spouse exchange provides a system of riverine social cohesion over wide lowland areas of their expanded settlement, and indicates an antiquity to kinship, residence, and domestic group alliance networks not dissimilar to Cuevan chiefdom social organization. Although the Choco pattern of social and political organization is distinct from Cuevan chiefdoms, the systems of alliance established through marriage by both groups appears to have an important function for incorporating settlement sectors into larger cooperative and economic groups. Among the Guaymî of western Panama, a related system of kindred links through marriage serve to provide economic exchange over Pacific and Atlantic area settlements and further provides an understanding of how earlier forms of social organization permitted the unification of valley and riverine settlements into a territorial Cuevan polity (Young 1971). The sketchy reference to this system of women exchange by the early Spanish chroniclers makes it difficult to discuss more in detail the nature of Cuevan social organization; however, there seems to be sufficient data to indicate both warfare and alliances were closely related to the movement and exchange of women between the various sixteenth-century provinces. The exchange of children may have also been an important activity in these early alliance formations. Ethnographic data from lowland South America and eastern Panama indicate similar exchange systems operating for both local and regional cohesion of settlement areas. The slave population of captured women observed by Balboa in the various Cuevan provinces suggests a form of women exchange that functioned for allying riverine settlements into a larger polity for military and economic strength.

Cuevan provinces around the Bay of San Miguel. Two other areas of concentrated Cuevan settlement in lowland eastern Panama were along the lower courses of the drainages feeding the estuary of the Gulf of San Miguel on the Pacific side and along the lower to middle courses of the Atrato river on the Caribbean side. No original documents are available for the first Spanish contact occurring in these areas; however, Martire gives an extensive account of the first exploration in these densely populated indigenous zones based on Balboa's "entradas" up the Atrato in 1511 and his Pacific discovery expedition in 1513 (Martire 1964: Dec. II, Bks. IV, V: 237-247). Oviedo and Las Casas provide additional accounts of indigenous settlement in these zones as witnessed by

Balboa and his party; however, much of these descriptions are copied from Martire's earlier account. In addition, Balboa's 1513 letter to the King of Spain, published in Navarette (Navarette 1945: Vol. III: 360-363), provides some valuable data relating to Balboa's contact with indigenous provinces along the Atrato and Río Negro.

The Pacific lowlands around the Gulf of San Miguel were first visited by Balboa in the balmy month of November, near the end of the rainy season in 1511. He and his party traveled down the lower course of the Chucunaque river and eastward along the bay, visiting a dozen or so well-populated provinces, each politically under the control of an individual Tiba, like the larger inland riverine provinces. The major settlements within each of these provinces were away from the bay, along the lower courses of the various rivers which feed the large Gulf estuary. Balboa's party was led into the Tiba settlements of each province by guides obtained from each of the neighboring provinces they entered. Most of the travel between provinces was done in indigenous dugouts since the riverine paths and bay were waterways connecting each of the provinces.

The economic orientation of these various chiefdoms appears to have been largely maritime orientated. Martire reports manioc and maize bread were offered to Balboa and his party in some of these Tiba settlements, indicating the cultivation of both food crops (Martire 1964: Dec. III, Bk. II: 301.

Bay fishing was an important economic activity among these groups, providing a valuable protein source from mollusks and bay fish. Oysters were collected as an important local meat source. They also contained pearls, a valuable commodity for trade. Pearls were stored in the houses of the Tibas in each province. In the province of Tumaco, along the lower Chucunaque river, the Tiba had a trained group of divers who obtained oysters from the bay. Balboa's party was actually given a demonstration of their ability to recover sizable quantities of these pearls (Martire 1964: Dec. III, Bk. II: 300). In the provinces visited by Balboa's party around the Gulf of San Miguel, oysters were offered by the Tibas as tribute, further indicating their economic importance in this area.

The relationship of these Pacific coastal provinces to the large interior riverine chiefdoms is not clear because of the inadequate information in the early chronicles about contact between these groups. Although the territory of each coastal province was smaller than their interior relatives, political organization led by a chief served to maintain control over provincial agricultural lands and productive marine zones. It may be these coastal pronvices represent earlier riverine groups pushed off their upriver locations by the more powerful chiefdoms of the Chucunaque and Bayano rivers. Because of their inability to compete for upriver agricultural lands, they appear to have developed a more maritime economy.

Cuevan provinces of the Atrato river. The Atrato river was the other zone of dense Cuevan settlement at the time of Spanish contact and, as already mentioned, was an area which Carib groups were beginning to colonize when the Spanish arrived here in 1501. Balboa led the first expedition up this river in January 1511. He was well informed by his Comogra and Careta informants of the locations of the major Atrato settlements, consisting of Cuevan provinces along the Atrato lowlands and upriver Carib settlements (Balboa in Navarette 1945: Voll III: 360-363). The knowledge of these Atrato river provinces by the distant Atlantic chiefdoms of eastern Panama implies considerable contact between these groups. Helms has suggested one important contact situation existing between these groups throughout eastern Panama and northern Colombia was journeys, frequently taken by religious leaders or Tequinas (shaman) of each province for the acquisition of esoteric knowledge (Helms 1979). Oviedo's remark about the requirements of a Tequina to spend a designated period far in the jungle supports Helms' argument and indicates shamen were awarded special freedoms of travel through highly competitive territories, frequently in battle (Oviedo y Valdes 1853: Vol. III, Lib. 29, Ch. 31: 169). There was, as reported by Martire, established trade between the interior Atrato Carib groups and the Comogra of the upper Chucunaque by which Comogra would receive pottery and necklaces in exchange for harvested crops and slaves (Martire 1964: Dec. II, Bk. III: 235). These instances of long distance trade and contact by the lowland groups of Panama and Colombia at the time of the Spanish contact clearly indicate a long-established network of economic, political, and religious interaction between these distant chiefdoms.

The numerous provinces encountered by Balboa's 1511 expedition were located along the lower and middle courses of the Atrato river and one of its major tributaries, the Río Negro (Martire 1964: Dec. II, Bk. IV: 239-247). A variety of different settlement patterns were observed; however, the most common settlements were not dispersed households within wide valleys, as in eastern Panama, but large nucleated villages along the middle course of Río Negro, Colmenares, who led part of

Balboa's party up this river, observed sixty villages scattered along the river with ten houses per village. Farther upriver, larger villages existed, with up to five hundred houses in each settlement (Martire 1964: Dec. II, Bk. IV: 240). In swampy areas, along the upper courses of the same river, houses were built in trees, similar to the villages of multi-house groups built on palm trees along the lower Atrato river reported by Oviedo (Oviedo 1853: Lib. 29, Ch. II; Lib. 29, Ch. 18: 131).

Movement throughout this lowland riverine zone was in dugouts, some containing sails used during the windy dry period season which was just beginning during Balboa's first visit here (Balboa in Navarette 1945: Vol. III: 362-363). According to Balboa, this was an area of extensive trade with coastal groups traveling inland to exchange products. Some distant villages Balboa did not reach contained workshops for manufacturing gold ornaments. He was informed of these special settlements by downriver Cuevan groups. These gold ornaments were traded over a wide lowland area, including the Atlantic Cuevan provinces of eastern Panama.

The major settlement zones occupied by the early sixteenth-century Cuevan groups of eastern Panama and Darien were thus in the interior lowland riverine vallesy of the Bayano, Chucunaque, and the Atrato river drainages. Along the Atlantic slopes, settlement extended into similar rich alluvial zones of the major rivers. Political control of these coastal territories was maintained by the various neighboring chiefdoms of the interior valleys. The most powerful were the Careta and Ponca of the Chucunaque and the Comogra, Pocorosa, and Tumanama of the Bayano. Similar large Cuevan provinces were located along the lower and middle courses of the Atrato and Río Negro further to the east. Along the Pacific lowlands, the major settlement zone in eastern Panama was the lower course of the Chucunaque river and nearby drainages feeding the Gulf of San Miguel. Among these Cuevan groups, the political structure was the same, consisting of individual provinces divided into territorial units supporting large rural populations, an organized military, and an elite social class under the command of a chief.

Ethnohistorical Record and Archaeological Research

The sixteenth-century chiefdoms of eastern Panama clearly represent closely related cultural groups whose settlement, agricultural activities, and socio-political organization imply a long adaptive evolution in this moist tropical region. Patterns of earlier occupation, therefore, must have been influenced by similar factors affecting the sixteenth-century settlement. Archaeological investigations conducted in the Costa Arriba sector of eastern Panama show evidence of this in the spatial distribution of sites and the material assemblage associated with these settlements. The ethnohistorical information of sixteenth-century Cuevan settlement thus provides a model for understanding earlier prehistoric settlement along the Caribbean slopes of eastern Panama.

The economic basis of these various Cuevan chiefdomes was maize agriculture. One of the principal factors influencing settlement was the location of favorable land for cultivation. As mentioned, the concentration of population during this period was in the riverine lowlands where these soils occur. Therefore, the areas of agricultural activities were the areas of settlement. Extensive areas of forest clearings were noticed by the

Spanish in these areas, indicating swidden activities for the cultivation of not only maize, but also root crops and orchard tree fruits. An exception to this riverine settlement pattern among Cuevan groups was along the Pacific coast, near the Bay of San Miguel, where settlements were apparently more coastal and groups were marine orientated. In the Costa Arriba area, Cuevan settlement was similar to the interior riverine groups with settlement along the streams near the wide areas of cleared forest, implying a productive crop complex and sizable demographic pattern.

Other factors influencing settlement among these sixteenth-century Cuevan groups were political and socio-economic pressures. The Cuevan population was divided into a numberof territorial groups, each under the leadership of a cacique, whose primary responsibility was to regulate food production. Since food could only be cultivated in the areas of agriculturally rich soils, there was competition for these areas, resulting in established alliances or aggressive warfare. At the time of Spanish arrival to the provinces, there was clear social stratification. Groups inside the provinces were fissioning apart and some provinces were being pushed off their land because of their weak military strength. The settlement situation observed by the early Spanish explorers in eastern Panama from 1500 to 1515 involved dense settlements in the interior Bayano-Chucunaque valleys, mainly consisting of standing armies and rural farmers, collectively forming large population clusters throughout the provinces during times of war. Most of the Caribbean agricultural lands were controlled by the interior riverine chiefdoms who maintained rural farming and fishing settlements as part of the food production lands within their territories.

In the Costa Arriba area as many as five provinces are mentioned by early Spanish sources. These include Chuana or Xaguaguara located near Portobello, Caranaca, Juanaca, Pequent, and Chagres located along the Chagres river and along the smaller rivers of the north coast, and the Secativa, located along Río Culebra and Río Mandinga (Map VIII). Las Casas mentions that all these Cuevan settlements were in the province of Chagres (Las Casas 1951: Vol. III: 89). Martire, however, states that the coast of Nombre de Dios was within the province of Careta (Martire 1964: Dec. VI, Bk. I). The Cuevan groups encountered here by Columbus in 1502 and Nicuesa in 1510 were allied with interior based chiefdoms, and Martire's placement of the Costa Arriba groups into the province of Careta appears to be the most accurate. Careta thus appears to have controlled a large portion of coastal slope land, Atlantic ports, and interior riverine settlements along the Chucunaque and Chagres rivers. The sixteenth-century occupation of Costa Arriba then represented riverine-based Cuevan settlements, forming a territorial sector of the Careta polity, providing a variety of agricultural and marine products for distribution over a wide area of lowlands.

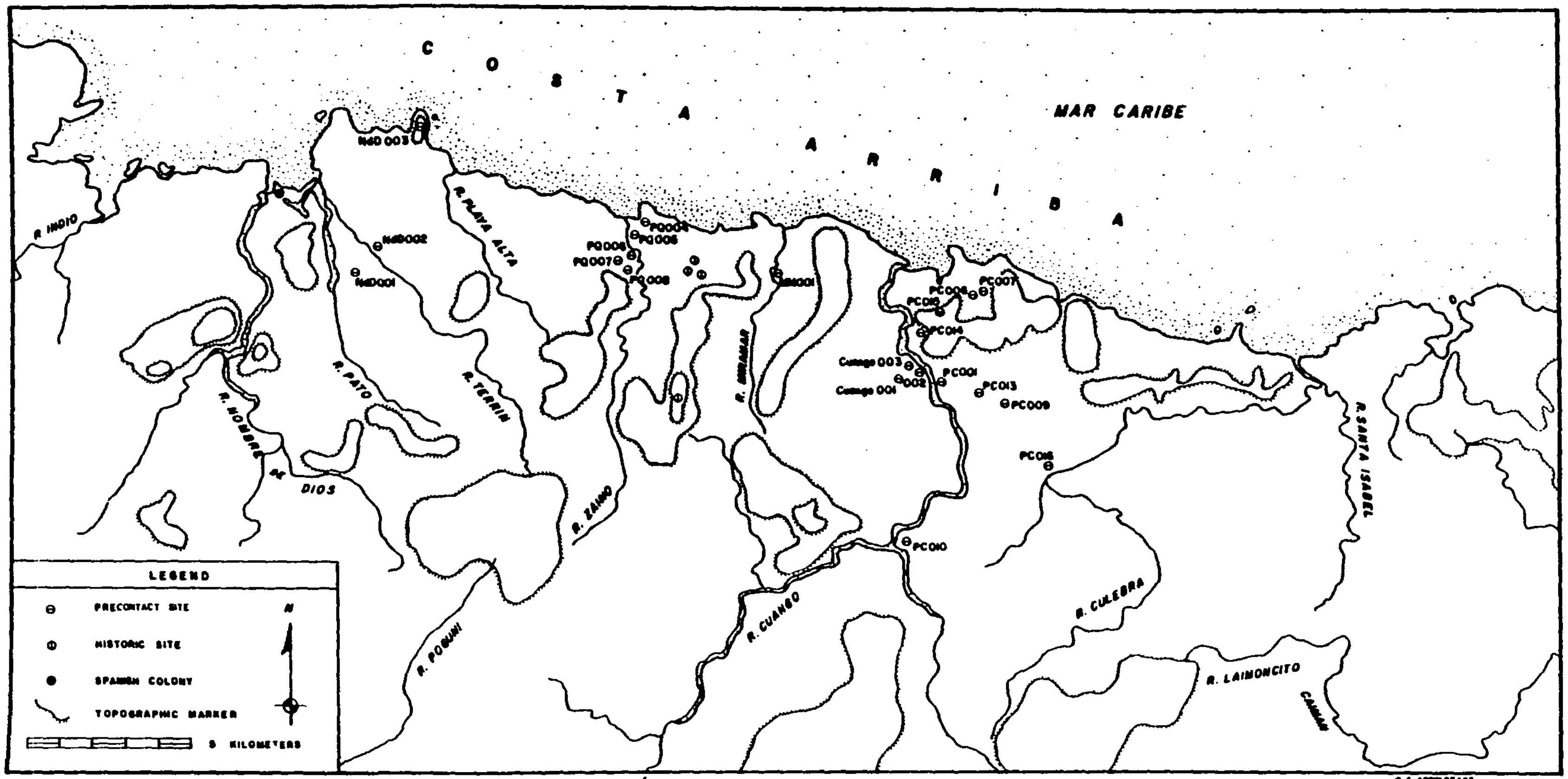
Archaeological survey in the Costa Arriba area indicates the zone was occupied long before the contact period by agricultural oriented groups related to the sixteenth-century Cueva. The distribution of small, dispersed sites is in the areas of the richest agricultural soils. Further evidence of this early farming economy and cultural link to sixteenth-century Cuevan population was obtained from an excavated site containing an assemblage of forest clearing tools and other tools used to process cultivated foods, including maize. These patterns suggest a long Cuevan occupation in the Costa Arriba area. Other archaeological evidence recovered, including specialized sites and the existence of trade materials, suggest political and socio-economic pressures influencing Caribbean valley settlements similar to sixteenth-century Cuevan control of this area.

CHAPTER IV

ARCHAEOLOGICAL SURVEY

Introduction

Field archaeological investigations in the Costa Arriba area focused on locating early farming settlements associated with the expansion of Cuevan polities into this area. Within this eastern Panama sector, site survey was conducted from the coast inland, following the major stream channels. From Río Santa Isabel on the east to Río Indio on the west, the survey covered an area of approximately 350 square kilometers (Map X). The survey was conducted along the fifty to eighty meter high terraces located along the middle and lower courses of the major rivers, since it was felt this would be the locations of these early deposits. These terraces provide geographically protected locations above the flood-plains and river courses and, therefore, offer the most sutable areas for human settlement. Further away from the riverine courses and flood-plaines, the terrace system continues; however, these locations are associated with tall canopy forest and poor lateritic soils. Survey in these more inland, elevated forest zones resulted in no recorded sites. The protected littoral zones along the coast were surveyed for archaeological sites and, likewise, no deposits were located. Instead, the concentration of sites was distributed along protected terraces, elevated above the river channels and scattered inland from the coast, one to four kilometers upstream.



SOURCE: R. DROLET, AND DISTRITO de SANTA ISABEL, 1960, INSTITUTO CARTOGRAFICO, PANAMÁ.

Map X. Location of Archaeological Sites in the District of Santa Isabel.

Surface collections were made on each site, including ceramic, lithic, and shell debris. Features were recorded when present. The surface collections were made by walking the terrace tops and adjacent slopes. Some terrace sites were totally or partially exposed from agricultural clearings, while others were heavily covered with secondary growth and forest floor overburden. The more exposure the site had, the more eroded materials were found, especially along the slopes. The low sample size of some site collections reflect the degree these sites were buried under forest vegetation. A hoe was used on heavily vegetated terraces in an effort to expose more area of the forest floor. Occasional sound testings were made on these sites with a small shovel to determine the extent of the deposit.

Table 9 shows the total quantitative sample of cultural materials collected from the surface of the twenty-one precontact sites located on survey. Larger surface collections were obtained on some of the Río Cuango--Río Culebra sites than on those found along the river channel terraces to the west. Possibly this is from more site exposure and slope erosion of site materials rather than denser deposits. Sites, such as PQ 005, PC 001, PC 014, and Cuango 003, however, clearly had more ceramic debris associated with their surface deposits than the other sites recorded. Despite this unequal density of cultural material associated with the different site deposits, all were equally small in size, ranging between eighty and one hundred meters square.

The large surface sample associated with site PC 001 was the result of more intensive site clearing and grid collection. After completion of the general site survey over the six river channel areas, it was clear a

Table 9

Surface Collection Materials

Site	Santa Isabel Undecorated	Plastic Decorated	Other
A. Río Terrin			
1. NdD 001	11	0	0
2. NdD 002	20	0	0
3. NdD 003	20	0	Shell (C. pica)
B. Río Zaino			
1. PQ 004	20	0	Shell (C. pica), 1 lithic
2. PQ 005	32	0	Lithic (1)
3. PQ 006	13	0	0
4. PQ 007	11	0	Ground stone (1)
5. PQ 008	19	0	0
C. Río Escondido			
1. MM 001	67	0	0
D. Río Cuango and Río Culebra			
1. PC 001	2,411	12	Lithic (35), Celt
3. PC 006	21	0	Ground stone (1), Celt
4. PC 007	21	0	0
5. PC 009	13	0	Ground stone (3)
6. PC 010	10	0	0
8. PC 013	108	0	0
9. PC 014	161	0	0
10. PC 015	103	0	0
11. PC 016	9	0	0
12. Cuango 001	18	0	0
13. Cuango 002	84	0	20 (Lithic)
14. Cuango 003	9	0	0

better quantitative sample of cultural material had to be obtained from one representative site in the district. This intensive, surface investigation conducted at PC 001, followed by archaeological testing, makes this a "type site" for this Atlantic coast sector.

Since the predominant cultural item associated with all site deposits was utilitarian ware sherds, the random collections from each of the sites were grouped into rim, body, and base fragment groups. These groupings provided the samples for vessel reconstruction. This utilitarian, undecorated ware was termed Santa Isabel Undecorated. Besides this ceramic category, a small sample of plastic decorated sherds was recovered. Other than a few unprovenienced sherds found in riverine gravel desposits in the Playa Chiquita river area (see Fig. 1), these plastic decorated sherds were found exclusively from the surface and later excavated deposit at the site of PC 001. Two stylistic wares were separated in this sample, one corresponding to Incised-Relief Brown Ware, a ceramic type well known from sites in the Pacific eastern Panama and northern Colombian lowlands (Biese 1964: 3-51; Reichel-Dolmatoff 1961). Another plastic decorated local style found was termed Río Cuango Punctate, a ceramic style which seems to share close similarities to punctate wares dating to as early as 1,000 B.C. in the Atlantic watershed zone of Costa Rica (Snarskis 1978: 70-89). These three ceramic wares were given typological distinctions to enable comparison with established ceramic types from other areas. In the case of the Santa Isabel Undecorated Ware, a type description was made by choosing rim orientations, surface treatment, and vessel categories (Appendix A). The Río Cuango Punctate wares also showed distinctive decorative modes

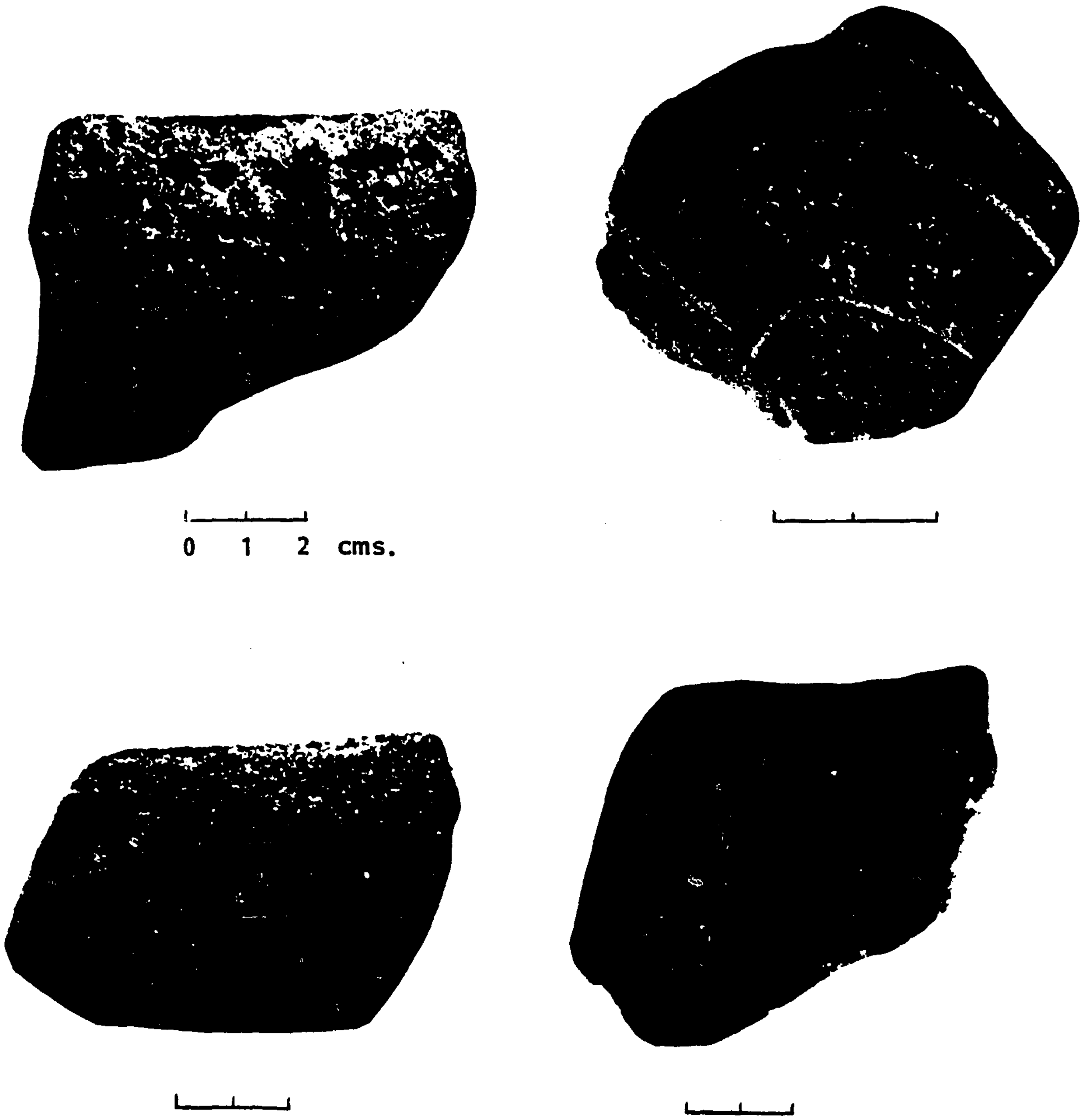


Figure 1. Rio Cuango Punctate. Sherds showing punctate and incision designs. Sherds were found along gravel deposits of Rio Playa Chiquita.

of lineal design, shallow incision, and a predominately restricted-wall vessel form.

The absence of the two plastic decorative styles from surface collections obtained on other district sites is curious. However, it may be totally the result of heavy surface erosion on these sherds. Many plastic decorated sherds from both above ceramic types found at PC 001 had poorly visable surface decoration because of heavy erosion from lateritic soil. Clearly, the more intensive work at this site made it possible to distinguish these eroded wares.

Thus, the archaeological survey in the Costa Arriba zone was able to locate a total of twenty-one ceramic bearing prehistoric sites. It is the intention of this chapter to discuss each of these sites within the riverine valleys where they occur and present the general uniform features characterizing them. More specific discussion will follow, focusing on the more intensive investigations conducted in the Río Cuango area at the site of PC 001. The high sample of Santa Isabel Undecorated sherds collected here provided the basis for reconstruction of vessel varieties of this important utilitarian ware present on the other district sites recorded on survey (Appendix A).

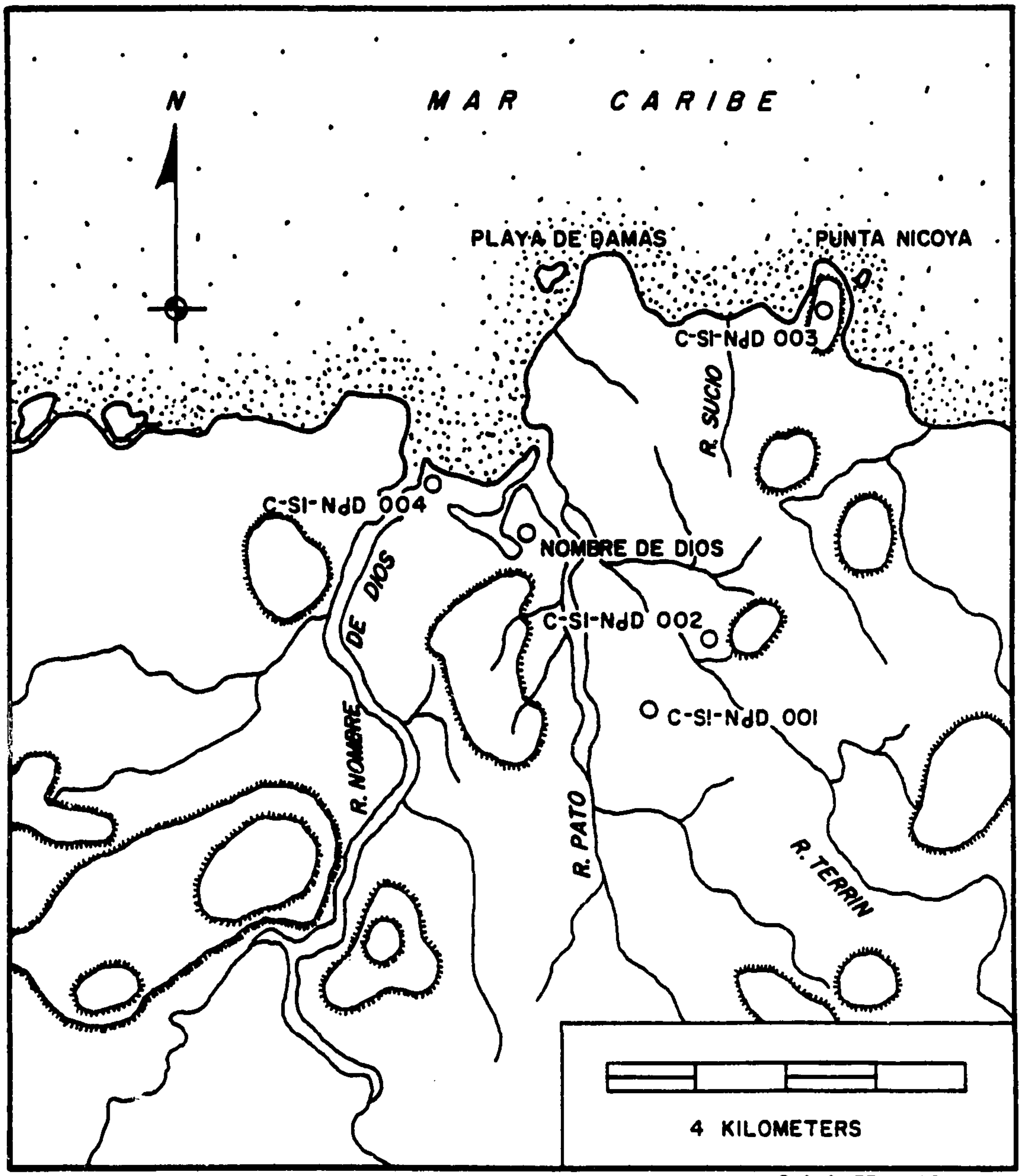
The Sites

The twenty-one ceramic-bearing sites were recorded along six different river systems in the Costa Arriba area. These sites had prehistoric deposits and were located along terrace tops, adjacent to these rivers in the vicinity of flat floodplain zones. Most sites occurred along the middle courses of these rivers; however, some were found further downstream in similar ecological surroundings as the upriver sites. The sites recorded consisted of small, dispersed habitation occupations, unassociated with any architectural features.

Río Terrin

Along Río Terrin, located just east and south of the modern village of Nombre de Dios, two sites were located approximately one kilometer from the river's mouth (NdD 001; NdD 002) (Map XI). Each site was located on top of a separate terrace, 300 to 400 hundred meters apart. Sherd material was collected mainly along the cleared slopes of the terraces, which were under manioc cultivation at the time of survey, permitting easy surface observation. Both had small, flat terrace top surfaces, measuring approximately eighty meters square in area. The sherd sample collected consisted of small, Santa Isabel Undecorated ware sherds with highly eroded surfaces.

The lower course of Río Terrin, in the vicinity of the sites, is characterized by a low, flat floodplain in which alluvial soils are annually deposited over a 1,000 to 1,500 square meter area. Río Terrin actually drains into Río Pato close to the latter's mouth. The floodplain where the two sites are located is created by the merging of these two drainages at their lower courses. These rivers, along with another larger one to the west, Río Nombre de Dios, drain a large interior lowland area of agriculturally rich land. The survey of the terraces further up river along these three watercourses could not locate any other occupational deposits. It is probable desposits exist further up river; however, they appear to



SOURCE: R. DROLET, AND DISTRITO DE SANTA ISABELA, 1960, INSTITUTO CARTOGRAFICO, PANAMÁ. -G.A. APFELSTADT-

Map XI. Site Locations of NdD 001, NdD 002, NdD 003. NdD 004 is the location of the historic colony of Nombre de Dios.

be well buried and difficult to detect because of the amount of heavy forest vegetation and surface overburden. Ceramic sherds of Santa Isabel Undecorated wares were observed in bank side gravel deposits farther up Río Terrin and Río Nombre de Dios, indicating occupation extended well up these rivers; however, it was impossible to locate the sites from which this ceramic material originated. The undecorated sherds found in these upriver gravel deposits were identical to the Santa Isabel Undecorated sherds collected from the lower course Terrin river sites.

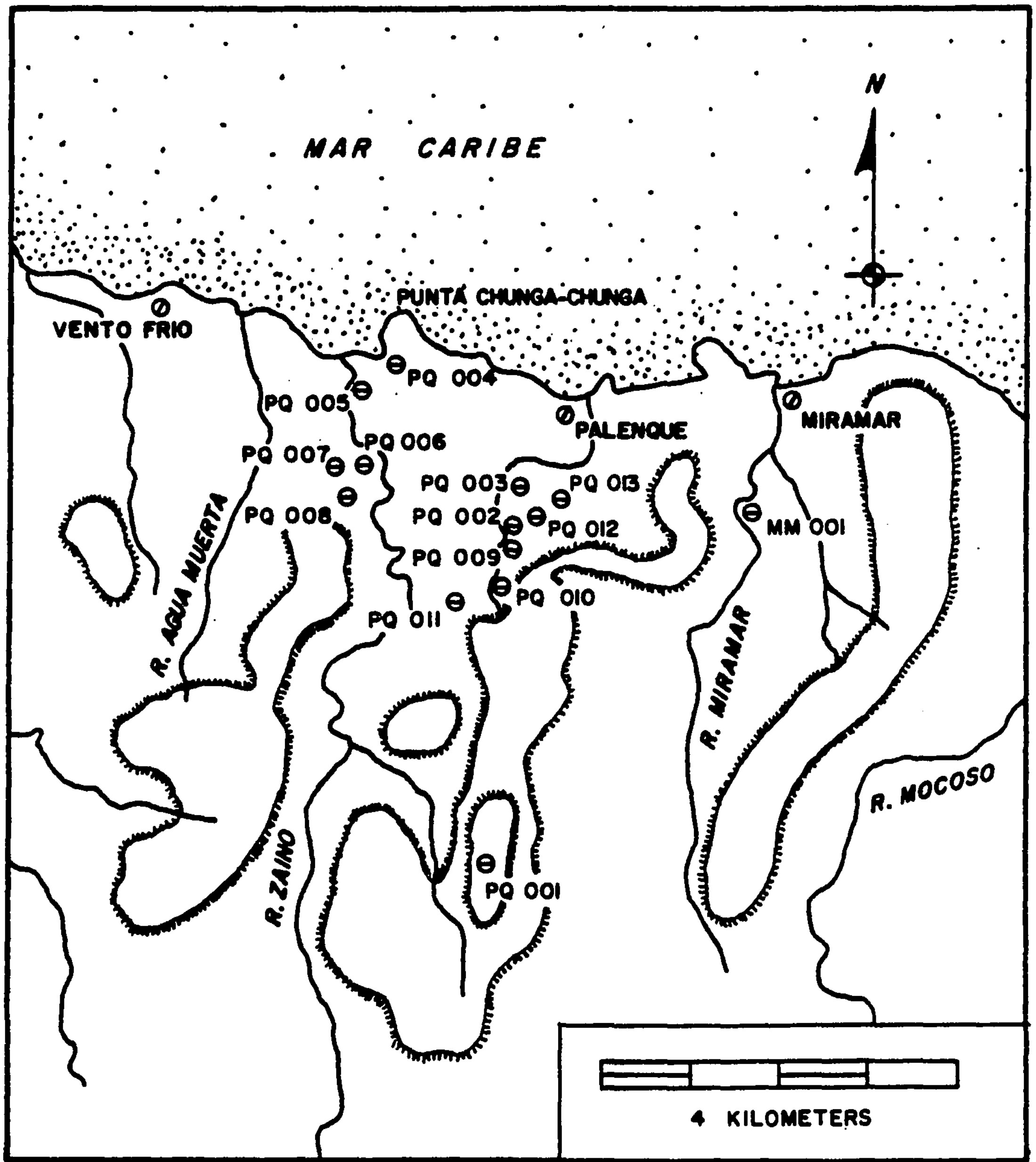
Another site was located east of Río Terrin, three to four kilometers away, along a sixty meter high coastal cliff (NdD 003, Map XI). A very light sherd scattering was recovered along the top of this cliff and its adjacent slopes (Table 9). The Santa Isabel Undecorated sherds were the same as those on the Río Terrin sites. Concentrations of shell (*Cittarium pica*) were present on the surface of this site, indicating its possible use as a temporary activity location for the collection of this shell species occurring along the wide reef area in front of the cliff site. The small ceramic sample of Santa Isabel Undecorated wares recovered here tend to confirm no permanent occupation. The surface shell debris consisted of whole and broken examples of *C. pica*, scattered in small fifty to seventy centimeter wide surface deposits and distributed in various areas along the top and slopes of the cliff. This mollusk species is abundant along the nearby reefs and is collected in considerable quantities every month by present-day Black villagers, especially during the dry season months when it is a primary meat source. The presence of these shell remains, associated with the ceramic debris, suggests earlier riverine-based indigenous groups were also collecting this marine mollusk.

The importance of this shell species is not so much its individual food resource value, but rather its association with other reef-dwelling food species together providing an important protein source. When modern Black villagers collect the reefs, they bring back not only Bulgao (C. pica), but also lobster, crab, octopus, chiton, and two or three different species of snapper (Lutianus). A typical two-hour trek along the reef usually results in twenty to twenty-five pounds of edible meat for one household. The existence of this coastal site (NdD 003) suggests a similar pattern of reef species collection by earlier indigenous groups.

Río Zaino

Moving east along the coast, five sites were located along the lower course of Río Zaino (PQ 004, PQ 005, PQ 006, PQ 007, PQ 008; Map XII). They extended from the mouth to approximately one kilometer upriver, separated from each other along individual small terraces. The western portion of bank, associated with Río Zaino, is characterized by low slopes and floodplain. The archaeological sites were grouped along the higher terraces of this rich agricultural land. Farther upriver, the floodplain narrows and then, at two to two and one-half kilometers upriver, the alluvial formations widen, forming another relatively flat valley. Beyond here, the terraces become higher with more rigid, elevated angles, supporting predominantly high climax canopy forest and poor soils. Although no sites were found further upriver than one kilometer, Santa Isabel Undecorated sherd material was observed in the gravel deposits along the river bank, indicating the existence of additional sites in the upriver valley areas.

The Río Zaino empties into a small bay, lined with a wide sandy beach on the western side and a well-formed reef along the eastern portion.



SOURCE: R. DROLET, AND DISTRITO DE SANTA ISABEL, 1960, INSTITUTO CARTOGRAFICO, PANAMÁ.

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Map XII. Location of Río Grande–Río Momoní Sites.

The reef extends along a wide point, locally called Chunga-Chunga, measuring approximately eighty meters wide by two hundred meters long (Map V). During the rainy season (April-October) sizable schools of sardines inhabit the bay, attracting considerable species of gamefish, including mackerel, jack, bonito, tarpon, shark, and cojinua. In addition, the wide reef area houses similar quantities of diversified marine fauna food species like those described for the reef zone further west near Río Terrin. Various species of marine turtle, including the Hawksbill (Eretmochelys imbricata) and Green turtle (Chelonia mydas), frequent the wide beach front during the months from June to October, during which the females bury their eggs in the sand. It appears these turtles have developed a behavioral pattern to elude and confuse predators, the most serious of which is man. Female turtles will select only remote beaches. They will generally leave the water at night for the beach where they leave a long lineal trail created by their large shell and fin-like legs. These trails terminate in a series of concentric circles where the turtle has laid the eggs; however, the female will travel the beach two to three different times, making these trails, and only on the last trek will she deposit 100 to 150 eggs. The egg-laying trip is carefully done in that the turtle will bury the eggs in an excavated hole and cover them by scattering sand over them and disturbing a wide area of beach in order to make it difficult to determine the exact spot of the buried eggs. This egg-laying process used by the female turtle clearly has been developed over a long period of time and indicates a very sophisticated adaptation to predation. One wonders how local this pattern is and if it really represents an adaptation to the human collection of turtle eggs.

The archaeological sites located along the terraces of the lower course of Río Zaino were small, sixty to seventy meters square, habitation deposits, clustered in this 700 to 800 meter long river bank area (Map XII). All contained the typical Santa Isabel Undecorated sherd debris, identical to the sherds found on the surfaces of the Río Terrin sites. The density of ceramic materials on these Río Zaino sites was greater here than on the Río Terrin sites further west, making it possible to identify some vessel categories. The most typical vessel forms were represented by rim sherds of small bowls, having either inward or outward curving walls (Fig. 2). Larger unlipped, wide-mouth ollas and pedestal-based vessels were also represented in the collected sherd samples, indicating two more common vessel shapes (Figs. 3 and 4). The sherds contained a characteristic gravel temper, reddish brown paste, and generally smoothed body surface treatment.

Basalt flakes were collected at two sites (PQ 004, PQ 005), each showing utilized edges, suggesting use as scrapers. Only one flake tool was found at each site, indicating the relative absence of lithic debris in these deposits.

Some shell remains were associated with the surface ceramic materials at site PQ 004, located near the mouth of Río Zaino, which included three common species (Cittarium pica, Aequipecten gibbus, Olievela sp.). This shell material was scattered very sparsely over the site area without any concentrations like those described for the Río Terrin area site of NdD 003. The presence of this shell material may indicate collection of these species in the nearby bay and reef zones; however, their association with the ceramic debris is somewhat unclear.

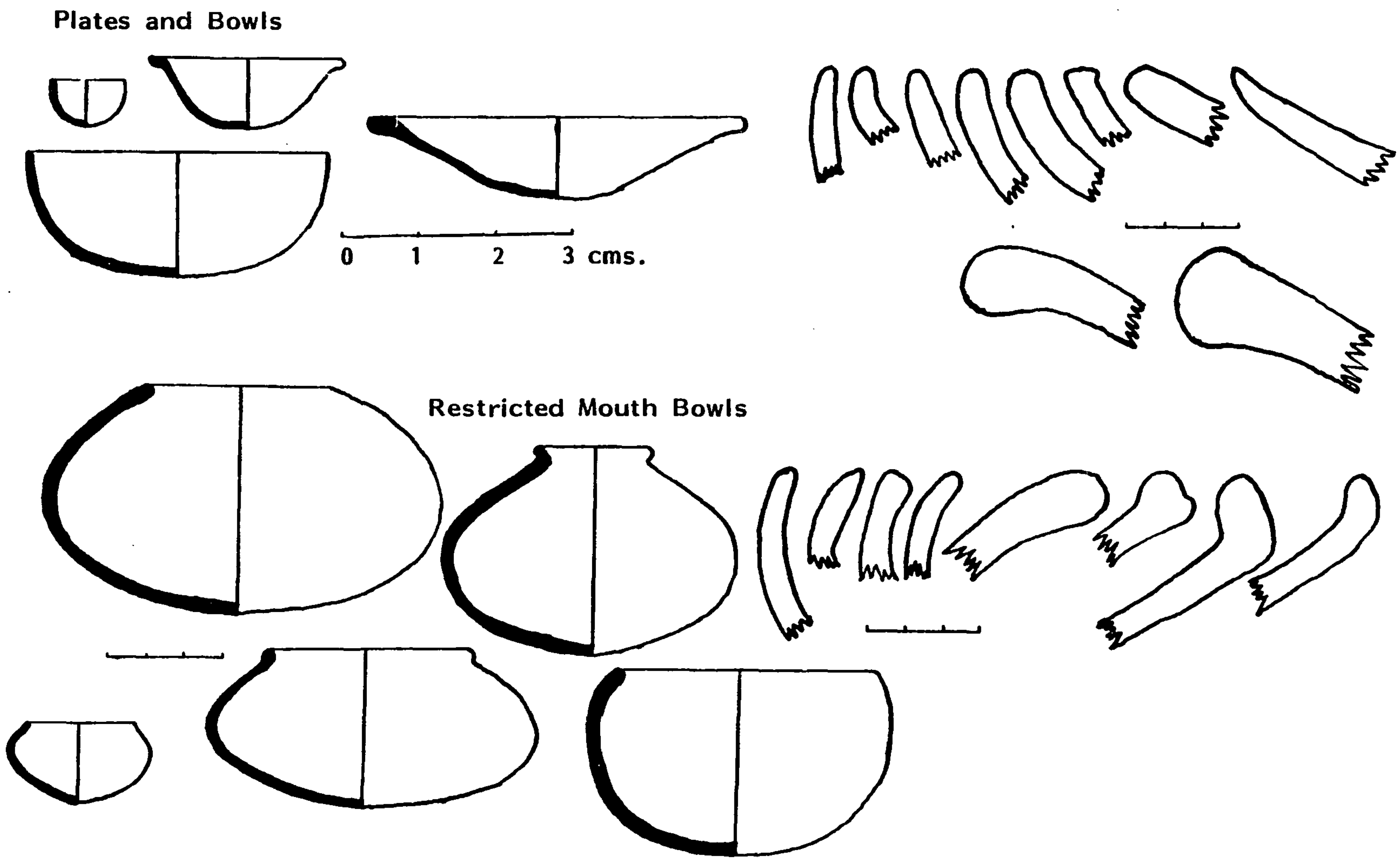


Figure 2. Rim Profiles: Santa Isabel Undecorated Plate and Shallow Bowl Forms and Restricted Mouth Bowl Forms.

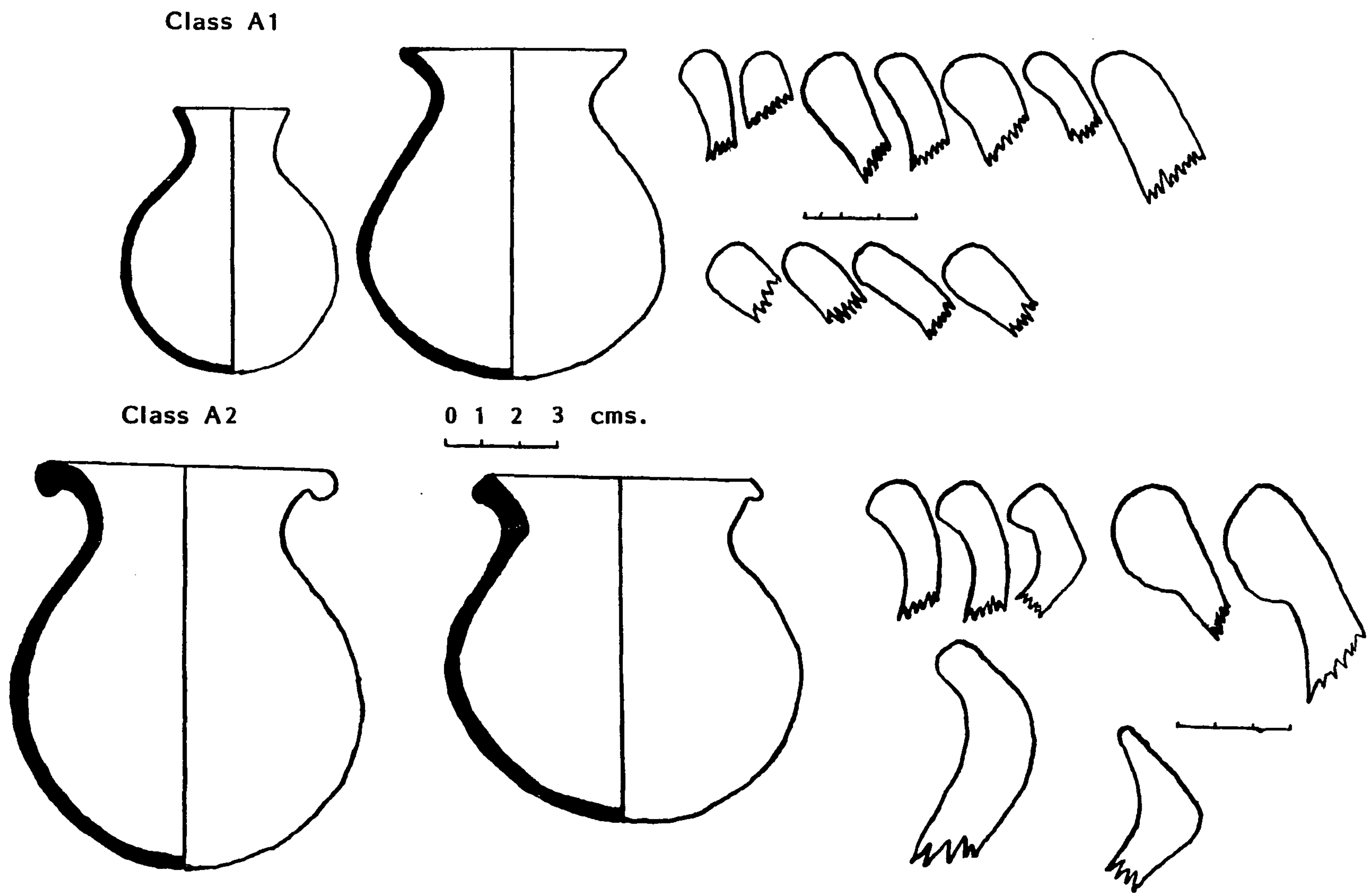


Figure 3. Rim Profiles: Santa Isabel Undecorated Wide Mouth Olla, Classes A1 and A2.

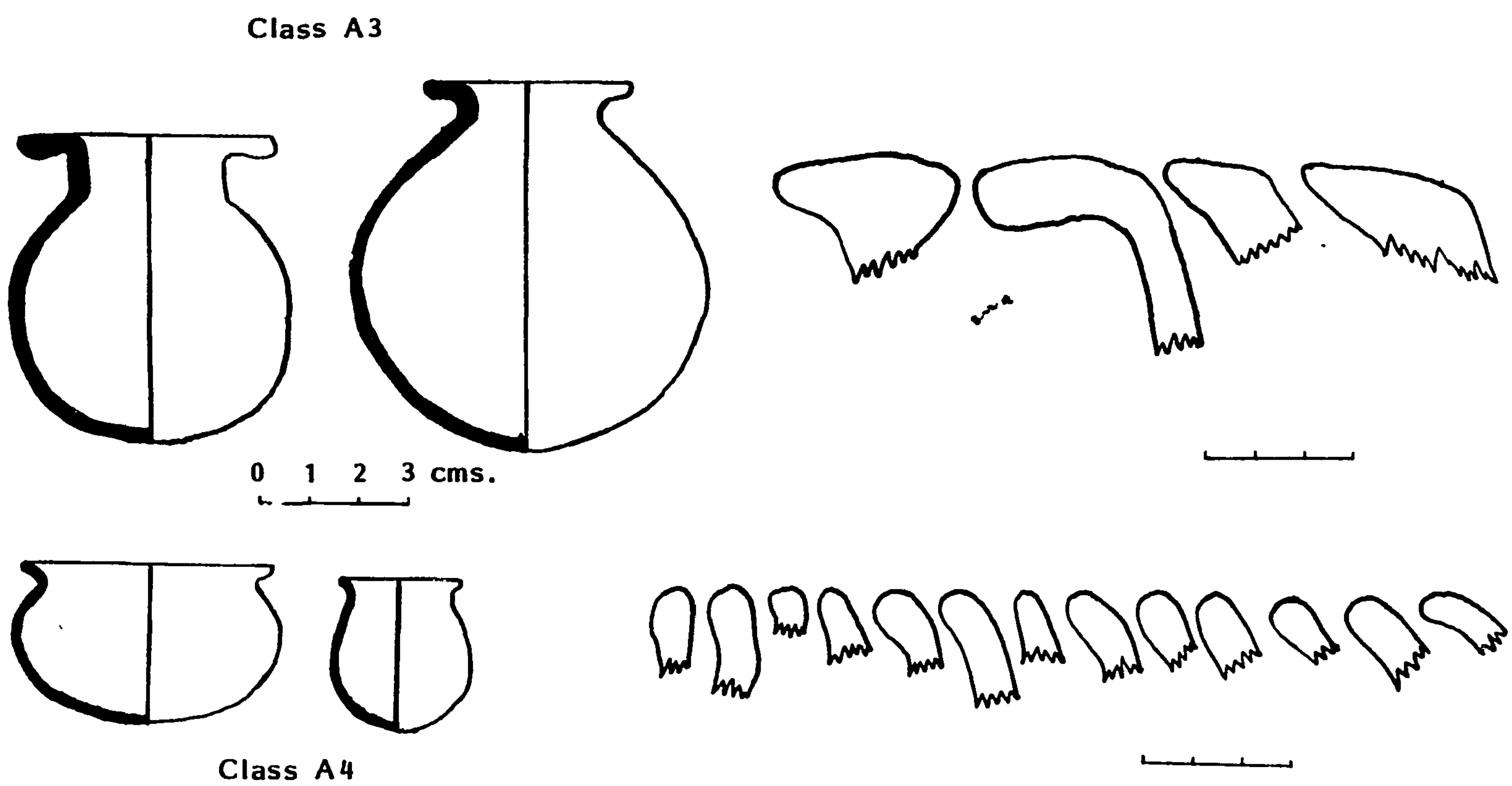


Figure 4. Rim Profiles: Santa Isabel Undecorated Wide Mouth Olla, Classes A3 and A4.

Río Grande and Río Momoni

East of Río Zaino, hills and choppy terraces predominate with small drainages associated with scattered areas of alluvial fans along their lower portions. These dispersed agricultural zones are separated from the coastal area by a belt of pantano forest, stretching east of Río Zaino some eight kilometers to the lower course of Río Escondido (Map V). Long areas of sandy beach occur between the mouths of these two larger rivers, broken by occasional reef.

Survey along the terraces near these interior valleys located a number of archaeological sites concentrated in the area of Río Grande and Río Momoní. A total of eight sites recorded (PQ 001, PQ 002, PQ 003, PQ 009, PQ 010, PQ 011, PQ 012, PQ 013; Map XII). They consisted of ceramic bearing deposits, occurred on nearby terrace tops. Santa Isabel Undecorated wares were recovered on all of these sites, along with historic sherds of early sixteenth-century Mayolicaware and undecorated, straight-walled ollas with modeled neck coiling (Fig. 5). Ceramic pipes, glass fragments, and metal objects were collected on these sites, further indicating historic period occupation. The mixture of precontact indigenous wares and later historical ceramic and metal materials on these sites suggests either a cohabitation of indigenous and cimarrón Black groups in early contact period times or a habitational sequence of settlement on the terraces in which Black cimarrones replaced an earlier indigenous settlement. There is documentation suggesting this was the location of an early cimarrón camp, dating as early as 1519-1520 (De la Guardia 1976: 87-93) and occupied by escaped slaves from the Spanish colonial village of Nombre de Dios, located some ten to twelve kilometers to the

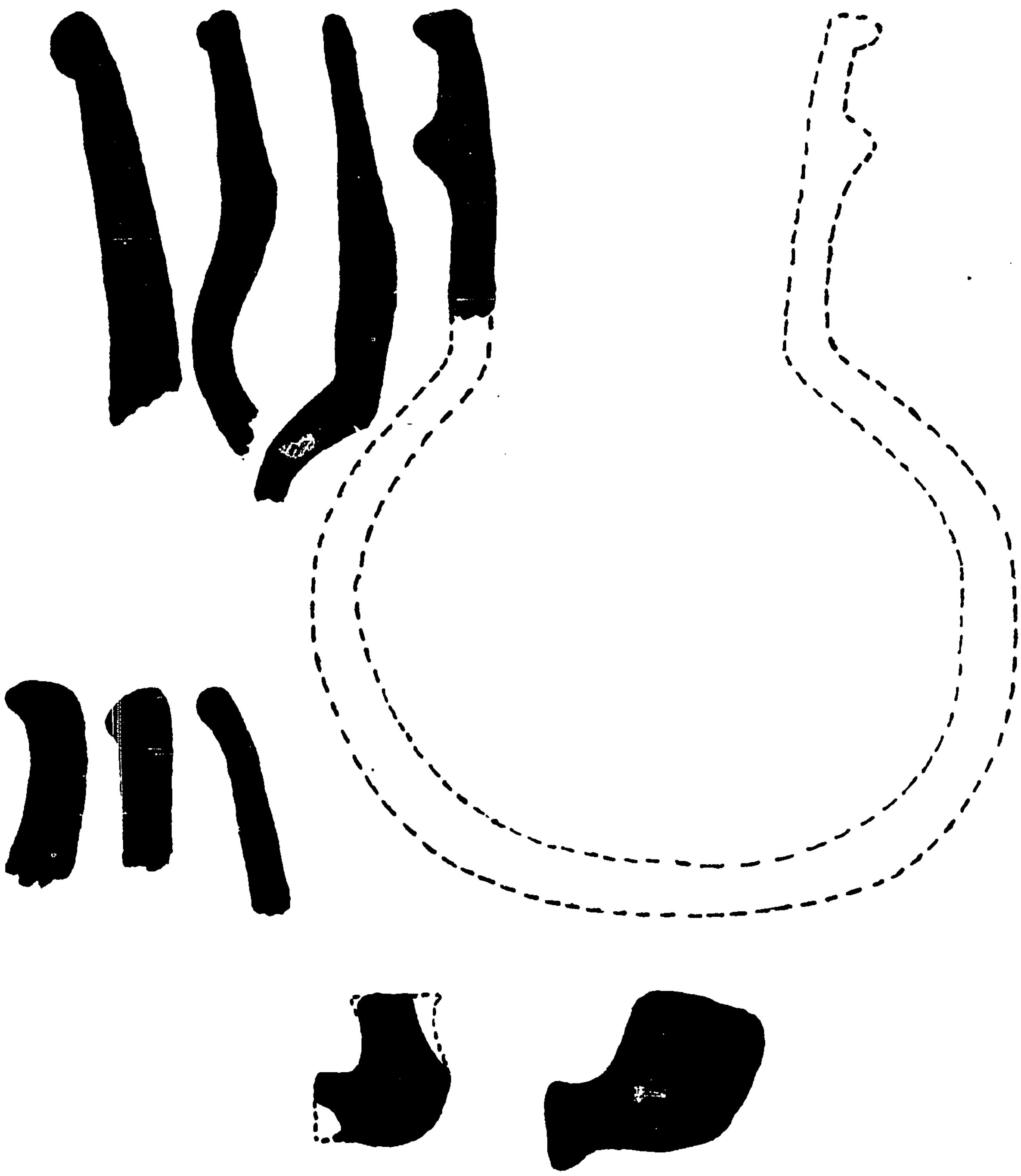


Figure 5. Rim Profiles of Ceramic Wares Collected from Historic Sites in the Río Grande and Río Momení area. Sherds are full-sized.

west. Wassen (Wassen 1938: 80-146) has published a 1739 document indicating this settlement area was occupied by Black groups with their settlement known as Palenque. This is also the name of the modern coastal village, located near the zone of the archaeological sites. Historical records indicate a long history of Black settlement here, dating from the early sixteenth-century through the nineteenth century, and the archaeological sites, located east of Río Zaino near the present location of the modern town of Palenque, clearly confirms this. Whether remnant Cuevan groups cohabited with sixteenth-century Blacks or maintained earlier precontact settlements along these terraces, or both, is not confirmed by the surface investigations. More careful testing of these sites would be necessary to determine this. Possibly, some sites were occupied by Cuevan groups who traded with Columbus during his 1502 visit here since some artifactual material dates to this early sixteenth-century period.

Río Escondido (Río Miramar)

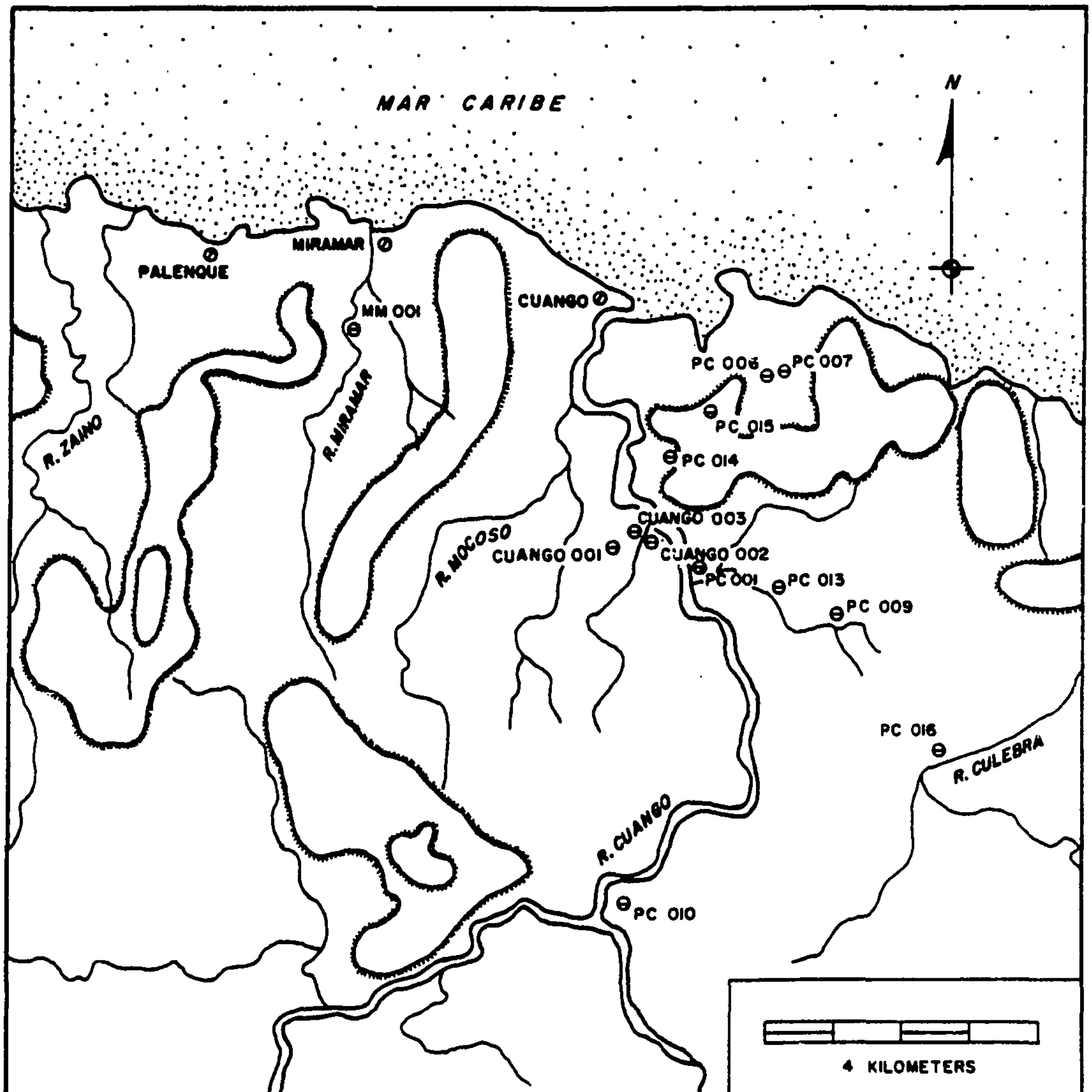
Only one site (MM 001) was located along this riverine zone, situated approximately three kilometers up stream, along a long terrace top overlooking a wide area of lowland, locally known as El Llano (Map XII). This area has been farmed by local Black villagers for a considerable period of time because of its rich agricultural soils and relatively flat landscape.

Ceramic materials collected from the surface of this site included rim, base, and body sherds of exclusively Santa Isabel Undecorated ware (see Table 9). Like the other precontact sites discussed in the Costa Arriba area, there was very little lithic material associated with the deposit, nor was there any evidence of architectural features. Similar style sherds were recovered farther upriver along an adjacent stream called Río Mucoco, located to the east of Río Escondido, indicating the presence of other site deposits in this area. Unfortunately, because of the amount of heavy forest cover, the latter sites could not be located.

Río Cuango-Río Culebra

The most concentrated area of ceramic-bearing sites was located between Río Escondido, Río Cuango, and Río Culebra (Map XIII). A total of twelve sites were located along these riverine areas, and their associated secondary streams. The sites were found on the tops of terraces surrounding wide areas of rich agricultural lands. Eleven of the twelve sites were clustered around the lowland portions of Río Cuango and one additional site was recorded along the upper portion of Río Culebra, situated in an adjacent valley region, separated from Río Cuango by a low divide. All of the sites were small, averaging eighty to ninety meters square in size, with the surface deposits covering both the terrace tops and nearby slopes. The surface collections from these sites contained only Santa Isabel Undecorated wares with the exception of one site, PC 001, containing a small sample of incised decorated sherds. The Santa Isabel Undecorated ware sherds collected from these sites consisted of similar bowl, plate, and olla vessel forms as collected from the already mentioned sites to the west. Ring bases were recovered from the surfaces of a number of these sites, presumably attached to one of these vessel categories.

No architectural remains were associated with the sites in this area; however, two (PC 001 and Cuango 003) Río Cuango sites contained



SOURCE: R. DROLET, AND DISTRITO DE SANTA ISABEL, 1960, INSTITUTO CARTOGRAFICO, PANAMÁ. -G.A. APFELSTADT-

Map XIII. Location of Archaeological Sites in the Bajo Grande valley of Río Cuango.

surface features characterized by small circular mounds with high concentrations of lithic debris. This lithic material consisted of cores, tools, and waste flakes made from cobbles and pebbles of river-worn igneous stone. On the other ten sites in the Río Cuango-Río Culebra area, only very sparse scattering of lithic material was collected, consisting of only a few isolated examples from three sites in the district.

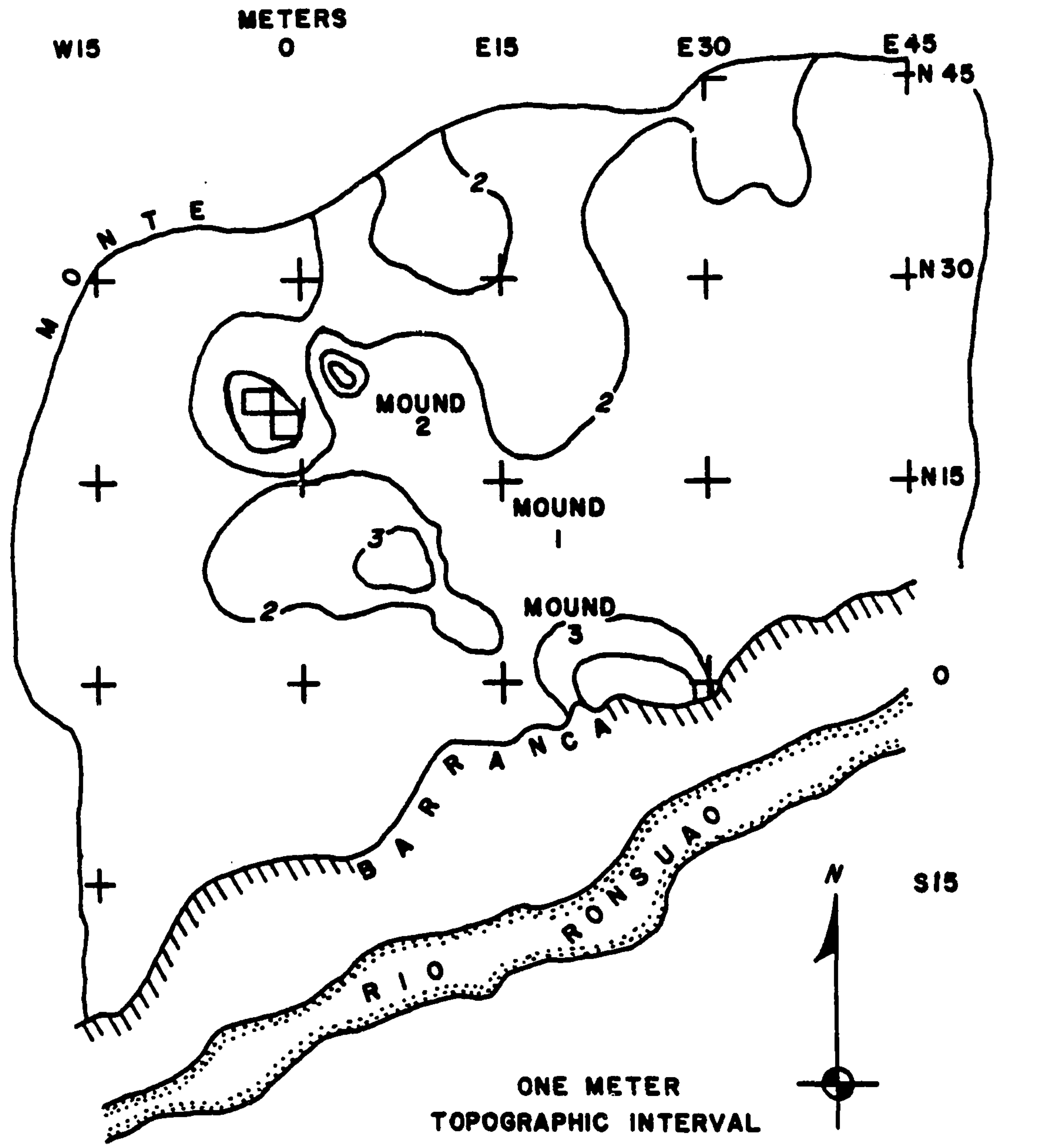
The high density of sites in this portion of the district suggests more intensive settlement, probably because of the more extensive area of agricultural soils and the larger rivers and tributaries of Río Cuango and Río Culebra navigable throughout the year. Certainly, the location of these sites along the river and their lowland valley positions argues for this agricultural orientation of the settlements and for the use of the rivers as important transportation networks. Even the settlements located off these two river systems, farther to the east (PC 006, PC 007), were situated along smaller streams in ecologically similar valley zones, pointing to the fact that the selection of settlement areas was the same in both forest zones. The sites located further west, along rivers Zaino, Escondido, and Terrin had this same riverine orientation, showing a definite similarity to settlement throughout the whole district. The exclusive presence of Santa Isabel Undecorated wares in twenty occupational deposits argues for a related cultural population dispersed into small, one to two household-sized settlements. In the Río Cuango area, this settlement was the densest and include the presence of site features not found on other surveyed sites to the west, including lithic concentrations found at sites of PC 001 and Cuango 003, and plastic decorated sherds found at one of these special feature sites (PC 001). Sherds of this style were absent from surface collections made on other district sites, further distinguishing PC 001.

Surface Survey of PC 001, Río Ronsuao

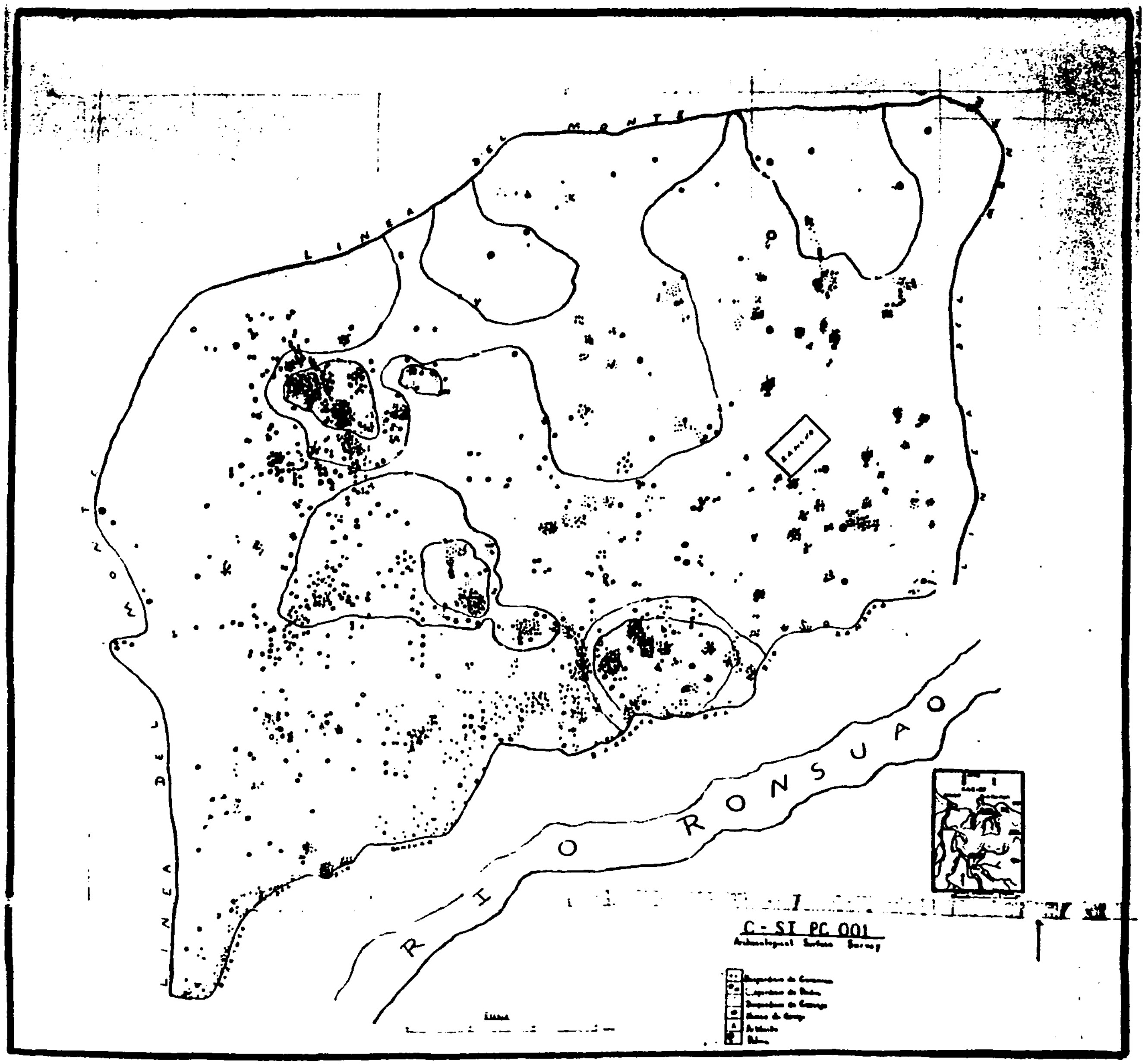
Intensive surface collections were conducted at the site of PC 001 to more carefully investigate the site features and obtain a large sample of Santa Isabel Undecorated sherds for reconstructing vessel shapes of this ware exclusively dominating the surface materials on all sites in the district. To properly complete the survey of this site, the vegetation was removed by machete and axe, a site map was drawn, and the area of surface debris was gridded off into fifteen square meter quadrants for total collection (Map XIV).

PC 001 is located on a forty meter high terrace, bordered on the south by Río Ronsuao and on the west by Río Cuango (see Maps XIII and XV). The terrace is flat, extending some 400 hundred meters south of Río Ronsuao and 450 to 500 meters east of Río Cuango, with a very gradual slope south and east, dropping less than 10 meters from the highest point of the terrace to the lowest (Map XV). The surface materials were located along the highest part of the terrace top in an area of forty-five meters by sixty meters within the cleared portion of the terrace.

Both the ceramic and lithic materials showed similar distribution over the site, heavily concentrated along the western sector atop three small, natural, circular mounds, measuring two to three meters high and five to six meters in diameter. These mounds were considered related features, running the length of the site north to south and separated from one another by three to four meters. As one moved off the small



Map XIV. PC 001: Surface Grid Layout, Mound Locations, and Test Unit Locations.



Map XV. Site Map: PC 001. Surface Distribution of Ceramic (dot) and Lithic (circle) Material.

mounds, the surface debris diminished quickly and random sounding test holes placed outside of the surface deposit area showed no evidence of cultural materials extending outside this area. No other features were recorded on this site besides these moun groups which were clearly activity areas, primarily associated with lithic manufacturing of tools from igneous cobbles and pebbles brought to the site from nearby gravel deposits along Río Cuango.

Ceramic Sample

The ceramic material recovered from the surface sample, consisting of predominately Santa Isabel Undecorated ware, included identical vessel categories and sherds with the same paste and temper characteristics as the Santa Isabel Undecorated sherd samples described from all other sites recorded in the district. A total surface sample of 2,411 sherds of this ceramic style were collected at PC 001 (Table 10). The predominant form was a large-mouth olla with thick walls (57%) (see Table 11), showing some variation in size, mouth diameter, and degree of lip flare (Table 12; Figs. 3 and 4). The second most frequent form was an open plate form (30%) (see Fig. 2). Other forms were incurved-wall bowls (6%) (Fig. 2) and ring base sherds (7%) (Table 12; Fig. 6). Most of this sherd material, like that collected from other sites in the district, was considerably weathered, although numerous examples did preserve their original, smooth surfaces, which in some cases had dark red or maroon color slip. Generally, the inclusions were large and irregular-sized gravel particles, while much less frequently, others had more uniform homogeneous sand-sized particles of temper.

Table 10

Rim, Body, and Base Sherds of Santa Isabel Undecorated and Incised-Relief Brown Ware Recovered on Survey of Site PC 001

	Rims	Body	Base	TOTAL
Santa Isabel Undecorated	103	2,301	7	2,411
Incised-Relief Brown Ware	0	12	0	12

Table 11

Frequency of Santa Isabel Undecorated Vessel Forms Found During the Surface Survey of PC 001

Form	Sherds found outside mound areas	Sherds found in mound areas	Percentage of sherds found in mound areas
A	12	44	79
B	8	22	73
E	1	7	87
F	3	4	57

Table 12

Measurements of Santa Isabel Undecorated Vessel Forms

Form	Sample	Mouth Diameter Average	Rim Angle Average	Body Wall Thickness
A1	11	17.2 mm	35°	10-12 mm
A2	26	17.1 mm	37°	8-12 mm
A3	4	22.9 mm	65°	10-19 mm
A4	15	12.6 mm	33°	6- 7 mm
B	31	14.3 mm	35°	6-7.5 mm
E	6	15.6 mm	25°	4.6-9 mm

Measurement of Ring Bases, PC 001

Form	Sample	Base Diameter	Base Height	Body Wall Thickness
F	7	12.9 mm	22 mm	13-15 mm

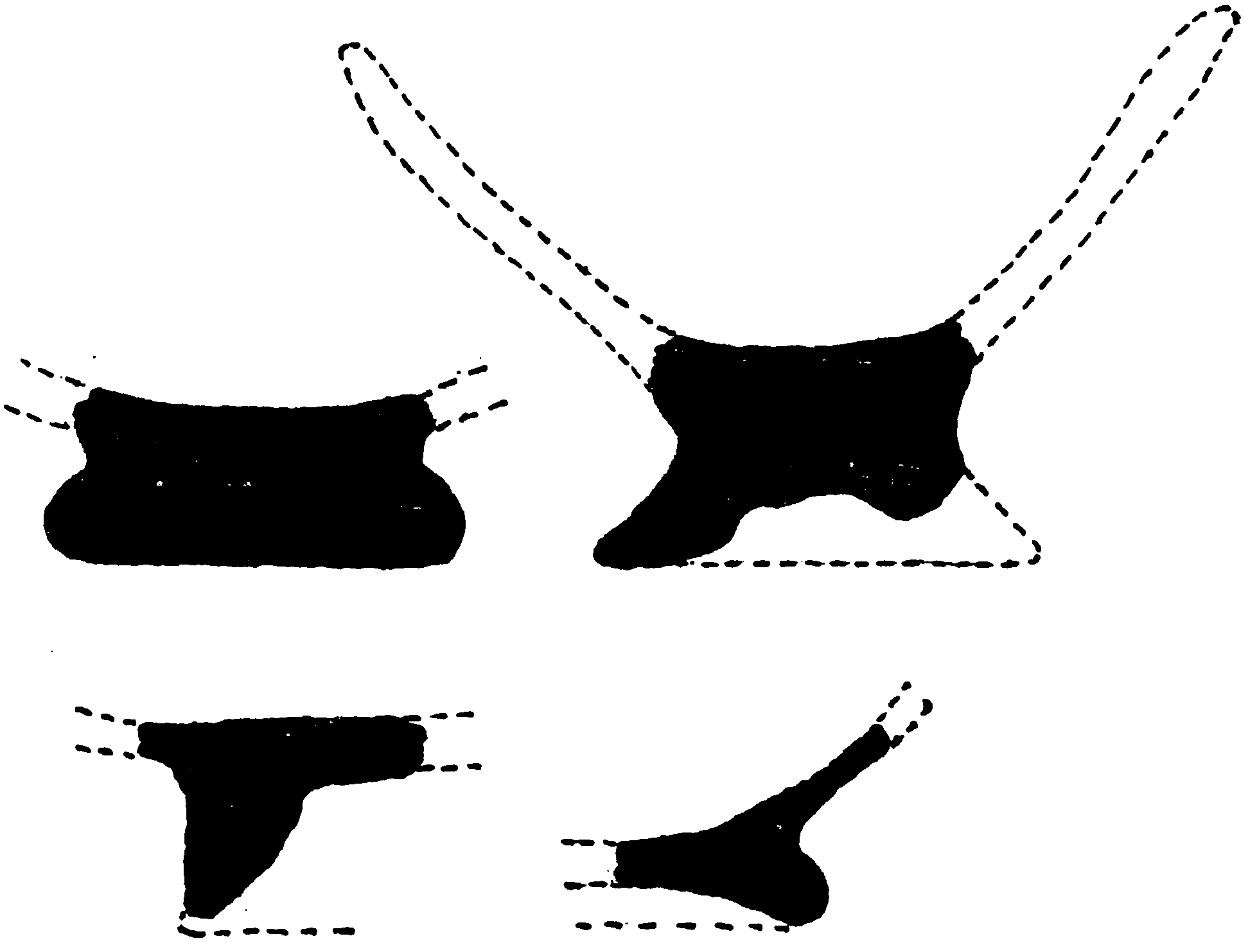


Figure 6. Ring Bases from PC 001.

In addition to the Santa Isabel Undecorated sherds, a very small sample of twelve plastic-decorated sherds corresponding to Incised-Relief Brown Ware were recovered in the surface collection (see Fig. 7). Eight of these contained shallow, linear incision. Two others were collected containing modeled coils along the exterior body walls. Unfortunately, no rim sherds were collected in this sample of Incised-Relief Brown Ware sherds, making it impossible to reconstruct vessel shapes. The paste and temper characteristics of these sherds were similar to the Santa Isabel Undecorated sherds; however, the weathering of the twelve sherds had greatly altered their original condition.

The surface location of the sherd material had restricted distribution on the site. This distribution was principally in the area of the small, natural mounds where 70 percent of the sample was found (see Tables 13 and 14). In the adjacent areas of the site, the sherd counts were considerably less, indicating the principal deposits were associated with these mound areas.

Lithic Sample

The lithic materials recovered on the surface survey of PC 001 were igneous cobble and pebble cores, tools, and flakes concentrated on top and immediately around the three small mounds. This stone was brought from nearby gravel deposits of Río Cuango with the exception of one tool form, a jasper blade, found on top of mound II (Map XIV; Fig. 35, p. 282). Since this mineral is not locally available, and no waste flakes were found at PC 001, it clearly represents an imported tool. A variety of large basalt flakes were recovered, showing definite edge wear, possibly indicating

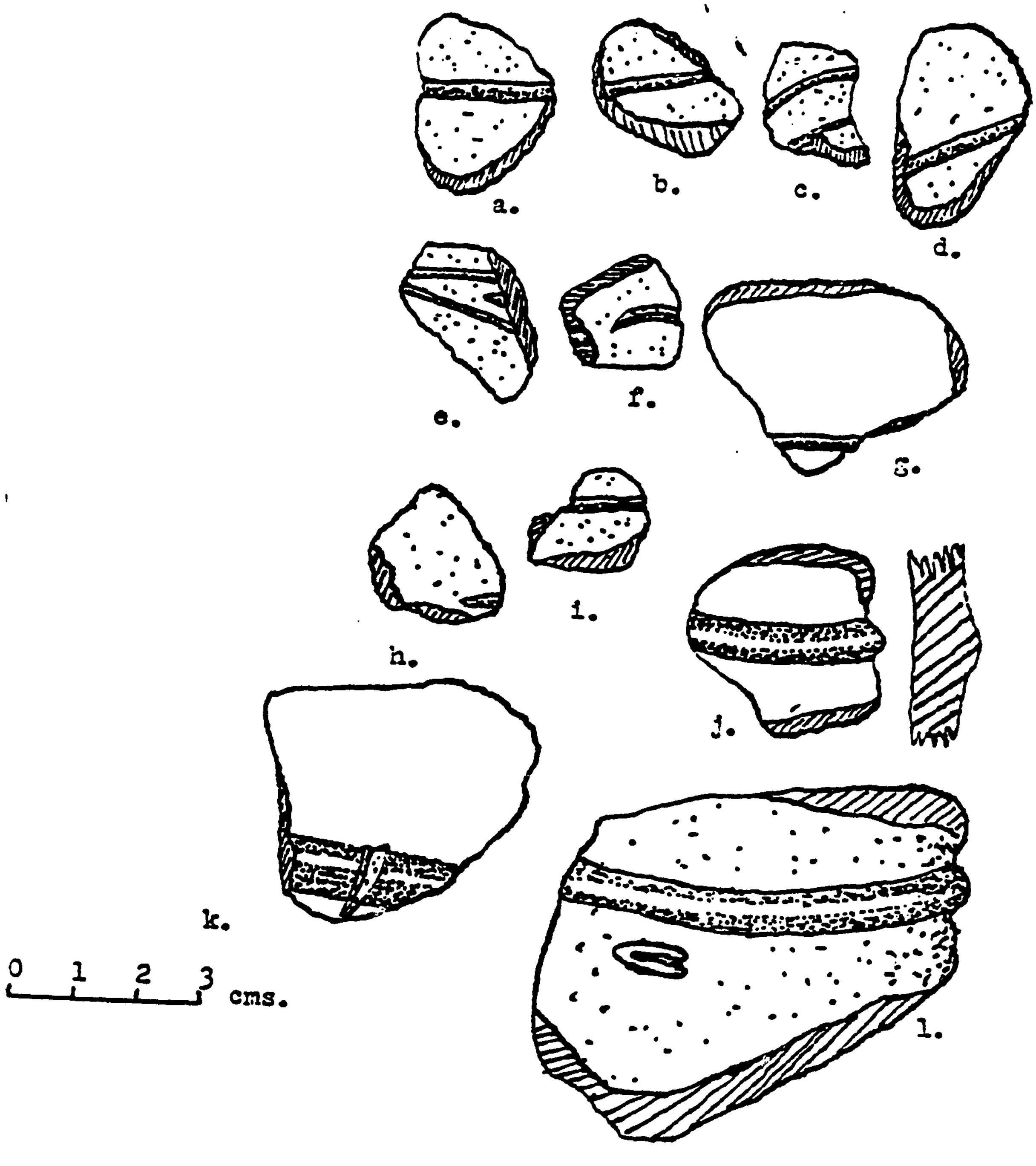


Figure 7. Incised-Relief Brown Ware, PC 001.

Table 13

Surface Distribution of Ceramic Sherd Material: PC 001

QUADRANGLE	Northeast	Northwest	Southeast	Southwest	TOTAL
1	62	38	118	10	228
2	0	19	2	62	83
3	3	40	0	28	71
4	1	2	10	5	18
5	238	111	0	0	349
6	10	27	116	274	427
7	22	37	32	2	93
8	0	2	0	0	2
9	160	3	249	2	414
10a	34	30	99	4	167
10b	Quadrangle not divided into sections				120
11	Quadrangle not divided into sections				13
12	Quadrangle not divided into sections				192
13	0	0	0	10	10
14	0	0	4	30	34
15	0	0	25	53	78

Table 14

Frequency of Santa Isabel Undecorated and Incised-Relief Brown Ware Sherds Along the Surface of the Three Mounds at Site PC 001

			Mound I	Mound II	Mound III
RIM SHERDS	Wide Mouth Olla	A1	2	1	7
		A2	9	1	7
		A3	1	0	3
		A4	2	5	6
	Plate	B	5	2	15
	Bowl	E	5	1	1
BASE	Ring-Bases	F	3	0	1
BODY		Santa Isabel Undecorated	191	480	912
		Incised-Relief Brown Ware	1	0	11

Note: The rims, bases, and body sherds of surface ceramics found on the three mound areas at the site of PC 001: 70 percent of all rims and bases were found in the mound areas, and 69 percent of all the Santa Isabel Undecorated body sherds were also found in the mound areas.

use as scraper and blade tools. A large pebble, with pecked notches along the middle of its two long sides, was recovered on another mound and represents a fishing weight. A small celt fragment was recovered, representing still another tool variety. The overwhelming amount of stone debris consisted of flakes, ranging in size from large end pieces taken off cobble cores to small, thin secondary flakes. These were concentrated on and immediately around the mound areas and mixed with the high density of sherd material recovered. Numerous cores were found around the mounds, generally triangular-shape in profile with steep flakes taken off one or both sides. Reused cores were found showing considerable edge or apex battering. Rather than removing all of this lithic material from the surface of the site, it was decided to conduct test excavations on one mound to obtain a more controlled sample and look for stratigraphic evidence of occupation.

Prior to conducting the intensive surface survey of PC 001 and discovering this lithic assemblage, very little evidence was obtained from other surveyed sites on lithic manufacturing activities in this area because of the paucity of stone materials associated with the surface debris on these sites. Very few examples of flakes were found on any site except PC 001 and Cuango 003, the two sites with stone working, mound features. Two large basin-shaped metates and one stone mortar were recovered from a site close to PC 001, located farther up Río Ronsuao (PC 009; Fig. 8); however, no lithic debris was associated with this deposit. Polished stone celts and axes were recovered from four sites (PC 002, PC 006, PC 007, PQ 007; Fig. 9), but again, only as isolated artifacts, unassociated with any concentrated lithic debris. This suggests only

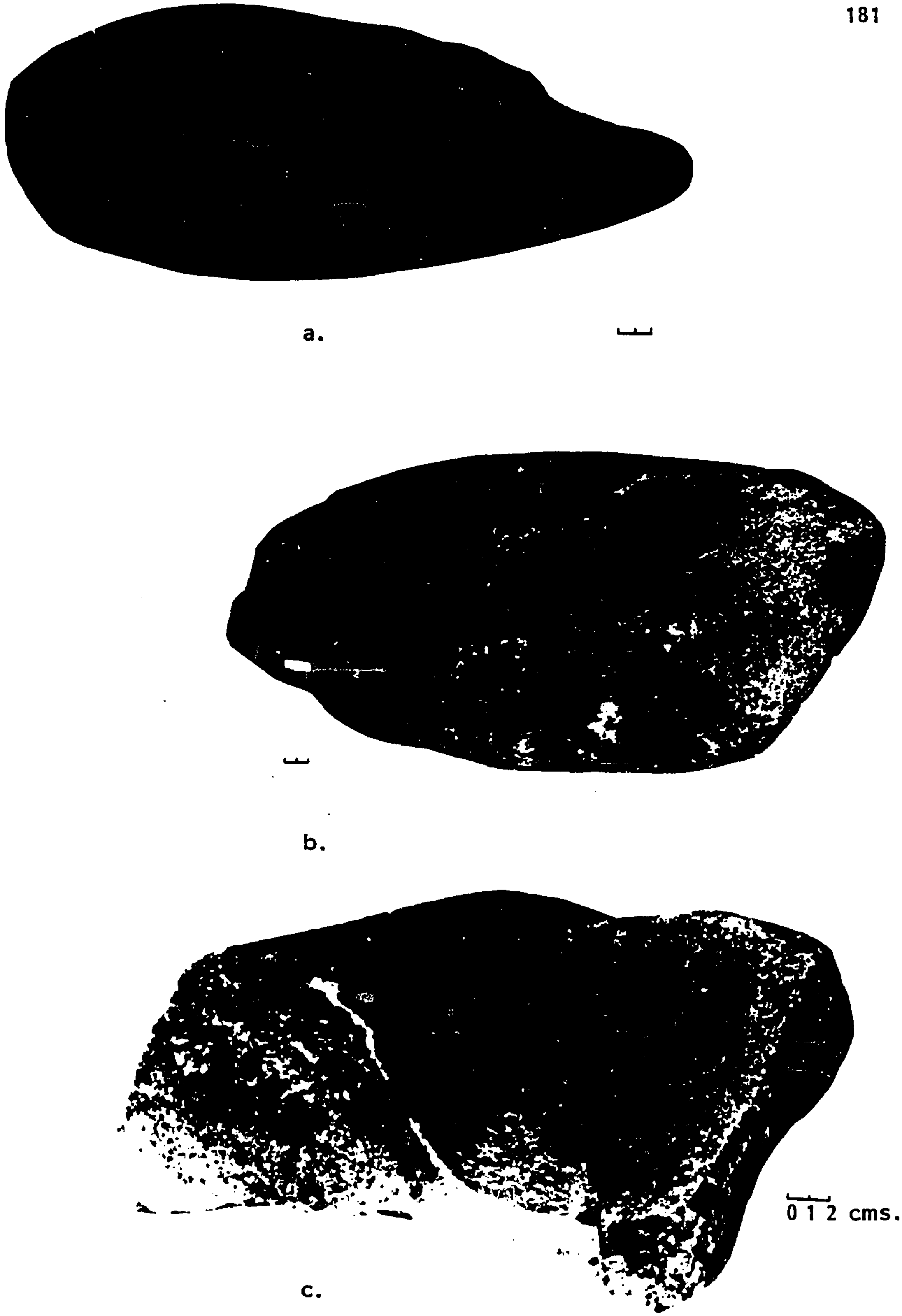


Figure 8. Metates (a-b) and Partial Mortar (c). Found on the surface of site PC 009, Río Ronsuao.

Figure 9. Celt and Axe Forms. These examples were collected on survey sites in the district of Santa Isabel (also see Fig. 32, p. 270).

specific sites associated with the period of settlement were actually manufacturing tool types and all other sites received these tools from sites like PC 001 and Cuango 003.

The absence of stone tools on the surfaces of the large majority of these riverine terrace sites is partially due to their removal by modern Black farmers of the district. Local villagers continually clear these terraces and slopes for cultivation of root and grain crops and frequently find a variety of stone tools in their gardens. These tools are taken back to the village. The most frequent examples seen in the villages are polished stone axes and large metates, manos, and occasionally mortars, kept in and around the individual households for a variety of uses. The celts and axes are believed to be rayos carrying good luck. When put in the house, they protect a family from being struck by lightning. The mano and three-legged metates, seen less frequently than in earlier years, were widely used thirty to forty years ago for grinding harvested corn. Large stone mortars have been brought from their upriver original locations to be used as water containers for household pets and other domestic animals. These stone artifacts have been preserved in the village houses for a number of generations and indicate their removal from the upriver archaeological sites.

The archaeological survey of the district of Santa Isabel thus located twenty-one prehistoric habitation sites associated with predominantly utilitarian wares. These Santa Isabel Undecorated wares were bowls, plates, ollas, and ring-based vessels. Along with these utilitarian wares, a small sample of Incised-Relief Brown Ware sherds were found while conducting more intensive surface collections at one site in the Río Cuango area (PC 001). This uniform ceramic group of Santa Isabel Undecorated wares, recovered from the twenty-one sites and associated with Incised-Relief Brown ware sherds at one site (PC 001), indicate chronological date range of between 1 A.D. and 1500 A.D. for the occupation in the district.

All of these sites were riverine-oriented, small-sized, and dispersed occupations located on protected stream channel terraces, adjacent to flat, valley agricultural soils. Their distribution was generally along the middle courses of six river valleys with apparently more concentrated settlement in the Río Cuango area of Bajo Grande. The lineql distribution of settlement along the rivers implied an agricultural orientation for these groups and use of the rivers for quick movement between the coast and interior forest zones. Shell remains (C. pica) at two sites suggested collection of reef resources. A line weight found at another site suggested bay fishing. The absence of architectural remains at these sites pointed to the use of hardwoods for dwelling construction and thus the harvesting of interior forest timbers. The manos and metates, as well as the celts and axes, recovered from some of the sites clearly pointed to swidden activities and maize cultivation.

The overall survey of the district, therefore, defined the distribution and size of these riverine terrace settlements. The ceramic materials offered a chronological placement for occupation. Although there was a relative absence of other cultural materials associated with the small terrace deposits, the occasional lithic tools recovered from some sites suggested the presence of a local cobble industry and the manufacturing of diversified tools for obtaining and processing a variety of economic resources.

In the Río Cuango area more intensive work was conducted after completion of the general survey because of the presence of lithic workshops associated with two sites. At one of these sites, PC 001, a total clearing of the site and intensive grid collection of surface debris allowed precise mapping of the workshop feature and analyzing a large sample of associated ceramic and lithic materials. Because of the rarity of the lithic site feature at PC 001, it was decided to more carefully collect the associated assemblage here by means of excavation of one mound. This would provide valuable information concerning functional aspects of this site activity. The intensive surface survey of PC 001 provided excellent results in mapping the size of this settlement and in defining two ceramic styles. Since PC 001 was apparently occupied by a small group related to the residents of the similar-sized, dispersed settlements of the district, more intensive investigation here would provide a controlled sample of archaeological data to interpret the temporal and adaptive features of settlement over the entire district. The more intensive work would also provide the basis for discussing Atlantic settlement within a broader regional network associated with the eastern Panama and northern Colombian Cuevan polities.

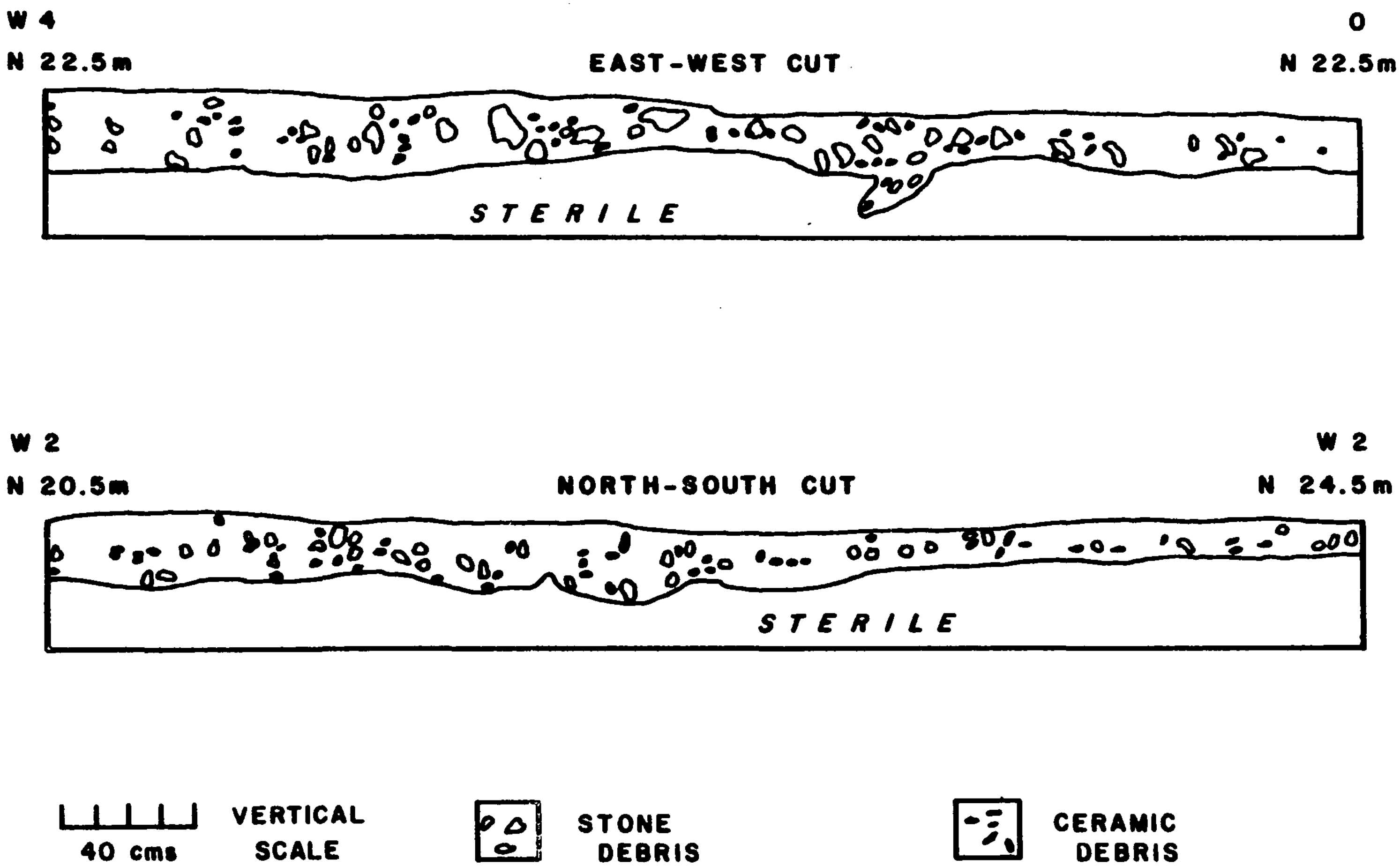
CHAPTER 5

EXCAVATIONS AT PC 001 AND THE CERAMIC CONNECTIONS TO OTHER AREAS

Introduction

To obtain more chronological control over the surface materials collected from these various riverine sites in the district and to investigate the nature of stone working techniques and related economic activities of early settlement in the district, PC 001 was selected for testing. Both ceramic and lithic debris at the site were concentrated atop three, small, natural mound areas. Test units were placed along one mound to obtaine a reliable quantitative sample of cultural materials. Excavation of this feature was designed to provide more specific information relating to lithic work activities on the site.

Mound II was excavated using two test pits each measuring two square meters (see Map XIV). The excavations were undertaken in ten centimeter artificial levels until sterile soil was reached. The upper fifteen to twenty centimeters of each unit was composed of black to brown soil, densely packed with ceramic and lithic materials. After the twenty centimeter level, the deposit continued another five to ten centimeters. Below the twenty centimeter level, cultural materials were only occasionally present (Map XVI). The deposit was uniform in both units, descending not more than thirty centimeters. In both cases, the deposit terminated



Map XVI. PC 001: Stratigraphy.

when the hard-pan clay soil appeared. Approximately 80 percent of the natural mound and feature area was excavated (Maps XV and XVIII, pp. 171 and 230 , respectively).

Unfortunately, no organic material was recovered despite screening the entire excavated deposit. No architectural features or stratigraphic units could be detected in the deposit. In addition, no differences in soil layering or cultural materials could be detected in the vertical or horizontal exposure within either test unit (Map XVI). Thus, the shallow, uniform nature of the deposit suggests a relatively short period of mound use on the site. This depositional pattern appears to have been the same for the two other mounds on the site. An exposed profile of Mound III, located along the river bank, was obtained with identical depth and identical cultural materials as that found in the Mound II area. The uniform nature of the surface ceramic sample collected on the three mounds and over the entire site indicates a single occupational settlement. More careful analysis of the excavated ceramic materials and the lithic assemblage from the site, however, indicates two ceramic components and a relatively long period of occupation.

Excavated Ceramic Wares

A total of 23,501 sherds were recovered from the two test units. The vast majority of the total sample consisted of Santa Isabel Undecorated body sherds (22,778) with rim and pedestal based sherds of the same ware mixed throughout the deposit (see Figs. 10 through 13). Also recovered was a small sample of plastic decorated and painted wares (112 sherds).

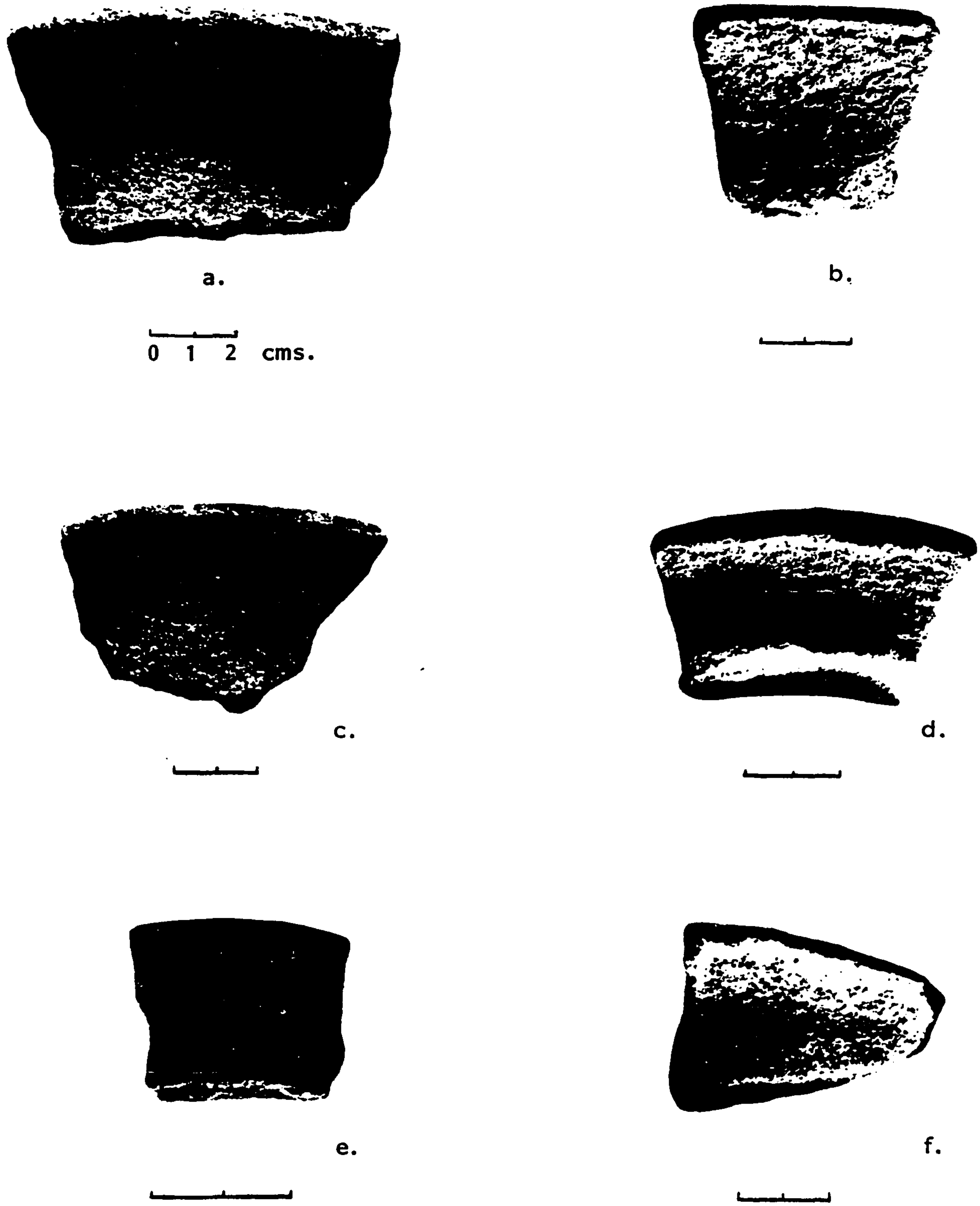


Figure 10. Rim Sherds: Santa Isabel Undecorated, Wide Mouth Olla. Everted Rim Vessel Forms.

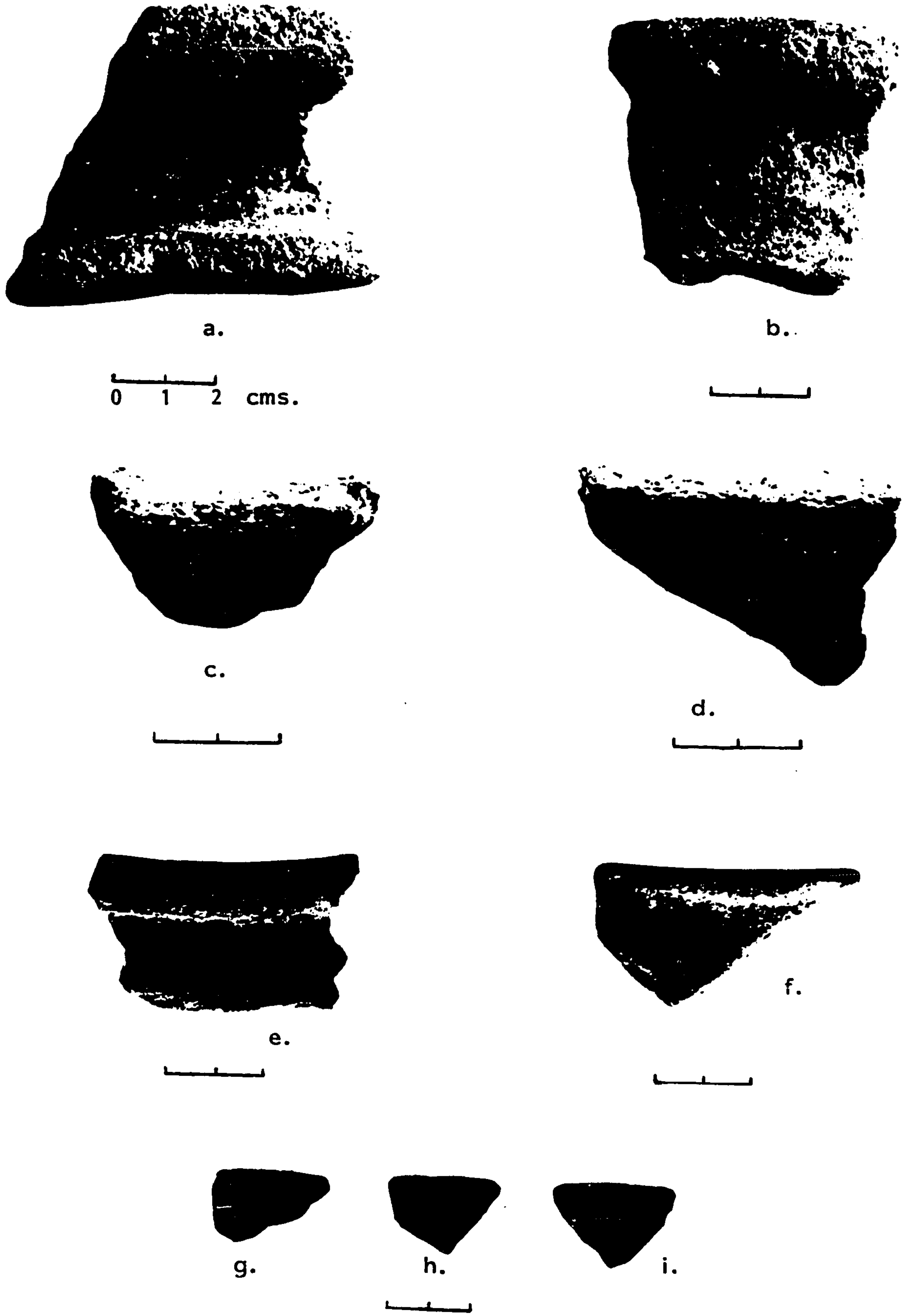


Figure 11. Rim Sherds: Santa Isabel Undecorated, Wide Mouth Olla. Everted Rim, Flat Rim, and Beveled Rim Vessel Forms. Everted Rim (a-b), Flat Rim (c-d), Beveled Rim (e-i).

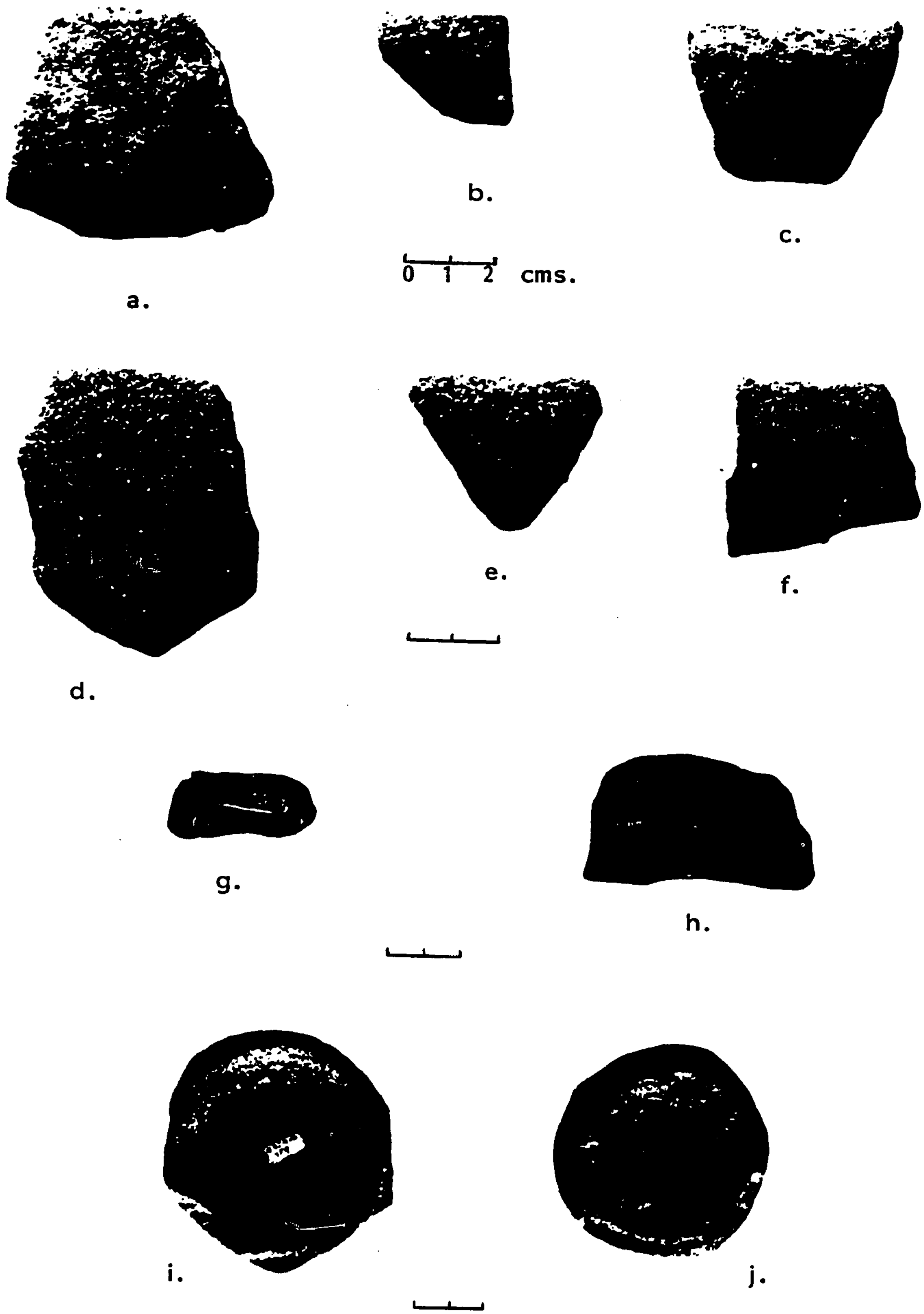


Figure 12. Rim Sherds: Santa Isabel Undecorated, Restricted Wall Bowls and Ring Base Sherds. Restricted wall bowl sherds (a-f), ring base sherds (g-j).

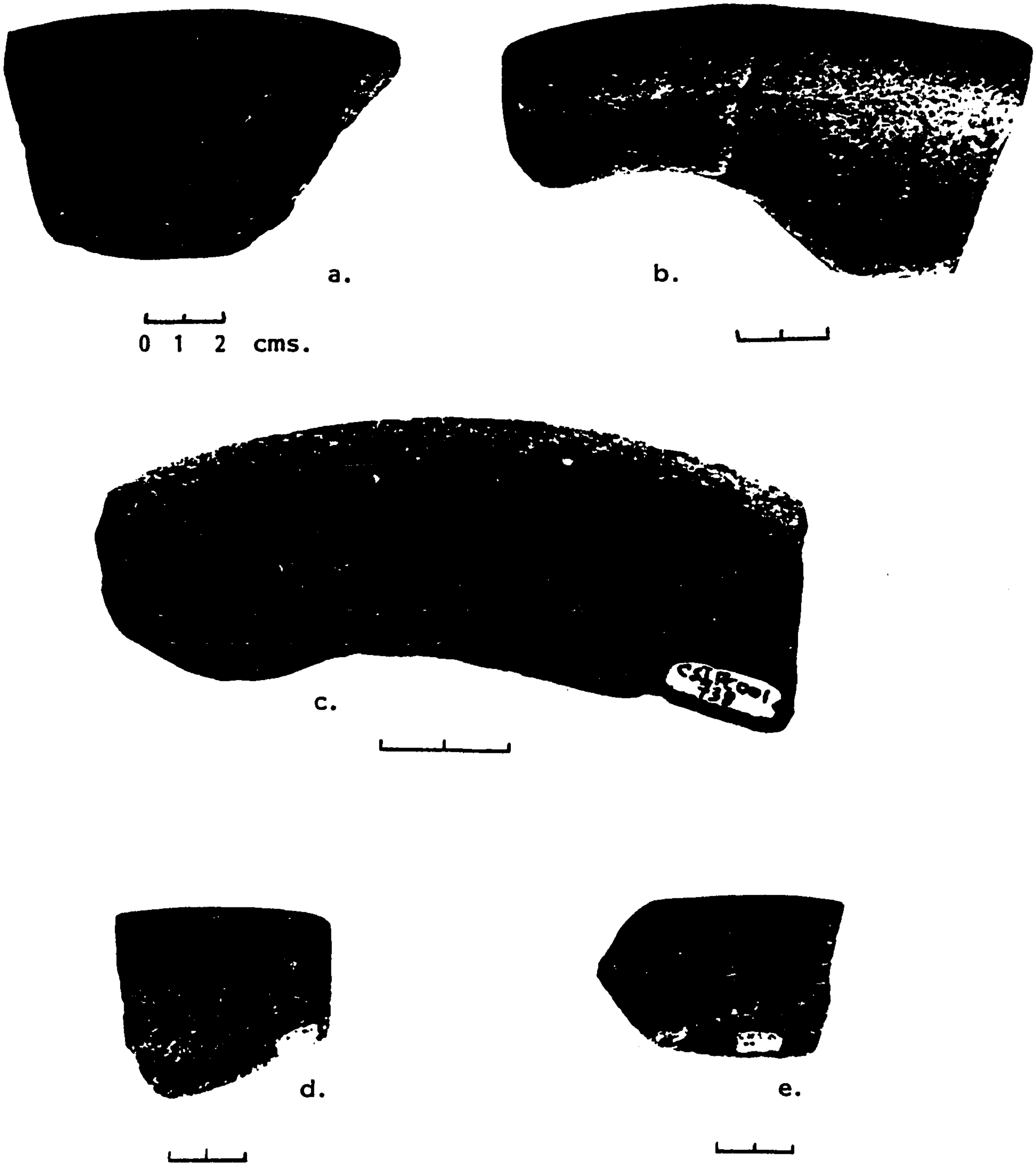


Figure 13. Rim Sherds: Santa Isabel Undecorated, Shallow Plates and Bowls. Shallow plates (a-c), bowls (d-e).

The subsurface ceramic sample excavated from PC 001 was larger than the surface sample (approximately ten times); however, both samples contained roughly the same percentage of both undecorated wares and plastic decorated wares. The vessel categories of Santa Isabel Undecorated wares were generally the same in the two samples. No painted ware was found in the surface sample, yet in the excavated sample numerous examples were found (Tables 11 and 16; see Fig. 14). The absence of these painted sherds from the surface sample was probably from more excessive erosion on their surfaces.

Along with the sherd sample collected in each of the test units at PC 001, several ceramic artifacts were recovered, including one small mortar-like vessel, three flat, disk-shaped forms, one cylinder-shaped form, and an engraved ceramic pendant (Fig. 15).

Santa Isabel Undecorated

A total of 651 rim sherds from an excavated 737 were classified into four vessel categories (see Appendix). The first category included Wide-Mouth Ollas of three various classes. A wide range of sizes, rim angles, and mouth diameters characterize these three olla vessel categories (Table 15). Another vessel category consisted of shallow bowls and plates, and a third category was small-sized to medium-sized restricted-mouth bowls. A sample of seven rim fragments formed another vessel category, Neckless Olla. These vessel groups contained concave bases, although fifteen ring base sherds were recovered, indicating their attachment to one of the above vessel groups. None of the ring bases contained upper body wall portions; however, their attachment to hemispherical bowls and shallow plates seems certain. No other vessel supports were found.

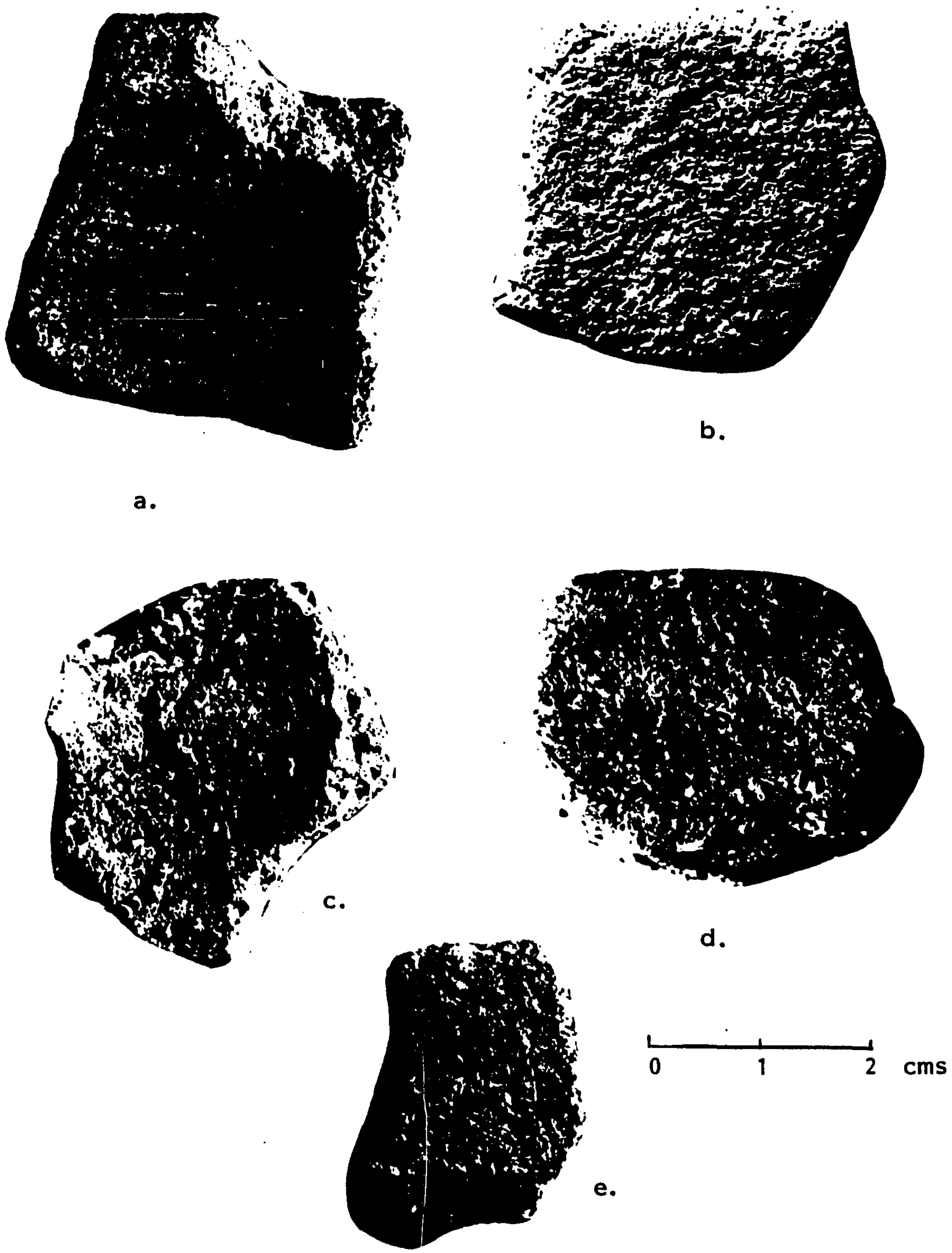


Figure 14. Painted and Slipped Ware, PC 001. Example a. contains Black and White painted bands over a solid red paint producing a "trichrome" effect. Example b. contains solid red paint; example d. contains solid black paint; e. contains black paint over red; and c. contains white slip over orange slip.

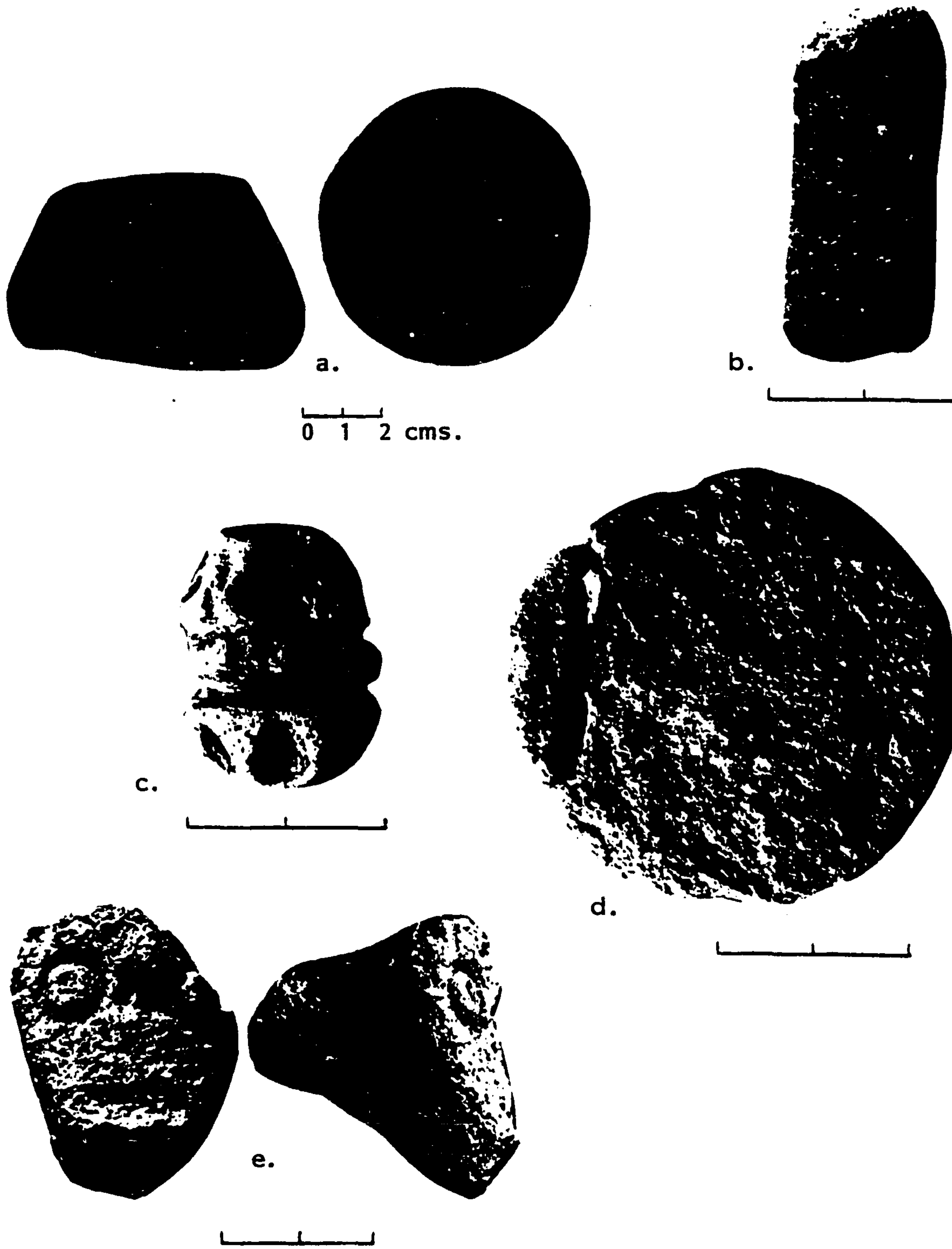


Figure 15. Cereamic Artifacts, PC 001. Ceramic artifacts found in excavations at PC 001; a. small mortar-like vessel; b. cylindrical-shaped form; c. pendant; d. ceramic disk; e. monkey head appendage.

Table 15

Measurements of Santa Isabel Undecorated Vessel Forms from Excavated Rim Sherds, PC 001

Form	Sample	Mouth Diameter (mm.)	Body Wall Thickness (mm.)	Depth of Vessel (mm.)
I. Wide-Mouth Olla				
Everted Rim Olla				
a. Group 1	29	120-180	8	?
b. Group 2	46	180-260	9	?
c. Group 3	20	100-150	5	?
d. Group 4	34	160-190	8	?
e. Group 5	57	200-320	9	?
Flat Rim Olla				
a. Group 1	9	90-120	8	?
b. Group 2	10	140-220	11	?
c. Group 3	6	240-420	10	?
Beveled Rim Olla				
a. Group 1	3	100-?	7	?
b. Group 2	3	?-260	9	?
c. Group 3	8	?-240	10	?
d. Group 4	9	140-180	7	?
e. Group 5	1	420	10	?
II. Neckless Olla	7	160-220	8	160-220
III. Plates and Dishes and Hemispherical Bowls				
a. Group 1	8	160-220	10	50-70
b. Group 2				
1. Subgroup a	16	100-220	9	30-50
2. Subgroup b	13	90-160	7	50-70
3. Subgroup c	4	180-200	8	30-50
4. Subgroup d	3	240	9	10-20
c. Group 3	18	180-220	8	50-80
d. Group 4	6	240-300	7	100-150
e. Group 5	27	180-500	9	70-150
IV. Restricted-Wall Bowls				
a. Group 1	1	160	8	100
b. Group 2	5	100-190	6	60-80
c. Group 3	15	160-240	7	110-140
d. Group 4	7	200-240	7	130-180
e. Group 5	12	120-180	6	30-50

The most frequent vessel form recovered from the excavated deposit was the Wide Mouth Olla (see Figs. 10 and 11). Three distinct vessel varieties were distinguished, including everted-rim ollas, flat-rimmed ollas, and beveled-rim ollas (Figs. 10 and 11). Each vessel variety contained subgroups showing a range of rim orientations and mouth diameters (Table 15). The everted-rim olla (Figs. 10 and 11) was the most frequent vessel form of this family with 186 rim fragments separated into five different subgroups (see Appendix). Mouth diameters of this vessel form ranged from small, ten centimeter openings to larger, thirty-two centimeter wide mouths. The flat-rimmed and beveled-rim forms showed similar mouth diameter range, indicating considerable variation in vessel size within each of the three related olla forms. The lips of the olla vessels were predominately unmodified; however, some have lip fattening and angular shaping (Appendix).

Another olla form, the Neckless Olla, was represented in the excavated sample. Reconstruction of this vessel variety indicates a mouth diameter range of sixteen to twenty-two centimeters and a body depth range of sixteen to twenty-two centimeters (Table 15).

Hemispherical bowls and shallow plates were the next most frequent category of vessel forms found, with ninety-nine rim sherds (Table 15). The bowls ranged from nearly straight-walled vessels to larger, more flaring walled forms (Appendix). The larger group of bowls was more frequent and resembled the lower, flatter plate forms. Plates were typically thick-walled (seven to nine millimeters) with predominantly unmodified lips. Fattened lips were placed on large (sixteen to fifty centimeter wide) <u>budare</u>-like plates and one smaller-sized plate group (Appendix).

The large budare-like plates occasionally contained scalloping along the interior lip (see Fig. 16-d).

Restricted wall bowls were another vessel category of significant frequency (Table 15). These vessels ranged from nearly straight-walled forms to more restricted wall orientations (Appendix; also see Fig. 12). One sherd of this vessel form was found with a raised, beveled lip, yet unmodified lips predominated. These vessels ranged from six to eighteen centimeters in depth and contained six to seven millimeter thick body walls. A shallower, open-mouth bowl was also distinguished (Table 15; Appendix).

Vessel categories shared similar paste, temper, and surface treatment characteristics and were found to be in various stages of weathering from the acidic clay composition of the soil deposit. Paste color ranged from a tannish brown to a brick red with the core being generally darker and more uniform in color, indicating incomplete, relatively low temperature firing. The porous, gritty consistency of the paste indicated its relatively poor quality of clay composition and low firing process. Tempber added to these vessels was generally a large particle, uneven-sized riverine gravel made mostly of irregular-edged igneous stone, quartz, andasite, and feldspar particles. These inclusions would often create a sandpaper-like surface on the body walls. Other vessels were made with a more uniform sand-like temper or no temper at all. All categories of vessel forms contained some better preserved sherds with surface wall smoothing. In a few cases, it appears even a red or maroon slip was occasionally placed over the vessel before firing. Unfortunately, much of this surface treatment has eroded off the sherds and only small portions of the original surfaces are visable.

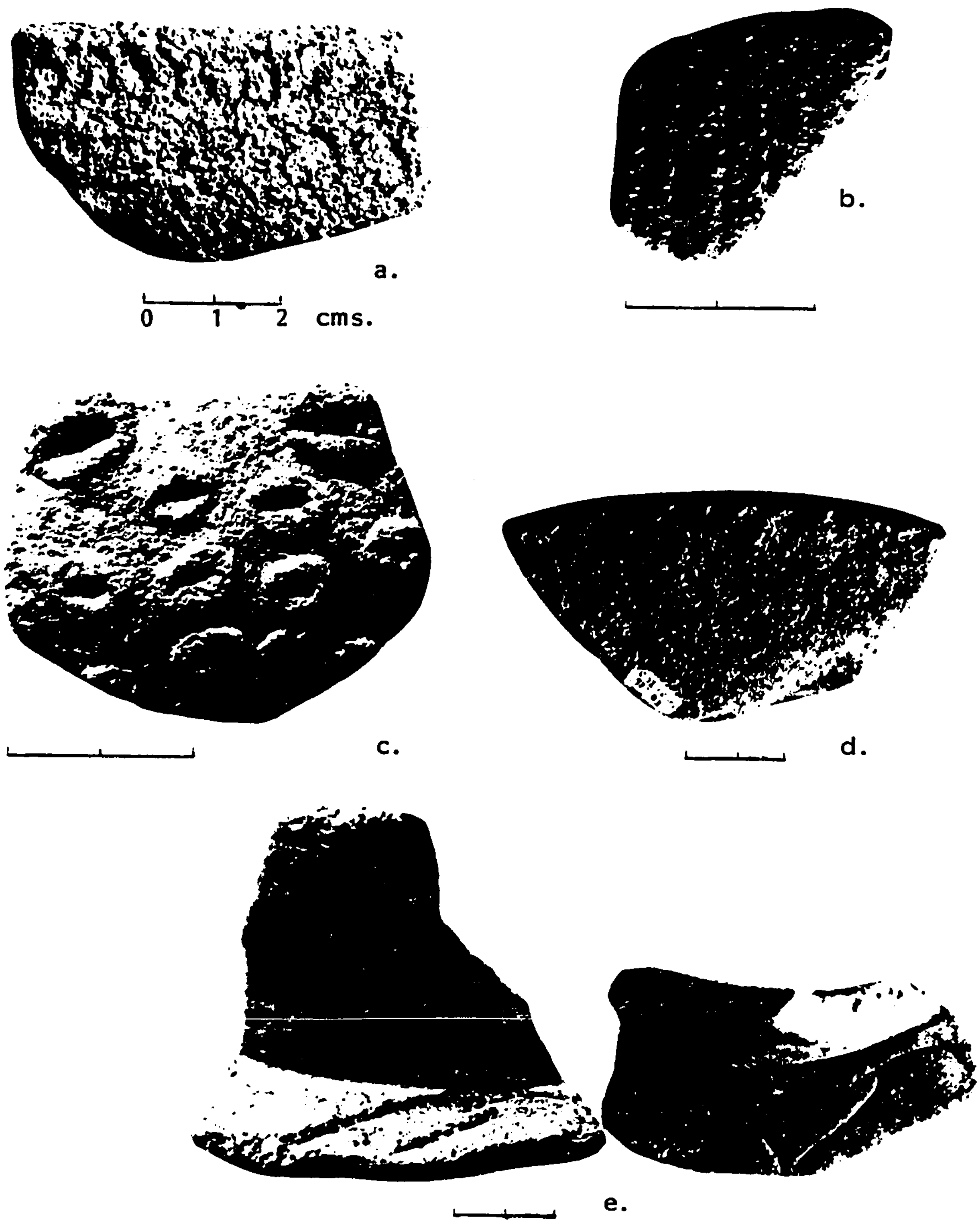


Figure 16. Plastic Decoration Motifs, PC 001. Sherds with plastic decoration excavated from PC 001. a. Shallow open bowl form with fingernail impressions; b. shell stamping; c. pellet punctate; d. lip scalloping on large diameter plate; e. shallow incision.

There seems to be no discernable difference in the frequency of these vessel categories vertically through the depth of the deposit. Table 16 shows the distribution of the rim fragments from the vessel forms throughout the various excavated levels and indicates only a proportional decreasing frequency of all forms from the upper to the basal level of the deposit.

Decorated Ware

Plastic, painted, and slipped decorations were contained on a small sample of 112 body and rim sherds in the excavated deposit. These decorated wares correspond to different stylistic ceramic groups, some known from dated archaeological deposits in the Pacific lowlands of eastern Panama. One other style, termed Río Cuango Punctate, appears to be a local ceramic style of early chronological importance which may link together Formative period settlement over a wide area of the Caribbean lowlands. Except for the Río Cuango Punctate wares, the other decorated ceramic groups and the Santa Isabel Undecorated Ware found in the Costa Arriba area form a ceramic component chronologically datable to between 1 A.D. and 600 A.D.

Río Cuango Punctate. A group of fifty sherds containing predominately lineal punctate designs were seaparated from other plastic decorated sherds and given a type designation of Río Cuango Punctate. One vessel form, indicated by rim sherds of this ware class, is a restricted-wall bowl. This is a relatively shallow (eight to twelve centimeters) vessel with a wide mouth (ten to fifteen centimeters) opening. On the upper shoulder walls of these bowls, one or two lines of small punctate dots or dashes occur, running parallel to the lip (Figs, 17, 18,

Table 16

Distribution of Excavated Rim Sherds of Santa Isabel Undecorated Vessel Forms, PC 001

	UNIT 1				UNIT 2			
	0–10	10–20	20–30	30–40	0–10	10–20	20–30	TOTAL
I. Wide-Mouth Olla								
a. Everted Rim Olla	57	29	5	4	92	38	11	236
b. Flat Rim Olla	31	6	1	0	17	33	21	109
c. Beveled Rim Olla	5	4	1	0	14	0	0	24
II. Plates and Hemispherical Bowls	26	5	7	3	46	6	6	99
III. Restricted-Wall Bowls	11	8	0	4	18	14	2	57
IV. Neckless Olla	3	1	0	0	3	0	0	7
V. Ring Bases	4	1	0	0	7	3	0	15
TOTAL	150	54	18	13	223	158	33	651
					Eroded and weathered rims not classified			86
							TOTAL	737

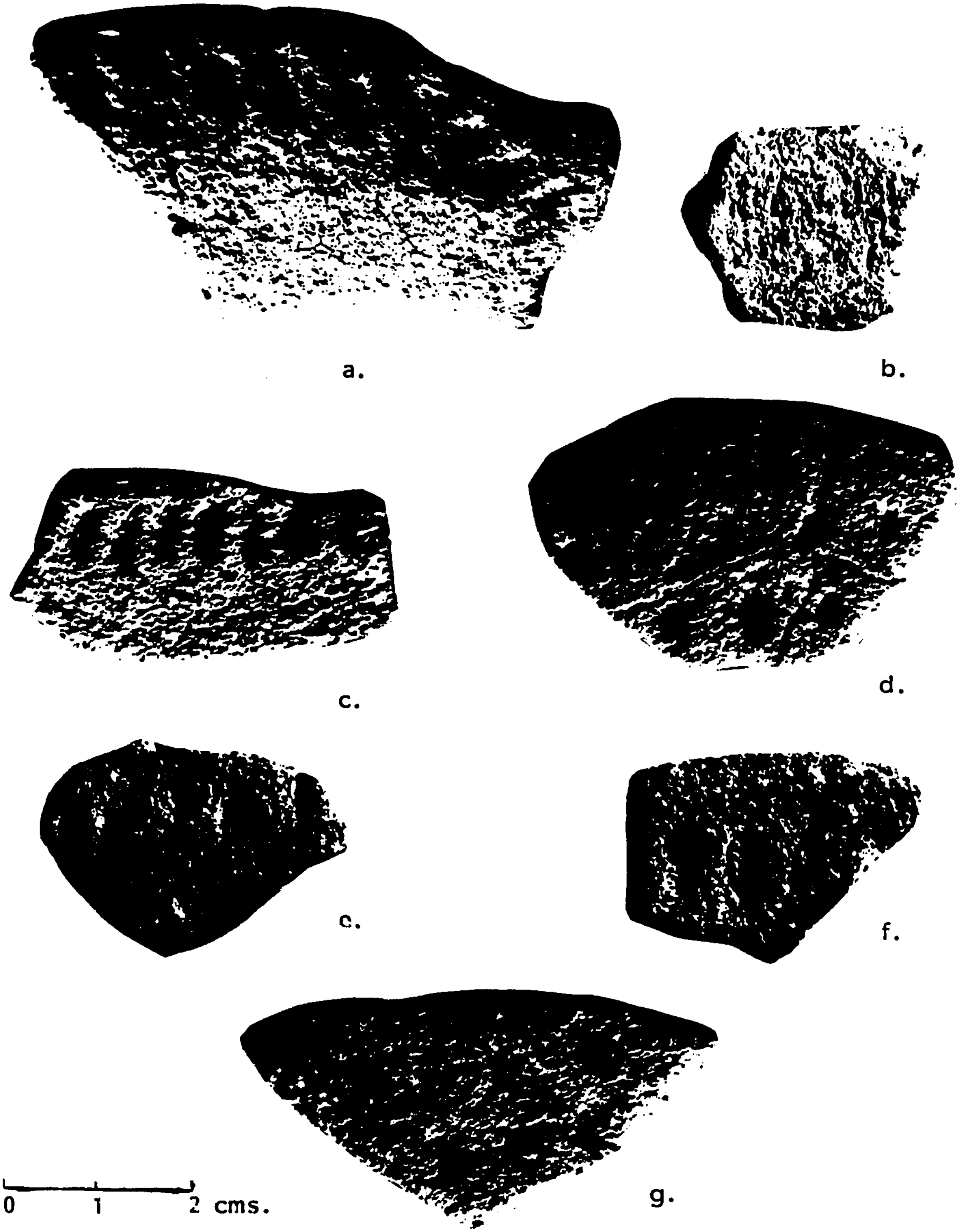


Figure 17. <u>Río Cuango Punctate</u>: Lineal Punctate Designs. Excavated sherds from PC 001.

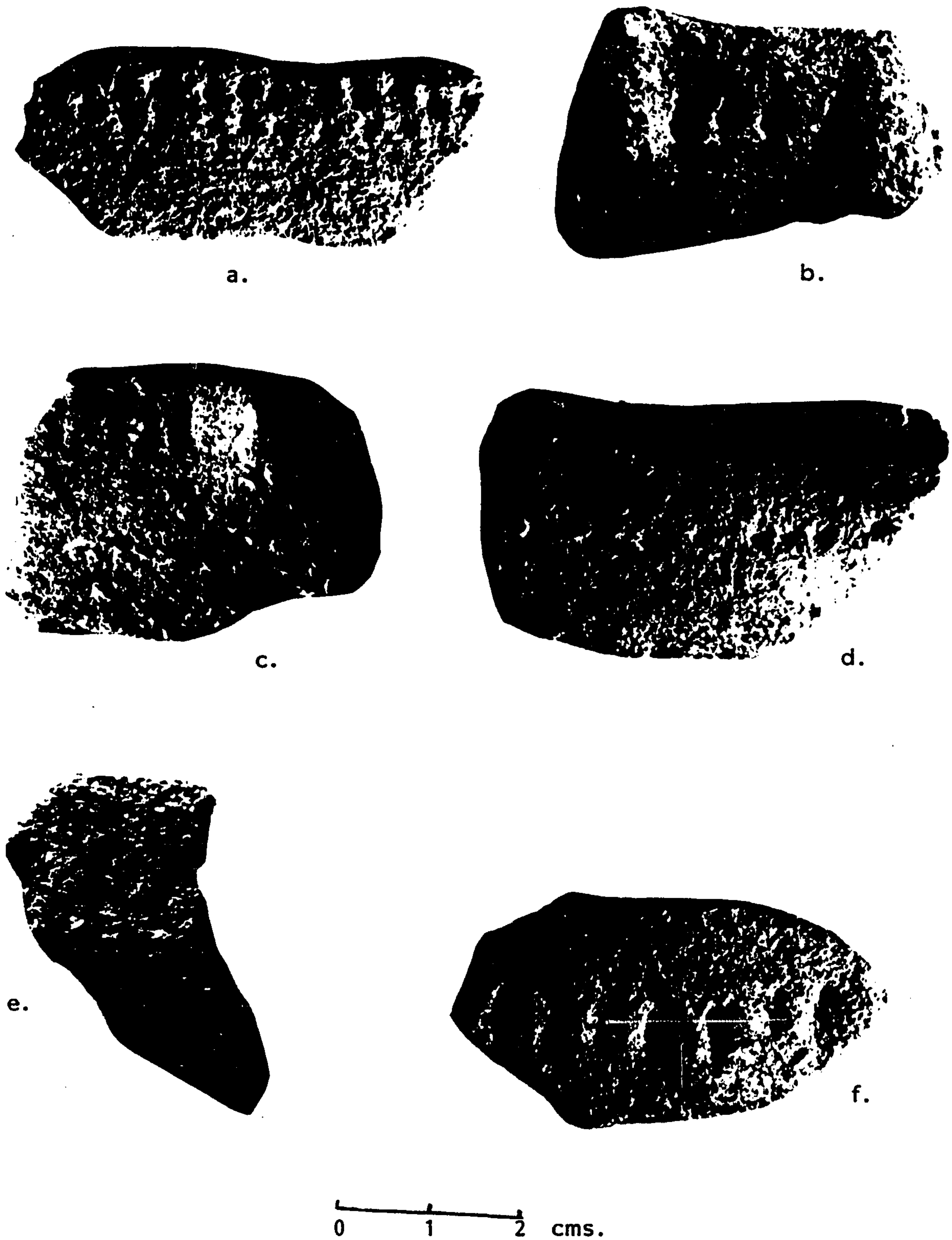


Figure 18. Río Cuango Punctate: Rim Sherds and Punctate Designs. Excavated sherds from PC 001 containing punctate designs. All are from shallow, open-bowl vessles (Fig. 19).

and 19). Two small, modeled applique lugs are often placed on the exterior lips of these bowls, intersecting the lineal punctate designs (Figs. 18-b,c; Fig. 19-b,d,e,g).

Besides the predominant punctate designs found on these small, restricted-wall bowls, other plastic decorations were used. Fingernail impressions, found on one restricted-wall bowl rim sherd (Fig. 16-a), were arranged lineally along the exterior unmodified lip wall. Shell stamping was used on another bowl rim sherd (Fig. 16-b). The lineal arrangement of the shell-stamped design occurs around the exterior lip like the punctate and fingernail impressions placed on similar vessel forms. A deep, wide groove around the exterior lip was found on several rim sherds of restricted-wall bowls (Fig. 20-e). Shoulder ridging, two narrow parallel coils around the exterior lip, was a related design also found on these bowls (Fig. 20-c,d).

Another distinguishable vessel form within this ceramic ware is a shallow, everted-rim plate (Fig. 21-h). Punctate designs also occur on this vessel form, arranged in a lineal pattern around the interior lip portion.

The incision, punctate, and modeling designs placed on the bowl and plate vessel forms always appear in lineal fashion, either as one continuous straight-line pattern or two parallel straight-line patterns (Fig. 19-d,h). In addition, only one design technique is used on a single vessel; for example, incision is never accompanied with punctate. The only case in which punctate is combined with modeling is on restricted wall bowls with ornamental lugs. Rim sherds of these vessels show the punctates are placed between the shoulder lugs (Fig. 18-b,c). Even in

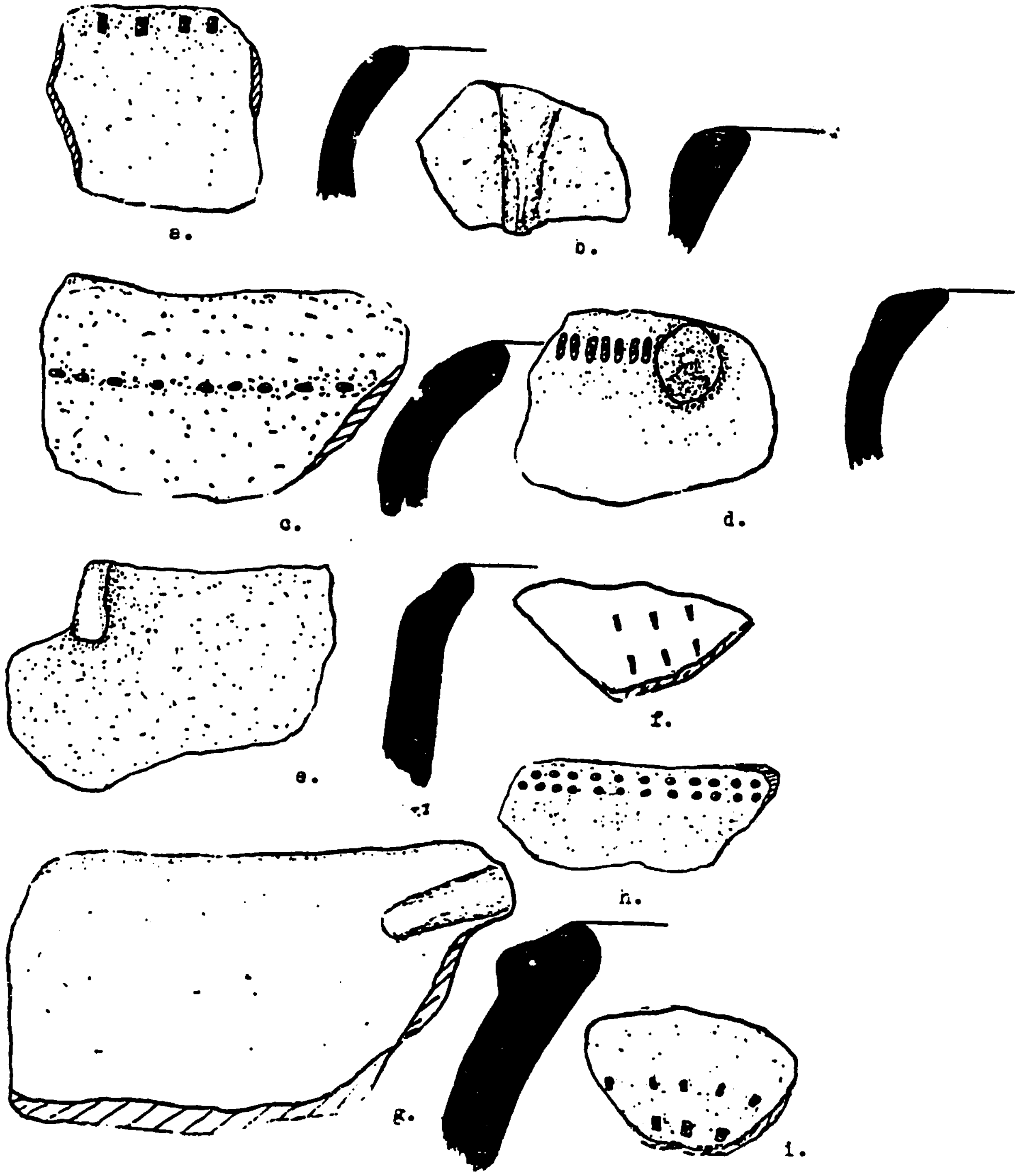


Figure 19. Rio Cuango Punctate: Rim Sherd Profiles and Punctate Designs.

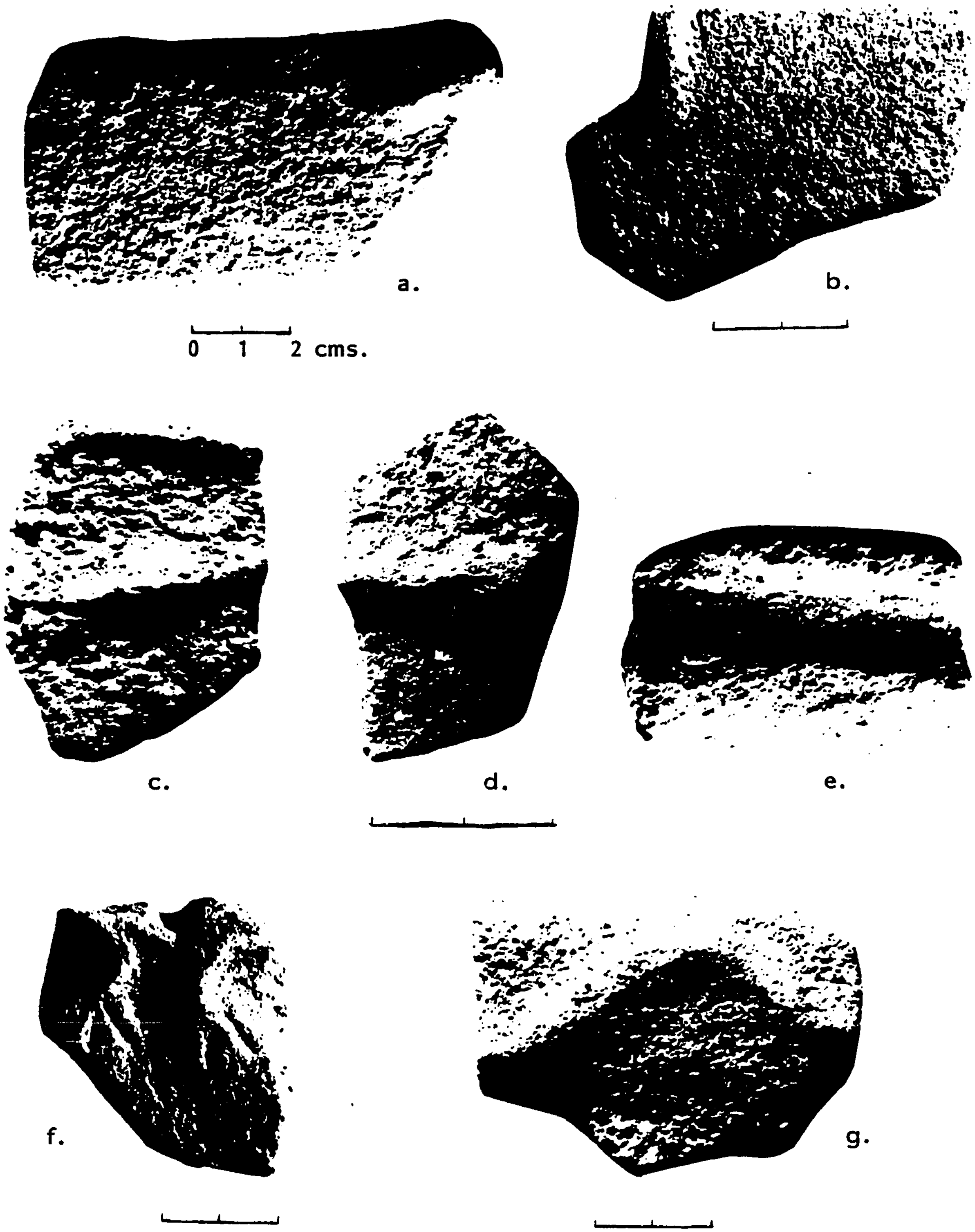


Figure 20. Río Cuango Punctate: Shoulder Lugs, Ridges, Grooving and Modeling. Excavated sherds from PC 001 showing ornamental shoulder lugs (a-b), elevated shoulder ridges (c-d), shoulder grooving (e), and modeling (f-g). Sherds a-e are from shallow, open-mouth bowls.

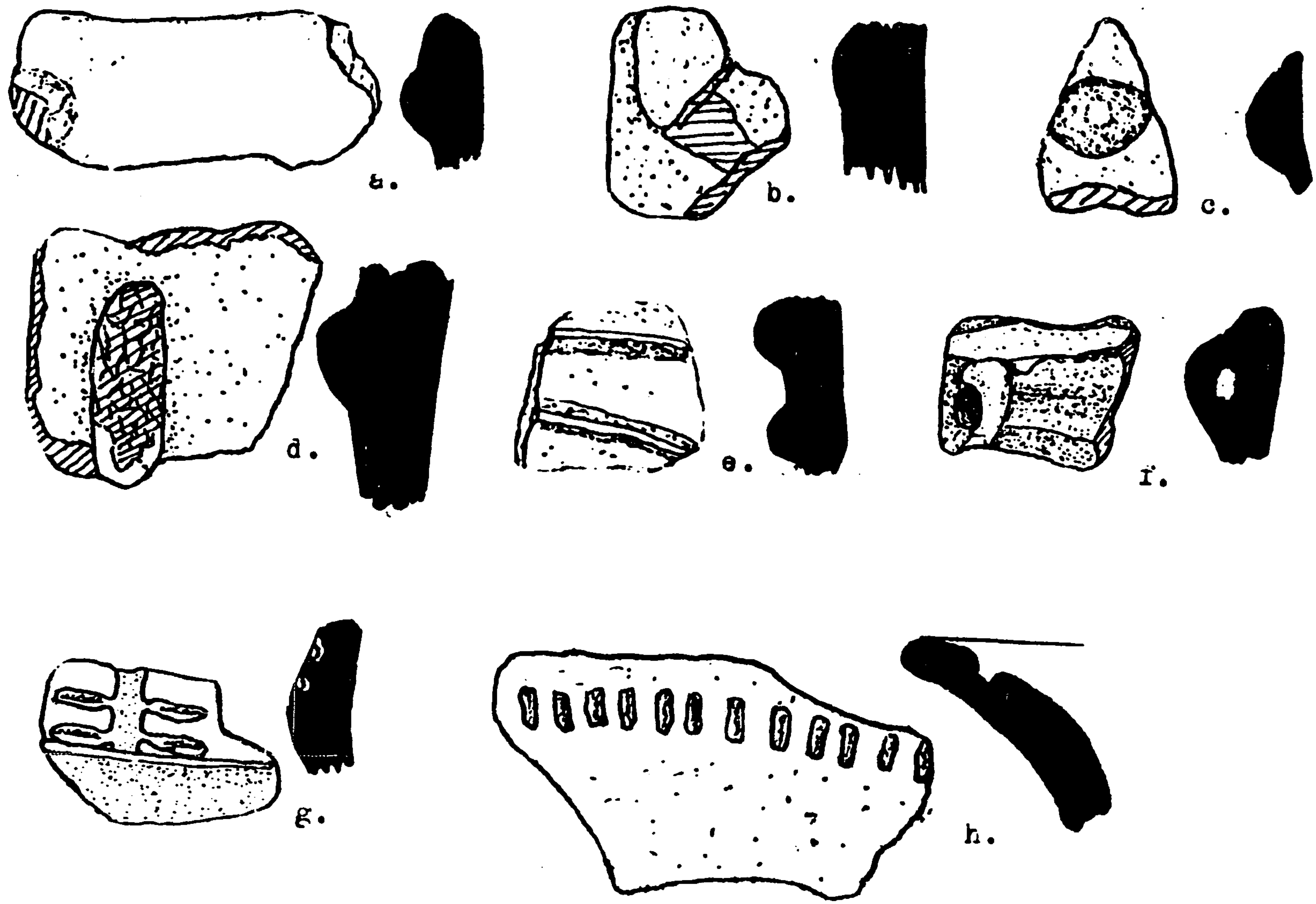


Figure 21. Río Cuango Punctate: Shoulder and Rim Profiles.

this case, however, the two plastic techniques employed are designed independently of one another.

The design arrangements and vessel forms associated with Río Cuango Punctate make them easily distinguishable from another class of ceramic wares, Incised-Relief Brown Ware. This class of ceramic wares uses similar punctate, incised, and shell-stamped designs, but does not share the same lineal arrangement motifs or the same vessel categories as the Rio Cuango Punctate Ware. Since sherds of both ceramic wares were found in the excavated deposit at PC 001, a clear separation could be made.

The lineal punctate, grooving, and lip-ridging designs contained on the shallow bowl and plate forms of Río Cuango Punctate appear to represent a ceramic component chronologically earlier than the other utilitarian and plastic and painted wares found in the excavated deposit of PC 001. No comparable ceramic style is known from excavated sites in Panama. The ware does share close similarities to La Montaña phase ware from eastern Costa Rica, dated between 1000 B.C. and 500 B.C. (Snarskis 1978: 63-89). La Montaña phase ware contains broad-line grooving, shoulder ridging, lineal dot punctate, and shallow-line incision designs displayed on predominantly tecomate and restricted-wall bowls (Snarskis 1978: 72-77, Figs. 6 f-l, 11, 12 g-i, 13 e). Snarskis has argued a close relationship of this early phase component to Formative ceramic complexes from northern Colombian sites of Barlavento and Momil (Starskis 1978: 75-77; 1976: 342-363). The presence of similar Formative-like wares at the site of PC 001 in Costa Arriba suggests a close cultural link between these distant, early Neolithic complexes. Possibly, other vessel forms, such as the neckless olla and budare-like plates excavated at PC 001 (Appendix), should be placed within this Formative-like, plastic-decorated ceramic component. These vessel forms are important diagnostic wares dominating Formative-dated complexes in northern South America and Mesoamerica (Reichel-Dolmatoff 1954; Ford 1969: 92-95; Snarskis 1978: 86-87). Their presence at site PC 001 in association with the Río Cuango Punctate wares strengthens the case for Formative period settlement here.

The small sample of Río Cuango Punctate obtained from the excavated deposit at PC 001 prevents more comparative analysis. Nevertheless, the presence of this Formative-like component in eastern Panama supports the idea of early Neolithic expansion from northern Colombia to more distant Caribbean locations.

Incised-Relief Brown Ware. The Río Cuango Punctate bowl and plate forms with the various mentioned plastic decorative motifs are distinguishable from another class of unknown vessel forms with body sherds containing a combined mixture of punctate, incision, and modeled designs (Fig. 22). This second stylistic ware is known as Incised-Relief Brown Ware, first defined by Biese in 1964 (Biese 1964: 3-51) in his description of ceramic materials from the Pacific site of Panama Viejo. Radiocarbon dates associated with this ceramic ware at other Pacific area sites place it chronologically between 200 and 600 A.D. (Lothrop 1959: 169; Cooke 1973: 93-96).

At PC 001, nineteen highly-weathered body sherds of this ceramic style were found. The larger, better-preserved examples contain raised motifs with incision combined with reed punctate and solid dot designs arranged in circular fashion (Fig. 22). One excavated sherd from PC 001

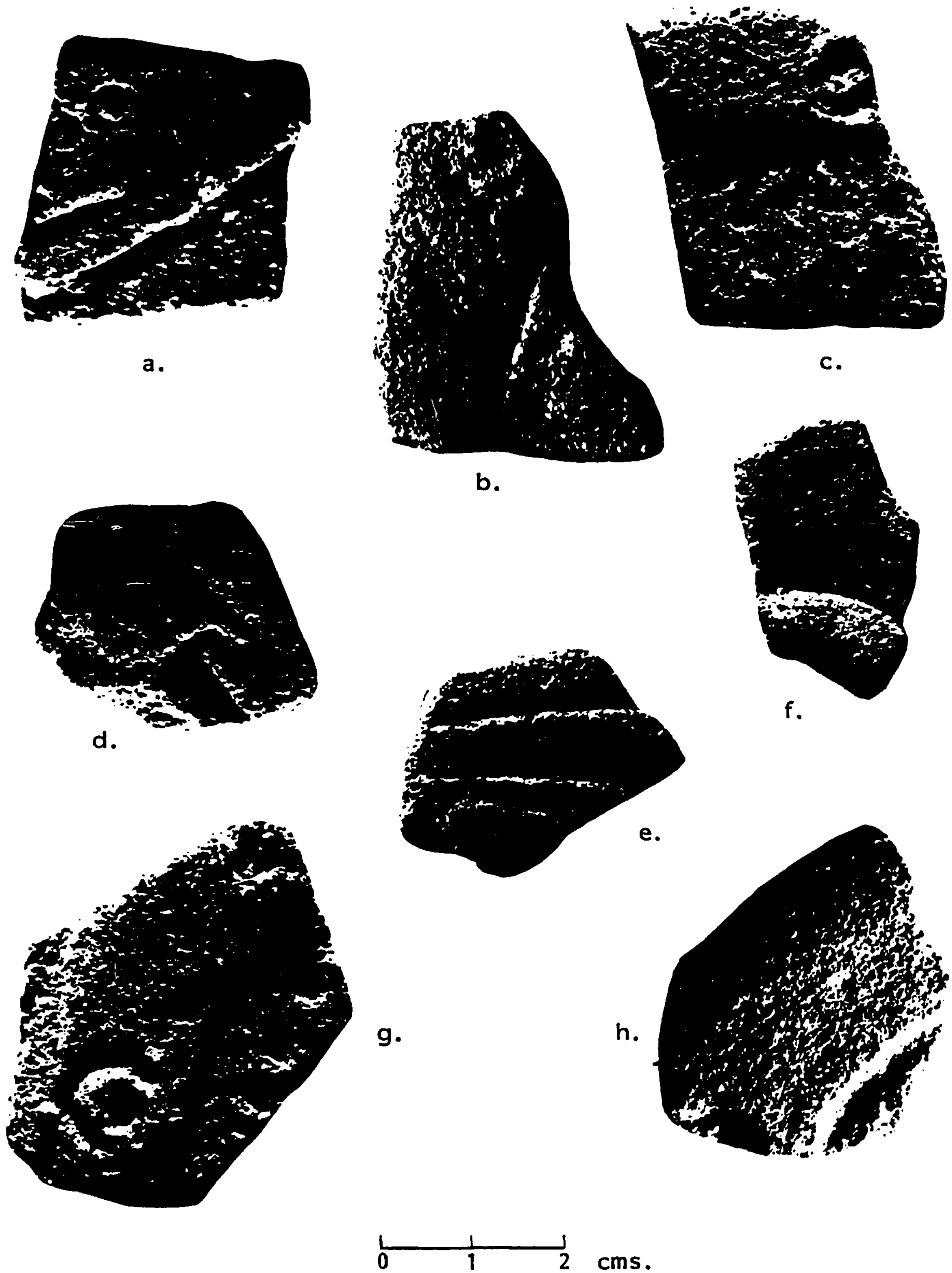


Figure 22. <u>Incised-Relief Brown Ware</u>. Sherds excavated from PC 001 showing characteristic incision, punctate, and relief modeling.

has a raised bird representation outlined by incision (Fig. 22-d). Another body sherd of this same style contains small, applique pellets with shallow incision, apparently representing a toad (Bufo) with characteristic body warts (Fig. 16-c). The relief-incised sherds are flat and generally thin (four to eight millimeters), suggesting they are from large, urn-like vessels. At the site of Panama Viejo, large urn vessels were found with these characteristic plastic designs (Biese 1964), suggesting this same vessel form for the PC 001 sherds.

The nineteen sherds of Incised-Relief Brown Ware found at PC 001 were equally distributed throughout the various excavated level in both test pits with no clustering within the deposit (Tables 17 and 18).

The presence of this stylistic ware at PC 001 indicates vessels were traded into PC 001 from Pacific area sites. The rarity of these sherds in archaeological deposits in the Costa Arriba area suggests vessels with this distinctive plastic decoration were not locally made.

Painted Ware. Thirteen sherds were found in the excavated deposit at PC 001 with painted decoration. The degree of preservation of these sherds makes it difficult to place them in categories representing their orginal surface treatment and painted color arrangements. For example, half the number of sample contained red painted surfaces (Fig. 14-b), while on others, black paint was added over the red, producing a bichrome combination (Fig. 14-e). It is not known whether the sherds containing solid red surfaces were originally bichrome, and the black paint subsequently eroded off. Some monochrome and bichrome painted sherds may have originally been "trichromes" since one sherd was found with black and white painted bands over a solid red painted surface (Fig. 14-a).

Table 17

Occurrence of Ceramic Decorative Traits, Unit 1, PC 001

Decorative Trait	0-10	10-20	20-30	30-40	TOTAL
Punctate	3	4	0	1	8
Fingernail Imp.	0	0	1	0	1
Shell Stamping	0	1	0	0	1
Lip Scalloping	1	0	0	0	1
Shoulder lugs	5	7	0	0	12
Modeled ridges	1	0	0	0	1
Relief Incision	3	2	0	0	5
Relief Modeling	2	0	0	0	2
Strap Handle	0	1	0	0	1
Shoulder grooving	0	0	0	0	0
Orange slip	0	0	0	0	0
White slip	0	0	0	0	0
Red paint	1	1	0	1	3
Black paint	0	0	0	0	0
Black/Red	0	0	0	0	0
Black and white/red	0	0	0	0	0
White paint	0	0	0	0	0
TOTAL	16	16	1	2	35

Table 18

Occurrence of Ceramic Decorative Traits, Unit 2, PC 001

Decorative Trait	0-10	10-20	20-30	30-40	TOTAL
Punctate	17	11	0	0	28
Fingernail Imp.	0	0	0	0	0
Shell Stamping	1	0	0	0	1
Lip Scalloping	0	1	0	0	0
Shoulder lugs	9	2	0	0	11
Modeled ridges	2	7	0	0	9
Relief Incision	16	6	0	0	22
Relief Modeling	2	2	0	0	4
Strap Handle	0	0	0	0	0
Shoulder grooving	2	4	0	0	6
Orange slip	2	0	0	0	2
White slip	0	1	0	0	1
Red paint	2	9	0	0	11
Black paint	1	5	0	0	6
Black/Red	0	5	0	0	5
Black and White/Red	0	1	0	0	1
White paint	0	1	0	0	1
TOTAL	54	55	0	0	109

Clearly, bichrome and trichrome wares of black/red and black and white/red are represented in the sample and solid red painted sherds also were present.

Only two rim sherds were recovered in this painted ware sample, each from a gently curved, open-mouth bowl (see Fig. 24-a,e). One ring base was found with solid red paint on the exterior and a black paint or smudge on the interior. Another body sherd from a vessel with a flat shoulder flange contained a solid red painted surface and shallow, curvilinear incision on the shoulder flange (Fig. 16-e). These painted sherds appear to be from trade ware vessels, originating from Pacific area sites where they are associated with a 1 A.D. to 600 A.D. time range.

White and Orange-Slipped Ware. Besides the occasional maroon slip present on ollas, bowls, and plates of some Santa Isabel Undecorated wares previously discussed, sherds containing orange and white slips were recovered. The slips were applied on the interior and exterior portions of the vessels, sometimes covering the sherd and other times applied to restricted zones. Only one rim fragment was found with orange slip. The slip was applied in a thin band along the interior and exterior lip. This rim fragment was from a shallow plate form. Only one body sherd with white slip was found and the slip was applied in a narrow band over a solid orange slip (Fig. 14-c).

Implications of the PC 001 Ceramic Sample

The ceramic sample from PC 001 provides an important comparative collection for relating the occupation of this site to others recorded in the district. The surface and subsurface ceramic materials from PC 001 indicate the predominant ceramic vessel forms were undecorated ollas, bowls, and plates of the Santa Isabel Undecorated style. This ceramic style and its vessel form categories were collected from surface samples on the other precontact sites in the district along rivers Terrin, Zaino, Escondido, Cuango, and Culebra. The Río Cuango Punctate, Incised-Relief Brown Ware, and painted wares from the subsurface deposit at PC 001 were not found at any other surveyed sites; however, because of the very low sample size of these wares at PC 001 and their highly eroded condition, they are difficult to distinguish from other Santa Isabel Undecorated wares.

Sherd samples collected along riverine gravel deposits in the Playa Chiquita stream drainage contained Río Cuango Punctate sherds (Fig. 1), but unfortunately, the sites from which these wares originated could not be located. The presence of Río Cuango Punctate sherds in these gravel deposits, along with Santa Isabel Undecorated ware sherds, indicates site deposits in this area similar to that investigated at PC 001. More rigorous survey and testing in other recorded sites in the district would probably provide better evidence of the presence of these decorated wares in predominately Santa Isabel Udecorated ceramic deposits.

Thus, based on the presence of Santa Isabel Undecorated sherds at the twenty-one archaeological sites surveyed in the Costa Arriba area a close chronological, as well as cultural, relationship is indicated between these dispersed, riverine-oriented occupations. In addition, the excavated Incised-Relief Brown Ware, painted wares, and slipped wares from PC 001 indicated a relationship to Pacific area archaeological complexes with these same plastic and painted wares.

No significant stratigraphical or statistical differences were recorded in the excavated deposit at PC 001 for these two ceramic components (see Tables 16 and 17). They were recovered homogeneously throughout the twenty-five centimeter deposit in both test units.

The ceramic evidence from PC 001 thus points to two different components despite the absence of clear stratigraphic separation. Río Cuango Punctate ware appears to represent an earlier Formative occupation in the area and is related to similarly dated complexes in Costa Rica and northern Colombia. The Santa Isabel Undecorated Ware, Incised-Relief Brown Ware, painted ware, and slipped ware represent another ceramic component. This component indicates close contact with Pacific area sites where the decorative wares were most likely manufactured. The second ceramic component is closely associated with a lithic assemblage found at PC 001 discussed in the next chapter.

Chronological Assessment and Relationship to Other Areas

The most important chronological indicator of settlement along the north coast is the ceramic wares collected from the surveyed sites and excavated at PC 001 that separate into two distinct components. The predominate ware of the later component found at all district sites is the utilitarian family of vessels referred to as Santa Isabel Undecorated. The association of this ware with Incised-Relief Brown Ware, painted ware, and slipped ware sherds at the site of PC 001 indicates an occupational date of between 1 A.D. and 600 A.D. for this component. Identical ceramic wares occur in dated archaeological sites south and east of the district of Santa Isabel in a wide area of Pacific eastern Panama and Darien and northern Colombia. It is thus possible to chronologically connect the settlement along the north coast of eastern Panama with the larger regional area of eastern Panama and northern Colombia.

Ceramic Wares of Eastern Panama

Cooke has recently proposed a chronological separation of ceramic styles for the eastern Panama area (Cooke 1973; 1976). In Table 19 I have arranged this sequence according to various ceramic styles, site associates, and subregional zones. The chronology is based on a number of radiocarbon dates associated with ceramic wares from excavated sites in the Río Chagres drainage, the Pacific coast, and the Río Bayano area. Although there have been no recorded stratified sites from the eastern Panama area, a temporal sequence of occupation is suggested by different ceramic units present at excavated sites and by the distribution of these various wares.

Cooke separates six distinct ceramic styles within the eastern Panama region (Cooke 1973: 91-96). Two of these were recovered from the excavations at PC 001 along the north coast. The absence of the other four regional styles from the excavated deposit at PC 001 and the other twenty surveyed sites in the district of Santa Isabel supports the occupational date range of 1 A.D. to 600 A.D. for these twenty-one Costa Arriba sites.

Zoned Linear-Incised. The earliest ceramic ware recovered from the eastern Panama area is Zoned Linear-Incised, which Cooke suggests dates to between 300 B.C. and 1 A.D. (Cooke 1973: 93). This ware appears to have a restricted distribution along the Pacific coastal sites of Playa Venado, Playa Chumical, and Isla Tabogilla (Tabogilla I and II)

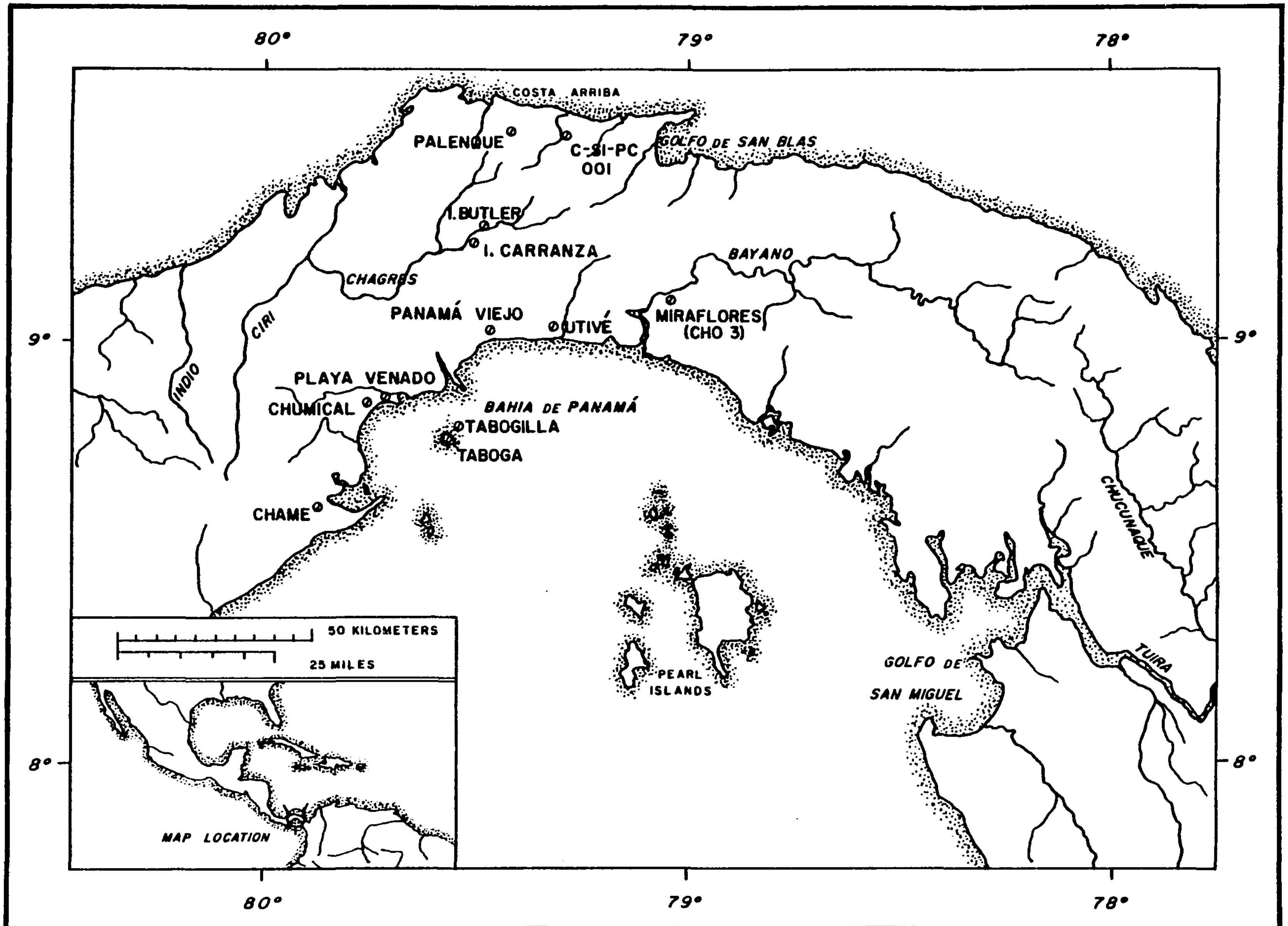
Table 19

Chronological Chart for Eastern Panama Archaeological Sites

	Caribbean north	Río Chagres	Río Bayano	Pacific E. Panama	Darien	Northern Colombia
1500						
1100						
700			La Joyita			
			CHO-3	Utive	P. Patiño	Cupica
300				Panama Viejo	Pearl Is.	
	PC 001	Butler Lake		P. Venado		
A.D.– B.C.–				Taboga I		
		Caranza		Tabogilla I-II		
300						

(Cooke 1973: 93; Stirling and Stirling 1964: 312-317). Unfortunately, no published reports are available for the first two excavated sites. Zoned Linear-Incised ceramic materials are known to have been recovered from the basal levels of these deposits (Cooke 1973: 93), demonstrating the early chronological placement of this ware. Each site contains later stylistic wares, indicating possible stratigraphic components corresponding to Cooke's regional ceramic sequence. The Zoned Linear-Incised style has been recovered as trade ware in some central province sites of western Panama, occurring in dated deposits after 80 B.C. (Cooke 1972: 266-275; Cooke 1973: 93), further supporting the early occurrence of Zoned Linear-Incised in the ceramic sequence of eastern Panama.

Zoned Linear-Incised contains a variety of different plastic motifs, including bold and light incision, combing or brushing, shell stamping, and fillet applique. In 1927, Stirling excavated a one meter deep midden deposit on Tabogilla Island in the Gulf of Panama (see Map XVII) containing bowl and larger olla vessel forms with these plastic decorative motifs (Stirling and Stirling 1964: 312-318). Unfortunately, Stirling's excavations are the only published descriptions of this early ceramic ware. Tabogilla I and II vessel forms and decorative motifs, including Zoned Linear Incised, represent an early ceramic component for eastern Panama clearly distinguishable from later dated stylistic wares. Zoned Linear-Incised may have been recovered from an excavated refuse pit at the site of Caranza in the interior zone of the Río Chagres valley. Recent work at this site by Cooke located two sherds with shell stamping and incised motifs associated with a radiocarbon date of 155 B.C. ± 70 B.C. (Cooke 1976a: 138; 1976b: 34). The sherds, similar to Tabogilla I and II



SOURCE MAP: CARTA AEREA DE LA REPUBLICA DE PANAMÁ, PANAMÁ, 1967

-G.A.APFELSTADT-

Map XVII. Eastern Panama Archaeological Sites.

wares, were found immediately above a preceramic component, suggesting the same chronological date on this Caranza ceramic ware as for the Zoned Linear-Incised ware of the Pacific coast. The nature of the Caranza archaeological material remains unclear, however, since there is no published report.

At present, the Zoned Linear-Incised ware is not known for other subregions in eastern Panama. Recent site surveys conducted in the Río Bayano Valley (Miranda 1974; De la Guardia 1972) and the Darien (Torres de Araúz 1975: 67-68) have found this ware to be absent although only preliminary survey work has been conducted in these areas. This early stylistic ware is also absent from the Caribbean coastal sites investigated in the district of Santa Isabel.

Zoned Bichrome. Beginning around the time of Christ and continuing to approximately 600 A.D., there appear two contemporaneous ceramic styles, each with no apparent evolutionary antecedent. One is a painted ware, outlined with incision, called Zoned Bichrome and the other is a plastic decorated ware with raised motifs, outlined with incision and supplemented with punctate, shell stamping, and low relief modeling. The later ceramic style is known as Incised-Relief Brown Ware.

Zoned Bichrome ware is elegant in appearance and seldom seen with any embellishments. It is decorated in a two-dimensional pattern with red and black painted zones, outlined with incision, usually occurring on bowls or larger olla and urn vessels. At the Pacific Gulf island site of Taboga, it dominates the Taboga I ceramic wares, whereas at Tabogilla Island, it is compoletely absent from the excavated Tabogilla I and II phase wares (Stirling and Stirling 1964: 296-299), indicating a clear chronological difference between these two nearby sites (Map XVII). However, in neither of these excavated midden deposits, located on Taboga and Tabogilla islands, were there associated Incised-Relief Brown Ware sherds, as is common in other eastern Panama sites. Possibly this indicates an early abandonment of these island sites.

Zoned Bichrome ware is widely distributed along Pacific coast sites, occurring with Incised-Relief Brown Ware at Panama Viejo (Biese 1964), Playa Venado (Lothrop 1960), Playa Chumical (Cooke 1979: personal communication), and Capira (Cooke 1979: Personal communication) (Map XVII). This ceramic style was recovered from an excavated tomb at the Miraflores site (Cho-3) in the Río Bayano valley where it was found only in the shaft refill with Incised-Relief Brown Ware sherds (Cooke 1973: 93). Further distributions of Zoned Bichrome ware in the Río Bayano valley and eastward into the Darien are still unclear. It is apparently absent from the Río Chagres valley sites of central interior eastern Panama and was not found in any Caribbean sites in the district of Santa Isabel. Zoned Bichrome ware was apparently manufactured exclusively at Pacific coastal sites. Its occurrence outside this zone, at Miraflores, may indicate it was tradeware imported into this site rather than locally made.

Incised-Relief Brown Ware. Excavations at PC 001 recovered a variety of plastic-decorated sherds corresponding to Incised-Relief Brown Ware (Fig. 22). This ceramic style is widespread throughout the entire eastern Panama region and has been associated with a number of radiocarbon dates ranging from 200 A.D. to 600 A.D. Sherds and vessel forms of this style have been recovered in the same deposits with other datable stylistic wares, supporting this temporal placement.

The earliest date associated with this ceramic style is 227 A.D. ± 60 (Lothrop 1959: 169) from the site of Playa Venado in the Gulf of Panama (Map XVII). This ware was associated with sherd material corresponding to the five other known ceramic styles of eastern Panama. Unfortunately, the context of this association is not clear because no full report was ever published. This site deserves further attention since there is the possibility of a stratigraphic sequence associated with the various ceramic style wares.

Further east along the Pacific coast, at the site of Panama Viejo (Map XVII), numerous vessels and sherds of the Incised-Relief Brown Ware were recovered by Biese (Biese 1964: 1-52). At this site, ware of this style was found in association with Conte polychromes, suggesting a date of 500 A.D. (Biese 1964; Cooke 1973: 95). Undecorated utilitarian ware, which Biese called Panama Viejo Red Ware, dominated the ceramic sample recovered from this site. Panama Viejo Red Ware has large-mouth olla, bowl, and shallow plate vessel forms (Biese 1964: 29, 30, 33, 35), sharing a close relationship to the Santa Isabel Undecorated Ware excavated at PC 001 and to identical utilitarian ware found at other sites surveyed in the Santa Isabel district. The similarity of the utilitarian ware present in Pacific and Caribbean area sites further links the occupation between the sites of Panama Viejo and PC 001.

An important difference between the ceramic wares of Panama Viejo and PC 001 is the presence of two additional ceramic styles at Panama Viejo which were absent at PC 001. These are Zoned Bichrome Ware, apparently contemporaneous with the Incised-Relief Brown Ware, and a later style discussed below, Votive Ware. Neither of these ceramic styles were found at archaeological sites in the Santa Isabel district suggesting a number of different possibilities for the temporal occupation of PC 001. One possibility is PC 001 was contemporaneous with Panama Viejo, but was outside the trade network of the groups manufacturing these two other wares. A second possibility is the occupation of PC 001 dates earlier than Panama Viejo, this would explain the absence of Votive Ware at PC 001. However, the absence of Zoned Bichrome Ware at PC 001 is peculiar, possibly suggesting a restricted Pacific distribution for this early style. I tend to favor the former possibility since other ceramic wares found at both sites, including Incised-Relief Brown Ware, utilitarian ollas, bowls, and plates, and painted wares, represent closely related ceramic components. The absence of Zoned Bichrome and Votive Ware from Costa Arriba sites may point to the establishment of regional territorial boundaries, restricting trade networks by this time.

Besides the sites of Panama Viejo and Playa Venado, the only other archaeological site in which the Incised-Relief Brown Ware ceramic style can be dated is the Miraflores site (Cho 3) in the Río Bayano valley (Map XVII). At Miraflores, excavated tombs contained sherds of this ware in the shaft refill. On the tomb floors, another local stylistic ware, consisting of "bottles" and "trays," was recovered with imported Macaracas trade ware from the central provinces (Cooke 1973: 18-19). The floor material has a radiocarbon date of 680 A.D. to 900 A.D. (Cooke 1973: 96). Since Incised-Relief Brown Ware sherds were exclusively found in the shaft refill, Cooke argues they predate the burials. A date of around 500 A.D. is offered by Cooke for chronological placement of the Incised-Relief Brown Ware sherds at this site (Cooke 1973: 93).

On the basis of these dates, Incised-Relief Brown Ware style can be firmly placed in a chronological range of between 1 A.D. and 600 A.D. The terminal date is not securely known. There is a distinct possibility this style survived to Spanish contact times in various areas of eastern Panama.

Sherds of Incised-Relief Brown Ware have been found in numerous other surveyed sites in the Pacific lowlands. Recent survey of the Río Bayano valley has located numerous sites containing Incised-Relief Brown Ware sherds (Miranda 1974; De la Guardia 1965: 151-154). At the site of Utivé, located west of Río Bayano, "stone piles" containing "axes, knives, and grinding stones," along with plastic-decorated sherds corresponding to Incised-Relief Brown Ware, dominate the deposit (Stirling 1950: 227-246). Utilitarian wares were also reported here. The lithic concentration at this poorly reported site points to a workshop feature similar to the mounds of lithic debris discovered at PC 001. The association of this lithic material and possible specialized work activity with Incised-Relief Brown Ware and utilitarian wares place the site of Utivé in a close relationship with PC 001, Miraflores, Panama Viejo, and Playa Venado.

Further east in the Darien, Incised-Relief Brown Ware has been recovered from site deposits on the Pearl Islands and at the site of Punta Pantiño in the Gulf of San Miguel (Linne 1929: 99, 81, 90, 154). On the Pacific northwest coast of Colombia, sherds of this style were recovered from the site of Cupica (Reichel-Dolmatoff 1961). This distinctive ceramic style thus covered the entire northern Colombia and eastern Panama lowlands by 500 A.D.

The Lake Madden area in the Río Chagres valley of interior eastern Panama (Map XVII) contains archaeological deposits with Incised-Relief Brown Ware identical to those described for the Costa Arriba area and the Pacific lowlands. Only sketchy reporting is available for sites in this area (Sander 1964; Mitchell 1959; 1960a; 1960b; 1962; Harte 1958; Bird and Cooke 1977; 1978). There appears to be a long cultural occupation here, beginning as early as 8000 B.C. to 9000 B.C., associated with Paleo-Indian fluted points (Bird and Cooke 1977; 1978). Later ceramic-bearing sites contain predominantly three styles: (1) Zoned Linear-Incised; (2) Incised-Relief Brown Ware, and (3) Undecorated utilitarian ware. Unfortunately, much of the context of these deposits has been destroyed since they are located along the original terraces of the river receiving periodic innundation during high water levels of the artificial lake. This erosional process has continued since 1934 when the construction of the dam was completed. Butler Island is a terrace site appearing as an island during high water periods. It contains various circular trash pits filled with ceramic remains of Incised-Relief Brown Ware and utilitarian wares (Cooke 1979: personal communication). The utilitarian wares, consisting of sherds from ollas, bowls, and plates, correspond closely to Santa Isabel Undecorated Wares of Costa Arriba area sites and similar utilitarian wares from Pacific area sites, such as Panama Viejo and Utivé in the Río Pacora valley (Stirling 1950: 227-246). At Butler Island, many of the flake tools are jaspar, occurring with igneous cobble cores and flakes (Bird and Cooke 1977: 17-18). A similar assemblage, including many basalt cores and polished axes, is known from the site of Caranza, located close to Butler Island (Cooke 1973: 93). These two sites thus appear to share a close relationship with occupational sites located over a wide area of lowland eastern Panama and northern Colombia, indicating a related cultural settlement in both the Pacific and Atlantic areas during the period from 1 A.D. to 600 A.D.

A most important chronological indicator of the site PC 001 is thus the Incised-Relief Brown Ware sherds recovered from the deposit. Although this sample was relatively low, the individual sherds contain raised motifs outlined in incision and supplemented with reed and dot impressions identical to sherds of this ware recovered from the various Pacific zone sites and Río Chagres valley sites. Unfortunately, only body sherds were recovered from the PC 001 deposit, making it impossible to reconstruct vessel forms. Based on the nearly flat curvature of the sherds, they were probably from large bowl, urn, and plate forms, similar to those described by Biese from the Panama Viejo site (Biese 1964), and may have even originated from this later site. The presence of this distinctive Incised-Relief Brown Ware at PC 001 has both chronological and cultural importance, linking PC 001 with the widely scattered lowland sites of Panama Viejo, Playa Venado in the Gulf of Panama, Utivé in the Río Pacora valley, and Miraflores in the Río Bayano Valley, and Butler Island and Caranza sites in the Río Chagres valley. Finally, the same chronological and cultural links are shared between these sites and Cupica, located in the northwest Pacific coast of Colombia, where this Incised-Relief Brown Ware clearly was traded in from Pacific eastern Panama.

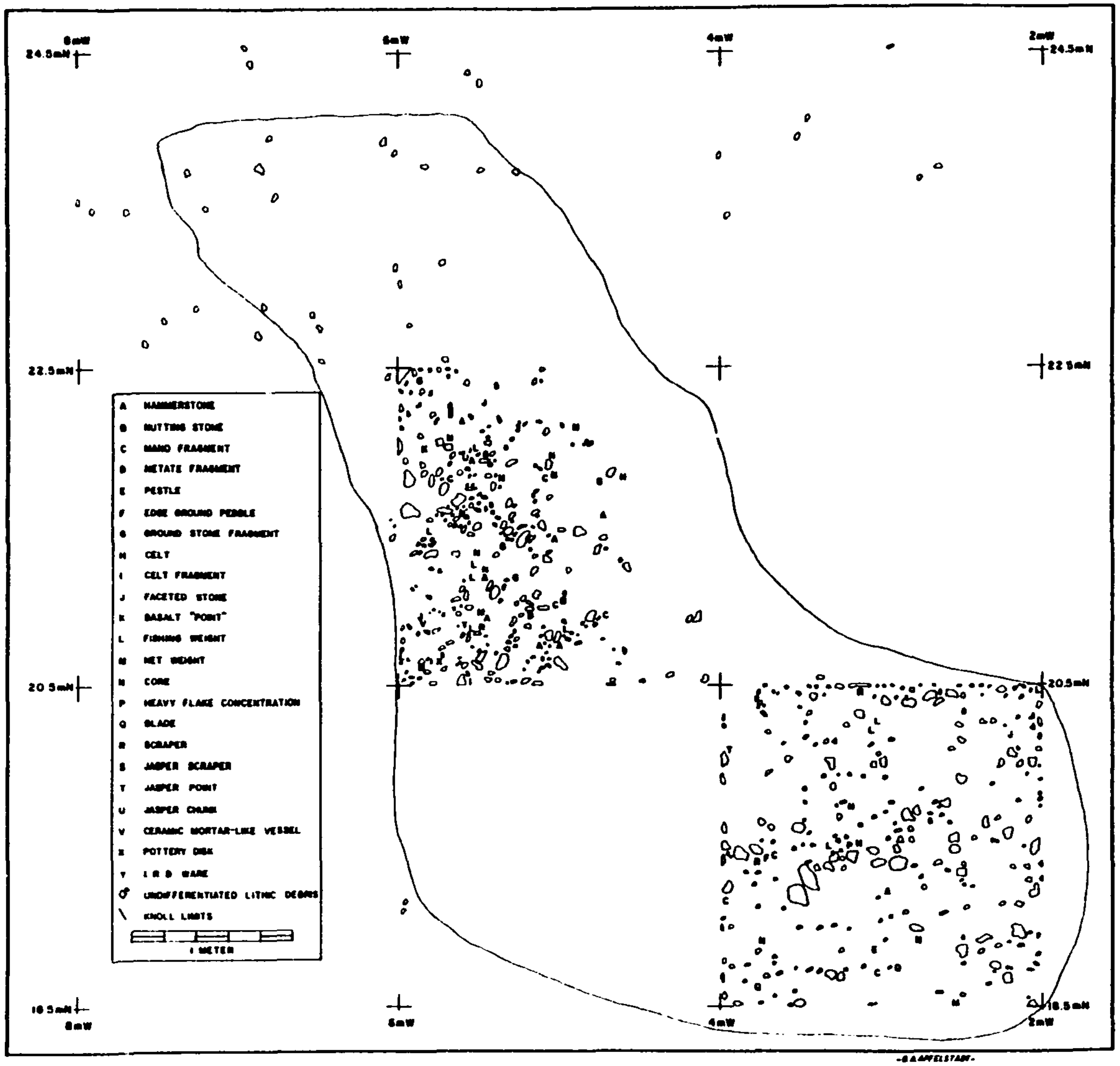
Painted wares. Associated with the Incised-Relief Brown Ware at PC 001 were a number of painted sherds with solid red, black, and white linear designs in monochrome, bichrome, and trichrome combinations. Also present were white and orange-slipped sherds. These painted and slipped decorated wares were found on only thirteen sherds, making it a poor comparative sample. Nevertheless, the presence of this decorative ware in the deposit of PC 001 clearly shows both temporal and cultural relationships with Pacific coastal sites where these wares were apparently being manufactured. At the Taboga I site on Taboga Island, Stirling found very similar painted and slipped ware sherds associated with predominately Zoned Bichrome ware (Stirling 1964: 296-307). The vessel forms containing these monochrome, bichrome, trichrome, and slipped color combinations occurred on bowls and ollas, some with long pedestal bases. Vessel forms with similar painted combinations were found on Tabogilla Island at the sites of Tabogilla I and II, also excavated by Stirling. Here, however, these painted and slipped wares were recovered with mostly Zoned Linear-Incised ware. Unfortunately, no absolute dates are available for these sites. It seems clear, however, from the ceramic chronology presented above, there is a temporal difference between the Taboga I and Tabogilla I and II midden deposits. Since no clear divisions have been established for this painted style and only a small sample was recovered from excavations at PC 001, it is difficult to offer a correct temporal placement in the proposed sequence. However, since painted wares were recovered with the Incised-Relief Brown Ware at PC 001, and since they occur elsewhere in Pacific coastal sites with the same ceramic associations (Biese 1964) as found at PC 001, PC 001 must share the chronological date range of 1 A.D. to 600 A.D. with the Pacific area sites mentioned.

Votive Ware. After 600 A.D., the ceramic sequence for the eastern Panama lowlands is unclear. One distinctive style, known as Votive Ware, has been found at various Pacific coastal and Río Chagres valley sites

(Biese 1964; Cooke 1973). Votive Ware appears limited to these two areas since it has been reported absent from the Río Bayano valley sites (Miranda 1974; Cooke 1973) and was not found at PC 001 or any of the surveyed sites in the district of Santa Isabel. There seems to be no apparent local antecedent to this very Baroque-like ware consisting of long, pedestaled vessels with modeled zoomorphic appendages, applique, and heavy curvilinear incision (Biese 1964). Besides limited distribution in Pacific eastern Panama, Votive Ware occurs as trade ware in the central provinces of western Panama where it has been securely dated to between 900 A.D. and 1500 A.D. (Ladd 1964: 199; Cooke 1972: 472) in Cocle, Herrera, and Tonosí province sites.

Miraflores Ware. Apart from Votive Ware, the only recognizable, late period ceramic style for the eastern Panama lowlands is one with a variety of "bottle" and "tray" vessel forms from the Río Bayano valley site of Miraflores (Cho-3; Cooke 1973; 1976). Miraflores Ware appears to be a local style, associated with radiocarbon dates ranging from 685 A.D. to 895 A.D., derived from excavated tomb materials (Cooke 1973: 94).

At the time of Spanish contact, a series of Cuevan polities controlled the riverine lowland and marine zones around the Bay of San Miguel and the Chucunaque-Tuira rivers (see Map VIII). These groups were known to be in sea contact with Pacific coastal South American groups, controlling trade networks to the south and distributing products into interior eastern Panama areas (Collección de Documentos Inéditos para la História de España 1884: Vol. V: 196). Indigenous dugouts from Peru, carrying large cargos of trade items, were observed by the Spanish as late as 1525 along the eastern Panama coast. The southern trade networks



Map XVIII. PC 001: Excavated Workshop Feature.

maintained by the Pacific Cuevan groups were known by the Spanish as early as 1511 when Balboa was told of this by the Bayano river Comogra chiefdom (Marytr 1912: Ch. III: 144-146). At the contact period, Pacific Darien and eastern Panama were thus important focal points for trade with Pacific South America. The antiquity of these trade networks appears to have been well established by 1 A.D. when Incised-Relief Brown Ware was traded into the Pacific Colombian site of Cupica. Pottery and many other items were being brought from northern South America and traded into eastern Panama Cuevan communities. Because of the lack of archaeological work in the Pacific Darien and eastern Panama area, the extent and nature of the early trade networks will remain poorly documented.

The Miraflores Ware, under closer analysis, contains numerous ceramic vessels and decorative motifs well known for coastal Ecuadorian and Colombian complexes. Effigy jars, sharply carinated bowls, long pedestal base vessels, double-spout-and-bridge jars, what appear to be snuff trays, and vessels with irridescent painting and broadline, geometric incision (Cooke 1973: 119-135) appear to be ceramic trade wares brought into this site from ocean contacts to the south. Manabí, Bahia, Tumaco, and Esmeraldas contain related archaeological complexes where this ceramic ware may have originated (Meggers 1966; Reichel-Dolmatoff 1965). Thus, both the Pacific and Atlantic area archaeological sites of eastern Panama indicate an establishment of trade networks and social alliances linking distant lowland communities. This pattern can be traced to as early as 1 A.D. It continued through the domination of this whole area by the sixteenth-century Cuevan polities.

Conclusions

On the basis of the stylistic affinities noted between the ceramic material excavated at PC 001 and those from excavated Pacific area sites, the major occupation of the moist Caribbean slopes of eastern Panama dates to approximately 1 A.D. A small sample of Formative-like wares points to a possible earlier occupation. All surveyed sites in the Costa Arriba area consist of closely related occupations with similar ceramic materials and riverine orientations during the 1 A.D. and later time period. The relatively shallow, twenty-five centimeter deposit excavated at PC 001, as well as the overall uniform nature of the ceramic materials collected from the surfaces of the other district sites, point to related single component occupations. The ceramic wares associated with these deposits may have a longer life history than presently thought. It is entirely possible the local Santa Isabel Undecorated Ware and the Incised-Relief Brown Ware represent two ceramic industries continuing from 1 A.D. to Spanish contact.

PC 001 and the other twenty archaeological sites recorded for the Costa Arriba area clearly share a close cultural relationship with other eastern Panama and northern Colombian sites over this approximately 1,500 year sequence. Incised-Relief Brown Ware, firmly dated at Pacific area sites of Panama Viejo, Playa Venado, and Miraflores, was found as trade ware at PC 001, linking together all of these sites. This distinctive, plastic-decorated ware is known from northwest Pacific Colombia, Río Bayano valley, and the Río Chagres valley, uniting these areas into a vast trade network for the distribution of this ceramic ware. The manufacturing sites for Incised-Relief Brown Ware are not known; however, the best guess would be the Pacific lowland sites of Utivé, Panama Viejo, and Playa Venado. Utilitarian wares at many of these sites share vessel categories and stylistic features with Santa Isabel Undecorated Wares of PC 001. When related painted and slipped ware sherds are compared between these sites and other closely related wares, it becomes clear these various ceramic groups represent important industries linking together widely separated lowland settlements into trade networks and socially organized alliances. The ceramic evidence associated with settlement in the Costa Arriba area thus clearly shows how expansion and trade linked these communities to interior and Pacific area populations beginning as early as 1 A.D.

In 1964 Biese suggested the site of Playa Venado was an important ruling center for other occupied Pacific area sites since more trade ware from the west moved into this site (Biese 1964: 49). He felt the site of Panama Viejo, located to the east of Playa Venado, represented an economically dependant tribe of a ceremonial or ruling center of which Playa Venado was the "capital." This pattern of political hierarchy between lowland eastern Panama sites appears more regional than Biese originally thought. Economic dependence and political alliances seem to have extended from the Pacific coastal sites into the interior area of the Río Chagres valley, the Río Bayano valley, and the Atlantic zone of Costa Arriba. The similar ceramic wares recovered from excavated sites in each of these areas indicate a developed alliance network was established by 1 A.D. and eventually led to the large territorial Cuevan polities in the same lowland zones. If one examines the archaeological record for the Caribbean lowlands of Colombia during this time period, a similar cultural sequence is present. Maize-based farming groups with predominantly plastic-decorated and utilitarian wares expanded into slope and valley locations, forming large, chiefdom polities (Reichel-Dolmatoff 1965: 117-141). The amount of related ceramic styles occurring throughout the lowlands of eastern Panama by 1 A.D. indicates this area was completely dominated by the large agriculturally based polities, including the Caribbean zone of Costa Arriba which was incorporated into this regional pattern by at least 200 A.D.

Now that there exists some evidence for a general sequence and contemporaneity of the occupations of the sites throughout the various subregions of eastern Panama, northern Colombia, and the Caribbean slopes, aspects of economic and political activities can be discussed. The lithic material excavated at PC 001 along Río Cuango provides the basis for interpreting these cultural patterns and clearly indicates the adaptive nature of this early Caribbean slope, tropical forest settlement.

CHAPTER 6

EXCAVATED LITHIC ASSEMBLAGE FROM PC 001

Introduction

Few New World lithic assemblages have been described for the moist tropics. Even less is known of manufacturing activities associated with lithic industries in these zones. Recent work with preceramic lithic assemblages from cave deposits in western Panama have demonstrated a diversity of tools and manufacturing techniques associated with forest exploitation, food processing, and woodworking industries (Ranere 1972; 1975; 1976). Lithic assemblages have also been described for archaeological complexes associated with later tropical forest riverine agricultural groups scattered throughout the moist Caribbean sector (Snarskis 1978: 89-164; Kennedy 1978: 43-56; Linares and Ranere 1971: 346-355; Reichel-Dolmatoff 1965: 124-138). The importance given to these assemblages, associated with primarily maize and tuber-based farming groups, is often secondary because of the absence of site manufacturing workshops or of the difficulty of some investigators to recognize a wide range of tools used for specific economic activities in forest clearing, food processing, woodworking, fishing, and stone tool manufacturing. The absence of good lithic sources in the tropics has led to the false assumption that lithic industries are rare in these zones. The tremendous dependence by early tropical forest groups on obtaining, processing, and reworking forest resources implies the existence of stone took kits and the establishment of specialized areas for manufacturing primarily wooden products that have long dominated the artifact inventory of tropical forest groups in the American tropics.

Lithic assemblages provide the basis for understanding economic orientations and specific settlement activities in the moist lowlands of eastern Panama. The ceramic and demographic data of prehistoric and ethnohistoric periods clearly shows domination in this wide area by related maize-based polities over a nearly 1,500 year period prior to Spanish contact. The presence of an efficient lithic industry operating within these territorial polities provided the tool and utensil equipment for obtaining and processing a diversity of forest products. In the Costa Arriba area, excavations at the site of PC 001 recovered a lithic assemblage within the context of a workshop. Tools found within this specialized site feature provide clear evidence of a local industry that operated to not only manufacture tools for surrounding settlements, but also to obtain forest resources for more regional distribution. The lithic assemblage excavated at PC 001 thus provides some understanding of local adaptation, but more importantly, it indicates an intensive effort by interior-based chiefdom polities to secure agricultural lands, timber resources, and marine products.

The excavation of the mound at the site of PC 001 was designed to determine the size of the workshop feature and distribution of lithic artifacts. Although ten centimeter levels were used, excavation of the twenty-five centimeter deep deposit exposed the cultural materials in each test unit slowly to permit mapping recognizable artifacts. Recovering spatial association of artifacts in the workshop area was more meaningful than mapping arbitrary depth levels (Map XVIII). No floor feature could be observed and spatial distribution of the lithic artifacts showed only a few meaningful associations. Some hammerstones were found associated with cores and flake concentrations and there appeared to be some provenience association between a few ground stone tools (Map XVIII). Beyond this, there were no significant spatial clusterings of artifacts. The shallowness of the deposit and the apparent homogeneous mixture indicate it was a complete single component unit with no single areas designated for specific work activities. Instead, the small, five to six meter in diameter mound seems to have been a specialized workshop where a variety of activities were conducted over the entire area.

Excavation of the workshop was extremely slow, taking at least a week of seven to eight hour days to complete one ten centimeter level. Brushes, dental tools, and ice picks were used more often than a trowel. All dirt in the deposit was screened to recover small flakes. After mapping the spatial distribution of artifacts in each level, the lithic material was removed, sorted, and counted. Miscellaneous stone, weathered rock, and large, split cobbles were left at the site. All artifacts, including cores and flakes, were carried back to my house in Playa Chiquita. These materials were washed, catalogued, drawn, and bagged.

After completion of the excavations, the entire assemblage was reexamined in laboratory facilities both in Panama City and at the University of Illinois, Urbana. A functional classification was devised using wear pattern analysis, resulting in the formation of tool, core, and flake categories. The lithic assemblage consisted of all igneous stone with the exception of four jaspar artifacts. A variety of surface wear patterns was observed, produced from activities such as battering, cutting, pounding, and scraping. Workshop tools were distinguished and consisted of those tools used exclusively inside the manufacturing area to make and repair other tools. Flake material was separated into edge tools, gross waste material, and waste repair flakes. The flake and core material provided combined information on percussion flaking techniques employed in the workshop. Finally, the combined tool assemblage recovered from PC 001 permitted hypothesizing about seasonal activities relating to agricultural forest clearing, woodworking, food processing, hunting, and fishing.

Wear categories were distinguished on the basis of naked eye and low-power miscroscopic observation. There was considerable difficulty, however, in assigning rigid categories of use wear in many cases because of the amount of erosion on the edge and edge faces of igneous flakes. On other examples, weathering made it difficult to distinguish river-worn cortex polish from human surface polishing. Nevertheless, edge and surface wear on flake and cobble tools showed distinctive use patterns associated with microfracturing and/or surface and edge polish. These two characteristics were used as primary criteria in determining wear differences. Size, shape, edge angle, and the location and size of surface area wear were used as additional criteria for establishing tool class categories.

Only recently have there been attempts to analyze edge and surface wear on lithic assemblages from tropical America (Hester and Hammond 1976; Sheets 1977). These studies deal principally with lithic tools of cryptocrystalline stone. Unfortunately, analyses of this kind have little application to the assemblage excavated at PC 001 because of the different wear characteristics produced on the recovered igneous stone assemblage. I am not aware of any serious analysis of microfracture or abrasion ware analysis on igneous stone tools, except for the limited experimental work conducted on scraper tools made from Hawaiian basalt (Price-Beggerly 1976). Ranere's research in preceramic sites of western Panama has offered useful data on flaking and manufacturing techniques associated with these early lithic assemblages (Ranere 1975: 173-209). There seems to be at least some functional relationship between the tool inventory of these early complexes in western Panama and that excavated at PC 001, primarily in reference to axes, celts, wedges, scrapers, edge-ground cobbles, and pestles used in association with other tools for a diversity of woodworking and food processing activities.

An igneous tool assemblage showing a closer relationship to that found at PC 001 has been reported from the lowland tropical zone of eastern Costa Rica (Kennedy 1978: 43-56). The range and diversity of flaked, polished, and ground stone tools in this 850 A.D. to 1400 A.D. assemblage replicate most cobble and pebble tool categories found at PC 001. The Monte Cristo stite assemblage of eastern Costa Rica was recovered from a workshop context within a maize-based riverine settlement, further linking it closely with the PC 001 lithic industry and tropical forest economic orientation. Unfortunately, the Monte Cristo assemblage has not been given any intensive wear pattern analysis useful for comparison to the PC 001 materials.

Thus, with the absence of sufficient lithic analysis studies dealing directly with igneous assemblages, an independent classification was established for the PC 001 lithic materials. The categories of excavated stone material presented below are my own, based on a separation of the assemblage using wear surface distinctions and additional attributes already mentioned. Some experimental work was performed to replicate manufacturing techniques and use patterns associated with tools made from similar igneous stone. These experiments, which will be pointed out as we proceed, proved helpful in understanding distinctions observed on the excavated tool and flake samples.

Lithic Assemblage

The excavated lithic assemblage from PC 001 contained 479 catalogued tools and cores, 1,588 waste flakes, 1,538 unmodified cobbles and pebbles, and 4,970 lumps and nodules of weathered rock (see Table 20). As mentioned, this large quantity of material consisted of igneous stone. Cobbles and pebbles with various mixtures of basalts and andasites were raw materials collected from nearby gravel deposits along Río Cuango. One quartz chunk and four jaspar flake tools were found mixed in the deposit; however, no waste flakes of these minerals were recorded, indicating their origin outside the local area. Occasional pieces of pumice stone were also found; however, these appeared completely unmodified.

In the following description, numerous tool categories will suggest important economic activities associated with both site activities and cultural settlement over the entire district. For example, flaked stone artifacts appear related to a local woodworking industry which, in part, must have served for the production of economically important hardwood tools. Other chipped stone artifacts, such as net or line weights, were clearly important marine and freshwater fishing equipment, while tools with

Table 20

Flake Material, Core Material, Miscellaneous Stone

	Pit I				Pit II			
	0-10	10-20	20-30	30-40	0-10	10-20	20-30	TOTAL
1. Scraper planes	6	6	1	0	7	3	0	23
2. Flake Scraper	4	5	1	0	3	3	0	16
3. Blades	6	2	0	0	6	3	0	17
4. Resharpening Flakes	1	2	0	0	4	3	0	13
5. Chert Flakes	0	0	0	0	2	0	0	8
6. Shatter	3	0	0	0	35	4	1	43
7. Core Flakes	98	91	29	5	149	72	6	450
8. Ends of Cobbles with Double-Faced Splits	0	16	16	2	11	21	0	85
9. Split pebbles	79	46	1	1	137	71	111	446
10. Angular Chunks	106	15	14	3	112	63	7	320
11. Unmodified Stone	483	285	139	15	52	535	29	1538
12. Fire-cracked Rock	1	0	0	0	0	4	0	5
13. Lumps & Nodules of Weathered Rock	1210	480	438	0	2372	470	0	4970
14. Blank Cores	6	0	0	0	0	0	0	6
15. Cores w/Ends Split Off	24	17	21	0	9	3	1	75
16. Cores w/Oblique-Angle Flaking	27	24	7	1	7	3	0	69
17. Polyhedral Cores	68	13	4	0	37	33	0	154
18. Ends Detatched from Oblique-Angled Cores	29	9	0	0	6	0	0	44

Table 20 (Continued)

	Pit I				Pit II			
	0-10	10-20	20-30	30-40	0-10	10-20	20-30	TOTAL
19. Ends of Cobbles with Straight-Faced Fractures	63	12	13	0	19	18	1	126
20. Ends of Cobbles with Irregular Angle Fractures	42	5	1	0	6	7	0	61

heavily battered surfaces were workshop manufacturing tools and food processing utensils. Ground stone tools were numerous in the deposit and indicate processing of a variety of wild and cultivated food products (see Table 21). The excavated assemblage thus points to important aspects of local settlement and permits reconstruction of strategies used in selective resource exploitation and tool manufacturing in this moist Caribbean zone.

Battering Tools

Five different categories of tools are included in this group. They are differentiated by wear patterns and surface damage characteristics. Some contain restricted apex wear surfaces. Others contain wear along an entire edge and apex, while still others contain areas of surface wear along rounded or flat surfaces.

Restricted-surface battering tools. Seventeen samples of this tool type were recovered in the excavated deposit. They are all made on either cobbles or pebbles and contain one battered surface, located at the apex of a projecting part of the stone (see Fig. 23). The

Table 21

Tool Measurements: Ground Stone

Catalogue no.	Length (mm.)	Width (mm.)	Thickness (mm.)	Number of ground surfaces
Manos				
A101 (Broken)	20.0	8.3	5.8	1
A324 (Broken)	6.8	5.3	3.0	1
A419 (Broken)	12.2	4.1	4.3	1
A263 (Broken)	10.2	4.5	6.8	1
A326 (Broken)	5.5	8.2	2.6	1
A359 (Broken)	10.2	10.1	4.8	1
A102 (Broken)	6.6	4.8	1.5	2
A398 (Broken)	5.3	5.1	2.0	1
A400 (Broken)	5.2	5.9	5.0	1
A384 (Broken)	5.2	8.1	3.5	1
A327 (Broken)	20.5	8.5	7.1	2
Metate				
A104 (Broken)	7.0	5.2	5.2	1
A430 (Broken)	9.1	6.5	9.4	1
A105 (Broken)	7.3	5.1	3.1	1
A329 (Broken)	17.5	9.6	6.5	3
Edge-Ground Cobble				
A439	9.0	6.6	5.0	(1.5 x 3.4)
A317 (Composite)	10.2	4.6	4.1	(1.1 x 2.1)
Ground Stone Fragments				
A175 (Broken)	8.1	5.7	3.4	(4.0 x 5.4)
A187 (Broken)	9.8	4.2	3.0	(2.4 x 6.9)
A184 (Broken)	7.1	3.0	2.6	(2.2 x 6.4)
Faceted Stone				
A451 (Broken)[a]	5.1	2.8	2.2	(1.8 x 2.4)P
A223	4.5	3.3	1.2	(3.1 x 3.9)P
A437	5.2	4.0	3.3	(2.8 x 3.1)P
A229	3.5	2.6	2.5	(1.8 x 2.2)P
A390 (Broken)	4.3	3.9	2.0	(4.0 x 3.3)P
A389 (Broken)	6.9	5.1	1.2	(3.4 x 4.2)P
A433 (Broken)	10.2	2.9	2.4	(1.7 x 5.8)P
A130	6.3	3.2	2.6	(2.2 x 3.5)P
A348 (Broken)	4.5	6.6	5.1	(3.6 x 5.8)P
A218	5.0	4.1	3.0	(3.3 x 4.4)P
A126	5.5	2.4	2.1	(1.4 x 1.7)G
A131	4.4	3.0	2.0	(3.7 x 2.2)P

Table 21 (Continued)

Catalogue no.	Length (mm.)	Width (mm.)	Thickness (mm.)	Number of ground surfaces
Faceted Stone (Cont.)				
A221	4.7	3.4	3.1	(2.5 x 3.5)P
A392	4.2	2.4	2.9	(1.6 x 3.8)G
A349 (Broken)	7.3	5.6	2.0	(2.6 x 3.6)P 2 sides
A219[a]	6.6	3.8	2.3	(3.4 x 5.8)P
A394	4.2	2.9	1.6	(3.5 x 2.3)P
A201	4.1	2.9	2.0	(3.5 x 2.2)P
A198	3.2	3.7	1.7	(3.6 x 2.5)P
A350	8.7	5.8	3.2	(6.8 x 3.6)P
A127	3.5	2.6	1.6	(2.4 x 2.4)P
A226	5.2	2.6	1.8	(3.4 x 2.2)P
A388	10.5	6.7	2.1	(10.0 x 6.0)P
A391	10.5	4.1	2.5	(3.5 x 8.0)G
A151	7.6	2.3	1.6	(7.0 x 2.1)P
A365	5.2	3.5	2.3	(4.4 x 3.0)P
A220	5.1	4.0	2.8	(2.2 x 2.7)P
A434	6.3	2.9	1.9	(5.4 x 2.6)P
A125	4.3	2.0	1.0	(3.7 x 1.5)P
A429 (Broken)	8.5	7.5	5.2	(5.5 x 8.2)P
A438 (Broken	7.8	8.1	3.5	(6.2 x 6.2)P
A222	5.8	3.5	3.0	(3.2 x 3.6)P
A228	4.8	4.0	2.6	(3.4 x 4.4)P
A396 (Broken)	5.5	3.7	1.4	(3.7 x 4.1)P
A451 (Broken)[b]	5.4	3.6	1.3	(3.2 x 4.9)P
A444	10.3	1.9	1.9	(1.8 x 3.4)P
A202	4.1	2.8	2.5	(1.3 x 1.9)P
A376	3.5	3.0	2.2	(1.0 x 1.6)P
				(1.1 x 2.3)P
A135	2.9	2.6	1.4	(2.3 x 2.5)P
A224	3.4	2.5	1.8	(2.2 x 1.3)P
A134	4.9	2.4	1.5	(2.2 x 4.7)P
A219 (Broken)[b]	3.1	3.0	1.1	(1.7 x 2.7)P
A227	4.3	2.6	2.3	(2.3 x 3.6)P
A124	3.2	2.1	1.0	(1.9 x 2.8)P
A132	4.0	2.3	1.4	(1.9 x 3.3)G
Scored Stone				
A305	17.3	6.8	5.3	(4.2 x .5)
A204	10.3	2.5	3.0	(2.0 x .3)

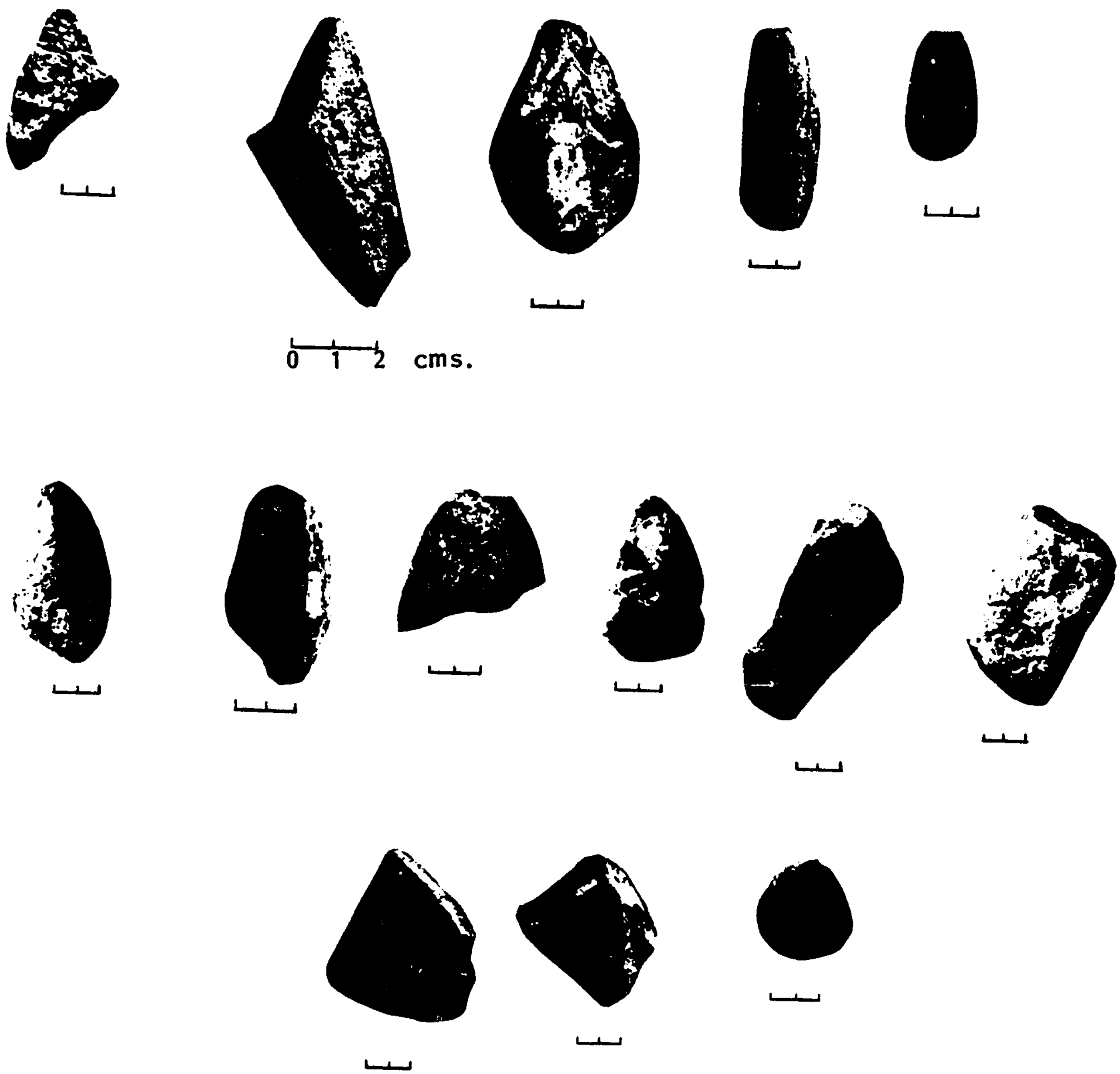


Figure 23. Restricted-Surface Battering Tools. Battering is along the apex of the tools, shown at the top of each example.

battering on these apex surfaces ranges from six millimeters to twenty-five millimeters in diameter, with the battering wear occurring in a circular pattern on the apex or projected use surface (see Table 22). Most tools are hand-size cobbles but some are smaller and finger-size. The battered surfaces contain small chipping scars and crushed, hammered-down appearances. The restricted area of battering on these tools indicates use as hammerstones for controlled, precise flaking. They appear to be a special variety of hammerstone used for manufacturing other stone artifacts found in the deposit, such as fishing weights. Excavated examples of fishing weights contain small, side-pecked notches made along the middle portion of pebbles (see Fig. 24). Flaking required a hammerstone with a projected and restricted area surface to peck notches without breaking the small pebbles. In addition to notching pebbles for fishing weights, these hamerstones may have been used for resharpening other edge-cutting tools. A total of fifteen examples of this tool form were found.

Tools with edge battering. A variant of the above-described hammerstone tool is one containing heavy wear from the pointed apex down along one extending edge (Fig. 25). Twenty-four examples of this tool variety were found. The principal striking surface on these tools was the edge which is rounded from heavy battering. Two classes are distinguished: first, a restricted-edge tool (Fig. 25, a-m); and second, a wide-edge tool (Fig. 25, n-s). Examples of tools with straight and curved edges were found in both classes. Many tools were made on cobble-sized stones modified by removing large oblique-angled flakes to produce a projecting apex and edge surface. In some cases, it seems old discarded

Table 22

Tool Measurements: Battered Cobbles and Pebbles

Catalogue no.	Length (mm.)	Width (mm.)	Thickness (mm.)	Wear surface size
a. Restricted-Surface Battering Tools				
A367	5.0	2.8	1.4	1.2
A361	6.9	2.8	2.8	.6
A404	6.6	3.8	3.8	2.0
A217	7.8	2.8	2.3	1.6
A183	4.5 (B)	5.5	2.5	1.8
A214	6.4	3.6	2.4	1.6
A364	6.1	5.2	1.9	1.9
A319	10.4	6.6	5.3	1.7
A156	11.4	7.9	4.2	2.5
A318	7.7	4.2	4.3	1.9
A289	8.6	5.1	4.4	1.6
A299	8.6	5.1	4.4	1.8
A343	7.6	7.0	3.7	1.1
A415	8.1	6.2	5.7	2.0
A342	12.5	8.4	6.0	2.4
A403	4.3	3.6	2.8	1.6
A341	6.9	5.3	2.8	1.4
b. Tools with Edge Battering				
A446	10.7	6.6	5.3	3.7 x 1.8
A421	8.5	5.7	4.0	3.1 x 1.4
A316	8.0	6.6	5.1	2.9 x 1.6
A410	13.6	8.3	5.2	6.6 x 1.9
A294	12.2	7.0	5.5	6.3 x 1.4
A291	10.9	4.9	5.5	3.7 x 2.4
A297	14.3	6.2	5.5	3.6 x 1.6
A296	7.9	7.6	4.5	3.3 x 1.4
A315	7.8	5.2	3.5	4.4 x 1.0
A425	12.4	4.4	3.1	1.2 x 1.2
A420	9.9	6.7	3.6	4.1 x 1.3
A295	9.8	7.3	4.2	3.0 x 1.3
A154	7.1	4.9	2.4	4.0 x 1.3
c. Tools with Edge Battering (Wide-edge)				
A408	9.3	5.7	6.3	6.7 x 1.3
A123	6.5	7.9	7.0	11.4 x 3.1
A169	5.8	8.0	7.2	5.2 x 2.2
A356	8.5	5.8	2.8	7.7 x 2.0
A366	5.8	3.7	2.0	3.0 x 1.5
A292	6.8	4.9	3.5	2.7 x 2.0
A372	6.5	5.0	2.2	6.5 x 1.4

Table 22 (Continued)

Catalogue no.	Length (mm.)	Width (mm.)	Thickness (mm.)	Wear surface size
c. Tools with Edge Battering (Wide-edge) (Cont.)				
A414	10.0	9.2	4.7	8.8 x 3.1
A158	9.1	11.0	6.3	6.7 x 1.8
A287	9.3	8.9	8.6	4.0 x 1.3
d. Flat Split-faced Battering Cobbles				
A363	12.7	5.6	3.9	3.6 x 2.2
A407	12.5	6.0	4.5	4.7 x 5.7
A328	11.4	6.4	4.2	4.4 x 6.3
A406	8.3	9.9	3.1	9.6 x 3.6
A306	10.3	4.7	4.0	3.9 x 2.7
A193a	8.1	2.4	3.4	2.7 x 2.4
e. Oval Pebble Battering Tools (Class 1)				
A314	6.4	4.1	2.4	4.3 x 2.2
A146	5.0	4.3	3.2	4.7 x 2.6
A338	9.5	4.3	3.5	9.0 x 3.1
A157	8.3	6.9	5.5	7.8 x 4.4
A182	5.8	4.7	5.8	19.9 x 3.8
A337	4.4	3.8	4.4	10.5 x 2.8
f. Oval Pebble Battering Tools (Class 2)				
A387	6.5	4.7	6.3	2.0 x 2.3
A386	5.7	4.1	4.1	1.0 x 1.5
A385	4.7	4.7	4.0	1.3 x 1.1
A325	6.6	7.2	7.0	3.6 x 1.6
g. Anvils				
A427	14.9	12.9	4.5	11.9 x 10.7
A359	16.2	9.3	3.3	10.6 x 7.2
A260	10.9	8.0	3.2	8.8 x 6.2
A257b	8.4	6.4	3.3	4.0 x 2.5
A258	6.9	5.3	2.7	1.8 x 1.8
A286	10.7	8.4	6.5	5.3 x 4.5

Figure 24. Fishing Weights.

Figure 24 (continued). Fishing Weights.

Figure 25. Tools with Restricted-Edge Battering. Battering extends from the pointed apex down along one edge. Examples a-m represent restricted-edge tools, and examples n-s represent wide-edge tools.

cobble cores and scraper planes were resharpened for use as an edge-battering tool.

The function of this category of battering tools appears related to the apex-battered hammerstone. Each has heavy crushed wear surfaces along restricted apex faces. On the second hammerstone variety, this wear continues down one projecting edge. The similar pattern of wear contained on the edge-battered hammerstones suggests they were also an important class of flaking tools. The longer, often widened, battered edge surface indicates an instrument used for secondary and retouch flaking. More than simply repair tools for sharpening work edges on old tools, this large class of edge-battered pebbles is the principal form of hammerstone used at PC 001 for flake tool manufacturing.

Oval pebble battering tools. Ten examples of this tool variety were found and separated into two classes. The first class is oval-shaped pebbles with heavy battering along the sides (Fig. 26, h-j). The crushed and battered surfaces of these pebble tools are similar to the two tool categories of hammerstones, indicating similar function. The second class of round pebble tools contain one flat face with pecked or gouged cavities. This wear pattern may be the result of use as a nutting stone (Fig. 26, k-n).

Flat, split-faced battering cobbles. Six examples of this tool type were recovered (Fig. 26, a-d). This category of tool consists of elongated cobbles, triangular-shape in cross-section. They have one end portion split off at a straight angle. The straight-faced split surfaces on these tools were clearly used for some pounding activity since the small ridges and uneven surfaces on the flat split-faces have been worn down gently to

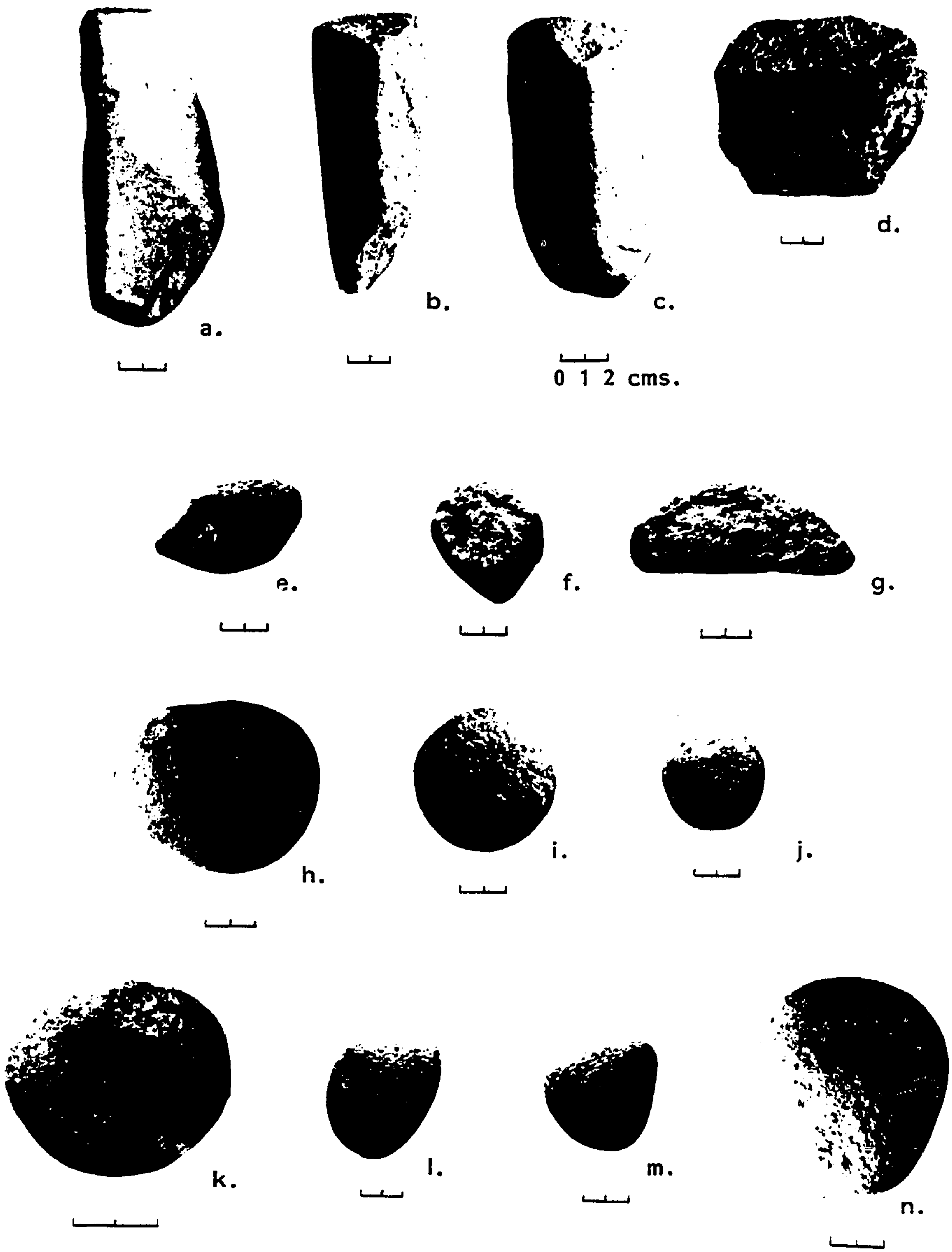


Figure 26. Flat, Split-Faced Battering Cobbles (a-g); Oval Pebble Battering Tools (h-n).

a relatively even, smooth surface. In a number of cases, this wear pattern continues up the sides of the cobble tool from the striking platform. These form and wear characteristics suggest use as pestle tools for pounding foodstuffs. The ground, matte-like gloss of the wear surfaces also indicates use with a substance softer than stone but hard enough to wear down these split-faced surfaces. Since this water continues up from the split face along the sides of the tool, they probably were used with mortars. The polished wear pattern and the absence of shoulders on the pebble tools indicate the mortars were probably wooden, not stone.

Anvils. Six examples of anvils were recovered from the excavated deposit (Fig. 27). These tools were used in conjunction with the above described hammerstones. All contain pecked and battered surfaces. Five of the anvils are rectangular cobble forms with two flat faces. One oval cobble with face battering was found with the wear concentrated in a restricted area of the face, forming a pecked depression (Fig. 27). This wear may be the result of use as a nutting stone rather than as an anvil.

Fishing Weights

These artifacts are generally oval and elongated in shape. They consist of river pebbles with opposing pecked notches in the midsection of the long sides. The concave notches are made deep and roughly pecked. The notches were left roughly pecked presumably so a line could be securely tied around the pebble. A total of sixty-nine examples were excavated in the two test units and were found widely distributed throughout the deposit (Fig. 24).

The weights of these sinkers ranged from five grams to 306 grams, with the majority clustering in the one-half ounce to three ounce weight

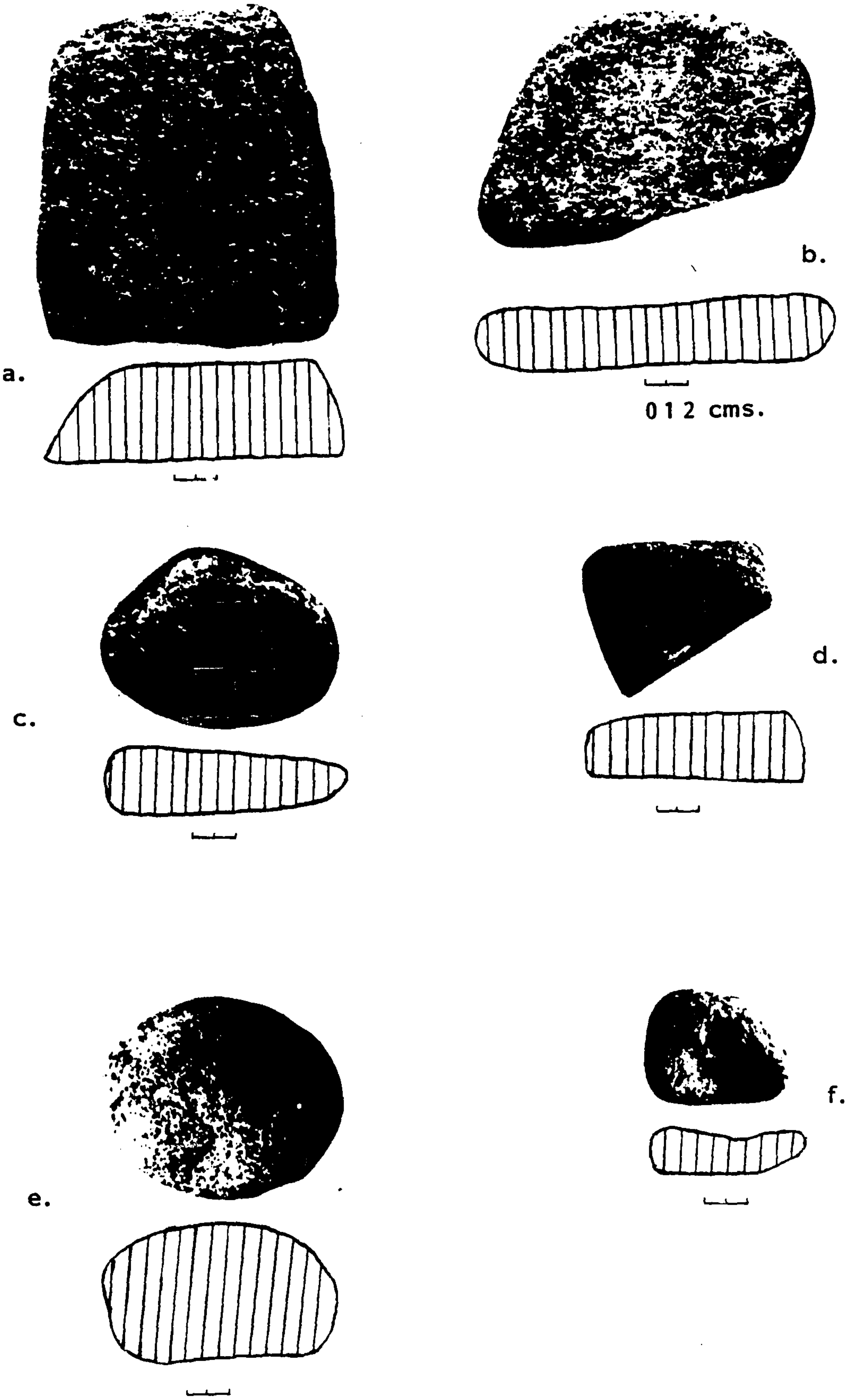


Figure 27. Anvils.

range (forty-six examples; Table 23). Heavier sinkers made with larger pebbles averaged between eighty and ninety grams (a total of twenty-one sinkers ranging from 60 grams to 128 grams). Two sinkers with heavier weights were found in the excavated deposit, one weighing 193 grams and another 306 grams. It would appear from this weight distribution there was selection for primarily two weight classes, those weighing below three ounces and those weighing above three ounces. Experiments performed in the local rivers and bay areas of the coast with replicated pebble weights confirmed this separation. Sinkers below three ounces were too light to sink monofilament line to a fifty foot depth. Beyond this, the deeper the water, the heavier the weight had to be. In the freshwater pool areas of Río Cuango, a three ounce weight was adequate in dropping line ten to fifteen feet to the bottom. Smaller weights worked correspondingly well in the shallower pools.

All weights cannot be assumed to represent line sinkers. Weighted nets may have also been used in freshwater and marine localities. Modern Black and Choco residents of the coast use weighted throw nets in shallow marine and freshwater area to capture sardines and similar-sized fish. These fish are used as live bait for bay fishing with line and sinker. One these five to six-foot throw nets, it is necessary for the attached weights to be uniform in size and weight to facilitate throwing the net and its quick and uniform sinking in shallow waters. The excavated fishing weight examples from PC 001 contain considerable size variation in both weight divisions (Table 23), however, suggesting most functioned as line weights instead of net weights. The quantity of these manufactured sinkers indicate fishing was an important activity at the site, both in freshwater and marine locations.

Table 23

Tool Measurements: Fishing Weights

Artifact no.	Weight (grams)	Length (mm.)	Width (mm.)	Thickness (mm.)
A441 (Broken)	3.7	1.9	2.4	.6
A187	7.0	3.1	2.0	1.2
A374 (Broken)	7.4	2.1	2.3	1.3
A321 (Broken)	7.5	2.7	2.1	.9
A375 (Broken)	7.4	2.9	2.0	1.2
A335	8.0	3.3	2.1	.8
A121	8.4	3.9	2.0	.6
A377	9.0	3.4	1.9	1.0
A111 (Broken)	12.0	3.7	2.2	1.1
A119	13.0	4.2	2.0	1.1
A213	13.5	3.7	2.2	1.3
A373	13.7	3.1	2.4	1.0
A162	14.0	5.2	1.9	1.0
A215	14.2	3.5	2.2	1.2
A333	14.2	3.8	2.8	1.0
A334	14.6	4.6	3.0	1.5
A353	15.2	3.9	2.2	1.3
A211	15.2	3.4	2.8	1.2
A212	15.5	3.5	2.4	1.3
A206 (Broken)	15.9	4.9	2.3	1.2
A209	16.2	3.1	2.5	1.4
A113	18.1	4.7	2.6	1.2
A181	18.0	4.9	3.2	.9
A190	18.8	4.2	2.2	1.2
A120	19.0	5.1	2.3	1.3
A355	19.1	4.4	2.9	1.2
A452	19.9	4.5n	2.2	1.4
A110	22.4	4.4	2.6	1.4
A112	22.6	4.9	2.2	1.7
A423	23.3	5.5	2.5	1.5
A160	24.4	4.5	3.8	1.1
A188	24.6	5.5	2.5	1.2
A109	25.1	4.5	2.2	1.6
A117	25.6	4.6	2.6	1.6
A180	26.0	4.9	3.0	1.3
A118	17.6	4.2	2.8	1.6
A205	30.2	4.4	3.2	1.7
A207	30.2	4.5	2.8	2.3
A347 (Broken)	30.4	4.4	3.1	1.8
A453	32.2	5.8	4.3	.9
A169	34.0	5.3	3.3	2.2
A440 (Broken)	37.1	4.6	4.5	1.9
A198	37.4	4.3	3.3	1.9
A182 (Broken)	39.7	5.7	4.2	1.4

Table 23 (Continued)

Artifact no.	Weight (grams)	Length (mm.)	Width (mm.)	Thickness (mm.)
A405	43.3	4.9	4.5	1.9
A443	48.0	6.6	4.5	2.0
A454	49.1	4.6	3.5	2.5
A431	54.0	6.6	3.3	1.8
A371	58.1	5.7	3.7	1.8
A177	61.2	5.1	3.9	2.6
A161 (Broken)	65.4	5.3	4.6	1.8
A203	67.7	7.7	3.8	1.5
A418	68.0	5.9	4.8m	1.8
A368	70.0	6.2	3.8	2.1
A176	70.6	5.3	4.4	2.5
A153	82.7	6.6	5.4	2.8
A149	82.9	6.3	4.3	2.1
A115	88.7	6.7	3.9	2.5
A179	88.7	6.5	4.9	1.8
A178 (Broken)	89.1	6.3	4.9	2.1
A360	89.8	7.0	4.4	3.1
A208	91.5	6.4	5.5	3.3
A216 (Broken)	94.9	6.4	5.1	3.0
A152	109.8	7.0	5.5	2.1
A116	113.7	7.5	4.5	2.2
Surface	117.2	7.8	6.4	1.8
A114	128.1	7.6	5.3	2.2
A417	128.3	7.5	5.8	2.1
A357	306.4	9.8	6.8	2.8
A424	196.0	10.0	7.0	2.0

The larger, seven to twelve ounce sinkers may represent open-sea net weights for turtle fishing (<u>Chelonia</u>, <u>Eretmochelys</u>), similar to the seven to twelve ounce stone weights presently used by modern Black turtle fishermen of the coast.

An important aspect of these fishing weights is their relationship to the lithic industry at the site. As mentioned, hammerstones, excavated from the PC 001 deposit, were used to manufacture the fishing weights. Specifically, apex hammerstones, or restricted battering tools, seem to be the specialized instruments used to peck notches on the pebble sinkers. Much of the small chipping waste recovered in the excavated deposit probably represents waste debris from the notched fishing weights, indicating the manufacture of these sinkers in the workshop area of PC 001. Because of the quantity of these fishing weights recovered in the deposit, their manufacture at PC 001 workshop appears to have been an important activity and they were probably made for distribution throughout the habitation area.

Ground Stone Tools

This group of artifacts consists of pebbles and cobbles with ground surfaces. All excavated examples are igneous stone with dense amounts of feldspar, quartz, and andasite inclusions. Five classes of tools have been separated within this large artifact category. Surface wear on these artifacts has been produced by a variety of economic activities and the tools contain wear patterns ranging from ground to highly polished surfaces.

Manos. Eleven examples were recovered in the excavated deposit. All are incomplete, consisting mainly of end fragments of various sizes (Figs. 28, a-c; 30, h-k). The most common example was a rectangular, tabular-shaped form with one flat grinding surface. One other mano fragment had two flat grinding faces. Another excavated form was a long, round-sided cobble with two grinding surfaces (Fig. 28, a). This latter mano form is similar to the roller manos used by present-day Terraba groups of the interior Caribbean riverine zones of Bocas del Toro (Torres de Arauz 1964: 16-37; Gorden 1968: 14) and Boruca of Pacific Costa Rica (Stone 1949: 8).

Most of the mano examples are made on basalt cobbles with heavy amounts of feldspar and quartz particles, while others are made on more

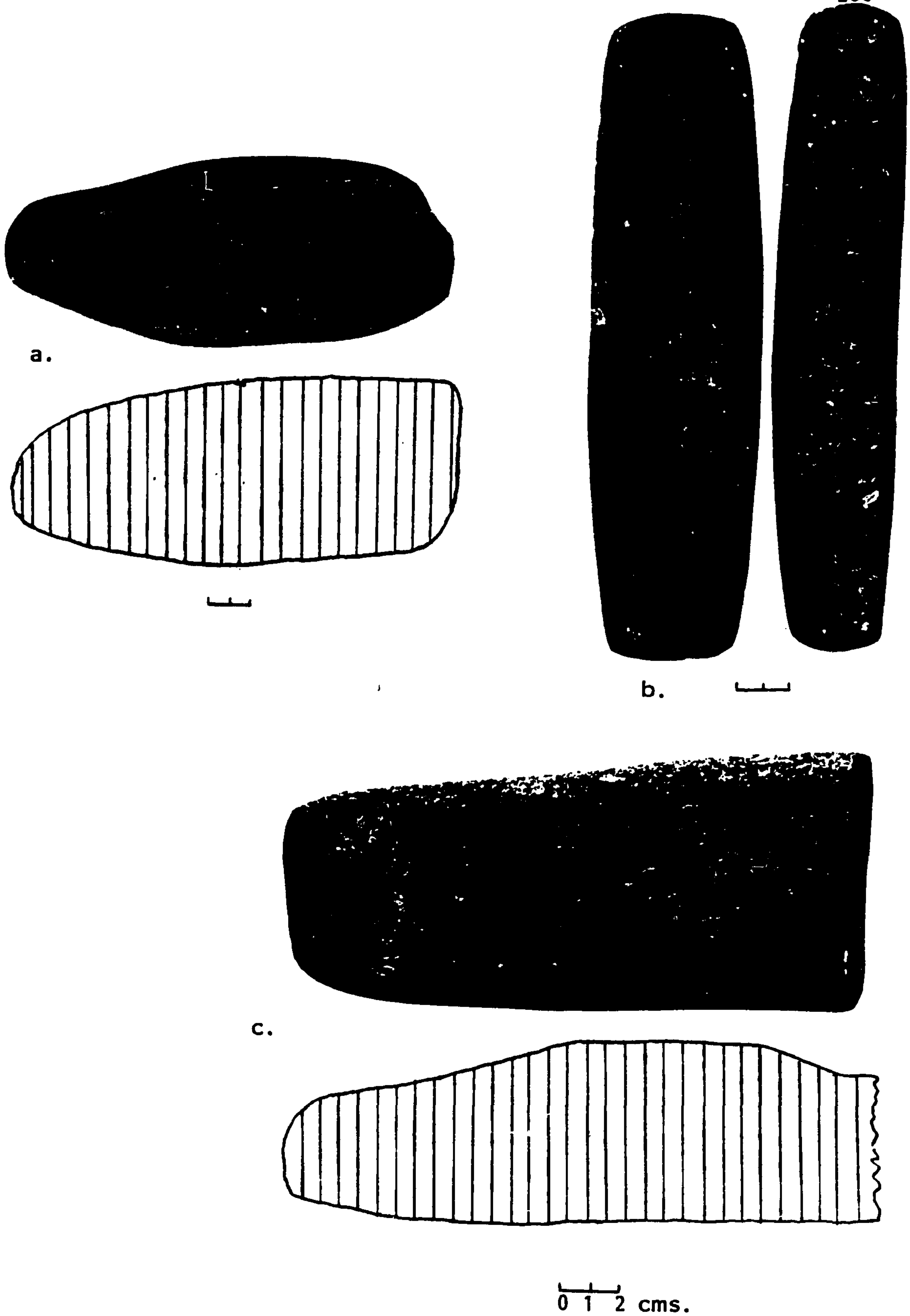


Figure 28. Manos. Examples a and c were excavated at PC 001 and example b was recovered from the surface of a Río Terrin site (also see Fig. 30).

porous, granular igneous stone. The wear surfaces have smooth, slightly dulled, glossed appearances with very light, parallel striations. The grinding faces typically are ground flat, or round in the case of the roller mano example, and they gradually dislodge small, circular feldspar and quartz particles along the wear surfaces. The loss of these particles results in pock holes. Small scrape trails also result from particles being dragged out of position. This loan of granular particles from the grinding faces gives the artifacts a porous appearance, resulting in an efficient, self-sharpening utensil.

A number of the manos have heavy flake scars around the broken ends, indicating reuse in some cases as secondary cores.

Metates. Four incomplete fragments of metates were recovered from the two excavated units at PC 002 (Fig. 29). They have two different forms: (a) a three-legged slab form and (b) a shallow basin boulder form. The single fragment of the first metate form consists of a portion of one leg with a portion of the slightly convex grinding surface. The second metate form was represented by three small fragments, each containing portions of a grinding face and adjacent unmodified rock. Three fragments of the boulder form have more convex wear surfaces than the three-legged form. The three-legged form was pecked into shape with porous igneous stone. The boulder form was made of dense particle basalt, unmodified except for the grinding surface.

The relative absence of both mano and metates on the surveyed sites in the district is curious given the apparent floodplain locations of the settlements and the clear evidence for maize cultivation indicated by the excavated manos and metates at PC 001. Probably one principal reason for

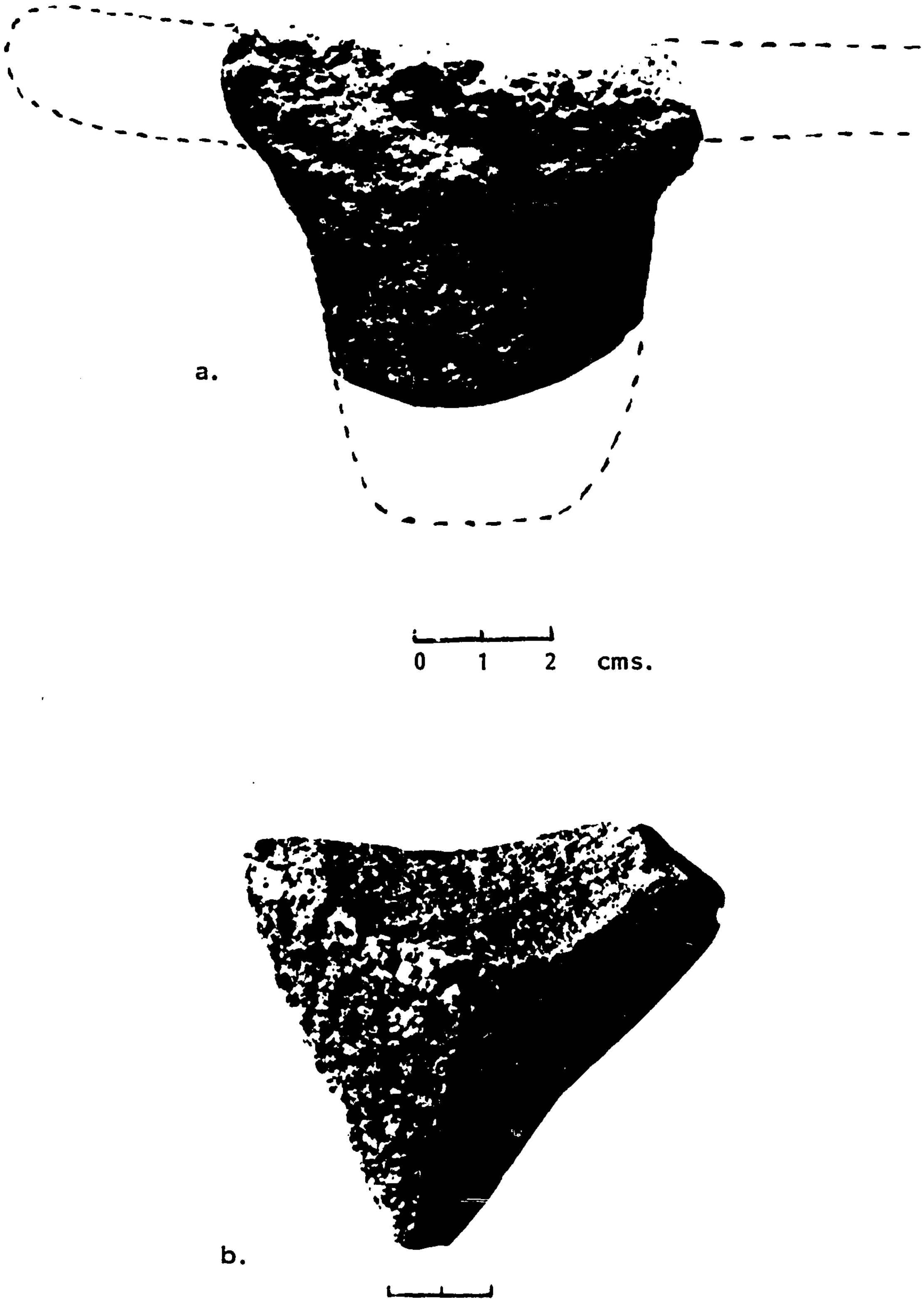


Figure 29. Metates. Excavated fragments from PC 001.

their absence is the removal of these stone tools by Black village farmers who clear and cultivate the lowland slope zones where archaeological sites are located. As mentioned, swidden farming by local Blacks has continued for the past four hundred years in this area, and because of the need for utensils in processing their cultivated corn, Black farmers have removed these artifacts from archaeological site locations.

At a site located near PC 001 (PC 009), surface survey located two complete examples of boulder metates with the same form as the three excavated fragments from PC 001. One example of a deeply concave stone mortar was also found on the surface of this nearby site (Figs.9 and 32). No examples of mortars were found in the excavated deposit at PC 001 or on any other site surveyed in the district. I suspect stone mortars were rare utensils in the prehsitoric district settlements and were made of wood. The flat, split-faced battered stone pestles excavated at PC 001 (Fig. 27 a-d) have wear patterns more characteristic of use with wooden mortars than with stone ones.

Faceted stone. A total of forty-five pebbles and small cobbles with one or more faceted surfaces were found in the excavational units (Fig. 30, l-u). Most examples were small, rounded river pebbles with the faceted surface occurring on one, naturally flat side. The surfaces with the wear facets were generally highly polished or, in some cases, ground with some evidence of light striations. All the faceted stone examples were igneous stones with various percentages of feldspars, quartz, and andasites (Table 21).

Experiments performed with similarly sized, igneous pebbles closely replicated the wear patterns shown on the archaeological examples. Celt

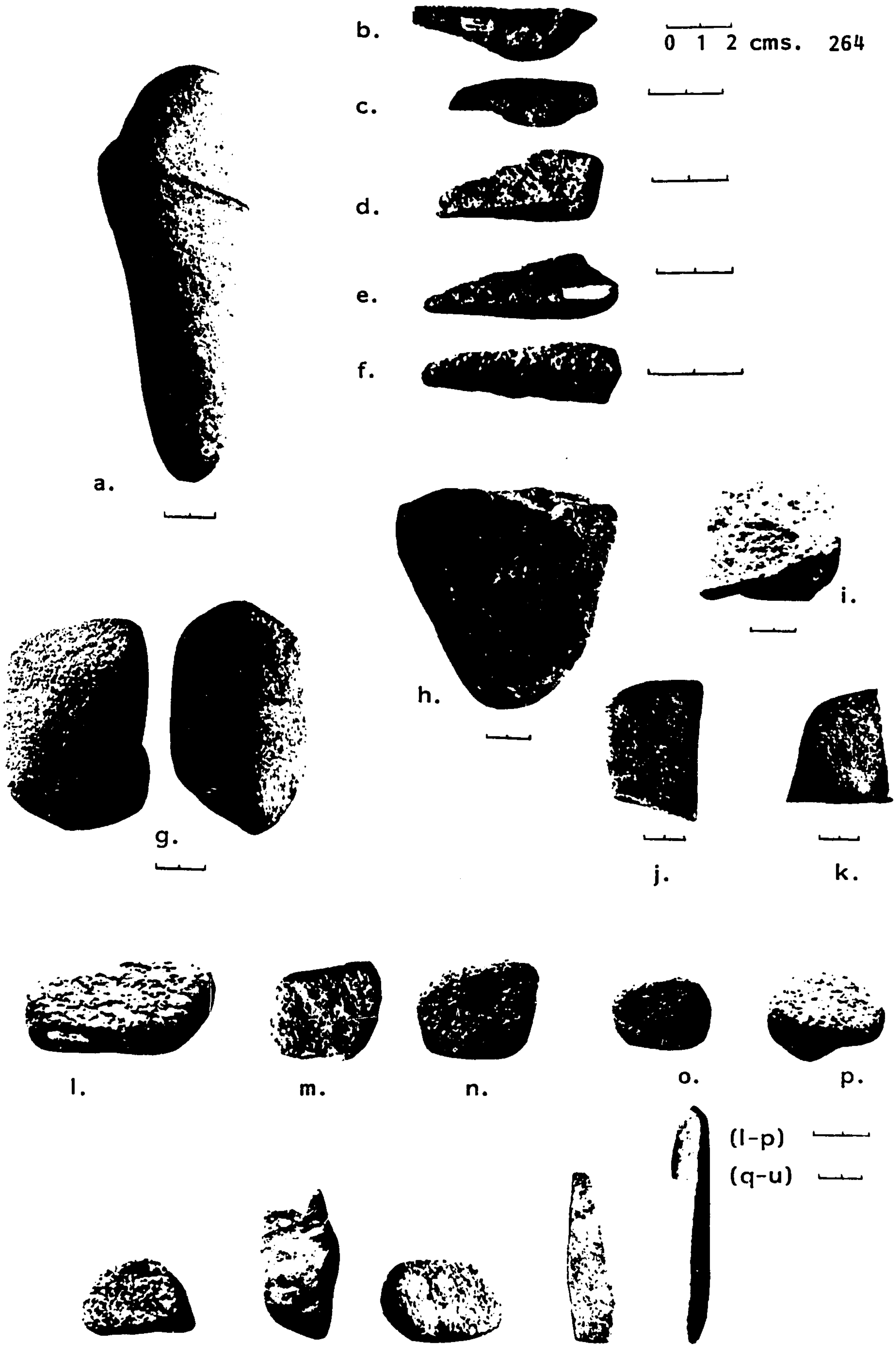


Figure 30. Scored Stone (a), Ground Basalt Points (b-f), Edge Ground Cobble (g), Mano Fragments (h-k), Faceted Stone (l-u).

and axe forms of basalt were flaked down to size and polished to obtain a cutting edge and smooth body surface. The polishing stones efficiently shaped the celt and axe forms. As the polishing stone smoothed the surfaces and edge of these tools, they continually shaped a smooth, polished surface facet on the pebbles. After the facet surface on the pebble tools smoothed, the polishing or abrasive action on the celt diminished and a new pebble had to be used. The results of these experiments indicate the majority of the excavated examples of faceted stone represent polishing tools for the manufacturing of celts, axes, and chisels. The relatively high number of faceted stone examples found in the excavational units suggests these tools were discarded after abrasive efficiency was lost.

Edge-ground cobbles. Two examples of these tools were found in the excavation units (Fig. 30, g). Each are made on small, well-rounded, river cobbles. The angles of the narrow, ground surfaces range from thirty to forty degrees (Table 21). These tools, made on igneous stone, appear to have some specialized function because of the small size of the wear facets. Possibly they are related to the pebble polishing tools already described since the facets on the edge-ground cobbles have very similar polish wear. This tool occurred in early preceramic and ceramic deposits from Pacific Panama area sites although its function is not clear (Ranere 1976: 113-114; Willey and McGimsey 1954).

Ranere has found the same tool at the excavated preceramic cave deposit of Aguadulce rock shelter in the Río Chiriqui area of western Panama. Edge-ground cobbles frequently occur in the first defined Talamanca phase (5000 B.C. to 3000 B.C.) of this sequence and continue through the second phase of Boquete (3000 B.C. to 500 B.C.). Ranere speculates the tool was used for preparing cultivated tubers. Identical tools have been recovered at the coastal site of Cerro Mangote (Willey and McGimsey 1954; Ranere and McCarty 1975). These artifacts were also found at Sitio Piti in Volcan highlands, associated with a well-established agricultural complex of maize, beans, and tree-fruit crops (Linares, Sheets, and Rosenthal 1975: 142). Linares has suggested they were used as mashing stones for Xanthosoma (Linares, Sheets, and Rosenthal 1975: 142).

Scored stone. Two examples were found containing similar scoring marks on small river cobbles (Fig. 31, a). The scoring marks are deep, narrow cuts, perpendicular to the length and stretch the width of each cobble. Only one scoring mark is contained on each cobble. These scoring marks appear to have been made by rubbing a thin stone along the surface of the cobbles. Five examples of basalt points were found in the excavated deposit (Fig. 30, b-f) with ground down, rounded edges, possibly indicating their sharpening on these cobble scored stones.

Celts, axes, wedges, and chisels. Two examples of celt tools were found (Fig. 31, a-d). Both have a tabular shape with a well-rounded, symmetrical edge. One of the long tabular sides on both examples is flat, while the other side is concave. Both examples have highly polished edges with the polished surface extending back from the edge approximately one-fifth of the length of the tool. Each of the two celt examples have well-charpened edges containing little evidence of wear damage. Both are finely ground, suggesting they were being repaired at the workshop sites. The two celt examples range in size from five centimeters to approximately

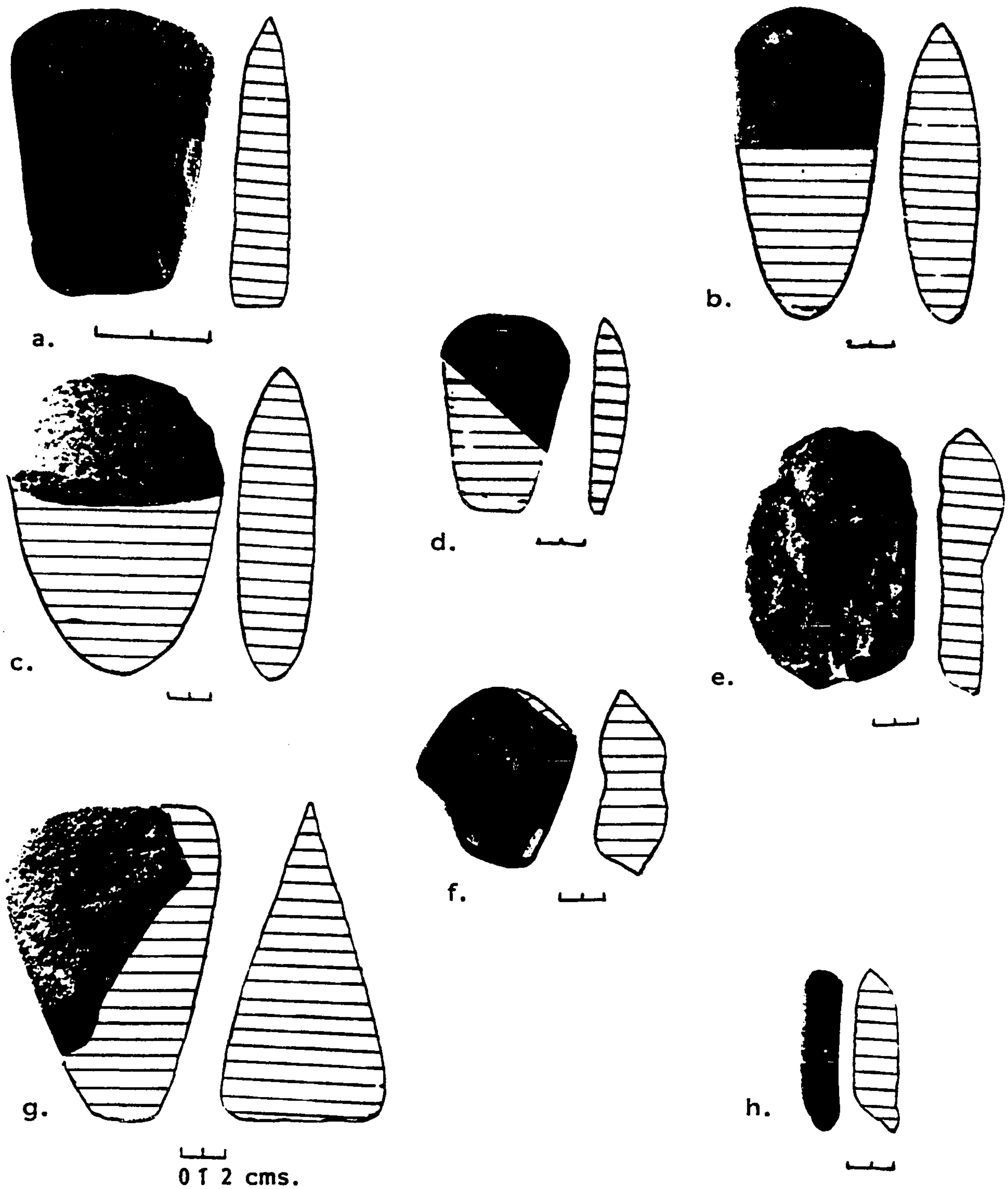


Figure 31. Celts (a,d), Axes (b,c), Wedges (e,g), Chisel (h), and Grooved Axe or Macana (f). All excavated from site FC 001.

nine centimeters long, with the larger excavated example (Fig. 31, a) having only about half of its original form. The flat butt on the smaller celt form (Fig. 31, d), suggests its additional use as a wedge. Polish on the butt surface may have resulted from use with a wood mallet. In addition to the polish, small, stepped flakes are removed from the butt edges further indicating this activity. Possibly, the tool was also used as a handheld celt without hafting to a handle.

The larger celt form appears to have been broken through use. The breakage is in the mid portion of the tool, the area where most pressure would be focused if the tool were hafted to a handle.

The celts were found in the first ten centimeters of the excavated deposit. One was found in each of the two test pits. Each of the celt tools was located among concentrated lithic and ceramic debris with no particular association to other tools.

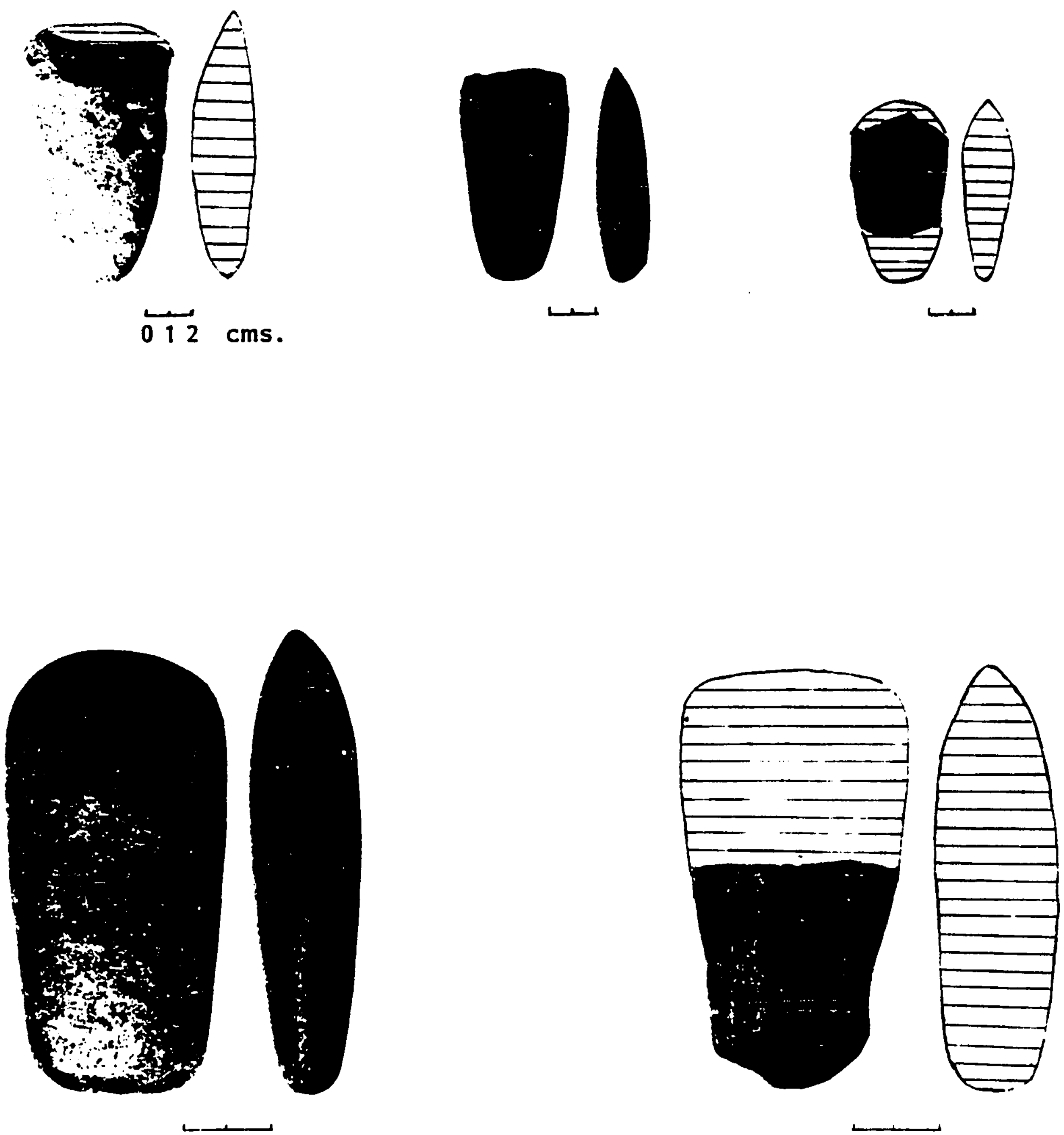
The celts described here appear to have been important tools principally used for shaping wood products. The carefully ground, symmetrical edges and the relatively narrow body and edge thickness suggest use primarily as finishing tools for wood rather than as cutting or splitting tools. The highly polished edges contain small chipping scars clearly indicating this woodworking function.

Two axe forms were found in the excavated deposit (Fig. 31, b-c). These are distinguished from the celts by their more oval, symmetrical cross-section, larger size, and generally rounded, convext edge shape. Axes can be distinguished from the relatively thin, small-sized, and generally straight-edge celt tools. But like celts, axes are tabular in form and contain highly ground and polished surfaces. The axes also show evidence of resharpening, containing a ground and polished surface over old edge chipping scars.

Each of the excavated axes was found with the butt halves missing. Breakage at this section of the tool indicates heavy use, probably associated with timbering activities. Edge damage on the excavated axes is a series of stepped flake scars. One of the broken, excavated axe examples (Fig. 31, c) has heavy battering along the cutting edge indicating its reuse as a hammerstone.

Similar axe forms were found along the surface of other surveyed sites in the district (Figs. 9 and 32). These axe forms have the same tabular shape and highly polised surfaces as those excavated from PC 001. In addition, all have rounded edges with considerable damage scars along the edges. The excavated axe examples from PC 001 are identical in shape to the axes found on the surfaces of the nearby sites, sharing the same tabular construction, concave edges, and generally oval cross-sections. Both the excavated and the survey-collected axe examples have the same shape, a wide top portion starting at the edge and narrowing down to the smaller, rounded butt portion. This triangular-like form appears associated with hafting. Many of the axes collected on the surfaces of surveyed sites were top and bottom portions, broken in the middle of the tool. Breakage at this section of the tool indicates hafting to a handle. Improper striking force, concentrated at the middle of the axe, caused breakage where the tool was hafted to a handle. Similar edge and broken sections on the axes indicate their importance as timbering tools used to girdle trees for clearing and obtaining hardwoods.

Three examples of wedges were found in the excavated deposit (Fig. 31, e-g). One of these (Fig. 31, e) has a rounded edge and is



Figures 32. Celt and Axe Forms. These examples were found on surveyed sites in the district of Santa Isabel (also see Fig. 9, p. 182).

bifacially flaked with a flat, rectangular butt portion. This tool contains considerable luster-like polish on the higher portions of the two flat faces above the edge. The form and polished surfaces on this tool indicate its use primarily as a wedge. Another excavated example (Fig. 31, g) is celt-like in form with a triangular cross-section. The top portion of the tool is symmetrical, beginning with a straight, ground edge that angles out twenty degrees on each side. This tool is highly weathered with the surfaces badly eroded. It, however, maintains its original form. Unfortunately, the butt portion of the tool is missing.

One other tool included in this large celt-axe category is a chisel form excavated in the PC 001 deposits with the celt, axe, and wedge tools described above. This tool (Fig. 31, h) is made on a small elongated pebble and ground on one end to form an edge. The edge shows considerable wear, having a rounded, worn surface.

Finally, another excavated tool in this category is a celt-like form containing a ground-out groove completely around the artifact. The circular groove indicates it was hafted to a handle (Fig. 31, f). The tool has two ground faces terminating together to form the edge. However, the edge face shape on this artifact is peculiar. On one side of the tool, the edge face has a high ridge perpendicular to the edge. This ridge divides the edge and its face into two steep-sided parts with a projecting apex in the middle. The function of this tool is not clear from its shape or wear patterns. Two large flake scars are seen on the underside face of the edge, possibly indicating the tool was still being shaped. Perhaps this is not a tool at all, but a Macaraca, a celt-like war club used during battle by sixteenth-century indigenous Cuevan groups of eastern Panama

(Oviedo y Valdes 1853: Tomo III, Ch. 26; Martire 1912: Vol. I, Dec. III, Bk. II: 301; Andagoya 1945: 395-396; Mendez 1847: 211).

Flake Material

All of the flake material recovered from the two excavational units at PC 001 consists of small tools (56 examples), waste flakes (1,370 examples), and cores (304 examples). This material consisted entirely of igneous stone with the exception of three jaspar flake tools, one small jasper waste flake, one pebble chunk of agate, and another chunk of quartz.

Since the flake tools, waste flakes, and cores are related in this assemblage, both manufacturing procedures and functional classes of flake material could be distinguished. Excavated flakes and flake tools were found scattered heavily throughout the deposit as were igneous cobble cores. The flake tools were in various stages of manufacture, repair, and reuse. In many cases, waste flakes could be associated to either core or tool forms. Small flakes removed during tool repair were recovered.

Three categories of excavated flake tools were found, including scraper planes, flake scrapers, and blades. The majority of waste flakes were primary core flakes, split pebbles, angular chunks, and ends of cobbles. Closely related groups of flakes from manufacturing and repair activities are small scatter flakes and resharpening flakes. Finally, four categories of cores were distinguished in the excavated deposit, including examples of unmodified blank forms.

Flake tools. These tools were taken off igneous cobble cores, with the exception of two jasper blades and one possible spokeshaver.

The jasper tools represent imports into this assemblage. Collectively, these flake tools indicate both woodworking activities and possibly butchering activities on the site. A basalt flake taken freshly off a core has excellent cutting efficiency, although its edge rapidly dulls. From the quantity of dulled and damaged flake tools made from basalt cores in the deposit, it appears there was rapid artifact turnover. Only occasional repair and retouch were noted on these flake tools. The pattern seems to be replacement with a new tool and discard of the old tool in the workshop rock heap.

Scraper Planes:

Twenty-three examples of this tool variety were found in the excavated deposit (Fig. 33). All are made from basalt cobbles and resemble modern block planes in their rectangular, oblique angle face form. In most cases, the end section of a large rectangular cobble was split off at an oblique angle, leaving a straight front edge, perpendicular to the flat cobble base. Other scraper planes were made from top or side section flakes of triangular-shaped cobbles. On these tools the straight-faced cut would become the base of the tool and one straight edge would be used as a plane. Others were shaped by trimming down a large flake to achieve the desired flat, bottom surface, straight edge, and oblique angle edge face. One excavated example of the latter variety, a small reduced flake, was shaped for hafting, indicating use with a handle.

Edge angles on the scraper plane tools range from twenty-five degrees to sixty-three degrees (see Table 24). Two groups were separated. One group of nine examples have edge angles between twenty-five degrees and thirty-five degrees. A second group of fourteen examples have edge

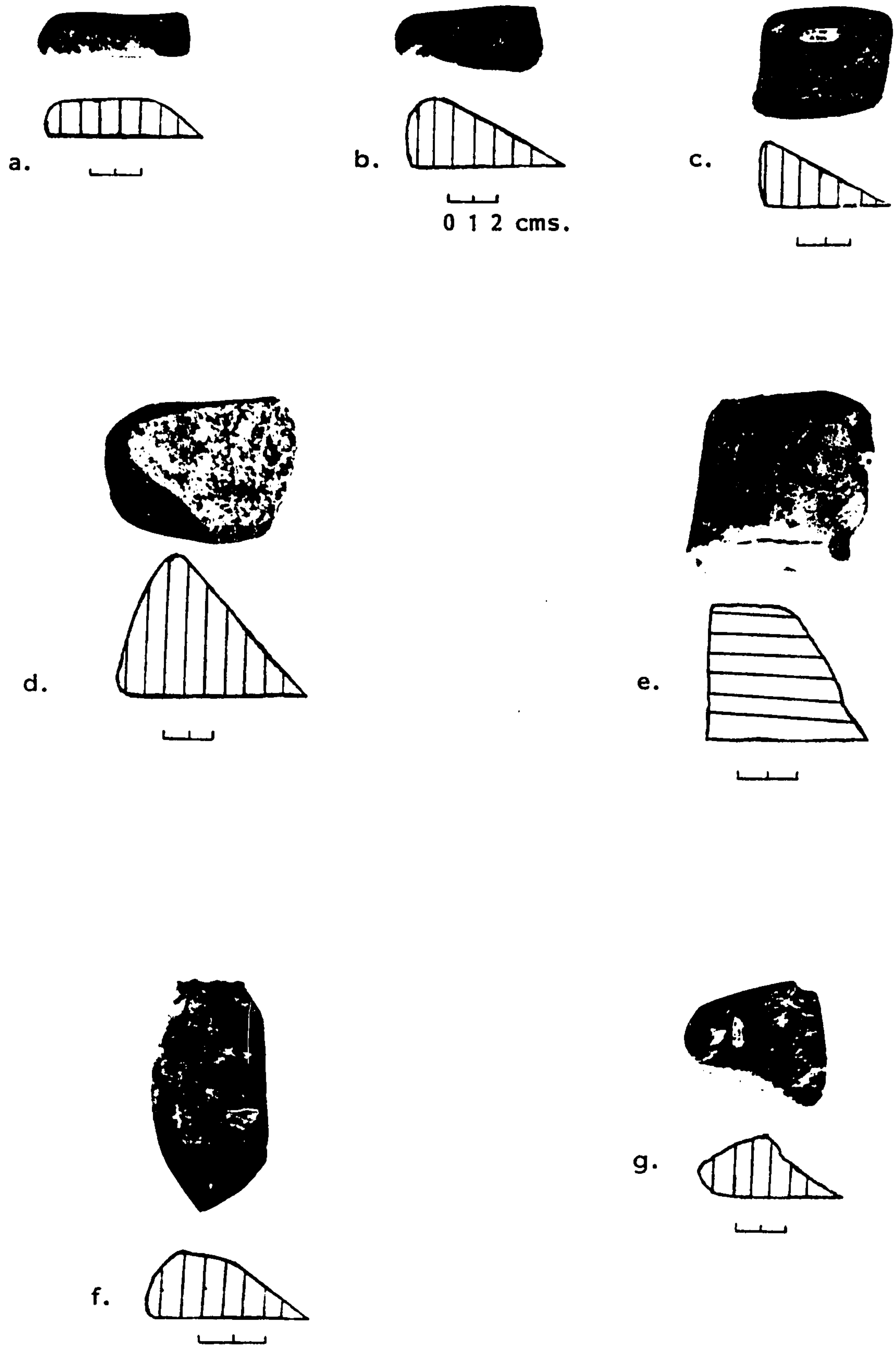


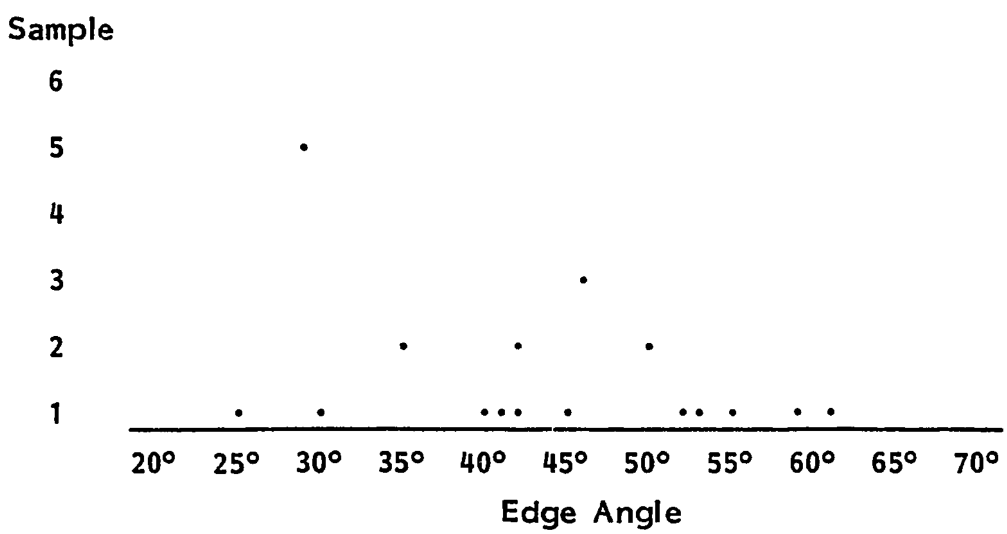
Figure 33. Scraper Planes.

Table 24

Bag Weights for Core Flakes and Edge Angles for Scraper Planes

Bag Weights for Core Flakes	Level	Flakes	Weight (grams)
A. Pit 1:	0–10	98	472
	10–20	91	2218
	20–30	29	290
	30–40	5	158
B. Pit 2:	0–10	149	600
	10–20	72	467
	20–30	6	25

Edge Angles for Scraper Planes



angles ranging from forty and fifty-five degrees. Two other examples were included in this tool category with angles over fifty-five degrees; however, it appears these artifacts were multipurpose tools since the edges are rounded and have considerable battering scars. The wear patterns on these last two examples indicate their original use as scraper planes and reuse as hammerstones.

The two groups of scraper planes (Table 24) indicate two desired variants of similar tools for different cutting functions. The two varieties contain similar wear patterns, characterized by rounding of the edge and polishing of the flat basal portions. The edge rounding and base polishing probably were the results of using the tools as block planes for wood scraping and finishing work. The two scraper plane groups of different cutting edge angles seem to have been for rougher and lighter cutting. The quantity of these tools excavated at PC 001 implies considerable woodworking activities at the site.

Similar scraper planes are known from preceramic cave deposits in western Panama (Ranere 1975: 192-195). Their function as woodworking tools has been well demonstrated in experimental work by Ranere. In these early deposits and at PC 001, the scraper planes represent one of a number of important woodworking tools. Their association with wedges, celts, flake scrapers, and blades points to well-established woodworking industries (Ranere 1975: 186-202).

Flake Scrapers:

Sixteen small flakes were found in this tool class (Fig. 34). These are primary flakes with portions of cortex. The cortex is usually on the

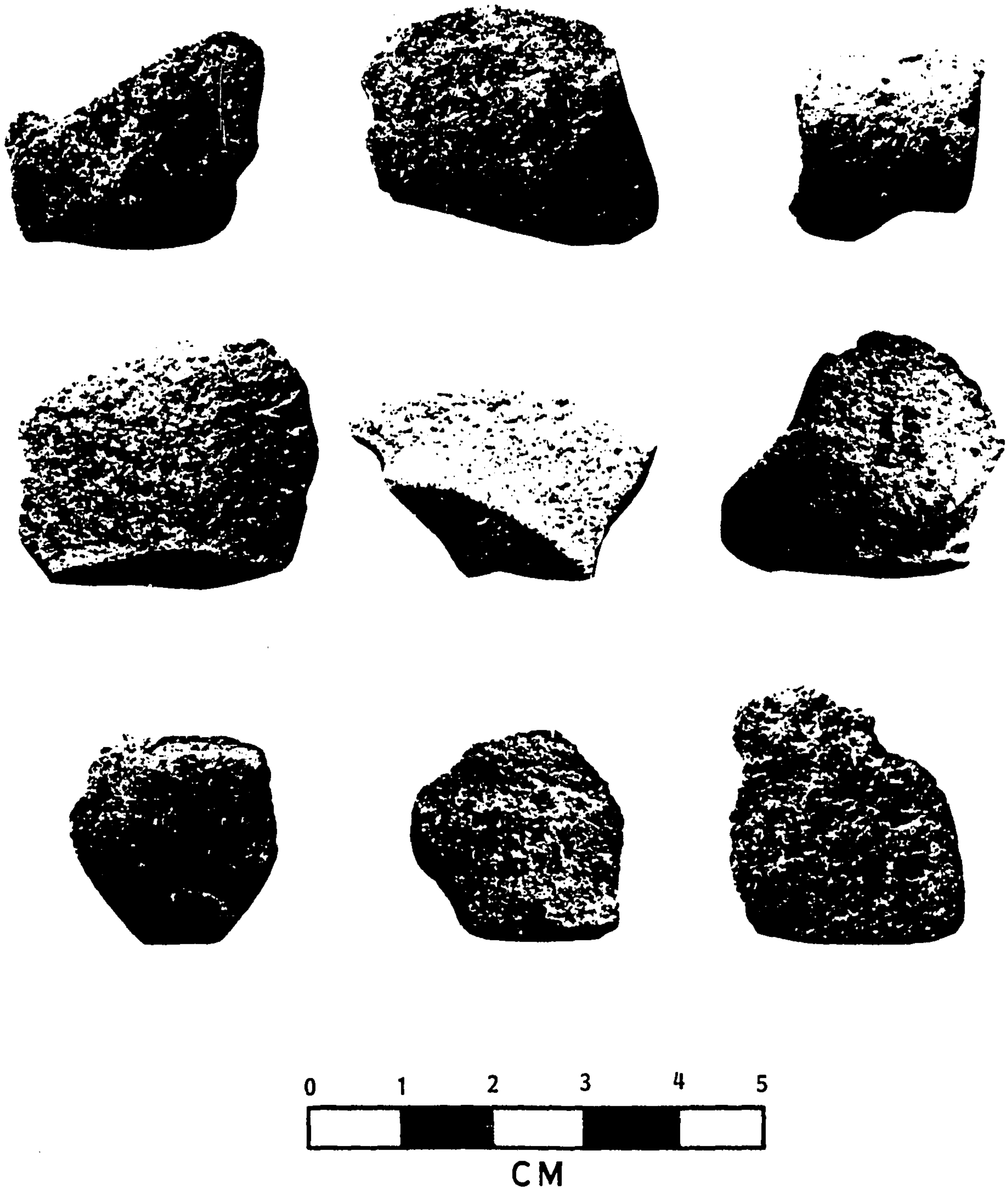


Figure 34. Flake Scrapers.

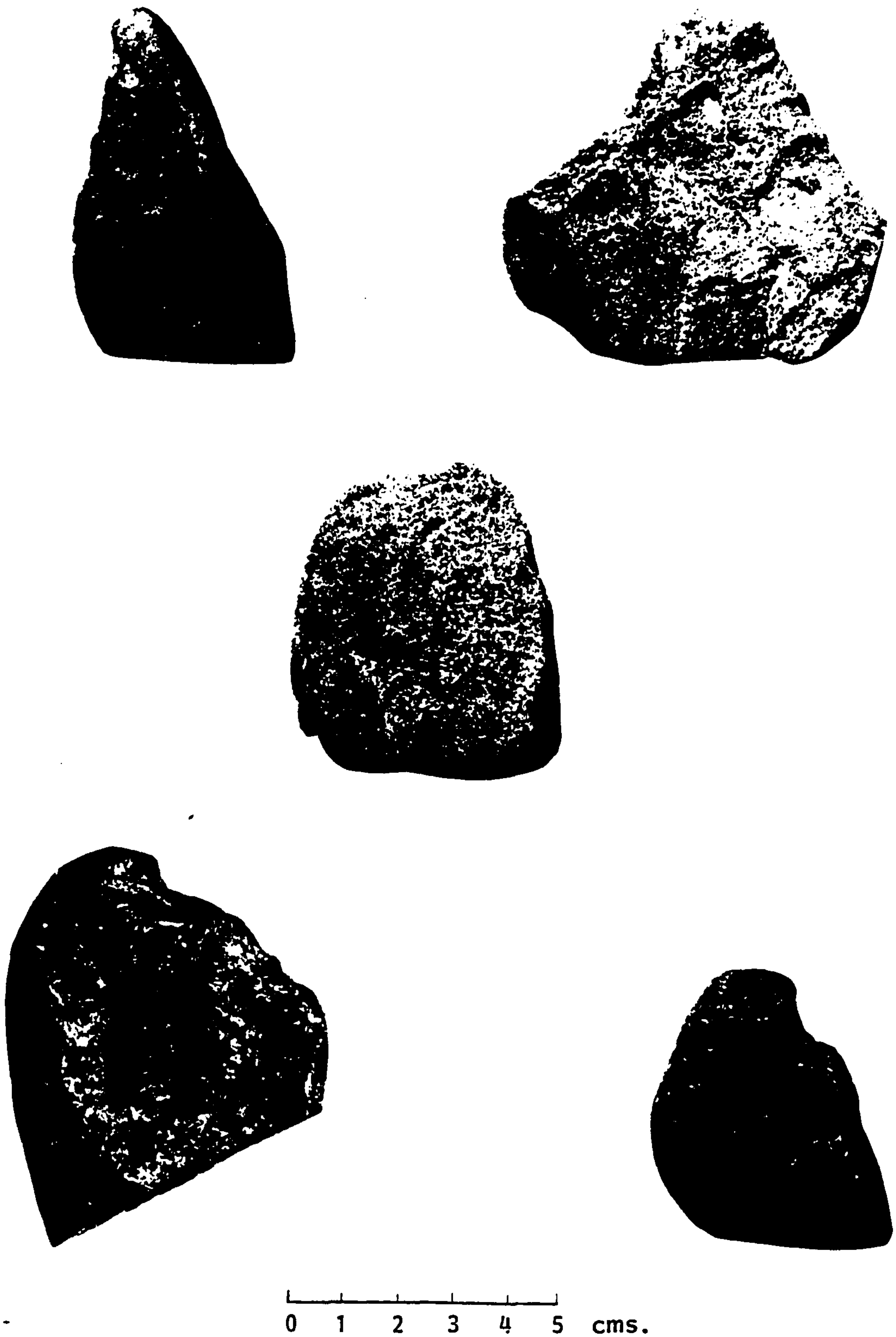


Figure 34 (continued). Flake Scrapers.

dorsal portion, opposite the cutting edge. In some cases, the cortex is also on the frontal side when the flake was the first to be removed from the core. The edges of these tools are convex and contain angles ranging from twenty-three degrees to fifty degrees. The majority of examples, however, contain edge angles between twenty-five degrees and thirty-two degrees (Table 25). Only one edge on each example was utilized and has a rounded appearance with occasional microfractures. The faces along the cutting edge have wear polish extending from the end of the edge up two to three millimeters along both edge surface faces. All examples are convex in cross-section. The length of the cutting edges on these tools ranges from 1.8 centimeters to 3.1 centimeters.

Blades:

Seventeen examples of this tool type were found in the excavated deposit (Fig. 35, a-n). All are made from igneous cobble cores, except for three struck-off jasper cores (Fig. 35, l-n). The igneous blade tools have one utilized edge. The edges are straight to slightly convex in shape. Some edges have small microfractures but most are characterized by slight rounding of the edge and light polish along the edge surface and face. These tools differ from the scrapers in that their edge length is longer and the edge angles tend to be somewhat steeper (Table 25). Most of the blade examples have two beveled or angled-edge faces instead of one angled and one straight as in the case of the scraper tools.

The three jasper blades are obvious imports into this assemblage. No jasper waste material or cores were found in the deposit. One example (Fig. 35, n) is a double-edged blade with considerable chipping wear

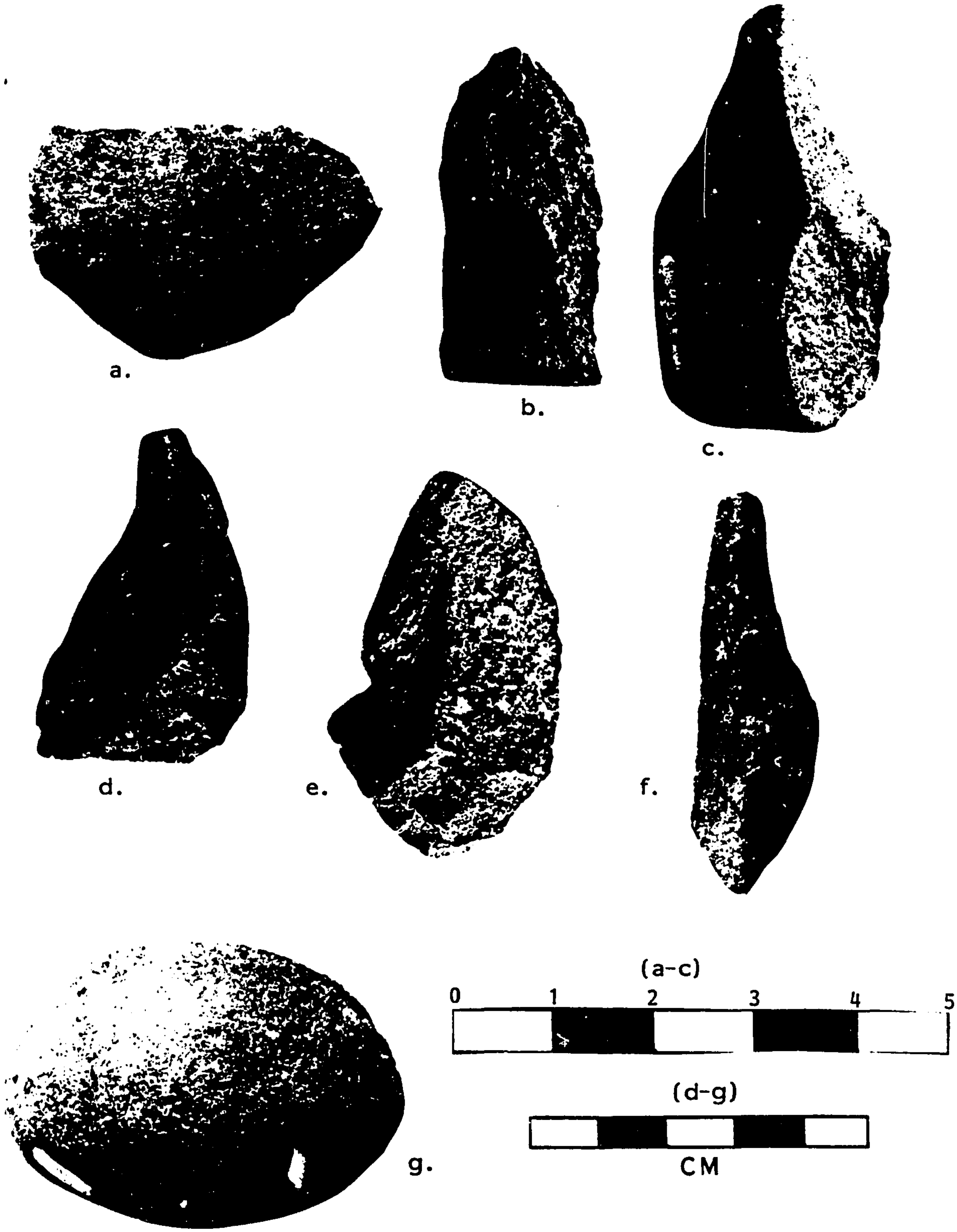
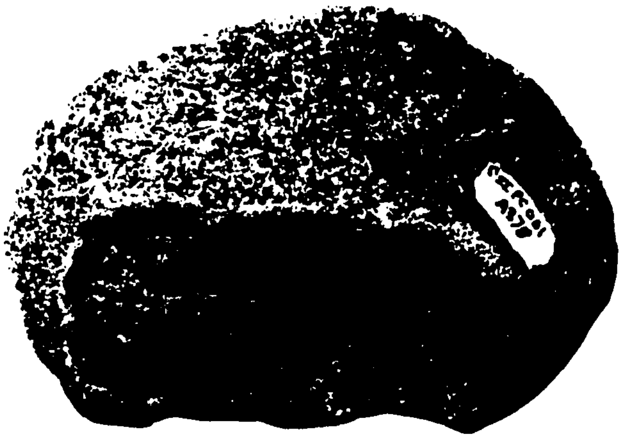


Figure 35. Blades (a-c). A jasper flake (d) possibly used as a burin.

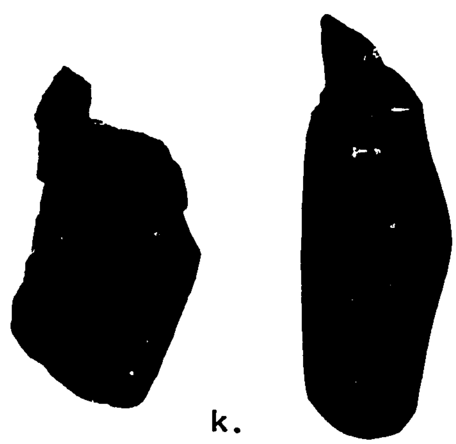


h.

0 1 2 cms.

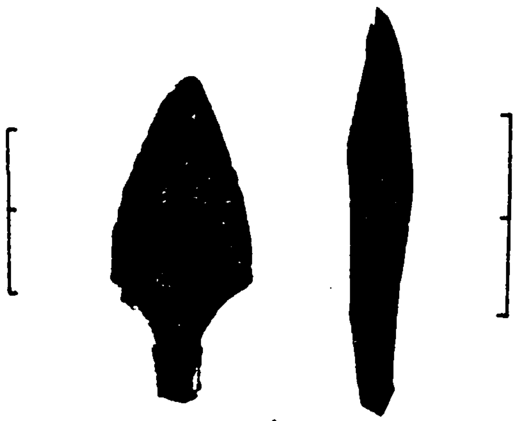
i.

j.



k.

Figure 35 (continued). Blades.



l.

m.

0 1 2 cms.

n.

Figure 35 (continued). Blades. All of the above are made on jasper flakes and represent imported tools into PC 001. Example c appears also to have been used as a spokeshaver.

Table 25

Tool Measurements: Flaked Stone

Catalogue no.	Length (mm.)	Width (mm.)	Thickness (mm.)	Edge Angle (degree)	Edge Length (mm.)
Scraper Planes					
A340	5.7	1.5	1.5	43	
A383	6.1	2.4	2.4	50	
A346	4.8	4.1	2.8	30	
A308	7.7	5.5	5.1	50	
A432	5.1	5.5	4.1	60	
A173	4.6	6.8	1.9	35	
A382	5.5	5.0	2.4	48	
A381	4.9	4.7	2.6	54	
B117	6.2	6.0	2.6	48	
B133	3.1	2.6	1.1	55	
B137	6.9	2.9	2.2	45	
B149	4.9	4.0	2.1	50	
B151	4.2	5.0	2.2	46	
B169	6.3	4.1	2.2	43	
B158	5.1	3.5	2.0	63 & 44	
B156	4.6	3.2	1.2	35	
B154	2.3	2.3	.6	30	
B165	2.6	2.3	1.4	30	
B155	3.5	3.6	1.1	30	
B152	2.1	1.9	.5	30	
A194	5.2	3.0	1.4	53	
A309	7.9	5.2	3.4	40	
B114	4.2	4.5	1.7	48	
Flake Scrapers					
B126	3.6	2.4	.6	32	2.9
B134	3.3	2.4	1.0	46	3.1
B120	3.2	2.3	.8	25	2.0
B159	3.8	3.2	.9	26	2.1
B121	2.7	1.9	1.2	23	1.8
B135	3.2	3.0	.7	25	4.3
B136	3.8	3.1	1.0	58	3.1
B150	3.2	2.1	1.1	25	3.1
B153	2.3	2.3	.6	46	2.3
B123	2.3	2.3	.5	31	2.8
B166	2.1	2.1	.6	32	2.0
B107	6.6	3.8	1.5	31	.7 + 3.0, ground on one edge
B138	6.5	7.0	2.2	50	2.2 (6)
A442	5.6	4.8	2.1	28	3.0 (10)
A167	4.5	3.0	1.2	24	1.2 (7.8)
A168	7.0	7.9	1.3	30	2.2 (6.2)

Table 25 (Continued)

Catalogue no.	Length (mm.)	Width (mm.)	Thickness (mm.)	Length of use edge (mm.)	Edge Angle (degree)
Blades					
B139	6.7	3.1	2.5	6.6	32
B164	3.8	4.9	1.3	4.0	28
B118	5.7	3.3	.6	4.0	47
B122	3.2	3.1	.7	2.2	42
B170	3.4	2.5	1.0	2.8	55
B161	3.6	2.3	.6	4.2	44
B125	3.4	1.6	1.0	3.2	41
B109	4.7	2.5	1.6	3.6	60
B108	4.2	2.4	1.0	2.6	49
B113	4.4	2.5	1.2	3.5	49
B111	3.8	3.0	1.2	3.0	56
B105	5.0	3.1	1.3	5.5	38
B106	5.8	1.8	1.1	3.1	58
A378	7.9	5.1	2.7	10.2	56
A380	7.4	5.0	2.5	9.4	55
B103	5.6	2.	.7	4.8 & 2.3	49 & 67
B104	4.0	1.9	.6	2.6 & 2.6	48 & 40
A001 (Survey)	8.6	2.8	.8	6.6 & 5.0	35 & 30

along the edge. One edge side is long and nearly straight. The other edge side on this same tool is deeply concave, resembling a spokeshaver. Besides having small chipping scars, both edges are rounded and dull from use. No retouch is visible.

The other jasper blade example (Fig. 35, l) is a small point-like form with a small basal stem. Tiny chips are visable along both symmetrically shaped edges, indicating use as a cutting tool rather than as an arrowpoint.

All of the jasper blades are unifacially flaked as are the igneous blade tools. Two jasper blades (Fig. 35, l,n) were excavated at PC 001 and the other was found on the surface of mound I. The latter blade has similar structural features as the other examples in that it is unifacially flaked, contains a basal stem, and is symmetrically shaped.

Waste flakes. A total of 450 basalt core flakes were recovered (Table 20).

Core Flakes:

These are primary and secondary flakes with a percussion bulb and at least one cortex surface. The edges or faces of the flakes show no evidence of wear from use and appear to be waste material. It is possible, however, some of these flakes were used as cutting tools and immediately discarded, leaving little or no trace of prolonged use.

The size of these flakes range from as small as one-half centimeter to over six centimeters. Bag weights are listed in Table 24 indicating the relative size of the flake sample.

Shatter Flakes:

This category of flake material consists of small, irregularly shaped flakes with no percussion bulbs or cortex surfaces. It represents the small fractures resulting from percussion blows off cores or large flake tools when thinning or resharpening was performed (Table 20). Others were removed from pebbles in the construction of fishing weights.

Resharpening Flakes:

A total of thirteen examples of this flake category was found (see Fig. 36). All have a small, highly polished surface and rough underside surface. These small flakes come from polished celts and axes in the process of being resharpened. In some cases, the edge of the celt or axe is

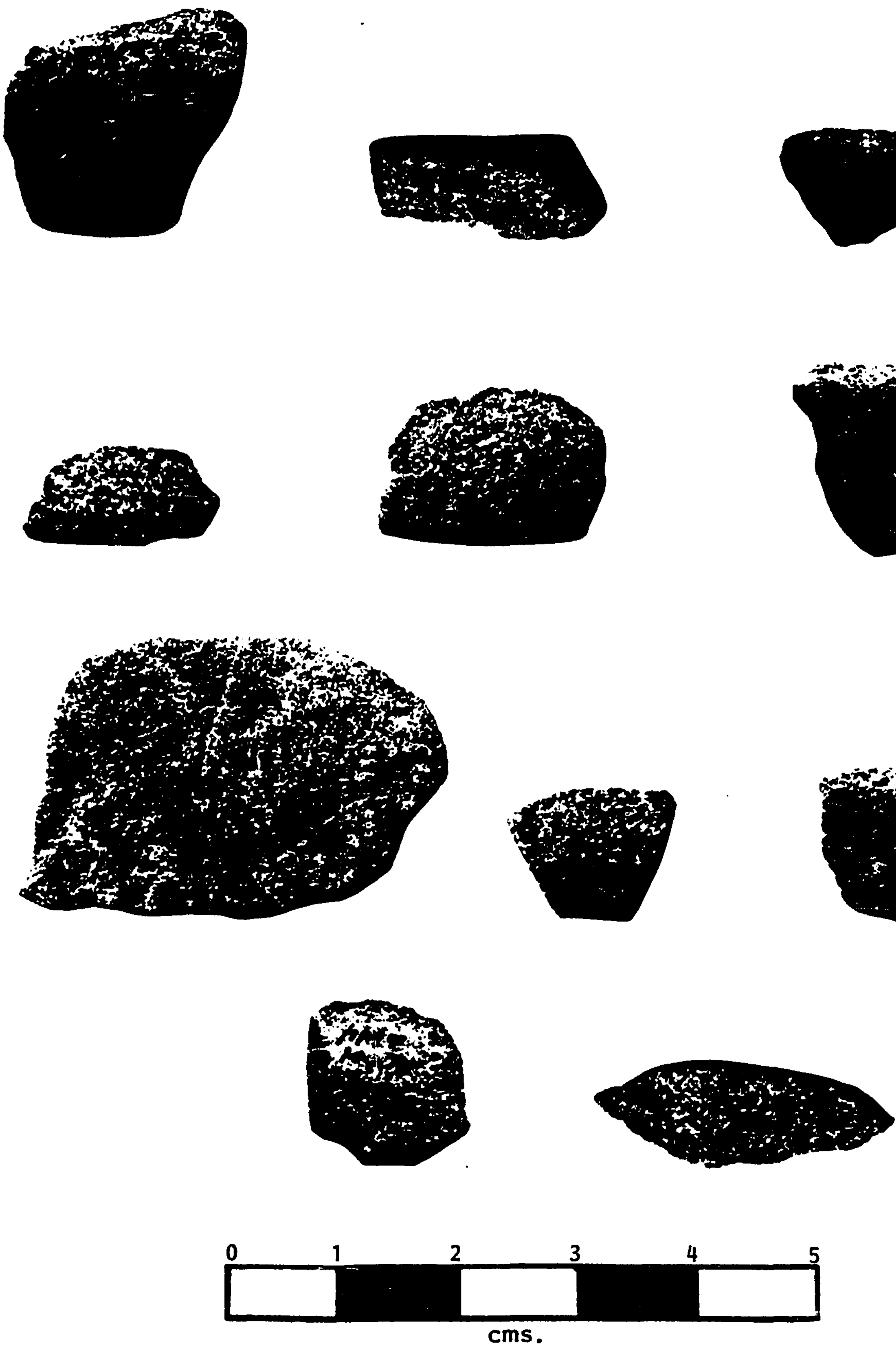


Figure 36. Resharpening Flakes.

clearly visable, being rounded from use and containing polish over old flake scars. The polishing of the edge face is from the previous re-sharpening and tree girdling or related woodworking use. When the edge of these tools dull and round, they require edge straightening by flaking and polishing to obtain a fresh, straight cutting edge. Although this category is represented by a low sample, it clearly indicates the workshop activities at PC 001 included repair as well as manufacturing activities.

Ends of Cobbles:

A variety of different sized end-sections taken off larger cobbles were found in the excavated deposit (Fig. 37). Eighty-five examples of end-sections with double-faced splits were found and appear to be the discarded sections of manufactured hammerstones, pestles, and scraper planes. The double-faced splits were designed to first remove the end from the larger cobble and, second, to obtain a desired cutting edge and an appropriate edge-face angle.

The most numerous class of end-sections of cobbles recovered were those with straight-faced and oblique-angle splits, totaling 170 examples (see Fig. 37). The cobbles and pebbles from which these end-sections were removed are core and tool types with the end-sections taken off, as described in the sections on cores, hammerstones, and scraper planes.

Sixty-one end-sections of cobbles and pebbles were recovered containing irregular face cuts. Originally designed as tools with cutting edges and oblique angle faces, these artifacts appear to be mistakes or discards because of faulty fractures. When they were incorrectly split from the core, they were discarded. These examples, however, were still functionally usable as restricted-edge or apex-type hammerstones for further flake removal from cores.

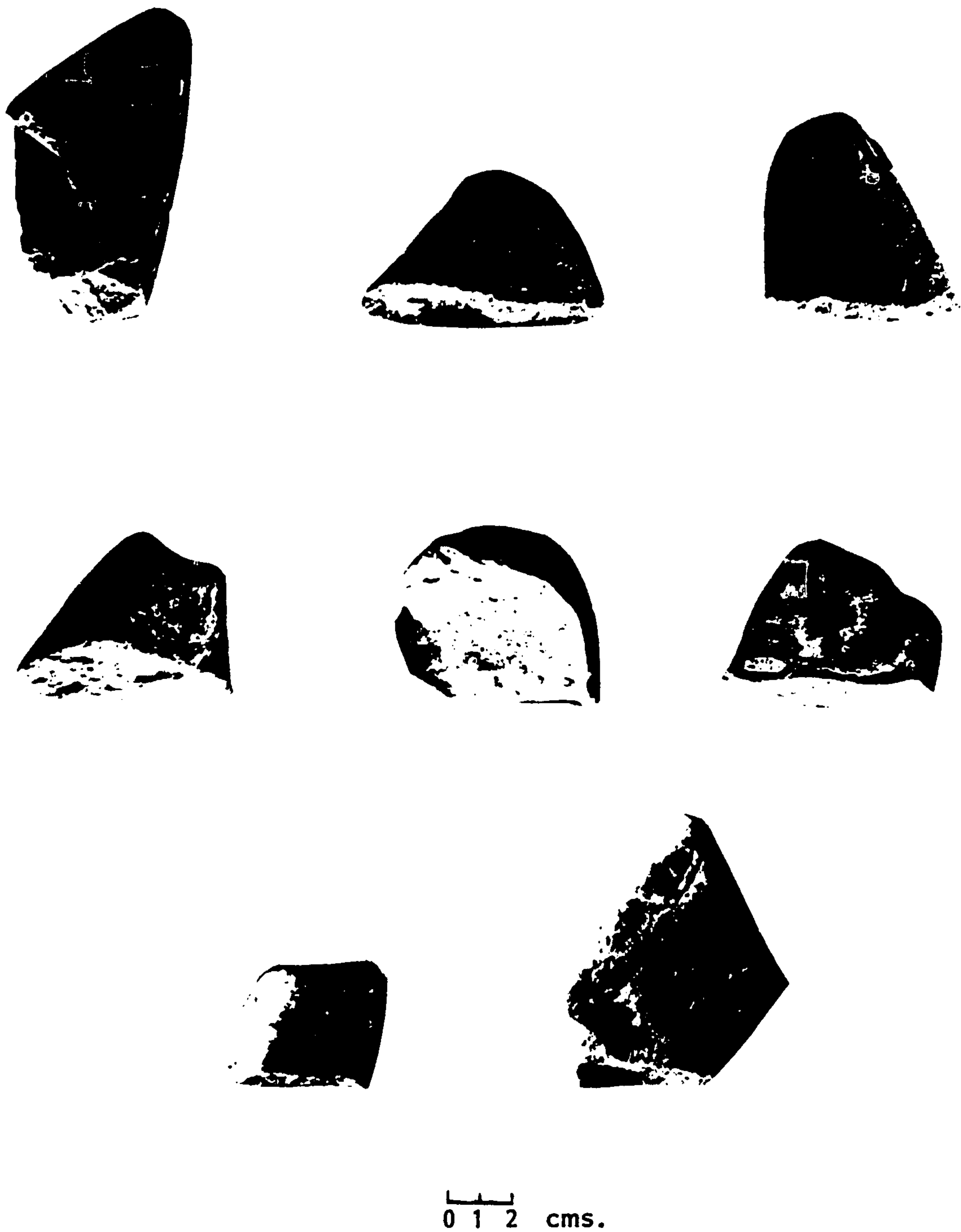


Figure 37. Ends of Cobbles.

Split Pebbles:

A large sample of 446 hand-sized and smaller pebbles were recovered. Many were split in half or missed one-quarter section. The purpose of splitting these pebbles is unclear; however, some appear to be broken examples of fishing weights which split while being notched. Numerous broken fishing weight examples were recovered from the deposit with a pecked notch on one side and the other side of the pebble missing (Fig. 24). These incomplete examples indicate they were broken during manufacture, resulting in a split pebble.

Angular Chunks:

Three hundred and twenty chunks with irregular, multi-faced fractures were found in the deposit. This material appears to be waste from tool manufacturing activities and ranges in size from small, fractured pieces removed from pebbles to larger examples taken off cobbles.

Core material. Three hundred and four cores were recovered from the excavated deposit and separated into four different categories (Figs. 38-40). The categories of core types related to the categories of flake types and neatly provide an understanding of the systematic way in which selected basalt cobbles and pebbles were flaked for manufacturing of tool types. The percussion flaking of the cores necessitated specific mineral quality for the production of good cutting edges. Specific core shapes were required to control the removal of desired flakes and to properly shape final tool forms.

Blank Cores:

These occur in various shapes, including round, rectangular, and triangular cobbles and pebbles. Six examples found in the deposit were

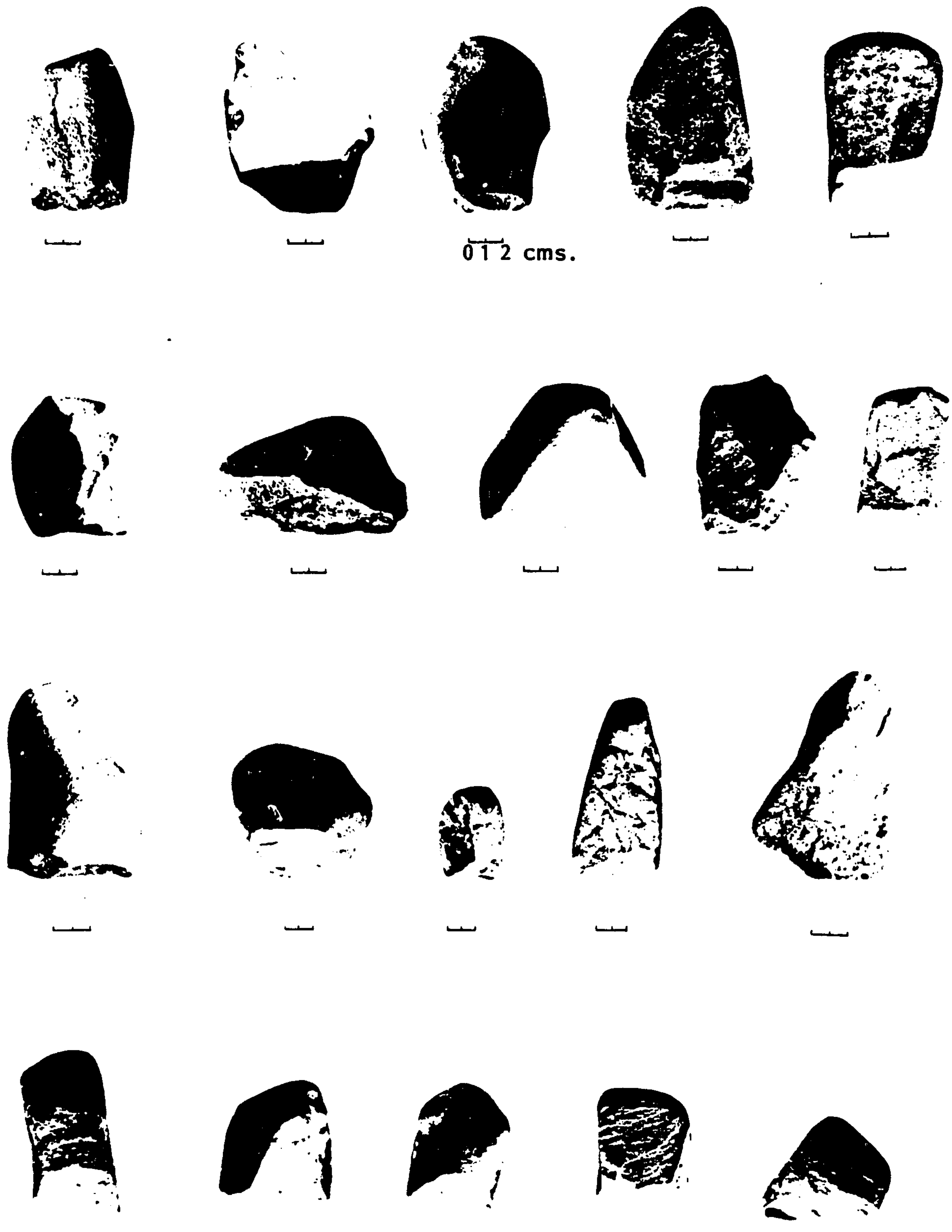


Figure 38. Cores with Ends Split Off.

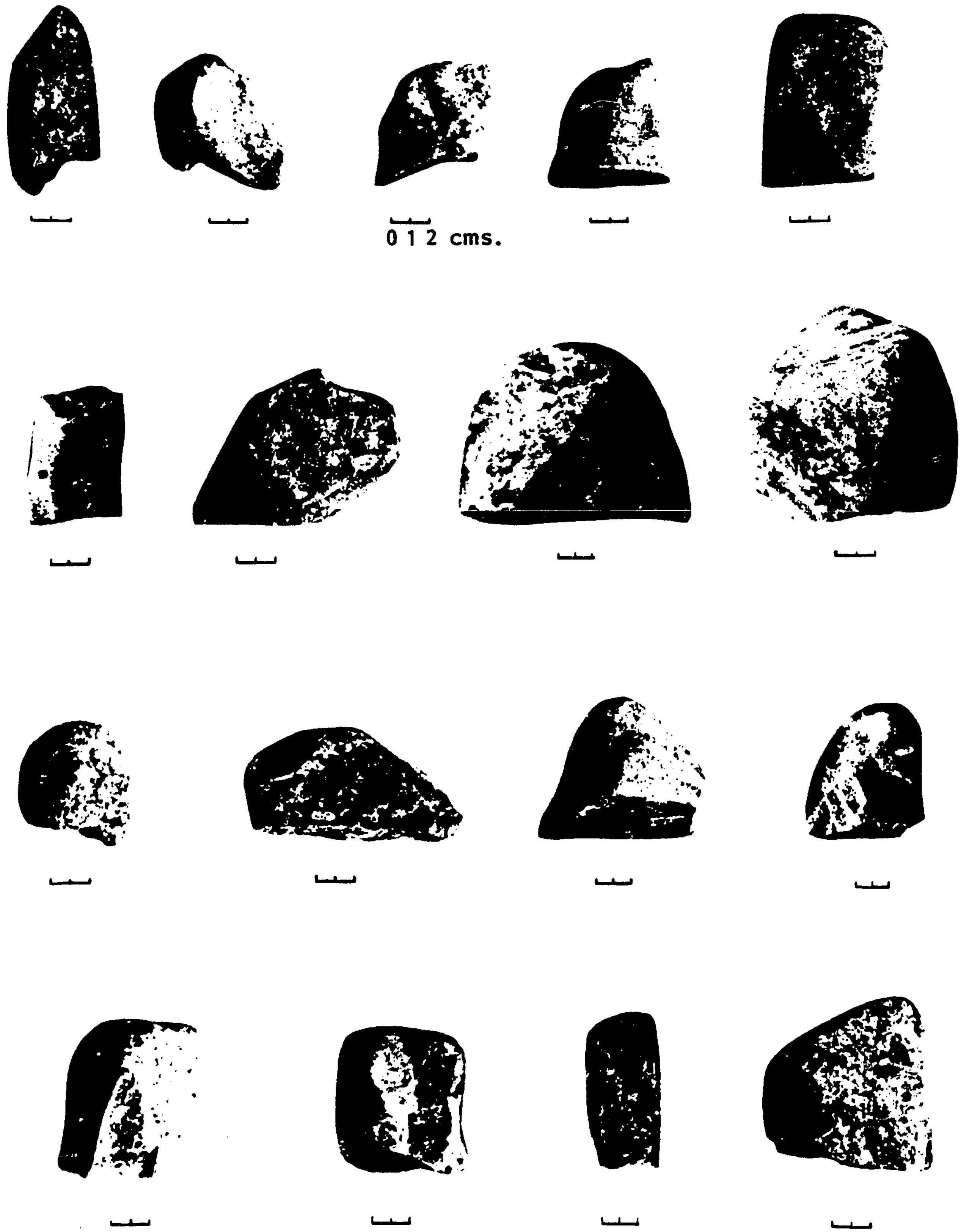


Figure 38 (continued). Cores with Ends Split Off.

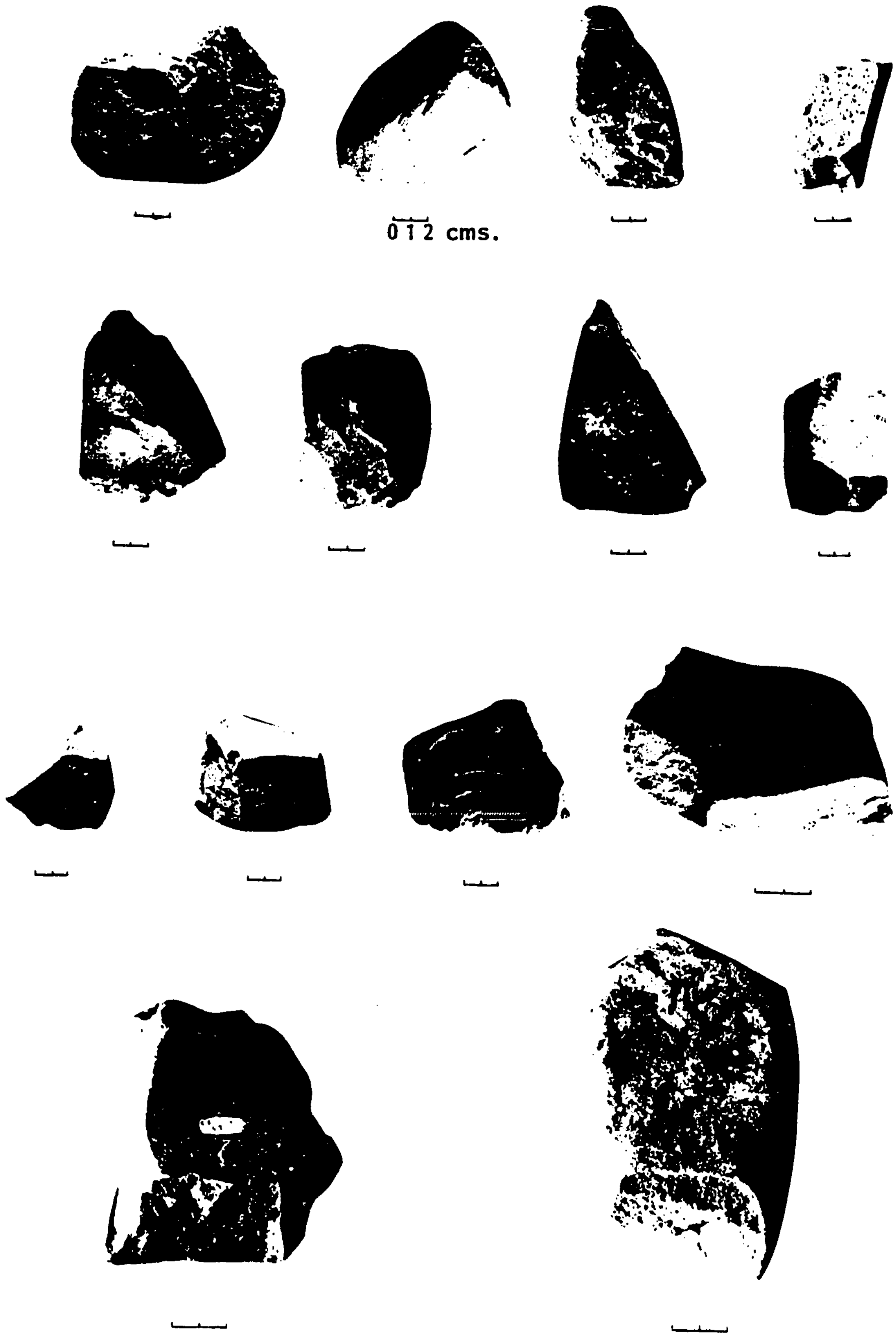


Figure 39. Cores with Oblique-Angle Flaking.

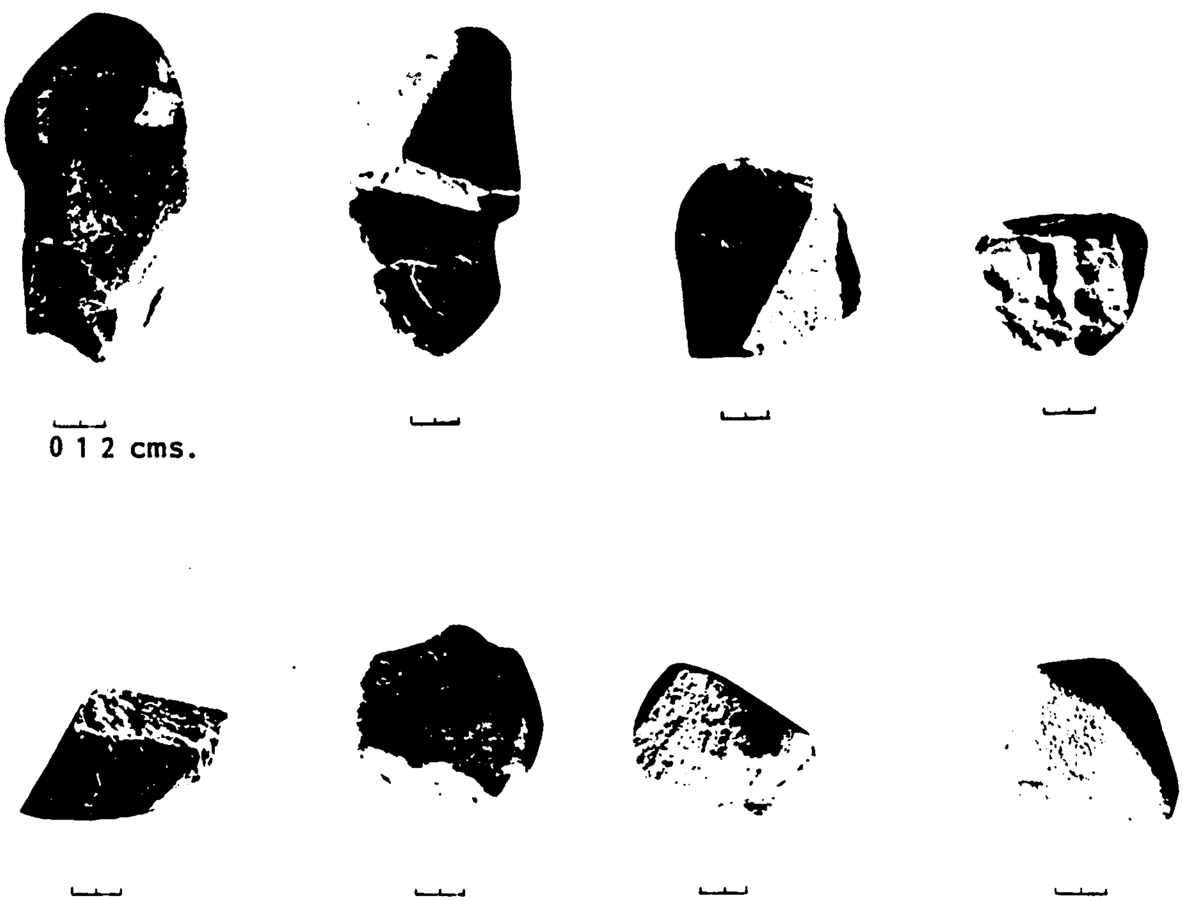


Figure 40. Polyhedral Cores.

classified into this category; however, a large sample of the 1,538 unmodified stone cobble and pebble forms were selected core material brought to the site to be split and flaked.

Cores with Ends Split Off:

Seventy-five of these examples were found in the deposit of the two test units (Fig. 38). They are rectangularly and triangularly shaped cobbles and large pebbles with one end split off. Most examples have straight-faced splits or slightly oblique-angled splits. Some have one or two more smaller flake scars along an adjacent side of the core. The ends of these cores were discussed under waste flakes.

Cores with Oblique Angle Flaking:

Sixty-nine examples of these cores were recovered (Fig. 39), consisting of the same rectangular and triangular shapes as the above-mentioned cores. Steep-sided, oblique-angle flaking on one or two sides was consistent on all these cores. Some examples have only one oblique angle fracture in which the end or ends were split off. Others have one or two faces from which a series of smaller oblique angle flakes had been removed. These latter cores were used for the manufacture of flake scrapers and blades, whereas the former cores, with larger single-faced splits, were clearly fractured in this way to obtain scraper plane tools.

Polyhedral Cores:

These include 154 cobble and pebble cores with irregular fractures, differing from the above-described cores which show more uniform size and angle flaking (Fig. 40). Some are flaked on only one end, while others are flaked on both ends. A number of the triangular-shaped cobble cores have a long, thin flake removed from their top section, apparently removed to obtain straight-sided, moderately steep-angled blade and scraper tools.

Miscellaneous Stone

Unmodified stone. One thousand five hundred and thirty-eight examples of unmodified pebbles and cobbles were recovered in the excavated deposit. This material was selected igneous stone brought to the site from nearby riverine gravel deposits. Clearly, this material represents the unmodified forms of pebbles and cobbles that would be shaped into manufactured tools. Large, flat-bottom, steep-sided basalt cobbles were frequently represented and appear to have been selected for form and minderal characteristics. Cores of this shape could be used to efficiently make various flaked cutting tools, such as blades and scrapers. Smaller oval pebbles were clearly blank fishing weights ready to be notched. Other unmodified igneous stone examples were found with heavy andasite inclusions and tabular, elongated shapes. These were probably collected for the manufacturing of larger cutting tools, such as celts, axes, wedges, and chisels. Others were destined for use as polishing stones because of their efficient abrasive quality. Finally, unmodified, elongated cobbles were also found in the deposit resembling the various classes of hammerstones and pestles already described. These unmodified forms were clearly chosen for shaping into these tool types.

Lumps and nodules of weathered rock. A large quantity of 4,970 examples of this material was excavated. The high acid content of the lateritic clay soil cau[illegible]y weathering of the igneous stone in the deposit and, as a result, much of the deposit were these granular, discolored basalt cobbles, pebbles, and flakes.

Firecracked rock. Only five examples of firecracked stone were found. Apparently, no hearths were placed in the excavated workshop area because few stones showed evidence of burning and no features were found in the deposit relating to firepits.

Economic Categories of Tool Types

The excavated assemblage at PC 001 thus represents an important cobble industry for the moist Caribbean area. Distinctive manufacturing techniques are evidenced from the tool, flake, and core samples. Flaking was entirely done by percussion, with little evidence of retouch on flake tools. Larger cutting tools, such as celts and axes, were repaired by thinning down the worn edge and polishing the edges back into shape. Most of the other excavated tools, except for manufacturing instruments such as the hammerstones and anvils and the fishing weights, were found broken, dulled, and discarded. For the most part, an old tool was replaced rather than repaired. The large quantity of cores and unused cobbles and pebbles in the deposit point to quick replacement of any desired tool. The low percentage of sharp, newly made tools in the deposit suggests these artifacts were carried off the site for use and only the old discards remained. Clearly, the placement of PC 001, along the mid-course of Río Cuango, was in part because of the large gravel deposits in this area from which selected cobbles and pebbles were returned to the workshop area.

Lithic classifications often obscure the real indigenous categories of tool types. The excavated lithic assemblage in the PC 001 workshop reflects economic activities conducted over a wide area of the Atlantic sector. Tools used for food processing, woodworking, fishing, and forest clearing represent the most important tool kits in the PC 001 assemblage. Workshop tools represent another important category of instruments. The economic activities indicated by the tool kits suggest seasonal scheduling for both tool manufacturing and subsistence planning. PC 001 workshop was one of two workshops found in the district. The shop tools and their owners at these two sites represented a specialized industry that permitted and may have controlled an intensity and diversity of seasonal scheduling for both the local and regional area.

CHAPTER 7

ECONOMIC ADAPTATION ALONG THE MOIST SLOPES OF CARIBBEAN, EASTERN PANAMA

Introduction

Excavation of the workshop feature at the site of PC 001 recovered a large sample of cultural materials useful for both dating the occupation of the site and determining the economic activities associated with settlement. Locally made utilitarian wares and plastic decorated and painted tradewares, found at PC 001 and at twenty other district sites, point to settlement of this Caribbean sector as early as 1 A.D. The distribution of twenty-one small, dispersed sites along middle courses of major rivers indicated settlement was oriented to agriculturally rich valley and slope lands. The lithic assemblage excavated from the workshop at PC 001 contained a diversity of tools and utensils indicating maize-based farming groups were clearing forest lowland areas, while exploiting a variety of other scattered food resources. Food processing tools excavated at PC 001 revealed a diversity of both cultivated and collected subsistence resources. Other excavated tools at this site indicated woodworking to be a specialized industry for manufacturing of a wide variety of timber products.

The workshop at PC 001 represents a specialized site feature in the community of small settlements in the Costa Arriba area. Only one other similar-sized lithic workshop was located in the district, indicating the rarity of lithic manufacturing sites in the area. Presumably, these two site centers supplied most local Caribbean settlements with tools necessary for forest clearing, fishing, hunting, and food processing. Actual workshop tools recovered at PC 001 contained specialized forms and indicated techniques used for manufacturing other tool sets. Manufacturing of these tools at PC 001 probably followed a seasonal schedule of subsistence and timber-harvesting activities, requiring the making of different tool sets at different times of the year.

Workshop Tools

Lithic material used for tool manufacturing at PC 001 was principally igneous basalt and andasite cobbles and pebbles collected at gravel deposits along the middle-to-upper courses of Río Cuango. The size, shape, and mineral quality of this raw cobble material were selected according to the tools desired. For instance, cores were generally fine-grained igneous cobbles with heavy inclusions of feldspar, quartz, and andasite and were typically plano-convex in cross-section. Scraper planes, on the other hand, were made from a rectangular-shaped cobble of similar mineral consistency. Small oval pebbles of basalt were selected for manufacturing notched weights to be used for line and net fishing. Elongated cobbles and pebbles, either triangular or rectangular in cross-section, were brought to the workshop to be manufactured into manos, hammerstones, and pestles. Cobbles and pebbles with heavy feldspar content and naturally flat surfaces were collected and brought for use as polishing tools. Others containing these hard mineral inclusions were manufactured into axes, celts, or chisels . This cobble material was the only available local source for tool manufacturing. A few jasper tools were excavated at the workshop site of PC 001, indicating special blades and scrapers were obtained through trade with Río Chagres valley groups to the south. These jasper tools were likely sought because of their superior edge quality and became part of the permanent workshop tool kit for use as specialized cutting utensils. Martire reports that the sixteenth-century Cueva of eastern Panama used stone tools for making their houses and canoes, and adds "they do all their carpenter work with tools of sharp stone, which they find in the rivers" (Martire 1964: Vol. I, Dec. III, Bk. 1). This would indicate that the igneous bed rivers were the source of much of the lithic material used by the Cuevan to make their cutting tools. The source of the flake tools made in the workshop excavated at PC 001 was also the river, indicating the igneous river cobble industry was widespread throughout eastern Panama up until contact times.

The bulk of the excavated deposit at PC 001 consisted of unmodified river cobbles and pebbles that were to be used for tool production. A total of 1,538 examples were recovered along with nearly 5,000 examples of highly weathered rock, most unmodified. A large quantity of selected cobbles and pebbles were thus stored at the workshop for future manufacturing activities. Considering the quantity of this material, along with the nearly 500 hundred tools and cores concentrated in a twenty-five centimeter deep deposit over a four square meter area, it clearly suggests specialized and intensive lithic work activity.

Tool making at the excavated workshop of PC 001 was performed through the use of a variety of different styled hammerstones, anvils, polishing stones, and pecking stones. The most diversified class are the hammerstones. Some hammerstones are subspherical to oval in shape with battering around the periphery, while others are prepared cobbles with projecting-apex surfaces and edge surfaces used for hammering. Each class of hammerstones appears to have been designed to use for flaking, occasional retouch, or pecking of different manufactured and repaired tools. For instance, the apex-battered hammerstones, made from large, pebble-sized, igneous stones, appear to have been used for more controlled flaking. The small flakes taken off the sides of the oval-shaped fishing weights required a pointed or restricted-edge tool to control the size of the flake removed from the small sides of the pebble. This hammerstone style, along with the ones with narrow hammering edges, were probably used for resharpening and removing thinning flakes from smaller flake tools; such as scrapers and blades. The larger hammerstone varieties consist of oval-shaped pebbles and larger core-sized tools. They contain battered and rounded-end surfaces used for initial shaping of unmodified stone into desired tool forms. Celts, axes, and scraper planes were shaped using these larger lithic tools. These larger hammerstones, containing a wider striking surface area than the smaller hammerstones, were also the principal tool used to remove core flakes. The quantity of these hammerstone varieties recovered in the deposit indicate the importance of this tool type in manufacturing different tool forms.

Anvils were recovered in the deposit. Their presence indicates use with cores to remove long, straight flakes for use as blades. Numerous blade flakes and cores were found exhibiting this bipolar flaking technique. Anvils may have also been used for controlling removal of smaller flakes during edge repair and as bases facilitating the pecking of notches on fishing weights.

A large sample of polishing stones, recovered from the deposit, was another category of workshop tools used for shaping and finishing activities. Most of these polishing stones are large-sized cobble fragments with heavy amounts of feldspar inclusions. They have one or more natural flat surfaces utilized for polishing or grinding down faces on manufactured tools, such as celts and axes. Before grinding and polishing with these tools was done, flaking down the cutting edge portion of the celts and axes to their desired form was necessary. The primary function of polishing stones thus was to produce a smooth, sharp edge by grinding or polishing. A number of celts recovered from the PC 001 deposit exhibit recent polishing. Celt repair flakes also were found in the workshop area. These small flakes were blunted and worn indicating they were taken off edges of dulled tools. Some small flakes have evidence of old flake scars that had been polished over during a previous repair (Fig. 36). Thus, the polishing tools were important for both newly manufactured, polished tools and repaired ones dulled from use.

Two cobble tools were found that were used as sharpening stones for other tools. It is not clear what tools were sharpened with these cobbles. Each cobble contains a straight, thin scoring mark that continually deepened into the cobble's surface as it was used. Small, pointed basalt flakes were found with ground-edge facets on them corresponding to the size of the scoring marks on the cobble tools (Fig. 30, a-f). These pencil-thick, rounded-edge pieces may be ground points that were attached to wooden spears for fishing or hunting. Unfortunately, this association is not confirmed. The scoring marks on the cobbles appear to be the result of grinding or rounding edges on stone rather than hardwoods, like Bamboo or Chonta, because of the amount of deeply incised wear within the scored surfaces.

The sixteenth-century Cueva of eastern Panama made long spears from various hardwood palms including Chonta (Astrocaryum). Some of these lances had fire-hardened tips. Others had points made from animal and fish bones (Oviedo y Valdes 1853: Tomo III, Ch. 16: 129), while others were tipped with stone points (Andagoya 1945: 396). These long spears were used both in warfare and for hunting deer. The scored stones and ground basalt point-like forms present in the deposit at PC 001 may indicate the use of similar spears by these earlier groups and the manufacturing of such bone and stone-tipped lances at the site.

Besides the workshop tools used for forming and shaping the cobble, pebble, and flake tools, there appears to be a diversity of other tool forms used for splitting, shaping, and finishing wood. These lithic artifacts indicate stone tools were used to make wooden tools and products. The stone-stipped spears just discussed are one possible example. Larger cutting tools, such as axes and wedges, were found in the deposit, as well as celts and scraper planes, and were used for shaping wood. In addition, a variety of smaller flake scrapers, a jasper blade, and a jasper spokeshaver were recovered along with numerous igneous blades. Some of these tools may have been brought back to the workshop area for repair from neighboring settlements; however, it would appear more likely this tool set was a permanent tool kit at PC 001 for woodworking activities. The woodworking tools represent shop tools similar to the permanent shop tools described for stone working. Similar woodworking tools were probably made for distribution to other sites, such as the flake scrapers, blade tools, celts, and axes, since examples of these tools were recovered from the surfaces of various other surveyed sites.

Woodworking Industry

The suggestion that the workshop excavated at PC 001 was both a stone manufacturing center as well as a woodworking center provides important clues to the kinds of forest exploitation and strategies used by local riverine groups in their adaptation to the moist Caribbean slopes. Wooden tools and utensils have been an important part of the material culture of most tropical forest groups in Central America and South America, reflecting a long period of adaptation to wet forest environments. Yet these artifacts are seldom preserved in the archaeological record. Ranere's work in western Panama has demonstrated the importance of woodworking tools in deposits as early as the preceramic period (Ranere 1975: 173-210). The Monte Cristo lithic assemblage from eastern Costa Rica includes a similar range of igneous flake tools, celts, and axes suggesting a woodworking industry related to the one at PC 001 (Kennedy 1978: 43-56). Both of these assemblages, like the one at PC 001, contain similar tool kits designed for making other wooden tools and utensils from tropical forest timbers.

The Atlantic slopes of the Costa Arriba area contain a variety of excellent wood resources that were available to these early riverine communities. The lithic assemblage from PC 001 points to hunting and fishing equipment, pole and thatch houses, household utensils, and dugouts as being locally manufactured, wooden products and forming the basis of the woodworking industry. Settlements like PC 001 were located close to good quality forest timbers. Hardwoods, such as Ceder (Cedrela), Espavé (Anacardium), Chonta (Astrocaryum), and Chunga (Astrocaryum), are found throughout the low-slope forest and at higher upriver locations, easily reached by dugout. Among modern Black and Choco woodsmen of Costa Arriba, these timbers are highly valued for construction of their material products, including dugouts, large food-processing mortars, spears, bows, and large plates and wide-mouth, shallow bowls. Both local groups work this wood, as well as numerous softer wood species, with three tools: axes, machetes, and celts. The modern tool kit is made of metal; however, it does relate to the classes of flake and polished-stone woodworking tools excavated at PC 001. Both the modern and prehistoric woodworking tools contain edge-cutting instruments that represent similar woodworking industries.

Other forest timbers of local importance are numerous species of palms. These forest woods are useful for manufacturing a variety of products, including larger constructions such as houses. Although no evidence of house forms was recovered from the excavations at PC 001 or from other archaeological sites in the district, the absence of these house features on the habitation sites indicates they were principally constructed of wood, most probably from palms. The cutting, splitting, scraping, and finishing stone tools recovered from PC 001 consist of a set of woodworking implements capable of working local hardwood palms. The small size of the archaeological sites and their dispersed pattern of settlement is identical to modern Choco and sixteenth-century Cuevan settlement. Pole and thatch dwellings were the typical house constructions among the Cuevan groups of eastern Panama and still remain the same among modern Choco of Costa Arriba. In a tropical area with heavy seasonal rainfall, houses of this construction dominate and provide raised, dry conditions above the often wet, clay soil. Thus historical, lithic, and environmental evidence suggest prehistoric dwellings in the Costa Arriba were probably pole and thatch constructions, utilizing local palm wood as timber sources.

Among the present-day Choco of the Río Cuango valley, pole and thatch houses are constructed using five or six palm species. Choco select these timbers because of their straightness and weather-resistant qualities. The houses are rectangular, raised dwellings with palm-thatched roofs made from three species of palm leaves (Astrocaryum, Manicaria, Guadua). Strong, vertical, primary support pillars are cut to size from two canopy forest palms (Astrocaryum, Quenocarpus). A raised, slat-like floor is cut and shaped from the bark of the Jira palm (Iriartea). These houses range in size from small, thirty by fifteen-foot dwellings to larger ones three to four times that size. All Choco houses are constructed with similar, fine quality palm wood, tied tightly together with strong, flexible vine. The construction of the Choco house requires wood be cut at the right time of the month, properly dried, stripped, smoothed, and shaped for correctly connecting it into place. Constructing a pole and tatch house clearly requires good woodworking tools, technical experience, and more than basic knowledge of forest woods. The details of Choco house construction make it reasonable to assume prehistoric dwellings were similar and constructed with palm woods prepared and shaped with woodworking tools like those found at the site of PC 001.

Subsistence Activities

Besides the PC 001 workshop tools associated with the lithic and woodworking activities, there was a variety of subsistence-related tools excavated at the site. One of these varieties consisted of pestles made of elongated, igneous cobbles, shaped by splitting off one end-section to form a straight, flat, pounding surface. These pestles have crushed surfaces on the pounding faces and a dull polish or sheen. This wear pattern indicates use in processing a hard food substance inside a wooden mortar.

The food processed with these pestles is not known, but a good guess would be palm nuts. Various species, such as Guilielma, Astrocaryum, Phytelephas, and Elaeis, are palms that bear mature, nutirtious fruit during most of the dry season. These species and others are distributed throughout the pantano forests and lower slope zones. One of these palms, known locally as Corozo (Elaeis olifera), is the biggest producer of palm nuts in the Costa Arriba area. To extract the rich oil and pulp from the fruit, the nut must be cracked with a pestle tool. Present-day Black and Choco groups of the district harvest large quantities of this food during the dry season. Both groups use wooden mortars and pestles for processing the Corozo nuts. This palm nut and other local palm fruits appear to have been important food sources collected by prehistoric communities of Costa Arriba and processed with pestles and mortars as in modern Black and Choco households. The excavated pestles from PC 001 suggest palm fruits were processed similar to present-day methods. Similar pestle and palm nut associations have been found in Pacific-zone preceramic sites in western Panama (Linares and Ranere 1971: 348-351). At a later-dated site in the same region, that of Sitio Piti, pestle tools associated with Corozo palm nuts have been reported (Linares, Sheets, Rosenthal 1975: 187). Better preservation at these sites has made it possible to identify the nut remains of Corozo (Corozo , Elaeis). The recovery of these nuts in preceramic and ceramic deposits in Pacific area sites and the association with pestle tools in both the Pacific and Caribbean area demonstrate the antiquity of this food source in Lower Central America.

The presence of manos and metates at PC 001 and on the surfaces of other district sites in Costa Arriba indicate the antiquity of maize cultivation along the Caribbean slopes of eastern Panama. Maize was a principal crop among these early riverine groups. PC 001 and the twenty other similar, small-sized settlements in the district are located on terraces within agriculturally-rich valley and slope lands. The similar lowland orientations of these settlements indicate cultivation of surrounding fertile soils. Forest-clearing tools, such as axes and wedges found in the deposit at PC 001, indicate these lowland areas were continually cleared for cultivation. Similar forest clearing tools were found on the surfaces of other surveyed sites in the district. Mano and metate utensils excavated at PC 001 indicate maize was a principle crop cultivated in swidden plots.

Despite the over 3,000 millimeter annual rainfall registered in this zone, two to three crops of maize can be harvested annually by using a swidden technique of forest fallow. This agricultural pattern of forest clearing and cultivation still persists in Costa Arriba. Black and Choco residents both harvest two maize crops a year. Clearing and planting in the floodplain zones are done during the dry months (December to April). Higher slope elevations are cleared and planted during the more rainy months (May to November). Slope plots located off the floodplain require removal of primary forest growth. After harvest, these plots are easily cleared because of a predominately succulent and grassy plant cover. The floodplain areas receive new deposits of alluvial soils between planting, making them rich agricultural areas.

The Choco cultivate up to eight different varieties of flint and flour corn that are well-adapted to this zone. Each variety is used for different consumptional purposes. One variety is ground for making a chicha beverage. Another is harvested early and either roasted or eaten uncooked on the cob. Another is used for animal feed and still another is used for preparing a boiled food similar to a tamale. The Choco maize varieties are planted in different cleared slope and floodplain areas located close to one another. After garden plots are harvested, the maize is stored in large bins constructed of cut balsa (Ochroma spp.) bark.

The use of balsa bark by the Choco appears related to the tending of this tree by earlier Cuevan groups of eastern Panama who utilized various harvestable products from the tree. Oviedo states the Balsa tree (Ochroma) was planted by the sixteenth-century Cuevan groups in eastern Panama and could often be seen close to the houses and in the surrounding fields (Oviedo y Valdes 1853: Lib. 29, Ch. 28: 136). The tree had major importance with the Cueva as a source of cotton, which was used to weave cloth and make fishing nets. Besides being used by modern Choco for bark containers, both Choco and Black residents of Costa Arriba use balsa wood for carving such things as marine turtle decoys, net floats, rollers for storing their boats on the beach, and hand-held fishing reels. The Balsa tree thus contains a variety of different resources and appears to have been an ancient tree crop selectively tended along the Caribbean slopes.

The modern-day swidden system of forest clearing and maize cultivation has considerable antiquity along the moist Caribbean slopes. The earliest European account of indigenous Cuevan settlement in the Costa Arriba area was written by Christopher Columbus' son Fernando (Colon

1942). Fernando accompanied his father during the fourth historic voyage to the New World in 1502. Skirting the Costa Arriba coast in November of this year, Fernando observed extensive maize fields cultivated along the interior slopes belonging to theriverine Cuevan groups residing here (Colon 1942: 92). Columbus' account clearly states large areas of the forest were cleared and cultivated with maize (Colon 1942: 93). The maize Fernando observed must have been along the higher slopes where it would be visable from the ocean. November, the month Fernando was visiting the coast, is the end of the rainy season, suggesting the observed corn was planted three or four months before on the protected slopes. The maize would have been at the end of its growth cycle when Fernando made his observations. The planting of maize along the higher slopes by these local Cuevan groups indicates the use of these drier areas during the rainy months for maize cropping a pattern identical to modern Choco and Black farmers of the area. Local Cuevan maize farmers appear to have practiced a shifting maize cultivation pattern, using the protected slopes in the rainy months and the floodplains in the drier months, making possible two harvests a year. Fernando's November observations thus make it possible to determine the scheduling and swidden pattern associated with Cuevan maize-based farming communities of the Costa Arriba area at contact times.

A similar shifting system of maize cultivation used by interior and Pacific Cuevan groups is reported throughout the entire eastern Panama lowlands at the time of Spanish contact, indicating maize was also a principle crop among these more regional groups. The swidden system associated with maize cultivation required the control of extensive areas of rich valley and slope soils. The movement and territorial settlement associated with sixteenth-century chiefdoms of eastern Panama involved competition for good agricultural lands necessary for maize cultivation. This expansion and colonization began by at least 1 A.D. in Costa Arriba where settlements had penetrated the major lowland river valleys. Over the rest of eastern Panama, related maize-oriented groups controlled the rich riverine zones, leaving few, if any refuge areas. The presence of manos and metates and forest-clearing tools at PC 001 and the riverine settlement orientations of the twenty-one recorded sites in this area indicates these groups were part of this early maize-based expansion dominating lowland eastern Panama by at least 200 A.D. The maize agricultural communities of Costa Arriba were thus incorporated into the regional economic network of agriculturally oriented groups of eastern Panama by the time of Christ and continued this cultural association until contact times.

The earliest archaeological evidence of maize in Panama is from the highlands of Chiriqui, in the valley of Volcan and Cerro Punta, where seed remains of maize along with beans (P. vulgarus), avocado, and Corozo palm nuts have been radiocarbon-dated to 430 ± 60 B.C. at the site of S tio Piti (Linares 1975: 142). Early settlement in these rich volcanic soil valleys apparently was the result of groups expanding down from the north. A good chronological sequence has been worked out for both the Chiriqui highlands and central provinces, as well as the Atlantic sector or western Panama (Linares, Sheets, and Rosenthal 1975: 137-145; Linares and Ranere 1971: 346-355). This sequence indicates a long period of agricultural settlement leading to the formation of large habitation sites and chiefdom territorial groups (Cooke 1976; 1972; 1975a; 1975b).

In eastern Panama, less intensive investigations have been done and no dates are associated with excavated plant remains at archaeological sites. Cultural settlement in eastern Panama is not historically related to the agriculturally oriented, ceramic-bearing complexes of western Panama (Cooke 1976: 32; Linares and Ranere 1971: 352). The sequence of agricultural settlement in both areas thus is distinct. Fossil maize pollen, recovered from core samples taken in Gatun Lake areas of the Canal Zone (Bartlett, Barghoorn, and Berger 1969: 389), has been dated from 3100 B.C. to 200 A.D., suggesting maize was a cultivated crop in the tropical wet zone of the Isthmus at this early time. Charcoal was found in these core samples, implying agricultural clearing and burning. In addition, maize pollen, dating from 5300 B.C. to 4300 B.C., was obtained from deeper core samples in the Gatun Lake area (Bartlett, Barghorn, and Berger 1969: 389). The riverine orientation of eastern Panama groups is connected closely with the expansion of early agricultural groups out of northern Colombia where maize has been shown to date earlier than in western Panama (Reichel-Dolmatoff 1957; 1956; Rouse and Cruxent 1963; Zucchi 1973; Lathrap 1958; 1974; Wagner and Zucchi 1966: 36-38). In Costa Rica there is now firm evidence that this northern maize expansion reached the Caribbean lowlands by at least 200 A.D. (Snarskis 1976: 384). The importance of this seed crop among the early tropical forest groups of the Caribbean lowlands points to a rapid spread of maize-based groups out of northern Colombia by at least 1 A.D. following the Caribbean sector of tropical forest slope and valley lands. This hypothesis offers a reversal of the old notion ascribing Mesoamerican origins for Lower Central America. Eastern Panama thus appears to be an area containing evidence for the penetration of early maize agricultural groups from northern Colombia.

Cooke has suggested the earliest evidence of maize-based communities in Panama should be found in the more arid Pacific coast zones (Cooke 1976a), yet the Gatun pollen samples, the maize-oriented settlements in Costa Arriba, and the earlier maize groups of the moist Magdelena valley of Colombia (Reichel-Dolmatoff 1965: 117-141) argue for an earlier antiquity of this agricultural complex in the riverine lowlands of eastern Panama. The settlements along the Caribbean slopes of eastern Panama clearly indicate maize was well adapted to this moist area by 1 A.D. and it must have been present even earlier in the more extensive agricultural interior zones of Río Chagres, Río Bayano, and Río Chucunaque.

Little direct evidence was recovered at PC 001 for the cultivation of other crops. There was a total absence of organic remains in the deposit. No other tool forms directly indicate processing of domesticated crops; however, one suspects this early agricultural system was not based solely on maize. Root crops, especially manioc (Manihot esculentus), must have been part of the plant complex. Santa Isabel Undecorated utilitarian ware vessels, such as the wide-mouth ollas and large bulgare-like plants, may indicate their presence.

Domesticated fruits appear to have been important. A well-established orchard-crop complex was present in the Costa Arriba area at contact times (Oviedo y Valdes 1950: 203-241). This orchard complex included such tree crops as Cacao (Therabroma sp.), Papaya (Carica papaya), Mamey (Mamea americana), Avocado (Persea americana), and Pineapple (Anana comosus). These and other tree fruits show considerable variation as domesticates and cultivar forms in this lowland zone, suggesting a long period of selection and cultivation. Some possibly were originally domesticated in this zone since wild relatives of many of these tree crops are abundant throughout the wet forest zone of the Caribbean slopes. There is a distinct possibility this orchard tree-fruit complex dates as early as the Formative period in eastern Panama and forms part of the agricultural basis for the early occupational component at PC 001 as evidenced by the Río Cuango Punctate wares.

Fishing was an important activity among these early riverine maize-based groups of the Caribbean area. Numerous fishing weights found in the excavated deposit indicate a wide range of seasonal fishing activities. Two weight classes represented by sixty-nine excavated fishing weights indicate both freshwater species and marine species were being caught through the use of drop lines and possibly nets. Larger notched weights present in the PC 001 deposit suggest marine turtle was being netted in the more distant, open-sea shallows. Mollusk remains of Cittarium pica on the surfaces of a number of sites indicate the reefs were important areas for collection of shellfish. With the abundance of diversified marine fauna inhabiting the reef zone, it is reasonable to suspect fish, lobster, octopus, and other edible species were also being collected. Unfortunately, poor preservation on these sites has resulted in total absence of fauna remains. Nevertheless, the large sample of fishing weights excavated at PC 001 clearly indicates the importance of fishing in the overall economy of these Atlantic area groups.

Riverine and marine fishing required the use of watercraft. The riverine locations of PC 001 and the other district habitation sites indicates waterways were used for quick and efficient traveling between marine and deeper forest zones. Fishing conditions in the rivers, bays, and open-sea areas involve different aquatic conditions, suggesting different styled dugouts were manufactured by these early riverine groups for travel in the Costa Arriba waterways.

Dugouts were manufactured by the sixteenth-century Cueva groups of eastern Panama for riverine and ocean travel. Oviedo describes these dugouts as well-built, consisting of small and large sizes. The larger ones were capable of carrying fifty to sixty people (Oviedo y Valdes 1853: Tomo III, Lib. 29, Ch. 32: 159), indicating sizable watercraft. The two different dugout sizes were probably built for separate riverine and marine use. The construction of dugouts by these Cuevan groups indicate a well-established woodworking technology similar to that known for PC 001. Certainly the woodworking industry, represented by the lithic assemblage at PC 001, was well designed for construction of dugouts and suggests the site may have been an important boat-building center.

The size variation of excavated fishing weights from PC 001 make it difficult to determine which were line weights and which were net weights. The variation in size may, in fact, indicate most were line weights since uniform size and heaviness are important factors in the use of weights on fishing nets. The possibility of larger dragnet use is unlikely because of the shallowness of the rivers and the amount of off-shore coral covering the ocean floor. The attachment of some weights to smaller throw nets, however, is a distinct possibility. Present-day Black residents of the coast make five to six-foot throw nets using monofilament line and small, uniform size and weight, lead pellets. The throw nets are used by Black fishermen to catch sardines, both in riverine and shallow marine locations. The sardines are then used as live bait to catch larger bay and open-sea fish on individual drop lines with weighted sinkers. Riverine fishing by Black and Choco fishermen is done in small dugouts with drop lines, using the live bait caught with the throw nets. Upstream, deep pools are fished for Robalo (Centropomus), Ronco (Haemulum, bonarensis), and Boca Chica (Caracidae). In the ocean, Black fishermen use larger dugouts and weighted drop lines also baited with sardines caught with the throw nets. Heavier weights permit the Black fishermen to catch a larger and more diversified range of ocean floor fish species than in the rivers. As mentioned, ocean fishing requires a considerably heavier weight attached to the fishing line than in freshwater situations. This is due to the deeper marine depths and buoyancy factors. The Black fishermen use metal scraps as line weights. The weight divisions between their freshwater and marine sinkers correspond to the two weight divisions of sinkers excavated at PC 001. Experiments using replicated weights of the excavated PC 001 examples indicated the heavier weights found at the site were used for bay and open-sea line fishing and the lighter weights were used for freshwater line fishing.

Scheduling

The scheduling of all subsistence activities was influenced by seasonal changes affecting the Caribbean forest and ocean zones. Early prehistoric settlement in Costa Arriba involved shifting emphases in resource collection between the forest and the sea at different times of the year. One aspect of this scheduling system has already been mentioned in the discussion of maize cultivation. Dry-season planting in the floodplain zones and wet-season planting along the higher elevation appear to have been a seasonal swidden cycle of maize cultivation among the early riverine groups of Costa Arriba. The lithic assemblage excavated at PC 001 containing forest-clearing tools and food-processing tools provides further evidence for different dry and wet-season activities.

In the Costa Arriba area, the dry season lasts from December to April. The forest receives a minimal amount of rainfall during these months, resulting in a drying of the forest soils and a stabilization of the rivers. This drying effect permits more efficient penetration and travel through the forest at a time when many resources can be collected. Pestle tools excavated at PC 001 indicate one of these resources was palm nuts. The pantano and lowland valley forest produce edible fruit only in the dry season when the lower forests are relatively dry and free from standing water. Large populations of land crabs inhabit the predominately palm-covered pantano forests. Crabs are easily caught during this dry period, offering another high protein food for prehistoric groups of Costa Arriba.

Timbering is most efficiently done during the dry season since weather conditions permit complete drying of cut wood. December to April was an important period of the year for woodworking and archaeological evidence recovered from the Costa Arriba zone allows reconstruction of activities associated with this dry period industry. The diversified lithic assemblage of woodworking tools excavated at PC 001 indicates large forest hardwoods were being cut and shaped during this season for use as construction manterial in manufacturing dugouts, household structures, smaller utensils, and hunting tools. Individual trees of the large timber species are scattered along the higher 100 meter upriver slopes, requiring long-distance travel through the forest to cut and to transport the timber to downriver settlements. Direct, easy travel to upriver zones is possible during the relatively rainless months when rivers remain calm and shallow.

The lithic assemblage at PC 001 indicates one of the most important timbering activities during the dry season was boat building. Dugouts were necessary in this and other riverine settlement for fishing and water travel. Construction of these dugouts had to occur during this dry period of the year. Axes, celts, wedges, chisels, and smaller flake tools excavated in the deposit at PC 001 represent tools used to cut and to shape the large forest hardwood trees for manufacturing dugout canoes. Local Choco and Black residents still construct their riverine and marine dugouts from these locally available hardwood timbers. The process of locating, cutting, shaping, transporting, and finishing these dugouts by modern residents of Costa Arriba reflects the amount of intensive labor required in this activity and offers valuable ethnographic information for reconstructing earlier prehistoric activities relating to dugout construction.

Hardwood timbers in the upper forest zones occur as individual canopy forest trees, well separated for one another, make it necessary to travel these zones to locate a suitable tree. Once located, the tree must be cut and a section removed for roughing out the dugout form. Black and Choco woodsmen use metal axes for this work. The numerous stone axe forms excavated at PC 001 and those recovered from other site deposits in the district, indicate large forest trees were girdled with these cutting tools and left to die. Afterwards, the tree could be completely cut down. This timbering technique has widespread distribution in lowland tropical America (Chagnon 1968: 33; Up de Graff 1974: 120-121).

Roughing the dugout into shape from the separated portion of the fallen tree is the next process. Roughing out of the dugout in the deep forest is done so the boat can be transported more easily from its jungle origin down to the river. The distance to the river may be as far as one to two kilometers. Blacks and Choco woodsmen try to cut large trees along a small, secondary stream bed which serves as a relatively clear trail for a labor group to push the roughed-out dugout down to the river. Poles of smaller trees are cut with machetes and placed under the heavy, roughed-out dugout, making movement easier down the narrow and winding, gravel stream bed. A roughed-out, ten to fifteen-foot dugout made from hardwood cedar or espavel can weigh as much as 3,000 pounds. A sizable group of strong individuals is required to transport the dugout down to the river. Leaving the jungle with the heavy dugout often requires overland crossings where the stream bed makes sharp, narrow curves.

Once the roughed-out dugout reaches the river, it can be easily floated downstream to a protected location where further shaping will be done. Both the Blacks and Choco transport their roughed-out dugouts to their homes. After two to three months of letting the wood slowly dry, final finishing will begin using metal celts. Final finishing work is performed by a specialist. Careful construction at this point is required to insure the boat's strength and stability. A correctly constructed and cared for dugout will last up to seven years. Dugouts are the only means of travel along the rivers and ocean, making them essential for settlement in this area. The movement of agricultural goods and other forest products back to the settlements is also greatly facilitated by dugouts. Black and

Choco residents of the area depend daily on their dugouts for this heavy transport. The movement of cultivated agricultural products and forest resources among the prehistoric groups of Costa Arriba was probably another important factor in the construction of dugouts.

The local ethnographic data relating to the construction of dugouts by Black and Choco residents indicates technological aspects of the earlier woodworking industry present at PC 001. Timbering was restricted to the dry season when weather conditions permitted the harvesting of wood sources and proper curing. The excavated woodworking tools at PC 001, including celts, axes, wedges, scraper planes, and smaller flake tools were special cutting and shaping utensils used to manufacture a variety of wood products, including dugouts necessary for river travel and ocean fishing. The more technical aspects of the contruction of dugouts used by earlier prehistoric groups are not well documented from excavations at PC 001. Local ethnographic evidence suggests a sequence of dugout construction activities involving specialized woodworking tasks necessary to complete the final dugout form. The presence of the woodworking tool kit at PC 001 indicates this was a special site where final shaping of dugouts was done. The absence of similar lithic tools at other surveyed sites in the district suggests the workshop at PC 001 was actively conducting dry season timber harvesting in the construction of dugouts and other wood products.

In addition to the archaeological evidence recovered in the Costa Arriba area for forest clearing, maize cultivation, palm-nut collecting, timbering, and woodworking activities conducted in the dry season months along the Atlantic slopes, there is reasonable data pointing to hunting and riverine spear fishing as other dry season activities. No direct evidence for hunting was recovered from PC 001. Tools associated with this activity were probably made of wood and manufactured at the lithic workshop of PC 001. The drier conditions along the higher slopes during this season attract terrestrial and arboreal mammals to lower zones where ripe food sources are available, including fruits, grasses, and cultivated crops. Among prehistoric tropical groups of western Panama, it appears forest hunting was focused largely in cultivated swidden plots where forest mammals often feed (Linares 1976: 331-349). Similar "garden hunting" techniques have also been reported for the lowland Maya (Reina 1967: 1-20; Lange 1971: 619-639). In the Costa Arriba area, the extent of agricultural swiddening associated with this early settlement would have also permitted this kind of hunting during dry season months when the forest game animals are concentrated in the lowland zones. Browsing mammals, such as peccary (Tayassu tajacu), paca (Cuniculus paca), and borcket deer (Mazama americana), are present along the Atlantic slopes. These animals tend to have a more restricted, lowland territorial range during the dry season because of higher concentrations of available food in this zone. Dry season cultivation plots, located in floodplain and lower slope areas, further attract and restrict the territorial range of these animals during this time of year. Heavy rains from May to November make hunting these animals on the Caribbean slopes more difficult. Tracking animals in the wet forest at a time when their territorial ranges increase limits the quantity that can be captured in the rainy months. These present ecological factors were the same in prehistoric times along the Atlantic slopes and suggest hunting was conducted more systematically during the dry season months. The present-day Choco of the Río Cuango area concentrate their hunting activities during the dry season months, principally because of these seasonal influences on game. There is little reason to doubt the prehistoric hunting schedule was dissimilar.

Andagoya mentions that, among the sixteenth-century Cuevan chiefdoms, special reserves ("cotos") were set up within the territorial provinces. These reserves would be used by chiefs who hunted deer during the dry season (Andagoya 1945: 396), suggesting the most successful hunting of deer and other terrestrial forest mammals took place in this seasonal period.

Butchering tools used for dressing hunted animals were apparently common in the Cuevan provinces. Stone knives (piedras de perdinales; perdinales delgados) were common tools (Oviedo y Valdes 1853: Lib. 29, Ch. 28: 136, 138). Deer, paca, and peccary were important forest meat animals hunted by these groups and butchered with these small flake tools. At PC 001, flake tools were frequently recovered and probably functioned for woodworking tasks as well as butchering activities.

Riverine fishing is most productive during the dry season when the rivers remain clear and calm. Dry period months along the Caribbean slopes are the only time of year when these swift-moving, gravel river beds remain stable and transparent, a condition rare during the rainy months, making it difficult to fish or even to travel by dugout. Only limited evidence was collected from excavations at PC 001 indicating dry season river fishing. Although the smaller-notched weights indicate line fishing in deep pools of upriver areas, spear fishing may have been more typical. Flake tools and one jaspar spokeshaver excavated at PC 001 represent woodworking tools that could have been used to shape hardwood palm spears. As mentioned, the sixteenth-century Cueva of eastern Panama manufactured long Chonta spears with fire-hardened, bone, and stone-tipped points (Andagoya 1945: 396). As suggested earlier, the small, basalt points found in the PC 001 excavation may represent the spear points attached to similar Chonta fishing lances. Unfortunately, poor preservation in Costa Arriba makes identification of this dry season activity difficult to confirm. Freshwater fish are a major dry season food item in riverine Choco settlements in the Río Cuango area, indicating the seasonal importance of this food resource for these forest-oriented groups. Choco reliance on dry season riverine fishing and the methods they use to capture them offer an ethnographic example suggesting a similar pattern used by earlier riverine groups of the area.

Middle and upper river pools in the Río Cuango drainage contain schools of Ronco (Haemulum bonarensis), Robalo (Centropomus), and Boca Chica (Caracidae) reaching weights of two to four pounds. Shrimp, crawfish, and large schools of titi are abundant in the river and secondary streams during the dry season. Collectively, these freshwater species are present in all the major rivers of Costa Arriba and are seasonally important protein sources presently caught by Choco residents of Río Cuango. Better preservation at archaeological sites in the Río Cuango area and neighboring riverine valleys would probably have resulted in large quantities of fish bone and fishing equipment used to capture this nutritional dry season food. Tropical lowland riverine communities in the Caribbean area demonstrate the antiquity of seasonal freshwater fishing and there is little reason to doubt it was different prehistorically in Costa Arriba.

The Choco woodsmen of Río Cuango are excellent fishermen and provide a local ethnographic example of riverine fishing techniques used in the same waters fished by earlier residents of PC 001 and nearby neighboring settlements. During the dry season, the Choco frequently make trips upriver in their long, slender dugouts to the ten to fifteen-foot deep pools. These trips are often made by five to six males in two or three dugouts for two to three-hour, short fishing expeditions. At other times the fishing trips have larger groups and last two to three days. Once a pool is reached, a few Choco men will leave the dugout and go upriver to the rapids located immediately before the deep pool. Here they stagger the width and length of the shallow rapids area. Meanwhile, the rest of the party in the pool area prepare to dive, leaving their floating dugouts in the middle of the pool. The divers position themselves in various sections of the pool area. All in the fishing party are equipped with ten to fifteen-foot Chonta spears, tipped with six to eight-inch pieces of thin, round metal points, filed down at the end to pin-like sharpness. The divers submerge with their spears and quickly scatter the schools of larger fish feeding at the pool bottom. Each diver attempts to spear a fish, take it back to the boat, and quickly return to his position to spear another fish. The divers start from the downriver side of the pool and work to the upriver side, spending ten to fifteen minutes spearing in the pool. The diving and spearing activity causes the majority of the fish to head upriver into the rapids. Awaiting their exit are more Choco armed with similar Chonta spears. Choco standing in the rapids use their spears to capture individual fish as they move upriver. The same pattern is continued at the next upriver pool, and the party continues upriver until it has captured enough desired fish.

The total amount of fish to be speared can be calculated early by the Choco, based on the quantity represented in the various pools on a given day. If it appears an adequate amount of fish are available in only a few pools, and their adjoining rapids, the party will not travel far upriver. Estimates of how much fish will be speared on a given trip are discussed after two or three pool spearings. The total estimate will include the return downriver travel when the same pools are refished. Each fishing trip has as its goal the capture of a minimum amount of fish, so the original estimates of fish quantity in the pool areas will give the party an idea of how far upriver they will have to travel.

Once spearing is completed, and the party returns back downriver, the fish are distributed among the members of the party and taken to individual households where the fisherman's wife and children clean the fish along the gravel shores of the river in front of the house. After cleaning, the fish are cooked by smoking over a firepit located inside the open-walled pole house. Portions not eaten are saved for the following days.

Thus, dry season river fishing by the Choco is done efficiently with Chonta spears and dugouts. Quantities of fish are speared on fishing trips providing daily fish for all households during this time of year. Spear fishing among the Choco has obvious implications for archaeological identification of similar prehistoric dry season fishing activity. The lack of more fishing equipment at PC 001 and other early riverine sites suggests a similar wooden assortment of fishing gear as posssessed by the Choco. Choco use hook, line and small weight sinkers for river fishing; however, this is usually only done after heavy rain when visibility in the water is poor, making spearing difficult. Choco make and use thrownets with attached weights for catching live bait. Crawfish are taken with long Chonta spears at night. Shallow, leaf-filled shore banks are illuminated with kerosene lamps or headlamps, making crayfish easy catches. These additional Choco riverine fishing patterns suggest a relationship to earlier riverine fishing techniques, evidenced by the small fishing weights and basalt points excavated at PC 001.

Most of the 3,500 millimeters of annual rainfall occurs during the wet season months. Heavy daily rains usually occur in the afternoons and evenings, gradually causing an innundation of the lowland floodplains and pantano forests. Rivers and secondary streams swell, cut new courses, and carry quantities of forest debris down to the ocean where it is deposited along the nearby beaches. Heavy rainfall during these months cause hazardous traveling conditions along the rivers. Resources contained within the various forest zones are either not obtainable or are only periodically exploitable during occasional light rainy periods. Weather conditions limiting forest resources during the wet season, however, provide optimum conditions in the marine zones for fishing and collecting abundant reef, bay, and open-sea shallow food resources. Strong northeasterly trade winds blowing during the dry season months subside during the rainy months, providing calm sea conditions. An enormous biomass of fish species are attracted to the offshore zones during these months. Thus, at the beginning of the rainy season, there is a shift in locally available food resources from the forest to the sea, lasting some six to seven months.

Marine fishing clearly was an important rainy season activity at PC 001, evidenced by the numerous excavated notched weights. These weights were manufactured at PC 001 in the same manner as the side-notched pebble weights used for river fishing; however, they were made on larger pebbles, ranging in weight from about four to six ounces. Watercraft were used to fish with drop lines and notched weights in off-shore areas. These dugouts were probably larger than the riverine dug-outs. Dugouts used in the river by Choco and Black residents of Costa Arriba are long, narrow, and shallow boats maneuvered by poling in the shallow local rivers. Ocean dugouts, paddled with oars or sailed, required a wider and deeper construction for stability. Since prehistoric groups used these same waters for travel and fishing, their dugout con-structions were probably similar in style to modern river (piragua dug-outs) and ocean (panga dugouts) watercraft.

No other associated marine fishing gear was recovered from the excavated deposit at PC 001. The material used for fishing line was probably made from Pita, a tough flexible vine used by local Black fisher-men prior to introduction of monofilament line. Fish hooks may have been made of bone or shell, as they were during the sixteenth-century Cuevan occupation of this area (Las Casas 1951: Vol. II: 26).

Excavated line weights from PC 001 indicate fishing of the bays at this time. Techniques for marine fishing were probably similar to modern techniques used by local Black fishermen who intensively fish this zone with dugouts and drop lines in the rainy season. Unfortunately, no excavated remains of fish bones were recovered from PC 001 which would have indicated the selected species caught for consumption. The excavated fishing weights do, however, indicate ocean floor species were being caught, including such species as Gato, Cojinua, Herrero, Chivo, and

Boquipendula (Table 2). These species are abundant in early morning and late afternoon periods daily during the rainy season and are easily caught with hook, line, and sinker. In addition, larger, surface-dwelling, predator fish, such as Bonito, Jurel, Mackerel, Serrucho, Picua, and Sabalo, are plentiful in the same bay zones and more easily captured with a non-weighted, free line, baited with a live sardine (Table 2). The evidence already discussed for the use of throw nets at PC 001 suggests these surface-dwelling bay fish were also being captured with live bait caught in nets. Local Black fishermen still fish the bays using this single drop line, metal hook, and lead sinker in addition to capturing surface-dwelling species with free-floating lines baited with live sardines. The excavated weights found at PC 001 indicate similar drop and free line marine fishing techniques were used by earlier prehistoric riverine groups of the area.

In addition to the evidence for bay fishing at PC 001, other excavated material indicates more distant Bajos or shallows were being fished. Large, coral-inhabiting fish species, taken with line and weights, and marine turtle, caught in wide-mesh nets, may have been captured during these rainy season months. Offshore shallows occur one to three miles out to sea and have large schools of coral-dwelling fish and egg-bearing turtles. The fishing equipment recovered at PC 001 suggests larger marine species were being fished in distant sea locations. Heavier, five to six ounce, weights recovered from PC 001 indicate fishing in deeper water than the bay, suggesting their use for lowering fishing line in deeper sections of sea shallows to catch large, cave-dwelling species, like snapper (Lutianus) and Mero (Serranidae). These two species obtain weights of seventy to one hundred pounds in these distant shallows.

The fishing of marine turtle in these waters is indicated by two larger notched weights recovered from PC 001. These weights, ranging from eight to ten ounces, are still made by local Black fishermen from beach cobbles and broken pieces of cement which they attach to lower portions of locally made wide-mesh turtle nets. The attached weights make the nets hang taut in the water. The two, heavier, excavated weights from PC 001 are within the same weight range as those used by local Black turtle fishermen, suggesting the same use.

During turtle season, from May to September, four different species travel these shallow zones (Table 2), feeding on grassy floor vegetation. Female turtles move slowly to the beach zone to lay their eggs in the sand, making them easy catches in well-placed nets. Local marine turtles attain weights of 200 to 300 pounds, making them the largest meat package in the Atlantic zone. Only the Tapir (Tapirella) of the forest reaches similar size. More excavational data is necessary to confirm the fishing of these distant shallows by the early residents of the Atlantic riverine slopes. The evidence recovered at PC 001 for marine fishing equipment and able watercraft indicates seasonal marine fishing in bays and reef areas. Fishing of the distant shallows for larger fish and turtle is a distinct possibility given the archaeological evidence for construction of stable watercraft and manufactured fishing equipment.

Agricultural activities in the rainy season supplemented the marine fishing resources. As mentioned, forest-clearing axe tools, excavated at PC 001 and found on other district habitation sites, indicate primary forest clearings for maize cultivation. The higher slopes were chosen for clearing and cultivation during these months because of rainy season flooding of floodplain zones. In the months of July and August, heavy daily rains subside, resulting in a condition locally referred to as Veranillo, or little summer. This short, drier period makes it possible to clear, burn, and plant a variety of crops before heavier rainfall resumes. Planting of fruits and root crops, in addition to maize, along the higher slopes were probably done during this short, dry period. Unfortunately, no direct evidence for other cultigens was recovered from the PC 001 deposit.

The seasonal cycle associated with subsistence activities for the early riverine maize-based farming groups thus was influenced by a shifting availability of forest and sea resources. Maize, the principle crop, was grown in both rainy and dry seasons, using the slopes and floodplains at different times of the year. Dry season subsistence concentrated on forest hunting, riverine fishing, palm-nut collection, and crop harvesting. Wet season activities included marine fishing and forest slope clearing. Woodworking and stone tool manufacturing were important industries permitting maximum exploitation of these seasonal resources. Both industries were centered at the site of PC 001. Timbering activities and construction of dugouts appear to have been seasonal activities directed by residents of PC 001. Manufacturing of food-gathering, forest-clearing, and food-processing lithic tools was another major activity at this site. PC 001 thus must be considered as a production center for tools, equipment, and manufactured wooden products available for both local and regional use. The various seasonal subsistence activities in Costa Arriba were maintained largely through the manufacturing of specific stone and wood tools at the workshop area of PC 001.

Final Perspective

Archaeological settlements located along the moist Caribbean slopes of Costa Arriba provide some understanding of tropical forest adaptation over the larger eastern Panama-northern Colombia lowland region. Ceramic wares and the cobble stone lithic industry excavated at site PC 001 indicate this site and the twenty other riverine terrace sites represent maize-based settlements inhabited by groups that penetrated this Caribbean sector by 1 A.D. from interior eastern Panama lowland locations. The expansion of maize-based farming groups into the Costa Arriba area is closely related to the same colonization of the eastern Panama lowlands by slope and valley farmers moving out of the moist floodplains of northern Colombia as early as 500 B.C. Movement of maize-based communities out of northern Colombia further west and north, along the Caribbean slopes, reached eastern Costa Rica by 200 A.D. Thus, a wide area of Lower Central America, especially the moist Caribbean belt, was covered by these maize-based farming groups between 500 B.C. and 200 A.D. The Costa Arriba area was one of the earliest penetrated zones as these groups expanded. Earlier Formative complexes, moving out of northern Colombia, seem to have followed this same Caribbean route, as evidenced by similar ceramic components found along the Atlantic watershed areas of eastern Panama, eastern Costa Rica, and eastern Honduras. The moist Caribbean lowlands of Lower Central America have offered, therefore, attractive ecological zones for northern expanding agricultural complexes since the Formative period, placing the neighboring slope and valley zones of Costa Arriba in a rich frontier area for documenting cultural expansion processes over apprxoimately 3,000 years of prehistoric settlement.

Agricultural settlement associated with maize farming in the Costa Arriba area is the most archaeologically recognizable portion of the occupational sequence for the area. This sequence begins as early as 1 A.D. and continues to Columbus' skirting of the coast in 1502. Cultural settlement during this later period involves the expansion and territorial control of the entire eastern Panama lowlands by large maize-based polities. Excavated trade wares from the Costa Arriba site of PC 001 indicate this Caribbean zone was incorporated into regional networks of economic control by at least 200 A.D. Incised-Relief Brown Ware, painted and slipped ware, and imported jasper tools recovered at PC 001 represent trade material linking the Atlantic settlements with interior and Pacific area polities.

The district of Santa Isabel represents the widest Caribbean stretch of developed slope and flat valley lands favorable for agricultural settlement between the Atrato river and eastern Costa Rica. Sixteenth-century sources indicate Cuevan occupation here consisted of a series of small, local populations controlling individual valley and riverine areas. Map VIII shows these groups to be the Secativa, Caranca, Juanaga, Pequení, and Chuana. Collectively, these groups represent a relatively high number of local settlements occupying a relatively restricted area of valley lands and forming a territorial sector of the larger interior based Careta polity. Costa Arriba must have been one of the few attractive areas for maize farming along the Caribbean sector, and local occupation represented an incorporated frontier of the larger economic and political network polity. At the time of Spanish occupation in the Atlantic zone local alliances were with Careta polity; however, over the long period of Costa Arriba occupation, alliances probably fluctuated through time with the other major polities.

The origin of Cuevan polities is from northern Colombia, and penetration into eastern Panama by 1 A.D. was related to colonization of valley and slope lands for agricultural use. Ceramic evidence for this spread seems clear. Similar plastic decorated and painted wares occur in excavated sites stretching from the Lower Magdelena, Sinú, and San Juan river drainages on the east (Reichel-Dolmatoff 1951: 1-384; 1958: 31-149; 1961: 239-317; 1965: 117-141) to the Bayano river (Cooke 1973) and the Gulf of Panama (Biese 1964) on the west. Undecorated utilitarian bowl, plate, and large olla vessels tend to predominate in these archaeological sites. Santa Isabel Undecorated wares recovered from twenty-one archaeological sites in the Costa Arriba area represent a tracing of early Cuevan movements. The predominance of similar utilitarian wares on sites in the Chagres river, Gulf of Panama, and Bayano river areas, to those on the Caribbean area sites indicate a single cultural unit for this wide area. Unfortunately, the sequence of Cuevan expansion from 1 A.D. to contact times remains incomplete because of the paucity of archaeological investigation in eastern Panama. Regional comparisons between site complexes using ceramic evidence still remains difficult because of the almost total disregard for utilitarian wares and the preference for describing decorative wares. The utilitarian wares appear to represent the most important evidence for linking the settlements associated with Cuevan polities, and the large sample of Santa Isabel Undecorated wares recovered from Costa Arriba sites reflect the range of vessel shapes associated with this drab, but diagnostic style.

Early incorporation of cultural communities along the Atlantic area by larger polities of the interior is best evidenced by the economic basis of settlement along the Caribbean at 1 A.D. The cobble stone lithic industry excavated at the site of PC 001 represents a manufacturing center for the production of forest clearing tools and related agricultural equipment for the cultivation of maize. Evidence collected at this site and twenty other surveyed sites in the district indicate slopes and floodplains were being used in a seasonal shifting pattern of planting two harvestable crops a year. This evidence demonstrates extensive farming of maize, using all suitable valley and slope lands surrounding the nearby dispersed terrace settlements. Ethnohistorical information of the sixteenth-century Cuevan occupants of this area indicates this agricultural pattern continued until Spanish contact and was efficiently designed for productive maize cultivation over a large demographic area. Costa Arriba agricultural settlement did not represent isolated farming communities, but rather fontier farmers who were incorporated into the larger interior and Pacific area polities. Knowledge of how this early system of economic networks worked is based on descriptions of sixteenth-century indigenous settlement, when large Cuevan chiefdoms politically administered agricultural production and rural maize farming settlement over wide areas of lowland valleys throughout eastern Panama and northern Colombia.

Excavations conducted at the Costa Arriba site of PC 001 recovered a lithic assemblage from a workshop context. The workshop produced a range of tools targeted toward exploitation of several environmental niches indicating seasonal scheduling of procurement activities. Tools for this resource harvesting ware manufactured at the workshop and distributed to neighboring valley sites indicating PC 001 represented a specialized center for tool production and raises the possibility of a hierarchy of site function. The tools enabled harvesting of food resources such as seed and tuber crops, freshwater and marine fish, forest game animals, and palm nuts located throughout various Caribbean area forest zones. In addition, the workshop involved timbering activities conducted over a wide area for construction of dugouts, household utensils, and wooden tools and weaponry.

Archaeological studies among early polity-sized populations in both the New World and Old World have demonstrated a hierarchical difference of settlement based on habitations' size (Isbell 1977; Wright 1978). Settlements with specialized activities tend to be less frequent, larger in size, and associated with political and economic activities affecting smaller uniform-sized habitation sites. Within these larger polities, such as the Wari state in Peru, a site hierarchy occurs that is archaeologically detectable, consisting of a range of different-sized settlements having different state functions (Isbell 1977: 52-56). In the Costa Arriba area, dispersed valley settlements were undifferenciated from one another in size. However, the specialized function of site PC 001 in relationship to all other sites seems clearly established. The specialized function of PC 001 suggests this site was one step above other sites in a hierarchical system despite it being the same size as the other settlements. As I have suggested, these Caribbean area settlements were within a territorial sector of a larger chiefdom polity of eastern Panama. However, functional differences in settlement occur without significant change in size, suggesting additional divisions in site hierarchy present at the lower level of a state-sized system.

The specialized activities at PC 001, as witnessed by the lithic assemblage, indicate this settlement was a manufacturing center for the flow of goods, raising the possibility that the flow of information and economic control for the numerous riverine valley areas passed through the same node. A higher level of social and economic interaction is also suggested by other cultural materials excavated from PC 001. Exotic trade wares and jasper tools recovered exclusively at this site indicate it was the recipient of these goods from interior and Pacific area settlements. Outside links and alliances appear to have been maintained with the exchange of such goods and their exclusive presence at the site of PC 001 suggests residents of this settlement were in a direct network of resource and communication flow with distant lowland chiefdom groups. The relationship between PC 001 and other eastern Panama settlements suggests a hierarchical structure of settlements, placing PC 001 in an intermediate position of importance between small farming household settlements in the Caribbean area and larger-sized habitation sites in the Pacific watershed area.

The archaeological evidence obtained from the 1 A.D. Caribbean area settlements points to a pattern of territorial alliances similar to the sixteenth-century Cuevan chiefdom control of lowland areas. Among the large Cuevan polities, settlements were dispersed and divided into various territorial sectors. In all of these sectors maize farming was the principal activity; however, there was considerable variation in resource exploitation, so that differential use of similar environments was typical. In some territories, hunting was the principal activity, while in others it was fishing or cultivation of selected crops. The territories were each controlled by a political leader under the authority of a _Tiba_, or chief, and thus widely scattered settlement territories were linked together by a network of political and economic organization. Population within a chiefdom polity was kept dispersed and uncentralized, except in times of war when dense populations clustered in the area of the Tiba's settlement for participation in battle. The more powerful chiefdom groups not only had to maintain a productive agricultural supply, but also had to control the manufacturing of industrial products for obtaining diversified territorial resources. Obtaining diversified resources required the manufacture of a variety of lithic and wooden tools, making specialized workshops important centers of regional interaction. The Caribbean slope zone was an important area of territorial control because of its diversified forest and marine resources, and each of the major sixteenth-century chiefdoms of the Bayano and Chucunaque rivers maintained Caribbean area sectors where cobble industries provided tools for local resource procurement. Hardwood timbers, palm products, marine turtle, and fish are important products concentrated in the Caribbean area. Obtaining these resources required control of a lithic and woodworking industry and control of dispersed valley settlements through social alliances. It may be that these early Caribbean settlements shifted alliances through time and the exotic materials excavated at PC 001 represent trade items obtained during these periods of shifting political and economic relationships.

The archaeological data obtained from the small scattered valley settlements in the Costa Arriba area indicates a long antiquity of chiefdom territorial control in the Caribbean sector of eastern Panama. The special lithic workshop at PC 001 represents a regional industry rather than simply a local industry. It provided a diversity of resources for interior and Pacific area groups that appear to have been in territorial alliance with the Caribbean valley residents. The eight river valley areas of settlement in Costa Arriba appear to form a territorial and demographic unit of a larger polity. Economic activities of maize farming, fishing, hunting, and timber harvesting appear to have been selectively scheduled in order to obtain these resources for both local and regional use. Because PC 001 was a manufacturing center, it was probably also a central territorial settlement that affected economic activities over the Caribbean valley areas while maintaining alliance with a chiefdom polity of the interior. The manufacturing of tools and products at a select settlement like PC 001 provided a network for social cohesion of dispersed valley settlement. As a specialized tool manufacturing site, PC 001 appears to have served as a central settlement where neighboring valley residents obtained their tools and utensils in exchange for economic and social benefits provided by the larger chiefdom polity, a pattern that was well established in Cuevan communities of the sixteenth century.

The limited information contained in the small excavated lithic workshop along Río Cuango, Costa Arriba, indicates the complexity of social and economic networks of settlement associated with early lowland-based chiefdoms of eastern Panama. The process of chiefdom formation and expansion is poorly understood in the lowlands of northern South America and eastern Panama; however, through investigation of imprtant site features and special activity areas of habitation sites in the Caribbean zone of Costa Arriba, it has been possible to demonstrate both the antiquity and regional nature of tropical forest chiefdom settlement.

APPENDIX

APPENDIX

Type Description of Santa Isabel Undecorated Ware

Paste and Surface

1. Manufacture. All vessels appear to have been manufactured by coiling.

2. Temper. Temper is generally uneven in size, consisting of rounded river gravel particles. The predominant temper inclusions consist of feldspar, quartz, and andasite gravels. In most cases, the lumpy particle temper is exposed on the surface of the vessel, while on a small sample, a thin bath of clay wash can be observed that covers the projecting particles on the body wall surface. Sherds that are badly eroded contain a rough, uneven surface much like a very course sandpaper.

3. Texture. The paste is crumbly and loosely compact showing various stages of weathering from the highly acidic, wet clay soil present on the terraces where the site deposits were found.

4. Color. Low firing and incomplete oxidation has produced a range of paste colors. Brick red is the most predominant paste color with brown and black and light tan variations. Few sherds contained core colors different from the rest of the paste.

5. Treatment. Smoothing was done to produce an even surface. No burnishing marks were found. In only a very few cases, body and neck sherds from wide-mouth olla forms contained tooling marks present at sharp angular portions of the vessel body.

Form

1. Body wall thickness. There is a wide range of wall thickness in the various vessel forms reconstructed. Small, three to five millimeter, thick-walled ollas and bowls were found, as well as much thicker, twenty to twenty-five millimeter, thick-walled plates and wide-mouth olla vessel sherds. Within the four vessel categories, the average body wall thickness was seven to eight millimeters.

2. Rim and lip. Everted rims belonging to wide mouth ollas, as well as flat rims and beveled rims on similar-shaped ollas, were the most predominate rim and lip form. Some of the rims on these vessels thicken at the lips, while others remain the same. A range from slightly convex to completely flat rims are present. Small ringed lips placed on the mouth of the vessel were also present but much rarer. Wide mouth ollas with these rim and lip orientations ranged from nine centimeters to forty-two centimeters in mouth diameter openings.

   Unmodified rims that remain the same thickness from the body to the lip characterize the majority of bowl, plate, and dish vessel forms. Rim curvature was either inward or outward curving. Inward curving rim orientations occurred on both restricted wall bowls and beveled rim ollas having mouth diameters of ten to twenty-four centimeters and ten to forty-two centimeters, respectively. Outward curving, unmodified rims of continuous body and lip thickness characterize the hemispherical bowls and shallow plate forms. Mouth diameters on these vessel forms range between nine and twenty-two centimeters and sixteen and thirty centimeters, respectively (Table 12).

Thickened and raised ring lips characterize the third category of rim and lip orientation. Raised ring lips occur on flat plates and shallow bowls. The ring lip is small and appears cut along the interior wall neck to form a one to two millimeter coil around the interior surface. Identical treatment is given to some lips placed on restricted wall vessels, except that the cut portion of the lip or rim coil is on the outside of the vessel neck. Diameters of these rims range between sixteen and twenty-two centimeters. Thickened rims occur in two variations: a fattened lip shape measuring about twice the size of the body wall, and an angular-shaped lip forming a three-sided appearance in cross-section. Fattened lips are found on large diameter plates measuring as much as fifty centimeters. Similar-shaped lips are also found on neckless ollas with mouth diameters ranging between sixteen and twenty-two centimeters. A few wide mouth olla rims contained fattened lips, but this was rare. Angular, three-sided, shaped lips were found on two variants of hemispherical bowl rim sherds and on small wide-mouth olla rim sherds.

Base and Supports

Concave, unmodified bases were predominate on all vessel forms.

Ring bases were attached to some plate and possibly some bowl forms. No complete vessels were found with ring bases, making this association tentative. Diameters of the ring bases were approximately calculated to between six and ten centimeters with heights between one and three centimeters.

Flat-bottom vessels were only found on small plate forms, although these were extremely rare and no flat body sherds were found in the sample that could be identified as bases.

Reconstruction of Major Vessel Forms

1. Large, globular body ollas. Rim and neck orientations vary from short to tall and mouth diameters range from small to large (Table 12). Everted rim, flat rim, and beveled rim were attached to this vessel form. All contained round concave bases.

2. Neckless olla. Only a few rim sherds (seven) were found corresponding to this vessel category. The neckless olla may be wrongly placed with this ceramic family of utilitarian wares. It possibly represents a class of vessels better associated with Formative like Río Cuango Punctate wares with plastic decoration found in the excavated sample at site PC 001.

3. Plates, dishes, and hemispherical bowls. This family or related vessels range from small cup-like dishes to large budare-like plates. Shallow hemispherical bowls with unmodified or slightly modified lips predominate, having mouth diameters from nine to thirty centimeters and body depths averaging between five and six centimeters.

4. Restricted-wall bowls represent another vessel category. Small, shallow forms with wide mouths and deeper bowls with similar wide-mouth openings occur. Only one rim sherd was found modified in this vessel class, having a ring coil around the mouth of the vessel.

Sample

Santa Isabel Undecorated wares were collected on the surface of twenty-one district sites. A total sample of 3,052 sherds belonging to this utilitarian ware was recovered from surface collections at these site deposits, and an additional 23,501 sherds were recovered from excavations at one site (PC 001). A large sample of measurable rim sherds were represented in this sample and provided the basis for distinguishing vessel categories and subdivisions within each vessel class. At PC 001, 103 rims and bases were recovered from survey and an additional 737 rim and base sherds were recovered from excavation at the site. A total of 129 rims and bases were found at the other twenty surveyed district sites. Vessel categories were uniform over all of the recorded district sites. The large sample of rim, body, and base sherds from these sites thus provides a reliable sample to distinguish vessel categories and modal characteristics. Unfortunately, no complete vessels were found at any site.

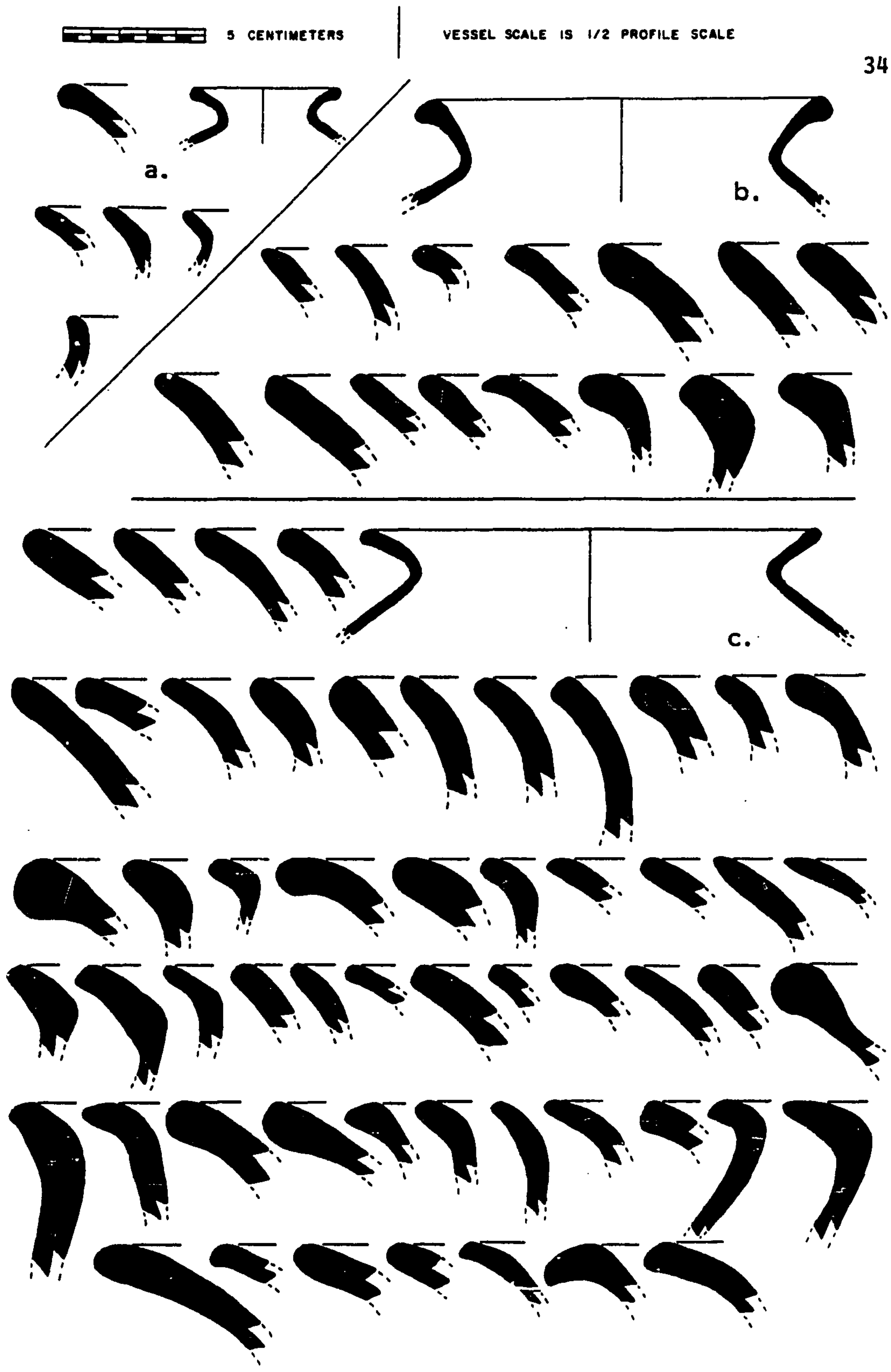


Figure 41. Wide Mouth Olla: Everted-Rim. Group 1 (a), Group 2 (b), Group 3 (c). Excavated rim sherds, PC 001. Santa Isabel Undecorated.

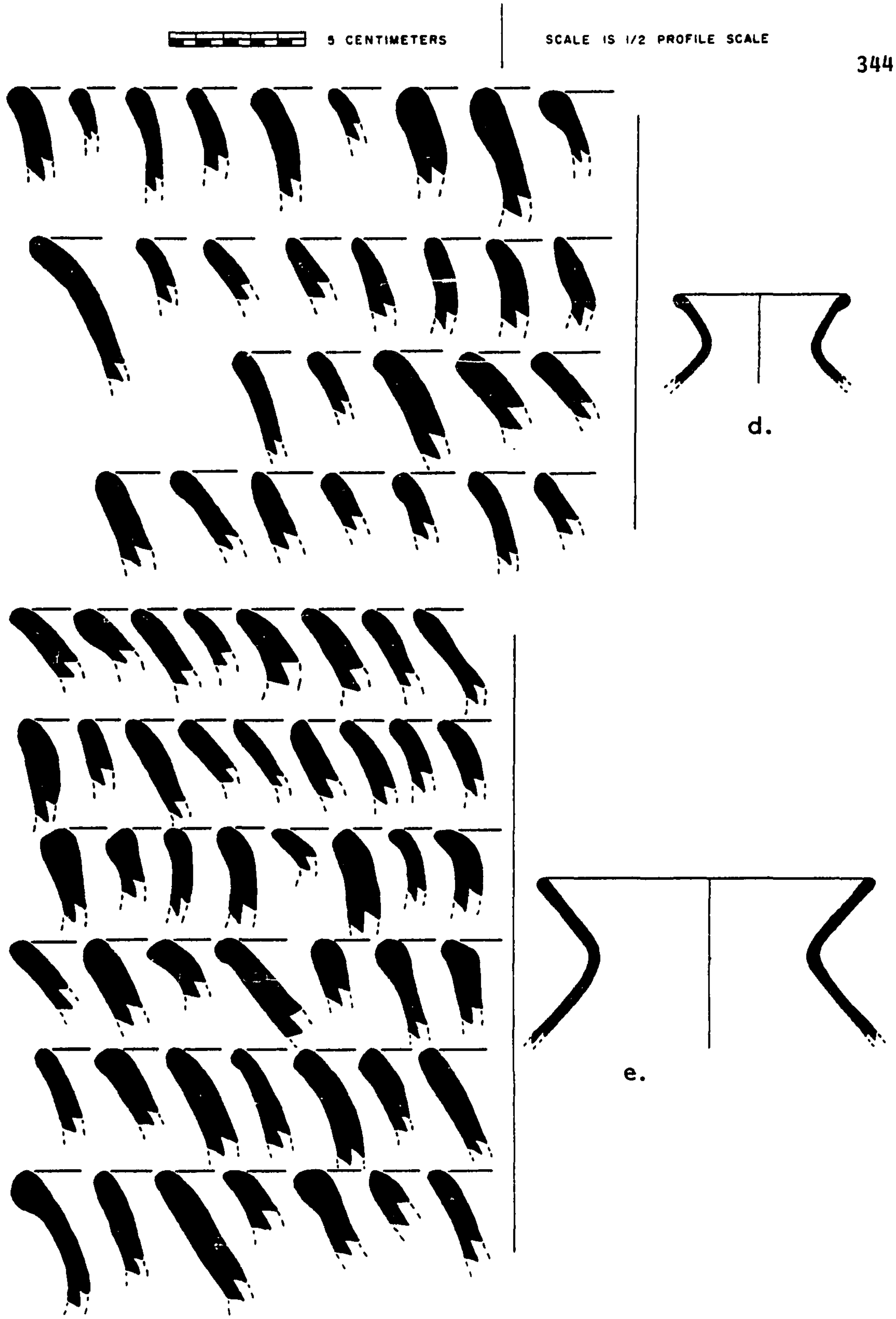


Figure 41 (Continued). Wide Mouth Olla: Everted-Rim. Group 4 (d), and Group 5 (e). Excavated rim sherds, PC 001. Santa Isabel Undecorated.

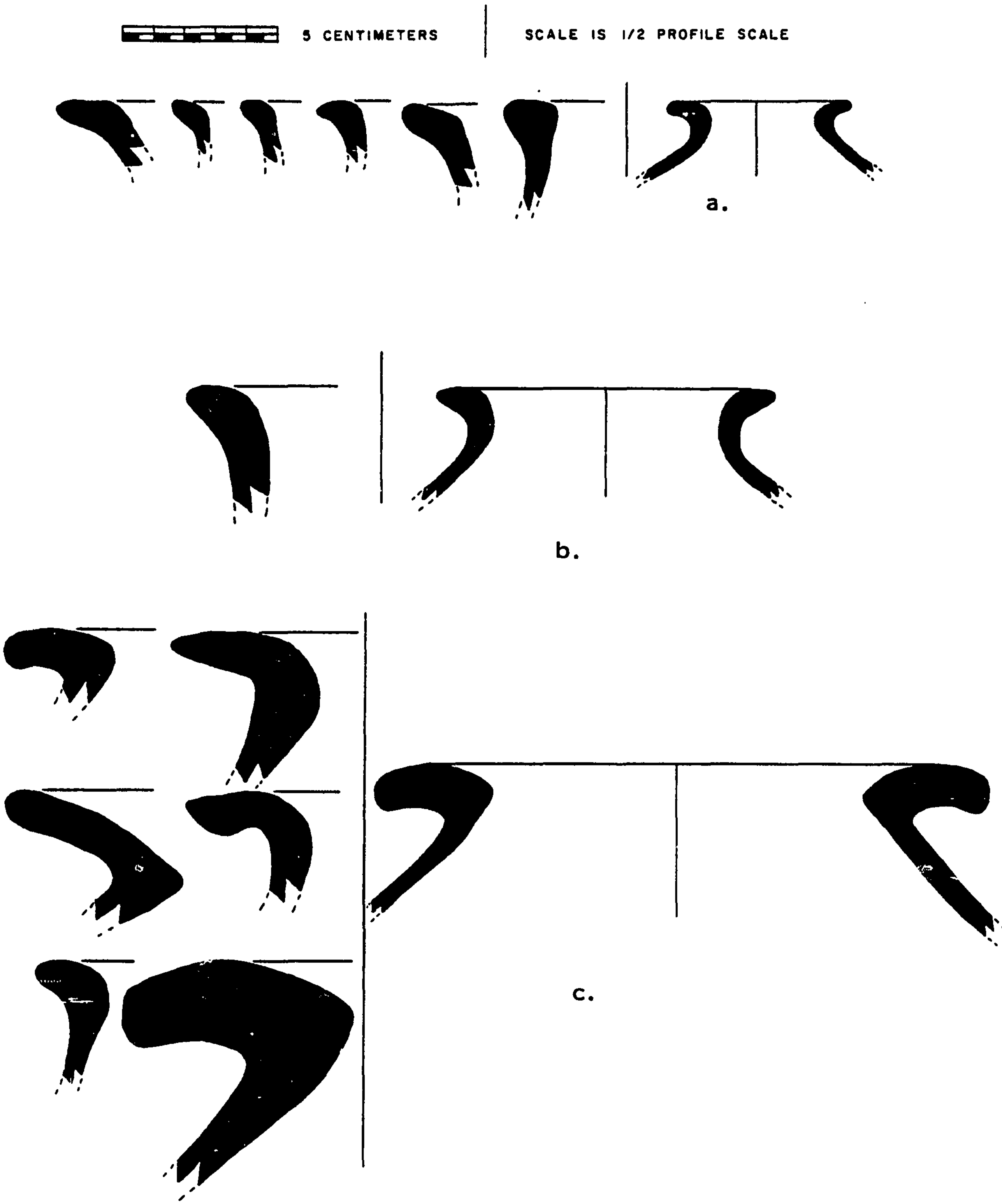


Figure 42. Wide Mouth Olla: Flat-Rim. Group 1 (a), Group 2 (b), and Group 3 (c). Excavated rim sherds, PC 001. Santa Isabel Undecorated.

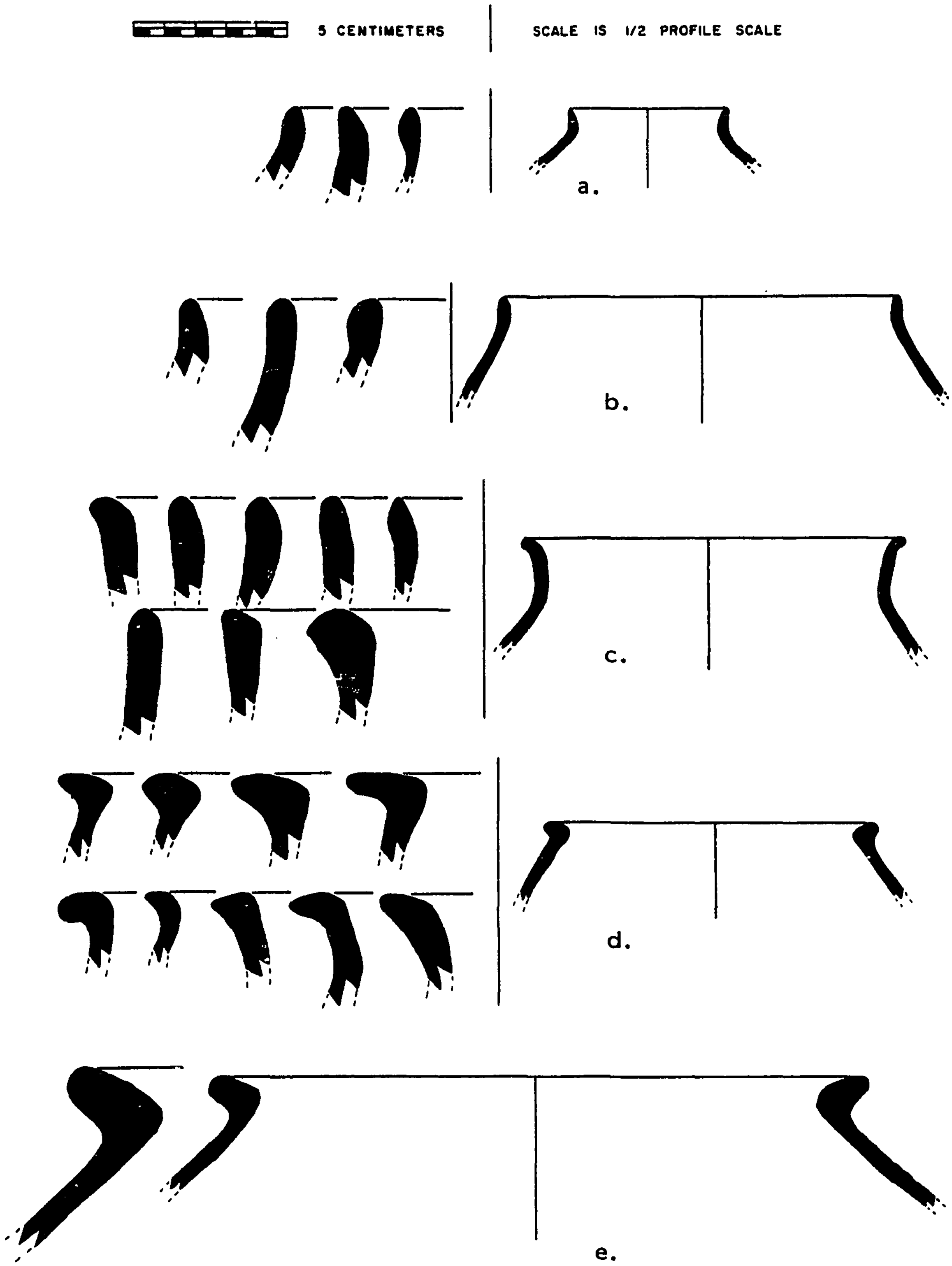


Figure 43. Wide Mouth Olla: Beveled Rim. Group 1 (a), Group 2 (b), Group 3 (c), Group 4 (d), and Group 5 (e). Excavated rim sherds, PC 001. Santa Isabel Undecorated.

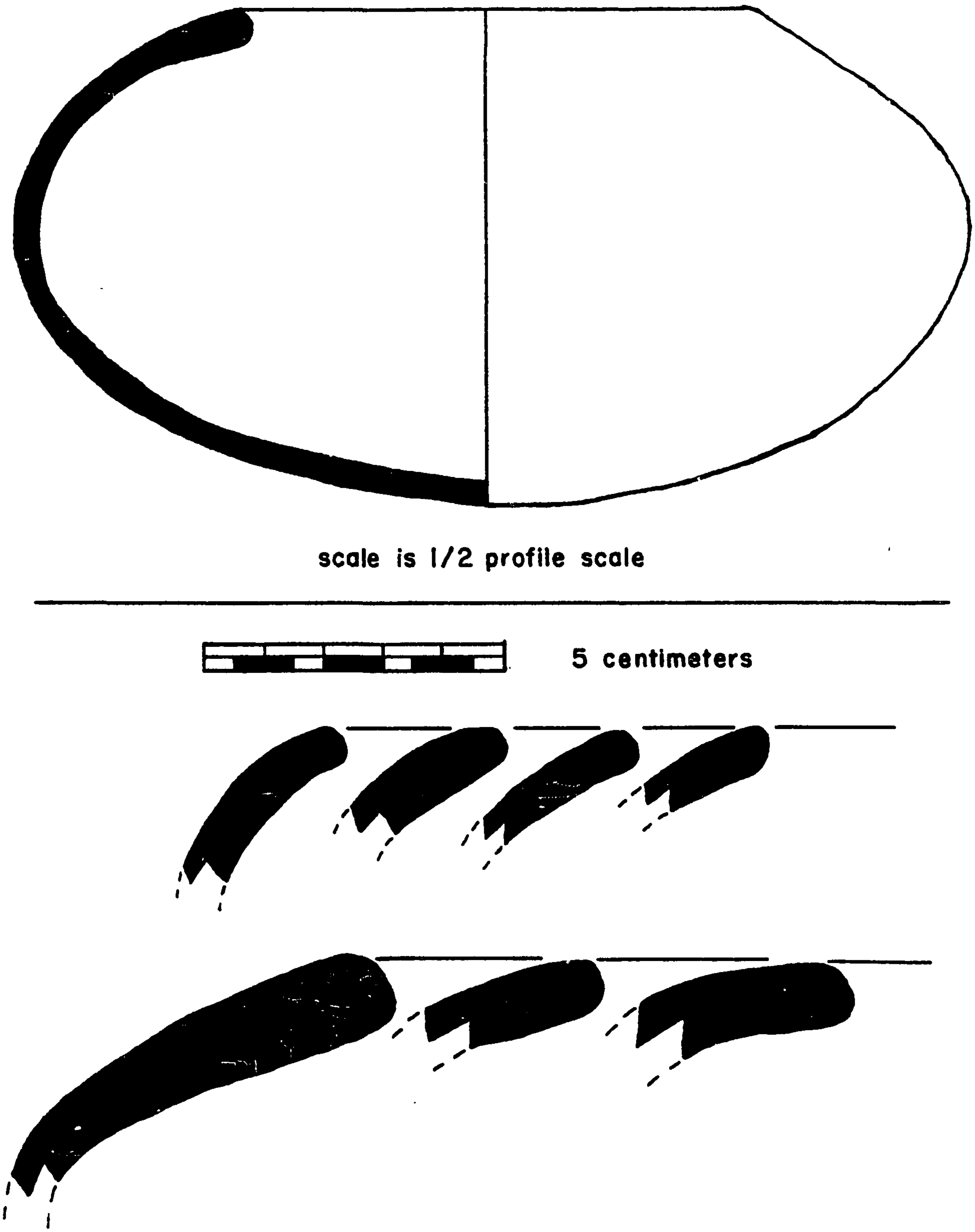


Figure 44. Neckless Olla. Excavated rim sherds, PC 001. Santa Isabel Undecorated.

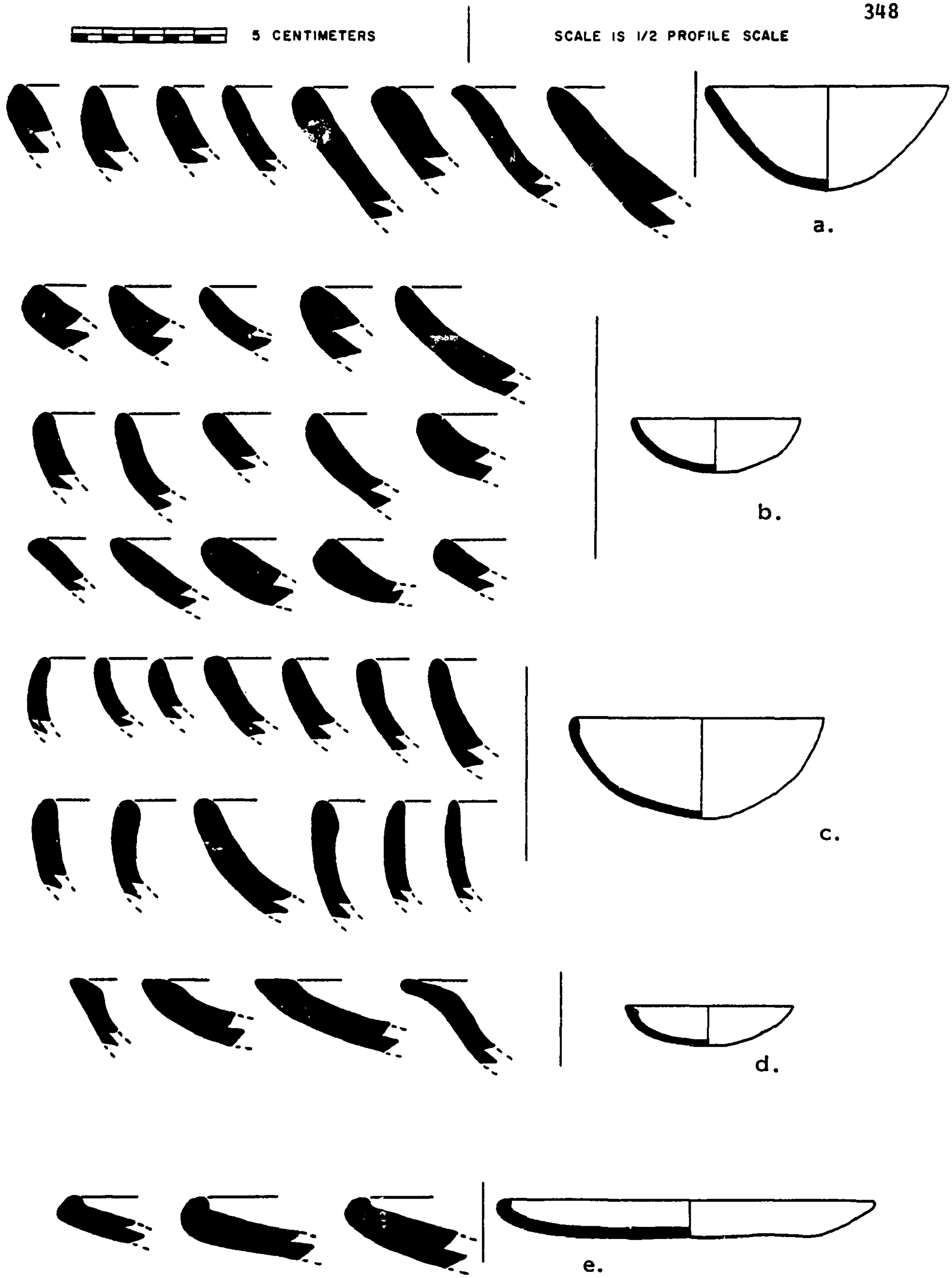


Figure 45. Plates and Dishes and Hemispherical Bowls. Group 1 (a), Groups 2; subgroup a (b), subgroup b (c), subgroup c (d), subgroup d (e). Excavated rim sherds, PC 001. Santa Isabel Undecorated.

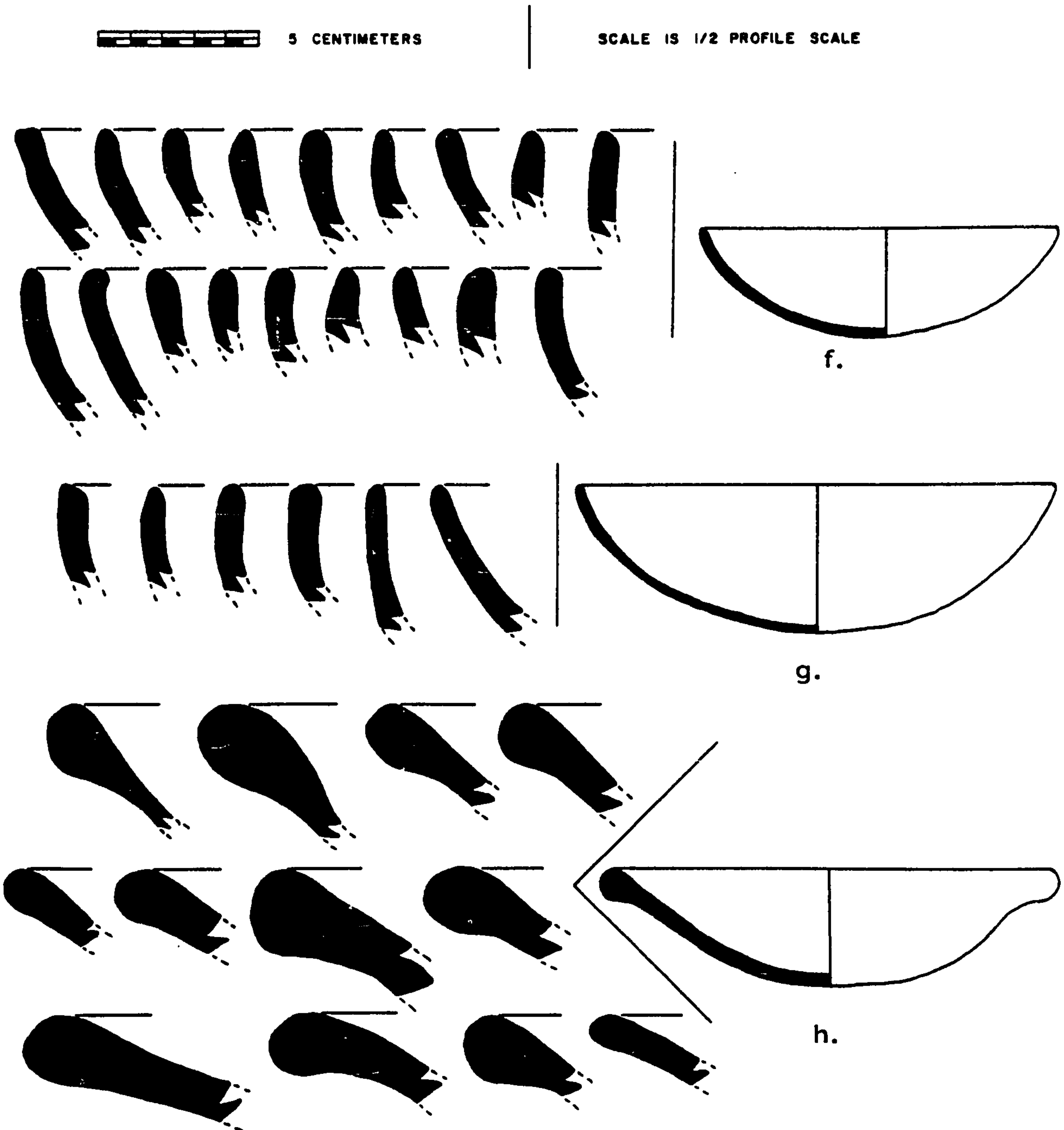


Figure 45 (Continued). Plates and Dishes and Hemispherical Bowls. Group 3 (f), Group 4 (g), Group 5 (h). Excavated rim sherds, PC 001. Santa Isabel Undecorated.

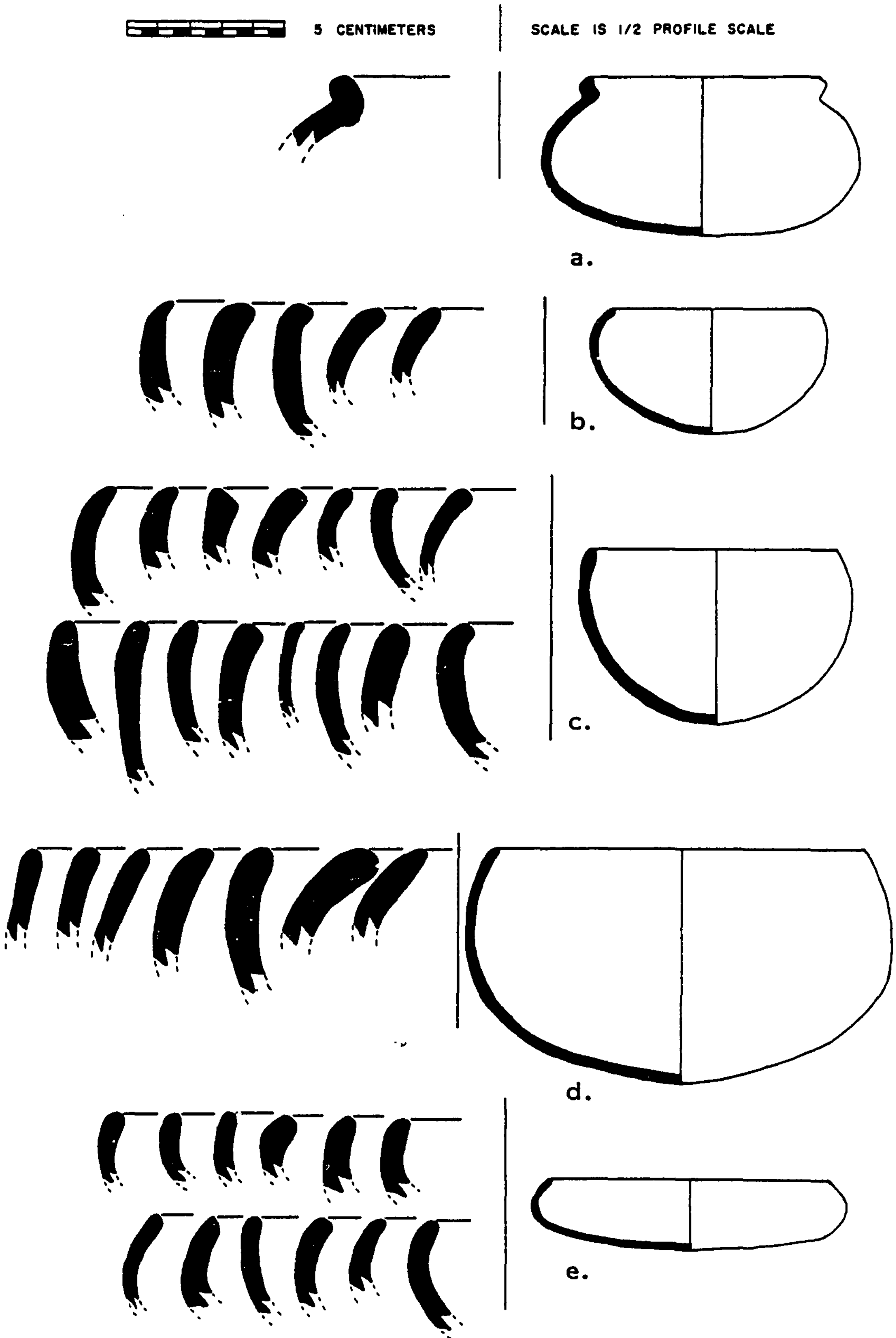


Figure 46. Restricted-Wall Bowls. Group 1 (a), Group 2 (b), Group 3 (c), Group 4 (d), Group 5 (e). Excavated rim sherds, PC 001. Santa Isabel Undecorated.

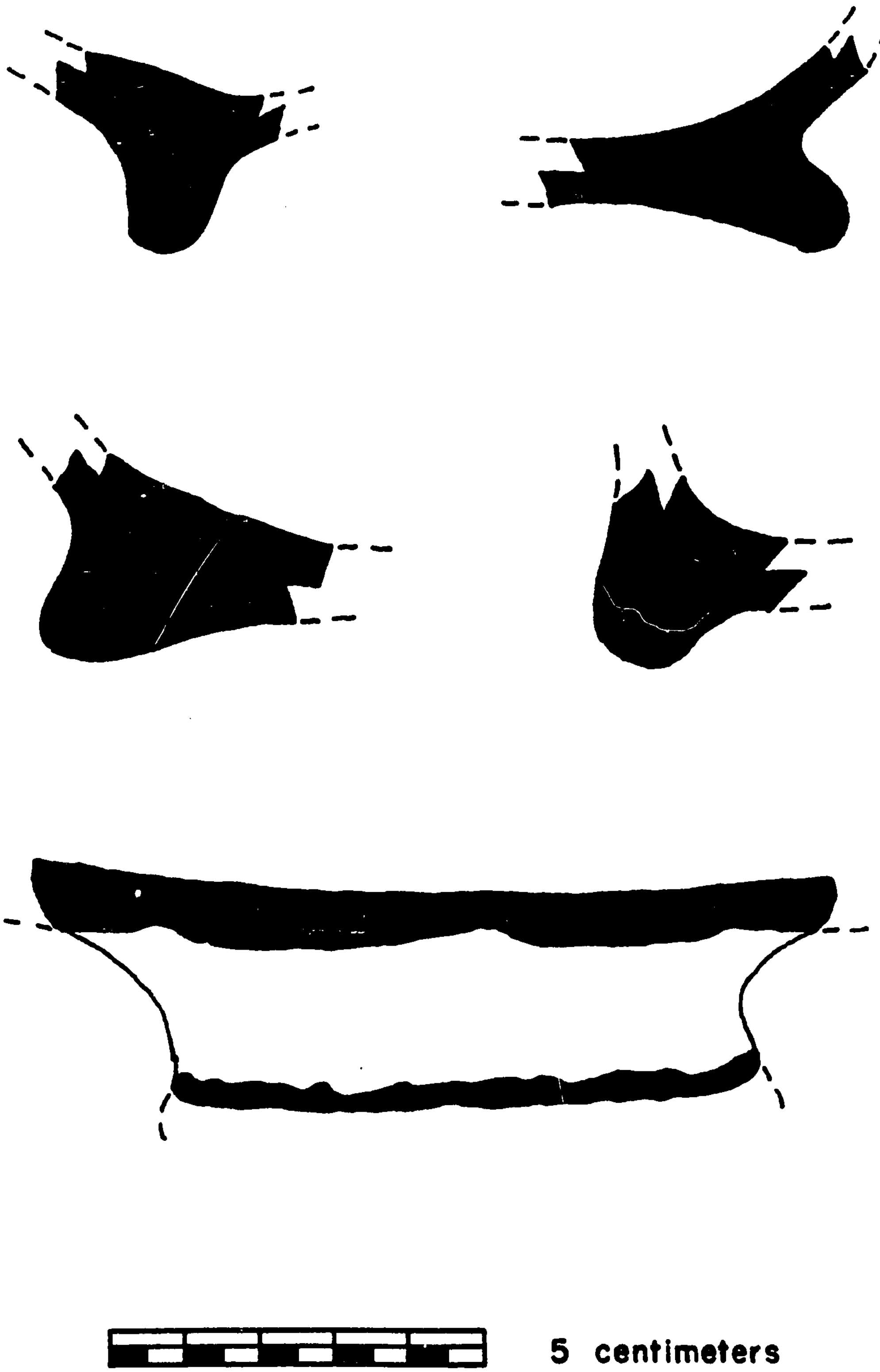


Figure 47. Ring Bases. Excavated base sherds, PC 001. Santa Isabel Undecorated.

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VITA

Robert Patrick Drolet was born in Evanston, Illinois, on July 30, 1945. He obtained his Bachelor's degree in 1968 from California State University (Long Beach), Long Beach, California. He was granted a Master's degree in Anthropology in 1975 from the University of Illinois, at Urbana-Champaign.

In 1976, Mr. Drolet was awarded a Fullbright-Hays Dissertation Fellowship for archaeological field research in eastern Panama. These research funds were supplemented with two other grants in 1976 and 1977 from the Graduate College Dissertation Award Committee, University of Illinois.

In 1972, Mr. Drolet authored two manuscripts that were submitted to the Museo Nacional de Arqueología, in Quito, Ecuador. One of these, entitled "Investigaciones Arqueológicas de Taques Tulcan, Ecuador," consists of an archaeological site report, and the other, "Excavación Arqueológica de Quitachala, Canton, Tulcan, Tulcan, Ecuador," is an archaeological report of a house mound and burial complex from northern Ecuador. In 1974, Mr. Drolet published an archaeological survey report of investigations completed in central Illinois, "An Archaeological Survey of the Iroquois River Drainage and Selected Portions of the Vermillion River Basin." In the same year, Mr. Drolet also published an article in the Journal of the Steward Anthropological Society entitled "Coqueros and Shamanism: An Analysis of the Capulí Phase Ceramic Modeled Figurines from the Ecuadorian Northern Highlands." In 1975 and 1978, Mr. Drolet wrote two manuscripts of archaeological survey and excavation work completed in eastern Panama. These two manuscripts were submitted to the Museo del Hombre Panameño, Panamá.

From 1967 to 1979 Mr. Drolet has been awarded both teaching assistant and research assistant positions at the California State University, Long Beach, and the University of Illinois at Urbana-Champaign, during both undergraduate and graduate training. From 1966 to 1968 he was archaeological field supervisor on excavations in San Pedro and Costa Mesa, California. From 1969 to 1970 he was a Peace Corps Volunteer in both Panama and Ecuador. From 1974 to 1975 he supervised field archaeological survey in central Illinois under the direction of the Illinois Archaeological Survey, University of Illinois. In 1977 and 1978, Mr. Drolet conducted archaeological investigations along the Caribbean slopes of eastern Panama as part of his doctoral dissertation field research.