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PRODUCTION AND EXCHANGE ON TWO ISLANDS IN THE GULF OF NICOYA, COSTA RICA, A.D. 1200-1550

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PRODUCTION AND EXCHANGE ON TWO ISLANDS IN THE GULF OF NICOYA, COSTA RICA, A.D. 1200-1550

A DISSERTATION

SUBMITTED ON THE EIGHTEENTH DAY OF MARCH, 1983

TO THE DEPARTMENT OF ANTHROPOLOGY

OF THE GRADUATE SCHOOL OF

TULANE UNIVERSITY

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS

FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY

BY

Winifred Creamer

WINIFRED CREAMER

APPROVED: E. Wyllys Andrews

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Frederick W. Lange

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External Examiner

ABSTRACT

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During the Late Polychrome period (A.D. 1200-1550) in the Gulf of Nicoya region of Costa Rica, island and coastal communities were linked by mutual need for scarce resources and by the distribution of surpluses through networks of regional and interregional exchange. This hypothesis was examined by comparing data from archaeological excavations on two islands in the Gulf of Nicoya with ethnohistoric accounts of the region. The gulf region was assumed to have had trade connections with Mesoamerica throughout most of prehistory. Sixteenth century reports of the region, especially those of Gonzalo Fernandez de Oviedo y Valdes, describe Chira Island and Nicoya on the mainland as centers of transshipment and resupply for travelers.

Excavations were carried out at two sites, Vigilante Alta on San Lucas Island, and Herramientas on Chira Island. Remains included ceramics, stone, bone, shell, and exotic materials such as obsidian, gold, serpentine, and possibly jade. Evidence for trade consisted of stone tools made of non-local materials recovered from both sites, and polychrome ceramics which were probably produced at sites further north in Greater Nicoya. Obsidian, serpentine, and jade would have been introduced to the island from further north where there were sources of these materials. Gold was probably introduced to the region from further south. Documentary and indirect evidence suggests that salt, pearls, mother-of-pearl, purple thread colored with dye from molluscs, turtle shell, stingray spines, and perhaps animal teeth were traded from the gulf region.

The Gulf of Nicoya was part of trade networks which extended from Panama to Mexico. Of the islands, Chira's role in trade was greatest, as a transshipment point. The Gulf of Nicoya appeared to have acted as a funnel for trade rather than as a center for accumulation. As such, the relationship between Chira and the mainland settlement of Nicoya may have been that of a paired "gateway community", redirecting surplus goods from the hinterlands of the region first to Chira and then to Nicoya from where they were exchanged for scarcer or exotic goods, and circulated within the region or beyond it.

ACKNOWLEDGEMENTS

During the four years I worked on my dissertation research I received help and encouragement from almost everyone I encountered. I cannot thank each one. Even if I remembered the name of every person who did me a good turn, I could not thank them all enough. The support and enthusiasm of the people I have met through this project has enabled me to carry it through.

Funding for my research was provided by a grant from the Shell Foundation, through the Program in Latin American Studies at Tulane University. The Anthropology Department at Tulane has supported my research with supplementary funds and with advice on grant-getting that has served me very well. The Organization of American States awarded me a graduate fellowship for three months of laboratory analysis in Costa Rica. A grant from Sigma Xi enabled me to complete the faunal analysis. Mr. Frederick Mayer and the JFM Foundation of Denver provided my transportation to Costa Rica for my first extended season of field work. I appreciate their support.

My advisor at Tulane, Dr. E. Wyllys Andrews, V, first suggested Costa Rica to me as a possible research site, and made it possible for me to spend my first field season there. Since that time he has supplied me with a mixture of wisdom, pragmatic advice, and bad puns, that I have found invaluable. It was also through Will that I met Dr. Frederick W. Lange, who has guided much of my work in Costa Rica. Fred introduced me to Costa Rican archaeology and to many of the quirks of those tropic shores. His advice has both steered me around the pitfalls I've managed to avoid, and headed me into some remarkable encounters as I explored Costa Rica's countryside. I appreciate all his help, and his confidence in me.

I am grateful to the Board of Directors of the National Museum of Costa Rica, who granted my permits to conduct archaeological investigations, and to the Director of the National Museum, Lorena San Román de Gallegos, and to the former Director of the National Museum, Luis-Diego Gomez P., for their help and advice on many occasions.

My colleagues and friends at the National Museum of Costa Rica, especially Hector Gamboa P., made my field work and subsequent lab work one of the happiest times I can remember. Don Hector made me at home in the Department of Anthropology and History at the museum, and it was he who insisted I learn to speak Spanish decently. I will always be in his debt for that, and for countless kindnesses.

Alonso Benavides and the staff of the Associated Colleges of the Midwest in San Pedro provided assistance and enthusiastic students for my field projects, and made it a pleasure to work with ACM. My students and fellow-workers through that program, Cathy Robison, Karl Koch, Julie Matts-

son, John Kenney, and Loren Nardick, deserve special thanks. They all worked hard on small projects in hotter weather than they ever imagined. Their field camps lacked all the basic comforts of home, like beds, fans, and cold beer. They know, probably better than I do, how little would have been accomplished without them. A large portion of Mattsson's report on burials at the Vigilante Alta site has been rewritten and included in Chapter Four.

On San Lucas Island my field work was facilitated by the Director of Acción Social of the Ministry of Justice, who repeatedly granted access to the island. Prison officials on San Lucas cordially assisted us with transportation, loaned us their telephone, and were interested onlookers.

On Chira, the late Adán Barrientos, his wife, Berta Medina de Barrientos, and their family, provided myriad services, boat and truck transport, the occasional lift on a motorbike, telephone, lodgings, friendly advice, and curiosity. In the corner of Chira called Montero everyone lent a hand to the project. Nicolás Peralta provided us with a base camp, while his daughters, sons, daughters-in-law, nephews, and acquaintances became our workers, cooked for us, sold us fish, and were our neighbors. Doña Damiana and her family, who lived only a few fields from us, graciously allowed part of their pasture to be excavated, and treated us generously throughout our stay.

After ending field work I spent nearly a year at the National Museum of Costa Rica working in a basement lab

which came to be known as "la cripta" for its bright and cheerful atmosphere. There I was assisted by several extremely helpful university student volunteers whose brief stint counting endless numbers of plain sherds and unmodified stone fragments probably convinced them to study business administration. During my months of laboratory analysis the entire staff of the National Museum, the Director, my colleagues the archaeologists, the librarians, secretaries, guards, and maintenance men, all managed to express interest in my work, and all helped me when they could. I value their expressions of friendship and collegiality above all my other experiences.

Dr. Michael J. Snarskis of the National Museum helped me with a number of questions, and was very supportive.

Dr. Richard Cooke of the Smithsonian Tropical Research Institute, Balboa, Panama, allowed me access to his fine faunal reference collection. Richard kept his patience while I struggled to identify bone fragments and constantly enlisted his expertise. He taught me a great deal about the way accurate research should be done.

Dr. Robert Drolet and Dr. Patricia Drolet gave me some of the soundest advice I have ever received, and taught me the meaning of professionalism. At the same time they were understanding of my foibles as a dissertation-writer; they have been real friends.

I am grateful, too, to Suzanne Abel-Vidor for an extended and profitable correspondence and for her comments on various chapters.

Since returning to the US I have lived by the generosity of my parents, George and Jeanne Creamer, who gave me an idyllic place to live while finishing my thesis. They have always supported my interest in archaeology, and I owe any success I achieve to their unfailing enthusiasm.

The drawings were carefully prepared by Vickie Walker and Leslie Daigle.

During the final revisions, writing, and typing, Jonathan Haas has been tremendously helpful, especially in supplying editorial advice at a point when I badly needed it. This project would have been vastly more difficult to complete without his aid and understanding.

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CHAPTER 1

INTRODUCTION

Documentary sources and oral tradition suggest that during the Late Polychrome period (A.D. 1200-1550), the islands in the Gulf of Nicoya, Costa Rica (Fig.1), were linked to one another and to coastal communities by mutual need for scarce resources and by the distribution of surpluses through networks of regional and interregional exchange. I attempt to identify potentially exportable resources available on the islands, to propose and document routes of exchange between the islands and the mainland, and to investigate the methods by which resources were imported to and exported from the islands.

Research at coastal archaeological sites, such as that sponsored by the Institute for Andean Research in the 1960s (Coe 1960, Linares 1968), focused on finding material links between North and South America, common artifact types, or evidence of trade. In recent years, research has focused on the unique characteristics of coastal sites:

> Coastal environments present situations where subsistence and other economic pursuits may differ markedly from those prevailing elsewhere. And coastal waters facilitate transport in a manner more marked than in most other environments. Therefore, coastal peoples may reveal adaptations representing a distinctive element in Middle American sociocultural evolution (Stark and

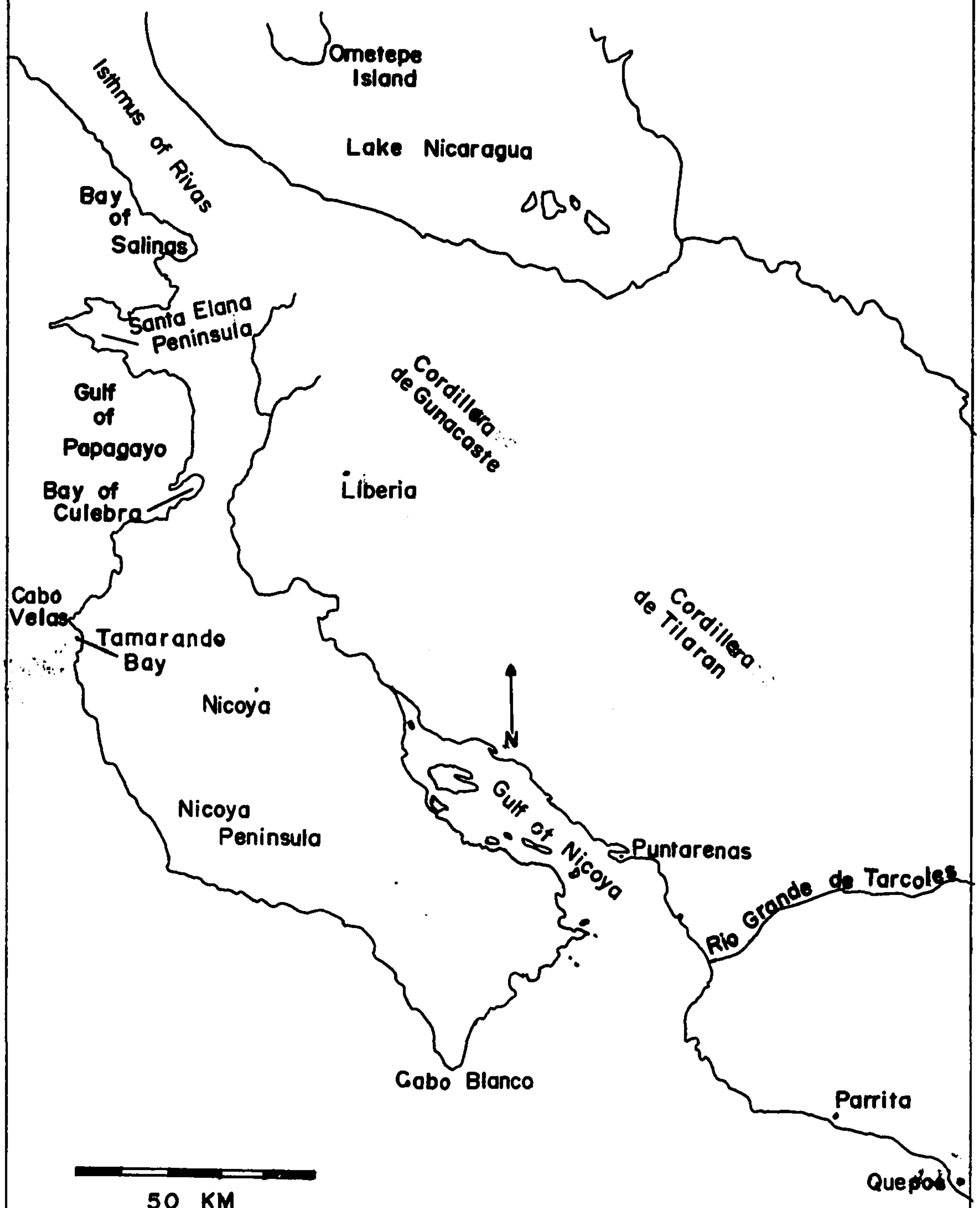

Figure I
Geographic Features
Gulf of Nicoya

Voorhies 1978:1).

There has also been recognition that differences between coastal and non-coastal zones and between environmentally different coastal zones have fostered exchange in many areas (Flannery 1976, Linares and Ranere 1980, Sanders 1976). By historic times in Panama, for example, ties between coastal and inland groups seem to have created a pattern of chiefdoms whose territories stretched from the sea to the Continental Divide (Helms 1979:Ch. 2) and possibly across to the opposite shore. This pattern may have considerable antiquity in Panama (Cooke, n.d.) and may have existed to some degree in Costa Rica (Lange 1980a:42). Barbara Stark and Barbara Voorhies note the importance of regional exchange of basic resources as a kind of "cement uniting social units," but they note the difficulty of identifying commodities exchanged in prehistoric times, as goods were often perishable (1978:294-295).

Looking specifically at Greater Nicoya it becomes apparent that the islands in the Gulf of Nicoya represent a special kind of coastal zone. As such, they may differ significantly from mainland zones in terms of subsistence patterns and economic organization. This is due to the fact that the mode of production on an island is influenced by its size, ecological composition, and boundedness. In general, islands may play one of two roles in a region. They may serve as special use sites where people from the mainland go for limited resource procurement, or they may be occupied by independent groups who are basically self-sufficient but who also participate in a variety of interaction networks. By examining the material manifestations of past occupation on specific islands it should be possible to determine the extent to which people using the islands were involved in local, regional, and interregional systems.

The Gulf of Nicoya in particular is an optimal location for looking at the role of islands in larger regional economic systems. Both archaeological and ethnohistorical data indicate that there was a fairly extensive exchange network in the Gulf of Nicoya region, with some evidence for patterns of reciprocity and redistribution, and at least the possibility of ports-of-trade and markets (Chapman 1965, Oviedo 1976). Evidence will be presented below for differing methods of exchange in the region, along with a discussion of where the gulf islands fit into this exchange system.

Background

In 1979 I made an inventory of archaeological sites located in the Gulf of Nicoya region for the National Museum of Costa Rica (Creamer n.d.). At that time the region had received little attention from archaeologists, and colonial period accounts, especially the chronicles of Gonzalo Fernandez de Oviedo y Valdez,[1] were relied upon by historians and archaeologists for information about the indigenous

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1 Hereafter referred to as Oviedo.

occupation. My goal in 1979 was to locate archaeological sites on the islands in the gulf and at locations around the shore, to describe the variety and density of prehistoric settlement in the region, and to determine the state of preservation of sites as an aid to the National Museum in its establishment of research priorities. The project was also a step in extending archaeological survey along the Pacific coast, a continuing research priority. Based on the results of the site inventory, more extensive survey for archaeological sites was conducted on two of the islands, Chira and San Lucas, the most thoroughly described by sixteenth century chroniclers.

To begin examining the role of exchange on the islands, excavations were initiated at the Vigilante Alta site (3245IV-144-3) on San Lucas from January to April 1980, and at the Herramientas site (3146II-141-1) on Chira from January to May 1981. Initial survey at both sites had revealed evidence of exchange in the form of imported ceramics and stone tools. Both sites also appeared to be contemporaneous in that they had exclusively Late Polychrome period (A.D. 1200-1550) materials on the surface.

It was felt that comparative excavations at the two sites on the different islands would provide more comprehensive insight into the exploitation of islands and their position in regional interaction systems. As will be discussed below, both islands are quite different in terms of size and certain environmental components. Yet both share major limitations which characterize all the islands in the region, seasonal scarcity of water, lack of stone for tools, and limited land for agriculture. However, the large shell mounds at Herramientas, Vigilante Alta, and other sites coupled with numerous stone tools made of imported materials, and ethnohistoric reports of sizeable population on both islands in the sixteenth century, would indicate that the islands were a valuable enough resource for people to overcome their limitations. The islands are thus similar in some regards and different in others, and offer an excellent laboratory for investigating potential variation and patterns of similarity in exchange between island groups and mainland populations.

My excavations on San Lucas and Chira were among the first tests of single component Late Polychrome period coastal sites in Costa Rica and yielded extensive data on that period in the Gulf of Nicoya. Each site included both habitation areas and interments, and both sites possessed a ceramic assemblage different from those of other sites in Greater Nicoya. This would suggest that regional differences had arisen by by the Late Polychrome period.

Only a few other late period sites have been excavated in Costa Rica, including Ruíz (Lange 1980a), and Hunter-Robinson (Moreau 1980) in the Bay of Culebra, and Late Polychrome levels of Las Marias (Lange 1971a), La Guinea (Baudez 1967), and a few sites for which data has not been analyzed. All of these sites are located north of the gulf region in Costa Rica (Fig. 2), where the coastline is irregular, marked with bays and inlets rich in molluscs and fish. This association of Late Polychrome period sites with sources of seafood suggests dependence on a broad subsistence base including a variety of marine resources for food and for items of exchange. Supporting this suggestion is the fact that no Late Polychrome period sites have yet been located on the straighter coastline of the Nicoya Peninsula (Lange 1976a, 1978a). Exposed to the open sea, the peninsula's coast is favored as nesting grounds for sea turtles, yet winds, rough seas, strong currents, and rocky shores make this region less hospitable for fish and shellfish than the sheltered Gulf of Nicoya. The integration of survey and excavation data collected here with results of previous research in Costa Rica illuminates the interrelationships of several systems that formed part of the cultural whole in the Gulf of Nicoya region during the Late Polychrome period. The position and role of this region in relation to Greater Nicoya and the rest of Lower Central America now emerges more clearly.

Island Paradise, or Working in the Gulf of Nicoya

On a map (Fig. 1), the Gulf of Nicoya appears in a favorable position in the zone delineated by Puntarenas, Costa Rica's largest Pacific coast port; Liberia, prosperous inland town in a cattle raising region; and Nicoya, one of the oldest cities in the country, also in an agricultural region.

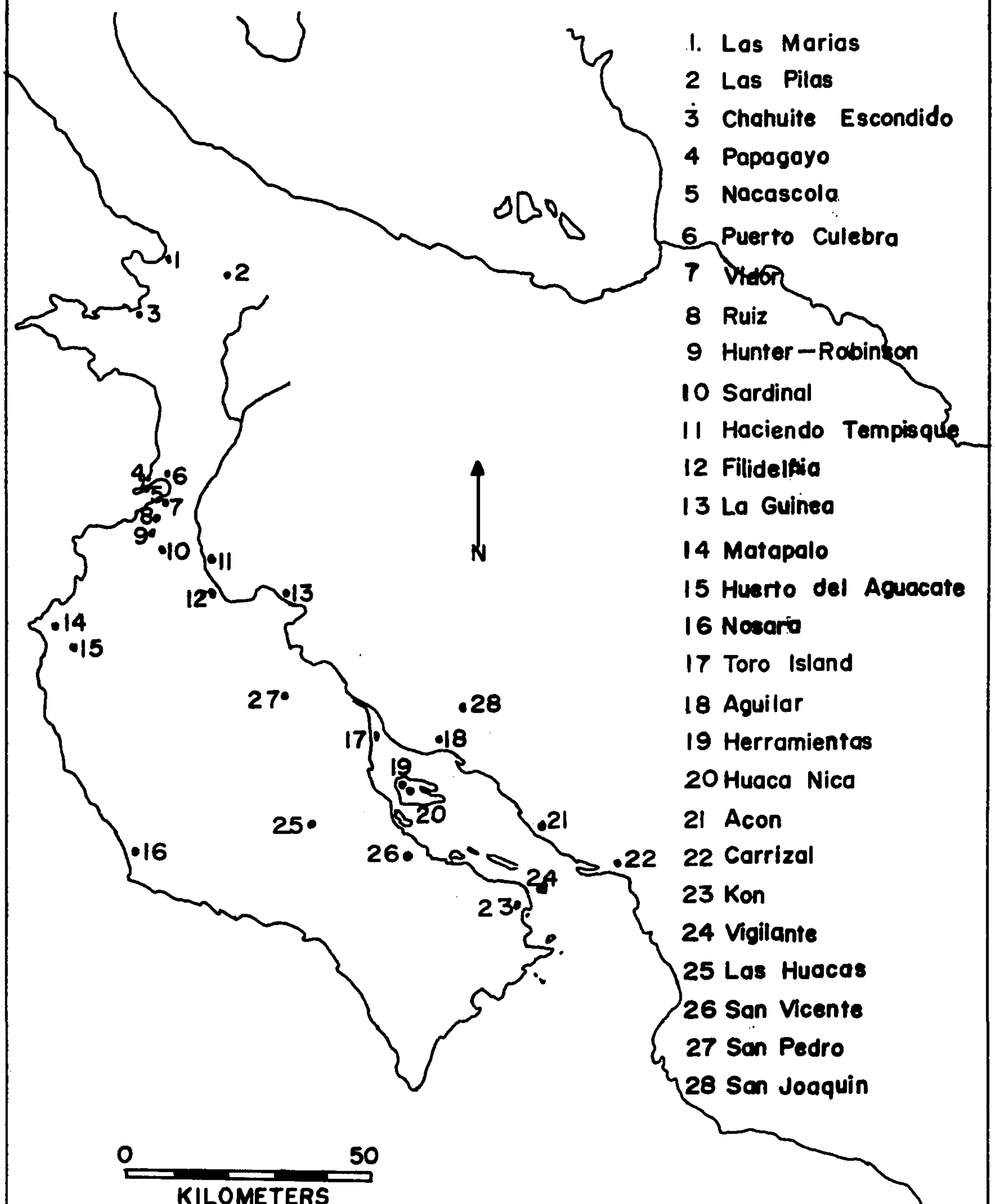

Figure 2

Archaeological Sites
Mentioned in the Text

Until recently virtually no archaeological research was carried out in this centrally located region, while studies were conducted in other parts of the country more remote from the capital and major cities. Excavations have been productive at La Cruz near the Nicaraguan border (Lange 1971a), Guacimo in the rainy Atlantic watershed (Snarskis 1978), and in the isolated Diquís Valley in the south (Lothrop 1963). My travel experiences in the Gulf of Nicoya between 1979 and 1981 show it is no surprise that archaeologists have steered clear of the region.

One paved road reaches the shore at Puntarenas, a major port and center for the fishing industry. There are some roads along the edge of the gulf, though not everywhere. Roads generally run perpendicular to the Panamerican highway, making a series of points along the shore accessible by vehicle. It is still not possible to drive all along the coast. With a great deal of doubling back, much of the shore, or the interface between dry land and tide flats covered with mangrove, can be visited by car. Our 1979 survey showed that the most effective transportation around the Nicoya region is still by boat.

Though boats leave from Puntarenas for settlements all over the gulf, little of this service is scheduled. A car ferry crosses eight times a day, barring breakdown, grounding in the shallows, diesel fuel shortage, or job actions by workers. A launch makes a daily trip from Puntarenas to Paquera on the tip of the Nicoya Peninsula (Fig. 1), and in

1979 a boat made twice-weekly trips to Chira, the largest of the gulf islands. By 1981 the service to Chira had broken down, and a communally-owned boat to make the trips was under construction, though not in service. San Lucas Island is owned by the Costa Rican government and operated as a prison popularly known as "Isla de los hombres solos", the island of lonely men. It is accessible on Sundays, when excursion boats leave Puntarenas in the morning and return in the afternoon. For our extended stay on San Lucas we received permission to ride the prison launch which makes three trips to Puntarenas from the island each week.

To visit the eight or nine islands which are without regular boat service, transportation must be chartered. This usually means canvassing the fishermen who land their boats behind the market in Puntarenas and agreeing on a destination, route, and price. I have helped lower and raise fishing nets and loaded cargo from broomstraw to beer for the privilege of renting a partially seaworthy craft. Travel by water anywhere in the region is slow. The islands are all one to four hours from Puntarenas by fishing launch and all trips take longer when there is rough water, rain, wind, mechanical trouble, travel against the tide, or when the boat stops to take on gasoline, supplies, passengers, ice, to fish, or to haul in nets.

If there is a drawback to travel with coastal people, it is the schedule they observe. Living with the tides, we left at three a.m. if the tide was high, and waited offshore while dugout canoes ferried passengers in the dark when the tide was too low for the launch to land on our arrival. During the day we'd wade ashore carrying cargo overhead, once through knee-deep mud, when I mistook an abandoned corral for a small town and had us set ashore on an oozing tide flat. Such slow travel could be dangerous in an emergency. Though no injuries or illnesses demanded we leave an island suddenly, I learned as a precaution to treat snakebites. On the one occasion that I wanted to leave Chira when no boat was scheduled, I hired a fisherman to row me to the mainland in a dugout (an hour of steady rowing), then I walked, hitchhiked to the main road, finally caught a bus to the ferry, crossed the gulf, and climbed on the last bus from Puntarenas to San José, arriving in San Jóse about ten hours after pushing off Chira's shore. After two seasons of field work I've traveled at dawn and at midnight, in storms, winds, and on rolling seas under a full moon. Though there wasn't always room to sleep on night voyages, when I was lucky there were bags of salt to lie on. I'll not soon forget falling asleep on the deck of an overloaded fishing boat and waking up with my chin awash as we shipped a wave.

Traveling around with fishermen has some advantages, too, which must not be underestimated. Since these are people who travel the breadth and length of the gulf, they know the prevailing winds, good anchorage, fishing spots, water sources, and even archaeological sites. In addition to the practical knowledge I gained, I observed a way of life that today provides valuable analogies with the precolumbian occupation of the gulf. The subsistence practices and settlement pattern of coastal fishermen have changed little over the past centuries in this region where the outboard motor is the single major innovation since the Conquest. Farmers on the nearby mainland have experienced deforestation, introduction of new crops, switched from agriculture to cattle raising, and also changed their settlement pattern. Fishermen have changed far less.

While travel is only restricted by time available and the individual spirit, one's destination may be limited by property owners. In 1979 while visiting several of the gulf islands we neared one remote spot in a fishing boat which could not land directly on the beach as it had to keep its engine running. After jumping in the water and carrying out survey supplies held over our heads we were greeted by the manager of the island's only structure, a tourist bungalow. He forbid us to look around until a "board of directors meeting of the corporation that owns the island" could be convened. Our permit and letter of recommendation from the National Museum and all our entreaties for permission to record sites with notes and photos only, fell on unsympathetic ears. He did allow us to buy cold drinks in their restaurant before swimming back to the fishing boat and leaving . . .

In 1980 we chose San Lucas, the island identified as

Chara by Oviedo, for excavations. Visits to San Lucas are restricted by the Costa Rican government, since the entire island is a penal colony. Although permission to conduct fieldwork on the island was granted relatively promptly by government officials, life in a penal colony poses surprising hazards, least of which are prisoners. We were unable to utilize local laborers on San Lucas, because there are none. Prison authorities did not want to let prisoners work with us, preferring to keep each group separate. A small force of Costa Rican and North American students did all the work, survey, excavation, laboratory analysis, even weekly grocery trips to the mainland. Since women are not allowed to walk alone on this island prison for 200-400 men, our survey crews had to be co-ed. This limited the flexibility of daily work groups. The most startling unforseen hazard arose when a group of students went snorkeling one Sunday afternoon. Our group had been excused from the body and luggage searches that visitors normally receive when they arrive on San Lucas, and therefore we were not aware that skin-diving equipment is prohibited on the island. Nor were we aware that on Sunday, visiting day, the guard along the coast is doubled to discourage escape attempts at a time when vigilance of prisoners is most difficult because of the many visitors to the island. When a group dressed in cut-offs and skin-diving gear took to the water to visit a nearby group of rocks and collect oysters, it is difficult to reconstruct which group, the swimmers or the guards, were the most shocked. When the students heard shots being fired over their heads they beat a hasty retreat toward shore. When the guards reached the shore from their outpost on the cliff above and found a huddle of disgruntled foreigners rather than drowning fugitives, they were a little embarassed.

Labor and communication problems on San Lucas were aggravated by scarcity of water at the end of the dry season, when the aquifer that supplied our water began to dry out. We were forced to abandon the site two weeks ahead of schedule when our supply of drinking water threatened to disappear. Our crew included only five persons. The water would have run out even more rapidly with the crew of ten or more I had hoped to assemble.

After working a season at the San Lucas prison, I arrived on Chira in 1981 with a strong sense of caution. When food began to disappear from our kitchen, however, I was not unduly alarmed, but assumed our cook was hinting for a raise. We discussed her salary and the vanishing cans, and she claimed to have noticed the phenomenon herself, concluding my ever-hungry assistant was snacking at night. My assistant claimed innocence, and stalemated, I dropped the subject. I awoke during the night about a week later and stumbled out of the house toward the kitchen, a separate building close by the sleeping quarters. I noticed the door was already unlatched, unusual since we always shut the doors at night. An open kitchen guarantees that neighborhood cats will eat all your rice and leave nothing for breakfast, the pigs will root in the woodpile under the fireplace, and the dogs will scatter the pans. I pushed the kitchen door all the way open and slowly shined my flashlight around the perimeter of the room, to catch the animal at work. Hugging one wall to stay out of the light was a neighbor fisherman! On the hearth a spoon was still sticking out of the pot of beans he'd been devouring, though our intruder's bulk did not suggest he suffered the least malnutrition. As an American from an urban area, I expect intruders to be armed or at least threatening. I hung back and called to my assistant, and to the family to wake up and help me. In Costa Rica, however, homeowners usually investigate prowlers with a shotgun while burglers come unarmed. When the thief realized I was armed only with my flashlight he bolted out of the room, just about the time the others were struggling out of the house. It was all over in three minutes; no one saw anything in the darkness. That wasn't the last I saw of the kitchen raider, though possibly it was the last night he ate at our place. I saw him several times in the following months; he lived down the road. As outsiders enjoying a higher standard of living than local people, we had no recourse. The owner of the house said only, "He's a bum," and as an afterthought, "Next time, I'll shoot him."

We found that Chira has fine fishing. Large corvina and other fish are taken close to shore and can be purchased cheaply from the fishermen as they come off the water in their dugouts. Anticipating fresh fish for dinner every night of the field season, I was puzzled to find canned tuna or sardines, our emergency food, appearing night after night. I threatened the cook, and swore I'd buy no more canned goods until fresh fish began to appear a lot more often. What I couldn't understand was why she chose to prepare canned tuna when the real thing was available. What I finally discovered was that canned tuna is prestige in a rural environment where transportation is costly and few families participate in the money economy. Our cook would gladly eat sardines, peas, Vienna sausage, and even more repellent fare, if it came in a can. She wasn't sure she would ever taste such delicacies again after we left.

The high cost of transportation in time, money, and mental anguish make food shopping and phone calls a luxury on some islands, and impossible on others. On San Lucas our supplies were brought in by boat, on horseback, and by oxcart, since there were no motor vehicles. Once, there was a tractor, but it broke down; it's still perched on the hill where it was always parked so that they could get a jump start. When supplies got low someone had to be sent to Puntarenas to shop, a full day's trip and sacrifice of the labor of one of only five people. The trip to make purchases had to be carried out by a Spanish-speaking crew member, doubling the burden on some and leaving others feeling imprisoned by not being eligible for a trip to town. A trip from Chira to Puntarenas and back often took two days and occasionally longer when boats failed to run on schedule, or when they went fishing for a few days between ferry trips. On both Chira and San Lucas the only telephone was a 45 minute to 1 1/2 hour walk from our field camp. After a full day in the field it was only urgent business that could induce me to walk to the phone. The National Museum nearly sent a police cruiser to Chira after we were seen to leave Puntarenas in a small, heavily laden outboard and were not heard from again because I forgot to call and report our safe arrival on the island. Smaller islands have no phone service, and communication with the mainland is sporadic.

Other phenomena of field work are common to island sites and to isolated field camps everywhere, the result of contact between conservative society and outsiders. I could not be surprised when our workers quit with a week of backfilling unfinished, because they had to plant. Nor could I be surprised to find that with many islanders unemployed and my project paying the highest wages on the island (minimum wage), I was able to attract only a few laborers, those who were willing to work for a woman.

While our difficulties may have been out of the ordinary, they were always minor. We always had food, and a telephone to walk to. We could leave the island at least once a week, not once a month or once every three months. (Those are the uncomfortable field camps.) My own memory of pains and irritations is short. Now out of the field I remember far more tropical sunsets than boat breakdowns, though they were probably equal in number. I also estimate more carefully the work that can be accomplished in a single field season. It took three season of field work under the conditions described here to produce the data on which this report is based.

PART I

RESEARCH SETTING, METHODOLOGY AND TESTING

CHAPTER 2

THE GULF OF NICOYA REGION

The term Mesoamerica was used by Kirchhoff (1943) to refer to a large area united by shared cultural traits such as corn agriculture, polychrome ceramics, and stepped pyramidal structures. From Mexico, Mesoamerica stretches through Central America to the Greater Nicoya Archaeological Subarea, which forms its southern border. Greater Nicoya, a tidy physiographic and archaeological unit, includes the Nicoya Peninsula and the shores of the gulf from the Rio Grande de Tárcoles northward to the Nicaraguan lakes region (Norweb 1964). At the time of Norweb's study the southern two-thirds of the Nicoya Peninsula had not been investigated, and he assumed cultural unity paralleled geographic unity.

Greater Nicoya can be divided into regions having distinct geography, topography, climate, and resource bases that appear to be reflected in material culture during the later part of the prehistoric occupation. The individual subregions include: the Isthmus of Rivas in Nicaragua; the northern coast of Greater Nicoya (Rivas-Cabo Velas), the southern coast along the Nicoya Peninsula facing the sea, the Gulf of Nicoya and much of its watershed, and the inland plains and hills east of the Tempisque River. Each also shares certain common traits, including marked seasonal change in rainfall, regular exploitation of marine resources after A.D. 500, and a similar range of subsistence goods, settlement patterns, ceramic forms and decoration, and materials for lithic artifacts.

Although the Gulf of Nicoya has commonly been included as a part of the Greater Nicoya Archaeological Subarea with its implied Mesoamerican connection, it might be viewed alternatively as part of the Intermediate Area. The Intermediate Area has been defined by archaeologists seeking to distinguish localized developments in the area extending from Honduras to Ecuador (Haberland 1957, Linares 1979, Rouse 1962, Willey 1959). Common traditions such as circular dwellings, dispersed settlement patterns, reliance on root crops for subsistence, and absence of monumental architecture which deviate from the Mesoamerican pattern unite the Intermediate Area. The Gulf of Nicoya forms an analytically convenient archaeological region within this larger area. Ultimately, it must be recognized that the gulf has ties with both the Greater Nicoya Archaeological Subarea and the Intermediate Area and exemplifies the environmental and cultural continuity characteristic of lower Central America.

During the Late Polychrome period (A.D. 1200-1550), the Gulf of Nicoya region can be separated from the larger areas and regional units by its distinctive ceramics, by an increase in site density along the coast and on the islands, and by its involvement in exchange. The gulf and its watershed from Cabo Blanco to Herradura point (Fig. 3), is a large and irregular territory, yet it may correspond to a single prehistoric cultural system during the Late Polychrome period. The region includes the islands in the gulf, the nearby coast of the Gulf of Nicoya, the lower course of the Tempisque River, the inland hinterland of the Nicoya Peninsula, and the foothills of the Cordillera de Tilaran.

Physiography of the gulf

The Gulf of Nicoya is 50 km long and over 10 km wide. It is bordered by the mainland on the northeast and is fed by the Tempisque River, which empties into the head of the gulf. To the west lies the Nicoya Peninsula, one of the distinctive landforms along the Pacific coast south of the Gulf of California. The gulf is one of two major indentations (along with the Gulf of Fonseca) of the Pacific coast in tropical latitudes.

The shores of the gulf are almost entirely covered with mangrove, in a band which ranges in width from a few meters to two kilometers. Inland from the mangrove is the coastal plain. On the peninsula this plain is narrow, rarely exceeding five kilometers in width, and is backed by hills which reach 600 m in height within a few kilometers of the shore. On the mainland side, the coastal plain is broader, gradually rising to the foothills of the central volcanic range 10 to 20 km from the coast.

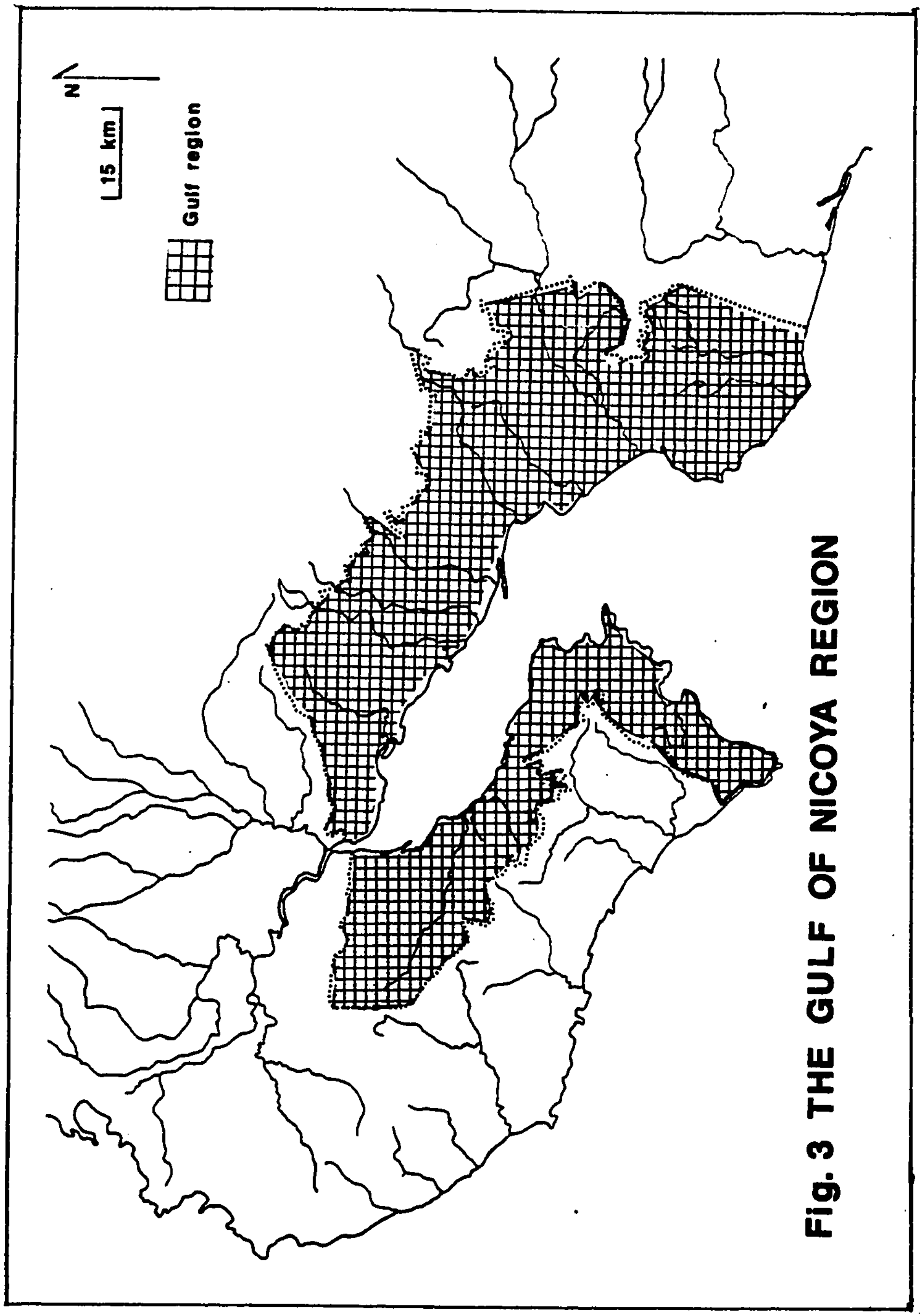

Fig. 3 THE GULF OF NICOYA REGION

Islands within the waters of the gulf range in size from less than 1/4 sq. km to 40 sq. km and include both uninhabited rocks and settlements of over 1,000 persons (Fig. 4). The smallest of these are rocky outcrops which support noisy colonies of birds and little else. The larger islands, once forested, have been logged for hardwoods in modern times and either cleared for planting or pasture or covered with secondary growth. The shores are alternating stretches of beach and rocky headlands or mangrove. Often a steep escarpment near the shore limits access to the interior, and the slope of the interior hills limits some places for agriculture. None of the islands has extensive lands under cultivation at the present, and those islands whose interior is exploited commercially are primarily used for cattle grazing.

The gulf and the alluvial deposits in the Tempisque Valley along this part of the Pacific coast form two zones based on similarities in geological composition and activity. The "Outer Arc" includes the Nicoya Peninsula and the islands, and is composed of Mesozoic and Tertiary age rock (200-7 my)(Dengo 1962:25). The "Inner Arc" includes the Cordilleras of Guanacaste and Tilaran and is composed of rock from the oldest complexes of the Cretaceous (135-65 my) and Tertiary (65-7 my) periods and intrusive and volcanic rock of the Tertiary and Quaternary (7 my-present) periods (ibid., 26), principally andesites and basalts (West 1964a:76).

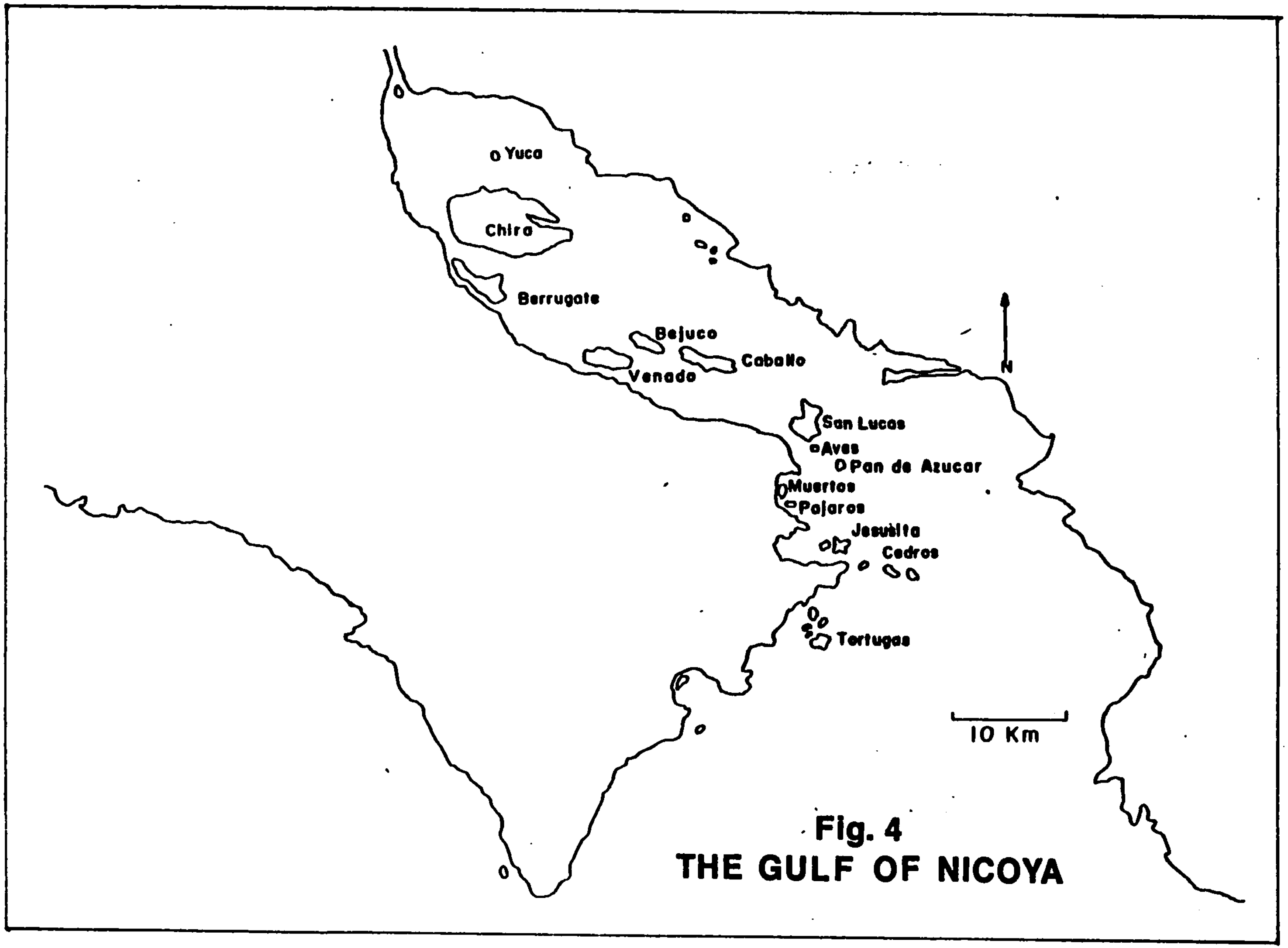

Fig. 4
THE GULF OF NICOYA

The Outer Arc is composed of the "Nicoya Complex", an association of basalts, gabbros, siliceous limestone, and graywackes that formed during the Cretaceous period, and other formations. The layers above the Nicoya Complex include the Sabana Grande formation, which consists principally of sedimentary rocks including siliceous limestone (Dengo 1962:29) and dates to the Upper Cretaceous (100-70 my). The Rivas formation, which is exposed in southwestern Nicaragua as well as on the Nicoya Peninsula consists of sandstone, slate, and some limestone and was also formed during the Upper Cretaceous (ibid.,28). The Las Palmas formation, Upper Paleocene to Lower Eocene (60-50 my) consists of shales and slates sometimes interbedded with sandstone and conglomerate. The Brito formation is a more recent part of the rocks that make up the Peninsula, formed during the Eocene (55-40 my) and is composed of clastics. The Punta Carballo formation is a Middle Miocene formation (15 my) that is made up of calcareous, fossil bearing sandstone (ibid.,27).

The islands of the gulf, like the more recent formations of the Peninsula, were formed under water. The islands were hills along the Tempisque River when it drained the entire area that is now the Gulf of Nicoya. The area submerged and the hills became islands (ibid., 102). Most of the islands are composed of relatively young formations. Chira is made up of the Brito and Las Palmas formations which include shale, slate, sandstone, conglomerate, limestone, clastics, and alluvial deposits around the large estuary. Berrugate, Venado, Bejuco and the western part of Caballo island are composed of the Rivas and Sabana Grande formations, of sandstone, slate, and limestone. On Caballo, a portion of the Nicoya Complex is exposed and on the eastern part of the island, a section of the Las Palmas formation. San Lucas is composed of the youngest geologic strata, the Punta Carballo formation, as well as the Las Palmas formation. All the islands south and east of San Lucas are composed of the Nicoya Complex. The peninsula is composed of the formations mentioned and of alluvial deposits. The mainland coast of the gulf is alluvium backed by older volcanic (ignimbrite) hills of the Brito formation (55-40 my) and further inland, the Aguacate formation. This formation dates to the Upper Miocene and Pliocene (10-5 my) and consists of flows of basalts, andesites, and strata of conglomerates and tuff.

The contrast in geologic composition between the islands and the mainland to the east of the gulf is striking in its effect on rock and mineral resources. The islands are made up of relatively soft materials such as shale, slate, sandstone, and limestone, and lack the principal rocks (basalt, andesite, quartz, chalcedony, and other cryptocrystalline rock) used in the manufacture of stone tools by prehistoric occupants of this region. Percolation of siliceous liquid through fault zones or cracks occasionally resulted in hard siliceous deposits on the islands though usually these were not large enough to provide workable sources of cryptocrystalline stone. Limestone hills along the Tempisque contain "numerous bandings of a siliceous material, frequently a type of agate" (Bourgeois et al.1972:21). Deposits of gold, which form under conditions of high temperature and pressure, are found on the Costa Rican mainland not far from the shore of the gulf, in placer deposits along the Abangares River and other rivers emptying into the gulf. These deposits could not occur on any of the islands or the peninsula due to the requirements for their formation.

The unequal distribution of mineral resources suggests two themes for Precolumbian occupation in the region. The lack of stone for tools may have hindered settlement in certain places, and exchange of stone from the mainland for goods from the rest of the Nicoya region probably has a long history.

Climate and resources

Any discussion of prehistoric settlement in the Gulf of Nicoya region must consider the habitability of the area, its climate, and fertility. The gulf region includes the low land between two mountainous regions along with those mountain hinterlands. On the east lie the Cordilleras of Guanacaste and Tilaran, and to the west are the high hills of the Nicoya Peninsula. Each of these ranges casts a rain shadow on the gulf (Stevens 1964:309). As a result, the annual rainfall on the islands and the coast averages under 1500 mm, making this the driest part of Costa Rica (Fig. 5). The climate is classified as the seasonally dry

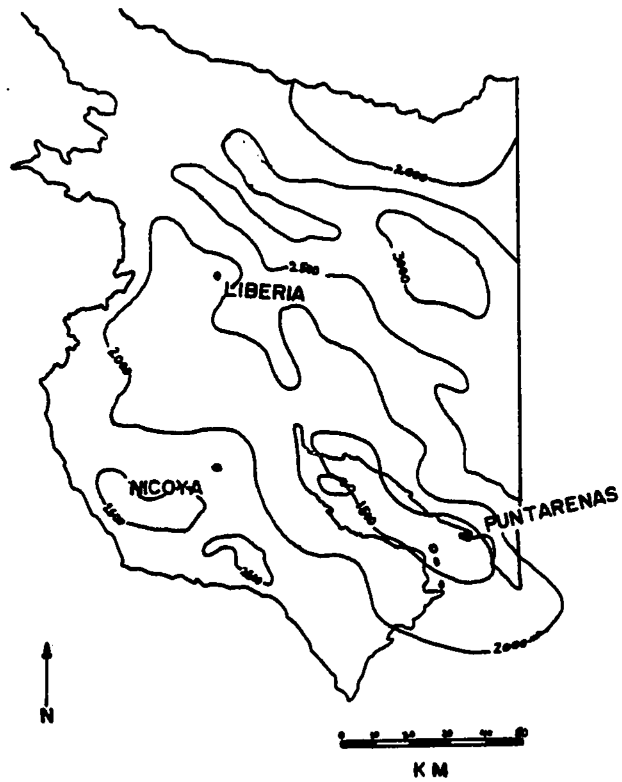

Figure 5

GREATER NICOYA

Mean Annual Rainfall (mm)

tropics, having mean annual temperature over 18 degrees centigrade. Most rain falls between May and November and the region is extremely dry December through April. The southern part of the Nicoya Peninsula has a slightly more humid climate with less distinct variation in rainfall than other parts of the gulf region (Tosi 1969, AID 1965). Near absence of weather-recording stations in the region obscures micro-climatic variation that may correlate with prehistoric settlement. All climate classifications are extrapolated from available mainland data and aerial photographs of vegetation. Compared to the coast, the islands in the gulf possess limited surface water, for on the mainland rivers and permanent streams provide fresh water in most areas even during the dry season. Only San Lucas and Chira Islands have permanent streams, and shallow wells are dug to supply drinking water.

Soil conditions in the gulf region must have been another factor limiting prehistoric occupation, especially during the Late Polychrome period (A.D. 1200-1550), when agriculture is known to have been widespread. The principal factors influencing soil formation are temperature, precipitation, runoff, and parent material. Alluvial soils are found at the mouth of the Tempisque River, along the coastal plain of the Nicoya Peninsula, and along the coast south of Morales on the mainland. Soils of the forest-grassland transition form over a variety of parent material, including volcanics, limestone, and sandstone (Harris et al. 1971), all components of the Nicoya Peninsula. Ecological studies carried out in this region provide descriptions of alluvial soils like those found along the gulf and in the estuary of Chira, and of soils formed over the limestone parent material typical of the islands.

Soils formed over limestone are generally shallow, reddish to yellowish in color, with bedrock outcrops. The alluvial soils of the Tempisque drainage are black to gray in color from organic matter and poor drainage. They also have a high montmorillonitic clay content (Bourgeois et al. 1972:28), which is a resource potentially valuable to potters. Present day potters in the Nicoya region work in three places, on Chira Island, on the mainland adjacent to Chira in San Pablo Viejo, and in Guaitíl near Nicoya. At all these locations potters take advantage of alluvial clay deposits, to make hand-built wares of remarkable diversity. These range from large, undecorated vessels for water storage to polychrome alligator effigy ashtrays for the tourist market. The wealth of locally procured clays and mineral pigments for this craft hints at the richness of this region for pottery making during prehistoric times.

In the Nicoya region vegetation is dry tropical forest in transition to moist tropical forest (Tosi 1969). Some factors, such as precipitation and temperature, that influence vegetation are similar to those affecting soil formation (Wagner 1964:220), but vegetation is also affected by altitude, periodicity of temperature and moisture, and drainage (ibid., 221). On the alluvial soils of the floodplain secondary species predominate, principally sandpaper tree, *Curatella*; nance, *Byrsonima*; and acacias, *Acacia* spp., while large areas are covered with grassland or pasture (Bourgeois et al. 1972, Wagner 1964:248). Many other tropical species are present in limited numbers including hardwoods, fruit trees, dywoods such as brazilwood (*brasíl*) (*Haematoxylon campechianum*) and *mora*, (*Chloraphora tinctoria*) (Wagner 1964:246-247). Although some well known palm species including the peach palm (*Guilielma utilis*), the coconut (*Cocos nucifera*), and the corozo palm (*Corozo oleifera*) are not widely grown in the region, many palm species are present. Furthermore, remains of palm fruits in archaeological contexts and stands of trees show that tree crops including palms and breadnut (*Brosimum utile*) were important to subsistence in prehistoric times in south Costa Rica (Honetschlager and Finch n.d.) and in western Panama (Smith 1980:163-169).

Lining the shore of the gulf and the lower course of the Tempisque is a wide belt of mangrove. The four genera, *Rhizophora*, *Avicenna*, *Laguncularia*, and *Conocarpus*, grow in different depths of water, and their interlaced roots stabilize the shoreline, capture silt carried in runoff, protect the larval and post-larval stages of shrimp and fish, and shelter small fish and molluscs (Blair 1979:27). Based on production of organic matter (grams of carbon per square meter per day [gC/m sq/day]), mangrove communities are more fertile than most marine and terrestrial communities, exceeded only by rainforest and coral reefs (Golley et al. 1962:18). In the gulf, mangrove provides breeding grounds for rich marine food supplies. In addition to abundant fish and shellfish, mangrove associated fauna include crabs, snails, crickets, roaches, other insects, lizards, and birds (ibid., 15).

The gulf possesses extensive fish resources, and one estimate is that the 4,000 non-fleet, or artisan, fishermen working on the Pacific coast of Costa Rica provide 50-60% of the fish consumed in the country (Blair 1979:10). Using lines or nets fishermen take _pesca blanca_, a generic category including snook, snapper, grouper, croaker, shark, and lobster (ibid.). An even greater variety of fish is taken for household consumption, including catfish, needlefish, corvina, grunt, and berrugate.

Commercially exploited shellfish species in the gulf are mangrove or mud dwellers, principally two species of _Anadara_, a medium-sized bivalve locally called _chucheca_ (_Anadara grandis_), and _piangua_ (_Anadara tuberculosa_). _Chione_ subgenera, locally called _piangua_, a large clam (_Pitar_), mussels (Mytilidae), and oysters (_Ostrea corteziensis_) are all exploited commercially. Many additional species live in the gulf, though few are collected even for domestic consumption. Mature, large-sized individuals of most species are either scarce or require a great deal of labor to collect.

Shellfish were used as a source of purple dye from Precolumbian times through the nineteenth century (Gerhard 1964:181, Melendez 1974:114), and dye producing species including Hexaplex, Muricanthus, Thais, Cymia, Acanthina, and Littorina (periwinkles), can still be collected in the region. Extracting shellfish dye is not presently an active pursuit, however. The same is true of pearl-fishing, which was reported from the sixteenth through the nineteenth centuries (Fernandez 1976:vol. 3, 125-128). Pearl oyster shell used to make buttons was exported from the Pacific coast as late as the 1920s (El Partido 1924:127).

Shrimp fishing is currently industrialized in Costa Rica, and trawlers are prohibited from the gulf proper in an effort to protect shrimp nursery areas (Blair 1979:10). Lobster fishing is uncommon north of a line between San Lucas Island and Puntarenas, because the niche occupied by lobsters, rocky reef, is not available. South of this line on both sides of the gulf lobster are taken for both commercial and domestic use. Crab are not widely harvested either commercially or for domestic consumption, in spite of their abundance.

Terrestrial food sources are determined by the natural vegetation and by the fertility of the soil and its potential for agriculture. The agricultural potential of the alluvial soils around the gulf is rated low, due to intense weathering and intermittent leaching. The islands and the adjacent coast are recommended only for extensive uses such as cattle and forestry, probably because of limitations imposed by the severe dry season and the scarcity of surface water for irrigation (Plath and van der Sluis 1964). The agricultural potential of the other soil groups is somewhat higher. Areas at the southern end of the peninsula that receive annual rainfall over 1500 mm (AID 1965) are considered suitable for intensive cultivation, and at present this area is a center for fruit and vegetable production. The mangrove swamps, which may be the most naturally fertile land in the region, have not been evaluated, as they are basically unsuitable for agriculture (Plath and van der Sluis 1964).

The resources described for the gulf region today differ from what was available even as recently as the first decades of this century when the islands were more heavily forested and virtually uninhabited (El Partido 1924, Melendez 1974:547). Industries such as pearl fishing, purple dye shell collecting, and dyewood cutting disappeared as the materials did. Hardwoods for construction and craft work are nearly exhausted. The fishing industry faces water pollution and overexploitation, while the population of game animals outside forest reserves is extremely small, coastal habitats which shelter migratory birds are shrinking, and along with the whale, the sea turtle is seriously endangered by human predation (Carr and Schroeder 1967, Zahl 1973).

In centuries past, however, the gulf region's resources included trees, plants, animals, fish, and shellfish in similar variety and greater abundance than today. The region's soil appears never to have been especially fertile, though always capable of supporting cultivation, as it does today. The mainland had greater wealth in water, game, minerals, and land than the islands, while the islands had clay sources and transportation and strategic advantages. From a broad perspective all parts of the gulf region were either habitable or exploitable by prehistoric peoples.

Archaeological research in the Gulf of Nicoya region

Archaeological research in the Gulf of Nicoya region does not have great historical depth. Though the Pacific coast of Costa Rica and the province of Guanacaste in particular are noted for the richness of archaeological materials based on the "finds" and tales of pot hunters, and on the size and number of private collections, the gulf was not investigated until recently.

Cursory visits to the gulf islands during the nineteenth century never yielded artifacts on a scale comparable to mainland exploration near Nicoya (Hartman 1901). The antiquarianism that later attracted the attention of researchers to many other parts of Costa Rica developed little around the gulf. Clerics including Bishop Thiel collected artifacts near Nicoya, and some of his accumulation is now at the National Museum of Costa Rica (Stone 1977:26). Artifacts from the gulf islands were lumped with pieces from Nicoya and the lower Tempisque Valley for the Exposición Histórico-Americano in Madrid in 1892, a lumping which foreshadowed the more recent notion of a Greater Nicoya Archaeological Subarea.

Both J. Bransford, in 1881 and Karl Sapper in 1899, were unwilling visitors to Chira, the largest of the gulf islands, during stormy voyages down the Tempisque heading toward Puntarenas. Sapper disembarked and climbed Cerro Chira (Sapper in Melendez 1974:326), and in doing so overlooked an archaeological site on that peak. Bransford stayed by the shore throughout his stay and expressed no interest in the island, archaeologically or anthropologically, describing it as virtually uninhabited (Bransford in Melendez 1974:322).

Carl Hartman's turn-of-the-century excavations in the gulf region are an exception to the pot-hunting-cum-research of the time. Among Hartman's best known excavations are those he conducted at Las Huacas near Nicoya, where he uncovered tombs dating to the Zoned Bichrome and Early Polychrome periods (Hartman 1907). Hartman's meticulous records provide the context of recovered artifacts unique among early work and make his report of lasting value. Hartman also excavated on some of the gulf islands (1900:968), but that work has never been published.

In 1910, a cleric named Velasco from Nicoya spent over five months on Chira Island looking for artifacts. One account tells of Velasco's finding ". . . something very important which he called the missal of the Chorotega, a rectangular book containing many hieroglyphs. . . " (Fernandez de Tinoco in Melendez 1974:551). This discovery is suggested to have been a painted folding screen similar to contact and Colonial period codices from Mexico and Guatemala (Stone 1977:91). The "missal of the Chorotega" was never seen by anyone but Velasco, and the location of his collection is not known.

After 1910 the islands and the shores of the gulf were ignored for years, with the exception of excavation by local residents looking for saleable items. Many sites have been destroyed or damaged by pot hunters over the years, and it is impossible to say when most of these explorations took place. From Chira alone I have heard reports of repeated looting for artifacts at three sites by different groups between 1930 and 1960.

By about 1960 followers of scientific archaeology began to travel throughout Costa Rica reporting archaeological sites, writing descriptions, preparing maps, and conducting excavations. The gulf attracted minimal attention, though there were some visitors. Doris Stone and Carlos Balser visited Chira Island, possibly to learn more about Velasco's reputed "missal of the Chorotega." They landed at a spot not far from where Velasco claimed to have dug. Their reconnaissance included excavations at one coastal site, and the information has been partially published (1977:84). Stone's interest in correlating archaeological remains with historically identifiable aboriginal groups resulted in unique archaeological and ethnohistoric research on the gulf region

(1946, 1966, 1977). Stone utilized early historic sources first compiled by Lothrop (1926) and went on to identify San Lucas island as sixteenth century Chara (1977:43) as well as to describe the Nicoya region based on sixteenth century accounts (1977:90-94). She illustrated monochrome ceramics from the region (1977:figs. 49,128), and suggested that different ceramic traits between northern and southern sectors of the Nicoya region could be attributed to Mesoamerican vs. South American contacts (1977:93-94).

At about the time Stone and Balser were visiting the gulf, Claude Baudez initiated the first archaeological survey in the Greater Nicoya Archaeological Subarea. In 1958 he located and tested archaeological sites in the Tempisque River valley. On Toro Island in the mouth of the Tempisque he recovered materials from a small habitation and cemetery site. He assigned it to his latest Precolumbian Bebedero phase (A.D. 1200-European contact), noting:

> The characteristics of the ceramics of Toro island are the abundance of the type Murrillo, the extreme rarity of polychromes, and the presence of new types. The differences between this material and that from other sites in the Valley may be due first of all to the time factor: the collection from Toro Island may represent a more advanced moment in the evolution of BEBEDERO ceramics not represented at the other sites, where polychromes were replaced by types decorated with applique or incising. On the other hand, the eccentric position of the island makes us suppose that it could have been inhabited by a group possessing ceramics contemporaneous with, but different from those of the valley (with the exception of the type Murrillo)(Baudez 1967:50) (italics in original).[1]

The site on Toro Island provided further evidence of the

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1 "Les charactéristiques de la céramique de l'Île Toro

regional difference in archaeological remains suggested by Stone, though the sample was small.

Baudez's work in the Tempisque Valley was not followed up in the direction of the gulf. Periodically sites in the region that were being destroyed by pothunters or construction projects were visited by staff members of the National Museum of Costa Rica. Archaeological survey and excavation programs were carried out further north, however. Michael Coe conducted survey and excavation along the coast of Guanacaste from the Nicaraguan border to Tamarindo Bay (Coe 1962)(Fig. 1). Though he did not locate the Formative deposits he hoped to find, he did find extensive occupation remains and, with Baudez, established the first regional chronology for Guanacaste and the Tempisque Valley (Baudez and Coe 1962). A detailed analysis of Coe's ceramics was also undertaken later by Jeanne Sweeney (1975). Baudez and Coe's work in Costa Rica provided basic chronological information, while Baudez's study of ceramics from his survey of the Tempisque Valley (1967) has become a standard reference for ceramic identification in the region.

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sont l'abondance du type Murrillo, l'extrême rareté des polychromes, et la présence de type nouveaux. Les différences entre ce matériel et celui des autres sites de la Vallée peuvent etre d'abord dues au facteur temps: la collection de l'île Toro peut représenter un moment avancé de l'évolution de la céramique BEBEDERO, non répresenté dans les autres sites, où les polychromes auraient été remplacés par des types décorés par pastillage ou par incision. D'autre part, la position excentrique de l'île nous fait supposer qu'elle aurait pu être habitée par un groupe possédant une céramique contemporaine mais différente de celle de la vallée (à l'exception du type Murrillo)".

In 1969, Frederick Lange began archaeological investigation in the Sapoa River Valley and around the Bay of Salinas, up in Greater Nicoya north of the gulf region. That project, like Coe's, was aimed at recovering remains of early settlement in Guanacaste. It also focused on settlement pattern and subsistence at sites in coastal and inland survey zones (Lange 1971a). Lange continued to study settlements in the Nosara River Valley on the south coast of the Nicoya Peninsula, and brought to light regional variation in settlement pattern and subsistence (Lange 1977, Lange et al. 1976). He then directed excavations and intensive survey of the Bay of Culebra on the northern coast of Greater Nicoya (Lange 1979b). The multiple goals of the research program included study of settlement, subsistence, the nature of contacts between the bay's inhabitants and inland groups, and the possible role of the Bay of Culebra in interregional exchange (Lange and Accola 1979, Lange and Abel-Vidor 1980:5). Though Lange's field work in the Bay of Culebra terminated in 1979, analysis continues to produce valuable information on coastal adaptation (Abel-Vidor 1978, 1980, Accola 1978, Accola and Ryder 1980, Kerbis 1979, 1980, Lange 1977, 1978a, 1978b, 1979b, 1980a, 1980b, Moreau 1975, 1980, Vázquez and Weaver 1980, Wallace and Accola 1980).

During the same period Lange directed the Guanacaste-San Carlos project of the National Museum of Costa Rica (1977-1978). Quadrat survey was conducted along a transect extending from the Tempisque River to Lake Nicaragua to examine Precolumbian settlement and contacts between the Pacific and Atlantic watersheds. Survey and excavations at Hacienda Mojica along the Bebedero River located sites dating to the Early Polychrome period (A.D. 300-800). Excavations at the Mendez site, located inland between volcanos in the central mountain chain, yielded Zoned Bichrome period (500 B.C.-A.D. 300) materials (Norr 1979). These research projects showed contrasting patterns of settlement and subsistence between coastal and inland sites, as well as differences in the time periods during which coastal and inland zones were occupied. Inland occupation appears to have occurred by 300 B.C. while few sites along the coast were occupied until A.D. 300 at the earliest (Creamer n.d., Lange 1976a, Norr 1979). While this pattern initially appeared similar to that recognized for prehistoric settlement in Panama (Linares 1977), more recent work by Lange suggests that patterns may reflect the limitations of field work rather than the reality of past occupation in the area (1980a:34). It would appear that following initial limited settlement of the coast during the Zoned Bichrome period (500 B.C.-A.D. 500), there was a major shift of population toward the coast around A.D. 500 (Lange 1976a, 1980a:42).

The survey project I initiated in 1979 has complemented the basic research conducted in other coastal zones in Greater Nicoya. The program of archaeological reconnaissance was undertaken to locate and record sites on the shores of the gulf and on the islands, to determine a chronological sequence of island habitation and to relate this to chronology established for the rest of Greater Nicoya (Baudez 1967, Baudez and Coe 1962, Healy 1980, Lange 1971a, Sweeney 1975). Comparison of archaeological remains on the islands with those from mainland sites was aimed at detecting cultural differences and similarities and locating centers of exchange and ceramic production.

Collections were made on seven islands and several shore locations and 78 sites were visited, representing occupation from the end of the Zoned Bichrome period (A.D. 500) to historic times (Creamer n.d.). Temporal ordering of the sites located depends on the ceramic chronology established by Baudez (1967) and Baudez and Coe (1962) for Guanacaste and the Tempisque Valley. The reconnaissance data show that the gulf region was occupied no later than A.D. 500 by groups dispersed from inland hilltops to the shore. Gradual growth of population is represented by more numerous sites during the Middle Polychrome (A.D. 800-1200) and Late Polychrome (A.D. 1200-1550) periods. Late settlement of the islands in the gulf around A.D. 1200 seems to be the result of a concentration of population along the coast noted elsewhere in Greater Nicoya (Lange 1976a, 1980:42). This general pattern would indicate that the value of island territory was being increasingly recognized in spite of access problems and limited water and land (Creamer n.d.). Perhaps due to its large size, Chira Island (40 sq km, vs. San Lucas, the next largest island, which is 4 sq km) does not conform to the pattern of settlement observed on the other islands, and was settled as early as the mainland. The present study was carried out subsequent to the reconnaissance, to compare available resources on each island and their role in exchange, both within and beyond the Gulf of Nicoya region.

CHAPTER 3

A SIXTEENTH CENTURY PORTRAIT OF THE GULF OF NICOYA REGION

During the sixteenth century, the first Europeans began their traverses of the Pacific coast of Central America. The few who recorded their journeys left the only documentary information available about the contact period in the Gulf of Nicoya region. The reports of coastal travel, descriptions of game, plants, and customs, give us a glimpse of the resources and people of the region. Many perishables are described, along with dress, customs and population. The chronicles add to the range of crafts and tasks we know existed, whether or not they are archaeologically recoverable.

There are relatively few ethnohistoric sources for the Gulf of Nicoya. The first Europeans to visit the gulf were Spanish explorers who traveled the Pacific coast, claiming the New World for their king and collecting tribute. There are no surviving native documents from the period before Europeans arrived. Gaspár de Espinosa's voyage northward from Panama along the coast in 1519 was the first to pass by the Gulf of Nicoya. While Espinosa's ships did not enter the gulf, they named it the Golfo de San Lúcar. Las Casas provides the most extensive description of the event:

> They found a gulf over 20 leagues long and full of islands, an admirable protected port; the Indians call it Chira and they [the Spanish] call it San Lucar; this is the port they call Nicoya, a fertile and pleasing province of Nicaragua. The ships were surrounded by a great number of canoes full of armed people, and many more appeared along the shore shouting fiercely, making threatening gestures and blowing trumpets; but after a few shots were fired, there was not one man left on land or sea who was not fleeing on winged feet. When Hernan Ponce saw this and that there was little to be gained, and the coast continued on straight ahead, he turned back to join Espinosa (in Nicaragua en los Cronistas de Indias 1976:49).[1]

First to enter the Gulf, Gil Gonzalez Dávila was heading from Panama to Nicaragua in 1522. Along the way he recorded differences in size, number and wealth of indigenous settlements along his trajectory, as well as the number of natives baptized (Gonzalez in Peralta 1883:3-26). The best known and most extensive accounts of the gulf region, however, are those written by Oviedo, who visited the New World six times between 1514 and 1556, and spent most of this time in Lower Central America (1976:2[1855]). He lived for a time in Panama as veedor de las fundiciones, overseer of mines and smelting for the King of Spain, and lived in Nicaragua as a government functionary (ibid., 3).

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1 "Hallaron un golfo de más de 20 leguas lleno de islas, y es puerto cerrado admirable; llámanlo los indios Chira y ellos lo llamaron San Lúcar; este es el puerto que dicen de Nicoya, que es una provincia muy fértil y graciosa de Nicaragua. Alli armada, y otras muchas gentes que apareció en la costa con sus trompetillas ó cornetas haciendo grandes fieros y amenazas; pero tirados algunos tiros de pólvora, no quedó hombre en la mar ni en la tierra que huyendo no volase. Viendo Hernán Ponce que por alli no podia ganar nada y que la costa iba adelante, tornose a juntarse con Espinosa".

Oviedo returned to Panama from Nicaragua in 1529, and on the voyage he passed through the Gulf of Nicoya and spent over a month there. By 1532, when he was granted the title of chronicler, Oviedo had advanced his career by acting as escríbano, clerk, to Lope Conchillos, secretary to the Council of the Indies, and had already published, in 1526, his De la natural historia de las Indias (ibid., 17). The first part of his Historia General y Natural de las Indias, Islas y Tierra Firme del Mar Oceano, was published in 1535.

Oviedo visited many of the places he discussed, and his descriptions are reliable, at least to the extent they can be checked in terms of such things as relative distances, locations, and place names. His discussions of plants and animals are also accurate when compared to modern descriptions of the same species. Exaggerations or obvious misinterpretations, such as his account of a "wild man" in Panama (ibid., 132) are not eyewitness reports.

Other sixteenth century reports of the gulf are quite brief, yet provide invaluable data. The report by Andres de Cereceda, treasurer for Gil Gonzalez Dávila on his exploration of the gulf, lists the caciques visited, tribute collected, number of individuals baptized, and distance between stops (Cereceda in Peralta 1883:27). Cereceda's report of the distance between stops around the shores of the gulf describes a different cacique every four to five leagues (20-25 km). Three caciques, Huetara, Chomi, and Nicoya, are described as living inland. Chorotega is reported to live on the coast, Chira and Pocosi on islands, and Gurutina, Paro, Canjen, Sabandi, Corevisi, Maragua are mentioned by name only and are assumed to have been located on the coastal plain near the shore. His mention of "Las minas de Chira" may refer to the gold placer deposits along the Abangares River, still mined today.

Mary Helms calculates the size of Panamanian chiefdoms at the time of European contact by assuming boundaries half way between reported sites of caciques and the resulting territories are usually bounded by rivers (1979:39). She suggests that spacing between chiefly settlements was equal to the distance that could be covered in a half day of ordinary travel on foot, 3-4 leagues (ibid., 51). Applied to the data available for the gulf region, a comparable distance between locales named by local chiefs can be seen (Fig. 6). We have little information on the extent of territories of the leaders recorded by Cereceda in the Gulf of Nicoya, though some appear to have been limited to islands.

Helms' model for Panamanian polities proposes that chiefdoms were the center of exchange networks, and that a leader's power and prestige increased through the execution of successful exchange transactions. Furthermore, items acquired from a greater distance had a greater value in the system (ibid., 139). This model may prove viable for the Gulf of Nicoya region, where there is evidence of long-distance trade and of distinct polities. For example, on the west side of the gulf, the cacique Nicoya held greatest

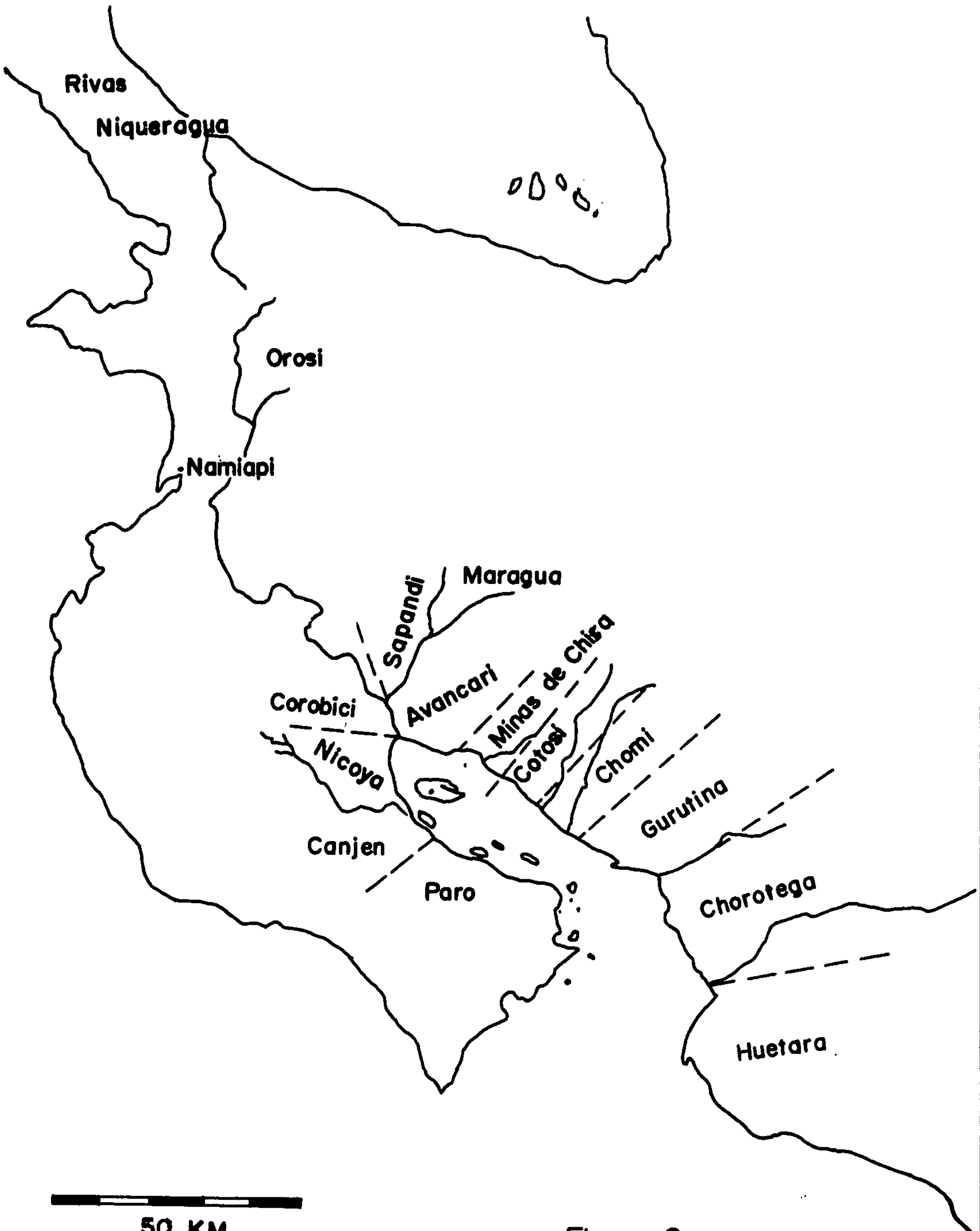

Figure 6

Caciques of the Gulf of Nicoya Region and Greater Nicoya, ca. A.D. 1522 power at the time of contact with Europeans (Castañeda in Peralta 1883:53), while the cacique Chira cooperated and perhaps competed with Nicoya from the gulf. A number of smaller territorial units can also be distinguished, which may imply two levels of participation or success in the exchange system.

Cereceda and Dávila, the expedition's leader present similar information in different forms. Cereceda made a list of the number of people baptized and the amount of tribute collected while Dávila provided a narrative of the voyage (Cereceda and Dávila in Peralta 1883:3-27). Comparison of the contents has provided insight into Spanish motives and perceptions in their exploration (Abel-Vidor 1980:183, 1981:85). Like the letters of Cereceda and Gonzalez, most sixteenth century accounts of the gulf are letters written to the king by explorers and clergymen visiting the region. Francisco de Castañeda accompanied the expedition of which Oviedo was a member in 1529, and describes disembarking on Chira on his way to Nicoya (Castañeda in Peralta 1883:36-60). Letters like Castañeda's are specific about the gulf and more likely to be accurate than accounts of better known chroniclers such as López de Gómara, Torquemada, and Herrera y Tordesillas, whose work was based on collected information (Abel-Vidor 1980:158).

Oviedo's writings and other letters to the king of Spain describe the physical surroundings of the Gulf of Nicoya during the sixteenth century. These provide exact information on geography, population, social organization, environment, flora, fauna, and subsistence, including products having exchange potential. Oviedo, who traveled the entire province of Castilla del Oro from Panama to Nicaragua, emphasized the uniqueness of his visit to the gulf region:

> I have described the form of the gulf of Orotina or of the Guetares, which is usually called part of Nicaragua, and in the sailing charts it has not been carefully noted, because the mapmakers who make them are not well informed or because they have not seen for themselves. I wish to relate all that the discoverers of this gulf have not told, for I have seen it, and it is so (Oviedo 1976:180).[2]

Oviedo's descriptions of the Gulf are by far the most extensive for the islands. He spent nearly a month on one of the islands, Pocosi, while his vessel was repaired (ibid., 184, 494). He reports position, size and population of many islands, and even prepared a map (Fig. 7). It is ironic that after his criticism of mapmakers above, Oviedo's map has thwarted every attempt thus far to use it to identify the modern islands by their sixteenth century names. The inaccuracies in mapping techniques and in measuring latitude at that time make most empirical measurements useless and the relative measures invaluable.

Only Chira retains its former name, though San Lucas

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2 "pues he pintado la figura del golpho de Orotiña ó de los Güetares, que comunmente suelen llamar de Nicaragua, y en las cartas de navegar, ó por no estar informados los cosmógraphos que las haçen ó por no lo aver visto ellos, no lo ponen tan puntualmente, quiero passar á lo demás que deste golpho estos descubridores no dixeron, é que yo ví, y es assi".

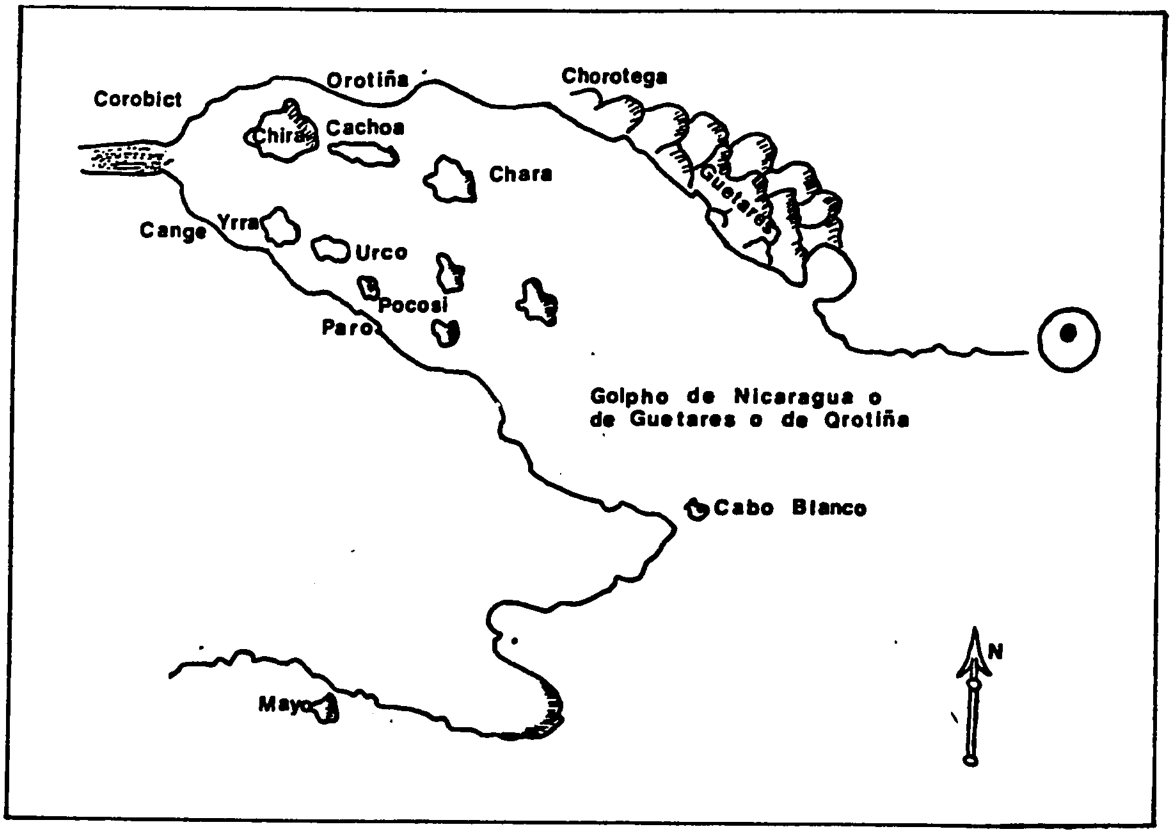

Fig. 7 OVIEDO'S MAP OF THE GULF OF NICOYA

Island can also be identified from the reports of Oviedo, "the island of Chara is the one which the christians call San Lucar"(Oviedo 1976:182).[3] In addition, the location of San Lucas compared to Chira corresponds to that reported for Chara: "the island of Chira, in the Gulf of Orotina or of Nicaragua, stands at ten degrees. The island of Chara, which others call that of San Lucar, is at nine degrees and thirty-eight minutes. . ."(ibid., 189).[4] Relative size corresponds as well, "The island of Chira is seven or eight leagues in circumference"(Oviedo 1959:297),[5] "The island of Chara is four leagues in its circumference" (ibid., 299).[6] Identification of Caballo Island as Cachoa is based on its location, size, and position on Oviedo's map (1976:181)(Fig. 7). Oviedo, however, calls Cachoa, Deer Island, ("isla de ciervos")(ibid.), recalling modern Venado Island, also Deer Island. Venado better fits his description of Pocosi,

> The island of Pocosi is small and is barely one league in circumference, I have walked along all its coast. This is a high and unusual port, it stands only a rifle shot from the mainland or a little more, and it has a small settlement of Indians, and it is extremely rich in fishing grounds" (ibid., 184).[7]

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3 "La isla Chara es la que los chripstianos llaman Sanct Lúcar".

4 "La isla de Chira, dentro del golpho de Orotiña ó de Nicaragua, está en diez grados. Está la isla de Chara, que otros llaman de Sanct Lúcar, en nueve grados é treynta é ocho minutos . . . ".

5 "La isla de Chira puede bojar siete ó ocho leguas".

6 "Bojará la isla de Chara, en su circunferencia, cuatro leguas".

Venado is among the islands closest to shore (Fig. 4). Oviedo also noted, "On the islands of Chara and Pocosi they don't have canoes but rafts" (ibid., 185)[8] suggesting the proximity of the two islands.

Identification of the other gulf islands is equally confusing, and various authors have tried with little agreement to interpret the limited information available. The island Pocosi, for example, has been identified as Venado Island (Stone 1977:43), Cedros Island (Lehmann 1920), and Caballo Island (Peralta 1883:816 ff.).

Human composition

Population of the islands in the Nicoya region at contact with Europeans is only minimally reported. Oviedo noted "the islands, which are Chara, Chira, Cachoa, Irra, Urco and Pocosi, are all populated and fertile" (1976:288).[9] He gave no numbers, however. Cereceda recorded gold collected as tribute on each island, but unfortunately did not even record the number of souls baptized, let alone give total population figures.

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7 "La isla de Pocosi es pequena e puede bojar hasta una legua, e yo la he andado por su costa a la redonda. Este alta e muy singular puerto, y esta un tiro de escopeta de la Tierra-Firme, o poco mas, e tiene un pueblo pequeno de indios, y es abundantissima de pesquerias".

8 "Chara e Pocosi no tienen canoas, sino balsas".

9 "sus islas, que son Chara, Chira, Cachoa, Irra, Urco e Pocosi, que todas estan pobladas e son fertiles".

The rapid decline in population in the gulf region makes it essential to utilize the reports written at the date of first contact between Europeans and natives. We are told, for example, that in 1526 over 500 "warriors" attended the ceremony in which Pedrarias Dávila claimed Chira island for Spain (Dávila in Peralta 1883:712). By 1531, however, Pedrarias was asked to protect the native population in the same region, "because they are so few that, removing any will make it impossible to sustain the existing towns and mines" (Fernandez 1964:vol. 4, p. 31).[10] Castañeda reported "400 able bodied Indians"[11] on Chira only three years later, in 1529 (in Peralta 1883:54). The population of Chara, San Lucas, was never specified, though the presence of a cacique, Nari, (Oviedo 1976:181) suggests a settled group. Nari does not appear again in the accounts, nor does his name enter Cereceda's tribute list. The importance of an individual called cacique by the Spanish varied greatly (Abel-Vidor 1980:180), and the passing mention given Nari and his subjects hints they were few in number. Possibly even less populous than San Lucas/Chara was Pocosi, described simply as a small island having one small village (Oviedo 1976:184).

The mainland population was larger than that of the islands. Cereceda noted 6,063 baptisms from the town of

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10 "porque hay tan poca que, sacandose alguna, no se podria sustentar los dichos pueblos e mynas".

11 "quatrocientos yndios de trabajo".

Nicoya during his stay in 1522, implying a much larger number if outlying areas were included. The native population of Nicoya appeared to decline rapidly, however, for Castañeda noted in 1529, seven years later, "the chief of Nicoya, who is the highest, leads at most 2,000 Indians, though I do not believe there are that many" (Castañeda in Peralta 1883:53).[12]

Regardless of the total number of inhabitants, the Gulf of Nicoya provided a vital link for travelers from Panama to Nicaragua and beyond during the sixteenth century, as a way station on a particularly dangerous stretch of coast:

> everyone who disembarks on Chira Island to come to the province [Nicaragua] over land, passes in canoes and boats to the home of the chief Nicoya . . . because the ships do not dare to pass this Gulf [Papagayo] . . . because there are such heavy seas (Castañeda in Peralta 1883:53-54).[13]

There were few choices for travelers along this route, for the coast was only lightly inhabited immediately to the south and to the north of Nicoya:

> from the cuchiras [Quepos] to Orutina [Gulf of Nicoya] where Bruselas was established are thirty-five leagues of unutilized land . . .and from Orutina to Nicoya is twenty leagues, and the land is inhabited by some Indians; from Nicoya to the territory of the chief Nicaragua are thirty-five leagues by sea . . . which are

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12 "el cacique de Nycoya, que es el mas principal, esta tendra, a mas tener, dos mill yndios, e aun no creo que tiene tantos".

13 "todos los que se desenbarcan en la ysla de Chira para venir a esta provincia [Nicaragua] por tierra, pasan en canoas e barcas a este cacique de Nicoya . . . porque no osan los nabios desde alli atravesar este golfo [Papagayo] . . . a causa que en este golfo anda mucha mar".

uninhabited (Pedrarias Dávila, Jan. 15, 1529, in Peralta 1883:xi).[14]

A pattern emerges in which the Nicoya region is a node of population consisting of local aggregations around the gulf and in the foothills of the Nicoya Peninsula and the Cordillera de Tilaran on the mainland, dominated by the _cacique_ Nicoya.

The base for success as a refueling and transshipment point had to be the local economy, as well as the gulf's location. Oviedo described the islands as fertile, all rich in fish, shellfish (1976:184-186), deer, peccaries (ibid., 182, 185) and small game including frogs (ibid., 186). Crops included corn, beans (ibid., 185), yuca (ibid., 41), cacao (ibid., 71) and a wide variety of fruits (ibid., 51-82). Oviedo noted that both extensive fields and smaller household gardens were planted (ibid., 121).[15] The pattern of planting both fields and household gardens persists to the present in some places (Wagner 1958:216 ff.). The only tree crop suggested to be "owned" or have territorial restrictions on its harvest was the _níspero_ (_Achras sapota_, _Manilkara spectabilis_) "this fruit is under the control of

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[14] "desde los cuchiras [Quepos] hasta orutina donde estava poblada bruselas ay treynta y cinco leguas de tierra desaprovechada . . . y desde Orutina hasta Nicoya, que son veynte leguas, esta poblado de algunos yndios; y desde Nicoya hasta el cacique de Nicaragua, ay treinte cinco leguas por mar . . . que esta despoblado".

[15] "la agricoltura de sus campos y sus huertos".

the Indians of the language of the Chorotegas" (Oviedo 1976:60),[16] presumably for the value of its wood and gum, as well as for the fruit, which Oviedo praised heartily. (see Appendix 1).

Watercraft, the principal means of transport, included both rafts of tree trunks lashed together (ibid., 185), and canoes, probably made of hollowed out tree trunks. Paddles for the latter were made of long shells (Pinnidae) (ibid., 185). All were probably made locally as canoes and boats are today. Thatched houses were mentioned (ibid.). One tool was described, a hoe or shovel made from a hafted shell. Such hoes were used for minimal or superficial cultivation, "where I have seen them the earth is very dusty and not difficult to dig and to turn" (ibid., 121).[17] Metates and manos were also described, "they grind [cacao] on a very clean stone" (ibid., 71),[18] and "they grind [corn] on a stone two or three palms long, more or less, and one and a half or two wide, and concave, with another round and smooth long stone which they hold in their hands" (ibid., 46).[19]

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16 "esta fructa está en poder de los indios de la lengua de los Chorotegas".

17 "donde yo las he visto es la tierra muy polvorosa y no reçia de cavar y volver"

18 "muélenle [cacao] en una piedra muy limpia".

19 "lo muelen [maiz] en una piedra de dos ó tres palmas ó mas ó menos de longitud é de uno é medio ó dos de latitud cóncava, con otra redonda ó rolliza y luenga que en los manos traen".

Products of the region having exchange value included dyewood (ibid., 86, 181), mollusc dye (ibid., 453), and fish and pearls (ibid., 185). The mainland was noted for honey and beeswax (ibid., 186) and for salt (Gage 1958:323). Gold was paid in tribute by the region's caciques (Cereceda in Peralta 1883:29). Within the region, trade in food, ceramics, cloth and shell beads were reported, "they take jars and pitchers and plates of black clay which they work very well, and lengths of cloth and beads, and corn and other foodstuffs, which those of the hills do not possess" (Castañeda in Peralta 1883:54).[20] Interestingly, there was no mention of cotton as a crop, yet on every island clothing of cotton was reported (Oviedo 1976:182), and cloth was an article of exchange. Gage reported export of purple dyed pita, plant fiber thread (1958:322), while modern ethnographic study has reported weaving of hats, rope, and baskets (Wagner 1958:245).

Fish was also not mentioned as a commodity, yet its abundance was constantly noted (Oviedo 1976:185). The mainland was wealthy enough to supply the Europeans with provisions when they arrived, and may have been more productive agriculturally than the islands. At least the mainland provided more area for planting, as Castañeda noted, "those from the island [Chira] go to work their cornfields on the

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20 "llevan cantaros e ollas, e platos de barro negro que labran muy bueno, e mantas de algodon e chaquira, e mayz e cosas de la tierra, que los de la syerra no tienen".

mainland, and to collect honey and wax" (in Peralta 1883:54).[21] The mainland side of the gulf appears not to have been part of such an agricultural system,

> The rest of the chiefs who live on the plain have few Indians, these people live by trade with those of the mountains, who they take . . . what those who live in the hills do not have (Castañeda in Peralta 1883:54).[22]

It appears that the inhabitants of the region maintained a balanced system of exchange from Nicoya to the central mountain range, using Chira as a pivot point between both sides of the gulf. Upon their arrival, the Europeans quickly became incorporated into this system. Travelers landed on Chira and continued on to Nicaragua overland, arranging for supplies and guides in Nicoya. The stress such caravans placed upon the relatively closed aboriginal economic system rapidly disturbed the balance between production and exchange. Before the arrival of Europeans, exchange may have been more important as "social cement" (Stark and Voorhies 1978:294) to integrate the petty leaders within the region, than it was to distribute goods. The demands of Europeans for supplies rapidly absorbed surpluses and all that could be produced, inducing the collapse of a system which relied upon circulation of excess goods.

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21 "pasan los desta ysla [Chira] a labrar en la Tierra Firme sus mayzales, e a coger miel e cera".

22 "los demas caciques que ay en la tierra llana son de pocos yndios, estos que he dicho biben de rescates con los de las syerras, que les llevan . . . que los de la syerra no tienen".

CHAPTER 4

THE VIGILANTE ALTA AND HERRAMIENTAS SITES: FIELD RESEARCH

Introduction

This research project grew from a desire to investigate cultural adaptation to island sites as possible outposts for exchange, and to look at the participation of gulf island residents in larger economic networks. The two sites were small, and best seen as two elements in a much larger cultural unit, the Gulf of Nicoya region. The region, in turn, is successively an element of Greater Nicoya, Lower Central America, and the New World. Thus, to the degree which goods from the sites were exchanged to the mainland, the Atlantic watershed, Panama, and Mexico, they can be viewed as participating in a nested hierarchy of exchange systems. At each level in this hierarchy, the systems were made up of component parts, each exchanging a variety of local and regional resources. By viewing this kind of exchange as one part of a larger cultural whole, we recognize that it is a process having material, economic, religious and social components (Clarke 1978:42). Therefore, "types and artefacts changing with time can be thought of as certain kinds of dynamic systems with certain inherent characteristics stemming from the general structure of the systems rather than from their specific attribute or entity values" (ibid., 39). The systems perspective helps evaluate areal classifiers long used in Costa Rican archaeology.

The Gulf of Nicoya sits squarely among different physical regions and between areas of different cultural traditions. Analysis of the region by associating it with either Mesoamerica or South America is likely to be biased toward either tradition, and this has proved to be the case. Costa Rica is frequently divided into an "Area of Mesoamerican Influence" and an "Area of South American Influence" (Baudez 1970, Ferrero 1977, Stone 1972), and only relatively recently has research in Central America tested rather than assumed that Mesoamerican traits dominate Greater Nicoya's culture history (Healy 1980, Lange 1971a). Lange was among the first to suggest that influence from South America on Costa Rica was underestimated by most investigators. (Lange 1971a, 1971b) and his premise has been supported by subsequent research (Creamer n.d.). Prehistoric cultural continuity between southern Costa Rica and western Panama has also been established (Drolet 1980, 1981). Emphasis on membership in better known cultural spheres, represented by distinctive elements absorbed from Central Mexico (Diehl, Lomas, and Wynn 1974), the Maya (Lothrop 1952:104), Ecuador (Paulsen 1977:152), or Amazonia has been stressed in place of understanding the long period of autochthonous cultural development comprised of attributes from both internal and external sources.

Setting

During reconnaissance in the Gulf of Nicoya, sites spanning the periods from Zoned Bichrome (500 B.C.-A.D. 500) to the Late Polychrome (A.D. 1200-1550) were located. Distribution of sites seems to conform to the pattern of early occupation in the interior, with sites clustered along the coast after about A.D. 500 (Lange 1976a, 1980a:42). This and applies equally to the Nicoya coast and the mainland coast of the gulf. Data collected during visits to archaeological sites located around the gulf and on the islands show that the Late Polychrome period was represented on all the occupied islands, while other periods were not. In contrast, a full range of sites have been found on the mainland. However, the Late Polychrome period in particular has been difficult to study in multicomponent sites, due to the fact that the late levels are often a minor proportion of the deposits (Lange 1980b:40, Abel-Vidor 1980:168), and the uppermost deposits are more subject to erosion than the earlier levels they cover. When Late Polychrome period materials form a small part of the collection recovered during excavations they have received less attention during analysis than more extenive, earlier components. As a result, reports on material of this period are limited (Lange 1971a, Baudez 1967, Healy 1980, Sweeney 1975). With the exception of Las Marias, the few single component Late

Polychrome period sites tested have yielded far more information than the multicomponent sites.

Chira and San Lucas Islands were chosen for investigation of the Late Polychrome period and both islands were visited in 1979 to locate sites. On San Lucas only coastal occupation was recorded, distinguished by extensive shell middens. There are no sites on the northern portion of San Lucas. A steep escarpment between the shore and the interior limits access from the beach on the north, and there are no sources of fresh water in this part of the island.

Choice of sites for test excavations was based on apparent preservation of sites and their accessibility. The Vigilante Alta site, 3245IV-144-3, was tested on San Lucas. The site is located on a ridge in the southwest corner of the island, near the road that circles the island (Fig. 8). Depth of material was revealed by a shell midden exposed along a cleared fenceline, and overall the site appeared to be well preserved.

On Chira Island our survey located 16 sites, many of which were around the large central estuary. Only one of the sites located in 1979, the Herramientas site, 3146II-141-1, was clearly from the same phase as the sites on San Lucas. The numerous sites located along the estuary were multicomponent sites, and we tested one of these in 1979 (Creamer n.d., Robison 1979). Herramientas was the only single component site dating to the Late Polychrome period, and thus similar to the sites on San Lucas. It is located in an open field and extends into surrounding thin secondary forest; the site is accessible from the only road in the northwest part of the island.

Methodology

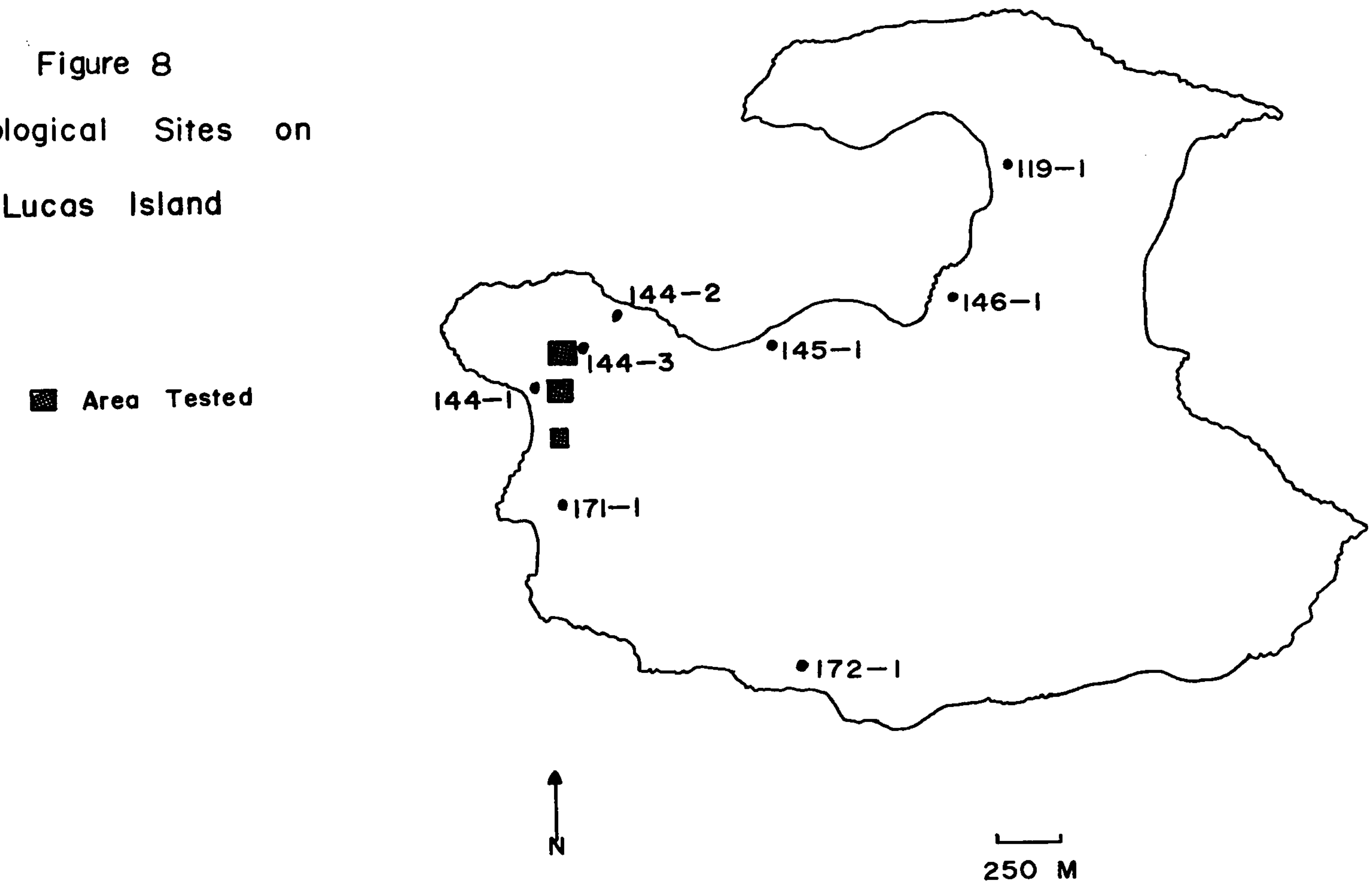
The land around both sites was examined carefully to locate the site perimeter and possible adjacent sites and a map was prepared. The Herramientas site on Chira Island is a discrete unit, bounded by a tidal salt flat, or salina, on the east, by the north coast of the island, and occupation remains gradually disappear to the west and south. Today there is a small stream in the low spot on the south side of the site during the rainy season. The stream may have carried water during a greater part of the year before deforestation and slight change toward drier climate occurred in the twentieth century (Pallant 1981). On San Lucas, occupation is contiguous along much of the west and south coasts of the island. A map of roughly five hectares was made to include the Vigilante Alta site and adjacent areas which were tested (Fig. 8).

A grid of stakes ten meters apart was set out over the Vigilante Alta site on San Lucas, while intersecting axes of stakes five and ten meters apart were placed over other sections tested. At Herramientas, a grid of stakes ten meters apart was laid over the entire central part of the site.

Testing emphasized excavation of contiguous units. By examining as large an area as possible at each site we would have the greatest possibility of discovering differences in

Figure 8

Archaeological Sites on San Lucas Island



site organization and content. These data were essential to the hypothesis that island sites were actively involved in regional exchange systems. The excavation strategy was also designed to locate habitation remains and other activity areas. It began with small tests placed along the grid, and continued with larger excavation units where features were located. At Herramientas, a series of test trenches were excavated to investigate the ground between shell middens. This inter-mound area appeared to have been purposely been cleaned of food remains, shell and bone, to provide living space. It was here that structures and special activity features were expected.

Besides recovering habitation and special activity remains, samples of ceramics from each site were needed to establish relative chronology of the islands with other sites in the region and adjacent regions. It also had been suggested that lithic artifacts on the islands are all made of material not naturally occurring there (Lundberg, personal communication); consequently, all lithic artifacts were kept for study, in order to assure an adequate sample.

Faunal remains received special attention because of their importance to subsistence and as possible exchange commodities. Study of faunal materials from Greater Nicoya has been plagued by preservation and collection difficulties (Kerbis 1980:125, Lange 1980k88). Samples of fauna were collected at each site using fine screen (4 mm). Optimum methods of collecting faunal remains are not standardized in the literature, and collection techniques differed between Vigilante Alta and Herramientas. At both sites, everything was dry screened through a 1/4 in (6 mm) mesh screen, which yielded a large faunal sample. At Vigilante Alta, wet screening through 4 mm mesh screen was also tried on a sample of material, which yielded an even larger faunal collection in terms of the total number of fragments. However, the time needed for screening, sorting, drying, and packing, 40-50 hrs for a 50 cm x 50 cm x 1 m column, prevented our using this method for more than a single sample. Shellfish remains were recovered along with the faunal remains.

Botanical samples were not collected at Vigilante Alta. Few features contained charred materials which might have preserved seeds or fruits, and the features were very near the surface. Often there were not adequate deposits from which to collect either flotation or pollen samples. Though this was also true for Herramientas, flotation samples from six midden units were collected. Each sample included 20 liters of unscreened fill.

All human skeletal remains were carefully collected. Upon return to the National Museum of Costa Rica, these were analyzed by Ricardo Vázquez L.

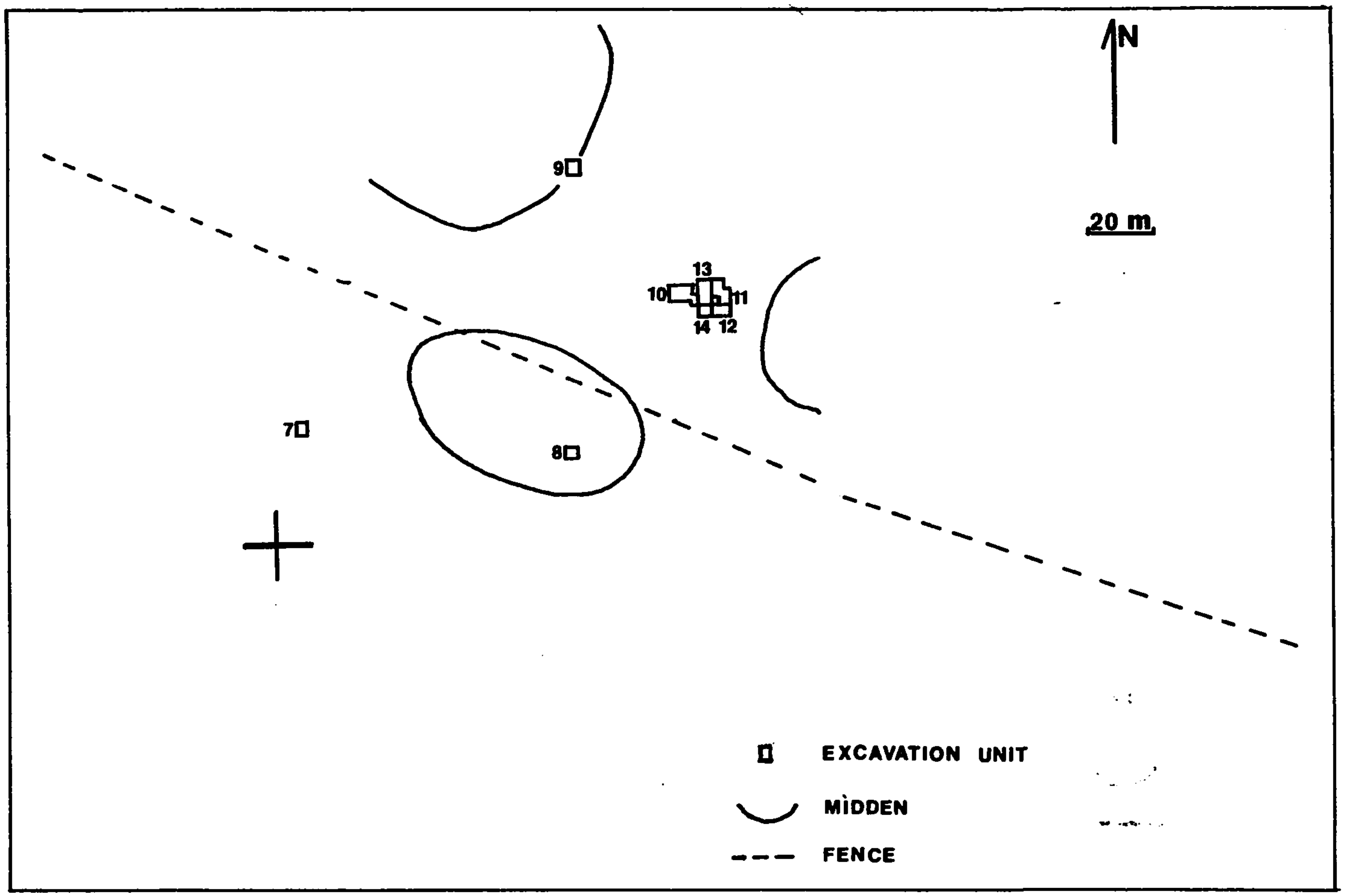
Excavations on San Lucas Island

The zone to be tested on San Lucas was chosen as representative of prehistoric occupation of the island, for its lack of disturbance, and for modern accessibility. The Vigilante Alta site is located near an exposed aquifer, which probably formed a spring in prehistoric times. Today it is tapped for use by the few inhabitants of this part of the island. The site is on a hill above the beach which can be reached in less than 10 minutes walk. Also within a short walk of the site is a small beach on the opposite side of the hill, where there is also evidence of indigenous occupation, the Vigilante Baja site (3245IV-144-2). From Vigilante Alta the view spans the gulf, the Nicoya Peninsula, neighboring Venado and Caballo Islands, and the mainland shore.

The site consists of low mounds of shell and sherds piled on natural rises around a stream valley (Fig. 9). It was selected for testing on the assumption that features such as house foundations, trash and storage pits, and burials, would be closely associated with the middens. To distinguish the site from the nearly contiguous remains on this part of San Lucas, the southwest corner of the island where Vigilante Alta is located was surveyed to determine the distance between occupation remains and the position of these remains near beaches---potential boat landings. Initial testing over the selected area, from the site to the shore, failed to reveal a pattern in occupation remains. Deposits were dispersed over the area and were very shallow, usually no more than 40-50 cm deep.

Work was limited by personnel available and by the water supply. In four months we tested 12,800 sq m (Fig. 8), of which the Vigilante Alta site comprises 33%. Of the 14 test

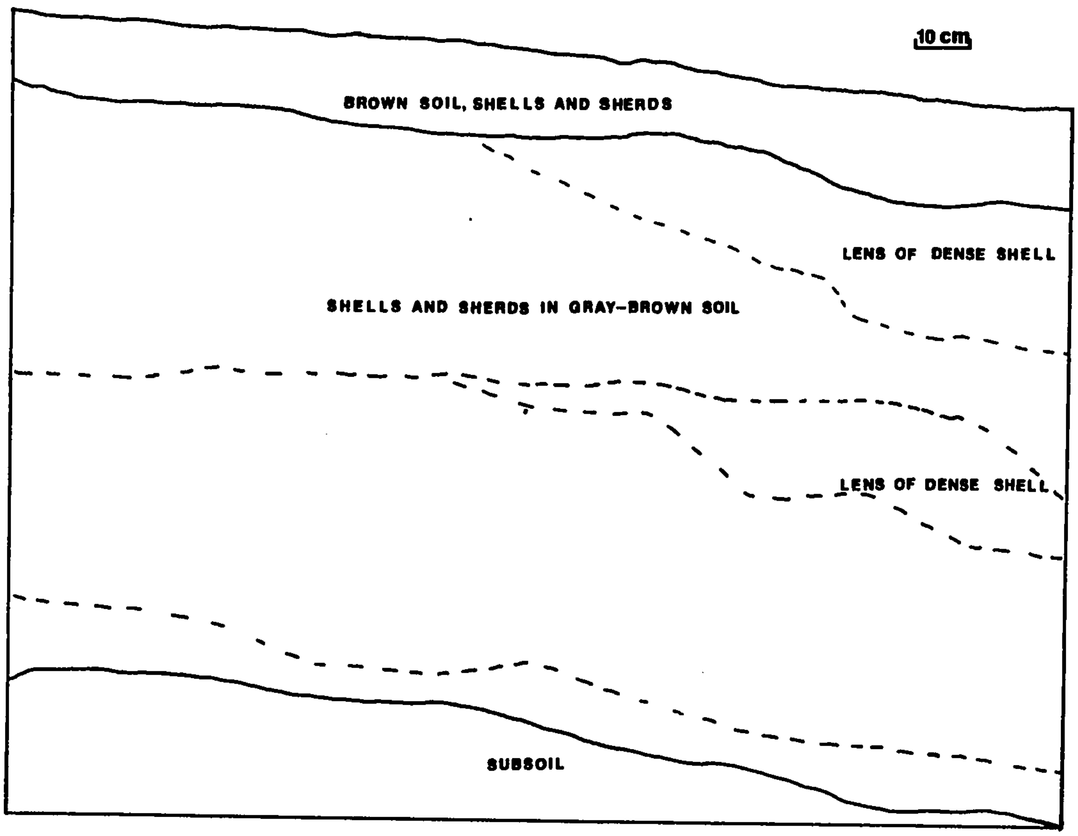
FIGURE 9 Vigilante Alta, 3245 144-3, San Lucas Island



units excavated (67 sq m), eight units, 7-14, were located at Vigilante Alta and totaled 47 sq m, less than 1% of the total site area. This reflects the limitations of field work already mentioned, while it fulfills the goal of maximizing contiguous excavation. Most of the sample excavated at the site, 30 sq m, was located in the level zone ringed by shell mounds. This was probably the main activity area of the site.

At Vigilante Alta the pattern of dispersed artifacts in association with shallow shell middens was clear, and one test unit was excavated to obtain faunal material from a midden. This test pit, Unit 8, was placed in the center of the most visible midden heap on the site. The 2 x 2 m unit was excavated in 10 and 20 cm arbitrary levels and reached a depth of 125 cm below surface before sterile soil was encountered (Fig. 10). A 20-liter sample from each level was screened through 4 mm mesh and all faunal remains collected. The unit consists of dense strata of shell intercalated with layers of gray-brown soil and crushed shell. Many shells retained their original color, possibly from rapid deposition. A lens of large gastropods (<u>Melongena patula</u>) was uncovered 20-40 cm below the surface in a level almost entirely made up of crushed shell rather than soil. Close examination of this fill showed that many <u>Mytila</u> or <u>Modiolus</u> (mussels) were part of the fill, while few of these species were recovered whole in the sample of shell. The soil was gray-brown in color, dry and loose. The base of

FIGURE 10 EAST WALL, Unit B, Vigilante Alta



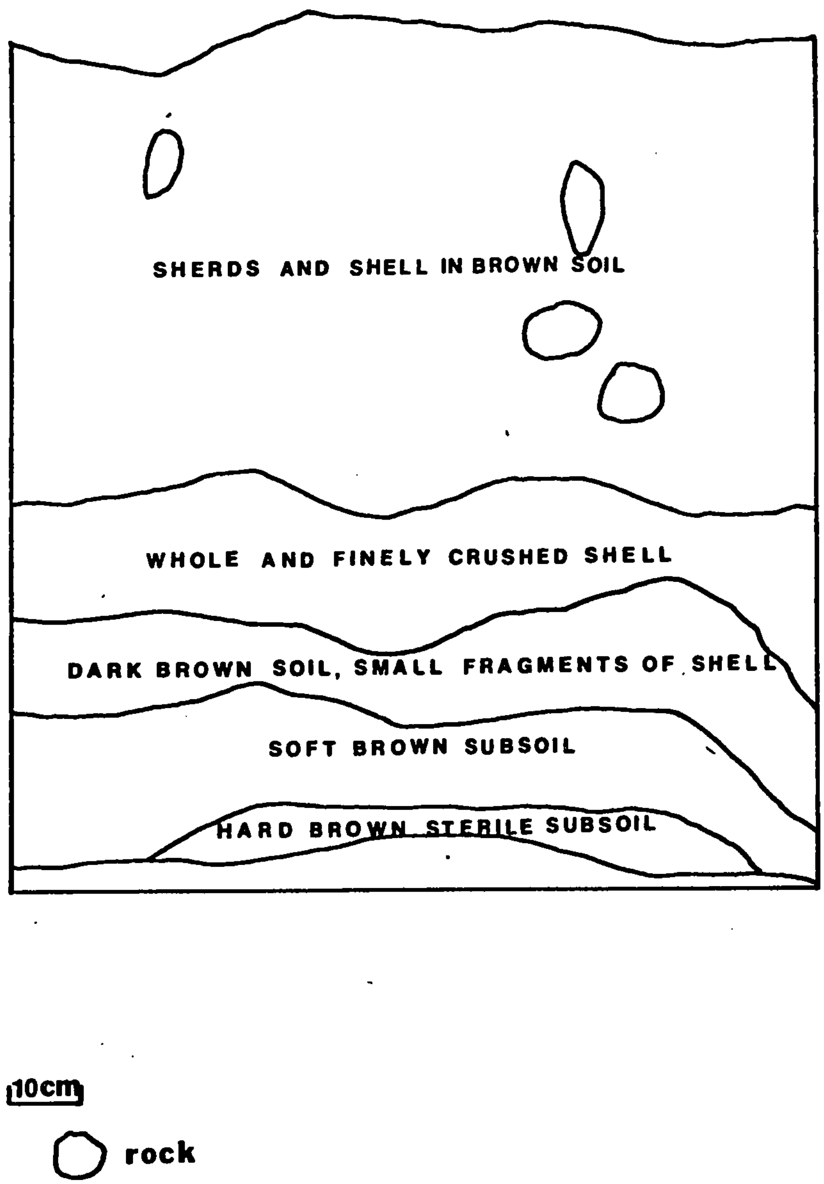
the unit was more sloped than the modern surface, and the visible lenses of shell sloped with the buried surface, suggesting the original deposition was on the side of a hill and that the low mound of midden is a product of deposition. The ceramic and stone artifacts recovered were uniform throughout the unit.

In October 1981 we returned to Vigilante Alta to collect an additional 50 x 50 cm unit of the same shell midden (Fig. 11). Due to its being excavated during the rainy season, differences in the soil color in the midden were clearer than during dry season excavations. This made it possible to excavate the unit in natural levels. Five levels were distinguished, ranging from 15 to 22 cm in thickness. The excavation reached 112 cm below the surface. All the excavated material was water screened to provide an optimal sample of faunal and shellfish remains.

Burial 1, Unit 7 (Fig. 12)

Testing in the central portion of the site and near the midden revealed several burials. The first of these, Burial 1, was located in Unit 7 in the wooded area of the southwest quarter of the site. A 2 x 2 m pit was planned, but when it became evident that the entire burial pit would not be contained within the 2 x 2 m unit, a one meter extension was added on at the southeast corner. In a shallow pit 55 cm below the surface, the remains were extended NW-SE with the head pointing NW. The bones were articulated in an extended supine position. Preservation was poor, and only the larger

FIGURE 11 NORTH WALL, Unit A, Vigilante Alta

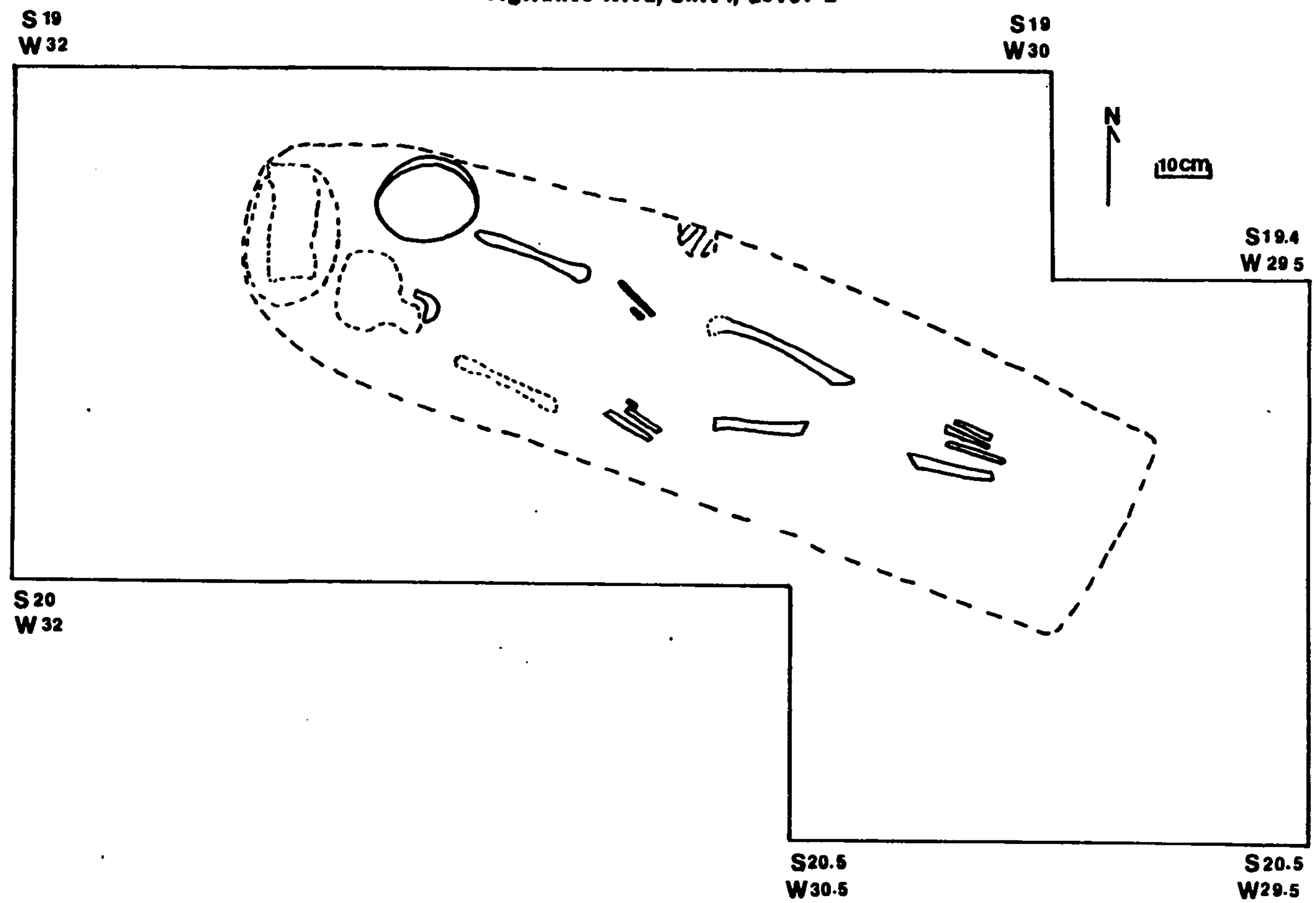


bones remained including the femora, tibiae, fibulae, humeri, and the ulnae, radii and fragments of the cranium. The burial pit outline was distinguishable only at the level of the bones, and it was apparent that the pit had been dug into crumbly limestone bedrock. It was roughly rectangular in shape, and just large enough to accomodate the individual and the few associated artifacts. The pit was 180 cm long, 50 cm wide and 60 cm deep.

Associated artifacts included one complete ceramic vessel, fragments of two others, and a ground stone "axe". The 11.5 cm long axe appeared at a depth of 42 cm, horizontally, and oriented N-S. It was ten centimeters above the level of the body, and located near the left lower long bones. The vessels were resting against the sides of the pit. Fragments of two separate vessels were together above the cranium, while a complete vessel was above the left shoulder. This vessel is a dark brown and gray mottled, flat-bottomed, shallow bowl, or escudillo. The vessel had tripod legs which had already broken off or been removed. Lying on its side with the mouth facing south, the bowl was cracked in several places and held together by the soil accumulated in it. The fragmentary vessels were of thick red plain ware and a thinner brown plain ware.

Little was found in the fill around the bones. The pit had been dug out of the limestone bedrock and the interment laid directly on the rock. In the dry, clumpy dirt above the bones, we collected a few plain sherds, a few shells,

FIGURE 12 BURIAL 1
Vigilante Alta, Unit 7, Level 2



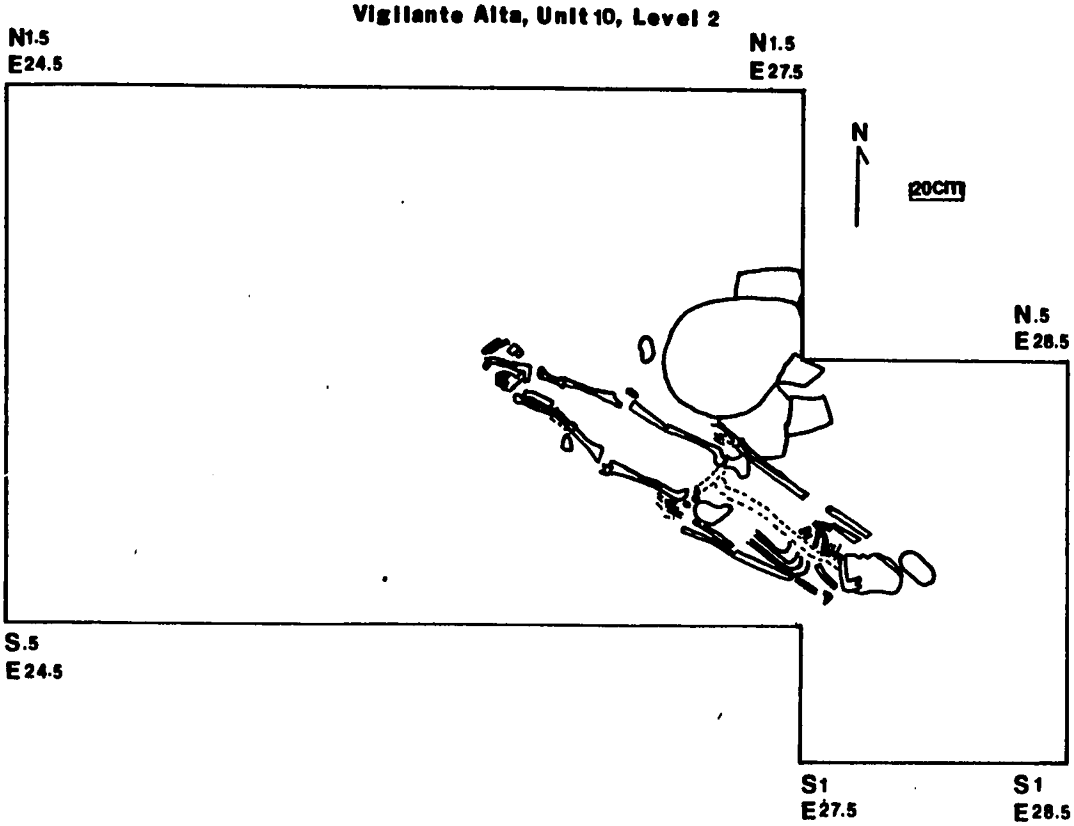
unidentified animal bones, volcanic rock fragments and four quartz flakes.

To judge only by the size of the long bones, the individual was of short stature, and probably a female. The presence of both third molars of the maxilla but not of the mandible suggests that the individual was a young adult, approximately 20-25 years of age. The teeth also reveal two characteristics which may have resulted from cultural practices, especially since similar pathologies were found in the dentition of other individuals interred at the site. Extreme wear on the labial surfaces of the incisors indicates they were used to hold or work something held in the mouth. Also, deep caries occurred between teeth, and may reflect oral hygiene practices that ignored the medial surfaces of the teeth. An anomaly detected only in this interment is the presence of an extra root on one of the molars (Vázquez 1981).

<u>Burial 2, Unit 10 (Fig. 13)</u>

Burial 2 was encountered 33 cm below the surface in the central, level portion of the site, 60 m northeast of Burial 1. A 2 x 3 m unit was begun and a 1.3 sq m extension added to the southeast corner. As in the previous burial, this was a primary, extended interment in which the individual was placed on his back in a pit created by removal of chunks of limestone bedrock fractured along natural bedding planes. The result was a shallow rectangular grave that was unmarked on the surface, oriented NW-SE. In this burial the cranium

FIGURE 13 BURIAL 2
Vigilante Alta, Unit 10, Level 2



pointed southeast, opposite that of the previous burial. The articulated remains of the individual were encountered at depths from 25 cm at the skull to 39 cm at the toes. The lower vertebral column was 47 cm below surface. This is the result of irregular limestone bedrock below the interment. Preservation was good and most bones, with the exception of the right scapula, were present and recognizable. The vertebrae were distinguished by the individual bones crushed in place, although none were recoverable.

Artifacts associated with the burial included a green stone axe which measured eight cm long and was horizontally oriented N-S. The butt end rested against the wall of the burial pit, while the bit end touched the left lower leg bones midway between knee and ankle. A small vessel of Murrillo Applique (Baudez 1967:165) had been placed above the skull on the left side. The vessel was 12 cm high, mottled dark brown and gray, globular in shape with a punctated applique fillet around the rim (Fig. 14). The presence of this vessel is one piece of evidence for dating the occupation of the site. Murrillo Applique ceramics are characteristic of the Late Polychrome period (ibid., 167).

The fill over the bones was rich in cultural material, especially in the 25 cm level closest to the surface. In this dry, clumpy dirt a large number of sherds and fragments of burned clay were collected. Other objects in this level included a spent, bipolar quartz core four and a half cm long, 22 quartz flakes, an obsidian flake fragment, and a

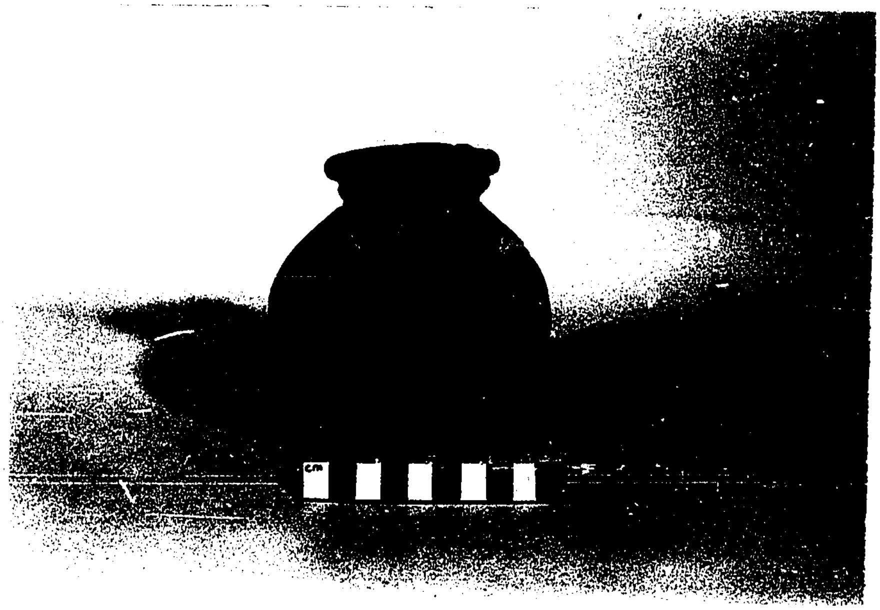


Figure 14. Murrillo Applique vessel from burial 2, unit 10.

small serpentine bead fragment. Between this upper level and the bones, some sherds and quartz flakes were recovered. Fragments of volcanic rock were also found in the fill. There was a concentration of sherds and charcoal around and between the knees. Nothing was found beneath the bones.

Age of the individual was estimated as 20-25 years by the fully erupted third molars of the mandible and the visible but unerupted third molars of the maxilla. Based on the form of the chin and knee, and the robust mastoid process the individual was probably male (Vázquez 1981). Osteological analysis also showed that this individual had osteoporosis. Dentition showed occlusal caries and hypercementosis of both third molars, which had come in sideways. Labial wear on the incisors, similar to the individual in Burial 1 indicated that teeth were used as a tool in a similar way by both.

Along with the burial, this test unit contained two circular features. Feature 1, a circular pit of dark soil 40 cm in diameter and 30 cm deep, was north of the burial. A fragment of volcanic rock was the only artifact recovered. Feature 2, a column of dark soil 20 cm in diameter located south of the burial pit, was much smaller than F. 1. This may have been a post hole. It was excavated to bedrock at 66 cm below surface and no artifacts were recovered from the fill.

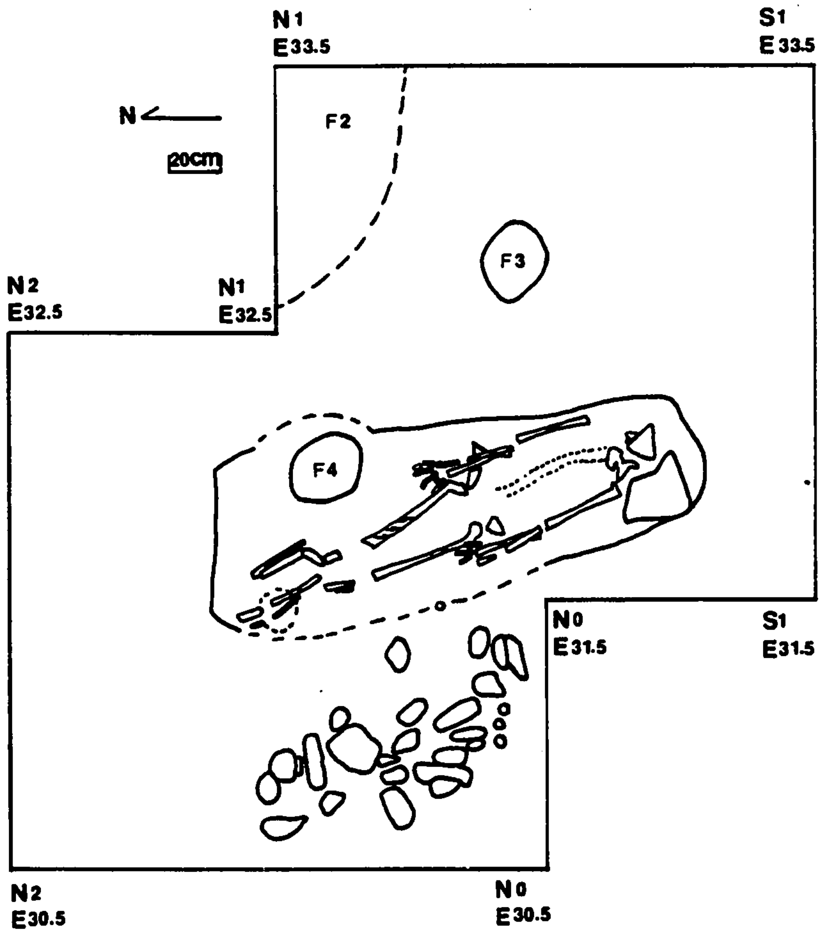
<u>Burial 3, Unit 11 (Fig. 15)</u>

Burial 3 was found five meters to the east of Unit 10, below a concentration of rocks. A 2 x 2 m excavation unit was expanded to examine the concentration. Complete exposure of this feature revealed a circular concentration of small rocks 110 cm in diameter at its widest. Recognizing that the pattern of rocks was not a living floor, excavation was continued in hopes that the pattern marked a grave. At 63 cm below surface a cranium was exposed in the unit. After completing the excavations we found that although much of the original feature lay to one side of the burial, it was superimposed over both lower legs.

The individual was in supine extended position in a rectangular pit just long enough to fit the interment, yet wide enough to encompass a circular feature 24 cm in diameter on the right side by the knees. Though the pit was 190 cm long, the skull touched one end and the toes rested on the other. The bones were oriented west of north, the cranium to the SSE. The skull was resting on a stone 63 cm below surface; the rest of the bones were at 70 cm below surface. Preservation of bone varied. The skull was fragmented, scapulae, vertebrae, and pelves were missing, but the other bones were present and in relatively good condition.

The only artifact associated with this burial was a stone axe seven and one half cm long. The axe was found lying horizontally, oriented E-W so that the heavily worked bit edge rested beneath the lower right arm bones.

FIGURE 15 BURIAL 3
Vigilante Alta, Unit 11, Level 3



This primary interment held the remains of a single individual, probably male. Absence of all third molars indicates the individual's age was 15-18 years, while incomplete fusion of the head of the femur suggests male sex. Osteoporosis was present in several bones, and possibly hypercementosis in the maxillary right second molar (Vázquez 1981).

The unit containing this burial, Unit 11, proved to be a complex collection of features. Besides the burial it contained a possible post hole and groups of disarticulated human bone fragments on either side of the burial. Sherds were recovered throughout the unit, the greatest number collected in the uppermost level, which also contained a fragment of volcanic rock and part of a flaked stone chisel. Fill from the other levels included ten small quartz flakes, fragments of burned clay, flecks of carbon, unassociated bone fragments, four human teeth, and a few shells.

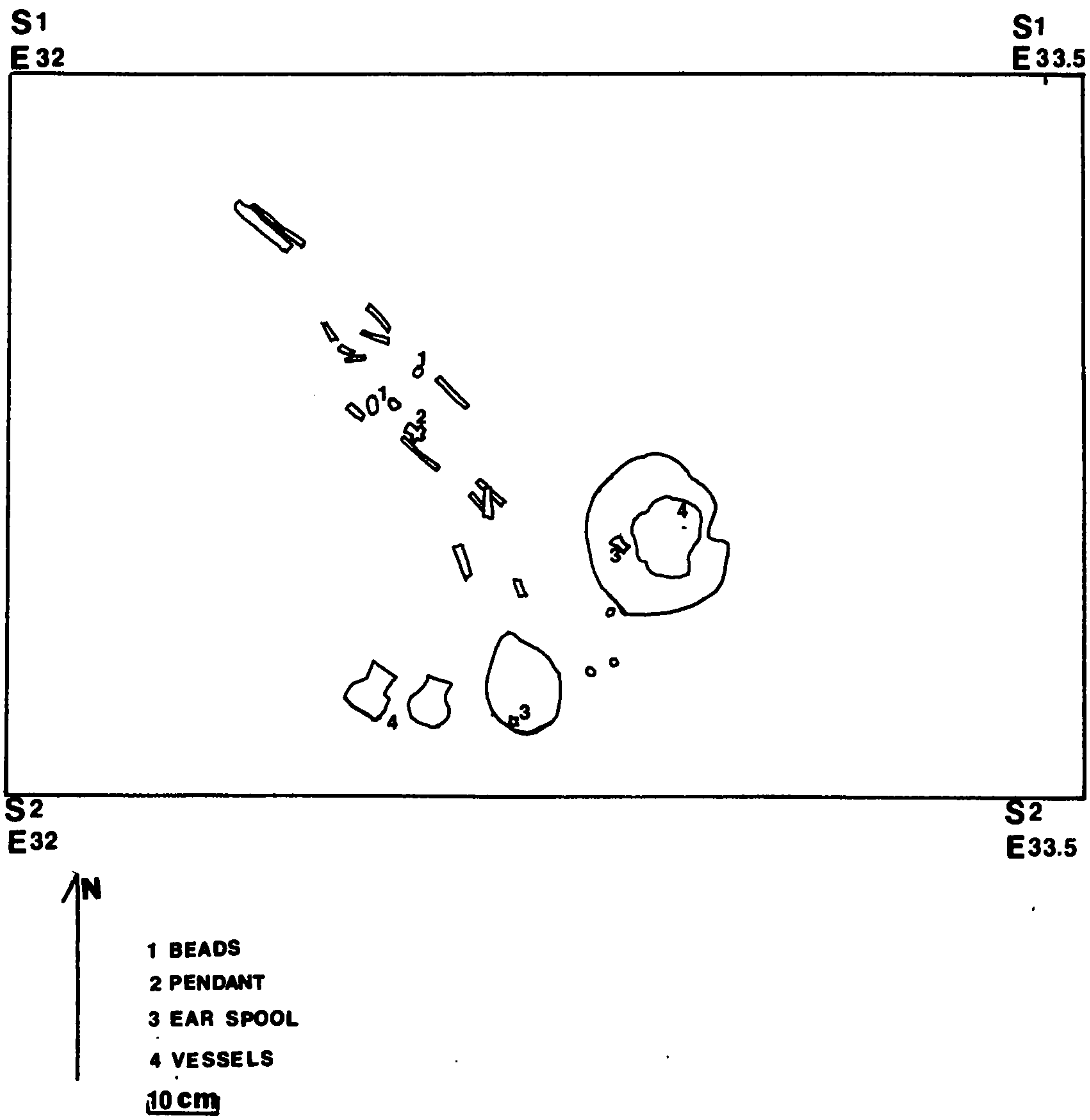
Burial 4, Unit 12 (Fig. 16)

This burial was located while inspecting pot hunter damage to Unit 11. In the south wall of Unit 11 fragments of an annular base and human bone were visible, and a 2 x 3 m unit sharing its north wall with Unit 11 was begun. Near the west wall, 63 cm below surface, the cranium of a burial was exposed. Like the other interments, a rectangular pit had been scraped out of the bedrock. The base of this pit was 73 cm below surface, and formed a level bed for the bones.

Figure 16

Burial 4, Unit 12

Vigilante Alta



The grave contained the remains of a three year old of undetermined sex. Age was established from dentition and vertebral development (Vázquez 1981). The bones were oriented SE-NW with the cranium to the SE. This was a secondary interment, a reburial in which only the larger bones were placed in the grave, and an effort was made to lay them in an extended positon. A femur, vertebrae, fragments of rib, radius, ulna, and cranium were recovered, though all the bone was poorly preserved and difficult to identify. Burial 4 was distinguished from the others excavated by the variety and quantity of grave goods. Five ceramic vessels were recovered. Only one of these was unbroken, the others being fragmented or completely crushed. One was a partial vessel. A pair of miniature vessels six centimeters high were placed close to the skull. Both are brown, globular, restricted mouth jars with vertical rims. They are similar though not identical in form. On the opposite side of the skull a third vessel was crushed along the wall of the burial pit. The orange-brown paste was so soft that fragments could not be washed without disintegrating. The fourth vessel placed near the skull was part of a brown plain ware jar with an everted rim. The fifth vessel, placed at the foot of the pit, and damaged by pot hunters before our excavation of the unit was part of an annular base white slipped jar. Residue of paint on the surface indicates the vessel was originally painted in red and black over the white slip.

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Spread out around the mid-section of the individual were several artifacts which may have formed a necklace. These included teeth, shell beads, and a gold pendant (Fig. 17). Three of the teeth were human molars perforated through the roots. The fourth tooth was a human incisor, also drilled through the root. Eight tubular shell beads found in the same part of the burial ranged from .4 to 2.2 cm long and were white to lavender in color. Their surfaces were badly eroded, making identification of the shellfish species from which they were made impossible.

The gold pendant, 1.8 by 2 cm, has the shape of a bird and was made of a shaped sheet of the copper-gold alloy *tumbaga*, with a soldered-on cast head and a loop for suspension added at the back. The loop is quite worn at the place where a cord would have run through it while the piece was suspended, suggesting the pendant had been worn a great deal. The small size and thin construction are characteristic of gold artifacts from Greater Nicoya (Lange and Accola 1979:32). The bird, or "eagle" form has been recovered from all over Costa Rica, from the Central Highlands at the Barrial de Heredia site (Snarskis, personal communication), in the Atlantic watershed (Bray 1981:156), and in the Diquís Valley (Bray 1981:160, Lothrop 1963:97-98). The exact origin of the pendant is unknown. Gold is still mined near the gulf shores, around Las Juntas de Abangares, and small quantities of gold can be panned from rivers in the main volcanic range. There is some evidence for manufacture of gold

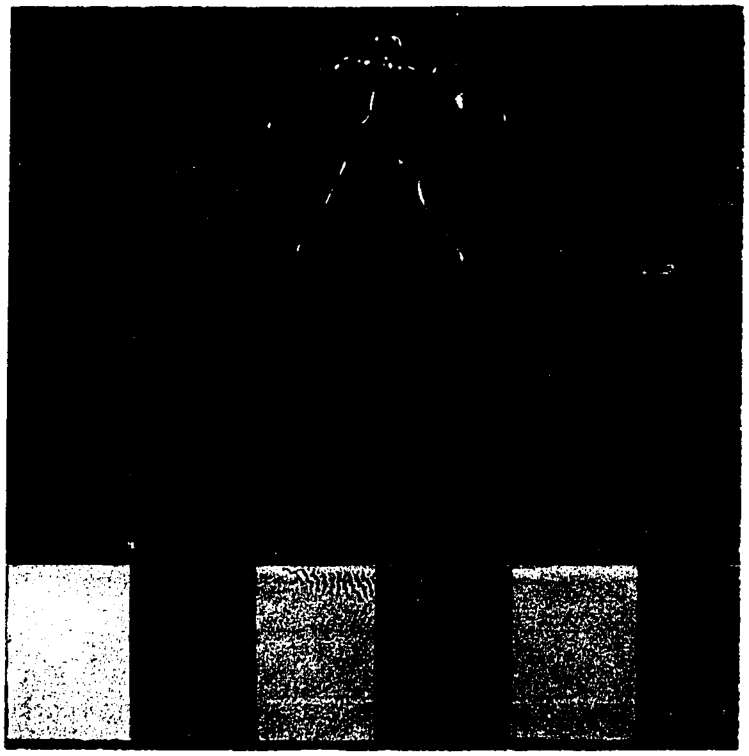


Figure 17. Gold pendant, burial 4, Vigilante
Alta.

in Greater Nicoya. For example, a fragment of a lost wax mold used to make a frog-shaped pendant was collected from the surface of the Ruíz site near the Bay of Culebra (Lange 1980:89) and a gold frog pendant was found on the surface at Guacamaya (Lange and Accola 1979). There are no ethnohistoric descriptions of goldworking in Greater Nicoya, although this craft was described as widespread in the Atlantic watershed (Ceballos in Peralta 1883:700) and presumably in south Costa Rica (Lothrop 1926:40, 1963:93 ff.).

Other artifacts recovered from the burial include two earspools of shell. These are each one centimeter in diameter and notched around the rim on one side. One was found by the vessels near the cranium, the other was beneath the skull. A heavily worn axe seven centimeters long of dark blue stone was found lying horizontally with the bit end toward the SW, 38 cm below the surface. Though the axe was 20 cm above the bones, it was over the burial pit, on the right side of the lower limbs.

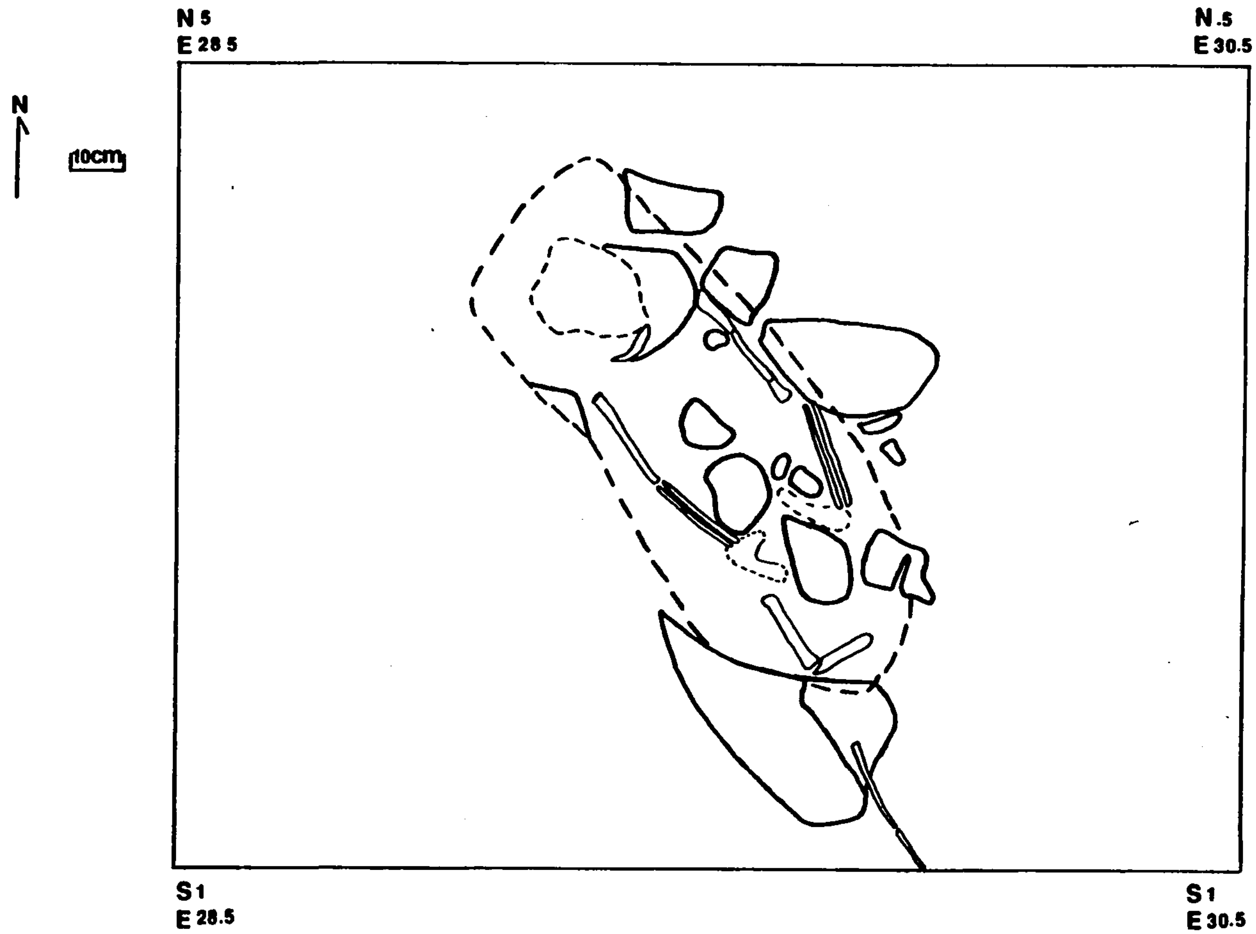
The fill in Unit 12 contained many sherds, and their size increased with depth. Fragments of burned clay and 21 quartz flakes were collected, along with an obsidian flake, some rock fragments, flecks of carbon and bone fragments. The bone includes a few fish vertebrae, a deer tooth and a tooth from another mammal. Two patches of dark soil were visible in the base of the pit. One of these was excavated and did not yield any artifacts. The smaller feature was not excavated.

Burials 5, 6, and 7, Unit 13 (Figs. 18 and 19)

The remains of three individuals were recovered from Unit 13, a 2 x 3 m unit placed between Units 10 and 11. Burial 5, Feature 1, was located in the south half of the unit. The bones were oriented NW-SE, with the cranium to the NW. The grave was formed by removal of chunks of limestone bedrock to form a pit with a regular floor. The pit measured 45 x 110 cm yet it was not long enough to hold the extended individual. It appears that the right leg bones were angled vertically and laid over rocks at a higher level. No left leg bones were present. The trunk, cranium, and upper limbs were uncovered 46 cm below the surface, while the lower limb bones were 20 cm below surface. The right hand was on or under the pelvis, two metacarpals were found beneath it. Though the assumption was made that the individual was placed in the position in which it was recovered, in Costa Rica it is possible that an earth tremor produced the shift in position.

The only artifact recovered from the burial was a ground stone axe. It was 13 cm long, only slightly worn, and was oriented N-S with the bit toward the south. The remains in Burial 5 were an adult female. Sex identification was made by the shape of the chin, as the bones were articulated but poorly preserved. Identification as an adult was based on extreme wear on the three recovered teeth, all premolars. The femora and humeri showed signs of osteoporosis, as in

FIGURE 18 BURIAL 5
Vigilante Alta, Unit 13, Level 3

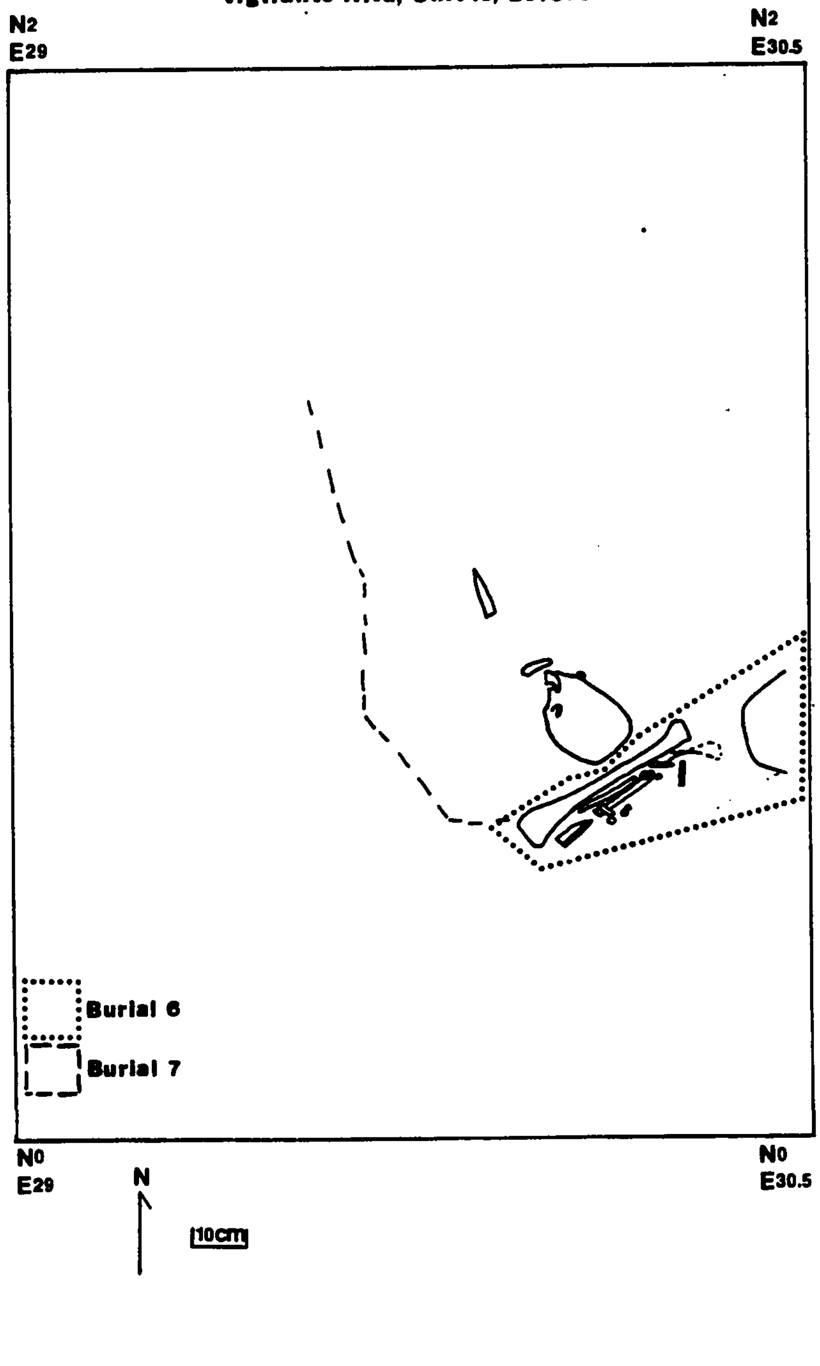


Burial 2 (Vázquez 1981).

Burial 6, Feature 2, was distinguished in the NE corner of the unit between 20 and 35 cm below surface. A pointed rock surrounded by small limestone fragments resembled the rock feature over Burial 3 that may have been a grave marker. Burial 6 had been disturbed, though it was still located under the south end of the concentration of rocks. The cranium was not fully exposed, as it extended into the east wall of the unit. The bones were disarticulated, including a femur, fibula, radius, ilium, three metatarsals, and cranial fragments. Most were arranged side by side. It appeared that this was once an articulated burial, later pushed aside for the interment of another individual, possibly Burial 7. Thirteen teeth were recovered; Four of these were third molars, indicating an adult. As in Burials 1 and 2, there was evidence of extreme frontal tooth wear on the incisors. Caries were present in both second left molars (Vázquez 1981). No artifacts were associated with this burial.

Burial 7 was north of Burial 6. The cranium was exposed at 55 cm below surface. Lack of time prevented completing excavation of this individual, though enough was exposed to determine its orientation and articulation. It was extended, articulated, oriented SE-NW with cranium toward the SE. The cranium was well preserved and was lying on the left side, facing west. The upper and lower jaws were closed, with all teeth exposed on the right side. Teeth

FIGURE 19 BURIALS 6 and 7
Vigilante Alta, Unit 13, Level 3



showed light to moderate wear and an unerupted third molar was visible in the right maxilla, indicating the individual was less than 25 years old at death (Vázquez 1981).

No artifacts were found with this burial. The dry, clayey soil over the burials contained many sherds, though few were found near the surface, and most were in the second level. Fragments of charcoal were collected and shells were occasionally found. Forty-one quartz flakes, fragments of burned clay, volcanic rock fragments, fish vertebrae, and a mammal bone were recovered from the fill. Two deciduous teeth, an incisor and a molar, representing a sub-adult, were found in the fill over Burial 6.

Summary

Excavations at the Vigilante Alta site yielded a variety of subsistence remains, burials, and few other features. The quantity of fish and shellfish remains suggests these were important resources, yet three of the seven individuals excavated bear marks of osteoporosis, caused by iron deficiency anemia. Anemia can result from a diet low in protein or in total calories. It can also be caused by diets high in carbohydrates, especially whole wheat or corn, which are low in iron and bind iron already in the system, and make it unavailable for absorption. In prehistoric populations in the New World osteoporosis has been frequently associated with high carbohydrate diets in zones of intensive agriculture. The gulf islands do not meet these criteria, as midden remains demonstrate that marine foods were an important component of the diet, and evidence for intensive agriculture is absent. However, osteoporosis may also result from dietary stress during weaning which was followed by rapid growth (Lallo et al.1977:480). Marks of osteoporosis in skeletons from Vigilante Alta were not distinguished as active or healed cases. Dietary stress during weaning, made chronic by cultural practices, and aggravated by parasitic or infectious disease, or further nutritional stress may account for the osteoporosis observed. Other causes, such as hereditary hemolytic anemia would be difficult to demonstrate (ibid., 473). skeletal sample from the Vidor site in the Bay of Culebra showed similar incidence of osteoporosis, and Vidor is located in an environment as rich or richer in marine resources than the Gulf of Nicoya. (Vázquez and Weaver 1980:101-102). An alternative to anemia caused by monoculture diet, whether related to other nutritional factors or other diseases, must be considered.

Unusual wear on the labial surface of the incisors on three individuals suggests a special task involved use of the teeth. The wear observed could have come from the individual holding an object in the mouth and pulling the head to one side, or pulling with the hands. This could be related to processing plant foods, plant fiber for rope, skins, or wood.

Seven burials, and teeth representing another individual, were recovered:

TABLE 1

BURIALS AT THE VIGILANTE ALTA SITE

Number	Age	Sex	Osteo-porosis	Labial Tooth Wear	Grave Goods
1	20-25	F	-	x	3 vessels, 1 axe
2	20-25	M	x	x	1 vessel, 1 axe
3	15-18	M	x	-	1 axe
4	3	-	-	-	5 vessels, 1 axe beads, pendants
5	adult	F	x	-	1 axe
6	adult	-	-	x	none
6	adult	-	(teeth only)	-	none
7	20-25	-	-	-	none

The burials include equal numbers of males and females and a range of ages. There does not seem to be correlation between individuals by age, sex, pathology, or grave goods. Burial 4, the burial of a child, is distinctive in the quantity and variety of associated grave goods. It is difficult to tell from this single example whether the richness of the associated objects is due to ascribed status of the child, or from a more general veneration of infants. However, at other sites in Greater Nicoya bones of infants have been recovered from midden fill (Kerbis 1980:140, Robison 1979:16), which shows that some infant remains were discarded without ceremony. Although the interment may represent ascribed status of the infant, some special condition other than rank, such as position in the family (first-born son, eldest child), high regard for children, or parental grief, may be responsible for the relatively rich offerings in the grave.

Five of the six fully excavated burials from the site have ground stone axes associated with them, usually placed by the arm or leg bones, a grave item which not occur as regularly in other reported burials in Greater Nicoya. Regional similarities in a variety of aspects of interment can be seen, however. At La Guinea, Baudez excavated a burial of an adult female, in extended position, and associated goods included two vessels of Jicote Polychrome placed by the left shoulder (1967:34) similar to Burials 1 and 2 at Vigilante Alta. Excavations at La Guinea also recovered a burial of a young child associated with lavish grave goods, including ten vessels of both plain and polychrome types (Hoopes 1980:5). Like Burial 4 at Vigilante Alta, the infant burial contained the richest array of goods among all the burials recovered. At the mouth of the Tempisque, on Toro Island, Baudez excavated an adult buried in a shallow pit scooped out of bedrock. Associated goods included a single monochrome vessel to the left of the cranium, as in Burials 1 and 2 at Vigilante Alta, and three shell fishhooks (1967:50). It is intriguing to think of these as a possible replacement for the axes found in the Vigilante Alta burials. At the El Chaperno site in the Bay of Culebra the extended burial of an adult was placed in a shallow pit scooped out of bedrock and a single polychrome vessel placed by the right arm. The cranium of an infant was also present. Unlike the Vigilante Alta site, however, there was evidence that a structure had been erected over the tomb

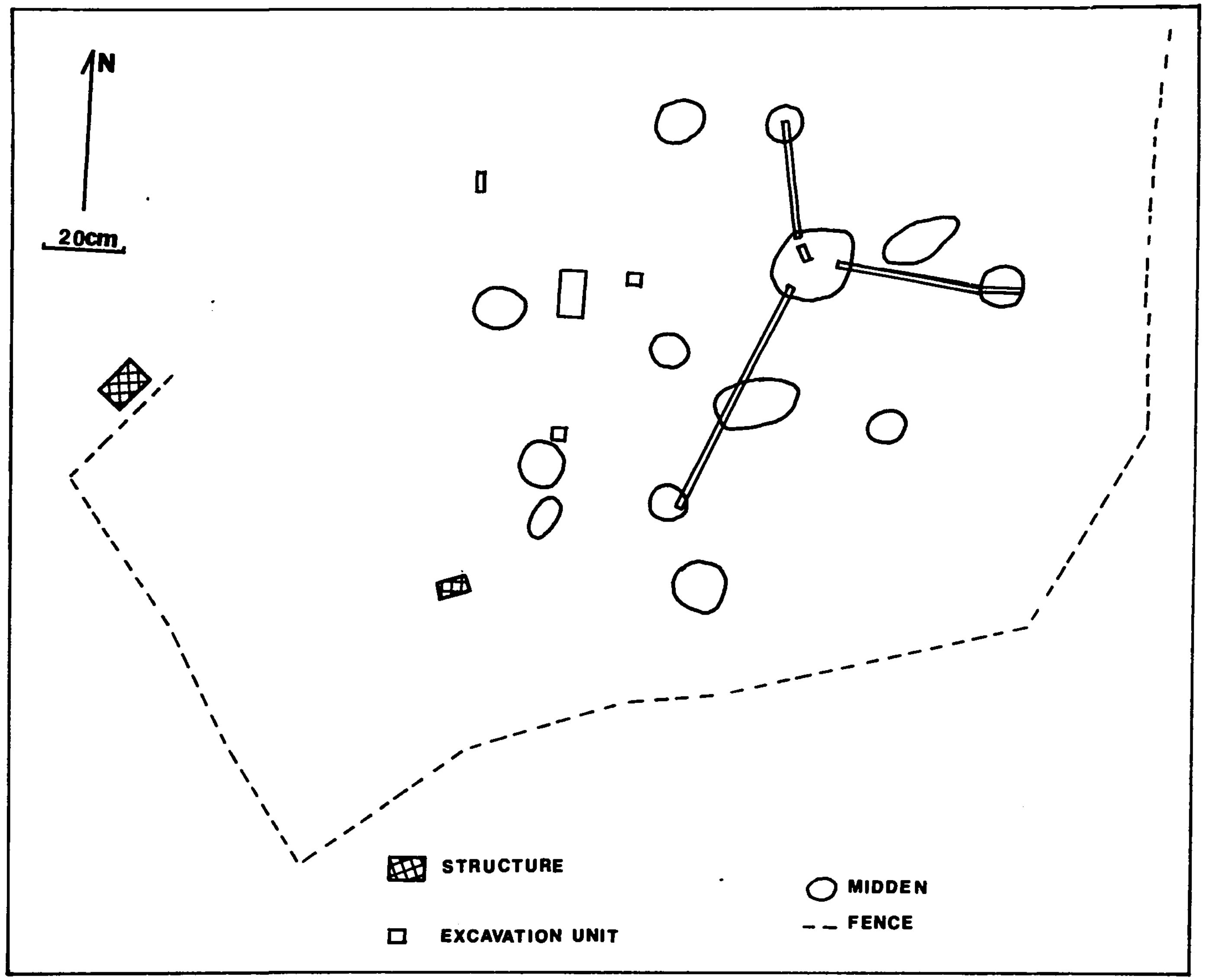
(Lawrence n.d.:10).

There appear to be some similarities in mortuary practices in Greater Nicoya during the Late Polychrome period, consisting of frequent, though not exclusive burial in extended position, shallow burial pits, grave furniture limited to one to three vessels except in the case of infants, and possibly positioning of grave goods by the head. The association of ground stone axes with interments appears to be a Gulf of Nicoya regional variant. It is perhaps attributable to the relatively greater scarcity of ground stone tools on the islands than on the mainland. Such scarcity might be expected to increase their value as a grave offering.

Excavations at the Herramientas site

The Herramientas site, 3146II-141-1, located on the northwest corner of Chira Island, was chosen for excavations for its similarity to the sites tested on San Lucas Island. The site is a single-component Late Polychrome period occupation, situated near the shore, consisting of mounds of shell and other cultural remains spread over an area of 2.5 hectares (Fig. 20). The site is on a rise overlooking a salt flat, where salt-making operations flourish during the dry season. This same location may also have been used to produce salt in prehistoric times. The Herramientas site is used for cattle pasture at present, though residents report that as recently as 1950 the island was completely forested. Fresh water sources are scarce, and wells are used by all

FIGURE Herramientas, 31 6–II– 41– , Chira Island



modern residents of the island. However, wells are not usually over ten meters deep, and it is not unlikely they were dug in prehistoric times. In the center of the site is a well surrounded by remains of shell mounds. Until 1970 a family lived here to be close to the water source. They moved a short distance away after heavy winter rains repeatedly washed burials out of the field around their house, and they believed it was unhealthy to live on a native "graveyard". However, all their water is still hauled from this well to their new home.

Herramientas is close to the Nicoya Peninsula and the trip by boat is not long. Canoes made of single tree trunks are still used to cross from Chira to the Nicoya mainland, a trip that takes about an hour. The coast along the west shore of the island near the site alternates between rocky outcrops and mangrove. There is easy access to fishing spots along the shore and to deeper water by canoe. The western part of the island also has several veins of clay, from which ceramics are still made.

Survey and testing in the immediate surroundings of the site showed that it was a discrete unit, though there are other sites from the same period not far away. A controlled surface collection over a portion of the site aimed at finding different activity areas did show the location of many of the shell mounds that constitute the site, but it did not show variation in activities among mounds or sectors of the site. The most visible remains were lithic artifacts which seemed to cover the surface. This may be due to the effects of erosion, which has gradually washed away lighter materials, leaving the stone (especially mano and metate fragments) exposed on the surface.

A series of 50 x 50 cm tests spaced ten meters apart along a grid set over the site helped define shell mounds and the limits of the site, but did not locate specific features. Test units 3 x 3 m were placed on the edge of two shell middens extending onto the adjacent level ground which may have been living area. One of these test units was expanded from 3 x 3 m to 6 x 12 m (Units 4-11) to study the relationship between the midden and clear areas. In one 3 x 3 m section (Unit 4) a cache of three ceramic vessels and a ground stone axe were uncovered 25 cm below the surface. One vessel was plain brown ware with attachments for handles, the second was a collared jar of Murrillo Applique and the whole vessel was a thick undecorated jar with a high ridged neck (Fig. 21). The cache was assumed to be associated with a burial, yet no burials were located in the vicinity. In the adjacent 3 x 3 m section (Unit 5), however, two unmarked, shallow burials were encountered.

Feature 1, the southernmost of the burials, was three centimeters below the surface. This was a primary burial, in supine extended position, oriented WSW-ESE with the cranium toward the east. No burial pit outline was visible and bone preservation was poor. The long bones were identifiable, though they were recovered as fragments. The

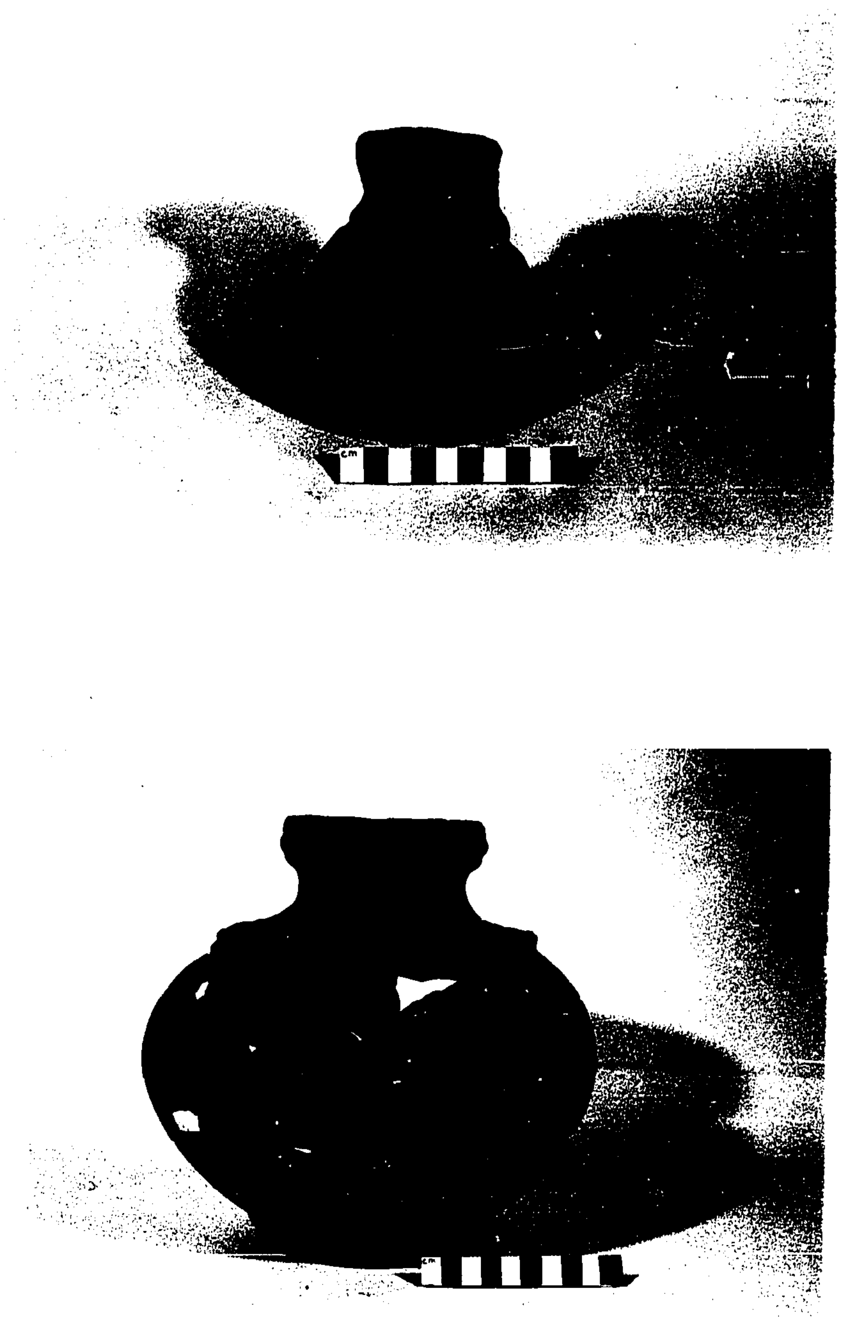


Figure 21. Vessels from cache, unit 4, Herramientas.

teeth were the only available indicators of age and sex. Two vessels were associated with this interment, one east of the cranium was a globular, restricted mouth vessel, with neck and rim missing. The vessel has a small applique motif on one side. The other vessel, placed in the center of the burial over the long bones was a restricted mouth, collared rim jar, or pitcher, with zoomorphic applique strap handle (Fig. 22). The applique on both vessels is typical of Murrillo Applique recovered from both Vigilante Alta and Herramientas (see Appendix 2 for type descriptions). A ground stone axe was recovered from between the long bones and the cranium and a small serpentine bead was found at the west end of the burial near foot bones (Fig. 23). Also at the west end of the bones was a quartz core, a second ground stone axe, and a fragment of limestone. A quartz chip and a scraper were recovered nearby. Based on tooth abrasion and the robust bones, this individual was probably an adult. Tooth surfaces, especially the incisors, are heavily abraded and the dentine was visible in most teeth, suggesting once more the use of teeth as tools (Vázquez 1981).

The adjacent burial, Feature 2, parallels Feature 1. It was oriented similarly with the cranium to the east and also in supine extended positon. No burial pit was visible. Preservation was poor and few bones could be removed. Long bones and some other fragments were mapped in situ. The cranium was fragmentary and only small bits and some teeth were recovered. Associated with the burial were five small

Figure 22. Murrillo Applique vessel from F. 1 burial, unit 5, Herramientas.

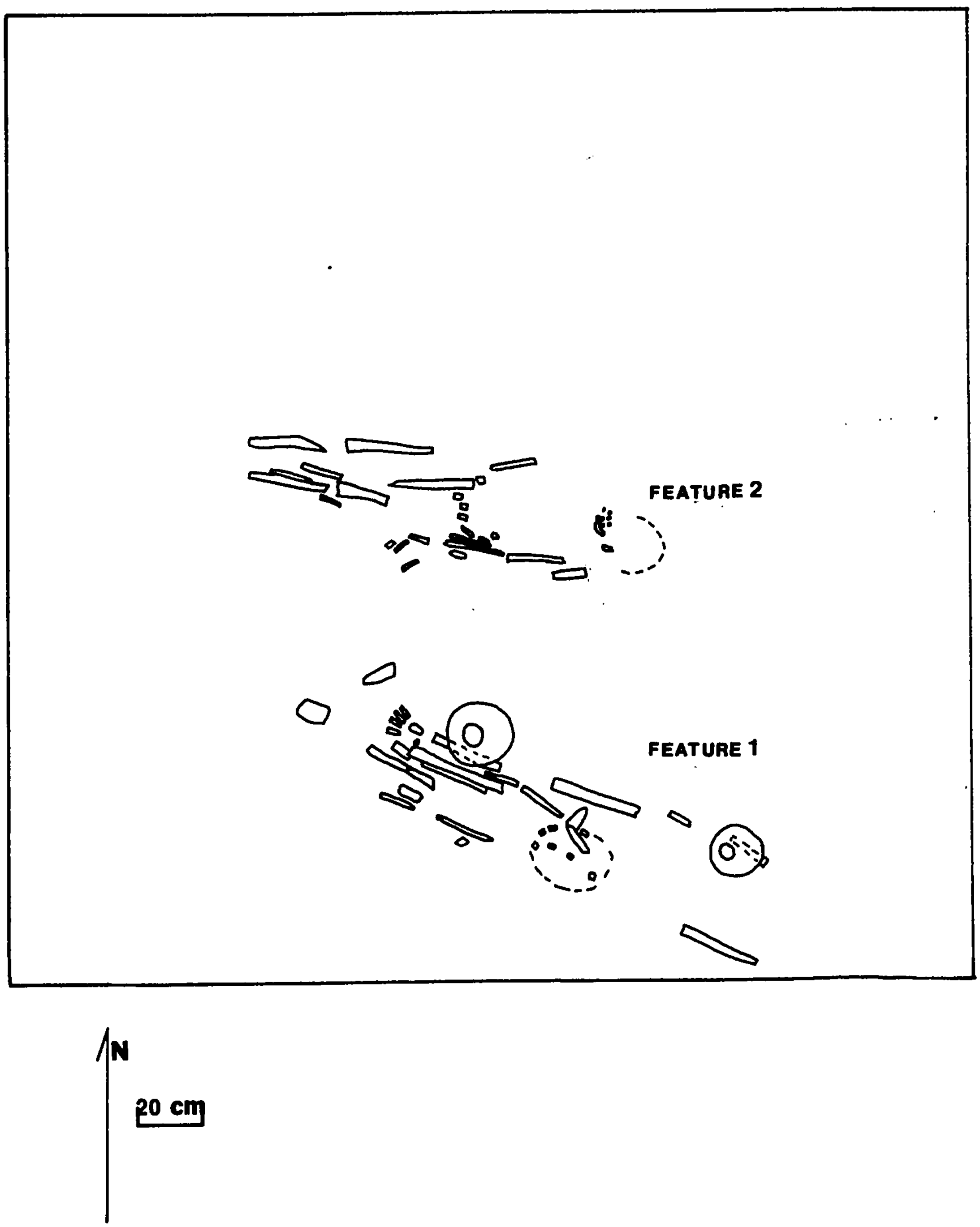
serpentine beads clustered in the center of the interment. This individual was an adult, and the robust bones suggest a male. Greater dental abrasion was visible in this individual than in the one from Feature 1, and the wear again suggested use of the teeth as a tool. Osteoporosis was visible in cranial bones (Vázquez 1981).

Similarity in orientation, depth and position of both burials suggests they may have been contemporaneous interments, and perhaps represent related individuals. Grave goods are concentrated in Feature 1, and include two vessels, two ground stone axes, a quartz core, and possibly a quartz flake and scraper. The tools suggest tool making or craft work, perhaps wood or shell-working. Feature 2 contained a cluster of five serpentine beads which may have been a bracelet. Because serpentine is a non-local material, the beads may have been a status marker for this individual. Conditions for joint burial of related individuals might include death by disease, attack, or accident, or death of one and suicide or sacrifice of the other. Alternatively, the individuals may be unrelated, or represent serial interments of members of a single group. This is perhaps the most likely possibility.

The remainder of the 6 x 12 m excavation unit containing the burials revealed the edge of the shell midden, and two modern features. No other features associated with the Late Polychrome period occupation of the site were uncovered.

Northwest of the large unit a 2 x 2 m test (Unit 3) was

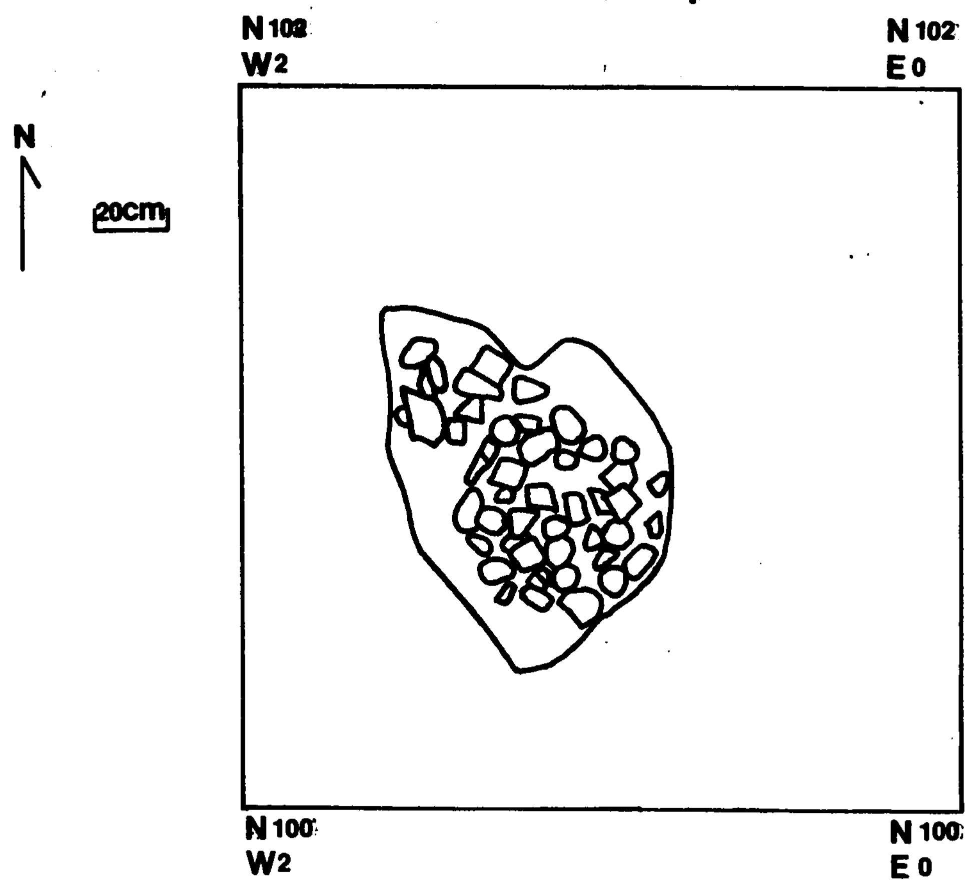
FIGURE 21 Herramientas, Unit 3, Level 2



begun at the edge of a shell mound, to investigate the boundary between shell mounds and cleared areas. Twenty centimeters below the surface a dark patch of burned soil and midden remains was uncovered. This feature was a pit 80 cm in diameter and 33 cm deep, excavated into the soft limestone bedrock. The pit was filled with shell, bone, sherds and dark soil. The base of the pit was lined with stones seven to ten centimeters in diameter, including a mano fragment (Fig. 24). Midden fill appeared to have been added later. The feature may have been a cooking site, oven, or smudge pit. Though some of the rocks from the floor of the feature appeared to be fire cracked, this may not have been from prehistoric burning, as a large burned tree stump was standing in the center of this feature. Its burning, possibly during field clearing, may have caused fire cracking in the surrounding rock. Excavation in adjacent areas (Units 3A and 3B) did not reveal any other features. The soil in this part of the site is only 20-30 cm above bedrock.

To obtain another sample of midden, a low shell mound at a distance from our initial units and near the eastern margin of the site was tested. A 1 x 10 m trench (Units 12 and 13) cut the mound, and bone and shell samples along with lithics and ceramics were recovered. Large sherds of both decorated and undecorated vessels and slabs of limestone were concentrated in the lowest levels of the mound on the downhill side (Unit 12, levels 8 and 9). No features were located. This mound appeared to have been used exclusively

FIGURE 24
Herramientas, Unit3 , Level 3
Stone lined pit



for refuse disposal, and like the mound adjacent to the 6 x 12 m unit, and Unit 8 at Vigilante Alta, the refuse was initially deposited on sloping ground.

To look for functional differences among middens a small excavation unit (Unit 14) 1 X 3 m, was placed in the largest midden deposit on the site. Fill from this unit consisted of soil and shell, most of which was crushed fine. After 40 cm of midden was removed a small limestone slab similar to the one recovered from Unit 12 was found. A whole vessel of Tempisque Incised (Baudez 1967:170) was found inverted in midden fill. Large fragments of two vessels, one of thick plain ware and one of Tempisque Incised were found in the wall of the unit 55 cm below the surface. A whole inverted vessel of thick undecorated ware was found in the center of the pit at the same level. A similar inverted bowl was uncovered in the subsequent level. The remaining two levels of this unit did not yield special features. Eight 10 cm levels were removed. A shallow depression was uncovered at the base of the unit. The contents are similar to the rest of the midden in the unit, though a concentration of deer bone was the distinctive component of the feature.

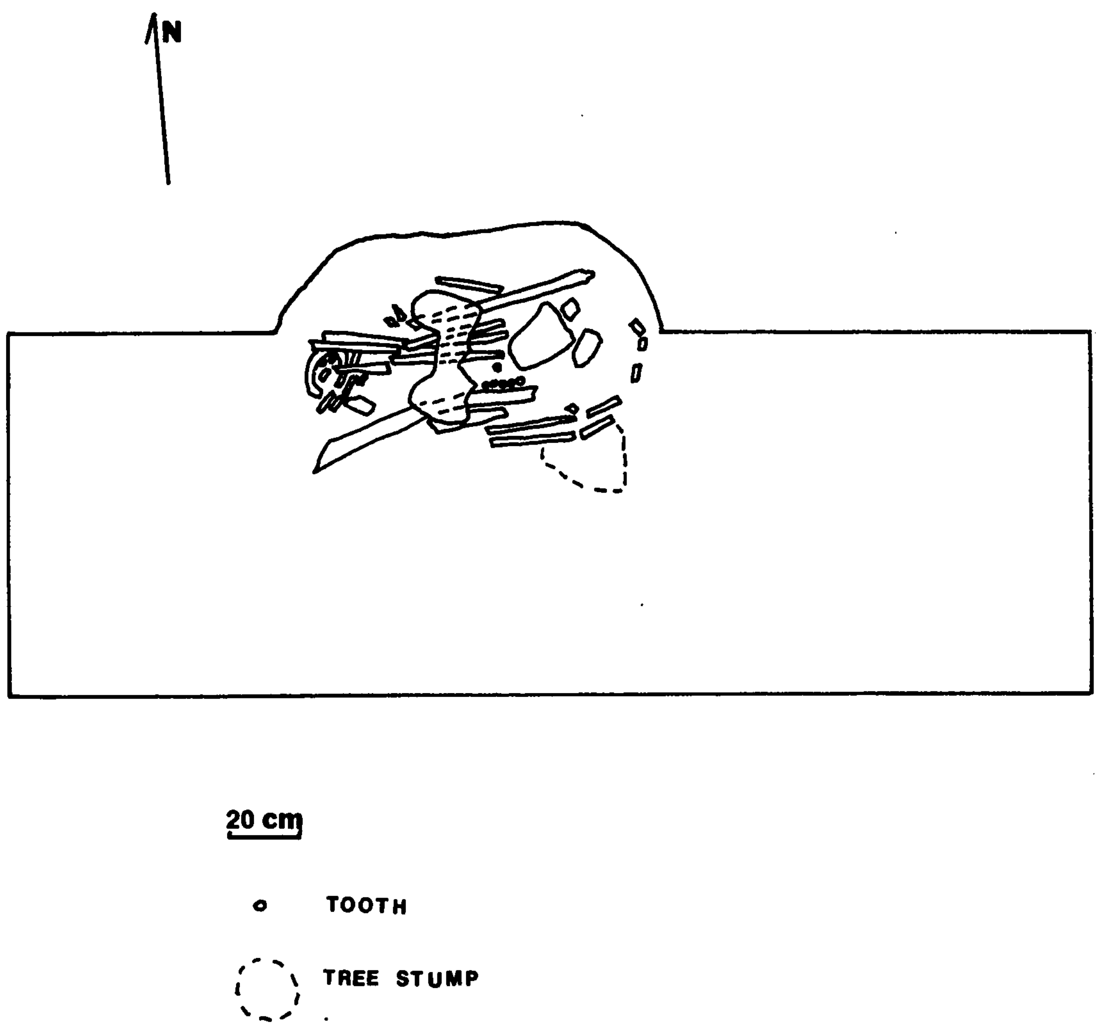
Between the midden areas a series of trenches was excavated. The occupation level of the entire site is shallow and test units could be excavated in a single natural level from surface to subsoil, usually less than 30 cm. Some of the units, however, were divided into two levels for greater control. Features were recognized at the subsoil/topsoil interface. These excavations were intended to examine the use of inter-mound clearings, and to look for patterns of features, features adjacent to the midden, features concentrated in inter-mound zones, or unusual features.

Three sets of 1 x 5 m trenches were excavated The first line extended from the edge of the largest midden for 30 m to the northwest, divided into five units, A-F. The south end of Trench A exposed part of the large midden, the only feature in this trench. A concentration of burned clay was uncovered in the south end of Trench B. The burned clay lacked a regular form, occurring in patches over a 1 x 1 m area. Below the adobe the soil was dark, flecked with charcoal and burned clay, and containing some sherds. In Trench C, a concentration of shells and sherds appeared to be a possible feature that was disturbed by tree roots. Another feature (F.5) was a shallow depression 80 cm in diameter. It contained stone and fragments of animal bone, along with shells and fragments of a colander. This feature may have been associated with food preparation, such as a waste water drain, or an area of unintentional trash deposit. Its shallowness implies brief or intermittent use, as does the light buildup of remains in it. Of the remaining trenches in this series, Trench D contained no features, while trenches E and F were not excavated because they were entirely shell midden, thus outside the objectives of the operation.

The second series of trenches, G-M, extended for 35 m between the largest mound and Unit 12. Trench G revealed that the large mound was built up on a natural rise in the terrain. The edge of the trench sloped uphill, yet shell fill was visible only in the edge closest to the midden. A shallow pit located in Trench G was filled with sherds and shells. The soil in adjacent Trench H was hard and dark, and contained no features. A small partial bowl, eight centimeters in diameter, was recovered from the topsoil-subsoil interface. It was not associated with a feature. The level of cultural material in Trench I was unusually shallow, extending to a depth of only 18 cm. At the base of this trench, a pit similar to that in Trench G was uncovered, containing a concentration of sherds and a few shells. This feature was basin-shaped and shallow, reaching 27 cm below ground level. The fill was dark and sandy soil, loose compared to surrounding material. The next two trenches in line, J, and K, were not excavated. They crossed a well-used path, and the occupation levels had been eroded away.

Trench I, the next in line, contained a patch of burned clay toward the center; the soil was shallow, with subsoil exposed 15 cm below the surface. Near the patch of clay we uncovered another burial (Fig. 25). Unlike the others, this was a flexed individual. The pit was unmarked and shallow, 40 x 50 cm and 29 cm below the surface. The burial was oriented E-W, with the head to the east. A quartz core and a small spherical stone were associated with the interment. Preservation was surprising in such a superficial burial. The mandible was separated from the cranium. The positions

FIGURE 25 Herramietas, Trench L, Feature 3



of the other bones suggested that the individual was interred flexed on his back. Separation of the mandible may indicate this was a bundle burial, though no trace of cloth was detected.

The individual was an adult with all third molars erupted. The robust mastoid process and long bones suggested a male and the degree of tooth wear indicated the individual was of about the same age as the one in F.1, Unit 5.

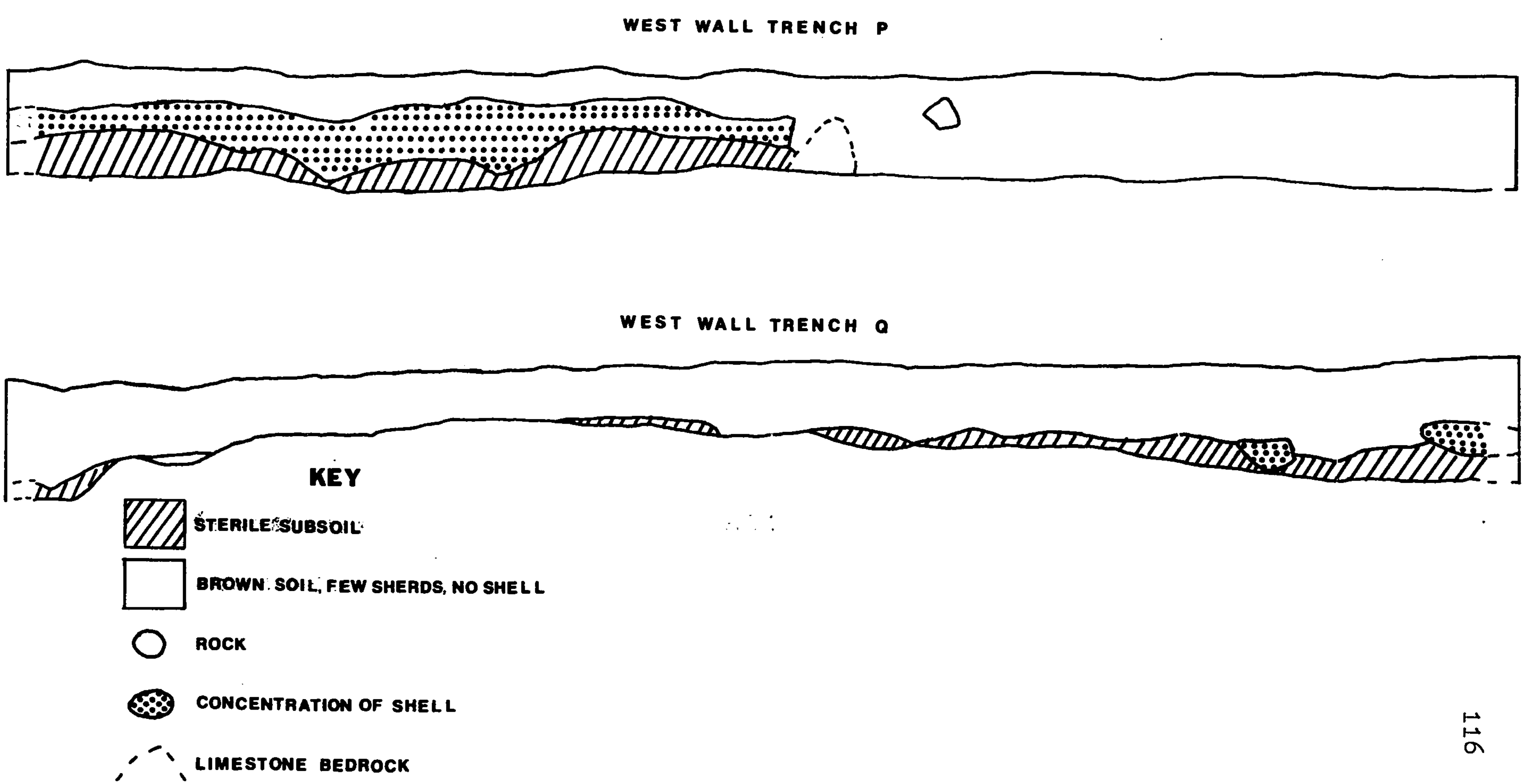
A different pattern of tooth wear from the other burials was visible in this individual. The lower teeth, especially the molars, were more heavily worn than the other teeth. The teeth of the maxilla on the right side had tiny fractures and flakes removed from the enamel all along the same part of the crown. The flakes were all at a consistent angle as though the fractures were produced by a repeated motion. Again this pointed to use of the teeth as tools, and in this case a specific action downward and away from the buccal surface of the teeth (Vázquez 1981). Trench M, the remaining trench in this series, contained no features.

The third line of trenches, N-Z, extended from the edge of the large midden 60 m to the southwest. Trench N included the edge of the midden at the north end of the trench; no other features were found, and subsoil was reached at 15 to 25 cm below surface. Trench O included two features. One of these, F. 9, was a pit filled with dark soil, sherds, and two metate fragments, one reworked as a pestle or nutting stone. No shell was found in this feature, roughly 60 cm in diameter and 46 cm deep. The other feature in this trench, F. 16, was also a possible trash pit, though shallow. The soil was flecked with charcoal, and only a few sherds were recovered.

In the north end of Trench P a concentration of burned clay (F. 17) was uncovered ten centimeters below the surface. The concentration was thick in places, and lacked defined form. Flecks of charcoal were collected for C-14 dating and some sherds were recovered from the fill around the feature. (Dates from this sample are still pending.) A second feature in this end of the unit, F. 18, was 80 cm in diameter, 100 cm deep and filled with fine dark soil. This was unlike any of the others excavated as it was much deeper and nearly without sherds. One narrow lens of shells occurred within the pit 80 cm below the surface. The feature may have served as a drain since seepage of water through the soil over time would produce buildup of organic matter and result in a dark soil.

Another possible feature, F. 22, a concentration of shells, sherds, and a mano fragment, was located near F. 18. F. 22 appeared to be at the edge of a midden zone. The section drawings of Trench P and adjacent Trench Q show a lens of midden close to the surface (Fig. 26). Below this lens are the features discussed above. This pattern of features associated with the edge of a midden, is unlike the other midden/clearing zones examined, where features were not

FIGURE TRENCH P and TRENCH Q, Herramientas Site



found near the margin of midden heaps. Trench P may show abandonment of one sector of the site. Features not in use at other sites, such as Nacascolo, were converted to trash piles; small clay cooking ovens have been located beneath middens (Vázquez, personal communication).

Four features were located in Trench Q. In the north half of this trench were two features. Fifteen to twenty centimeters below the surface a concentration of burned clay was uncovered, F. 15. Like the other concentrations we excavated, this feature did not have a visible outline. Excavated into the subsoil below and north of this patch of burned clay we encountered a cache of vessels, F. 14 (Fig. 27). As in other excavation units we presumed these were associated with a burial. Like the cache in the 6 x 12, however, no burial was located. Two vessels were buried 26 cm below the surface. One was an oval, restricted mouth jar with high neck and frog applique on either side. The exterior was slipped brown. The other vessel was a jar with vertical rim and applique strap handle. No pit outline was visible around the cache.

A shallow feature, F. 21, was excavated in the center of Trench Q and a similar feature in the south end of other trench, F. 13. Both contained brown soil, charcoal flecked and mixed with burned clay fragments, sherds and a few shells.

In Trench R a possible posthole, F. 20, was uncovered. This circular feature, 35 cm in diameter, extended 56 cm

Figure 27. Cache of vessels, trench Q, Herramientas.

below the surface. From the topsoil/subsoil interface the feature was filled with shells, sherds and burned clay in dark soil flecked with charcoal.

Only the north half of Trench S was excavated. The south half was a shell mound, as was all of Trench T and Trench U. In Trench S the only possible feature was associated with modern debris.

The group of trenches from V to Z revealed modern features associated with the occupation of the site before 1970. A small concentration of burned clay, F. 7, was located in the north end of Trench V within the midden. No distinct form or associations could be established. The only feature in Trench X was the edge of a large midden. Trenches Y and Z were not excavated; they were composed entirely of midden.

Summary

The total area of the site is more than two hectares, though over 3.75 h were tested in order to determine the full site size. The testing ultimately included 203 sq m of contiguous excavation. Testing was divided between sampling midden, 31 sq m, and testing possible activity in intermound cleared areas, 172 sq m. Though no unmistakable house foundations, fireplaces, ovens or distinctly identifiable features were found, indications of habitation were represented by some of the features uncovered. The uniformity of midden suggests these were used exclusively for garbage disposal. At other sites in Greater Nicoya, midden has been associated with burials (Baudez 1967:50, Hoopes 1980, Lawrence n.d.), hearths, and kilns (Abel-Vidor 1978, Bonilla and Calvo, personal communication, Vázquez, personal communication). At multicomponent sites, abandoned features were sometimes covered by midden, which could have multiple uses as well. Besides trash disposal, middens were used for interments in some instances. Herramientas appeared not to have been in use long enough for multiple use of midden to begin. However, in features 18 and 22 midden may have begun to accumulate over abandoned pits.

There were some similarities in mortuary remains between Herramientas and Vigilante Alta. Burials were shallow and distinct burial pits were not observed, two individuals were in extended position similar grave goods were recovered at both sites, including ceramics, ground stone axes, and ornaments.

The flexed burial from Herramientas contrasted with the others recovered both by its position and the absence of grave goods. However, a wide variety of burial types have been recorded for Greater Nicoya, including flexed and supine, primary and secondary, individual and group. These have been found in tombs, pits, unmarked, in midden, and in vessels (Baudez 1967:34, Lawrence n.d., Vázquez and Weaver 1980, Wallace and Accola 1980). The island sites yielded only extended and flexed individual burials. The teeth of the flexed individual were worn in an unusual pattern, and evidently the teeth were used regularly in a task like snapping a twig in half. The series of fractures on the crowns of the right hand side lower teeth could be made by consistently breaking small objects with a downward motion, by a right-handed individual.

CHAPTER 5

SETTLEMENT OF ISLAND SITES

Seasonality of occupation

The Vigilante Alta and Herramientas sites were occupied only during the Late Polychrome period. Whether these were permanent villages or seasonal camps may be evaluated by use of evidence from remains of structures, the variety of artifacts recovered, and seasonal indicators in faunal remains.

Deposits at both sites are shallow, and rarely more than 50 cm of soil and cultural debris overlie sterile bedrock. Little evidence of structures was recovered from either site. At Herramientas, patches of burned clay and an occasional posthole were all that remained of probable structures. The pattern of midden heaps across the site would suggest possible house locations, though there are no structural elements to support this possibility. Evidence for structures at Vigilante Alta is equally limited. Only scattered fragments of burned clay and a few possible postholes were recovered. These sparse remains suggested that structures were lightweight and made of perishable materials, such as the thatch, mentioned by Oviedo (1976:185).

While direct evidence of architecture at the two sites was minimal, excavations at other sites in Greater Nicoya have revealed architectural features, though these have rarely left behind substantial material remains. At La Guinea, a Middle Polychrome period site in the Tempisque Valley, clear remains of a wattle-and-daub house were recovered, including postholes and a clay and sand floor. A portion of a second feature, also part of a structure, consisted of "ten or more squared adobe blocks arranged in a curving line, possibly the arc of a circle of blocks approximately 12 m in diameter" (Hoopes 1980:6). Foundations, apparently of structures, made of circles of stone blocks have also been found at Papagayo, a Late Polychrome period site (Baudez 1959) and in Early Polychrome period (A.D. 500-800) levels at Nacascolo (Vázquez, personal communication); both sites are located near the Bay of Culebra (Fig. 1). Houses on the gulf islands may have been similar in form and in some construction elements. Observations of abandoned modern house sites on Chira Island, including one formerly located on the Herramientas site, show the impermanence of what were intended as permanent constructions. Nine years after abandonment, only a few trash pits and postholes remained of the more than 30-year occupation of Herramientas in the twentieth century. A house abandoned nearby during the dry season of 1981 consisted of foundation stones, posts of the main supports, and a two-level earth floor. The raised hearth was marked by spilled ash, and the waste water disposal area was darkened. A few broken vessels, an iron axe head and glass bottles were all that remained after two months. The rapid disappearance of structures after abandonment has been noted elsewhere in Costa Rica (Lange and Rydberg 1972) and further afield (Heider 1971).

The soil at the sites was heavy in clay, and could easily be oxidized and hardened by annual field burnings. Consequently, it was expected that repeated use of a hearth would oxidize and harden the surrounding soil to an even greater degree. At both sites, however, distinct burned patches located during testing consisted simply of chunks of burned clay of irregular size and irregular shape. One stone lined pit may have served as an oven or smudge firing pit. This pattern is unlike the obvious U-shaped hearths or the flat, circular, stone-lined kilns found at sites in the Bay of Culebra (Abel-Vidor 1978, Lawrence n.d., Vázquez, personal communication). However, it seems likely that the absence of hearth remains at the island sites was due more to a practice of having hearths raised off the ground (as is the practice today) rather than to their absence.

Looking at the question of seasonal vs. permanent occupation of the islands, there are both ethnohistorical and archaeological data pointing to permanence. Pedrarias Dávila, visiting Chira on March 16, 1526, described structures which he called bohío, or posada (in Peralta 1883:709). He noted that many Indians were present, including children (ibid., 713). The numbers of people and the children would tend to suggest permanent settlement on the island. The variety of artifacts recovered from both sites, including ceramics, lithics, bone, shell, and gold objects, represent a broad array of activities characteristic of permanent occupation. Ceramics were the most numerous class of artifacts, with plain wares dominant at both sites. Decorated types were recovered in much smaller quantities. Clay spindle whorls document spinning and weaving. Perforated rectangular clay pieces may be small line or net sinkers. Two animal figurines from middens at the Herramientas site show craft work in clay apart from vessels.

The lithic assemblage of both sites is varied and included tools made of materials not native to either island. The range of tools suggested that woodworking and agriculture were important tasks. Small faceted stones that were reported ethnographically as being used to burnish pottery suggest this craft was practiced at the Herramientas site. Bone points may have tipped spears for hunting or fishing, or sticks for planting. Pendants and beads of bone, serpentine, shell, and gold, and even bat excrement, show a range of craft activities, and production of luxury goods.

Though the range of activities represented by artifacts at Vigilante Alta and Herramientas suggests permanent occupation, seasonal occupation remains a possibility. The sites located during survey on San Lucas were uniform in material remains, yet these "contemporaneous" occupations may have spanned one or more generations. Considering that in Costa Rica archaeological contemporaneity encompasses periods of many generations, seasonal use of San Lucas during the Late Polychrome period may be difficult to detect, for material remains will not be separable into annual assemblages. The occupation of Chira could also have been seasonal, with a single site occupied repeatedly. Such an occupation could have resulted in the observed pattern of nucleated mounds and clearings, but the mounds would have been occupied serially rather than concurrently. This kind of pattern was noted for the Late Polychrome period Hunter-Robinson site near the Bay of Culebra (Moreau 1980:116).

The differences in site layout between Chira and San Lucas Islands may be tied to differences in access to land, community organization, or location of water sources during the dry season. Though Castaneda noted movement between Chira and the mainland, what he reported may have been islanders using the mainland for farming, as do the inhabitants of the San Blas Islands of Panama (Helms 1978:42).

Though mortuary remains associated with habitation does suggest permanent occupation, remains of only four individuals were recovered at Herramientas. Somewhat in contrast, the seven burials at Vigilante Alta show that the site was used regularly for interment. However, it is possible that the associated settlement debris could have accumulated during periodic visits for the purpose of adding interments. A modern parallel exists on another gulf island, Muertos, where the cemetery of a mainland community is located. Otherwise Muertos is not inhabited by mainlanders.

Extensive deposits of shell at both Vigilante Alta and Herramientas constitute evidence for seasonal tasks at each location. Shellfish are most easily collected between December and May, when little rain and runoff cloud the water. Extreme tides which occur during the March equinox are especially favorable for this task. In this regard, it is of interest to note that Pedrarias Davila visited Chira on March 16, 1526, within a week of the equinox, possibly a time of maximum population on the island. However, Pallant's growth ring analysis of shells collected from each site suggested that on both islands, shellfish were exploited at different stages of growth and in different seasons (1981). This would tend to negate a hypothesized seasonal occupation.

The fish and terrestrial fauna samples do not in themselves add to what is known of seasonal use of the sites. Estuarine fish and terrestrial fauna are available year round, and the samples collected do not include enough deer bone, for example, to obtain the age and sex data needed for discussion of season of death. The wide variety of fish and faunal remains by itself would argue for permanent occupation, more than seasonal camping.

Overall, the data indicate that the islands were regularly or continuously occupied. Group composition, size and density may have varied, however, according to the range of resources available, their distance from the site, and the labor needed to acquire them. This latter pattern is common among coastal groups throughout Mesoamerica (Magnus 1978:74, Stark 1977:214, Voorhies 1976) and possibly in Panama (Linares 1968:7-16, Ranere and Hansell 1978:57) and further south.

<u>Community layout at Vigilante Alta and Herramientas</u>

Both the Herramientas and Vigilante Alta sites are located near the shore, yet are not visible from it. Oviedo noticed similar concealment of villages in Nicaragua:

> Around the plaza and the houses are many fruit trees. . . so many that neither the square nor the structures can be seen until a man is standing right beside them (1976:464).[1]

Vigilante Alta is a single unit, consisting of three midden areas ringing a clearing. Herramientas is composed of several of these units, with numerous open spaces surrounded by midden heaps. At both sites, the irregular or circular clearings were most likely the location of dwellings. Midden areas were homogeneous. No features were found in them, and all contained shell, ceramics, lithics, and animal bone. Some human bone was recovered from midden fill. The intermound zones at each site included features associated with habitation, such as pits, postholes, and burials. Flecks of charcoal and burned clay were recovered in midden and in

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1 "En torno de la plaça é buhios della hay muchos árboles de fructa. . . é tantos, que la plaça ni buhios della no se pueden ver hasta que está el hombre á par della".

open areas of the sites.

This site layout pattern of mound-and-clearing is found at Middle Polychrome period sites of Hidalgo (also on Chira) and San Pedro on the shore of the Nicoya Peninsula; at the multiple component sites of San Joaquin, Aguilar, Finca La Laguna, San Vicente, and Acon on the mainland, and Huaca Nica and Mogote on Chira; single component Late Polychrome period sites on Caballo, San Lucas, Muertos, and Chira Islands, and the Las Brisas and Kon sites on the Nicoya shore (Creamer n.d.). The consistent spatial distribution would indicate that this was a standard local pattern established sometime before the onset of the Late Polychrome period. It should be noted at this point that mound-and-clearing is not to be confused with the Mesoamerican pattern of site organization in which an open area, or _plaza_, is ringed by structures, a pattern which Oviedo reported from Nicaragua (1976:504, Lam. 3).

Looking beyond the Gulf of Nicoya, the community layout of Vigilante Alta and Herramientas is similar to other Late Polychrome period sites in Greater Nicoya. Huerta del Aguacate and Matapalo, both near Tamarindo Bay, appear to be examples (Sweeney 1975:41, 44), while in the Bay of Culebra, Vidor, Nacascolo (Vázquez, personal communication), and Puerto Culebra (Abel-Vidor, personal communication), distinctly show mound-and-clearing organization. (The latter site may have been the site occupied by the _cacique_ Namiapi who Cereceda visited in 1522 (Lothrop 1926:29).) In addition, the Ruíz site, located a few kilometers inland from the Bay of Culebra consisted of at least 14 shell mounds over an area 400 x 400 m on a slight incline between a stream and the inland hills (Lange 1980b:81). Unlike the gulf sites, a separate cemetery was located a short distance from the mounds at this site (ibid., Fig. 1) and no burials were recovered during excavations in the midden areas. Like the gulf sites, the occupation level at Ruíz was thin and few remains from earlier periods were present (ibid., 87). In spite of the site's location a few kilometers from the coast Ruíz appears to represent the occupation of a group dependent on marine resources for part of their subsistence. Shellfish were transported to the site, and may illustrate the inland component of a shore/inland trade network rather than a mobile group of agriculturalists.

Also near the Bay of Culebra, the Hunter-Robinson and Sardinál sites date to the Late Polychrome period (Moreau 1980:108). Both sites consisted of low mounds of midden, predominantly shell. While this arrangement of mounds suggests a similar pattern to the island sites, testing at these site focused on the middens, and could not confirm the pattern of features in cleared zones found at Herramientas and Vigilante Alta. Two concentrations of adobe, one on each side of a shell midden excavated at Hunter-Robinson, may represent living areas. Like Herramientas, however, distinct remains of structures were not encountered. Distribution of potsherds between the burned clay concentrations suggested a living floor or specialized activity area (Moreau 1980:110, 118).

Further north, in northwestern Costa Rica, mound-and-clearing organization was noted at Chahuite Escondido on the Santa Elena Peninsula (Sweeney 1975:38), and the Las Marias site in the Bay of Salinas (Lange 1971a:95). Located less than one kilometer from the coast by a creek, the latter site consists of groups of mounds around a clearing. Mounds were composed of marine shells, bone, sherds, and stone (ibid., 91, 93).

Turning south of the gulf region, a number of sites in the valley of the Rio Grande de Térraba (Diquís) were investigated by Lothrop (1963). The organization and construction of these sites differed considerably from the island sites. Here, rectangular platforms were constructed of stone and earth (ibid., 15), and refuse was scattered over the rest of the site. A similar pattern was also observed at IS-3, La Pitahaya, in the Gulf of Chiriqui (Linares 1980:307). Lothrop did describe one site having no above ground features with shallow deposition of refuse and burials in the same part of the site (1963:15), not unlike Late Polychrome island sites in the gulf, but he did not provide chronological information.

Along the Gulf of Chiriqui, Linares (1968) investigated several sites dating to the Chiriqui phase, which was at least partially contemporaneous with the Late Polychrome period. IS-3, La Pitahaya; IS-7, Villalba; and IS-11, Las

Secas; all had components dating to A.D. 1000-1500. Villalba, on a ridgetop on Villalba Island, consisted of a concentration of shells and sherds over a 10-15 m area (ibid., 13). On Cavada Island, at Las Secas, shells and sherds covered a hilltop over an area 200 m in diameter, and there were three distinct mounds (ibid., 14). The concentration of shell in the middens and the absence of features within them (ibid., 16), were similar to middens at the Gulf of Nicoya island sites. On Palenque Island, La Pitahaya received more detailed study than the other Chiriqui gulf sites. Located near the center of the island, La Pitahaya was on a hill 50 m high (ibid., 7), and consisted of artificial mounds constructed along the ridgetop. It also included an open area covered with a hard-packed floor, basalt columns, and a flat, cleared area which may have been used for dwellings (Linares 1980:308). In this respect it was similar to the gulf island sites. The mound part of La Pitahaya covered a number of burials which were also like burials at Vigilante Alta and Herramientas. These included infants and adults, with few grave goods placed in the tombs. Two of the burials recovered at IS-3 were placed in graves excavated into bedrock, similar to Vigilante Alta. La Pitahaya was the largest and most complex of the Chiriqui gulf sites studied, and Linares suggested that a special activity such as trade may have resulted in the site's growth and elaboration (ibid., 75-76).

On the Pearl Islands of Panama, sites were described as shell heaps. Only single mounds were described, and chronological information was not provided. Materials illustrated from sites on Saboga, one of these islands, (Linné 1929:Figs. 17, 18) appeared similar to artifacts from Late Polychrome sites in the Gulf of Nicoya. Although middens including shell were recorded on the Pearl Islands, the pattern of community layout appeared to consist either of artificial mounds and house foundations similar to sites in western Panama (Linares 1980:307), or of raised floor dwellings like those reported in south Costa Rica (Drolet n.d.). They were not recognizably similar to the mound-and-clearing pattern of Gulf of Nicoya sites.

Burials

Turning from the midden and dwelling layout, burials were dispersed within the habitation zones of both Vigilante and Herramientas. At Herramientas, burials were placed near but not in the midden. At Vigilante Alta burials were bunched in the center of the site. Also there were single burials on the northwest side of the site, south of the site on a ridge, and another reported to have washed out of the road crossing that ridge, about 400 m from the center of the site. Near the center of Vigilante Alta the burial of a child was recovered, associated with more elaborate goods than in nearby adult burials. This would appear to correspond to an observation made by Oviedo in Nicaragua. In the plaza of Tecoatega he saw "two little houses were tombs of two sons of the chief; they had died in childhood"(1976:464).[2] Other Middle and Late Polychrome period sites in the gulf region tend to have burials in close proximity to the habitation areas. At La Guinea, Baudez recovered remains of four individuals, and a cluster of vessels which he assumed represented interments (1967:34-36). During later salvage excavations at La Guinea, Hoopes located four burials in association with a preserved house floor (1980:4). Baudez's testing on Toro Island at the mouth of the Tempisque yielded a Late Polychrome period burial along with remains of a small habitation site (1967:50). At San Vicente, which dates to around A.D. 1200 (Jane Day, personal communication, Silvia Salgado, personal communication), excavations yielded burials in a large habitation site.

Further north in the Greater Nicoya area, burials were recovered from the central clearing of Chahuite Escondido (Sweeney 1975:37), Las Marias (Lange 1971a), and Puerto Culebra (Abel-Vidor, personal communication). Puerto Culebra and four other sites possessing Late Polychrome period components located in the Bay of Culebra may also have had separate cemeteries (El Conchal, Nacascolo, Cerro Soto, 3047I-38-1)(Lange, Accola, and Ryder 1980:21-26). Interestingly, within the immediate Gulf of Nicoya region, there are cemetery sites dating to the Middle Polychrome period and earlier, but none from the Late Polychrome period (Creamer

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2 "dos buhios chiquitos eran sepolturas de dos hijos suyos del caçique, que se murieron niños".

n.d.).

Inter-site patterning

Inter-site patterning is different between Vigilante Alta and Herramientas. Herramientas was a discrete unit separate from neighboring occupations which were few in number and small. The site included at least 15 middens, which formed ten or more small clearings. In contrast, on San Lucas, sherd scatter was continuous over the southwest coast of the island. Small discrete units such as Vigilante Alta, consisted of two or three midden heaps and a single clearing. Although the basic unit of settlement is similar it is concentrated in space on Chira and dispersed on San Lucas. Each clearing surrounded by midden is likely to represent a single structure and residence of a minimal social unit. Little evidence of specialized activities was recovered at either site, which tends to indicate that the units were economically independent. Nevertheless, a social or political unit could have encompassed a number of sites organized in mounds-and-clearings. Clearings within a days walk of one another would allow free interaction between all participants in the system. Membership in the larger social or political grouping could have been maintained by exchanging surpluses, by sharing labor (in construction, boatbuilding, clearing, planting, fishing, harvesting), or by spouse-exchange.

The differing occupation arrangements on Chira and San Lucas may be due to the presence or absence of territorial boundaries within the respective social systems. Inhabitants of San Lucas, a bounded area apparently having a single leader, Nari (Oviedo 1976:181), may have felt little pressure to gather in nucleated settlements, and dispersal of minimal social units over the land may have maximized agricultural use and exploitation of the shoreline and marine resources. Chira, a much larger island, had an overall leader, the cacique Chira (Dávila in Peralta 1883:708), and may have been divided into smaller groups having defined territories. Specifically, Chira's ten sons who received Pedrarias in 1526 may have been obliged to share the island's 40 sq km among themselves. Where territorial boundaries had to be maintained, nucleation of sites may have been effective in validating land claims, and claims on water and fishing areas.

Settlement patterns

Chira, which is large enough to support a full time fishing and farming population, was occupied continuously from the Early Polychrome period onward. This would indicate either permanent settlement or repeated use of the island. More permanent occupation is suggested by the location of Middle Polychrome to Late Polychrome period sites. During the Middle Polychrome period sites were located toward the interior at the base of the hills, or in the hills, where sites were distinguished by large shell middens (Creamer n.d.). The variety of stone tools collected from these sites suggested that forest clearing and agriculture took place. Interior site locations occupied level ground suitable for planting near the hills. This was also where the best hunting was to be found, either along the margins of cleared fields (Linares 1976), or along the banks of streams flowing out of the hills. The distance of Middle Polychrome period sites from the shore (over 1 km), suggests that shellfish were less important than either hunting or farming to produce food, since their retrieval required transportation.

During the Late Polychrome period, however, sites were moved closer to the coast of the island, or to the estuary (Creamer n.d., Robison 1980). This location gave greater access to zones where shellfish were collected and implies less work was expended in transporting marine resources. Land suitable for agriculture was sometimes more distant from Late Polychrome sites than from Middle Polychrome sites, but was never more than 1 km away. Herramientas, for example, was located on land suitable for agriculture, yet it was close to the gulf and not near the hills as earlier sites were. This pattern and the analysis of midden remains suggest that during the Late Polychrome period the relative importance of shellfish increased while other subsistence practices continued. Demand for marine resources was also indicated by the density of sites in the mangrove, the richest zone for marine life.

The other, smaller, islands were not occupied until the Late Polychrome period, when sites marked by mounds of shell and fish bones were established along their coasts. Islands, including San Lucas, Caballo, Venado, and Cedros, have rich marine resources, and all probably could have supported permanent population from the moment of their first discovery by gulf inhabitants. Yet until the Late Polychrome period these islands at most were visited occasionally by itinerant fishermen and shellfish collectors. The small islands have limited land and smaller populations of animals than the mainland; therefore their territories were less attractive for agriculture and hunting than the mainland. At the same time, separation of these islands from the coast, however short the distance, limited access and increased the effort required to inhabit any of them. Resources not available on an island consequently would have to have been brought from another place by boat and resulted in greater expenditure of labor. Likewise, the procurement of scarce non-local resources would have been more difficult for island residents. While procurement of such resources may have been more difficult for mainlanders in terms of travel time, for the island residents an additional mode of transport--watercraft--had to be used to acquire all non-local goods.

Assuming the tendency of humans is to settle on lands where least effort is expended to obtain basic resources (Zipf 1949), the islands would have been the last part of the gulf to be inhabited. Expansion onto the islands can be viewed as expansion into a new niche, whether or not population pressure played a part. The gulf region was described as having greater population than the adjacent regions, yet lower settlement density and smaller site size than Pacific Nicaragua (Abel-Vidor 1981:90) to the north or Panama to the south (see Cooke 1979). When compared with modern population data, the 500 "warriors" observed by Oviedo would indicate a total population of somewhat more than 1000 people. In 1979, 300 families lived on the island, and total population was just over 1,000. Three hundred families would include nearly 500 males age 16 or older, even recognizing that all households did not have a male head. In 1979, Chira appeared to be straining its resources. Planting had been yielding less per year for the past few years, and most families had given up on agriculture, preferring to purchase food. Though this is a limited analogy for population and carrying capacity in prehistoric times it suggests that population pressure cannot be ruled out as a motive for settlement of the smaller islands. When the resources available on the small islands, land, fish, and shellfish, became scarce on the mainland and on Chira, the return for settling the islands and exploiting their resources increased, and may have come to outweigh the drawbacks of time and effort needed to establish and maintain settlements.

As an alternative to population pressure, the islands may have come to be viewed as a potential new exploitable niche in the Late Polychrome period. In this case, expansion may have occurred gradually as coastal people specialized more and more in fishing than in the procurement of other resources, and decided to move closer to their marine supplies. An increasing proportion of their product would then have circulated in regional exchange, for specialization implies dependence on exchange for distribution. By Late Polychrome times when all the islands were being exploited, an exchange network of at least two tiers, intra- and inter- regional, involved island sites. The intra-regional system circulated raw materials and foodstuffs along with craft items, between the islands and the mainland, while the inter-regional network, took rare or luxury goods (e.g. pearls, spondylus shells, and purple dye from molluscs) from the islands and coastal communities and circulated them outside the Gulf of Nicoya region. Increasing population and demand for land and food promoted exchange, intercommunication and interdependence, and incidentally occupation and exploitation of islands and their resources.

PART II

PRODUCTION AND EXCHANGE IN THE GULF OF NICOYA REGION

CHAPTER 6

LITHIC ARTIFACTS

Lithics can provide information on toolmaking, subsistence and leisure activities. Geologic and petrographic studies can show which materials were available locally and which were brought in from other locations. This can be extended by analysis of microwear to tell whether tools were used on wood, skin, plants, bone, or stone. Such functional implications of lithic artifacts suggest the range of activities that took place at a site, and what kinds of artifacts were produced. Determining the range of activities carried out at each site, along with the variety of goods either procured locally or imported represents the first stage in documenting exchange relationships which existed within the region.

Since both sites excavated were located on islands, they represented discrete bounded units for comparison of stone tool assemblages. All islands in the gulf are composed of sedimentary rocks; consequently, artifacts of volcanic stone, and almost all of cryptocrystalline stone, must have been imported from the mainland. Woodworking and food processing tools seemed to comprise most of the imports. This pattern would suggest that these pursuits were important enough to the islanders that they imported tools from outside sources rather than forego the activity.

Analysis of the lithic artifacts recovered from Vigilante Alta and Herramientas was intended to show the variety of tasks carried out at each site. Variation was represented by number of categories of tools, and the relative importance of activities as reflected by the frequency of artifacts in each class. Sources of raw materials both local and imported were identified to the extent possible. This would suggest not only which tools were produced locally, but also the balance between local production and importation.

Stone artifacts collected during excavations at each site were analyzed separately. At both sites, excavated materials were screened through 1/4 in (6 mm) mesh screen and all lithics were collected. Each collection was divided into groups by raw material: volcanic, cryptocrystalline, and sedimentary rock. Groups were divided again, into worked and unworked pieces. Worked fragments were grouped by position of visible use wear on the surface. A sample of used flakes and tools of each category were examined under a binocular microscope using 20X magnification, to verify the presence and consistency of use wear traces within each group. By grouping the tools according to visible use wear traces, artifacts of different materials which appeared to have been used in similar ways could be discussed together. At the same time, tool types which correlated exclusively with either imported or local materials also remained in discrete groups. The suggested function of each group of tools was based on replication studies and microwear analyses of stone artifacts from other sites in Central America (Bernstein 1980, Drolet 1980 , Einhaus 1980, Ranere 1975). For description and discussion artifacts were divided into the following functional groups: Toolmaking included hammerstones, anvils, nutting stones, faceted stones (polishers), cores, unused flakes, and waste material. Subsistence related tools included axes, adzes, chisels, wedges, manos, metates, other grinding stones, choppers, scrapers, used flakes, and projectile points. Craft production included pebble polishers, pointed tools, stone beads, and pendants. Functional names assigned to tools and tool categories must be considered interim designations until microwear and replicative study of artifacts from gulf sites can be carried out.

<u>The Vigilante Alta site</u>

Lithics recovered from excavations at Vigilante Alta formed a small collection of 299 ground and chipped stone tools and unused fragments. The raw material of these tools included quartz, obsidian, other cryptocrystalline siliceous stone and basaltic and andesitic rock. Small fragments of quartz were the most numerous. This may have come from veins formed within the limestone bedrock of San Lucas. The quartz cores all seemed to be water-worn cobbles which may have weathered out of the island matrix. Ground stone tools were made of volcanic stone unavailable on San Lucas. Since few unworked chunks of volcanic rock were recovered, it is likely that finished items were being imported. A few faceted stones were made of local limestone and sandstone. An obsidian blade fragment represents a trickle of blades from distant sources into the gulf region. The small quantity appears to indicate infrequent acquisition by the inhabitants and careful curation.

Toolmaking activities

Toolmaking activities included shaping and repairing tools which could have been used in any other activity. Tools were used for agriculture, hunting, fishing, boat building, house construction, and craft work. The artifact classes established from Vigilante Alta remains included hammerstones, anvils, nutting stones, faceted stones, cores, unused flakes, and unmodified fragments.

Hammers, anvils and nutting stones (Fig.28)

Hammers and anvils, including nutting stones, overlap in their battering function. There were five whole or partial volcanic artifacts which showed battering. One fragment showed heavy wear on an end. Another was apparently used as a nutting stone or anvil, and had a shallow circular depression pecked into one side and two depressions pecked into the opposite side. The stone was broken through the pecked areas. One large volcanic cobble 18.3 cm long showed battering on its more pointed end. This was a hammer that would have to have been held with both hands and wielded

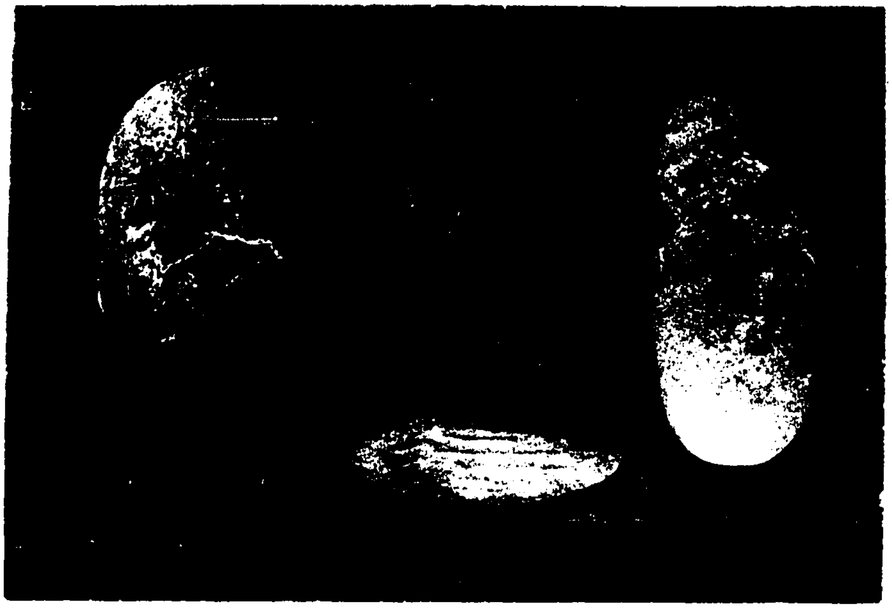

Figure 28. Hammerstones, anvils, nutting stones,
Vigilante Alta.

with a great deal of force to be used effectively. A fragment of a similar hammer also had pecked spots on one side from its alternate use as an anvil.

Two multipurpose tools, one on a flat oval sandstone and the second on volcanic stone, showed dispersed pecking on one face from use as an anvil, while the opposite face had a circular facet like a nutting stone. The ends and a spot in the center of both stones also showed pecking and battering from use as a hammer. A small sandstone cobble combined a pecked facet on one face and another possible facet from use as a polisher. There were three additional anvil fragments.

Faceted stones/polishers (Fig. 29)

Seven oval and two triangular pieces of sandstone were probably used as polishers. All had smooth surfaces that may be use-facets. One similar stone of volcanic rock was also recovered. Ranere (1975) has suggested that faceted stones may have been used to smooth and polish the surface of ground stone tools after initial shaping was completed.

Cores and hammers (Fig. 30)

Twelve fragmentary quartz hammers were recovered at the site. These ranged in length from 2.2 to 8.8 cm. Seven fragments were part of a single tool. The five remaining fragments were all waterworn on the surface, and four were used both as cores and hammers. Some of the battering on all the hammers may have occurred during bipolar flaking, the technique by which cobbles were split and flakes removed. One spent bipolar core was also recovered.

Figure 29. Faceted stones/polishers, Vigilante Alta.

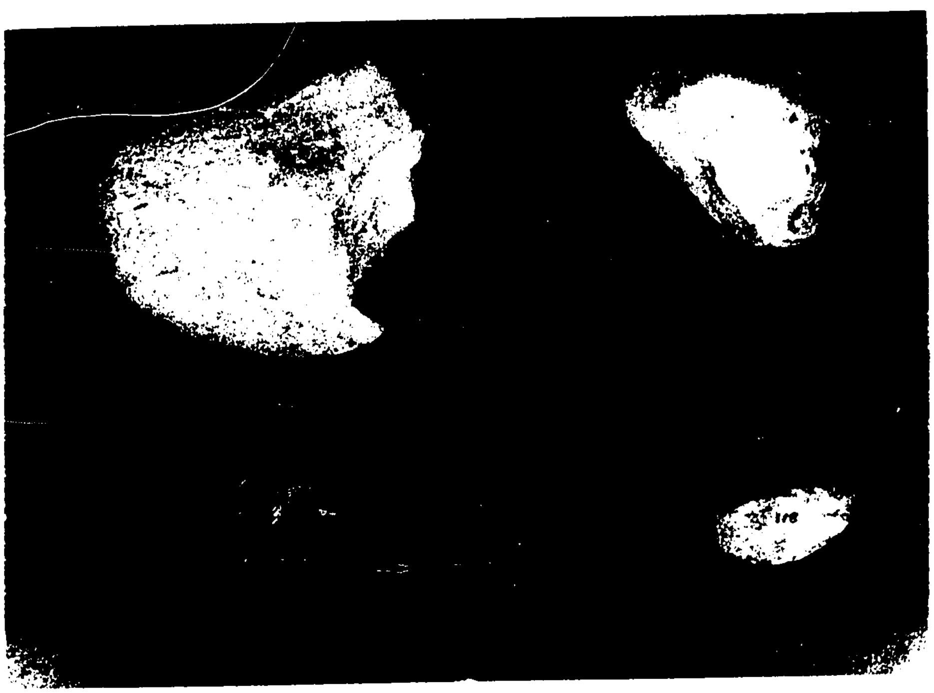

Figure 30. Cores and hammers, Vigilante Alta.

Unused flakes (Fig. 31)

Thirty-three unused flakes of siliceous rock were recovered, and 19 of these were produced by bipolar flaking. All the flakes ranged from one to four centimeters in length.

Unmodified fragments of crystalline stone (Fig. 32)

Ninety-eight fragments of siliceous stone were collected. Nearly all of these were rectangular fragments of quartz crust, from .5 to 2 cm on a side. One of the two opposing surfaces of these fragments was always irregular and covered with small crystals. Quartz forms in cracks in limestone deposited by ground water, and fragments the size of those recovered would never have provided useable material for even small tools. Consequently, they were probably broken off of larger chunks that did provide useable material for tools. It would appear that available raw material on San Lucas was used completely, if these fragments do represent the only remains of toolmaking.

Subsistence

Tools involved in subsistence activities included ground stone axes, adzes, flaked wedges, chisels, and used flakes. Manos, metates, and other grinding stones indicate agriculture, while a group of tools or artifacts indicating hunting or fishing has not been as clearly defined. Subsistence tools include those used for cutting and shaping wood and bone, tools used in field clearing, boatbuilding, house construction, wood carving, and other tasks.

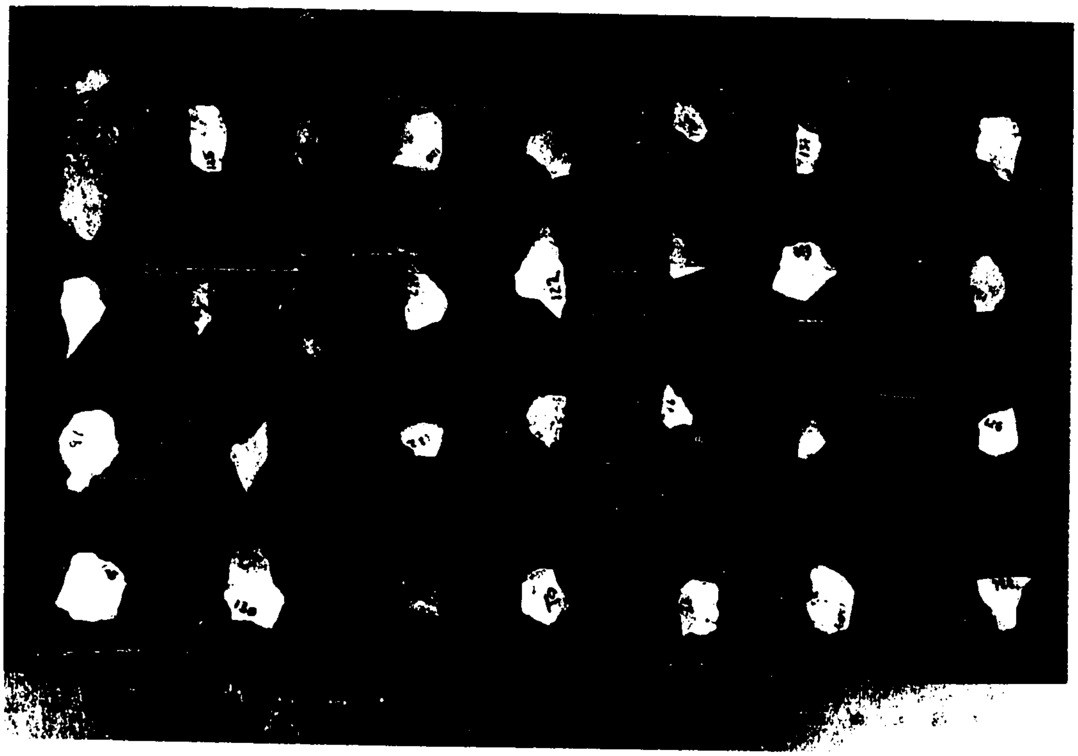

Figure 31. Unused flakes, Vigilante Alta.

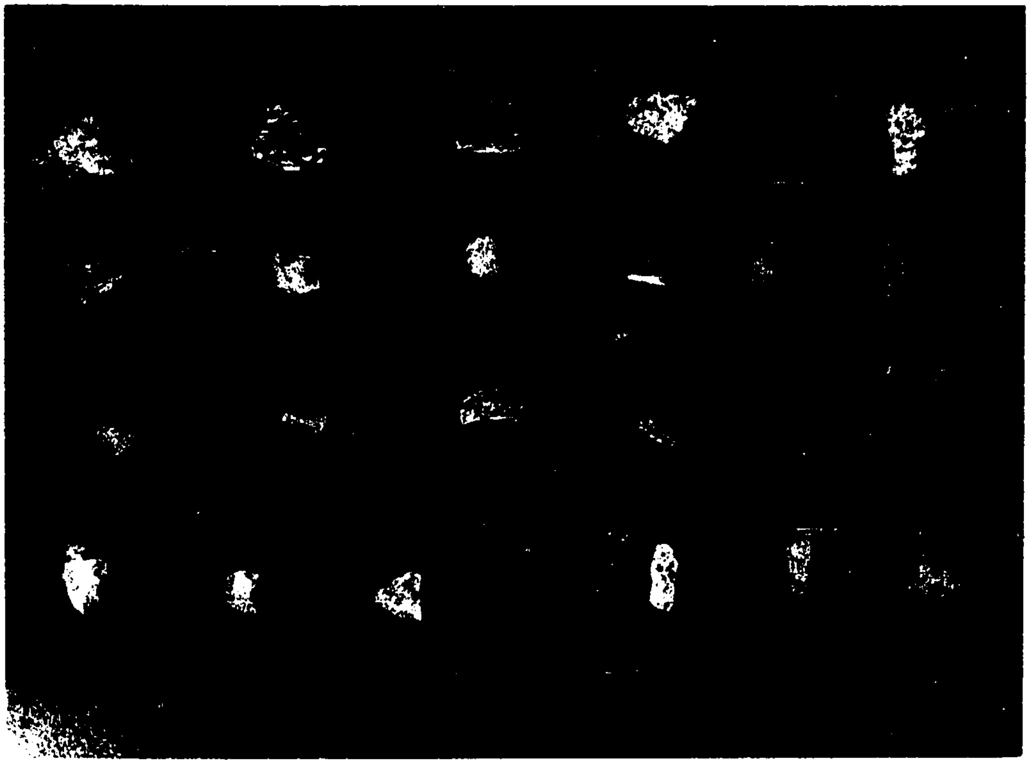

Figure 32. Unmodified fragments of crystalline stone, Vigilante Alta.

Ground stone axes (Fig. 33)

The sample excavated at Vigilante Alta included eleven ground stone axes. Pecking was noticeable on all examples, and was heaviest from the center to the butt end. The bit end was ground smooth on all specimens. Six examples showed battering on the butt end. One example was extremely worn on the bit, while other axes showed little or no corresponding wear. Three had flakes removed along the bit which may indicate resharpening. The axes fell into two size groups, one averaging 7.9 cm in length and the other over 12 cm in length. The latter group exhibited less wear than the former, suggesting the larger instruments were the original size produced and the smaller, worn tools were used longer and resharpened. All the ground stone axes were made from basaltic or andesitic rock not native to the island, but available on the mainland to the east.

Unlike most of the other axes, one was not battered on the butt and the bit was unchipped and smooth. This tool appeared to be used little or used in a different manner from the other tools. Wear across the bit end of the tool was uneven resulting in a slanted edge. The material and visible marks of manufacture, pecking and grinding, were similar to those on other axes. Short striations on the surface appeared to be marks of the initial grinding and polishing. These striations ran parallel to the long axis of the tool, both near the bit and on the polished sides of the axe.

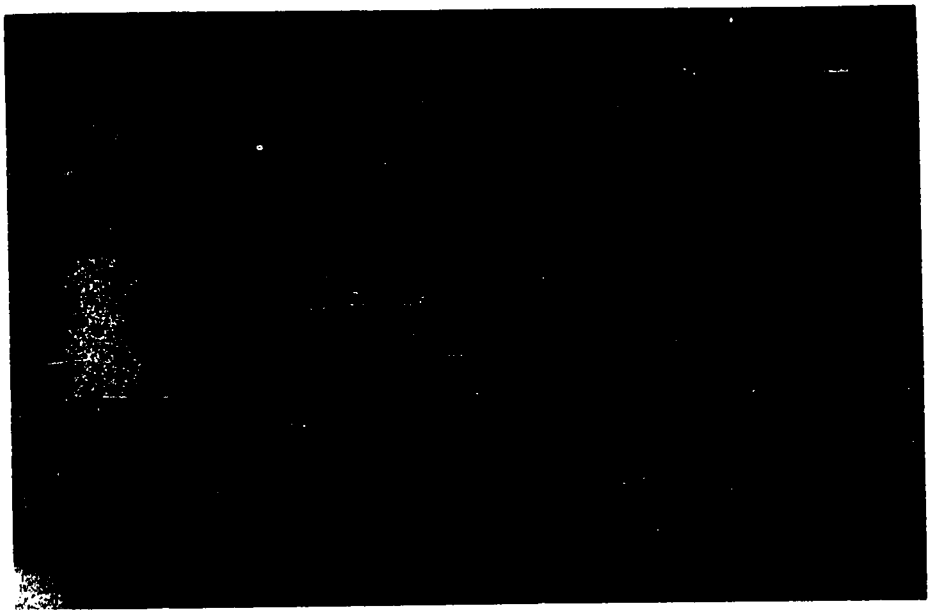

Figure 33. Ground stone axes, Vigilante Alta.

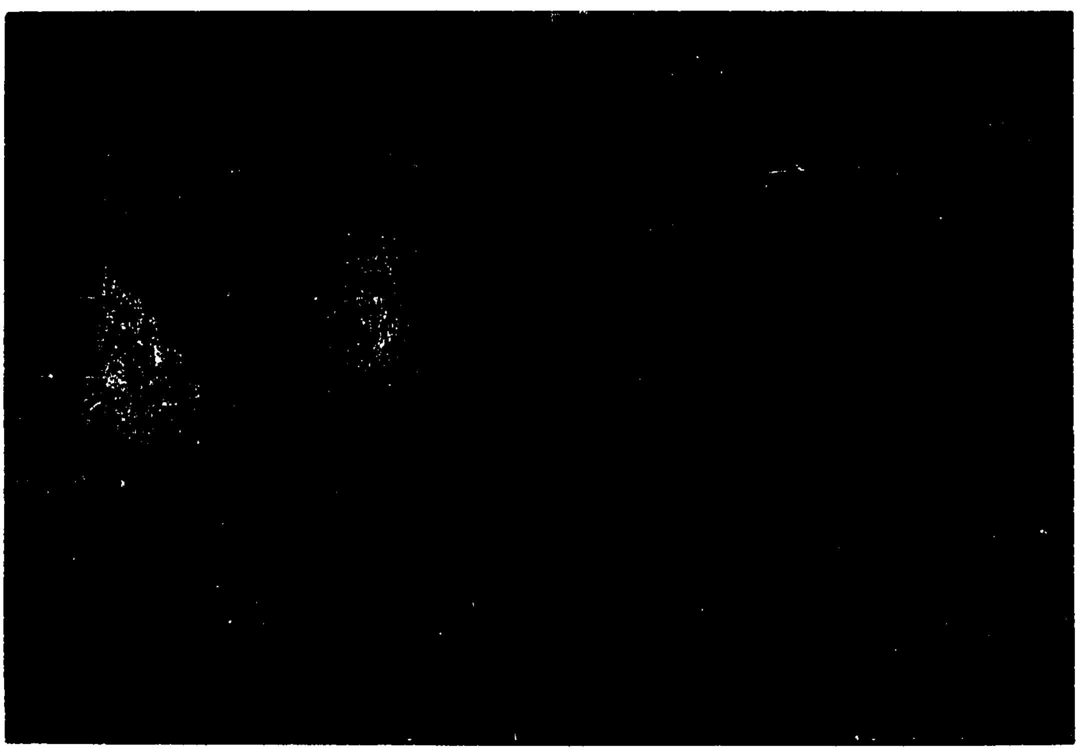

Figure 34. Adzes, Vigilante Alta.

Adzes (Fig. 34)

The collection included three ground stone adzes, distinguished by their asymmetrical cross section. One basaltic adze, was roughened by pecking on either side of the butt end, presumably for hafting. The butt showed no wear. Another was made of limestone, and had the blade produced by minimal reshaping of a small, flat, cobble. The third adze, made of an andesite, was recovered from the child burial in Unit 12. It was extremely worn along the edges and on the faces, and a flake scar may reflect an attempt at resharpening.

Flakes of ground stone tools (Fig. 35)

Twenty-six volcanic flakes with one ground surface were recovered. These flakes appeared to have been removed from ground stone axes during use or resharpening. Resharpening was inferred from the pattern of deposition of the flakes. Thirteen flakes were found in a single level in one excavation unit, and the others were recovered in groups of four, three, and two, respectively in various locations. One large isolated fragment showed secondary use as an anvil, with a shallow pit pecked into the flat polished side surface.

Chisel

The butt end of an axe or chisel was flaked over its entire surface and partially polished, while the edges of the tool were worn from use. The shape of the fragment and the pattern of flaking of the surface was similar to the

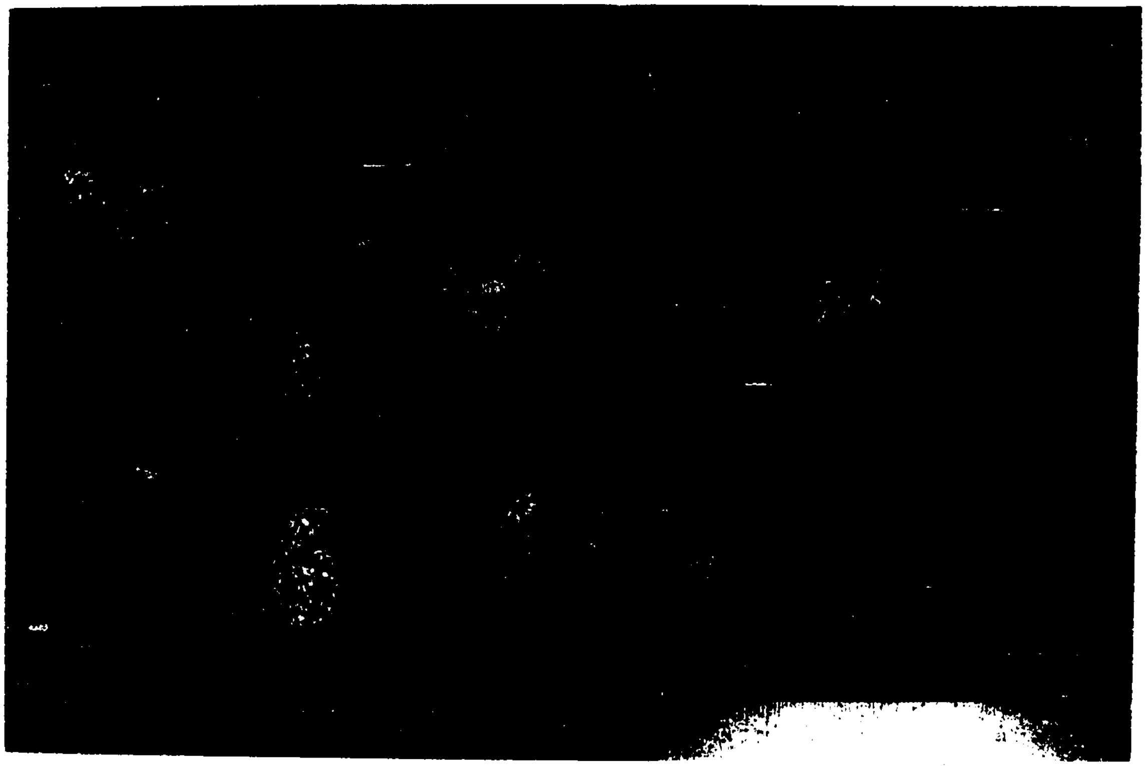

Figure 35. Flakes of ground stone tools, Vigilante Alta.

flaked chisel recovered from Herramientas (Fig. 53). However, the Vigilante Alta artifact was made from shale while the example from Herramientas and other examples known from the region (Creamer n.d.) were made of banded agate.

Wedge (Fig. 36)

One tool recovered from Vigilante Alta appeared to be a flaked stone wedge. The tool was battered on one end while the opposite end was covered with stepped scars. Edges of the tool were rounded from use, though not heavily scarred. A similar pattern of wear was noted on wedges used to split wood, from sites in western Panama (Ranere 1975:191).

Used flakes (Fig. 36)

Five used flakes of siliceous stone were collected. Microscopic examination of the five revealed heavy wear only on one edge. Wear was recognized by the removal of a series of tiny flakes on the dorsal side. The artifacts ranged in size from 1.7 to 2.1 cm in length and from .8 to 1.8 cm in width. Flakes of this size have been proposed to be part of grater boards used to process manioc (Manihot esculenta) or other starchy tubers (Davis 1975, DeBoer 1975, Einhaus 1980:444). The flakes were few in number, however, and not associated with botanical or ethnohistoric evidence for such domesticates. It thus appeared unlikely that these were parts of graters. These flakes are most likely scraping tools used for a variety of tasks. Without experimentation it is not possible to determine whether these were intended for shaping wood, cleaning hides, or other tasks.

Figure 36. Wedge, used flakes, Vigilante Alta.

Obsidian

The bulb end of an obsidian blade 1.65 cm long and 1.8 cm wide, and a tiny flake of obsidian were recovered. The blade fragment showed use along the edges, consisting of small consecutive flake scars. Striations parallel to the working edge were also visible over the entire surface of the tool, especially on the dorsal side, suggesting the blade was used in a cutting motion parallel to the used edge (Semenov 1964:71). Naturally occurring obsidian is not found in large enough fragments in Costa Rica to be useable in stone tool production. The nearest known sources of obsidian for tools are in northern Nicaragua (Lange 1980b:90).

Manos (Fig. 37)

Ten fragments of manos were recovered. These fell into three groups: those of oval section with swelled ends presumed to have hung over the edge of the metate; those of oval section with straight sides and pecked on the ends; and one of andesite, similar to the others, but triangular in section with one end used as a hammerstone. The manos having oval sections seemed to be consistent in size, though there were no complete examples in the collection. Nearly whole examples had a maximum length of 19 cm with the original length approximately 25 cm. Width of manos ranged from 8.5 to 10 cm. Thickness varied with wear from 3.3 to 9.9 cm. All these tools were made of porous volcanic stone.

Metates (Fig. 38)

Metates were represented at Vigilante Alta by many frag-

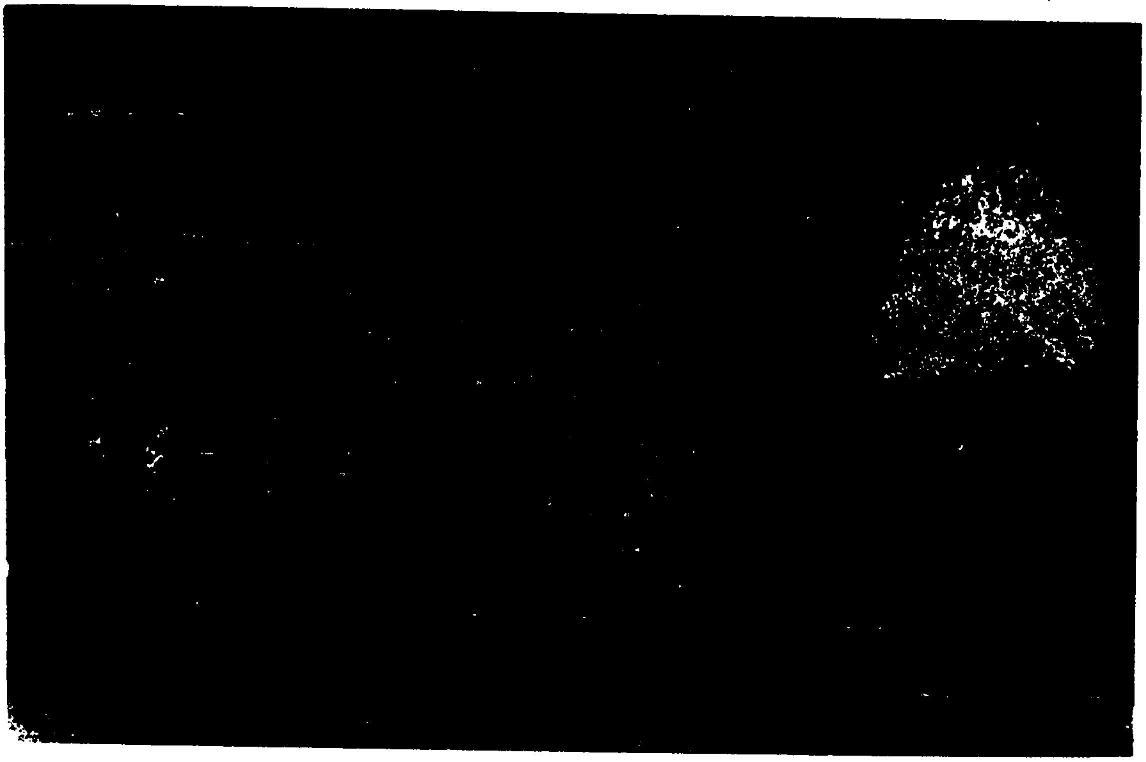

Figure 37. Manos, Vigilante Alta.

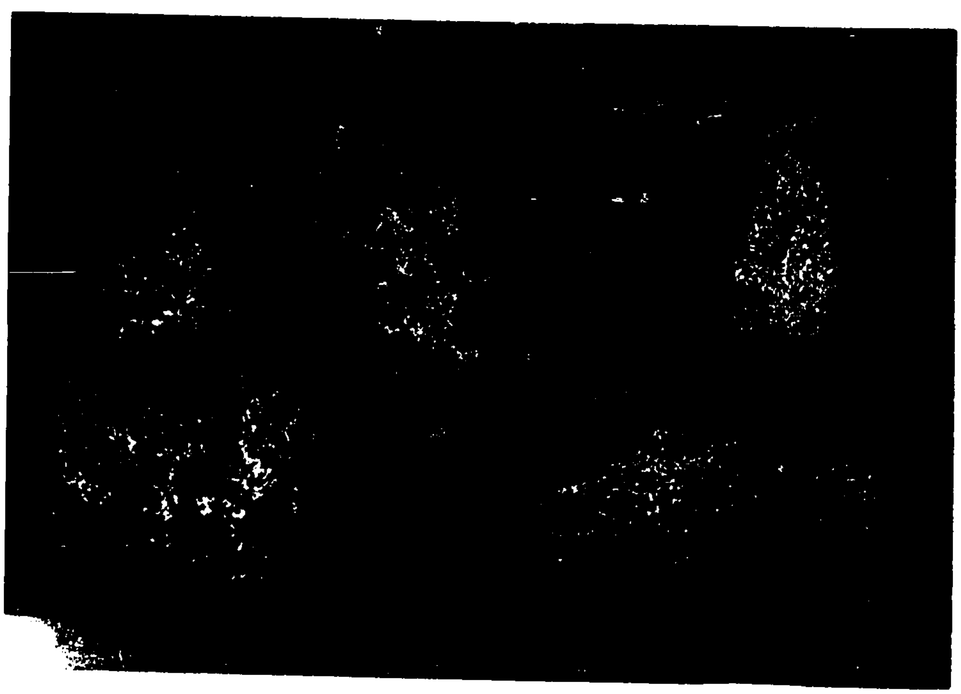

Figure 38. Metates, Vigilante Alta.

ments, though none were over 13.1 cm in length. Fourteen fragments had worn facets recognizable as the flat grinding surface of the tool. Sixty-one other fragments of the same volcanic material as the metate fragments were recovered that lacked clear use or work surfaces. As a whole, the relatively low density of metates at Vigilante Alta is similar to other sites in Greater Nicoya, as may be expected for groups which relied only to a limited extent on agriculture. Such tools may have been more numerous during the occupation of the site but were carried along when a group moved to a new location. In contrast, other smaller tools may have been left behind. All the fragments were porous andesite, volcanic stone not native to the island, though found on the mainland to the east.

Grindstone (Fig. 39)

A faceted volcanic stone from Vigilante Alta was nearly spherical and had a large triangular facet on one side. This appeared to have been used as a grindstone in a bowl-shaped mortar. The use facet was convex, where most manos have a flat grinding surface.

Craft production

Craft items included stone, and possibly shell beads. These were probably made with stone drills, knives, and polishers.

Pointed flakes (Fig. 40)

The collection included seven pointed quartz flakes.

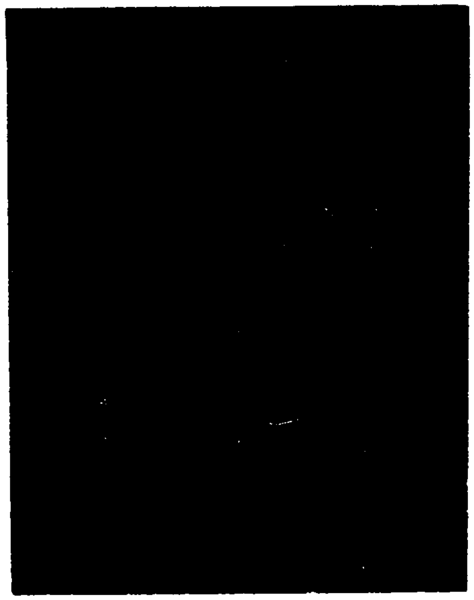

Figure 39. Grindstone, Vigilante Alta.

Figure 40. Used flakes with points, Vigilante Alta.

Three of these were very small, and none of the examples exceeded four cm in length. Four of the flakes with wear traces localized on the edges nearest the point, were used possibly as drills or gravers. On three examples the point had been broken off and re-formed through use (see for example Ahler 1979:fig. 7c). The other showed wear on the dorsal side of the point only, where a straight edge 4 mm wide was used as a scraper.

Another of the pointed fragments showed crushing along an edge. This fragment was too small to show how the tool may have been used, however. One artifact showed wear along one edge similar to a small knife. The remaining tool had a heavily battered dorsal ridge and may have been the backed side of a knife, the battered edge of a cobble, or the heavily worn edge of a scraper.

Stone Bead

Half of a bead of light green serpentine was recovered from Vigilante Alta. The perforation in the center of the bead was made by drilling from either side of a slice of rock, a technique identifiable by the off-center halves of the perforation where the two holes met.

<u>Lithic artifacts from the Herramientas site</u>

The Herramientas site yielded a collection of 3,752 ground and flaked stone tools and numerous worked and unworked fragments. Sandstone, limestone, and shale were available on the island, while cryptocrystalline quartz and chalcedony, including banded agate, onyx, and jasper could only be obtained from the mainland. Some quartz, formed in solution cavities in the limestone of the island, may have been useable material for tools, and some chert was available on the island. Any tools of basaltic and andesitic rock, including manos, metates, axes, adzes, and other grinding and polishing tools were imported to the island. The greatest number of fragments were waste flakes of locally available siliceous stone; however, no workshop areas for production of tools were located. Tools of local material may have been fashioned by each individual as they were needed, while tools of imported materials again appeared to have been brought to the island in their finished form. As at Vigilante Alta, principal groupings of artifacts included toolmaking, subsistence activities, and craft production, though the content of each of these broad categories varied somewhat between sites.

Toolmaking

Hammers (Fig. 41)

Most hammerstones were of silicified stone. Only four were of volcanic rock, and one of these may also have been a blank for a ground stone axe. Surfaces bore evidence of flaking, though no grinding was visible. The hammerstones ranged from 4.9 to 13.1 cm long. Twenty-two fragments of siliceous stone were used as hammers and 20 of these also served as cores. Most were roughly spherical and showed flaked facets and marks from battering. These ranged from

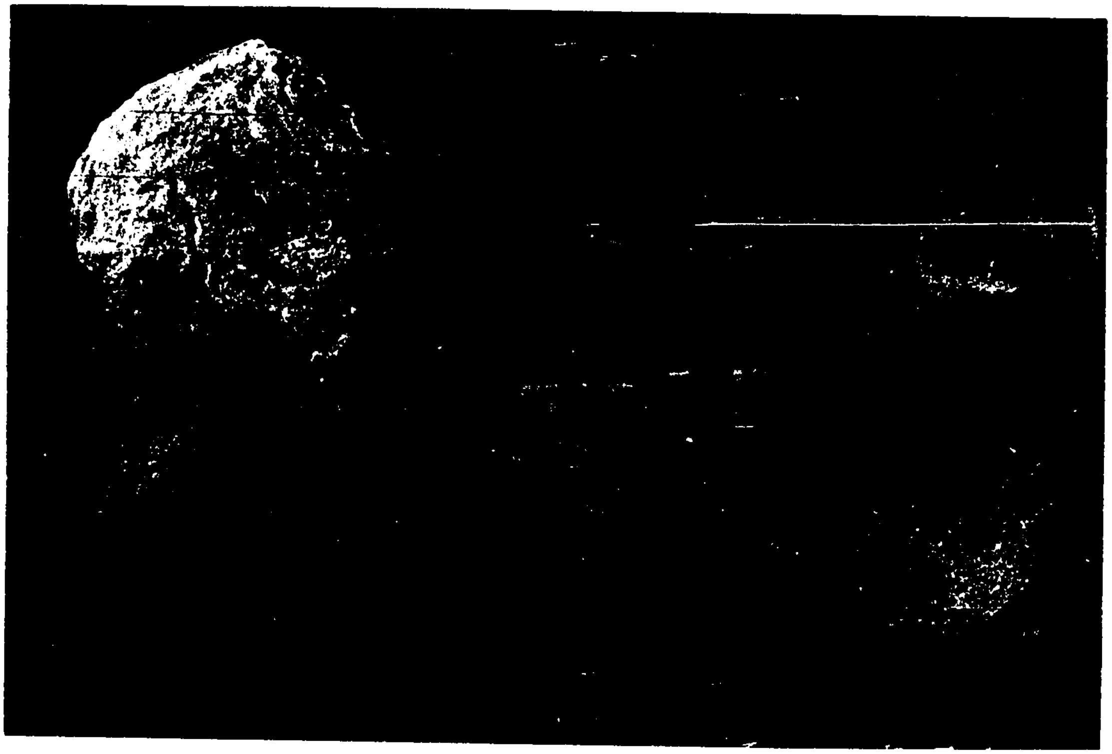

Figure 41. Hammerstones, Herramientas

4.2 to 7.5 cm long. Another five pieces of sandstone and calcite were used for battering. An oval sandstone 5.4 x 8.1 cm showed battering on either end, shallow indentations pecked on both edges and both flat faces. The pecking may be preparation for hafting, which would make this the only hafted hammerstone in the collection.

Anvils (Fig. 42)

Six sandstone fragments were used as anvils. All were flat, less than 3.3 cm thick. Five of the six showed pecking on one surface only, suggesting these may have been makeshift tools used when they were conveniently close at hand, but rarely reused or moved. Two may also have been used for hammering along the edges.

Nutting stones (Fig. 43)

The excavated sample from Herramientas included 13 nutting stone fragments. These included 12 fragments of flat sandstone and one reworked mano fragment. All had circular pecked indentations on one or both sides. Nine were indented on one side only, and of these, three were also indented on the edges. One had the reverse face ground flat. Four examples were indented on both sides and three of these were pecked or battered on the edges as well. Apparently these were multipurpose tools, used alternately for battering and as anvils or bases for pounding another object. These stones all had similar dimensions, averaging 11.8 cm long, 7.6 cm wide and 4.6 cm thick.

Polishers/faceted stones

Polishing tools could be divided into two groups, those

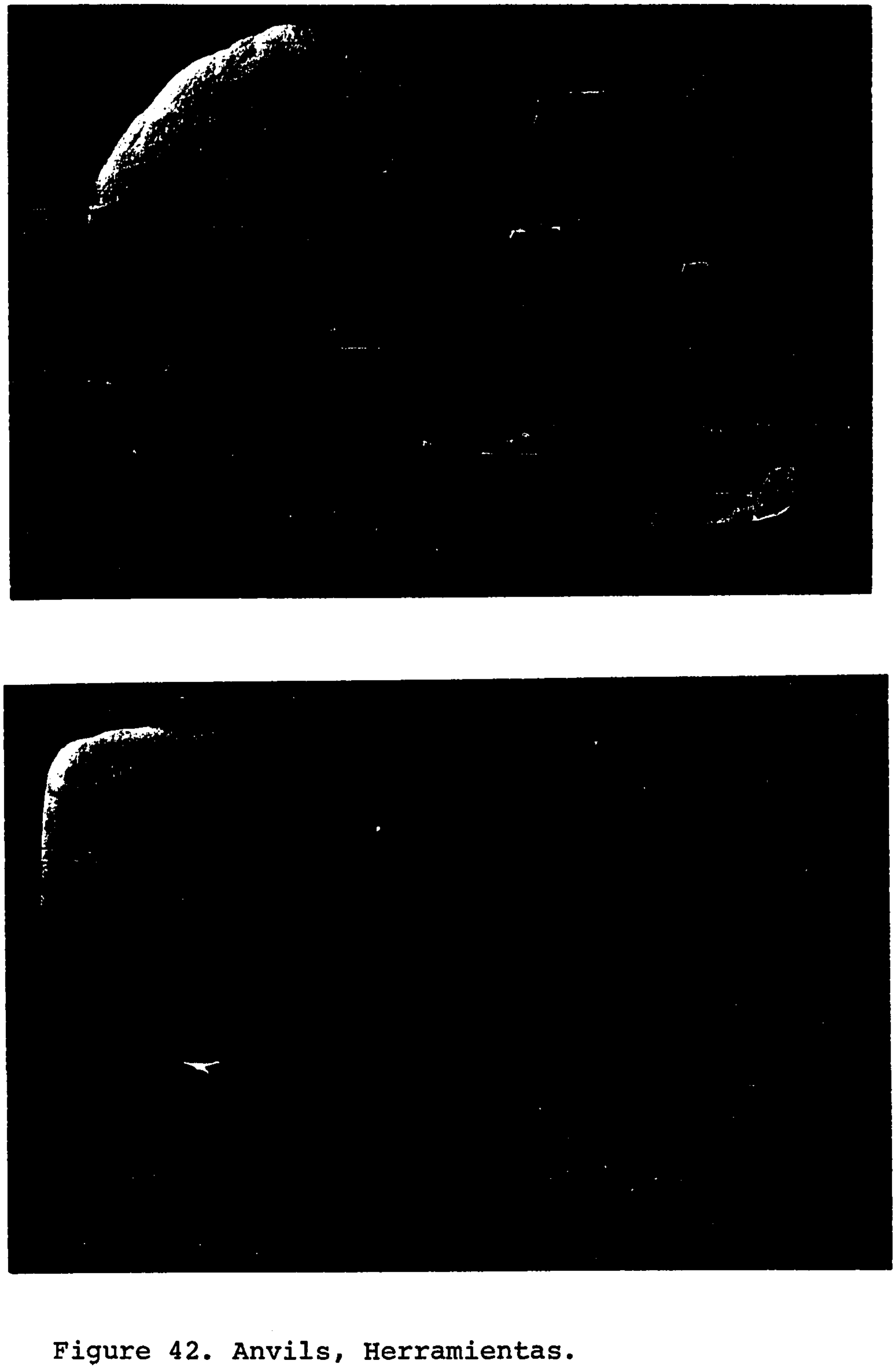

Figure 42. Anvils, Herramientas.

Figure 43. Nutting stones, Herramientas

small enough to be comfortably held in the hand, and those that were too large to be used in this manner. The smaller tools were called polishers and larger tools grouped as faceted stones.

The hand held polishers in the collection (Fig. 44) appeared to be unshaped stones faceted from use. Four of the hand held tools were sedimentary rock, sandstone or shale. Twenty-one similar fragments of fine grained sandstone, limestone, and shale may also have been used as polishers though they did not have distinct use facets. Seven small faceted volcanic stones from the site were flat and ranged from oval to triangular in shape, and had either one or both faces ground flat. In the larger group of polishers (Fig. 45) two volcanic artifacts, one of tuff and one of andesite, and ten limestone artifacts were recovered which appeared to have been used as bases for polishing. One had a concave facet produced by grinding, while the rest had flat facets on one surface. A single whole example, a volcanic rock 13.4 x 8.8 x 5.1 cm rectangle, may have been used on more than one edge, either hand held or set on another surface. The fragmentary faceted stones ranged from 3.8 to 10.7 cm in length. Six other flat fragments of sandstone may have been used similarly as polishers, though distinct wear facets could not be detected due to the grainy surface of the stone.

Cores (Fig. 46)

The collection from Herramientas included 62 variably

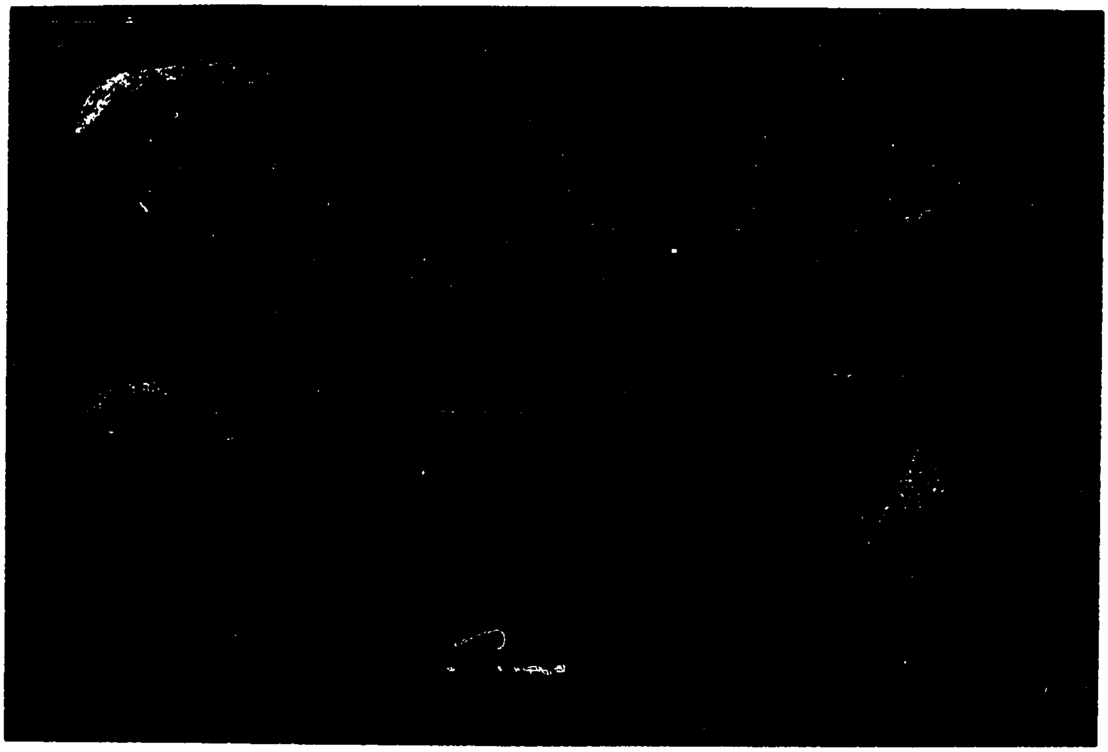

Figure 44. Polishers, Herramientas.

Figure 45. Faceted stones, Herramientas.

shaped cores of siliceous stone. Five of these were also used either as battering tools, choppers, or heavy cutting tools. The cores ranged in size from 2.2 to 10.8 cm in length.

Bipolar Cores

Six additional core fragments appeared to have been produced by the bipolar flaking technique. Three of these core fragments were also used as hammerstones and showed battering on the exterior. The cores ranged in size from 3.1 to 7.1 cm long.

Bipolar Flakes

Thirty-nine unutilized flakes from the collection appeared to have been made by bipolar flaking. That is, the core was placed on an anvil, or supporting stone, and struck with a hammerstone (Kobayashi 1979:116). The result was a flake that was flat and thin and may have a bulb of percussion visible at each end where the force of the blow detached flakes from both ends simultaneously (ibid., 117). Some of the utilized flakes may have been made with this technique. The unutilized flakes ranged from 1.3 to 6.3 cm in length and from .02 to .25 cm thick.

Unmodified Stone

One thousand, six hundred forty-nine unmodified broken fragments and 393 cobbles or pebbles of cryptocrystalline stone made up the largest part of this group. Most of the rest were non-local quartz, silicified limestone, and shale.

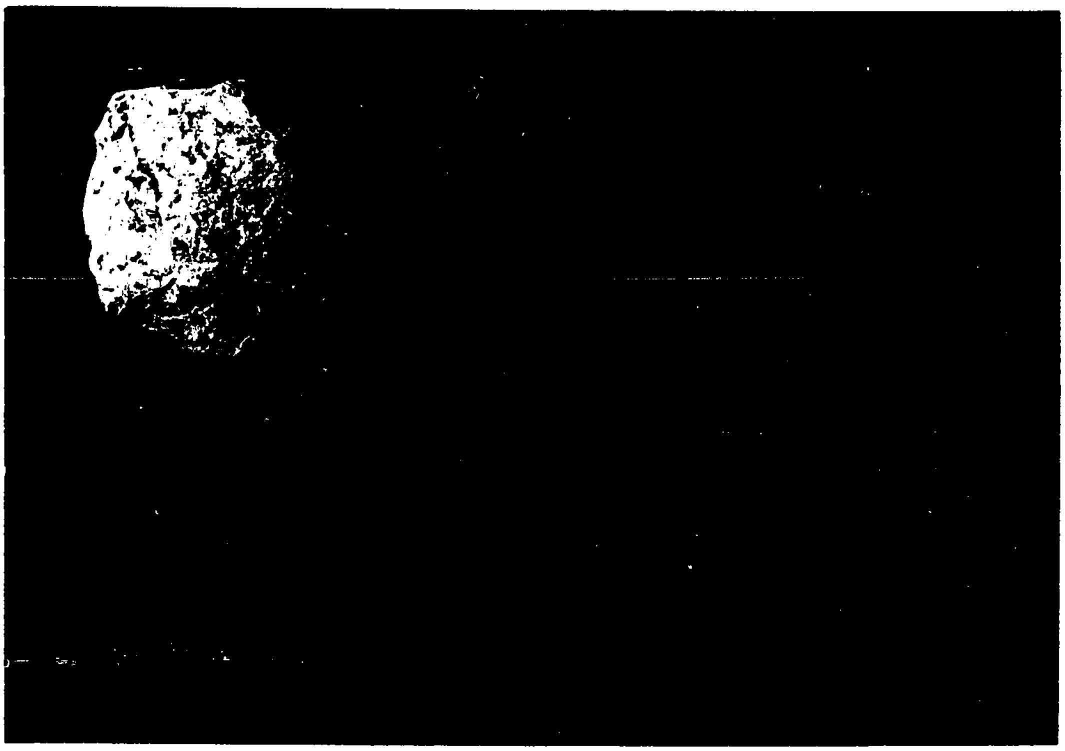

Figure 46. Cores, Herramientas.

Many were fragments that did not show a bulb of percussion or a striking platform, yet probably resulted from the intentional fracture of cobbles for the purpose of making tools. Unmodified volcanic and sedimentary rock were also found at the site, both in natural form (pebbles and large chunks) and as debris from the toolmaking process. Two hundred fifty-six fragments of sandstone and limestone were recovered along with seven volcanic pebbles. The latter may have been collected from the shore, where they had washed in from the mainland. No use wear was visible on any of these fragments.

Unutilized flakes

Excavation yielded 970 unused flakes. Of these, 198 included cortex and 70 were from battered cores. This group included flakes of a range of siliceous rocks, produced by percussion and bipolar flaking.

Subsistence

Ground Stone Axes (Fig. 47)

Eight whole and seven partial ground stone axes were encountered during excavation. All were made of basalt or andesite, and were symmetrical in section with varying shape depending on wear. The bits were straight to curved and smaller axes, possibly those which were resharpened, tended to have straighter bits than the larger examples. Nine of the 14 axes having the bit end preserved were barely worn or unworn, so possible effects of use on the shape of the bit were not visible. The disparity in condition and size

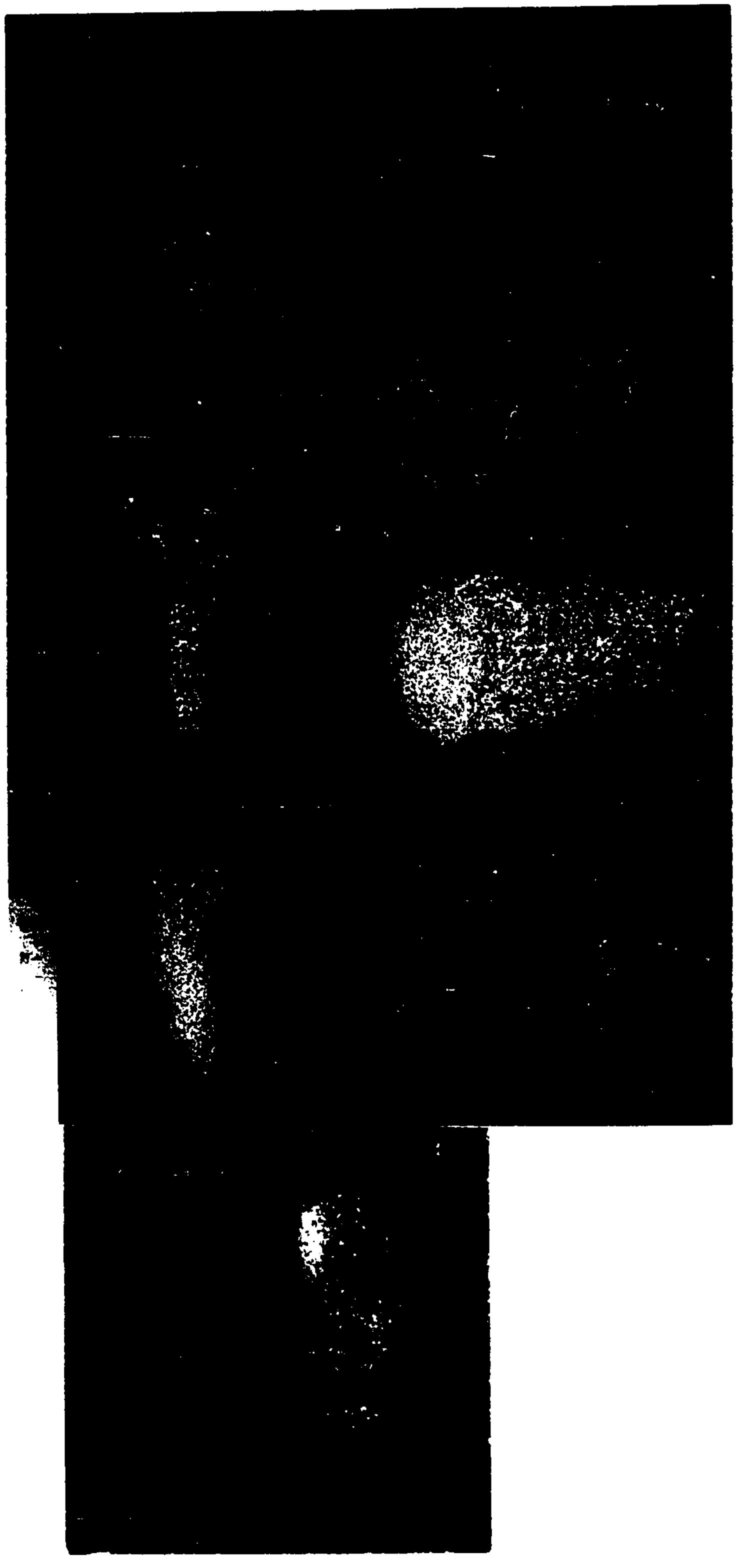

Figure 47. Ground stone axes, Herramientas.

between the heavily worn and virtually unworn groups may be the contrast between discarded used axes, and lost or intentionally buried new and unused imported objects. The butt end of all axes and fragments except one showed pecking from the fabrication process. Roughening of the sides for possible hafting was clear on two specimens. Friction of the haft against the sides of one axe produced a pattern of polish. Another had several large flakes removed from the bit end either from use or an attempt at resharpening.

Adzes (Fig. 48)

Two ground volcanic stone adzes characterized by asymmetrical cross section, were recovered from Herramientas. While neither showed definite marks of hafting, one was polished along most of its length and pecked on the butt half. An attempt also seemed to have been made to resharpen this specimen. Both artifacts had a rough spot or depression on the less rounded face which may be associated with hafting.

Flakes of ground stone tools (Fig. 49)

Thirty-two basalt and andesite flakes with a ground surface were collected. These fragments represented either breakage during use or debitage from the resharpening of tools such as axes and adzes. Flakes ranged in size from 1.7 to 5.9 cm long, large for repair flakes, and their dispersal over the site suggested they represent breakage during use of tools.

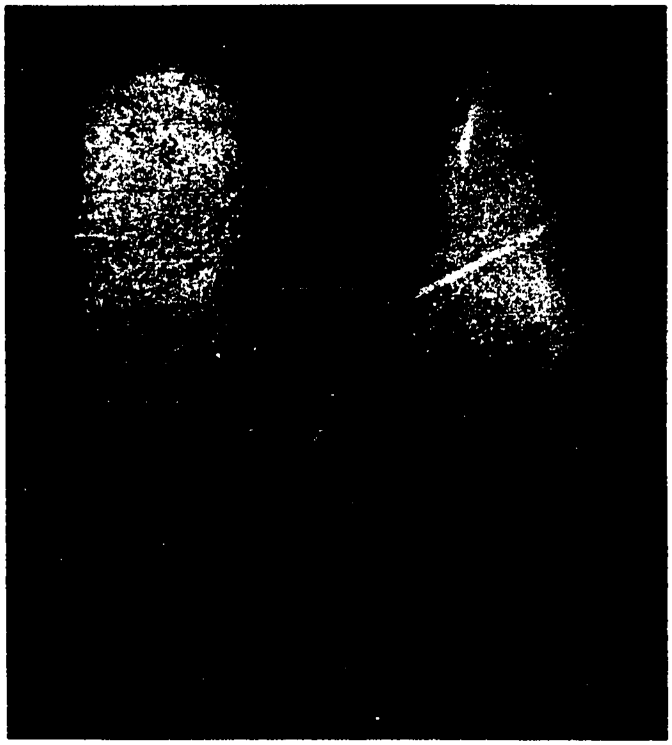

Figure 48. Adzes, Herramientas.

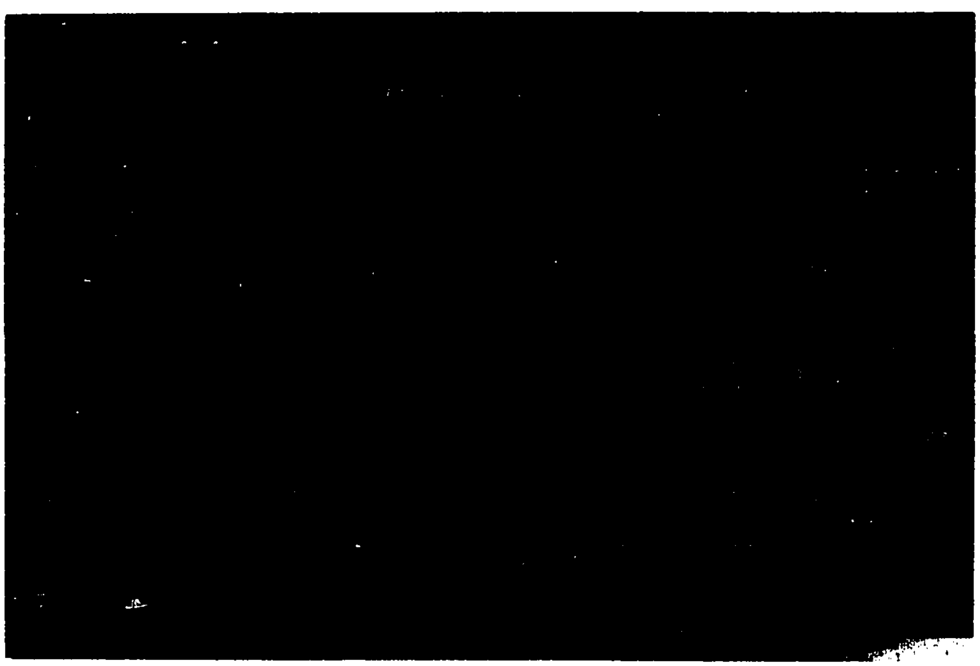

Figure 49. Flakes of ground stone tools, Herramientas.

TABLE 2

FLAKES OF GROUND STONE TOOLS, HERRAMIENTAS SITE

Location (Unit)	Quantity	Location (Trench)	Quantity
1	1	D	1
6	1	L	2
7	5	N	1
8	4	P	2
9	3	R	1
12	2	V	1
13	4		
14	2		

Flaked stone

A large number of flaked stone fragments and tools were recovered at Herramientas. Materials available locally predominated, though varieties of quartz and chalcedony imported from the mainland were present both as cobbles of raw material and as tools. No geological studies of Chira have been carried out, though geological mapping has been done with aerial photos. Consequently, the varieties of raw material considered local were established by observation, quantity of material recovered at the site, and the assumption that distinctive materials such as agate, onyx, and jasper were imported. These materials are not present in geological formations on Chira, but are found on the mainland around the gulf (Bourgeois et al. 1972, Dóndoli and Dengo 1968). They were also scarce in the middens. The tools produced were simple ones: slightly retouched or used flakes, scrapers with minimal shaping, cobbles used as hammerstones and later as cores, and cores used as hammers. Such casual preparation of tools makes it difficult to classify the results of toolmaking. Tools were grouped by the location of visible use wear, and a sample were checked under a microscope at 20X for consistency of identifications.

Heavy Tools (Fig. 50)

Four steep angled tools, possibly scrapers, were recovered at Herramientas. The tools were unifacially worked with a series of small flakes blunting a single flat edge. This pattern was similar to that found on tools described as scraper planes in Panama (Ranere 1980:329). Ranere replicated scraper planes and found the wear pattern when used on wood was the same as the wear on archaeological examples (ibid.). The tools in the Herramientas collection ranged from 5.0 to 13.2 cm long, 8.0 to 9.2 cm wide and 2.5 to 5.7 cm thick.

Choppers (Fig. 51)

There were eleven heavy tools which exhibited battering and scarring along one edge, and may have been choppers or cutting tools. There was little or no rounding of the worked edges of these tools; rather the edge was straight to sinuous, battered and showing scars of use. These appeared to have been hand-held tools, and one of the whole examples showed polish on the butt end, possibly from friction of a haft against the tool as it was being used (see for example

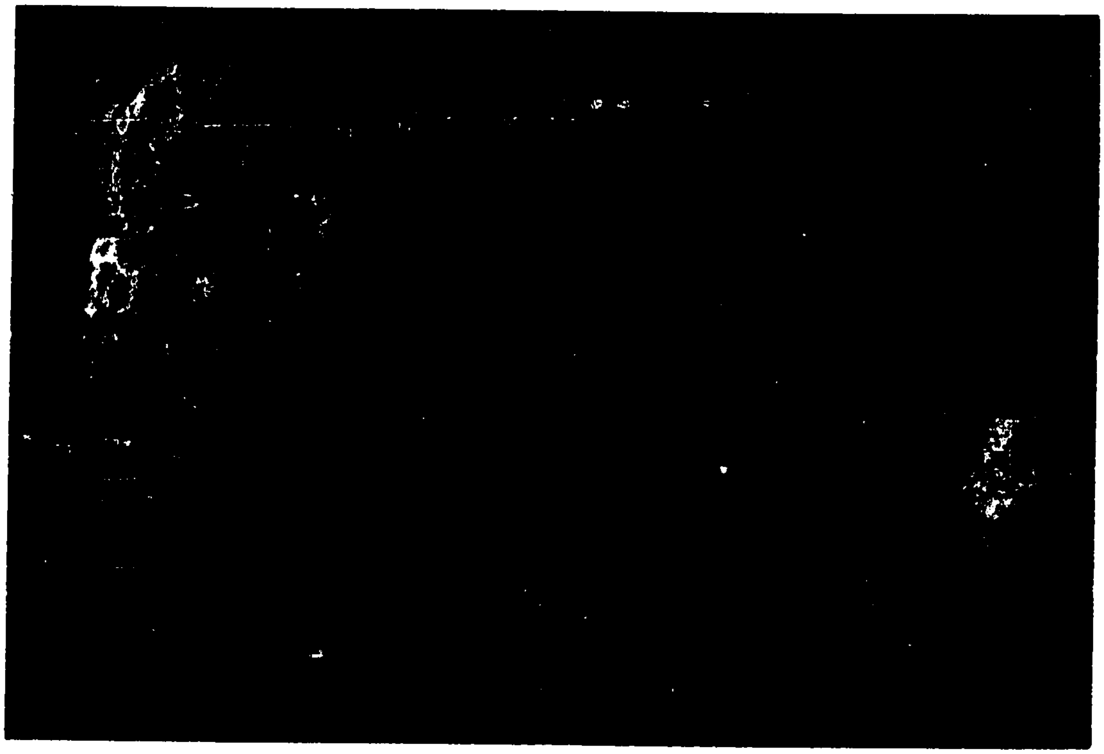

Figure 50. Heavy tools, Herramientas.

Figure 51. Choppers, Herramientas.

Ranere 1979:199, Pl. 11).

Wedges (Fig. 52)

The site yielded 18 flake wedges. These were tabular in shape, from 3.3 to 5.8 cm long and 7 to 28 mm thick. All were battered on one end, usually where the flake was detached from the core. Edges all were scarred and blunted from wear, with especially heavy blunting opposite the battered point. Similarly shaped and worn tools have been recovered from sites in Panama (Ranere 1980:326-327), where they were described as wedges, and in experiments were used for splitting wood (Ranere 1979:191).

Chisels (Fig. 53)

One whole and five fragmentary flaked stone chisels were recovered. The whole example, while shaped by flaking, had the form of a ground stone axe, with a broad bit and tapered butt end. The piece was made of a banded agate or onyx, and was most probably brought in from the mainland. All the fragments were similar in shape to the whole specimen, though one included a broad, rather than a tapered butt end. The care with which these chisels were produced distinguished them from all other artifacts excavated from the site. The whole chisel was scarred by use on all edges, and high gloss from wear was visible on the bit, particularly on high spots. The rest of the surface was blunted though not polished from use. The complete tool was 9.7 cm long, 4.5 cm wide and 2.2 cm thick, and the fragments ranged from 3.6

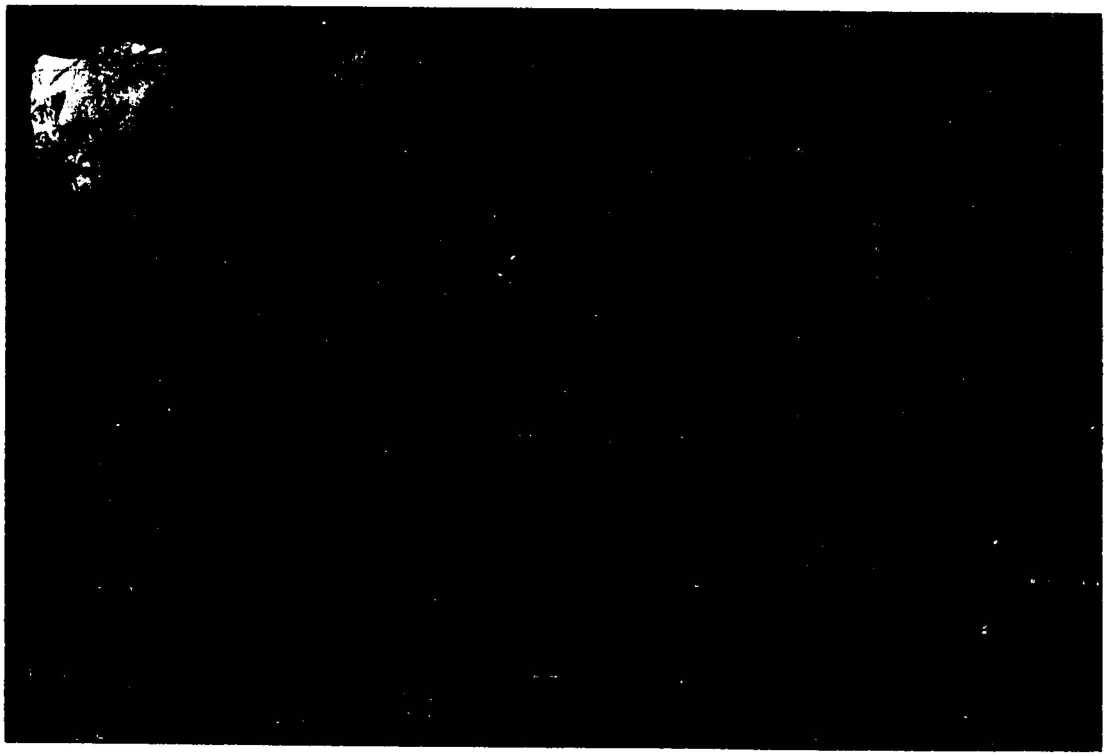

Figure 52. Wedges, Herramientas.

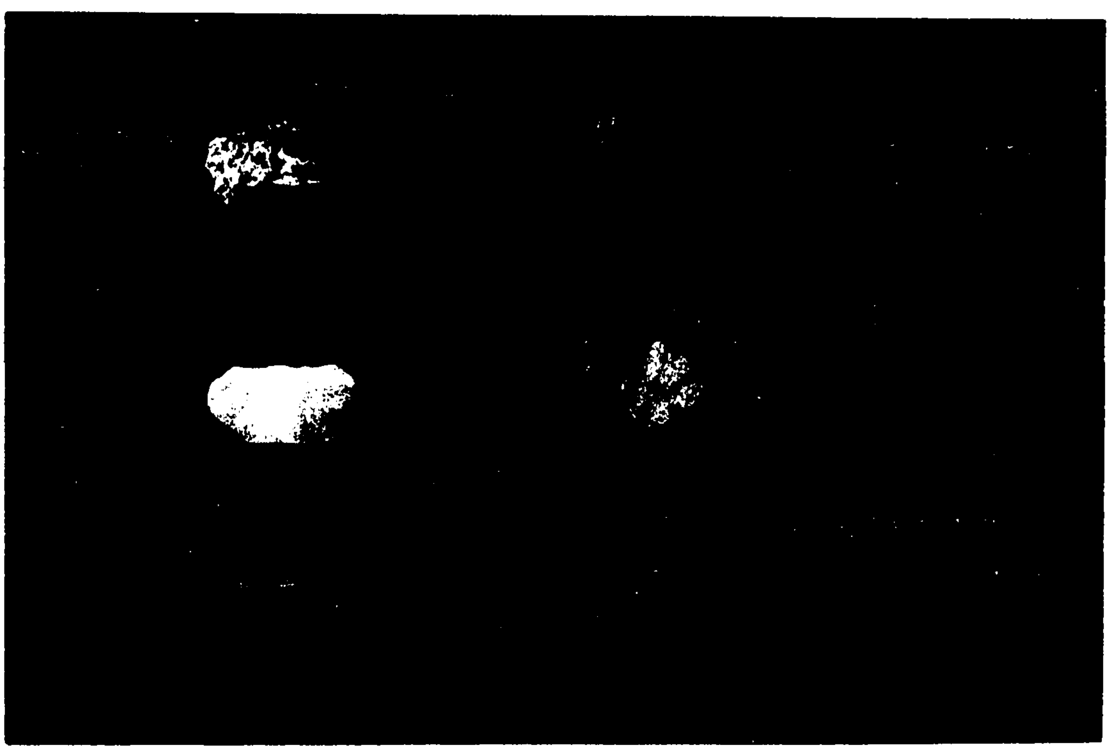

Figure 53. Chisels, Herramientas.

to 4.1 cm wide and 1.9 to 2.3 cm thick. Similar tools were recovered from the Huaca Nica, San Vicente, and Aguilar sites (Creamer n.d.), Nacascolo (Vázquez, personal communication), and Filadelfia (Stone 1977:92). All these sites date to the end of the Middle Polychrome period or to the Late Polychrome period, and are located within Greater Nicoya. From the Atlantic watershed of Costa Rica, similar flaked tools were exavated from the S-IT-1 tomb at the La Isabel site, dating to the Stone Cist period (A.D. 100-1500) (Snarskis 1978:270, fig. 150).

Scrapers

At Herramientas, 68 unifacial tools were recovered which appeared to have been used for scraping. These all had small flake scars and crushing along a steep angled edge. These edges appeared similar to those of stone skin scrapers (Hayden 1979:223). Most tools were used along a concave portion of the edge. The scrapers could be divided into two intergrading groups: 50 had a broad working edge greater than half the length of the tool, and 18 had a narrow working edge, less than half the length of the tool (Fig. 54). Within the broad edge group of 50 tools there were two subgroups: scrapers having an irregular edge (Fig. 55) and those which were used all around their circumference (Fig. 56). Three of the broad edge scrapers may be made on heat treated stone. (Heat treating of siliceous stone results in easier flaking (Crabtree and Butler 1964:2), and the technique has been used by aboriginal groups throughout the

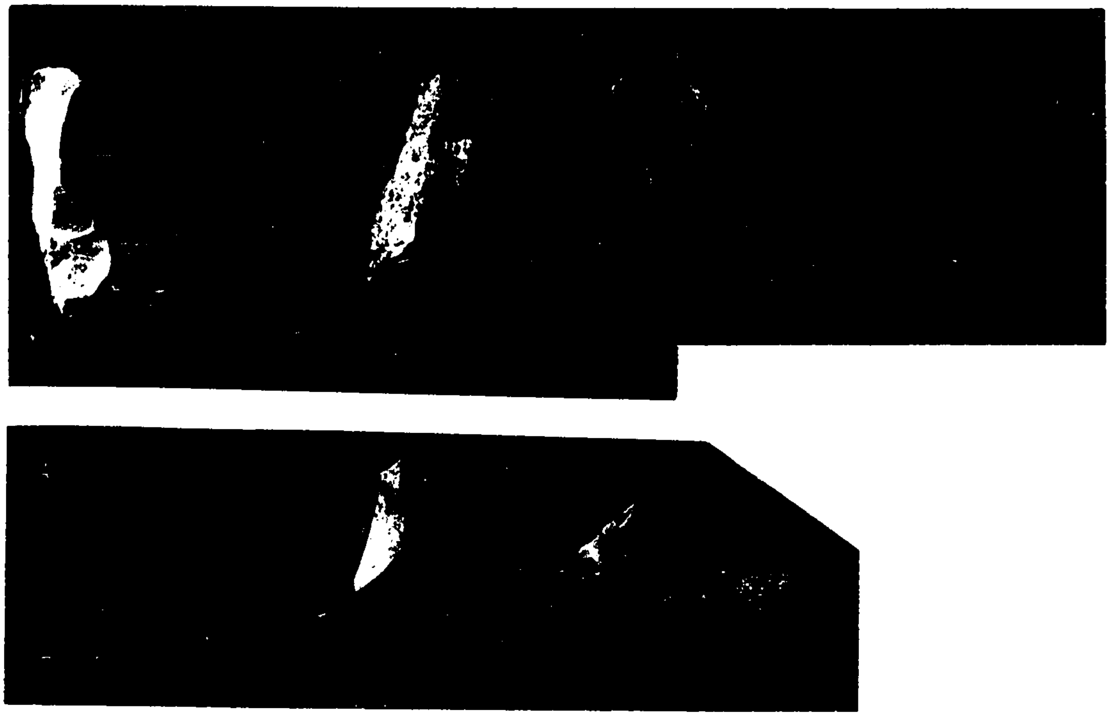

Figure 54. Narrow edge scrapers, Herramientas.

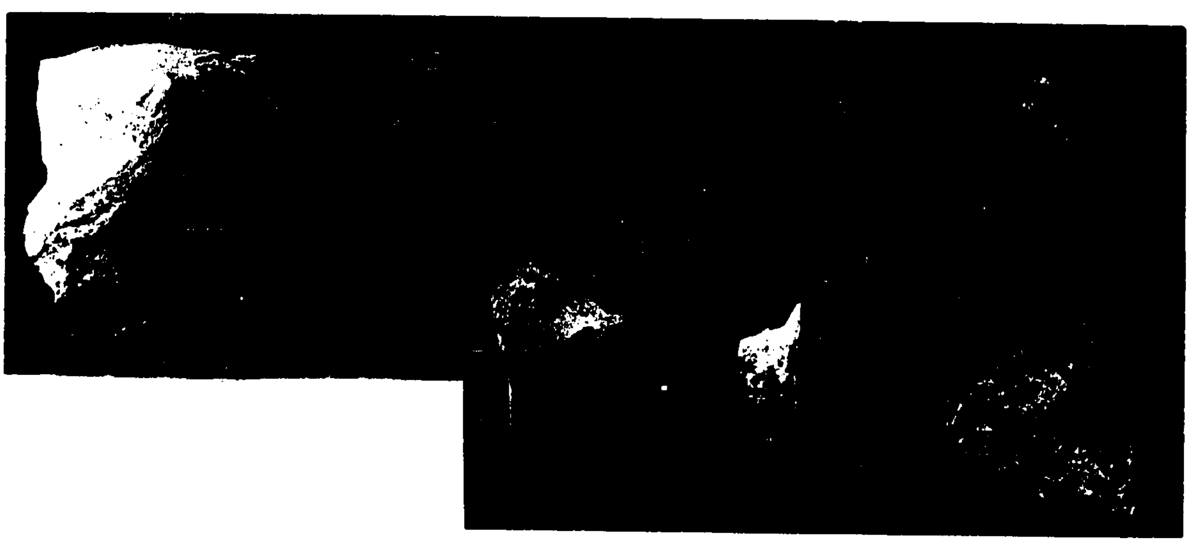

Figure 55. Broad edge scrapers used on one edge, Herramientas.

world (Olausson and Larsson 1982:276).)

Concave Edge tools/Spokeshaves

Three flakes having a concave working surface were recovered at the site. Tools were unifacial with flakes removed by use along the dorsal side. One example also had polish from use along the dorsal edge in the zone of heaviest wear.

Cutting Tools (Fig. 57)

Sixty-three flake cutting tools were separated from scrapers by edge angle, by the shape of the used edge, and by the kind of wear accumulated on the tool surfaces. The edge angle of these tools rarely exceeded 30 degrees, unlike the scrapers where the edge angle generally did exceed 30 degrees. Wear on these edges consisted of rounding and small parallel flake scars, with step scars present occasionally. Four tools were polished by use on the dorsal surface near the used edge. Six other tools showed polishing on high spots over the entire surface of the tool, possibly from wear of the hand against the tool during use. Wear, consisting of polished rounding, small scars, and stepped fractures along the edges, may have resulted from cutting action (Ahler 1979:312). Experiments have shown similar traces associated with cutting and sawing (see for example Ahler 1979:figs. 3, 4, 8). The group of tools from Herramientas may have been used for cutting and sawing, though other tasks cannot be excluded. Most were used on

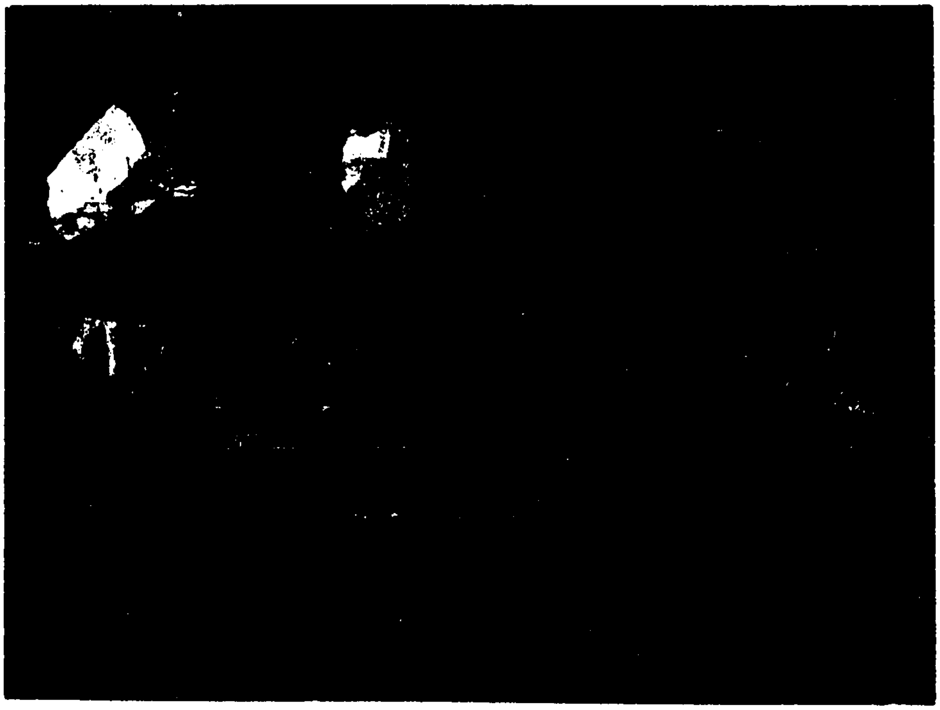

Figure 56. Broad edge scrapers used around circumference, Herramientas.

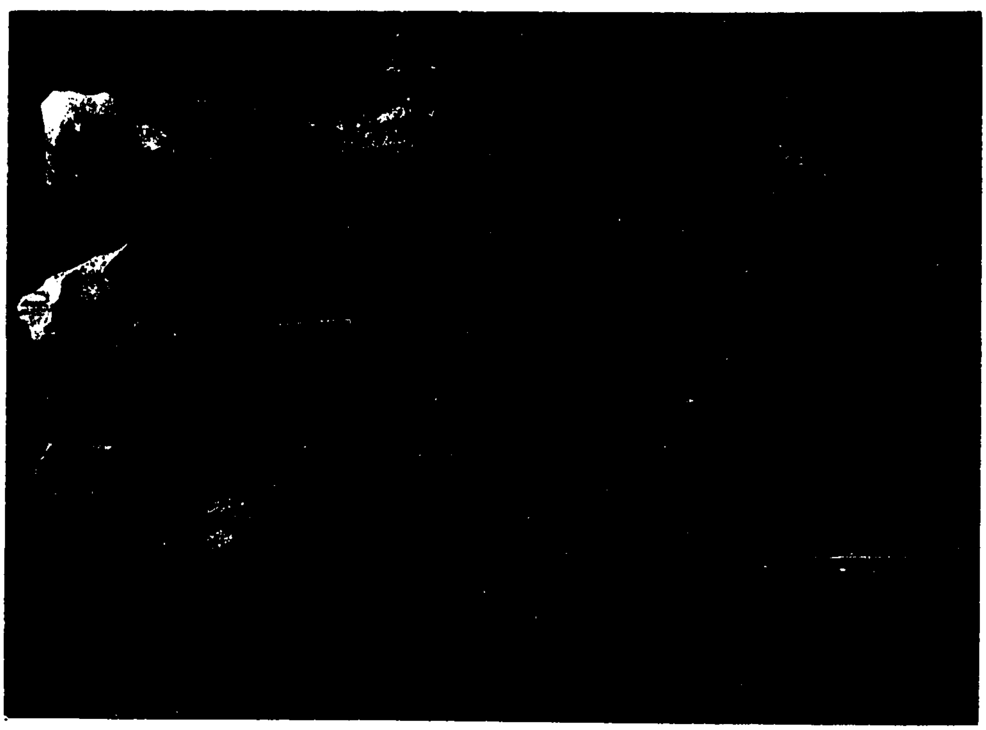

Figure 57. Cutting tools, Herramientas

the long edge of a flake, while nine examples exhibited use marks across the end of a broken flake.

Manos and metates (Fig. 58 and 59)

The collection excavated from Herramientas included a variety of tools associated with food preparation. Manos and metates were the most numerous of these, though anvils, nutting stones, and grindstones were also recovered. Ground stone axes and adzes, and fragments of these tools indicate agriculture through field-clearing, as well as suggesting woodworking. As at Vigilante Alta, all volcanic stone tools were acquired from the mainland. The absence of unworked fragments of volcanic stone among over 1000 fragments of unworked stone suggested that finished artifacts were brought in to the site.

Thirty-one mano fragments were encountered at Herramientas. As at Vigilante Alta, these were divided into two groups, those which were wider than the metates (overhanging-edge manos), and those that were equal in width or shorter than the width of the metate (straight manos).

Ten mano fragments had a swelled end, indicating they were wider than the grinding surface. The ends of these manos did not show pecking or battering use, though most had heavily worn use surfaces. Nine were oval in section and one was triangular in section from use of two adjacent rather than two opposing surfaces. One fragment of an overhanging mano 14 cm long was reused as a straight sided mano.

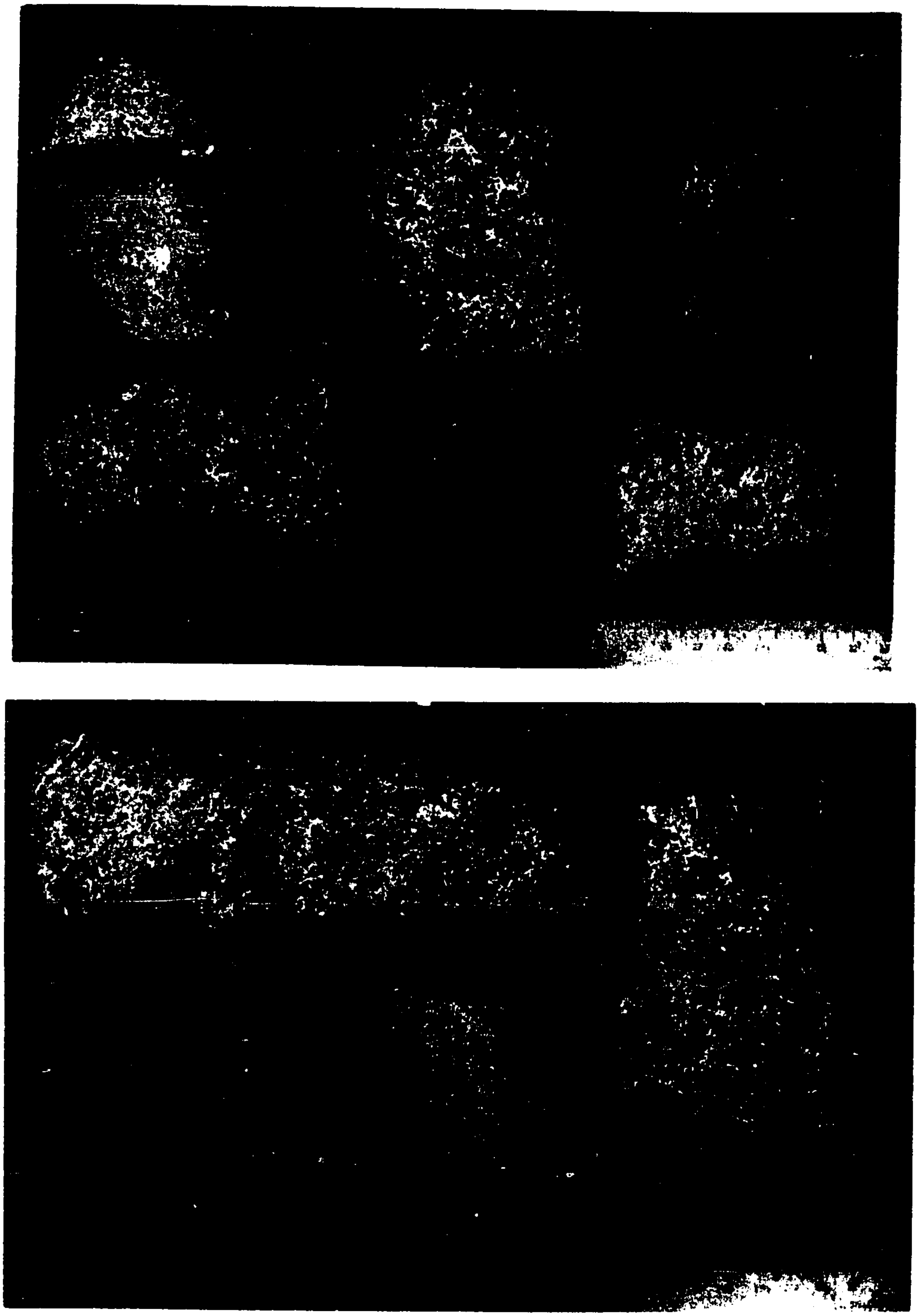

Figure 58. Manos, Herramientas.

The collection included one whole and 18 fragments of straight sided manos. All of these were made of porous andesite. Twelve included one end of the mano, and ten were battered on the end. In cross section, 14 were oval from wear on opposing surfaces, while fourweare triangular in section from wear on surfaces not exactly opposite one another. The single complete example was 18 cm long, and the fragments appeared to have been similar in size. Width ranged from 5.3 cm to 8.7 cm, and thickness from 2.7 cm to 7.1 cm depending on wear. Five of the fragments were reused, four as anvils or nutting stones, and two for battering, with pecked facets or indentations along the sides. Three fragments were made of denser andesite than the others. These were pecked on the end and triangular in section from use on three surfaces. They appeared to have been used in the same way as the other straight-sided manos.

Forty fragments of short legged, undecorated metates made of porous andesite were collected from Herramientas. Nine were leg fragments. Most of the fragments were small sections of shallow concave rectangular grinding surfaces which exhibitedg use polish on one surface. Ten small fragments had no visible use wear but were nevertheless believed to be metate fragments due to general size, shape, and material. As at Vigilante Alta, metates may have been used until they broke, and the fragments reused as manos, hammers, anvils, or nutting stones. The relatively low density showed that they were not among the most important tools, or

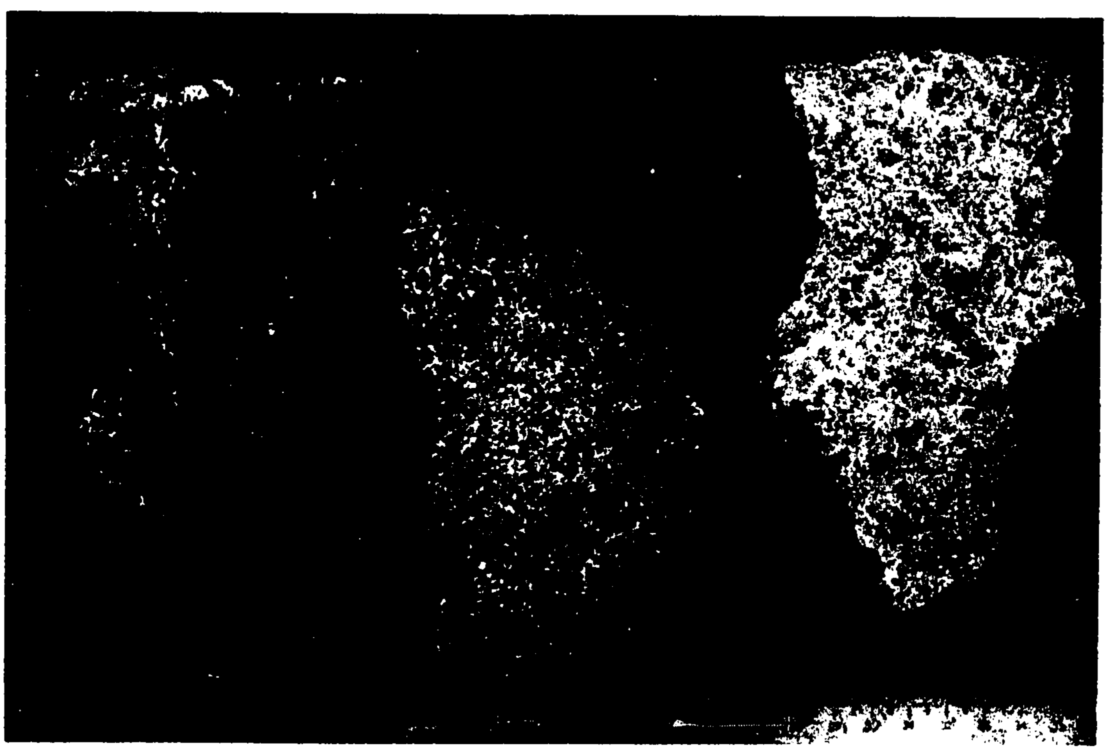

Figure 59. Metates, Herramientas.

that they were present in greater numbers when the site was occupied, and taken along when a group moved on to a new location.

"Average" density of mano and metate fragments in either prehistoric or historic agricultural communities has not been established. Such a calculation involves major supposition, though some index of grinding tools/unit population would be useful in archaeological interpretation. At Formative sites in the Valley of Oaxaca, for example, mano and metate fragments were recovered from all excavated household clusters (Flannery and Winter 1976:36). "While grinding stones . . . were common in households, it was decidedly uncommon to find them complete and in good shape" (ibid., 37), a situation similar to Herramientas. Winter suggested that in an area of about 300 sq m, a Formative household cluster in the Valley of Oaxaca might typically include "one house, two to six large storage pits, one to three graves, and various additonal features, separated from the nearest contemporary cluster by an open area of 20-40 m" (1976:25). At Herramientas there were at least ten clearings among shell middens (Fig. 20). Each of these open areas possibly provided a work space for one household. Total site area is at least 22,500 sq m, providing approximately 320 sq m per unit. If we assume that each household needed a minimum of one metate and one mano at any given time, then ten manos and ten metates would have been the minimum number of artifacts for grinding required during contemporaneous occupation of the entire site. It is also possible that the site was not occupied over its maximum extension at any one time, and that certain household clusters were occupied later than others. In this case the minimum number of metates and manos in use at any time would have been even lower. Though based on arbitrary parameters, this example shows that the presence of a "few" mano and metate fragments at a site has little bearing on the possible subsistence value of foods such as corn, processed by grinding. Erosion, too, may have played a part in the disappearance of metates from the site. Erosion of soil from the cleared area washed away the lightest particles first, leaving the heaviest surface deposits such as lithic artifacts. Surface collected artifacts, which included 33 mano fragments, and an equal number of metate fragments, were not included in this analysis, and would have doubled the number for the site.

Pestle (Fig. 60)

A volcanic stone pestle was recovered at Herramientas. Pecked and ground into shape, use facets from grinding and battering were visible on either end. The tool was 9.1 cm long, 6.6 cm wide, and 4.6 cm thick, oval to rectangular in section and resembled a blunt ground stone axe (see Ranere 1979:Pl. 15).

Hunting

Projectile points (Fig. 61)

Three fragments of cryptocrystalline projectile points

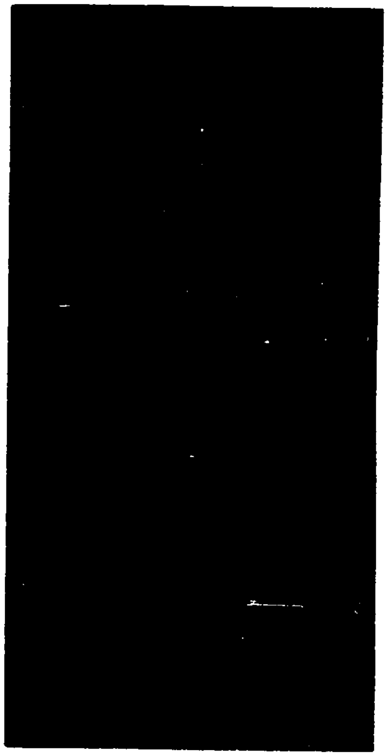

Figure 60. Pestle, Herramientas.

Figure 61. Projectile points, Herramientas.

were encountered in excavations at Herramientas. Two were tips, one of which was retouched (making it one of the few retouched tools in the collection from the site). The third was a flake slightly retouched to make notches for hafting. These points all appeared to be made on blades. Photomicrographs of unused and used arrowpoints show similar rounding through use on the tip and edges (Ahler 1979:310, fig. 5c). Two complete projectile points were surface collected. Both examples were flaked of silicified shale which can be found in the Sabana Grande formation (Teresita Aguilar, personal communication), which is exposed on Berrugate, Venado, and Bejuco Islands and on the Nicoya Peninsula. Both had notched bases, presumably for hafting and were similar to a point from the La Isabel site in the Atlantic watershed of Costa Rica (Snarskis 1978:270, fig. 175a).

Craft production

Pointed tools (Fig. 62)

There were 18 pointed flakes in the collection which were used as drills or gravers. Most were marked by use wear consisting of crushing and rounding at the tip and tiny flake scars 8-12 mm down along the edges from the tip. Only one example was distinguished by fine retouch along the curved dorsal edge. The blunted tip and blunting of the dorsal ridge on at least nine examples suggested some were used as drills and twisted in place, while the others were gravers. One fragment may have been a discarded attempt to make a retouched point. One pointed tool may have been made on a broken flake of heat treated material. Pointed tools could also have been used to make the beads and pendants of stone and shell recovered from the site.

Pebble Polishers (Fig. 63)

There were five pebble polishers from Herramientas. These were small, smooth pieces of siliceous stone with patina or facets from polishing. Ethnographic examples of the use of such stones for burnishing pottery vessels before firing are well established from the surrounding region. At Guaitil, modern revival of the hand-built pottery craft includes burnishing with pebbles, and on Chira the modern potter hunts for her burnishing stones at Herramientas, because those from indigenous sites are said to be best suited for polishing. Naturally, these are polishers which already have a smooth and glossy surface from their earlier use. They would need less "breaking in" than a beach pebble.

TABLE 3

PEBBLE POLISHERS, HERRAMIENTAS SITE

Location (Unit)	Length (cm)	Material
1	2.2	siliceous
8	3.4	flint
10	2.5	milky quartz
14	2.8	siliceous
Trench W	1.9	jasper

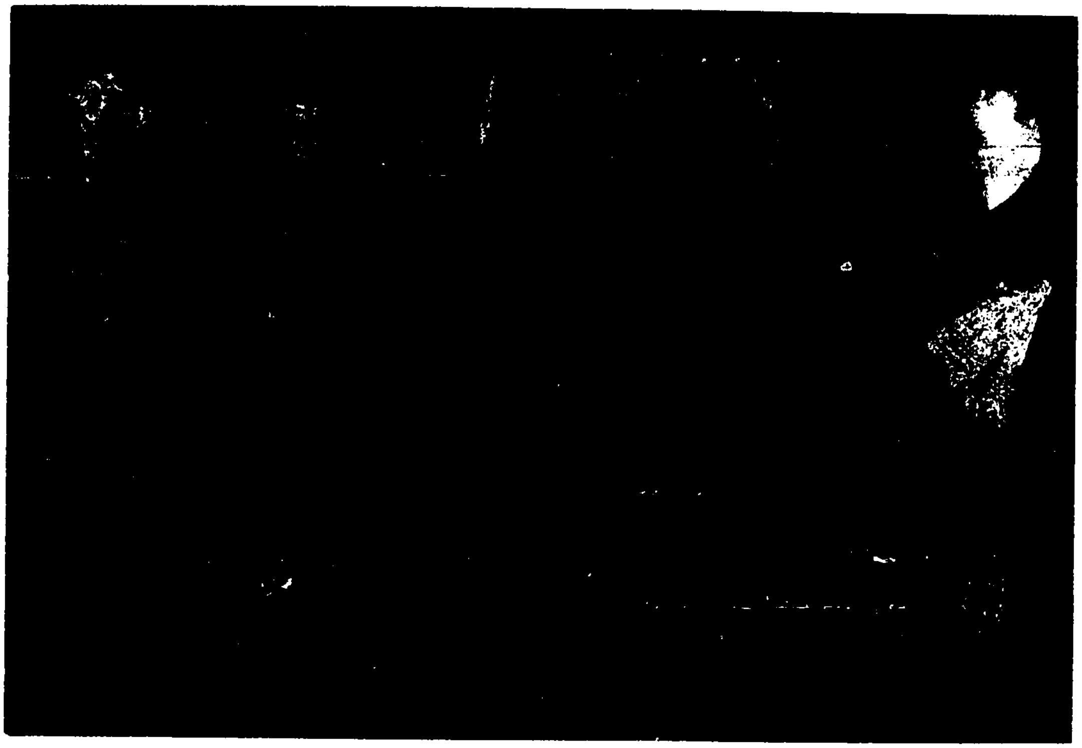

Figure 62. Pointed tools, Herramientas.

Figure 63. Pebble polishers, Herramientas.

Serpentine beads

Eight beads of highly altered serpentine were collected at Herramientas. Six of these were recovered from burials in the 6 x 12, while two others were recovered from midden samples. All the beads were tubular and were perforated by drilling from each side of the stone as shown by the narrowing of the perforation at the center of the bead where the holes met. Serpentine is found in northern Costa Rica, where it comprises much of the Santa Elena Peninsula (Dengo 1962:53). The formation bearing serpentine is restricted to Santa Elena, and is likely to have been the source of serpentine used in artifacts throughout the country.

Summary

Lithic artifacts from Vigilante and Herramientas included tools used in many facets of daily life, including field clearing, house construction, boat building, preparation of wooden implements, agriculture, hunting, and craft activities such as pottery- or bead-making. The greatest number of artifacts were multipurpose tools, hammer/anvils or hammer/core combinations, and simple flake tools used for cutting or scraping. These all suggest simple technology was employed in all locally made tools.

Greater effort was represented by carefully shaped projectile points and the flaked chisel from Herramientas, and by tools shaped by multiple processes such as the ground stone tools which were shaped by flaking and finished by grinding. Blade production, the most sophisticated technology evident in the lithic collections, was displayed in a single specimen of an obsidian blade, which was obviously imported.

The majority of tools were related to subsistence pursuits although many classes of tools could not be assigned specific functions. Tools were not identified with fishing, yet faunal remains indicated that fishing was an important part of subsistence. Fishhooks (Baudez 1967:Pl. 47h, i) and stone net sinkers (Einhaus 1980:459) are the kinds of artifacts most clearly identified with fishing. In a locale where hook and line predominated, and where composite hooks of wood or bone were used, there may have been few identifiable remains of fishing. Knives used for scaling and cleaning fish probably could not be distinguished from knives used in other ways. Thus while the residents of both sites were most probably engaged in fishing activities, these activities were not clearly reflected in the lithic remains.

Evidence of craft production was limited to a few artifacts, including shell beads and pendants, and ceramics. Workshop areas were not isolated and it appeared that casual craft production took place rather than any kind of full or part-time specialization. Many lithic artifacts were brought to Vigilante Alta and Herramientas, and based on the low density of naturally occurring materials it is highly unlikely that stone tools were exported from the islands. It is fairly clear from the lithic analysis that foodstuffs and craft items for export were produced, procured, and processed with the use of a wide variety of stone tools.

CHAPTER 7

CERAMICS

The analysis of ceramics from Vigilante Alta and Herramientas used existing types and varieties to identify and compare ceramics of the gulf region with materials from other regions (see Appendix 2). Two methods of analyzing pottery have been employed in Costa Rica, modal analysis (Accola 1978, Snarskis 1978), and Type-Variety (Baudez 1967, Lange 1971, Sweeney 1975).

Modal analysis offers the advantage that modes, which may be single attributes or groups of attributes, can be used to separate classes or types of artifacts without these classes being mutually exclusive (Rouse 1960). Types established by modal analysis therefore may be more accurate constructs in theoretical terms than types resulting from other analyses. Modal analysis also elucidates more clearly continuity of types through time and space, and this can be useful in studying the development of a site or a region over time.

The ceramics from Vigilante Alta and Herramientas were grouped according to criteria of the Type-Variety system of ceramic classification. This was done in order to separate discrete groups of sherds into classes that could be compared with existing chronological sequences and compared interregionally, as well. However, Type-Variety is a taxonomic system and by definition membership in the different categories is mutually exclusive. Also, intergradation of ceramics in Greater Nicoya makes such a classificatory system difficult to adhere to when sorting sherds. In establishing limited classes, furthermore, pan-regional or enduring modes may be obscured (Snarskis 1978:47).

According to the Type-Variety system, types of ceramics are distinguished by groups of attributes such as decoration, temper, surface finish, and form to define groups which were limited both spatially and temporally (Sabloff and Smith 1969:283). Individual types then, include one kind of ceramics from a single phase, and can be valuable for making regional comparisons. At Vigilante Alta and Herramientas, which were both single component sites, we were interested in relating the ceramics to those from other contemporaneous occupations. For this purpose the Type-Variety system appeared advantageous.

Analysis of the excavated ceramics from the two sites is presented in the format used by Healy (1980, after Sabloff 1975) which includes criteria of paste, temper, firing, form, decoration, intra- and inter-site contexts, and the principal modes, which are limited to decoration and vessel form. Existing types and varieties are used to make comparisons between the gulf and other subregions of Greater Nicoya.

Both sites yielded substantial collections of ceramics. From Vigilante Alta 13,030 fragments were recovered, of which 570 were decorated. At Herramientas 48,749 sherds were recovered, of which 4,304 were decorated. This relatively high percentage (8.8%) of decorated sherds is deceptive, however, since it includes the materials taken from the test trenches where decorated ceramics were selectively collected. Excluding these test trench collections, only 6.7% of the Herramientas ceramics were decorated. This is only slightly higher than the frequency of decorated sherds reported at other sites in Greater Nicoya, where the percentage of decorated ceramics rarely exceeds 5% of the excavated sample (Accola and Ryder 1980, Lange 1978a:112). The overall density of sherds per square meter of excavation is similar at both sites, 259 sherds/m sq at Vigilante Alta and 240 sherds/m sq at Herramientas.

The analysis of the excavated samples of ceramics included variables of size, shape, paste, firing, surface finish, and decoration. Whole examples of vessels were especially useful in relating size, shape, and decoration on fragments to whole vessels. Few whole vessels were recovered at the sites tested, and examples in public and private collections were used for comparative purposes. The National Museum of Costa Rica, the Instituto Nacional de Seguros, and private collections (Day 1980) provide many fine examples of polychrome vessels, though ceramics decorated with incising or plastic decoration are both less well known and not well represented in study collections.

Size of vessels was determined by direct measurement on whole vessels and by calculating interior rim diameter using a chart marked with concentric circles ranging from 6 cm to 50 cm. At the same time the arc of the fragment was measured and fragments including less than 5% of the total rim were not included in calculations of vessel sizes, since they were less likely to be accurate. A problem with this method of measuring vessel size is the effect of vessel shape on rim diameter. Restricted mouth vessels measured by rim diameter, distort calculations of vessel size since rim diameter is smaller than the diameter of the body of the vessel. Too few whole vessels were recovered in the excavations to determine the relationship of rim diameter to maxiumum diameter of a vessel.

Shape was determined from the whole vessels and from rim profiles. Again, fragments comprising less than 5% of the rim of a vessel were not included in calculations of vessel shape as it was likely that the fragments would not be oriented correctly. The most frequent point of confusion in vessel shape was provided by fragments which were broken in such a way that they could have been part of a bowl, or of a restricted mouth jar. Also, the frequency of tripod vessels was impossible to estimate from a fragmented sample such as this one.

Paste was examined on a sample of 299 undecorated sherds from Vigilante Alta and 490 from Herramientas. Paste of all decorated sherds were also examined. Criteria measured were color of paste, texture, temper, and oxidation. Color of paste was determined with the aid of a Munsell Soil Color Chart (Munsell 1942). Texture was used to separate fine, medium, and coarse grained paste. Temper was divided into shell tempered, grit, and grog (crushed pottery) tempered groups. Without petrographic identification, differences in non-shell tempers are difficult to distinguish. This is especially true of ceramics from gulf sites, where most ceramics appear to have been made of similar materials. Sherds tempered with shell and with grog are distinctive and scarce. Degree of oxidation, firing, of pottery was also divided into three groups. Completely oxidized sherds are the color of the fired paste throughout the body of the sherd. Incompletely fired sherds have a core of gray or black, and poorly oxidized sherds are gray or black throughout. Paste color of these sherds is not determinable, for surface color may be due to oxidation while the core color a result of reduction (Shepard 1954:106).

Surface treatment and surface appearance describe the condition of the vessel at the end of the manufacturing process: the smoothness of the surface, slip present and its color, and differences in treatment between interior and exterior surfaces. Surface treatment refers to the condition of the surface: granular, wiped, scraped, or slipped and whether this treatment covers the entire vessel, or only one surface or part of a surface. Surface appearance describes the luster of the fragment. No luster includes unslipped sherds, whether eroded on the surface, wiped, or scraped (ibid., 189). Low luster includes self-slipped, and slipped vessels having a smooth finish, due to polishing the surface (ibid., 192). Self-slip refers to slip prepared from the same clay as the body of the vessel, rather than slip prepared of other materials. High luster includes vessels slipped and polished which retain their luster after firing.

Attributes used in the analysis of decorated ceramics include technique, location of decoration on the vessel, and motif. In the two collections decoration included three techniques: paint, applique, and incising. Also at both sites painted ceramics were all polychromes and could be related to existing ceramic classifications from Greater Nicoya and other parts of Costa Rica. Since few painted ceramics were recovered from the excavations and these seemed to have been brought in from other areas, the use of existing typology seemed valid.

Overall, few new varieties have been established by this study due to the small size of the sample. There did not seem to be an advantage to breaking down each of the types into a series of subdivisons. For example, while the incised ceramics might have been divided into several varieties, a preliminary analysis showed that all designs were variants of a single motif, and no significant clustering of the variants was detected. Since one of the goals of the project was to determine the degree of similarity between the island sites and other sites in Greater Nicoya, similarity rather than differences of decorated types were stressed.

Further excavations on islands in the region will be needed before inter-island variation in ceramics can be detailed. As the first step in studying the ceramics of this region it has been preferable to identify types which may be recovered from all parts of the gulf and indicate local variations only when they can be clearly distinguished. These broad groupings will be refined by subsequent work.

Incised and applique decorated ceramics

A greater proportion of the decorated ceramics recovered from island sites have incised and applique decoration than ceramics recovered from other Late Polychrome period sites in the Greater Nicoya Archaeological Subarea. Until recently, monochrome decorated ceramics have received little attention, and their chronological placement, development, location of manufacture, and iconographic content are just beginning to be examined. At Vigilante Alta and Herramientas the incised and applique decorated ceramics were quite similar and there was substantial overlap in both decorative modes and motifs.

Incised ceramics can be divided into two classes based on the shape of incising. Fine line incised, or Tempisque Incised (Baudez 1967:170), and short broad line incised or impressed, Princesa Incised Rim (ibid., 150), occurred separately on most vessels, and together on a few examples. Applique decoration is a technique which often overlaps with broad line incising, and one example from Herramientas included all three modes of decoration (Fig. 64). This occurrence emphasizes the contemporaneity of the types mentioned, which all have been placed in the Murrillo Ceramic Group.

The development of Murrillo Applique, the best known of the Late Polychrome period decorated monochromes, remains somewhat enigmatic. Prior to the Late Polychrome period applique types included only Potosi Applique (Baudez 1967:171, Norweb 1964:559); however, undecorated ceramic types span the prehistoric record, and many of these, including Monte Cristo Beige (Baudez 1967:55), Chaparrita Red (ibid., 57), Yayal Brown (ibid., 114), Nautilus Brown (ibid., 123), and Danta Beige (ibid., 156) were described as having applique decoration as a minor mode. The Late Polychrome period decorated monochromes may have developed from these earlier types, as applique decoration became more prominent as a design feature.

Greater Nicoya has produced monochrome decorated and applique ceramics throughout the known cultural sequence, and it is possible that clues to local development have been overlooked for several reasons: 1) lumping of applique decoration as a variation within plain ware types, 2) detailed study of polychrome ceramics without corresponding

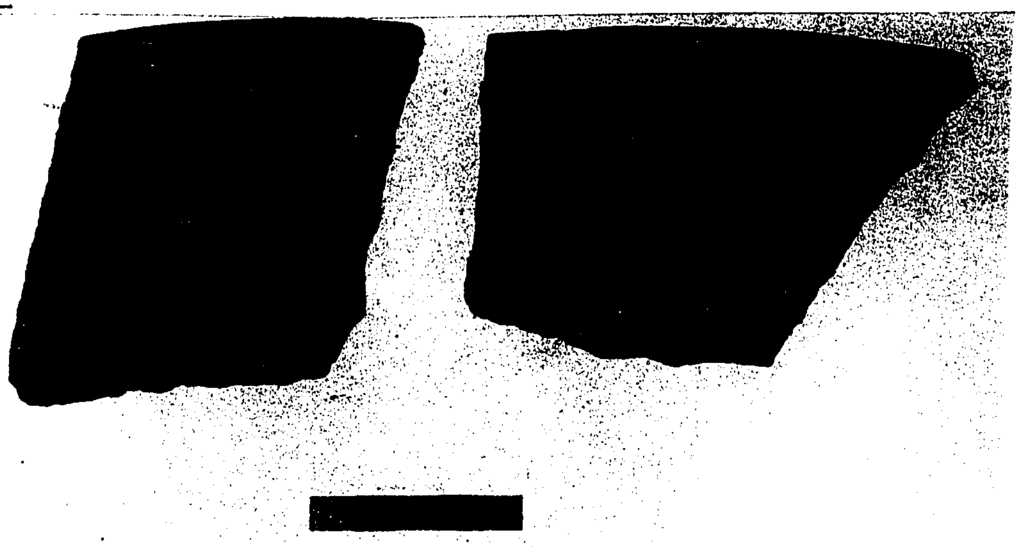

Fig. 64 Sherd Decorated with applique, fine- and broad-line incising

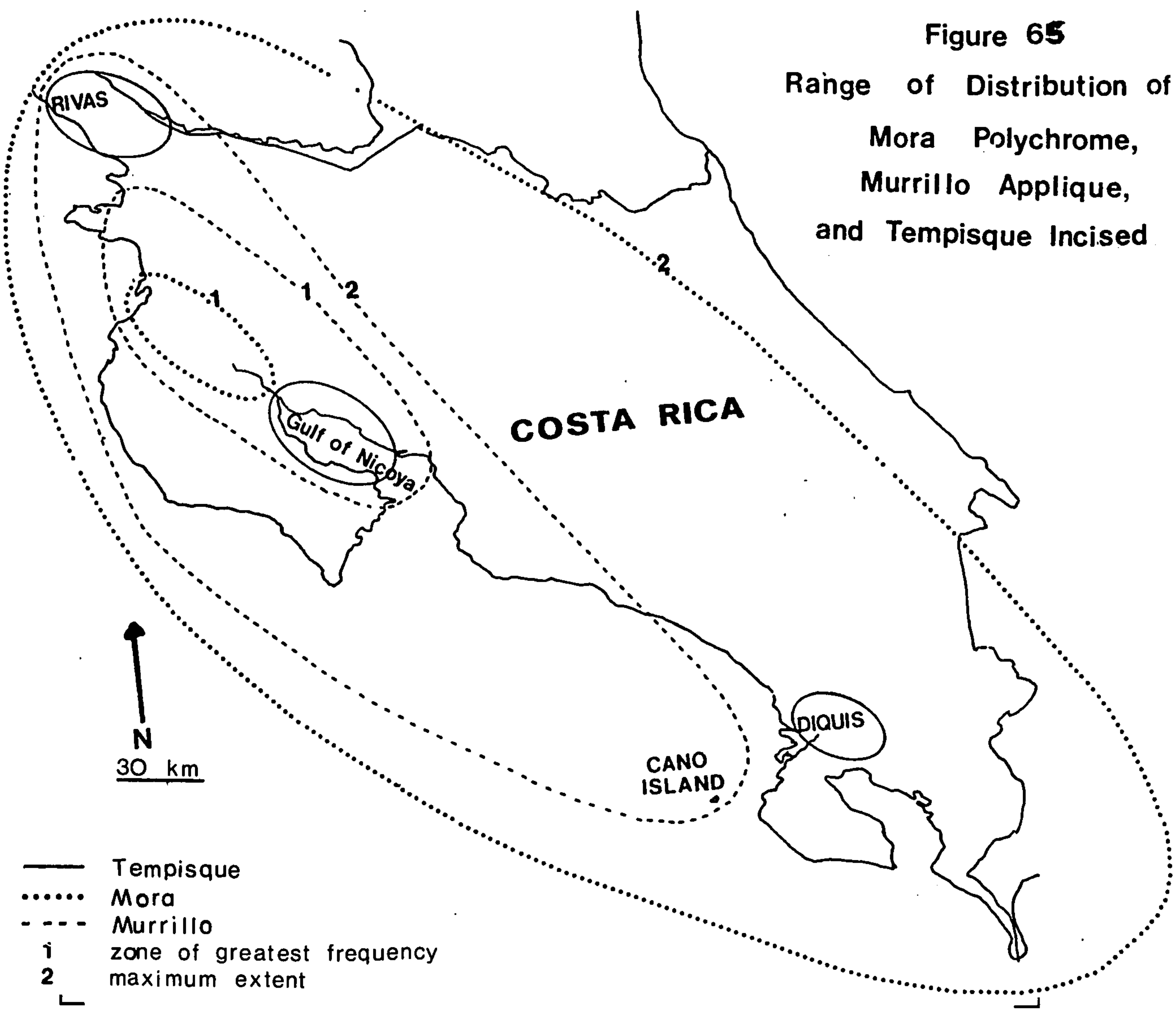

Figure 65
Range of Distribution of Mora Polychrome, Murrillo Applique, and Tempisque Incised

study of incised, applique, and plain ceramics, 3) incomplete analysis of key sites such as Hacienda Mojica, in the possible developmental sequence. 4) lack of detailed restudy of Lothrop's Chocolate Ware (1926:227 ff.), a ware which spans a long period of time and a large geographical area, and includes a wide range of vessel forms and decorative techniques. Some of these problems can be remedied more easily than others.

For example, zoomorphic applique was employed on ceramics throughout the Greater Nicoya sequence. From the Zoned Bichrome period, vessels of Rosales Zoned Engraved (Baudez 1967:68) are often zoomorphic in shape or have zoomorphic adornos along with incised decoration (Stone 1977:38-39, Fig. 39) (A frog effigy vessel misidentified as from the Zoned Bichrome period (ibid., 42), is an example of Murrillo Applique). The tradition of effigy vessels continues into the Early Polychrome period (ibid., 66). Burnished, modeled monochromes, reminiscent of later Murrillo Applique surface finish, are known (Benson 1981:nos. 67,68), while incised anthropomorphic and zoomorphic forms are not uncommon (ibid., nos. 54-66). During the Middle Polychrome period paint replaced incising in many cases, while zoomorphic adornos, vessel supports and figurines continued to be common (ibid., 1981:194-196, Stone 1977:74-75).

There was a tradition of both monochrome burnished vessels and of applique decoration which has been overshadowed in terms of the attention of researchers by the more spectacular polychrome painted tradition. The zoomorphic applique monochromes also come both before and after polychromes. Antecedents in form and technique may be sought in south Costa Rica and in Panama where similar ceramics have been noted and where the prehistoric record has been demonstrated to have greater time depth than thus far has been shown for Costa Rica. The extent of local development of applique monochromes in Costa Rica should not be underestimated. If indeed such types were widely developed locally they should be homogeneously distributed throughout Greater Nicoya and not concentrated in particular areas or sites. Consequently, broad ceramic types which have been given specific names in certain areas cannot be used to demonstrate diffusion. For example, there may be quite similar incised and applique monochromes which have been assigned labels such as "Castillo Engraved" or "Lago Black Modeled" in Nicaragua, "Chocolate Ware" in Diquís, and "Tempisque Incised" and "Murrillo Applique" in the Gulf of Nicoya. In other words, types which have been called "intrusive" during the Late Polychrome period may simply be locally developed variants of a single broadly dispersed general type.

Polychrome ceramics

One polychrome ceramic type dominated the small collection from the sites tested. I call it Black and Red on White slip Polychrome to show that it cannot be placed conclusively in an existing type description, due to the small sample size. (25 sherds, 4% of the decorated sherds from Vigilante Alta, and 118 sherds, 2.7% of the sample from Herramientas.) There are numerous similar polychrome types established for Greater Nicoya and for other regions in Costa Rica, and to place the sherds into one of these types, a larger sample was needed. The presence of polychrome ceramics, obviously not made on the islands, however, did show that the inhabitants of each site were in contact with their polychrome producing neighbors to the north and south.

Ceramic production

Based on the accounts of Oviedo (1976:453) Chira appeared to be a likely spot for the production of monochrome ceramics, such as Murrillo Applique (Lange 1981b). This impression was reinforced by the quantity and homogeneity of monochrome ceramics recovered at Herramientas, and by the work of a modern potter on Chira who used clay from the site.

Excavations yielded large numbers of sherds, many of which were of similar material, similar in grit temper, color, and consistent in decorative traits--all indicators of possible local ceramic production. Testing, however, yielded no features which unequivocally substantiate this possibility. Indirect evidence included three pebble polishers, a possible smudge pit, and the knowledge that kilns were not essential features of ceramic production. The quantity and uniformity of material suggested that types such as Toro Applique, Combo Colander, Tempisque Incised and

Murrillo Applique may well have been made on Chira, if not at the Herramientas site, and rim modes such as Princesa or Gulf Incised rim may have been hallmarks of Chira's production. It will take further testing, however, to come to a positive conclusion about ceramic production on the islands.

<u>Exchange of ceramics</u>

At many sites the presence of sherds or vessels likely to have originated in another place prompts discussion of trade. Yet the nature of the exchanges by which ceramics circulated through Greater Nicoya, whether through reciprocal exchange among kin groups, redistributive processes controlled by local chiefs, or market place exchanges, has barely been explored.

One method of exchange, redistribution, can be examined through the distribution of ceramics recovered from the gulf sites and elsewhere. Three types can be used in illustration, a monochrome (Murrillo Applique), an incised type (Tempisque Incised), and a tan-orange slipped polychrome (Mora Polychrome). The first two were recovered from both Vigilante Alta and Herramientas, while Mora was only recovered from Herramientas. The distribution information for each type is based on a variety of survey and excavation data from the gulf and elsewhere, and the observed patterns remain to be confirmed by more extensive survey and testing. (Fig. 65 shows the known range of each type.)

1. Murrillo Applique has been recovered from the Rivas region (Healy 1980:133, Lago Black Modeled) to Caño Island

(Honetschlager and Finch n.d.). The zone of greatest frequency lies between Las Marias in the Bay of Salinas to Herramientas and Vigilante Alta. Murrillo appears as a diagnostic type in Late Polychrome period sites throughout the gulf region and Greater Nicoya. Brown Ware from the Diquís region shares some similarities in applique decoration (Lothrop 1963:fig. 29) to Murrillo. Vessels with form and decoration similar to Murrillo also have been recovered from the Pearl Islands of Panama (Linné 1929:fig. 17), from the Pacific coast of Panama in the Darién (ibid., fig. 44 H-M), in Colombia (ibid., fig. 55G), and on the Gulf of Urabá (ibid., fig. 2). These are not Murrillo Applique, however.

2. Tempisque Incised is known from Toro Island at the mouth of the Tempisque River (Baudez 1967:Pl. 47) to the Diquís Delta (Lothrop 1963:fig. 20, Chocolate or Brown Ware), with the greatest known frequency at Vigilante Alta and Herramientas. Tempisque Incised may be found as far north as Nicaragua. Healy assumed that it was identical to Castillo Engraved (1980:97), but material from the gulf islands revealed differences in execution, vessel forms, and variety of motifs (extremely limited in the gulf). Thus, reconsideration of the relationship between the two types is necessary.

3. Mora Polychrome has been recovered from the Rivas region of Nicaragua (Healy 1980:152) to the Central Highlands, and the Atlantic watershed of Costa Rica (Snarskis 1978:263, Snarskis and Blanco 1978) and as far south as

western Panama (Einhaus, personal communication). Mora is among the most frequent polychrome types at Middle Polychrome period sites between the mouth of the Tempisque River and the Bay of Salinas. Outside that zone, Mora is usually in mortuary contexts (Lange n.d., Snarskis 1978:263, Snarskis and Blanco 1978).

The available data show a zone of production (supply zone) for each type, with corresponding high frequency of the type in that zone. Murrillo Applique and Mora Polychrome are also found in a wider area where they are represented by small numbers of sherds (falloff zone). Tempisque Incised, if it is found to be the same as Castillo Engraved (Healy 1980:97) may have had multiple centers of production in Nicaragua, in the Gulf of Nicoya, and in south Costa Rica. From this data it can be hypothesized that the distribtuion of Tempisque Incised represents reciprocal exchange, while the distribution of Murrillo Applique and Mora Polychrome represents redistribution. Reciprocity is reflected by the frequency of distribution of Tempisque Incised, which decreased steadily with distance from the source of materials (in this case multiple sources), resulting in several nodes of high frequency and lower frequency in the intervening regions.

In contrast, the redistribution of Murrillo Applique and Mora Polychrome is reflected in the restricted flow of these types outside their supply zone. This would appear to correspond to the pattern which would be expected if commodities were flowing to and from a surrounding region via a central place (Hodder and Orton 1976:146). While procurement of unrestricted resources is limited only by distance from the source(s) of raw materials redistribution serves to restrict the flow of goods outside the zone of production or control. The raw materials for ceramics may have been consistently available within a limited region, leading to territorial control over their acquisiton and dispersal:

> In a territorial system . . . resources are owned by specific groups, for whom they are available by direct access, and therefore they are relatively low in cost. But they can also be obtained by outside groups through the more costly process of trade (Bettinger 1982:112).

In the case of the gulf region and Greater Nicoya ceramics, the dispersal of goods made within distinct zones is proposed to have been controlled by a small group or by a single individual. The pattern of finds of ceramics is one that can be tested for its fit with mathematical models of redistribution. Goods being distributed are concentrated around a supply zone or region of origin. At the boundary of this zone, the frequency of these types would decline rapidly in the falloff zone, yet would continue to be present in low frequency beyond for a distance determined by its desirability in exchange (Hodder and Orton 1976:152-153). This pattern of high frequency of ceramic types in certain regions and low frequency over a greatly extended area, seems characteristic of the types mentioned, Murrillo Applique and Mora Polychrome. Exchange of ceramics beyond territorial borders may have been undertaken also for symbolic reasons, e.g. marking alliance, trade partnership, dominance or subjection.

CHAPTER 8

AQUATIC AND TERRESTRIAL FAUNA

Test excavations at both Vigilante Alta and Herramientas yielded a wide variety of marine and terrestrial fauna, which provided food, and may have provided products for exchange. To evaluate the relative importance of fauna we need to know whether shellfish, land animals, or fish provided the mainstay of the diet at each site.

The sites consisted of middens arranged around clearings, spaces relatively free of artifact debris, where houses may have stood. At Vigilante Alta we tested one large midden in two places to collect samples of fauna. At Herramientas we collected faunal samples from 14 excavation units in five different middens. The three largest samples from the site and one of the samples from Vigilante Alta were analyzed in detail.

Middens consisted of shell mixed with sherds, dirt, bone, and rock. Bone and shell were analyzed separately. Each sample from a single level of Herramientas was derived from one-tenth cubic meter of midden. Collections from Vigilante Alta were extracted from one-twentieth cubic meter of midden. Therefore, percentages of faunal species can be compared between sites, while absolute numbers of specimens cannot be related without adjustment for sample size.

Shellfish

Shell was separated into groups by species. For each species we counted whole shells or valves and fragments including the hinge. After counting we discarded all but a representative sample from each level. This technique proved effective for onsite recording and reduced the weight of bags that had to be carried back to camp, a necessary consideration on an island where two vehicles serve the population of 1000. The advantages of weighing shell samples in addition to counting them now seem desirable, however. We would have been able to calculate relative size of individuals and the ratio of meat to shell (Borgogno and Linares 1980:220, Wing and Brown 1979:139).

Shellfish samples from both sites probably under-represent molluscs having laminate shells, including oysters, *Ostrea*, mussels, *Mytilla* and *Modiolus* and pen shells, Pinnidae, all of which seem to disintegrate rapidly. In the excavation units where shell was densest we noticed powdery crushed shell comprised much of the loose fill. Closer examination of this material and the contents of preserved valves suggested that this glistening fill was largely laminate fragments. In *Mytilla* and *Modiolus* the hinge is small and may not have preserved any better than the body of the shell.

Subsistence

At both sites four species make up more than half the shellfish sample.

TABLE 4

MOST FREQUENT MOLLUSC SPECIES

Herramientas	Vigilante Alta
(Most Frequent)	
Anadara tuberculosa	*Protothaca asperrima*
Protothaca asperrima	*Anadara tuberculosa*,
Ostrea corteziensis	*Chione subrugosa*
Chione subrugosa	*Ostrea corteziensis*
(Least Frequent)	

The four species are all bivalves which live on muddy substrate such as mangrove and tide flats. At Herramientas, over half the species identified are mud-dwellers, while at Vigilante Alta more than half are species which live on sandy or rocky substrate. Many of the larger gastropods including the murex or rock shells (*Hexaplex and Muricanthus*), tun, *Malea ringens*, conchs, *Strombus*, Panamanian pearl oyster, *Pinctada mazatlanica*, and jewel box, *Chama*, live on sandy or rocky bottom below the tide line, making them more difficult to collect than species which are regularly exposed at low tide and can be collected without nets or diving. The ark shells, *Anadara*, and oysters, *Ostrea*, are sessile species, living in colonies or beds, a characteristic which makes them easier to collect than perambulating species.

Though four species seem to have been heavily exploited at the sites tested, many other species of shellfish were collected. A greater variety of species are present in the samples from Vigilante Alta than from Herramientas; when all the molluscs in one unit (50 cm x 50 cm x 100 cm) were identified, 66 species were noted. Tiny gastropods including horn shells, Cerithidea valida, Pacific fly-specked cerith, Cerithium stercusmuscarum, thais, Thais kiosquiformis, and moon snail, Polinices, may form a numerically large portion of the samples, up to 53.74% in Unit 8, level 2 at Herramientas (Appendix 5).

These were probably incidental species, however, collected along with larger individuals which provided more meat per individual. If molluscs were carried to the site in bags, bowls, or buckets, the smaller individuals may have been included. Tiny gastropods may have been eaten even though individually they have minimal food value (J. Zeitlin 1978:156). Along the Atlantic coast of Panama, modern inhabitants of rural areas harvest shellfish of all sizes, including sea snails and chitons, during the latter part of the dry season when all sources of food become scarce (Patricia Drolet, personal communication).

The species recovered in our samples do not include all molluscan species which have been observed in midden fill and on the beach near each site. We collected both Pacific Lion's Paw, Lyropecten subnodosus, and Pacific thorny oyster, Spondylus princeps, from the midden surface at Vigilante Alta, and observed examples in unsampled midden. These two species are distinctive large shells; other minor species may have been overlooked as well, as samples of heterogeneous fill fall short of collecting every species at the sites. Borgogno and Linares note similar sampling problems in midden from coastal sites in Panama (1980:217). Sites in and around the Bay of Culebra including Ruíz (Lange 1980b), Sardinal and Hunter-Robinson (Moreau 1980), Nacascolo (Love, personal communication), Vidor, and Monte del Barco (Accola and Ryder 1980), have yielded large and varied collections of molluscs. These provide substantial comparative data and crosschecks for the range of species found in coastal waters.

Of the 12 largest species encountered in samples from the gulf region, half live on rocky or sandy substrate, half on muddy substrate, and most live constantly submerged. This suggests selection for large individual molluscs, probably by diving, although the large individuals are numerically a small fraction of the total collected. Samples of molluscs from the sites near the Bay of Culebra yielded nearly as long a list of species present as at Vigilante Alta and Herramientas. Strombus appears to have been the major genera exploited at some Bay of Culebra sites; these are ambulatory, rock-dwelling species found below the tide line. Hexaplex and many of the minor species identified in the Hunter-Robinson and Monte del Barco samples also live under such conditions, and at both these sites diving for shellfish is suggested as the principal method of procurement (Accola and Ryder 1980:75, Moreau 1980:117). At IS-11, Las Secas, in the Gulf of Chiriqui, most mollusc species recovered live in completely marine, rocky or sandy habitats (Linares 1968:72). The presence of Pacific wide-mouthed purpura, _Purpura patula pansa_, one of the dye-producing mollusc species, was noted at Las Secas (ibid., 71).

Vigilante Alta shares some similarities with the sites mentioned above. Its location at the mouth of the gulf, away from the silty runoff of the Tempisque River, results in a greater proportion of its coast having rocky or sandy habitats than Herramientas, which is surrounded by mangrove and tidal flats. This microenvironmental contrast between the sites resulted in the acquisition of different mollusc species by the inhabitants of each site. Although the principal species are similar between the sites, a greater proportion of species from Vigilante Alta includes marine and rock dwellers than from Herramientas. Species found exclusively at Vigilante Alta include _Pinctada mazatlanica_, and the murex family, the Muricidae. This suggests that on San Lucas there may have been specialization by diving.

Sites possessing an inventory of species similar to Herramientas include Vidor (Sacharow 1973) and Puerto Culebra (Turpin 1978) in the Bay of Culebra (Accola and Ryder 1980:75) and IS-7, Isla Villalba, in the Gulf of Chiriqui, which is similar to Herramientas in its island location and likely participation in exchange. At IS-3, La Pitahaya, in the Gulf of Chiriqui, also similar in its island location and participation in exchange to Herramientas, Linares noted near absence of mollusc shell and concluded molluscan fauna played little part in subsistence at the site (1968:69).

It has been assumed that molluscs were an important part of the diet at coastal settlements from the size and number which make up shell middens, and recent studies of faunal remains have attempted to show the contribution of fish, reptiles, and animals prehistoric diet (Borgogno and Linares 1980, Osborn 1977, Wing 1978:Table 2, Wing and Brown 1979). One way the relative importance of molluscs can be shown is by graphically illustrating the meat available from each species (Stark 1977:190). Such comparison, while imprecise, adds to our understanding of the role of shellfish in the diet. The meat component is an approximation, based on the average size of each species (Abbott 1974, Keen 1971) and arranged in rank order, with adjustment for the number of bivalve fragments recovered (Appendix 5). Large molluscs yield far more than small species, and the numerous tiny snails such as Cerithium appear to have contributed little to the islanders' diet.

Only a few crab claws hint at the presence of crustaceans in the aquatic faunal sample from the islands. The absence of such remains is probably due to differential preservation, as the chitinous exoskeletons of these species are thin and may not preserve well (Voorhies 1976:52). At the present time crab is rarely eaten by the modern population of the gulf, and some consider crabs poisonous, which they may be in zones of modern water pollution. Filter-feeders such as shrimp and lobster are inhibited by sediment from runoff, and by lowered salinity in the gulf compared to the open sea. Gulf waters have been uninhabitable by coral and coral reef dwelling marine life since at least the start of the twentieth century (Pallant 1981). Though molluscs, crustaceans, and fish may have been dried as an exchange commodity, there is no direct evidence for trade in marine foods. Though dried shrimp are a product of Costa Rican waters today, shrimping is industrialized and not practiced by subsistence fishermen. Small-scale production or trade in dried shrimp is not now found in the gulf region.

Both Vigilante Alta and Herramientas sites' inhabitants exploited molluscs along with other marine and terrestrial fauna. The size of the shell middens, the variety of species recovered in them, and the food value they represent suggests that molluscs formed a consistent part of the diet. Shellfish were not necessarily the largest component of the diet though they may have been an indispensible one, at least seasonally.

Molluscan products not related to subsistence

When European explorers reached the Pacific coast in the sixteenth century, they made more of pearl fishing than of oyster harvesting for food, even when they were often in need of food supplies. Balboa named the Pearl Islands of Panama "Isla Rica" without having visited them, based on reports of pearls told to him by Indians he met on the mainland (Linné 1929:63). In the Gulf of Nicoya the emphasis was also placed on pearls and not on oysters on the half shell: "In these islands there are pearls, I have seen them on Chara and Chira and Pocosi and I have taken them from some of the oysters the Indians brought us to eat" (Oviedo 1976:184).[1] Further, "on the island of Chira a rancher for Pedrarias Davila, who governed the region at that time, had more than three ounces of pearls" (ibid., 453).[2] Fray Augustín de Ceballos noted similar abundance: "There are many fine pearls, and I have seen many of great value among the Indians of Nicoya" (March 10, 1610, in Peralta 1883:704).[3] European explorers appreciated nacreous shell as well as the pearls it contained: "These shells are beautiful on the inside, and lustrous, they glisten like the shells of pearl oysters" (Oviedo 1976:120).[4] "The shells in which they grow [pearls] are beautiful and very large, and I took some from these same islands to Spain"(ibid., 453).[5] Along with oyster, the colored shell of the thorny oyster, Spondylus

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1 "En estas islas hay perlas, e yo las ví en las islas de Chara é Chira é Pocosi é las saqué de algunas hostias que los indios nos traian para comer".

2 "Y en la isla de Chira tenia un estançiero de Pedrarias Dávila, que aquel tiempo gobernaba, más de tres onças de perlas e aljóphar".

3 "ay grandissima suma de perlas y muy finas, y he visto muchas y de gran valor entre los yndios de Nicoya".

4 "estos nacarones por de dentro son de hermosa vista y lustre, e resplandescen como las hostias de las perlas".

5 "las conchas ó nácares en que se crian [las perlas], son muy hermosas é muy grandes, é yo llevé algunas de las mesmas islas á España".

calcifer, and Spondylus princeps, has been used to make beads, pendants, and for inlay throughout Precolumbian times, often transported far from the coasts where it was fished. Pacific coast shells used in ornaments have been recovered from the gulf sites, from Nacascolo (Gutierrez, personal communication), from the Cruz site on Ometepe Island (Healy 1980:291), sites on the Isthmus of Tehuantepec (R. Zeitlin 1978), and from coastal Guatemala (Pires Ferreira 1976:322). Cut fragments indicating shell working with imported materials have been recovered from the Maya area (Feldman 1974), the Valley of Mexico (Millon 1981:227), and Formative sites in the Valley of Oaxaca (Pires-Ferreira 1976:313).

An account of mollusc collecting in the Nicoya region in 1803 shows it was a seasonal task:

> There are various sand bars and small islands which are revealed by the falling tide, and this is the time when pearl fishing takes place, because it is easier to approach the hollows where they live and to more easily find the shells . . . the months of January, February, March, and April are those during which one must fish, as one cannot do this in the other months for the many rivers and estuaries [whose runoff clouds the waters] (Fernandez 1976:vol.3, p.128).[6]

This shows that pearls may have been gathered without div-

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6 "Hay varios arenales é islas pequenas que se descubren en las vaciantes ó vajas del Mar, siendo el tiempo en que se verifican las pescas de Perlas, por que se facilita el aproximarse á las oquedades en que existen y se encuentran con más facilidad las conchas . . . son los meses de Enero, Febrero, Marzo y Abril, es en la que deben verificar las pezcas en el paraje indicado, por no poderse hacer en los demás meses á causa de los muchos Rios y bocas de esteros".

ing, collected at low tide during the dry season. Another sixteenth century product of the Gulf of Nicoya is purple dye secreted by marine snails of the Murex family (Muricidae), including Purpura patula pansa. Oviedo described purple dye from molluscs, probably the Purpura, which he saw in 1529: "They have those shells or oysters of purple dye in the Gulf of Orotina or Nicaragua along the coast from Cabo Blanco onward [toward Panama, and into the gulf] (Oviedo 1976:453).[7] Dye from shellfish and from plants were used to color cloth: "There [San Lucas] and on Chira and the others in this gulf the Indians wear a decorated sort of breeches, which are made from a bit of cotton cloth bearing embroidery in many colors" (ibid., 182).[8] Cloth was paid as tribute in 1682: "The village of Chira pays each year two lengths of cloth of six varas, and two varas more, four fanegas of corn, five chickens, four almudes of beans"(Fernandez 1964:vol. 8, p. 458).[9] Dye shells were collected as pearls were, and were removed from their beds only briefly:

> Fishing for purple shells takes place along with that of pearls during low tide in the following way: The shell

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[7] "é hay de aquellas conchas ó ostras de la púrpura en el golpho de Orotiña ó Nicaragua por aquella costa del Cabo Blanco adentro".

[8] "La isla de Chara es la que los chripstianos llaman Sanct Lúcar, é allí y en la de Chira y essotras desta golpho traen las indias unas bragas pintadas, que son un pedaço de tela de algodon de muchas labores é colores".

[9] " El pueblo de Chira paga al año 2 telas de 6 varas y 2 varas más, 4 fanegas de maíz, 5 galenas, 4 almudes de frisoles".

> encloses a worm which dyes purple thread with its juice, a task which is fruitful but laborious for to make the chosen one [mollusc] expel dye one blows on it, and once used, one returns it to its original location, and after a month it can be used again (Salvador in Fernandez 1976:vol. 3, p. 129).[10]

Marine snails used for purple dye and plucked from the sea just long enough to milk them of colorant leave no archaeological remains. Pearl oysters may also have left no trace apart from the pearls themselves:

> A skillful diver, that is, a good pearl diver, can collect from twelve to fifteen dozen oysters in the course of a day; these are thrown unopened in his small canoe; . . . the shell is examined with great care and even the smallest or insignificant pearl is extracted from the oyster with the point of a machete; the meat is saved separately for dinner; in contrast the empty shells are thown back into the sea unless they are very large or beautiful (Wagner and Scherzer 1944:285).[11]

Shell exported as raw material for beads and ornaments may also fail to leave a mark archaeologically. Whole valves "grandes y hermosas" or shells may have been exported; in Mesoamerica shell was sometimes worked at

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[10] "A la pezca indicada de perlas se agrega la de caracól en las vaciantes del Mar en los terminos siguientes: Este encierra dentro un guzano que con su jugo se tiñe hilo morado, cuya maniobra es prolija y trabajosa pués para que expida la tintura el enunciado se sopla por una de sus puntas, y verificado esto se buelve a colocar en el mismo lugar en que estaba, y pasado un més buelve a servir".

[11] "Un 'buzo' hábil, o sea un buen pescador de perlas, puede recoger de doce a quince docenas de ostras en el transcurso del día; estas se echan sin abrir en la pequeña canoa; . . . se examina la concha con gran cuidado y hasta la perla más pequeña e insignificante se saca de la ostra con la punta del machete; la parte carnosa (carnada) se pone aparte para la comida; las conchas vacías, en cambio, se botan de nuevo al mar a no ser las grandes y hermosas".

inland sites to which it had been traded (Pires-Ferreira 1976:312). At the Vigilante Alta site lavender shell beads, which from their color could be made from _Spondylus calcifer_, were found with Burial 4, Unit 12. Neither the raw material for such beads, nor fragments of worked shell were recovered, though the site is rich in shell remains. Oviedo reported:

> There is in these islands a type of fish which the Christians call 'Burro's Hoof', which is like a very large and very thick oyster, and pearls can also be found in these . . .from the shell the Indians make beads for their necklaces and bracelets which they call chaquira, these are very fine and colored, and resemble coral beads, though they also make purple and white ones; every color is perfect in the beads they make from these 'Burro's Hoof' shells, and they are sturdy (1976:184).[12]

Spondylus calcifer, a large shell with a brightly colored outer rim, is still called _pie de burro_, or _ostra de vaca_ by modern gulf residents.

At Herramientas, where we recovered pendants and beads of pearl oyster, _Pinctada mazatlanica_, olive, _Oliva_ sp., and other molluscs, no remains of cut shell or evidence of shell working was recovered. Small pointed stone flakes may have been used as cutting, engraving or drilling tools, though we have no direct connection between the tools and shell

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[12] "Hay en estas islas un pescado que llaman los chripstianos _pié de burro_, que son como unos hostiones muy grandes é muy gruessos, é también se hallan perlas en algunos dellos . . . de las conchas dellos haςen los indios qüentas para sus sartales é puñetes, quellos llaman _chaquira_, muy gentil é colorado, que paresςen corales, é también morado é blanco; é cada color es perfecta en las qüentas que haςen destas conchas del pié de burro, é assaz duras".

ing. Pearls and molluscs can be recovered in the Gulf of Nicoya, and shell artifacts were encountered at the sites investigated. However, we have not yet developed a way to trace shell or shell artifacts produced on the coast to inland sites, and shell artifacts have not been reported from highland sites in Costa Rica. Elsewhere in the Nicoya region, Baudez recovered shell fishhooks from a burial on Toro Island (1967:50, Pl. 47). To the north at Nacascolo, artifacts and fragments of cut Spondylus princeps shell have been recovered (Wallace and Accola 1980:55, Gutierrez, personal communication). Shell pendants have been reported from south Costa Rica (Stone 1963) and from IS-11, Las Secas, off the Gulf of Chiriqui (Linares 1968:63).

Though early visitors to the gulf praised the pearls they collected and the colored cloth the Indians wore, we cannot implicitly trust the judgement of the Europeans of the importance of these industries to local inhabitants. In the search for wealth in the New World, and for favor at Court on returning to Europe, explorers' reports often distorted the richness of a newly explored region. If newly found territory was described as rich enough to produce wealth for the Crown yet not so rich that the King would want personal control of the tract, the Conquistador might be awarded control of the land for his services.

The reports of Oviedo seem to be accurate in recording the rich variety of animal and plant species discovered in the New World. His reports of the Gulf of Nicoya seem to describe accurately the abundant fish and shellfish, the population and aspects of daily life (1976:180-184). At the same time, we know that the first European settlement in the region, Bruselas, vanished after only a few years when expected wealth of the region did not easily translate into European coin (Peralta 1883:33). Nor was Bruselas helped by its location on the east shore of the gulf, away from the land and sea thoroughfare established from Chira to Nicoya and north.

How then can the richness of the gulf's pearl and dye fisheries be judged? Pearls and dye were available in the Gulf of Nicoya; what seems to have been lacking was the labor needed to turn a profit commercially. In a letter to the King of Spain in 1531 Pedrarias Dávila asked that movement of natives be limited, to protect the work force (in Fernandez 1964:vol. 4, p. 31). Reports of both pearl fishing and purple mollusc dyeing as small commercial ventures continued to be made from Oviedo's time to the twentieth century. Pearl fishing is mentioned in accounts of 1765 (Fernandez 1976:vol. 3, p. 125) and 1803 (ibid., 128). At the turn of the twentieth century:

> All the exports of the Province of Guanacaste, which includes the Nicoya Peninsula, is logs of mahogany and cedar, some of which are loaded at Chira Island in the Gulf of Nicoya, and in Cocos Bay in sailing vessels, to these exports one may add pearls and mother-of-pearl which the Chiricanos [Panamanians] dive for in the bays and estuaries of the Pacific Ocean (Melendez 1974:322).[13]

Mother-of-pearl for buttons was as important as the pearls

13 "pues toda la exportación de la Provincia de

themselves in modern fishing operations near Cocos Bay (Zamora 1924:200). When Thomas Gage visited the region in 1637 he praised the purple dye produced there:

> Those Indians are employed like slaves by the Alcalde Mayor to make him a kind of thread called pita, which is a very rich commodity in Spain, especially of that purple color wherewith it is dyed in these parts of Nicoya. The Indians are here much charged to work about the seashore to find certain shells wherewith they make this purple dye.
>
> There are also shells for other colors, which are not known to be so plentiful in any other place as here (1958:322).

Purple dye was valued by European settlers in the gulf. By 1711 the Indians of Quepos, south of the gulf region, were complaining that they dyed quantities of thread for a local cleric who then refused to pay them (Perez Zeledón 1940:575). By the twentieth century purple dye from molluscs was used by few people, including the Boruca who live inland in the Talamanca Mountains of south Costa Rica. The Boruca visited the coast annually, as late as 1945, to dye thread for their weaving (Stone 1949:16). The Boruca still weave, but do not use mollusc dye.

After Oviedo's reports and the accounts of other observers, it is puzzling to find that Spondylus calcifer was not observed or collected from either island, while Spondylus princeps was observed only on San Lucas. Pinctada

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Guanacaste, que abarca al mismo tiempo la de la Peninsula de Nicoya, se reduce a maderas de cedro y caoba que en parte se carga en la Isla de Chira en el Golfo de Nicoya, y en la Bahía de los Cocos en buques veleros, a esto se agrega perlas y madreperlas que son buceadas por chiricanos en las ensenadas ó esteros del Oceano Pacífico".

mazatlanica, was collected in small numbers at Vigilante Alta, and was neither observed nor recovered during excavations at Herramientas. *Ostrea corteziensis*, a species of oyster not famed for pearls, was recovered in quantity from both sites (Table 4).

The Muricidae are equally puzzling. No *Purpura patula pansa* were collected or observed in prehistoric or modern contexts at either site, though this may be explained by the way in which dye was extracted. *Hexaplex* and *Muricanthus* form part of the samples recovered from Vigilante Alta and were collected from the beaches, but were not found at Herramientas at all. These species were also absent from modern contexts on Chira, and show temporal dichotomy on that island's archaeological sites. No Muricidae were observed or collected from Herramientas, which dates to the Late Polychrome period, yet Muricidae were prominent on the surface of a nearby site dating to the Middle Polychrome/Late Polychrome transition, approximately A.D. 1200 (3146II-170-1, Huaca Nica) (Creamer n.d.). The absence of the species at Herramientas, and their presence at Huaca Nica may show changing technology, as shells used for dye were milked rather than boiled to extract colorant. It could also show the disappearance of these species from the waters near Chira due to prehistoric deforestation. Apparently San Lucas Island did not experience similar events, for there the Muricidae appear.

From the preceding, it appears that pearl fishing, the production of purple dyed thread from mollusc coloring, and use of shell for making hooks, pendants, beads and buttons existed from prehistoric times through the nineteenth century. Absence of pearls and dyed cloth may be due to preservation problems, while shell artifacts are not uncommon, recovered from both midden and burial contexts at both sites tested. Absence of cut shell from which artifacts were fashioned is not surprising if we assume craft specialization, and that we did not discover a shell workshop site, such as may exist at Nacascolo, where cut shell has been recovered, or like those located near the Gulf of Tehuantepec (R. Zeitlin 1978:191). The complex of non-subsistence marine products, though procured jointly with their edible portions almost certainly entered a different system of distribution than marine foods, which were important locally for subsistence. Worked shell objects may have entered the extra-regional network of exchange, while foodstuffs circulated within the region.

Marine and terrestrial vertebrates

Midden remains from Vigilante Alta and Herramientas included well preserved fish and animal bones. Bone samples from three excavation units were analyzed in detail, two units from midden excavations at Herramientas and one unit from Vigilante Alta.

Fauna samples from the sites are qualitatively similar, as all were taken using the same excavation techniques, yet as mentioned the size of the units differed, and frequency comparisons were made between units rather than numerical comparisons. Dry bones from each level were sorted into mammal, fish, bird, and other remains. Within each category, bones were identified to genus and species if possible, by direct comparison using the faunal reference collection of Dr. Richard Cooke of the Smithsonian Tropical Research Institute, Balboa, Panama.

The identification of faunal remains is not as straightforward a process as the comparison and matching of one bone with another implies. Bones of species of similar size are frequently similar shapes, making exact identification dependent on whole bones, so that position of muscle attachments, foramena, and protruberances can be compared. Samples from archaeological sites include fragments more frequently than whole bones, making precise identification difficult, even for skilled technicians. Skill and experience are important factors in faunal identification, along with familiarity with a wide range of skeletal material. This is especially true for the identification of fish. Comparative materials used included 30 species of fish representing 16 neotropical marine families. All these fish were collected along the Pacific coast of Panama in habitats similar to those which exist in and around the Gulf of Nicoya. Identifications were compared with a study from the Bay of Culebra, for which fish bones were identified using the reference collection of fish at Florida State Museum (Kerbis 1980:134). Kerbis identified a greater number of species than were recorded for gulf sites. The difference, however, may be due to his use of a larger comparative collection than the one used here, rather than any real difference in the number of species present in the samples.

A special problem in identifying fish is that vertebrae are the most numerous element, while skull bones are most diagnostic for distinguishing species. Though vertebrae of sharks and rays are different from those of fish, among many fish species vertebrae are virtually indistinguishable. For example, the identified sample overrepresents marine catfish (Ariidae) because they have especially distinctive cranial bones and vertebrae. Other species may not be identified as frequently because their bones resemble several other species.

I have included only clearly identified bones under each family or species name, finding it preferable to have accurate information on less than 50% of a sample than to have uncertain identifications used in subsequent calculations. All of the remains identified in this study are labeled cf. (compare)--species name---citing the species with which the identification was made (Appendix 6). While family and genus level identifications are reliable, species are not as clearly distinguishable. Tropical fish species are numerous and incompletely studied, and species vary between Panama and Costa Rica, Costa Rica and Nicaragua, and so on all along the coast. At the same time, for both aquatic and terrestrial vertebrates slight variation in the age, sex, and health of an individual may create as great skeletal differences as exist between some species.

For marine catfish, specimens of <u>Arius dowii</u> were used during analysis, according to the existing classification of these fishes. The taxonomy of marine catfish is being revised by Dr. R. W. Taylor of the Smithsonian Institution, and for this reason, subdivision of marine catfishes at this time would not have been profitable.

All bones were weighed as well as identified and counted. Since each site is a single component, Minimum Number of Individuals (MNI) was calculated for each excavation unit and for the site as a whole. Differences in calculations can be seen (Appendix 7). Tapir, for example, was recovered in two different excavation units at Herramientas. The bones were all from different parts, and may represent a single kill, if meat was distributed among the site's inhabitants.

The MNI is converted to useable meat estimates for each species (Stark 1977:210-212), and a percent contribution to the diet is calculated where possible (Appendix 7). The weight of bone fragments as a percentage of the total sample was calculated with the percent contribution to the diet based on MNI (Appendix 7). The results differ in the inclusion of large species, deer and marine turtle, where a single bone represents a large contribution of diet based on meat weight calculations, though the individual bone is only a fraction of a percent of the sample by weight. The calculations do show relative dependence on marine vs. terrestrial food sources and the range of niches that were exploited.

Fauna and subsistence

In the sample from Vigilante Alta, marine species make up the bulk of vertebrate fauna recovered, and marine species appear to have accounted for three-quarters or more of meat in the diet. Of the fish, estuarine species are best represented, followed by rock and reef dwelling species. Pelagic fish are present, though in very small amounts. Terrestrial species include only deer (*Odocoileus virginianus*), birds, and small rat to raccoon sized mammals. Iguana is the only reptile present, and though recovered in small amounts, it probably represents a food source, to judge from modern parallels. Iguana are commonly eaten by the inhabitants of rural areas of Costa Rica, including Chira and San Lucas.

It appears that few terrestrial species were available on San Lucas during occupation of Vigilante Alta, perhaps only iguana, as deer meat may have been brought in from elsewhere. We know the island supported a human population (Oviedo 1976:288), which may have quickly have disposed of all available game. Modern conditions are quite different, however. Deer on San Lucas at present are protected and have no natural predators; as a result deer have reached pest proportions. The Justice Department, which administers San Lucas, estimates there are over 300 deer on the island.

Deer now suffer from inbreeding, famine during the dry season, and make agricultural planting difficult, since they are capable of jumping three meter fences to chew down new shoots. Prehistoric conditions must have been quite different, and the range of variation, from an ever-expanding deer population, to none at all, shows the extreme variability of biomass on an island, manipulated by only two variables, water and predators. The archaeolgoical remains suggest that few deer were killed during the occupation of Vigilante Alta, and that fish were the mainstay of the diet. The explosive increase in deer is a modern phenomenon, related to near extermination of deer predators and decreasing available habitat on the mainland, leaving deer no exit from the island.

At Herramientas mammal remains make up a larger part of the faunal sample than at Vigilante Alta. There appears to be substantial difference between the two samples from Herramientas created by a fragment of marine turtle (*Chelonia mydas*) in Unit 12, level 4, and by 19 fragments of tapir (*Tapirus bairdii*) in Unit 7, level 2 (Appendices 6 and 7). Calculations of contribution to the diet based on meat weight are altered by about 30% by each of these species. The remainder of the samples are not dissimilar. Besides deer, a variety of mammals were hunted, including armadillo (*Dasypus*), agouti (*Dasyprocta*), paca (*Cuniculus*), peccary *Tayassu tayacu*), small rat to raccoon sized species, and birds.

No single species dominates, and reptiles, amphibians, and birds may have been nearly as important as land mammals. Oviedo reported numerous deer and puercos, probably peccary, on the islands (1976:185), along with toads, and a generally omnivorous tendency among the inhabitants: "[toads] and I have come upon them tied up in the houses of the Indians, and I have seen them eat them roasted; there is no living thing which they decline to eat, no matter how dirty it may be" (ibid., 186).[14] Though toads are represented by only a few bones, toad bones have been recovered in large quantities from Sitio Sierra in Panama (300 B.C.- A.D. 500), where they were assumed to have formed part of the diet (Cooke 1981:82). Additionally, toxic chemicals in the skin of *Bufo marinus* have hallucinogenic properties (Kennedy 1982:285) and toad bones could represent use of a drug.

Marine fauna comprises 15-50% of fauna from Herramientas. Estuarine species, especially marine catfish, account for most of the fish. Rock and reef dwelling species make up 5% or less of the samples and pelagic fish are represented by only six out of 1300 fragments of marine species (Appendix 6).

Contrast between Herramientas and Vigilante Alta is most evident when the habitats exploited from each site are considered (Appendix 7). Estuarine species form a greater part

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[14] "é también sapos: é yo les he hallado atados en las casas de los indios, é se los he visto comer assados; e ninguna cosa viva dexan de comer por suçia que sea".

of the fish at Herramientas than at Vigilante Alta. Located on an island near the mouth of the gulf, the waters around San Lucas are less muddied by runoff than those around Chira. The shore of San Lucas is composed of rocky headlands and sandy beaches rather than mangrove as on Chira. Different proportions of estuarine and rock/reef zones in the near vicinity of each island resulted in the differing proportions of econiches fished, and parallels the variation recorded in mollusc samples.

Variation in available niches for hunting is even greater between the two islands. Chira's larger size and more varied faunal samples suggest a larger inventory of animals lived on the island or were hunted on the mainland. With the exception of tapir, species present in the samples are forest dwellers which may also eat cultivated crops and be hunted regularly along the margins of fields (Linares 1976). Most species identified in the Herramientas sample still do live, or could live on the island. Chira's inhabitants may have had access to hunting grounds on the mainland, where they are reported to have planted cornfields (Castaneda in Peralta 1883:54). They may also have sought tapir on the mainland, for tapir are large, primary forest inhabitants that have an extensive home range. Chira's 40 km sq area may not have had sufficient forest to support tapir. The tapir bone in our sample from Herramientas probably came from a single individual and included vertebrae, phalanges, and long bones. A perforated tapir tooth was recovered from Vidor, and its "ritual or commercial" value was stressed over its proposed nutritional value (Kerbis 1980:126), though both food and exchange value were probably important.

Composition of samples from the two sites suggests slightly different subsistence patterns. At Vigilante Alta fish appear to have been the most important source of meat, followed by deer, and by molluscs. We assume that agricultural fields and gardens were planted, yet that fishing and shellfish collecting must have consumed most time in food procurement efforts. When fishing and diving products such as pearls, purple dye, turtle shell, and marine shells are considered, it seems reasonable to propose that the inhabitants of San Lucas focused their attention on the sea.

At Herramientas, terrestrial mammals supplied most meat, though fishing and shellfish collecting also took place. The variety of species, and the tendency of many of them to be found along margins of cleared fields as well as in forest, suggests that hunting and farming were simultaneous and complementary pursuits. Again, goods having ritual or exchange value which originated on Chira may have been procured along with subsistence pursuits. Foodstuffs were exchanged, along with ceramics, for which the raw materials were available on Chira. Farming and hunting, on or off the island, promoted the accumulation of food while ceramic production may have been undertaken by those not immediately involved in the food quest. Emphasis on food and ceramic production at Herramientas reinforces the role of Chira as a transshipment or refueling spot. This does not mean that the island was converted to a single large agricultural field. Comparison of fauna from Herramientas with samples from other sites illustrates that the island was forested with some land cleared for planting, for mammal species recovered from the site can live near disturbed areas, but need forest cover (Linares and White 1980:192). Mainland cultivation may have augmented island fields.

Vigilante Alta and Herramientas are quite different in fauna from other sites tested in Greater Nicoya. During the Late Polychrome period occupation of Vidor, pelagic fish, especially tuna (Euthynnus lineatus) comprised 35-75% of the fauna (Kerbis 1980:133), and deer (Odocoileus virginianus) were the next most frequent component (ibid., 135). Neither of these predominated in the samples from the gulf sites, and pelagic fish were almost absent. The only other faunal data available for Greater Nicoya comes from sites close to Lake Nicaragua where deer were the dominant species (Pohl and Healy 1980:288-289).

To the south in Panama, deer formed most of the terrestrial fauna at IS-3, La Pitahaya (Linares and White 1980:192), unlike the gulf sites, though like Herrramientas, estuarine fish dominated the marine fauna (Wing 1980:215). Deer dominate the terrestrial fauna identified at most sites in Panama, from Cerro Mangote (5000-3000 B.C.) to Nata (A.D. 1100-1500)(Cooke 1981:Table 4), a pattern associated with early and extensive human disturbance of the tropical forest (Bennett 1968, Cooke 1979). Comparison with the Gulf of Nicoya region samples shows the gulf probably had lower population and less extensive or later introduction of agriculture than Panama.

Exchange of food

During the analysis, body parts were identified, as well as species, to try and detect butchering practices which imply exchange of meat. In the case of offsite butchering, only bones associated with edible cuts of meat and cleaned fish, possibly without heads, would be present. The difference between off-site hunting by the inhabitants, and actual exchange, would remain to be distinguished.

Using midden samples and archaeological sampling techniques, transport of a portion of an animal or animal product is difficult to detect once the remains have been deposited in midden, unless it represented a unique individual. Evidence for exchange of fish might be provided by a collection from which fish vertebrae were scarce or absent in relation to cranial bones. However, many fish species are identified by distinctive cranium or mouth parts and not by vertebrae. It would then appear that only heads of these species were recovered from midden samples, suggesting export of fish, when in fact the vertebrae are probably part of the Unidentified Fish Bone part of the sample. in Unit 8, level 1, at Vigilante Alta, four mouth parts of Tetradontidae and one of Belonidae were identified, and no vertebrae of either family (Appendix 6). There are, however, 97 unidentified fish vertebrae from the same level which may account for those "missing" from the Belonidae and Tetradontidae. For this reason the identified fish bone did not provide a good estimate of exchange of fish in terms of frequency of parts. Also, fish which are dried for storage or exchange by modern coast fishermen in the region are neither filleted nor the heads removed. Dried fish traded in this form would be represented only by bones of marine fish at inland sites. Hunter-Robinson and Sardinál, both near the Bay of Culebra, are 1.5 and 7 km from the coast respectively, and are marked by shell middens, which also included remains of marine fish species (Moreau 1980:108). Although it is assumed that marine foodstuffs were procured by the inhabitants of the inland sites, their acquisition by exchange with their coastal neighbors is equally as likely. Data from sites further inland in Costa Rica is not available, principally due to poor preservation of faunal remains.

Using mammal remains, fewer in number at the gulf sites than fish, and possessing greater variety of bone shapes per individual, it is easier to judge the presence of whole individuals vs. presence of parts only. However, meat and therefore bone may have been shared within a site, and scattered by animals after consumption, subject to differential preservation and reuse of bones for tools and craft work. Bone from heterogeneous fill, even when multiple samples are taken from a single midden, are unlikely to sort these variables for the archaeologist, in a single component site, and less so at a multi-component site. The contexts in which selection of specific parts of animals have been detected have been special features, including mass kill sites (Wheat 1972), and storage pits (Flannery 1976:39).

Data from Vigilante Alta indirectly suggest that some meat was transported for food, not fresh or dried fish going out, but venison coming in to the island. Mammals are rare in the site's samples, yet in one level, two deer bones were recovered (Appendix 6). Both have clear marks of butchering near the ends. It is possible that deer were hunted on the mainland and brought in to the island, which is small (4 km sq). Linares recovered only leg bones of deer from island sites in the Gulf of Chiriqui and suggested that islanders acquired meat from large adjacent islands or from the mainland (1968:105). Again, it is possible that the remains represent exchange rather than off-island hunting.

Many species may have been hunted for subsistence purposes and for objects of symbolic or exchange value at the same time. As is the case with macaw, armadillo, stingray, shark (Flannery 1976:340), and tapir (Kerbis 1980:126), portions of these animals are edible and portions are believed to have had ritual value, and may have been important in exchange. At Herramientas, tapir may have provided an important source of food, while the teeth were converted into pendants. The gulf sites yielded bones of parrot or macaw, which provided food along with feathers desired for exchange. Toads, too, were eaten, (Cooke 1981:82, Oviedo 1976:186), yet their bones may represent ritual consumption or prehistoric drug trade (Kennedy 1982:285).

All the non-food commodities would be light in weight, and possess symbolic value and higher value than subsistence goods, which were probably circulated throughout the gulf region, and not beyond.

CHAPTER 9

EXCHANGE SYSTEMS: ROUTES AND PROCESSES THROUGH THE GULF OF NICOYA REGION

In the introductory chapter the islands in the Gulf of Nicoya were hypothesized to be interdependent, and exchange was proposed as the catalyst for their settlement and successful functioning. The data presented have shown that Vigilante Alta on San Lucas Island and Herramientas on Chira Island were part of a network of economic, social/ritual, and political ties which encompassed each island, the gulf, Greater Nicoya, and ultimately extended beyond at least as far as Panama and Mexico. Settlement, lithics, ceramics, fauna, mortuary remains, and ethnohistoric documentation have been used to describe some of the commodities produced on the islands and within the region, and items which entered the region from outside sources. A summary of the products of the region as well as the imported goods brought in is presented below along with a discussion of possible exchange routes for the accumulation and dispersal of commodities. Processes that may have moved goods along those routes are also discussed, and a model for the role of Chira Island and the gulf region in Late Polychrome period exchange is presented.

The scope of this study has been greatly expanded by the use of documentary materials, from sixteenth century eyewitness accounts of Chira and Chara/San Lucas, to nineteenth century reports by casual visitors. Modern observations have also provided a glimpse of some durable patterns of settlement and exchange. One of my initial objections to previous work in the region was the tendency to accept historic accounts uncritically. Having compared some of the written accounts with archaeological data, I can attempt to gauge the utility and accuracy of ethnohistoric reports. As mentioned earlier, the sixteenth century eyewitness accounts include locational data that are accurate in indicating relative positions and sizes of the islands and certain sites; for example, islands described as populated in Oviedo's reports were found to have Late Polychrome period remains on them. Geographic and political detail has been enhanced by the description of named chiefdoms accompanied by reports of their respective populations and local products.

Population estimates from documentary sources have been more difficult to interpret than locational data, as precipitous year-to-year changes in native population during the first years after European contact make a significant difference in interpretations (Abel-Vidor 1980:166, 1981:90). In addition to change in absolute population figures, seasonal change in population of sites has not been clarified by the available accounts, as most visits to the region were made during the dry season (Jan.-April), when occupation reached its maximum dispersion for mollusc collecting and fishing. Nevertheless, available population data have provided relative numbers of inhabitants and such figures are needed for comparison of different areas.

Historic sources have also proved invaluable in amplifying archaeological evidence for subsistence. The midden remains recovered have confirmed the European reports of fishing, hunting, and mollusc collecting for food, pearls, and purple dye. Mano and metate fragments recovered archaeologically and interpreted as tools for processing corn or other plant foods have been supported by early historic reports of fields and gardens planted with corn, beans, cotton, cacao, fruits, and other crops. Spindle whorls recovered during excavation can be reliably associated with weaving, widely reported in Greater Nicoya. Stone axes and chisels can be correlated with reports of boats and rafts, field clearing, and thatched wooden dwellings. Until better recovery of botanical remains is achieved, such ethnohistoric information will continue to fill the gap in our knowledge of perishables.

Early reports from the region have occasionally proved confusing in providing details which have not been detected archaeologically, as in the case of the black pottery of Chira. Praised by Oviedo (1976:453), by Castañeda (in Peralta 1883:54), and by Lopez de Velasco (1971:166), the black ware conforming to Oviedo's description remains to be identified in the archaeological record. Also, descriptions of trade in historic sources have provided detail not yet available through archaeological research. While exotic materials, including gold, jade, obsidian, and serpentine, and ceramics produced outside the gulf region have been recovered from Vigilante Alta, Herramientas, and other sites (Creamer n.d., Lange and Accola 1979), quantitative studies which could suggest methods of distribution and routes of movement of goods (see for example Hodder and Orton 1976:146 ff.) have yet to be attempted. At the same time, such studies often provide explicit details on distribution, but fail to provide adequate information on the context of the basic data (Hodder 1982:203) that ethnohistoric sources often provide. Accounts describe some of the modes of exchange and transportation used, and models for testing can be developed from the observations of the first visitors to the region.

Archaeological analysis that does not consider the available documentation will reach conclusions diminished in scope and power. Archaeological and ethnohistoric data are complementary for the late prehistoric and early period of European contact in Greater Nicoya and in the gulf region and must be used together. The utility of the combined approach is clearly demonstrated in the present study by the recognition that exchange relations pervaded society in the Greater Nicoya area and that long distance trade was an integral part of a cohesive regional exchange system.

Products of the gulf region

Archaeological evidence of mollusc and fish remains at Vigilante Alta indicate possible foodstuffs that may have been exported, while shell beads from midden and Burial 4 and marine turtle bone suggest potentially exportable craft products. Ethnohistoric accounts add pearls (Oviedo 1976:184) and purple-dyed cloth (ibid., 182) to this inventory of marine resources and products. Mano and metate fragments from middens point to agricultural crops, which ethnohistoric data extend to corn, beans, cotton (ibid., 182, 185), fruits, and garden vegetables (Appendix 1). Axes, found in middens and in most burials, show woodworking and tree felling, which are clarified by documentary references to the cutting of dye woods (ibid., 182), and raft construction (ibid., 185).

At Herramientas, subsistence remains include molluscs, fish, and game, while Oviedo specified oysters, (hostias), (ibid., 184), fish, frogs, deer, and wild pigs, (puercos) (ibid.185). Mano and metate fragments reflect the cultivation and processing of crops such as corn, beans (ibid.), and possibly cotton (ibid., 182). Axe and chisel fragments suggest tree-felling, for field clearing and boat building (ibid., 185). Marine products may include turtle shell, shell beads, and pendants found in midden. Fabrication of shell beads is also described in ethnohistoric accounts (ibid., 184), as are pearls and dyed cloth (ibid.). Ceramics are well represented at the Herramientas site, in midden, in caches, and associated with Burial 1. Sources of clay are located near the site, and since ceramics are uniform in paste, color, forms, and modes of decoration, local production seems likely.

Chira is repeatedly cited as a producer of fine black ware (ibid., Castañeda in Peralta 1883:54, Lothrop 1926:29) and the failure to locate either abundant sherds or a site specializing in black ware is puzzling. A single sherd of an incised bowl identified as Tempisque Incised, having a highly lustrous, glistening black surface, was collected from the surface of the Kon site near Paquera on the Nicoya Peninsula (Creamer n.d.), and provides a tantalizing reminder that Oviedo's black pottery of Chira may yet be found.

Another potential local commodity mentioned by Oviedo but lacking archaeological documentation is the fruit tree nispero (Achras sapota, or Manilkara spectabilis) (Pittier 1978:209). Oviedo (1976:60) reported that the nispero was specifically under the control of the Chorotega, the dominant group in the Nicoya area (Abel-Vidor 1981:88, Lothrop 1926:21, 1963:8). In addition to the fruit, nispero wood and gum could be harvested, the former for construction, the latter for glue or boat caulk. In contrast, Oviedo did not report local trade in exotic feathers, yet preliminary analysis of a small sample of bird bones from the island sites included parrot or macaw (Rea, personal communication) and could indicate such trade.

Salt was probably an important product of the Gulf of

Nicoya in Late Polychrome period times, as it is today. Chira possesses extensive salt pans which are still employed. One of these adjoins the Herramientas site and may have been used prehistorically. The importance of salt as an exchange commodity in prehistoric Mesoamerica has been amply documented (Andrews 1980a, 1980b) and is reported in the gulf by Ceballos in 1610 (in Peralta 1883:704) and by Gage in 1637 (1958:323).

Most commodities represented by artifacts from Vigilante Alta and Herramientas were produced all along the Lower Central American coast, and not confined to the gulf. Salt, for example was produced along the coast of Greater Nicoya, "from Caldera Bay and Cabo Blanco to Santa Catalina point [Santa Elena Peninsula]" (Ceballos in Peralta 1883:704), at sites like the Panama Salinas, (Lange et al. 1980:24). Marine foods (Accola and Ryder 1980:77), shell artifacts (Wallace and Accola 1980:59), and ceramics (Abel-Vidor 1978) were also produced in the Bay of Culebra and in the Bay of Salinas (Lange 1971a). In general. it appears that a wide range of subsistence goods, woodwork, and craft items made from marine materials were produced in Greater Nicoya as well as in the gulf region.

<u>Commodities that circulated within the gulf region</u>

Though many goods produced on the islands could also be procured by inhabitants of mainland sites, micro-environmental variation throughout the region resulted in different proportions of products. Such a pattern can be expected to have generated local exchanges of regionally available goods not found at every locale. Stone tools which were scarce on the islands provide one example, and will be considered among goods entering the region.

At Vigilante Alta tools made of volcanic stone, manos, metates, axes, and adzes were unavailable on the island and had to be brought in from mainland locations. Examination of samples of these artifacts suggests most were brought from the eastern shore of the gulf (T. Aguilar, L. Lew, personal communication). Obsidian was not native to the island and had to have come from northern Nicaragua or beyond (Lange 1981). Gold was brought to Vigilante Alta in the form of an eagle pendant deposited in Burial 4. The nearest known source of gold is in placer deposits along the Abangares River and in streams flowing out of the Cordillera de Tilaran (T. Aguilar, personal communication). Gold artifacts were fabricated within Greater Nicoya (Lange and Accola 1979), and the pendant from Vigilante Alta could have been produced in the region. Similar gold pendants have been recovered on the San Carlos Plains in northern Costa Rica and in the Central Highlands (Snarskis, personal communication). Alternatively, the gold could have been acquired from south Costa Rica in the Diquis region where gold pendants have been found in many burials. Since south Costa Rica has numerous gold deposits it has been proposed as the source of many of the gold artifacts recovered elsewhere in the country (Balser 1966:392, Stone 1977:129).

Other mineral products include serpentine, represented by a bead recovered from midden. Geological formations around Sardinal or on the Santa Elena Peninsula are the most likely source of the raw material for the bead (L. Lew, personal communication).

At Herramientas, as at Vigilante Alta, stone tools were introduced from mainland locations in finished form. Manos, metates, ground stone adzes, and axes comprise this group. Carefully worked flaked stone chisels from Herramientas and from other sites in the region (Creamer n.d.), suggest these tools were acquired in their finished form as well. Some cryptocrystalline stone was brought to Herramientas in unfinished form, attested to by debris of onyx, agates, jasper, and chert. The jasper may be from sources near Sardinal (L. Lew, personal communication), and jasper artifacts, including flaked, chisel-shaped artifacts, are known from Late Polychrome period occupations in Greater Nicoya (Snarskis, personal communication). An obsidian blade fragment represents another tool acquired outside the region (Lange 1981b), as were the serpentine beads in the midden and associated with Burials 1 and 2. A green stone pendant of a jade-related mineral (Bishop, personal communication) that was surface collected from Herramientas is likely to have come from the Santa Elena Peninsula in northern Costa Rica. Sources may exist in the gulf region but have yet to be located (Lange et al. 1981:170). Oviedo reported seeing similar pendants in Nicaragua, "around his neck the child wore a string of green stones like emeralds" (1976:459).[1]

Ethnohistoric sources describe cacao on Chira and in the gulf region (ibid., 71, 75), though microenvironmental differences in temperature and rainfall suggest more fertile fields for cacao may have been located in the Nosara Valley (Bergmann 1969, Lange et al. 1976) or toward the tip of the Nicoya Peninsula where rainfall is higher than in the gulf (Fig. 5). Further north in Nicaragua, Oviedo reported the tree's cultivation (1976:71, 75) as well. Similarly, Oviedo mentions cotton cloth on the islands, but does not mention cotton fields. Thus, it is possible that cotton was either grown locally or brought over from the mainland.

Resources acquired or produced within the region and circulated within it appear widely throughout Mesoamerica:

> Because the cultivation of cotton and its spinning and weaving were universal in Yucatan, cloth may not have been an important item of trade within Yucatan proper. The same may have been true of honey. Certainly slaves, salt, and flint were traded internally. Many other articles were also traded pottery, canoes, dyes, copal gum for incense, maize, game, fruit, wooden idols and small amounts of native cacao (Chapman 1965:133).

The list of locally exchanged goods strongly parallels archaeological and ethnohistoric evidence of intra-regional exchange in the gulf region.

The function of intra-regional exchanges almost certainly differed from long distance transactions involving

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1 "estaba un sartalico de unas piedras verdes como plasmas de esmeraldas, quel niño tenia al cuello".

materials unrelated to subsistence, from sources outside the region. Items were usually small, light, and frequently carried visible symbolism in their form or decoration (gold, jade, obsidian, feathers, dyed cloth, beads, and pendants). Possible functions of exchange based on the physical and social structures through which exchange probably occurred, may be suggested using data from the present work, previous studies of the region and ethnographic examples. A look at the routes of exchange and at the social structures which may have guided transactions as they took place, may help clarify the role of the islands.

Routes of exchange

Routes of exchange are suggested by the known distribution of artifacts and by ethnohistoric descriptions of travel and trade along the Atlantic and Pacific coasts and in the Gulf of Nicoya. Within the region, goods which were widely available, foodstuffs, stone, ceramics, cloth, and woodwork, were circulated to satisfy demand created by micro-environmental variation. The direction of flow of goods was reversible between most locales depending on season and yields. A stable flow of goods to the islands from the mainland can be seen stone tools, which were never available locally, and by ceramics made in restricted zones. One pathway between Chira and the Nicoya Peninsula was reported by Castañeda in 1529: "all those who disembark on Chira to come to this province [Nicaragua] by land, pass in canoes and boats to the place of Nicoya" (in Peralta

1883:54).[2] Similar mainland-island, island-island, and mainland-mainland links over short distances surely existed. A dominant direction of flow is not noted along the route described by Castañeda. Subsistence goods were taken from the mainland to the islands, while ceramics, dyed cloth, shell artifacts, and pearls were taken from the island to the mainland. This route was also the first link in a chain going up the Tempisque River toward Nicaragua, as Castañeda noted. The route probably channeled stone and stone tools from the mainland to the island along with corn, honey and wax (ibid.).

A second known course of exchange led from the islands to the east shores of the gulf where stone suitable for manos and metates, axes and adzes could be procured. Castañeda reported that subsistence goods, beads, cloth, and ceramics were exchanged by the inhabitants of the islands with those of the hills (ibid.). A balanced flow of goods, and probably involving fewer goods than on the Chira-Nicoya route, moved along this path.

A passage to the south extended from the gulf islands toward the mouth of the Barranca River or the Rio Grande de Tárcoles, down to Quepos [Cochira] and finally Parrita. At the latter, in 1520 Spanish explorers accepted tribute of gold (Cereceda in Peralta 1883:28, Lothrop 1963:6), and in

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2 "e todos los que se desenbarcan en la ysla de Chira para venir a esta provincia [Nicaragua] por tierra, pasan en canoas e barcas a este cacique de Nicoya".

1562 the region was reported as producing "cacao, cotton, cloves, and peppers" (ibid., 9). Little archaeological research has been carried out along the coast south of the Gulf of Nicoya. Further south, however, in the Diquís region ceramics from the gulf and further north in Greater Nicoya (including Mora and Chircot Polychromes, and Gillen Black on Tan), were recovered (ibid., 88-92). Ties to the Central Provinces of Panama are represented by Cocle and Macaracas wares found in the same region (ibid., fig. 67, 68). On Caño Island, off the coast of the Osa Peninsula, sherds of Murrillo Applique were recovered, along with ceramics from Diquis, and from western Panama (Honetschlager and Finch n.d.). In the Gulf of Chiriqui at La Pitahaya (IS-3), sherds of polychromes probably from Greater Nicoya were recovered along with sherds brought to the site from the Central Provinces of Panama (Cooke 1980:376, 378).

Because ceramics are both durable and often distinctive, they offer the clearest evidence of the routes of distribution of goods within and beyond the gulf region. Compared to meat, fish, plant foods, cloth, or shell artifacts, the distribution of ceramics is accessible archaeologically. As a result we have far more data on ceramics than on other materials, and their distribution may be viewed as a model for redistribution or reciprocal exchange of subsistence goods as well. In Chapter 7, the redistribution of some ceramic types by territorial groups, and the reciprocal exchange of other types was proposed. Exchange of subsistence and craft goods may have paralleled the system of ceramic distribution, though there are problems with testing this hypothesis due to poor preservation. Artifactual evidence for redistributive exchange processes is still minimal, and reciprocal processes are discussed further below.

A few items moved beyond the routes outlined thus far. Dyed cloth, beads and other worked shell, and salt may have circulated beyond the region. Salt was traded throughout Mesoamerica (Andrews 1980a), and artifacts of mollusc shell and whole shells were worked at inland sites near Lake Nicaragua (Healy 1980:291). Also, items such as feathers, armadillo, shark, marine fish, and shells were being imported into Central Mexico by as early as the Formative period (Flannery 1976:340-343, Pires Ferreira 1976:315). While the data for the more relevant later time periods are not currently available, it is likely that such items continued to be imported through contact times. All the items mentioned above are available in the gulf region, and all could have been exchanged for obsidian, serpentine, jade or related stone similar to artifacts recovered at Vigilante Alta and Herramientas. They might also have traded for copper, magnetite, or pyrite like the bell and other fragments recovered at Nacascolo (Lange and Accola 1979, Wallace and Accola 1980). Gold artifacts passed through the gulf region, whether or not they originated there, and moved along exchange paths as far as Chichen Itza (Bray 1977, Lothrop 1952).

A variety of routes by which goods moved long distances may be proposed; however, each of these routes must be considered tentative given that there are as yet relatively few sites excavated along any of the specific routes, and relatively few trade artifacts at any particular site. From the Gulf of Nicoya and the route up the Tempisque River, travel overland to the lakes region of Nicaragua was practicable in the sixteenth century and probably earlier. From Rivas, the Gulf of Fonseca, another large and heavily populated coastal zone (Baudez 1976), could be reached by sea, as could the Pacific coast of Guatemala, Soconusco. From this point (Chapman 1965) or further on in the Isthmus of Tehuantepec (R. Zeitlin 1978:192), products could have been distributed to inland sites. One example of objects that made part of this journey are the polychrome vessels recovered at Tula (Diehl et al. 1974). Though not made in Greater Nicoya, the vessels were made in Central America, possibly in Honduras, and were successfully distributed northward.

A second route largely followed the Atlantic coast, from the Gulf of Nicoya to Lake Nicaragua as described above, then down the San Juan River which drains into the Atlantic. The eastern shore of the Central American isthmus could also be reached by travel overland from the Barranca River or the Rio Grande de Tárcoles, across the Central Highlands of Costa Rica to the Atlantic. Ferrero noted a group called the "Pococi", who lived on the Atlantic slopes "between the

Reventazon and Matina Rivers up to the Turrialba Valley" (1981:95). Geographically, this represents a corridor from the Central Highlands to the Atlantic coast. This group's name is the same as that of the gulf island where Oviedo spent a month in 1529 (1976:494). The correspondence in names hints at connections, though they remain to be substantiated. Canoe transport along the Atlantic coast was observed by Columbus (Sauer 1969:128), and stops may have included the Bay Islands of Honduras (Benson 1977:93, Strong et al. 1935:169) Naco, a major Late Postclassic (A.D. 1250-1450) center in northwest Honduras (Henderson 1979), and the Yucatan Peninsula (Bray 1977, Lothrop 1952, Pendergast 1969:39). Because there appears to have been gold available along the Atlantic watershed of Costa Rica, there would have been strategic advantages to crossing over from the Nicoya region to the Atlantic coast and proceeding north along the coast. Ceballos noted that on the Atlantic slopes: "Gold is most abundant . . . coins of gold, eagles, lizards, toads, spiders, medals, plates, and other works of all kinds" (Ceballos March 10, 1610, in Peralta 1883:699-700).[3] Thus, acquisition of gold for exchange further north might have taken place here.

From the gulf region to the south there was also coastal trade, though as mentioned, there is a gap in archaeological

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[3] "Y de lo que mas abunde es oro . . .piecas de oro, aguilas, lagartillos, sapos, aranas, medallas, patenas y otras hechuras, que de todos generos labran".

research from Puntarenas south to the Diquis region. Beyond Herradura point, the Parrita Valley and the lands around modern Quepos may have been stops on an exchange route, as the coastal plain was occupied at the time of European contact (Stone 1977:133-135). However, no material evidence of contact has been reported. A group called the "Cochira" or "Cuchiras" near Quepos, left the residual toponym of "Chiras," (Perez Zeledón 1940:575), which raises the possibility of some connection to Chira to the north. The zone was visited by Gil Gonzalez Dávila and Cereceda in 1522 (in Peralta 1883:28), indicating contemporaneity of occupation between the gulf sites and sites in the Quepos-Parrita region. Much later, in 1711, a complaint against a cleric in Quepos included:

> We are sent by the curate Father Naranjo to make canoes, which we construct by our own labor, and most of the time we are not paid, though we help to take goods to sell in the town of Nicoya, to Chiriqui, and other places (emphasis in original, Perez Zeledón 1940:587).[4]

Chiriqui and Nicoya by 1711 were permanent European settlements, yet both were founded near native settlements, which may indicate continuity in trade links. We know that goods did reach western Panama from the Gulf of Nicoya. Gold may have been the commodity which moved northwestward along this route in prehistoric times. As mentioned above, gold from

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[4] "Mandanse fabricar por dicho Padre Cura Naranjo en aquella costa canoas, a que asistimos con nuestros trabajos personales, y las mas veces no se nos paga, ayudandolas a llevar a vender a dicho Pueblo de Nicoya, Chiriqui y otras partes".

at least as far south as the Sinu region of Colombia made its way to south Costa Rica (Bray 1981:166), and from there as far as Chichen Itza (Bray 1977, Lothrop 1952), indicating a long and persistent route of exchange.

Summary of routes of exchange

In proposing routes for exchange, two general observations may be made. First, intra-regional routes provided links in the interregional system. Some networks extended further than others, interlinking the movement of subsistence goods, ceramics, and non-utilitarian goods. Second, a dichotomy did not necessarily exist between subsistence and sumptuary exchange networks. This implies there was not a separate system for the acquisition of non-subsistence commodities.

In the overall regional trade network, strong traffic in valuable stone and metals moving by sea along both coasts, stands out in terms of quantity. It is also of interest to note that the items moving north, particularly gold, held symbolic information in the variety of forms and decorative motifs employed. In contrast, items such as obsidian, green stone, even copper bells, moving from north to south, were valued for their inherent qualities rather than for their symbolic content.

Exchange processes

The data available from Vigilante Alta and Herramientas, and from archaeological research in Greater Nicoya, Mesoamerica, and South America, can be used to take an inductive look at exchange processes originating in or passing through the gulf region. My conclusions are necessarily simplistic, as I have lumped methods of exchange for the purpose of discussion. Exchange may be based on individual relationships (kin, trade partners, pochteca), and types of goods (low vs. high status, large vs. small volume). It also may involve many steps or few (Hodder 1982:202, Pires Ferreira and Flannery 1976:287). Goods which circulated primarily within the gulf region are proposed to have been perishables (salt, corn, fish, meat, etc.), or to have had relatively high volume per unit value (cloth, woodwork, pottery). The involvement of the islands mandated that goods moved by water for at least part of their journey.

Using documentary or artifactual data the pattern of distribution of subsistence goods appears to have involved a single or limited-step process which would imply reciprocal rather than redistributive processes. Movement of goods over short distances, or via a limited number of steps is one characteristic of reciprocal exchange (Hodder and Orton 1976:146), which is frequently kin based (Pires-Ferreira and Flannery 1976:289). A reciprocal intra-regional system could distribute commodities among the different micro-environmental zones of the gulf region. Such exchange would serve to dispose of small surpluses and make up shortages in goods universally procurable, or goods having numerous, limited sources (fruits and woods, volcanic stone, shell). At the same time, networks of trade partners based on kinship (whether real or fictive)(Spence 1982:187), may have led from a web of regional ties into multi-step exchange channels.

While subsistence goods may have been exchanged in reciprocal fashion, and ceramics through a redistributive network, long distance movement of subsistence goods and ceramics as well as high status items (obsidian blades, gold, marine shell ornaments, feathers, dyed cloth) could have been brought about through the extension of interlocking local networks. By this process, trade partners in the Nicoya region would have been indirectly linked with the southern end of the Mesoamerican redistributive market system (Sharer 1981). Thus, there was a crossover from one process to another somewhere along the line of march, where trade partners contacted trade specialists or entered redistributive markets. Markets are reported by Oviedo as near as in Nicaragua (1976:536), and while the mound-and-clearing site pattern in the gulf region provided a structure which could have been adapted for periodic markets, sites in the region and further north in Greater Nicoya have not been examined for facilities associated with markets; namely, "centrally located open spaces with unrestricted access, stall areas with small-scale storage, and small craft workshops" (Earle 1982:10). It is possible that among the numerous unstudied sites in the region a major market center will be identified at sites like Carrizal or Puerto Culebra.

The prehistoric use of the gulf as a node in such long distance trade networks is suggested by the range of artifacts from a variety of non-local and extra-regional sources, and possibly by the report that the inhabitants of Chara/San Lucas understood Cueva, the language of Panama (Oviedo 1976:184). Though Oviedo made his observation in 1529, ten years after the first sighting of the gulf, it may refer to a prehispanic adaptation which facilitated exchange, since we know that by the period of European contact Chira Island and the settlement of Nicoya were closely related nodes in transshipment and exchange systems (Castañeda in Peralta 1883:54, Radell 1969:102).

Summary

Exchange processes at work in the gulf region during the Late Polychrome period may have included reciprocal exchanges of foodstuffs and locally produced items, (including monochrome ceramics), while decorated ceramics circulated more widely by way of a redistributive network. Other items, mostly non-utilitarian, probably were channeled through and from the region via trade partnerships which apparently fed into Mesoamerican redistributive market or elite trade specialist systems along the way.

The fact that groups of commodities moved along different networks using a variety of exchange relationships suggests that market redistribution did not exist in the gulf region as it did further north. The absence of comprehensive redistributive mechanisms implies that some degree of political centralization in the region resulted in control of decorated ceramics while subsistence goods were equally distributed among geographic and climatic microregions by reciprocal exchanges.

A clue to the success of integrated systems of exchange such as that outlined here may be that:

> A system of elite exchanges would have several advantages over an egalitarian network of trade partnerships. The flow of material into the society would probably be more regular, and it might include goods from a wider area since more societies would be involved in the network and each trade link would cover a larger distance . . . On the other hand, the elite network would be more vulnerable in certain respects. A major and widespread dislocation would be required to intefere seriously with the flow of goods through a number of independent and redundant trade partnerships, but with the funneling of this flow through a few elite positions political disruptions would have more immediate and wider consequences (Spence 1982:191).

A multi-layer exchange system protected regions like the gulf which acted principally as supplier to polities having elite control of the distribution of all commodities. Disruption of the long distance network would probably have had symbolic and political impact on the region, but would not have disrupted the exchange of subsistence goods which comprised the bulk of regional transactions.

Though the islands in the Gulf of Nicoya were settled late in the prehistoric sequence, the gulf's role in transshipment and in maintaining exchange with the rest of the region may have arisen earlier. Many Middle Polychrome period sites located around the gulf have been recorded (Creamer n.d.) though large scale testing has not yet been undertaken at any of them. A Middle Polychrome period site on Chira, Huaca Nica, is a large habitation site and could represent an antecedent of Chira's role as a focal point for exchange in the region. The Early Polychrome period site of Carrizal, near Puntarenas, was unmistakably a major center. Covering more than six hectares (Lange 1978b), surface collected material included ceramics from the San Carlos plains in north Costa Rica and indicated an unusual range of contacts extending from this site, while pothunters have reported a wide variety of exotic goods. It is this lack of research, rather than lack of large, potentially important sites, which makes it seem that the gulf region flourished only toward the latter part of the prehistoric sequence. There was, however, a shift to island settlement after A.D. 1200, amply attested to by Late Polychrome period sites on islands previously uninhabited (ibid.). The reason for this change is still unknown, though it may have been for acquisition of territory as well as for exchange benefits (see Chapter 5).

Chira's prominence early in the sixteenth century and its rapid decline thereafter may be characteristic of long distance exchange centers, which disappeared after contact with European explorers, who did not maintain the system as they maintained other native institutions (Chapman 1965:119). The accumulation and movement of goods via the gulf, from Chira to Nicoya, can be compared with one model of the role of strategically located exchange sites. Hirth's summary definition of "gateway" communities contains much that applies to the Chira-Nicoya connection:

> Gateway communities develop either as a response to increased trade or to the settling of sparsely populated frontier areas. They generally are located along natural corridors of communication and at the critical passages between areas of high mineral, agricultural, or craft productivity; dense population; high demand or supply for scarce resources; and, at the interface of different technologies or levels of sociopolitical complexity. They often occur along economic shear lines where cost factors change and where there are economic discontinuities in the free movement of merchandise. The function of these settlements is to satisfy demand for commodities through trade and the location of these communities reduces transportation costs involved in their movement (Hirth 1978:37).

Late Polychrome period settlement of the gulf islands and the use of Chira as a transshipment and exchange center may have been in response to increased trade in metals. The gulf's location beyond the southernmost extension of most Mesoamerican traits has resulted in its being viewed as a frontier of Mesoamerica, or a buffer zone between the northern and southern hemispheres in terms of cultural development (Lange 1976b, 1979a). The Gulf of Nicoya provides a natural path of communication and stands at the southern edge of a region which actively produced polychrome ceramics (Greater Nicoya). Population was low compared to nearby regions including Rivas (Abel-Vidor 1981:90) and Chiriqui (Linares 1980:75). The gulf region was well supplied with marine products which could be extracted for both subsistence and exchange, and located in a major biological transition zone, between nearctic and neotropical flora and fauna (Stuart 1964), another exchange-generating factor. It has already been suggested that the island dwellers were at a different level of sociopolitical complexity than some of the groups who received their goods, while the coastal location indicates reliance on water transport for at least part of the movement of items of exchange.

In the gateway model, the hinterlands are seen to fan out from a gateway community, and contact may be limited among individual communities (Hirth 1978:37). The geography of the Gulf of Nicoya region would also promote such a system, for the coast would be closer to every site than many sites would be to one another. From the coast, travel by canoe or raft to one of the gulf islands would be faster and less expensive than overland contact with a neighboring site. Such a dendritic pattern of rural communities in a modern market economy exists in the gulf region today, though Puntarenas is the modern center.

The inhabitants of Chira, which acted as a landmark and port for coastal navigators, appears to have maintained a close symbiosis with the _cacique_ of Nicoya and his allies, through whom many exchange transactions moved. In concert, the two locations may have functioned as a binary central place, a gateway community having both a land and a sea component. The exploration of the ancient territory of Nicoya is now needed to follow up on what has been presented here.

A number of hypotheses, propositions, and models of exchange commodities and their procurement, routes by which they moved, and some of the social and political mechanisms which moved them have been presented. These have been based on archaeological and ethnohistoric data from Chira and San Lucas Islands, the rest of the Gulf of Nicoya region of Greater Nicoya, and beyond. Although the data do not specifically test the hypotheses, they do show plausible and profitable ways of viewing the assembled material, and suggest directions which studies of exchange may take in the future. The interrelationship of the gulf region geographically, economically, and socially is shown, as is the relationship of the gulf region to Greater Nicoya and to the more encompassing sphere of Mesoamerica.

APPENDIX 1

FLORA AND FAUNA REPORTED BY OVIEDO IN THE GULF OF NICOYA REGION, GREATER NICOYA, AND NICARAGUA

Fauna

Name According to Oviedo	Common Name	Scientific Name	Reference (L--Molina de Lines and Piana 1978) (O--Oviedo 1976)
(Mammals)			
ballena	whale		L:219
ciervo	deer	*Odocoileus virginianus*	L:179, O:452
conexo, liebre	rabbit	*Silvilagus* sp.	L:195, O:452
corrilla, maperiti	skunk	*Conepatus semistriatus*	O:134, 452
corzo, gamo, mazat	brocket deer	*Mazama americana*	O:109
cozumatle, marta gallega	coatamundi	*Nasua narica*	L:193, O:110
encubertados	armadillo	*Dasypus novemcinctus*	L:192, O:452
leone	puma	*Felis concolor*	L:189, O:452
lobo	coyote	*Canis latrans*	L:177, O:452
murcielago	bat	cf. *Chiroptera*	O:90
ochi, tigre pintado	jaguar	*Felis onca* *Felis pardalis* *Felis wiedii*	O:105, 452
ochi negro, tigre negro	jaguarundi	*Felis yagouraroundi*	O:106, 452

Name According to Oviedo	Common Name	Scientific Name	Reference (L--Lines and Piana 1978) (O--Oviedo 1976)
oso hormiguero	anteater	Temandua tetradactyla	L:185 O:452
perro mudo,	barkless dog	Canis sp.	O:101
perro de monte	bush dog	Speothos venaticus	L:178
puerco, baquira, chuche	peccary	Tayassu pecari	L:172, O:452
vaca, danta	tapir	Tapirus bairdii	L:172, O:452
(Birds)			
pavo	curasssow	Crax rubra	O:170
perdices pardas	partridge	cf. Perdix	O:452
(Invertebrates)			
culebra	sea snake, eel	cf. Conger oceanicus	O:126
sapo	toad, frog	Bufo marinus, Leptydactylus pentadactylus	O:186
(Insects)			
abejas	bees		O:186
alacrán	scorpion		O:90
avispas	wasps		O:186
(Fish)			
agujas paladares	needlefish?	cf. Belonidae	O:47
roncadores	grunt	cf. Pomadasydae	O:187

Name According to Oviedo	Common Name	Scientific Name	Reference (L--Lines and Piana 1978) (O--Oviedo 1976)
(Molluscs)			
nacarones	pen shell	Pinnidae	O:120, 185
ostias	pearl oyster	*Pinctada mazatlanica*	L:223, O:185
ostras de la púrpura	murex	*Purpura patula pansa*	O:453
pié de burro, hostias	spiny oyster	*Spondylus calcifer*	O:453 O:184

Flora Reported by Oviedo from Nicaragua and Nicoya

Name According to Oviedo	Common Name	Scientific Name	Uses	References
ánime blanco			incense, glue	O:32
brasíl	brazilwood	*Haematoxylon campechianum*	dye	O:86, 181
cacao, paco, cacaguat	cacao	*Theobroma cacao*	chocolate	O:65
calabaza	gourd	*Lagenaria* sp.	containers	L:96
ceiba	ceibo	*Ceiba pentandra* *Bombax barrigon*	wood, shade	O:83
corbana		*Gliricidia sepium*	shade	L:125
encina, yaguaguy	oak	*Quercus oleoides*	wood, acorns	O:89
fésoles	beans	*Phaseolus* sp.	food	O:99
guayacán, palo santo	guayacan	*Guaiacum sanctum*	medicine	O:95

Name According to Oviedo	Common Name	Scientific Name	Uses	References
higuero, guacal	gourd	Crescentia spp.	containers	L:138
mahiz	maize	Zea mays	food	O:185
mamey	mamey	Mammea americana	fruit	L:85
mamey	coconut	Cocos nucifera	oil, medicine, cups, tinder	O:82
munonzapot	nispero	Achras sapota	fruit, wood	O:59
mozot	mozote	Triumfeta spp.	medicine	O:100
nanzi	nance	Byrsonima crassifolia	fruit	O:85
paco, guaco	mango	Mangifera indica	fruit	O:75
papaya, olocoton	papaya	Carica papaya	fruit	O:77
perales	avocados	Persea americana	fruit	O:87
pimienta de los indios	chile	Capsicum sp.	fruit, spice	L:71
pina	pineapple	Ananas sativa	fruit, wine	L:72
pitahaya, cardones	pitahaya	Cereus sp.	fruit	O:60
poxot	pochote	Bombacopsis Fendle	wood, shade	O:84
tembixque	tempisque	Mastichodendron tempisque	edible seeds	O:80
tile			ink	O:34
xocot	jocote	Spondias purpurea	fruit, wine, medicine	L:86
yaat	coca	Erythroxylon sp.	drug	L:170
zapot	zapote	Pouteria mammosa	fruit	L:85

APPENDIX 2

CERAMIC TYPE DESCRIPTIONS

Type: Black and Red on White slip Polychrome

Variety: Unspecified

Sample: Four sherds, one partial vessel (ten sherds), and eleven sherds with white slip only were recovered from Vigilante Alta; 39 sherds bearing polychrome and 79 white-slipped sherds were excavated from Herramientas.

Description:

Principal Identifying Modes: (1) White slip, (2) Red and black motifs painted over slip, on interior or exterior, (3) Restricted mouth vessels, bowls.

Paste, Temper, Firing, etc.: Paste was reddish brown and oxidation was usually complete. The grit temper included rounded white flecks.

Surface Finish and Decoration: The white slip on these sherds had a yellowish cast (10YR 7/3 very pale brown). The orange-red paint (2.5YR 5/6 red) appeared to have been applied last, after slip and lines around rim and the break in bowls in black, and motifs outlined in black were drawn, red was used to fill in designs.

Of sherds having only white slipped surfaces, two were fragments of annular bases, while 16 were rims. Eight sherds were slipped on both surfaces, while 80 sherds were slipped on one surface only.

The fragments from a single vessel recovered at Vigilante Alta, were part of a pyriform vessel with an annular base. This was recovered from the excavation unit containing the most elaborate burial recovered from this site, Burial 4. The location was disturbed by pot hunters, who may have removed the remainder of the vessel. About half of the base is all that could be reconstructed from the fragments left *in situ*. The exterior surfaces of the vessel were generously coated with white slip while the base of the interior was left unslipped, and only a few drips of white reached the bottom of the vessel on the interior. Unslipped surfaces were smoothed. The paste is reddish brown, similar to other sherds in the collection from this site. The grit temper included rounded white flecks. Hollow tripod supports, two fragments of ring bases and a strap-shaped support show that both pedestal and tripod vessels were present.

Few complete motifs were preserved on the ceramics. Motifs include guilloche, exterior panels divided by paired red (10R 4/8 red) and black lines, red and black bands along the rim, dots or circles in red and black within a panel, and on vertical rims or necks, undulating or interlaced lines of black, filled with red paint and black punctations. Painted interiors of vessels include: 1) red and black lines around the rim and triangular designs of paired black lines filled with red paint, and black punctations, and 2) long ovals of black filled with red, punctated along the center and sides, painted on the interior walls of composite bowls. These may be stylized representations of an insect, a caterpillar or worm. Similar motifs, identified as marine worms, were painted on Cocle ceramics (Linares 1977:fig. 35b).

Form: While the body sherds seem to represent restricted mouth forms, based on slipping on one side only, the rim fragments represent simple and composite bowls as often as restricted mouth forms. This may illustrate similar rim diameter on both forms, while restricted mouth vessels had greater surface area.

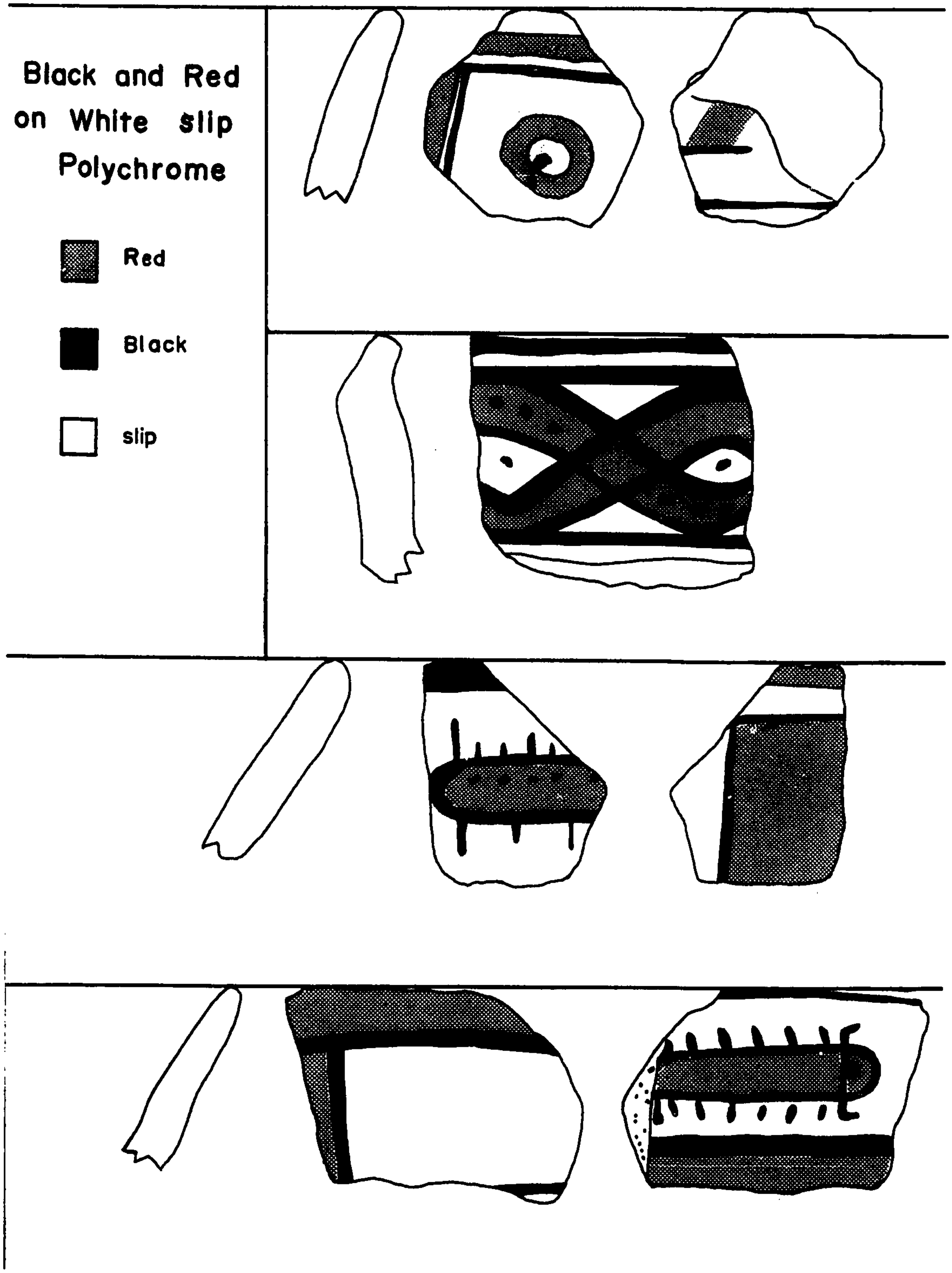
Intra-Site Locations and Contexts: Few sherds and no whole vessels were recovered though there appeared to have been a whole vessel in Burial 4 at the Vigilante Alta site.

Inter-Site Locations and Contexts: This sample came from sites located in the southern sector of Greater Nicoya. There appeared to be affinities in slip, paint colors, and forms with Papagayo Polychrome (Norweb 1964:559), Jicote Polychrome var. Lunita (Denver Conference 1982), and Madeira Polychrome (Healy 1980:140, Lange 1971:194). There also may have been similarities in forms, colors, and motifs with Lothrop's Red- and Black-Line Polychrome from south Costa Rica (1963:53-64).

Cultural Significance: A larger sample of polychrome ceramics from Late Polychrome period sites in the Gulf of Nicoya region is needed to make positive identification of the types present. The position of the gulf and its apparent exchange ties with other groups along the coast to both the north and south make it possible that black and red on white slip polychromes from both adjacent areas will be found.

Illustrations: Fig. 66

FIG. 66



Type: Santa Marta Polychrome

Variety: Unspecified

Sample: One sherd, Herramientas site

Description:

Principal Identifying Modes: (1) Orange-red slip (2.5YR 5/6 red), (2) Red and black motifs on both sides.

This body sherd was slipped then painted with black lines, which were filled with red. The red paint (10R 5/6) is similar to the slip color. The exterior was decorated with paired lines which may have formed adjacent triangles of alternating red and black. The interior was painted with one thick and two thin parallel black lines with lines at an angle below them. The thin parallel lines were filled with red paint.

Intra-Site Locations and Contexts: This sherd was recovered from one of the test trenches at Herramientas.

Inter-Site Locations and Contexts: Santa Marta Polychrome has been reported from sites throughout the Costa Rican portion of Greater Nicoya (Accola 1978:86, Creamer n.d., Lange et al. 1976:fig. 1), in the Atlantic watershed of Costa Rica (Accola 1978:86), and possibly in the Diquis Delta (Lothrop 1963:fig. 68b, fig. 70c).

Cultural Significance: The wide distribution of Santa Marta Polychrome suggests that it played a role in interregional communication during the latter half of the Middle Polychrome period. The presence of a sherd of this type may reflect the participation of the site's inhabitants in some system of interregional contacts, and temporal placement of Santa Marta appears to agree with the proposed date of occupation of the Herramientas site.

Type: Mora Polychrome

Variety: Mora

Sample: One sherd, Herramientas site

Description:

Principal Identifying Modes: (1) Dark brown or black and red motifs, (2) Orange-red slip (2.5YR 6/6 light red), (3) Bowl forms.

The rim fragment of a bowl of Mora Polychrome recovered at the Herramientas site is both thinner (5.5 mm) and has finer grained paste than other polychrome types recovered. The paste is a dark orange-brown color. The exterior rim is red (5R 4/6 red), three parallel lines encircle the bowl, with a saw-toothed line and another two parallel lines below that. The interior rim is red and beneath it is painted the bar-and-dot motif characteristic of var. Mora (Accola 1978:85). Another pair of lines circles the interior below the bar and dot. The motifs on this fragment are characteristic of the later mode of Mora, dated to A.D. 1000-1200 in the Bay of Culebra (ibid., 86).

Inter-Site Locations and Contexts: Mora Polychrome is found throughout Greater Nicoya during the Middle Polychrome period (A.D. 800-1200) (Accola 1978:85, Baudez 1967:133, Creamer n.d., Healy 1980:152, Lange 1971a, Sweeney 1975:254), and has been recovered from mortuary contexts in the Central Highlands and Atlantic watershed of Costa Rica (Snarskis 1978:263, Snarskis and Blanco 1978), and in south Costa Rica (Honetschlager and Finch n.d., Lothrop 1963:89), and in western Panama (Cooke 1980:376, Einhaus, personal communication).

The single sherd of Mora Polychrome may represent rare acquisition of this type by the site's inhabitants. Alternatively, it may have been introduced after abandonment of the site, for Mora is dated earlier than the proposed dates of occupation of Herramientas.

The sherd of Mora Polychrome recovered from Herramientas, was very likely brought in from the mainland of Greater Nicoya further north, where it is found most frequently. Outside northern Costa Rica, Mora is recovered from a wide area, though in small quantities. Whole vessels have been recovered from burials, and polychrome types including Mora may have been sumptuary objects associated with death ritual (Lange n.d., Snarskis and Blanco 1978).

Mora may not have been associated exclusively with mortuary contexts, and may have been traded for a wide array of perishables, gold, or stone tools within and beyond Greater Nicoya. The pattern of distribution of Mora suggests it was produced in the zone of greatest frequency of the type. This suggests that one possible base for exchange among regional groups in an area of largely similar resources may have been different polychrome ceramic types.

Illustrations: Fig. 67

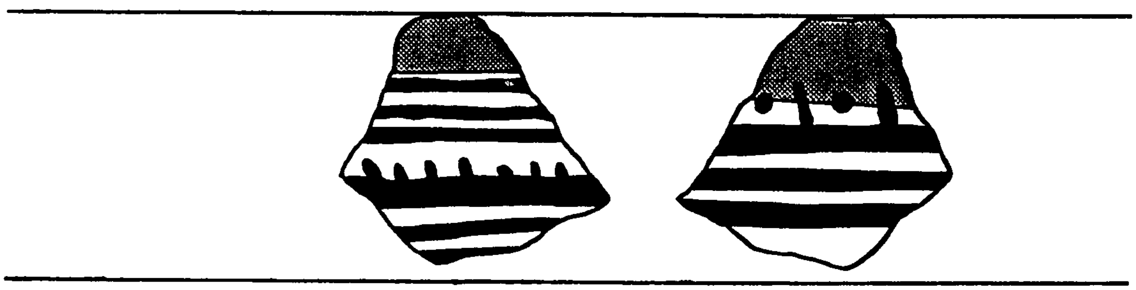
Mora
Polychrome

Red

Black

slip

Figure 67



Type: Tempisque Incised

Variety: Tempisque

Established as a Type/Variety: Baudez recognized this type based on a small collection from Toro Island (1967:170). Twenty-eight sherds were recovered from Vigilante Alta and 992 sherds from Herramientas. An additional 16 sherds from Vigilante Alta and 74 sherds from Herramientas are Tempisque Incised plus the Princesa Incised rim mode.

Ceramic Group: Murrillo Group

Ware: Chocolate Ware

Ceramic Complex: Bebedero

Ceramic Sphere: Greater Nicoya, Costa Rican region, to the Diquis valley.

Description:

Principal Identifying Modes: (1) Brown slip, or slip same color as paste (self-slip), (2) Incising in a band around the rim consists of parallel lines and triangles, (3) Bowl forms.

Paste, Temper, Firing, Etc.: Paste is red-brown, from very poorly fired to completely oxidized. The texture of the paste is consistent throughout the sample, fine to medium grained. The grit temper is flecked with white grains, similar to the temper of the polychrome sherds.

Surface Finish and Decoration: Surface color of sherds ranges from beige through red and brown to black. Vessels were smoothed, slipped inside and out and polished to varying degrees. Fine line incising consists of two sets of parallel lines around the rim of the vessel which are filled with alternating triangles or undulating lines, frequently punctated in the center of each triangle. This motif is executed in many ways, from a row of alternating punctations within paired lines (Baudez 1967:Pl. 47) to triple punctated triangles with additional punctated triangles hanging from the lowest incised line. All the lines are incised, not engraved (post-firing), though the softness of the clay, hence the depth of the incisions, varies of different vessels. Some of the lines are filled with white paint.

Forms: Open or composite bowls are the only form known for Tempisque Incised. Only one vessel was recovered whole, and it is possible that further study in the gulf region will reveal a greater range of shapes. No evidence of tripod supports on Tempisque Incised bowls has been recovered.

Intra-Site Locations and Contexts: Tempisque Incised was recovered from midden at both Vigilante Alta and Herramientas. A single bowl of Tempisque Incised was recovered whole from midden in Unit 14 at Herramientas, in an area which later proved to be disturbed by previous pot hunting. It is the only whole vessel not recovered from burial or cache contexts during the excavations.

Inter-Site Locations and Contexts: Baudez illustrates a single sherd of Tempisque Incised (ibid.), one of the few recovered during test excavations at Toro Island in the mouth of the Tempisque River. The motif and form are consistent with the material from Vigilante Alta and Herramientas.

On Ometepe Island and in Rivas, Castillo Engraved appears similar in color, form, and certain motifs to Tempisque Incised (Healy 1980:97, Norweb 1964). Castillo is decorated only with post-firing engraving, however, and includes a wider variety of vessel forms and motifs than Tempisque. For this reason, the two types are separated in this report. Incised and engraved ceramics are present in small quantities in northern Costa Rica. Sweeney reported a small collection of Castillo Engraved sherds from Chahuite Escondido (1975:325), and established the type Huerta Engraved, which now appears identical to Castillo. Lange described Alan Engraved (1971a:210) and Morice Engraved (ibid., 214) from the Sapoa River Valley, which also appear to be Castillo Engraved (Lange, personal communication).

Lothrop lumped a large quantity of incised ceramics in groups called Black Ware, Orange Brown Ware, and best known of the three, Chocolate Ware, and he suggested these were distributed from Lake Nicaragua to Chiriqui (1926:227). The limited range of forms and motifs present on examples from the Gulf of Nicoya sites suggests that Lothrop's groups each include more than one type. Many of the vessels Lothrop illustrated have modeled and applique motifs in addition to incising, and these may be as closely related to Murrillo Applique as they are related to incised types. The Princesa Incised rim mode cross-cuts Lothrop's monochrome wares as well as Tempisque Incised and Murrillo Applique, which tends to blur distinctions between types. For example, Lothrop illustrated examples of Tempisque Incised which he called Brown Ware from the Diquís Delta (1963:fig. 20 a, e, h). Linares described Chocolate Incised ceramics from the Chiriqui phase occupation of the Las Secas islands (1968:45), and on the opposite side of the isthmus this type was recovered from sites in Bocas del Toro (Linares and Ranere 1980:390, fig. 12/2 m). A similarly decorated type was identified in Venezuela (Cruxent and Rouse 1961:Pl. 77, Honetschlager and Finch n.d.), where it dates to Period IV (A.D. 1000-1500).

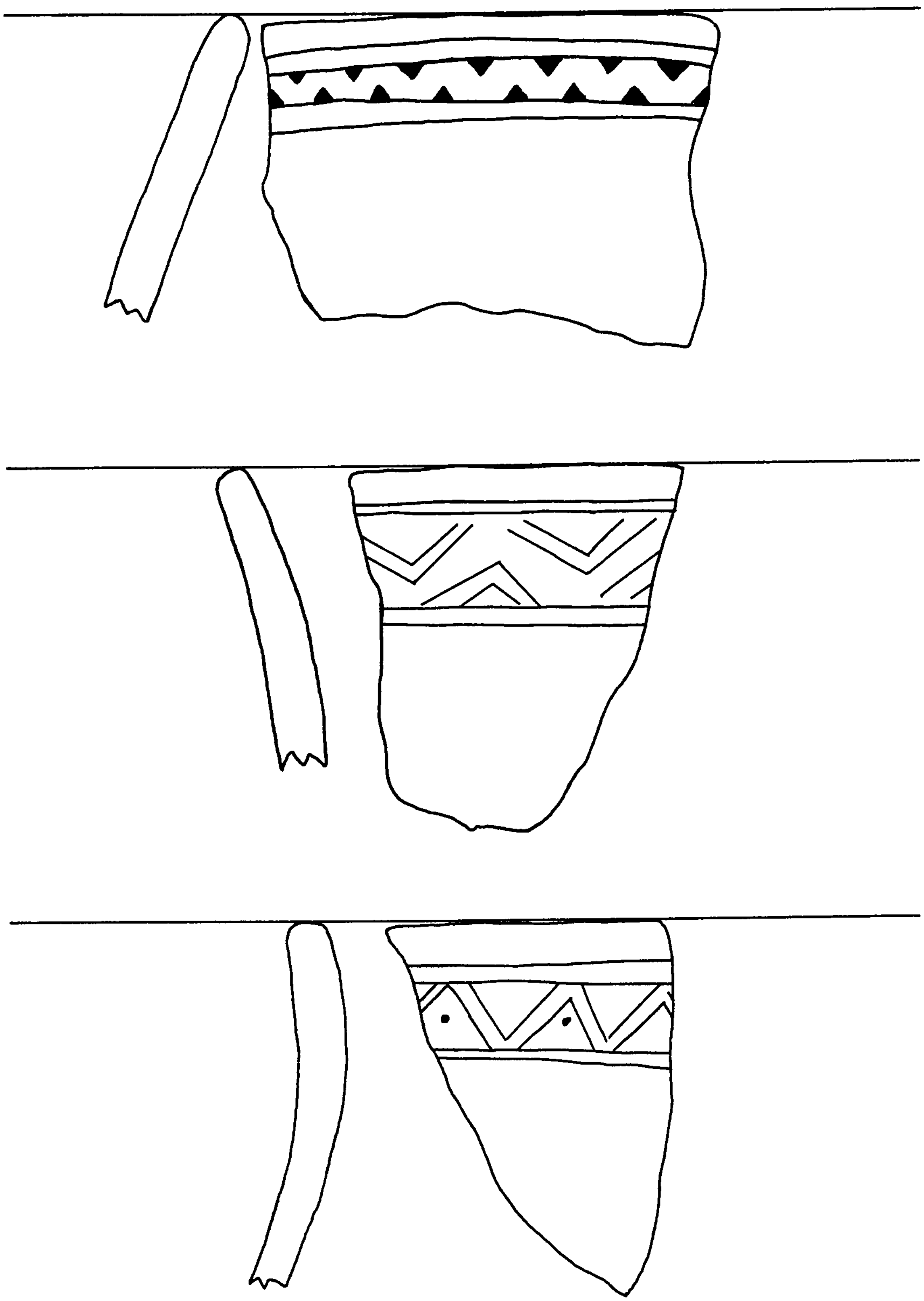
Cultural Significance: Though sherds and vessels having similar incised decoration have been recovered from sites from Ometepe Island to Venezuela, these are not all a single pottery type, but types related by shared motifs. At Vigilante Alta, 27 sherds have incising around the upper part of the vessel. These represent at least 17 different vessels, and suggest the vessels were not produced on the island. At Herramientas, however, the sample of incised sherds is large, and many appear similar, raising the possibility that some vessels were produced there. In western Panama, incised ceramics similar to examples from south Costa Rica are believed to be local products (Haberland 1957) whose "inspiration is the widespread Chocolate Ware of Costa Rica" (Linares 1968:45). In Costa Rica, incised ceramics are numerous in the Diquís region, where incised motifs even appear to have been transferred to polychrome (Lothrop 1963:fig. 56-60); this also occurred in Panama (Linares

1968:fig. 28, fig. 30u). Castillo Engraved and other engraved types from Nicaragua and northern Costa Rica also seem to represent a separate center for production, sharing motifs with similar types in adjacent regions. It appears that separate regions may have developed related but distinguishable ceramics, in western Panama, south Costa Rica, the Gulf of Nicoya, and southern Nicaragua.

Illustrations: Fig. 63

FIG. 68

Tempisque Incised Variety: Tempisque



Type: Murrillo Applique

Variety: Murrillo

Established as a Type/Variety: Baudez described Murrillo based on collections from the Tempisque Valley sites La Bocana, La Guinea, and Toro Island (1967:165). The present description is based on 67 sherds and one whole vessel from The Vigilante Alta site and 361 sherds and three whole vessels from the Herramientas site.

Ceramic Group: Murrillo Group

Ware: Chocolate Ware

Ceramic Complex: Bebedero

Ceramic Sphere: Greater Nicoya and south Pacific coast of Costa Rica to Cano Island.

Description:

Principal Identifying Modes: (1) Brown to dark brown slip, (2) Modeled or applique fillets, pellets, or adornos, (3) Jars with outflaring, bolstered rims, (4) Bottles with vertical, collar-like rims.

Paste, Temper, Firing, Etc.: Murrillo paste was reddish-brown in color and fine textured. Grit temper sometimes included rounded, white flecks, or red-brown angular particles. Firing was frequently incomplete and often sherds had a dark core.

Surface Finish and Decoration: Murrillo jars and bottles were smoothed on the exterior and scraped on the interior. Vessels were slipped with the same clay as the body (self-slipped, Shepard 1954:192), or were slipped dark brown. The surface was polished and even. Decoration consisted of applique fillets, occasionally impressed with round or oval marks; raised pellets were sometimes placed around the rim of the vessels. Rows of short, parallel incised lines were sometimes placed around the rim, neck or shoulder of a vessel, and occasionally, vertical fillets divided vessel exteriors into panels. Many vessels also had zoomorphic applique added. Figures represented are rarely identifiable, though bat, monkey, feline, and human forms are among those most frequently suggested. One adorno of the "button" or "mushroom" type described by Lange from the Las Marias site (1971a) was recovered from Vigilante Alta, and a lug similar to Murrillo var. Lago (Healy 1980:Fig. 51) was recovered from Herramientas.

Form: Vessels of Murrillo Applique were characteristically decorated around the rim, neck, and shoulder of restricted mouth jars and bottles. Occasionally applique extended onto the body of a vessel as part of an adorno. Bowls were not present in the collection, though bowl forms were found in other varieties of Murrillo (see Princesa Incised rim mode below).

Intra-Site Locations and Contexts: The greatest number of sherds of Murrillo Applique came from Herramientas, though sherds and vessels of var. Murrillo have come from both sites. Sherds were recovered from midden fill, while whole vessels were recovered from burials and caches. While the characteristics of Murrillo described here correlate closely with the descriptions of Baudez (1967:165, Pl. 47f, g), there are disparities between Murrillo described from gulf sites and Murrillo reported by Lange from the Bay of Salinas (1971a). At Las Marias and other Bay of Salinas sites, Murrillo had a square rim profile, and the "button" or "mushroom" adorno was common, while only one adorno of this type was recovered in the gulf. Vessels were black in color, and the applique fillet was almost always punctated. In the Gulf of Nicoya, this variety of Murrillo Applique was surface collected at Huaca Nica (3146II-170-1) on Chira Island, a site which dates to the end of the Middle Polychrome period, around A.D. 1200. It is possible that Murrillo Applique as described by Baudez and in this report is a slightly later, Late Polychrome period (A.D. 1200-1550) variant.

Inter-Site Locations and Contexts: Murrillo has been recovered from the Bay of Salinas in northern Costa Rica (Lange 1971a:183), from the Santa Elena Peninsula (Sweeney 1975:352), the Bay of Culebra (Lange 1976a, 1980b:84, Moreau 1980:108), the Tempisque Valley (Baudez 1976:165, Day, personal communication), the Gulf of Nicoya region (Creamer n.d.), Caño Island (Honetschlager and Finch n.d.). In Nicaragua, Murrillo Applique var. Lago has been defined by Healy (1980) in the Rivas region. Stone illustrates two vessels of Murrillo from El Moral de San Blas, Guanacaste (1977:82, 86), and a rare example of a whole vessel from San Lucas Island, though the illustration is incorrectly captioned as dating to the Zoned Bichrome period. Lothrop's Brown Ware from the Diquís Delta is similar to Murrillo in the frequent use of zoomorphic adornos and applique decoration (1963:fig. 28, 29, 30, 34). Feline applique heads are surprisingly similar as well (ibid., fig. 29d, 52). Vessel forms and tall tripod legs characteristic of Brown Ware are unlike Murrillo Applique, however. Linné illustrated vessels similar to Murrillo from Saboga in the Pearl Islands of Panama (1929:81) and from the La Gloria site on the Atlantic coast of the Panamanian isthmus, in Colombia (1929:10).

Cultural Significance: Murrillo Applique, when first reported, was believed to have been introduced into Guanacaste and Greater Nicoya without local antecedents (Lange 1976a:51, 1971a:192, 1980b:84), and Baudez did not find similarities between Murrillo and ceramics illustrated by Lothrop (1926). Since originally defined, however, Murrillo has been recovered from sites in Nicaragua and Costa Rica, and similar ceramics are now known from sites as far south as Colombia (Linné 1929:10). A South American origin has been suggested (Lange 1980b:84) and is probably true in general terms, as monochrome and applique decoration are strong traditions in South America in Panama, the Atlantic watershed and the Central Highlands of Costa Rica, all considered within the South American cultural sphere (Ferrero 1977:135).

Illustrations: Figs. 14, 22, 69

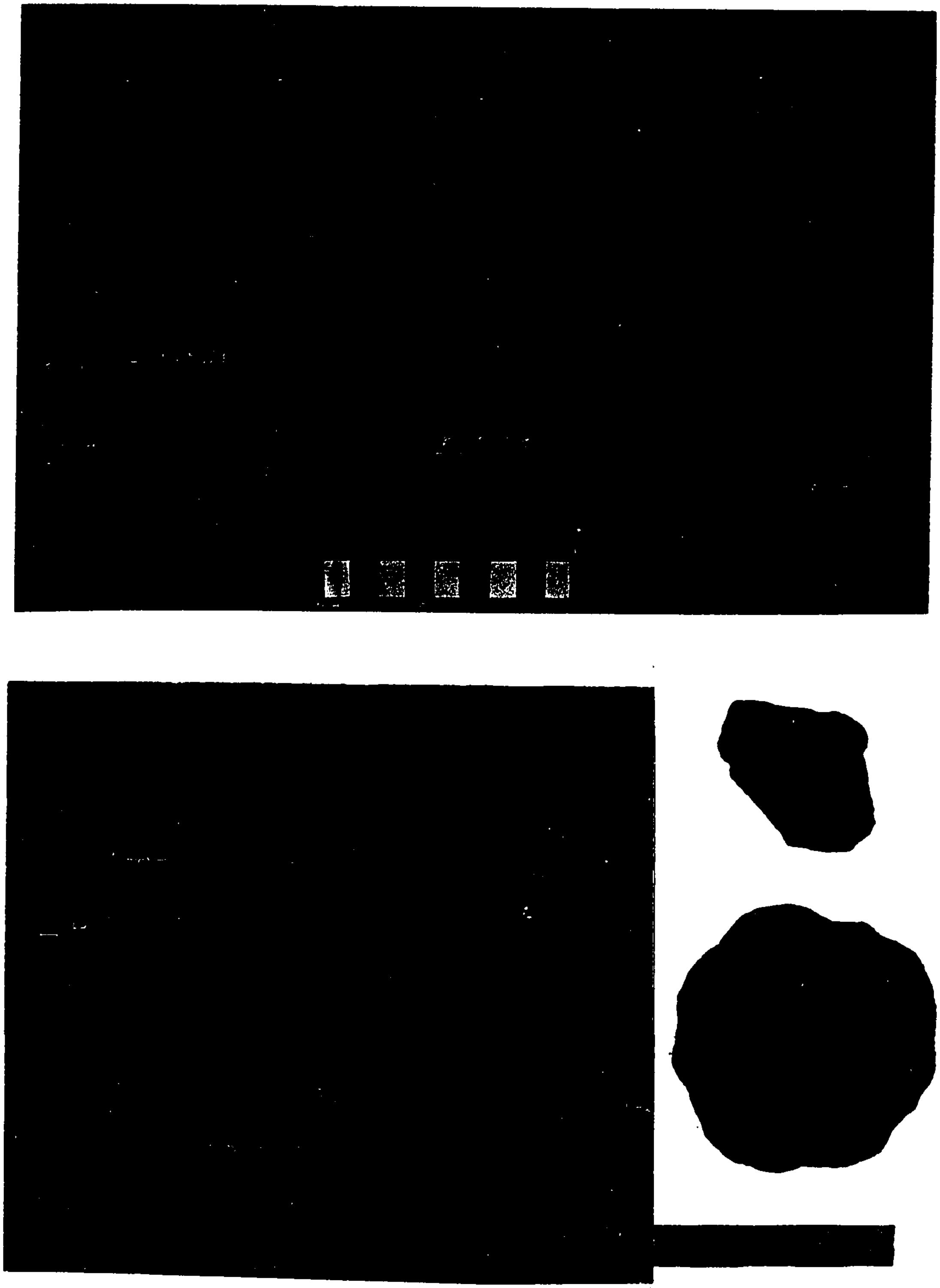


Figure 69. Murrillo Applique var. Murrillo.

Type: Murrillo Applique

Variety: Marina

Established as a Type/Variety: Day described this variety from a sample of thirteen vessels at Hacienda Tempisque (Denver Conference 1982). The present description is based on two sherds from Vigilante Alta and three sherds and 25 applique eye fragments from Herramientas.

Description:

Principal Identifying Modes: (1) Abstract faces in applique around the rim, (2) of jars.

Paste, Temper, Firing, Etc.: see Murrillo Applique var. Murrillo.

Surface Finish and Decoration: Jars were slipped red or were self-slipped, and applique strips and pellets formed eye, nose, and mouth.

Intra-Site Locations and Contexts: The few sherds recovered were from midden.

Inter-Site Locations and Contexts: Marina variety of Murrillo Applique has been identified at sites in northern Costa Rica, (Denver Conference 1982) though many examples probably have been classified as Murrillo var. Murrillo.

Illustrations: Fig. 70

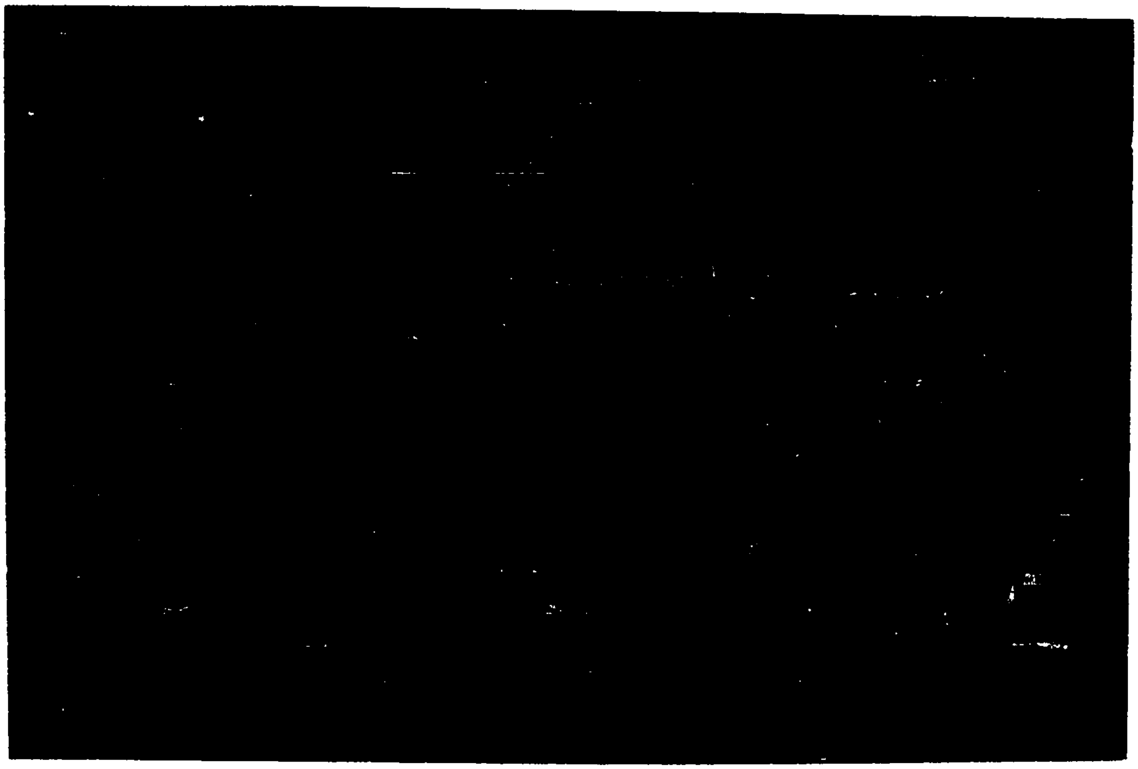


Figure 70. Murrillo Applique var. Marina.

Type: Toro Applique

Variety: Toro

Established as a Type/Variety: Baudez (1967:168) defined Toro Applique, which was not placed in his sequence. The sample from Vigilante Alta included 38 sherds and the sample from Herramientas 30 sherds.

Ceramic Complex: Bebedero

Ceramic Sphere: Greater Nicoya

Description:

Principal Identifying Modes: (1) Applique or modeled zoomorphic forms, (2) Handles.

Paste, Temper, Firing, Etc.: As Baudez noted in his original description (ibid.), many Toro handles were eroded on the surface, and the color of the slip and the surface finish no longer visible. Paste was fine to medium grained, red-brown in color. Temper was grit, with inclusions. Firing was usually complete, though some examples had a gray or dark colored core from incomplete firing.

Surface Finish and Decoration: Toro Applique, represented by handles on what were probably otherwise undecorated vessels, was modeled in zoomorphic forms, usually on strap handles. These were self-slipped or slipped red. Some were polished, while most were smoothed only. Two motifs are included in Toro variety of Toro Applique, bat and reptile representations. The "bat" is distinguished by circular eyes, C-shaped ears, and a corrugated, protruding nose, and the motif is extremely consistent in its components and execution. Bat motifs are common on Costa Rican ceramics (Benson 1981:32), stone artifacts (ibid., 150, 186), and gold work (ibid., 161, 223, Lothrop 1963:Pl. XL-XLIII).

The "reptile" motif is distinguished by slashed oval pellet "coffee bean" eyes, corrugations across the upper edge of the handle, and circular punctations approximately four millimeters in diameter in groups at the ends of the handles. These may indicate scales. The "alligator" motif is well known in Costa Rican artifacts (Benson 1981:52, 116, 150, 190, 195, Stone 1977:46, 55, 203).

Form: Toro Applique included only handles, most are large sized, possibly from large plain vessels, bowls, or jars.

Intra-Site Locations and Contexts: Toro was recovered for midden at both Vigilante Alta and Herramientas, both of which date exclusively to the Late Polychrome period, Baudez's Bebedero phase. Baudez recovered Toro Applique from Toro Island and two other sites near the mouth of the Tempisque River. All date to the Bebedero phase (1967:49).

Inter-Site Locations and Contexts: Applique zoomorphic handles have been recovered from the Bay of Salinas, where the motifs were considerably more naturalistic than examples from gulf sites. Limited reporting and study of applique decorated sherds has resulted in little comparative data. No similar material has been reported from Nicaragua. Similarly shaped handles have been recovered from Chiriqui phase sites in western Panama (Linares 1968:Fig. 34).

Cultural Significance: Toro seemed to be distributed over the same area as Murrillo Applique and Sweeney believed Toro was a red-slipped variety of Murrillo (1975:356). Baudez's original illustration shows only zoomorphic handles (1967:Pl. 47) like those illustrated here, all of which are distinct from Murrillo.

Illustrations: Fig. 71

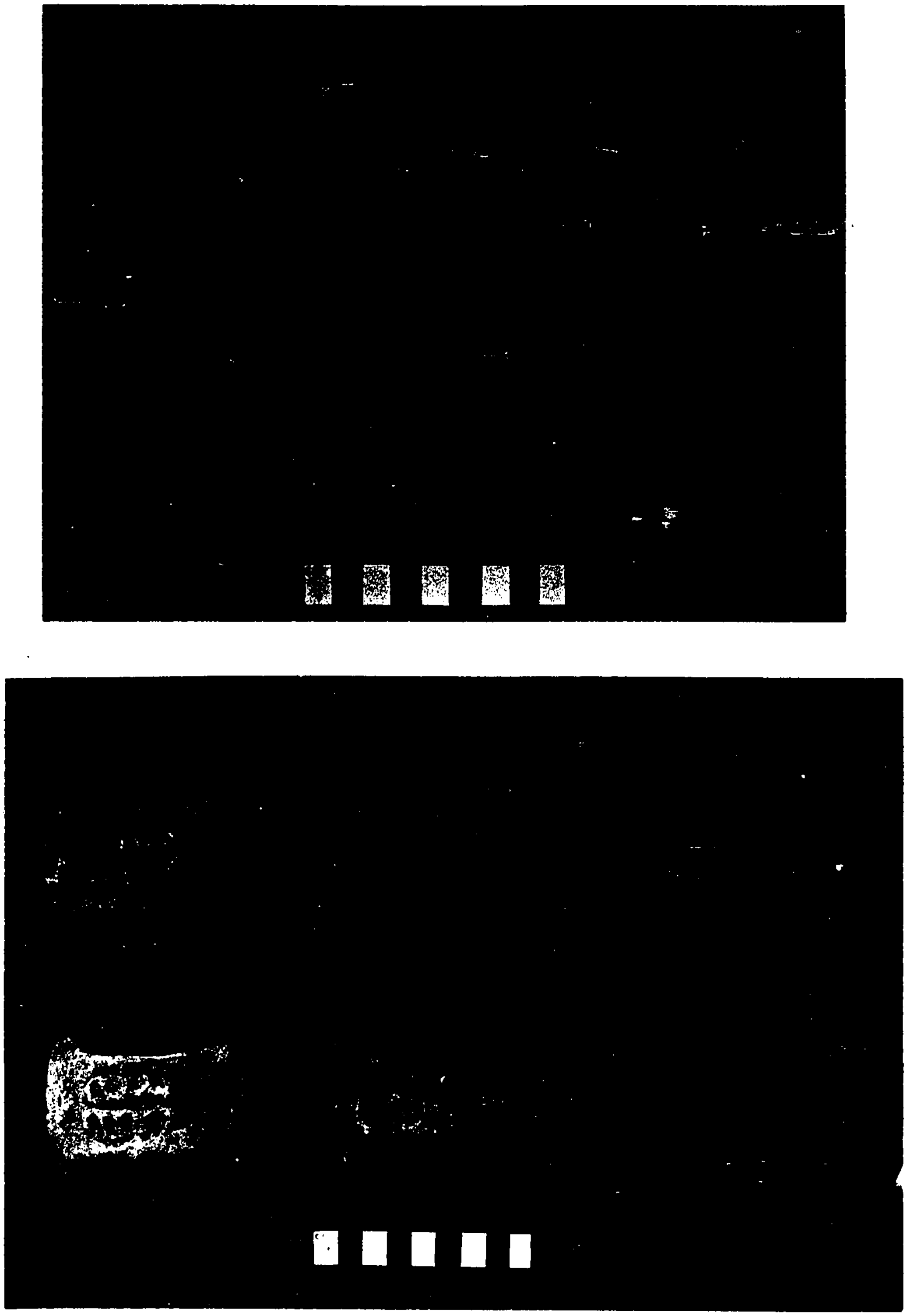


Figure 71. Toro Applique var. Toro.

Type: Toro Applique Variety: Unspecified

Established as a Type/Variety: This report, based on a sample of 9 sherds from Vigilante Alta and 21 sherds from Herramientas.

Ceramic Complex: Bebedero

Ceramic Sphere: Greater Nicoya, south Costa Rica

Description:

Principal Identifying Modes: (1) Applique or modeled zoomorphic motifs, (2) Self-slipped, and more rarely brown or red slipped, (3) Adornos, lugs, and handles

Paste, Temper, Firing, Etc.: see variety Toro

Surface Finish and Decoration: This variety included a wide variety of zoomorphic forms, such as monkeys, felines, frogs, turtles, bats, and many which were unidentifiable. Human figures were rare. Many appear to have been decorated lug handles on what were otherwise undecorated vessels. Unlike var. Toro, there is great range in handle size. Many are quite small, while the largest are nearly the size of var. Toro examples, the largest. Adornos were modeled with varying degrees of care, some were smoothed carefully, others were constructed of fillets and pellets which were barely pressed together. Most were self-slipped, though some were slipped brown or red, and some were polished after slipping.

Forms: These are adornos, lugs, or handles.

Intra-Site Locations and Contexts: The unspecified variety was recovered from midden at both sites. Though many were found, no special concentrations were located and deposition appeared to have occurred through breakage.

Inter-Site Locations and Contexts: Applique heads and zoomorphic forms, whether adornos, handles, or supports, were found throughout Greater Nicoya. Similar adornos were illustrated from the Diquís Delta and called Brown Ware by Lothrop (1963:fig. 29, 30).

Cultural Significance: The great variety of motifs represented in this variety have potential for study from the standpoint of iconography and the use of symbols in communication, whether rank or kinship significance, or as religious signifiers.

Illustrations: Fig. 72

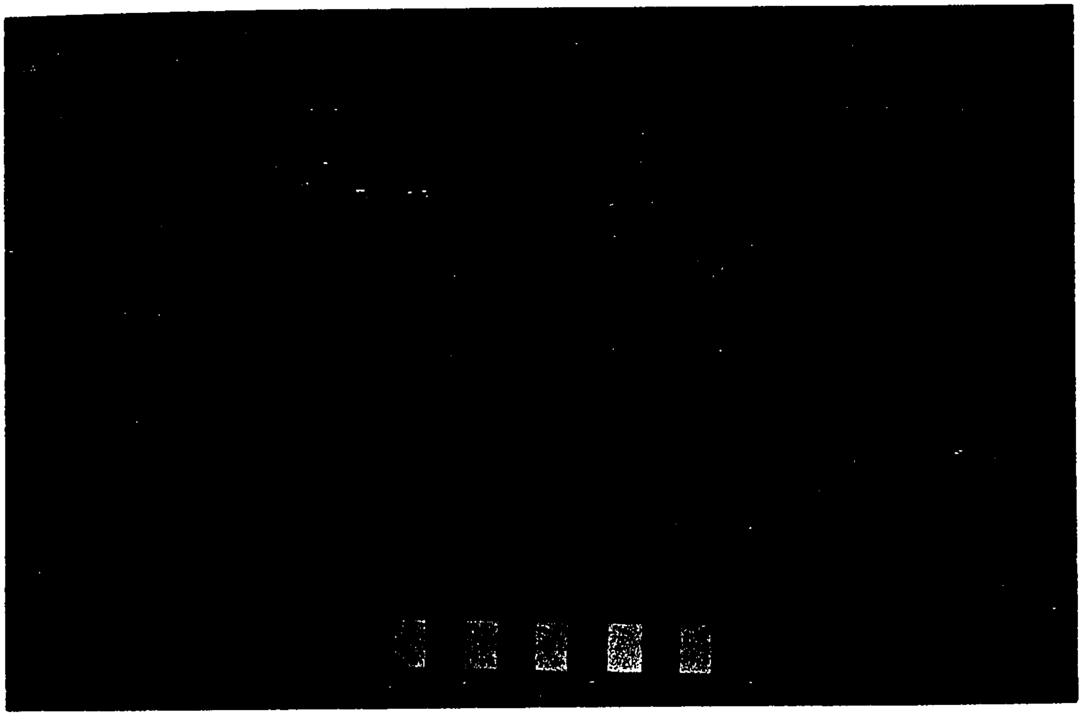


Figure 72. Toro Applique var. Unspecified.

Figure 73. Potosi Applique.

Type: Potosi Applique

Variety: Potosi

Established as a Type/Variety: Norweb (1964:559) established the name Potosi Applique and detailed description was provided by Healy (1980:194). Baudez (1967:171) established Alligator Incensario for the Tempisque Valley, and the two types have been merged (Denver Conference 1982). The present description is based on 21 sherds from the Herramientas site.

Description:

Principal Identifying Modes: (1) Applique pellets in bands, (2) on thick sherds of smoothed gray brown self-slipped material.

Paste, Temper, Firing, Etc.: The paste was coarse, tempered with grit and shell, and was gray brown in color.

Surface Finish and Decoration: The surface was smoothed and self-slipped.

Form: Only sherds were recovered, including a large handle and a portion of the rim of a large, double strap-handled jar.

Intra-Site Locations and Contexts: Sherds were recovered from midden at several locations at Herramientas.

Inter-Site Locations and Contexts: Potosi has been recovered at La Guinea (Baudez 1967:17), in northern Costa Rica (Lange 1977a:177), and in the Rivas region of Nicaragua (Healy 1980:199). A perforated annular base in the collection from Herramientas resembles the base of a Potosi vessel illustrated by Healy (ibid., fig. 86).

Cultural Significance: The placement of Potosi Applique in the Early Polychrome period (A.D. 500-800) does not fit our Late Polychrome period context. The sherds could represent a separate Late Polychrome period pellet studded type, or could be remains of heirloom pieces.

Illustrations: Fig. 73

Type: Combo Colander

Variety: Combo

Established as a Type/Variety: Healy (1980:113) described Combo Colander based on a sample of nine sherds. Baudez (1967:Pl. 47) illustrated colander sherds from Toro Island. The collection from Vigilante Alta included 263 sherds, and there were 200 sherds from Herramientas.

Ceramic Complex: Bebedero

Ceramic Sphere: Greater Nicoya

Description:

Principal Identifying Modes: (1) Red-orange slipped and lightly polished, (2) perforations completely covered fragments up to the rims, (3) open or slightly restricted bowl forms.

Paste, Temper, Firing, Etc.: Paste was medium fine, red-brown in color. Temper was grit flecked with inclusions of black and reddish material. Most sherds were completely oxidized.

Surface Finish and Decoration: Vessels were smoothed, then filled with circular punctations. These appear to have been made by pushing a pointed tool from the outside toward the inside of the vessel. Punctations could be divided into two size groups, tiny holes two to three milimeters in diameter, and larger holes, around six milimeters in diameter. Vessels were slipped a reddish color or were self-slipped. Most rims were plain, though some were decorated with punctations and the Princesa Incised rim mode of decoration.

Forms: Only bowl forms were used for colanders. Some were slightly restricted around the neck (tecomate forms), others were open bowls. Vessels ranged from 12 to 36 cm in diameter, and no whole examples were recovered.

Intra-Site Locations and Contexts: At both sites Combo sherds were recovered from midden fill.

Inter-Site Locations and Contexts: Colander sherds were surface collected from a number of sites around the shores of the Gulf of Nicoya and on many of the islands (Creamer n.d.), always in Late Polychrome contexts. Baudez recovered Combo sherds from Toro Island at the mouth of the Tempisque River (1967:175, Pl. 47 c-d). In Nicaragua, examples of Combo included only the tecomate form and the size having tiny perforations, while the gulf sites yielded bowls with larger holes. Perforated vessels were reported widely in the New World (Healy 1980:115, Linné 1929:23). During the Late Polychrome period they appear to have been distributed from the gulf region north as far as the Guatemalan highlands (Healy 1980:114).

Cultural Significance: These vessels appear to have been associated with food processing, and the greater number of colander sherds from Vigilante Alta than from the larger Herramientas site suggests that their function was connected with the exploitation of marine resources such as fish and molluscs.

Illustrations: Fig. 74

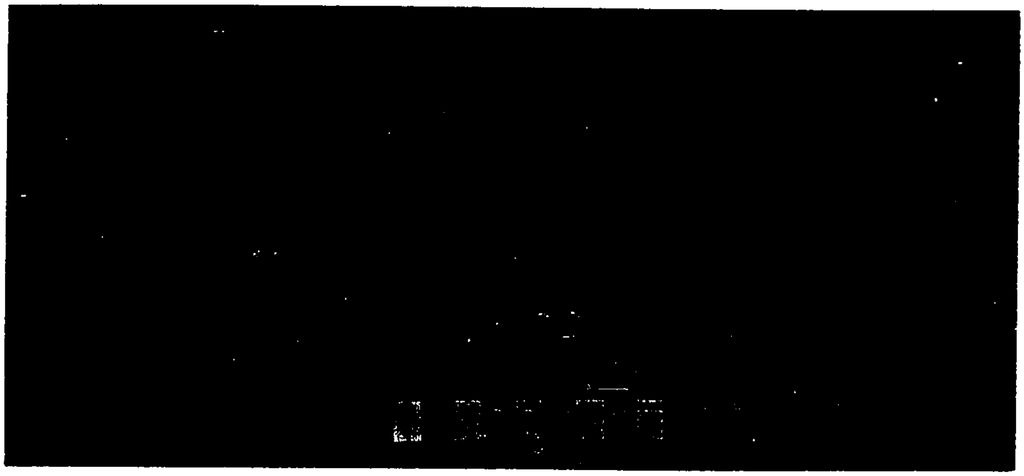


Figure 74. Combo colander.

Type: Gulf Plain

Variety: Gulf

First Established as a Type/Variety: This report, based on a sample of 299 sherds from Vigilante Alta, one whole vessel, and 490 sherds from Herramientas.

Description:

Principal Identifying Modes: (1) Self-slipping, (2) Red-brown, medium fine textured paste, (3) Bowl, or restricted mouth vertical neck ("collared", or "bottle" forms) jars.

Paste, Temper, Firing, Etc.: Paste was red-brown and ranged from very poorly fired to completely oxidized. The texture of the paste was consistent throughout most of the sample, and the paste appeared similar to that of Tempisque Incised. Temper was grit, flecked with white, black, and sometimes red particles. Two of the sherds appeared to be grog-tempered with coarsely crushed material. A few sherds appeared to have shell in the temper.

Surface Finish and Decoration: Surface color of sherds varied from beige and brown to red, and appeared to depend on firing conditions. Though most were scraped on the interior, self slipped, and polished the exterior some examples were slipped. Polishing and luster ranged from sherds which showed little surface finish, to others which were carefully finished on the exterior.

Forms: Bowls and restricted mouth vessels are the most common forms. Restricted mouth jars frequently have a vertical rim or "collar". Many sherds may have been part of vessels with decorated lug handles such as Toro Applique. Vessel sizes vary, though there appears to be clustering of rim diameters of 18-20 cm. The presence of a large number of restricted mouth vessels distorts vessel size based on rim diameter, for the rim diameter of such jars is one of the smallest dimensions of the vessel.

Intra-Site Locations and Contexts: Gulf Plain was recovered from both sites tested in midden. At Herramientas one whole vessel of plain ware was recovered from a cache in Unit 4.

Inter-Site Locations and Contexts: Baudez defined the type Piches Rouge based on sherds from La Guinea (1967:151). The forms are similar to Gulf Plain, though Gulf includes many sherds which were not slipped red, an important criterion for Piches. Temporal position of the two types seems to overlap, and it is possible that with further study, Gulf may be divided into several types, and the red-slipped portion may be placed with Piches.

Cultural Significance: Most of the undecorated ceramics from the sites excavated appeared to be a single ceramic type, Gulf Plain. Ceramics of this type may have been utilitarian, and made locally. Local sources for the raw materials would have made trade for utilitarian vessels unnecessary. At the same time utilitarian ceramics might not have been widely exchanged, for similar ceramics, such as Piches Rouge, were probably made at many locations throughout Greater Nicoya.

Diagnostic Modes

Princesa Incised rim mode

Defined as the ceramic type Princesa a levre Incisee by Baudez (1967:150), the type was found to overlap with previously identified ceramic types including Tempisque Incised and Murrillo Applique, as well as occurring on otherwise undecorated vessels. Accordingly Princesa has been reestablished as a mode diagnostic of the Late Polychrome period. The Princesa mode consists of short parallel lines impressed in the vessel surface prior to slipping. This mode was present on 129 sherds from Vigilante Alta and on 869 sherds from Herramientas. It was also found in combination with other types (see other descriptions).

Bowls, jars, or bottles were impressed around the rim, neck, or shoulder, with groups of short parallel lines, sometimes placed at oblique angles to one another. Slip was then applied and vessels were usually polished. This mode may accompany fine-line incised decoration such as on Tempisque Incised (ibid., Pl. 47), applique decoration such as on Murrillo Applique (ibid., 165), or it may appear along around the rim of bowls.

The distribution of this mode is the same as that of applique and incised ceramics. Large quantities have been found in the gulf region, and Baudez recovered examples from around the mouth of the Tempisque (ibid., 150). Sweeney reported three sherds of Princesa from Huerta del Aguacate near Tamarindo Bay (1975:314) which she described as Huerta

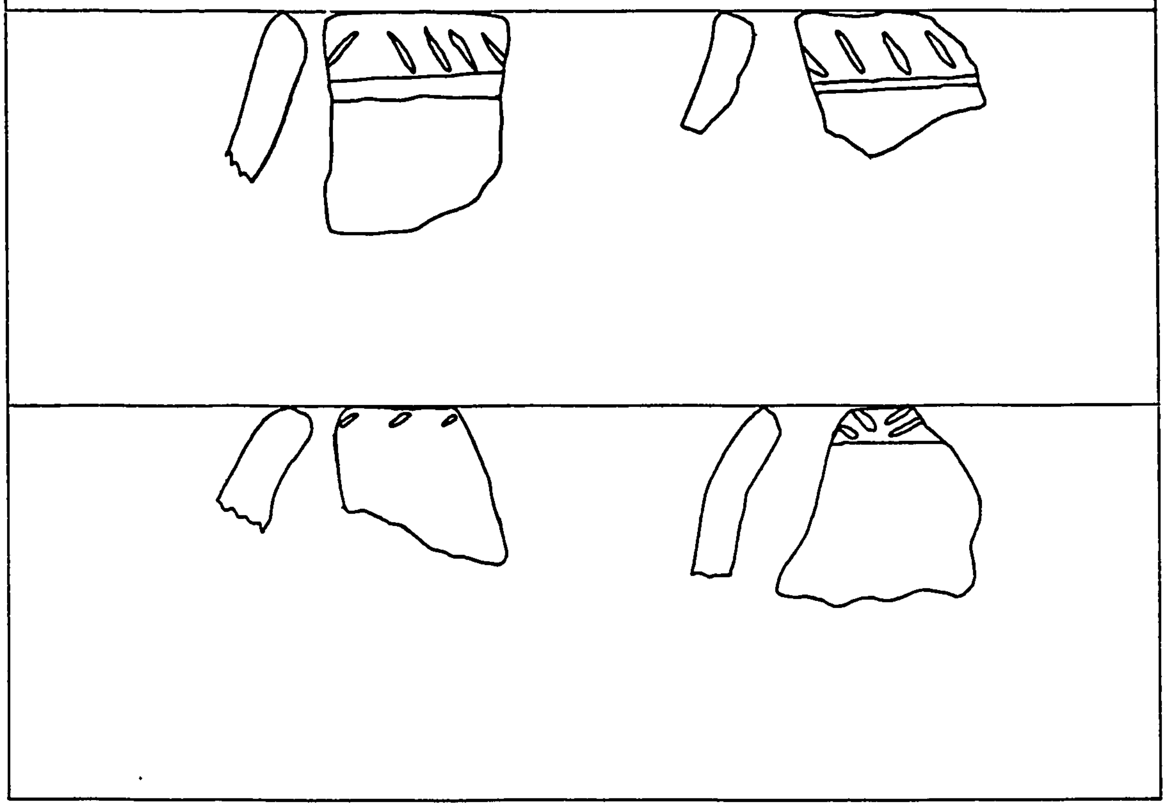
Punctate Rim (1975:300, Pl. 47D). Sweeney's Princesa included incisions made in wet paste (ibid., 314), however, while Baudez's original definition was based on incision prior to slipping (1967:151). Further south, Princesa was present on sherds from Caño Island (Honetschlager and Finch n.d.), the Diquís Delta (Lothrop 1963:fig. 19a), and on a vessel in the collection of the cantón of Perez Zeledón, in San Isidro de el General. Linares illustrated a similar mode on ceramics from La Pitahaya in Chiriqui (1980:103).

Though the possible time depth of Princesa Incised rim mode is not yet known, its geographic extension suggests it was part of a common set of techniques employed in the decoration of monochrome ceramics from Panama to northern Costa Rica. As it has not been associated with stylization of any particular animal, human, or other motif, these impressions may indicate a common tie of extreme generality, perhaps merely showing acquaintance with neighboring groups who employed the motif.

Illustrations: Fig. 75

Figure 75

Princesa Incised Rim Mode



Gulf Incised rim mode

This mode consists of parallel lines or grooves around the outside of the rim of bowls thickened on the exterior. This may be what Baudez designated as the type Tenorio Crenelated Rim (1967:155), though the placement of the notches appears to be different between Tenorio and the Gulf Incised mode. The Gulf Incised mode was present on 15 sherds from Vigilante Alta and 26 from Herramientas. Though generally this mode was found only on otherwise undecorated vessels, some examples of Combo Colander had Gulf Incised decoration. Bowls were the only form recovered. Lines or notches were usually impressed around the rim on the side of the vessel and these were usually vertical and parallel. Vessels were smoothed on all surfaces and were often self-slipped or slipped red. This mode has not been reported elsewhere in Greater Nicoya to date.

Illustrations: Fig. 76

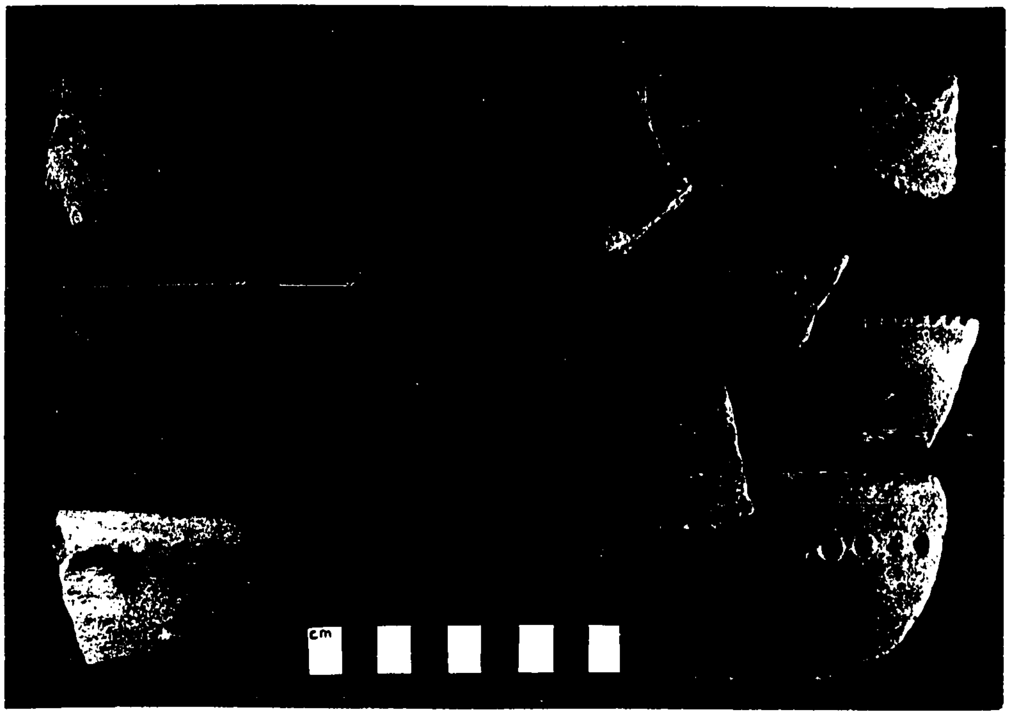


Figure 76. Gulf incised rim mode.

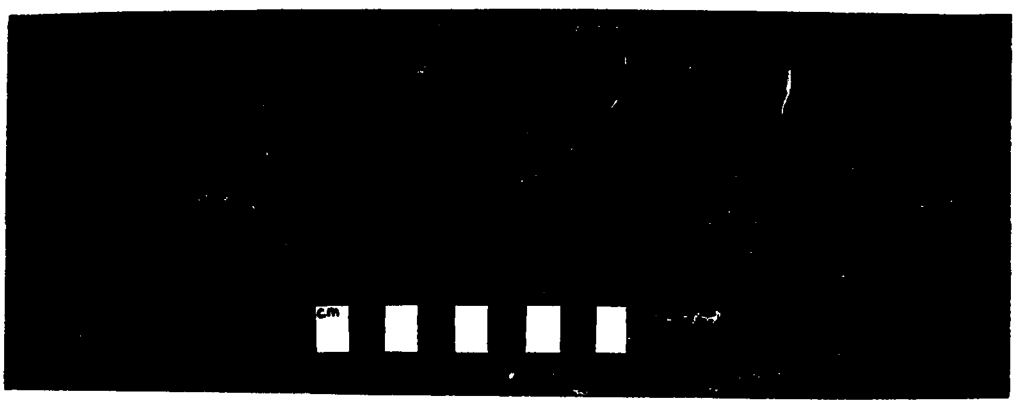


Figure 78. Unnamed punctated.

Type: Unnamed Punctated

Sample: Thirty-five sherds from Vigilante Alta and 12 sherds from Herramientas.

Most of these sherds were from small restricted mouth jars six to eight centimeters in diameter, though one was from a bowl 18 cm in diameter. Punctations were circular or triangular and were placed around the rim of the vessel just above the break. The interior of the rim and neck appeared to have been finished though on some examples the interior of the body was not as smooth as the exterior. Though the vessels were small, they were not finely made and were five to ten millimeters thick. Sherds range from red to brown and black in color. Paste was similar to that of the incised ceramic types, reddish-brown and grit tempered with varying amounts of round white grains visible. The example most similar in form and placement of decoration, though not in technique, is the Murrillo Applique vessel found in Burial 4 at Vigilante Alta. The small globular jar had an applique strip around the neck in which there were shallow circular punctations.

Illustrations: Fig. 78

Miscellaneous Ceramics

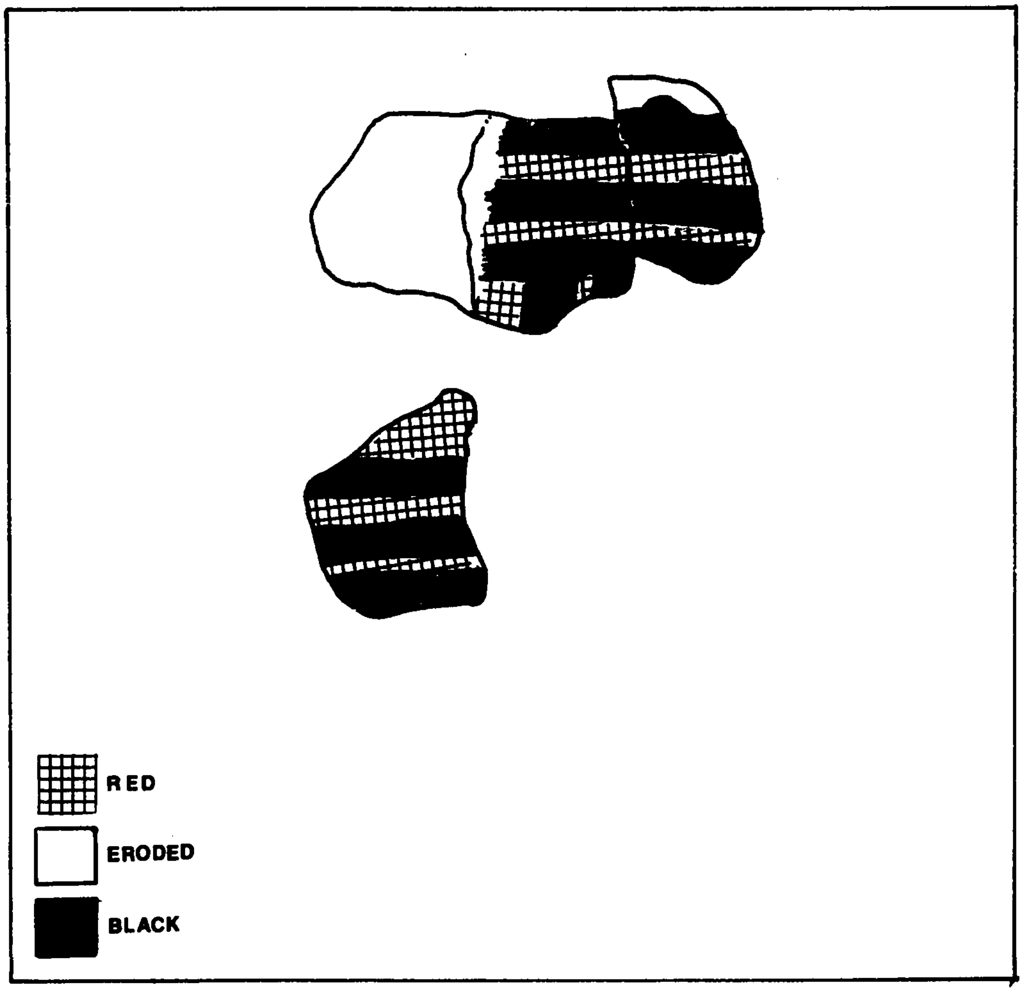
There were some ceramics recovered during the excavations that were distinctive when compared with other sherds, yet were too few in number to assign to a type. Brief descriptions are presented here, and future work may clarify their position in ceramic typology.

Type: Unnamed Black on Red (Fig. 77)

Three sherds of a vessel were recovered at Vigilante that were painted with black concentric rings around the rim and vertical lines around the body. This vessel was unslipped on the interior, possibly indicating it was a restricted mouth jar. The paste was light brown (5YR 5/6 yellowish red) tempered with grit. The red slip was 2.5YR 5/4 yellowish brown. Slip on the exterior was smoothed and black lines were painted over it. Similar black on red ceramics are known from earlier periods in Greater Nicoya, including Charco Black on Red from Guanacaste and the Tempisque Valley (Baudez 1967:83), and Obando Black on Red from Rivas (Healy 1980:157).

FIGURE 76

Unnamed Black on Red



Type: Unnamed Brushed

Sample: Twelve sherds from Herramientas.

The small collection of sherds were brushed on the exterior body of vessels which appear to have been bowls. The brownish paste had grit temper. Exteriors were brown, with one exception slipped red. The sherds were recovered in midden, throughout the site. These sherds may be Sacasa Striated, a type reported from Nicaragua, where it was frequent in Middle and Late Polychrome period contexts, and where it has been recovered from burials associated with European artifacts. Sweeney reported a few sherds from Chahuite Escondido and Matapalo (1975:275). The present sample is too small to determine whether the sherds are Sacasa Striated, or whether they represent a local type.

Unclassified Supports (Fig. 79)

A range of vessel supports were recovered from Vigilante Alta, including solid and hollow conical shapes, hollow zoomorphic supports and a fragment of an annular base At Herramientas the forms mentioned were present along with solid zoomorphic supports, hollow human effigy, incised, and transversally perforated supports.

Unclassified Handles (Fig. 80)

Undecorated strap handles and plain lugs were recovered from both Vigilante Alta and Herramientas.

Figurines (Fig. 81)

Two animal effigy figurines were recovered from midden at Herramientas. One was recovered whole and the other was in two parts in adjacent levels, and proved to be easily restored. Both were solid, smoothed but unslipped on the surface, and both appeared to be felines. One had a carefully modeled head and teeth, similar to many of the adornos recovered. The figurine lacking detail in the modeling of the head had clearly modeled female anatomy.

Perforated Clay Pieces

There were 34 rectangular and circular clay peices from Herramientas, and one was recovered from Vigilante Alta. Nineteen were rectangular, and these were consistent in size, ranging from four to five centimeters on the diagonal, with a central perforation of five to seven millimeters in diameter. Weight ranged from ten to twenty-five grams, and it is possible that these were used to weight fishing lines,

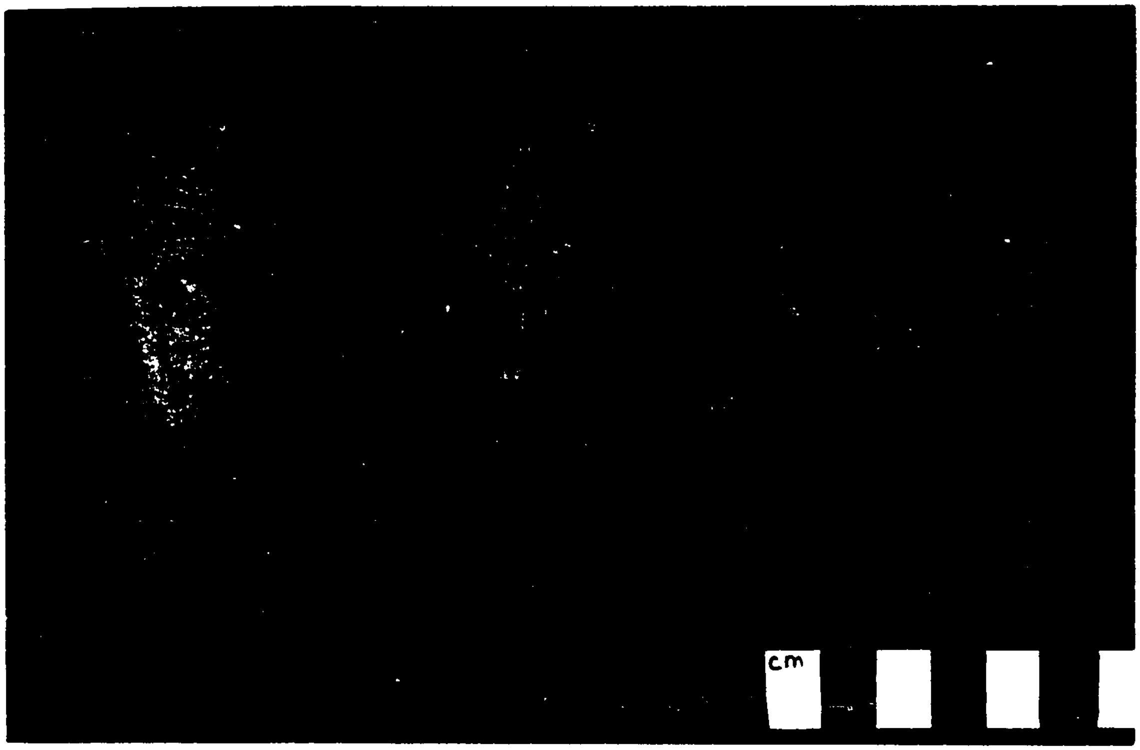


Figure 79. Unclassified supports.

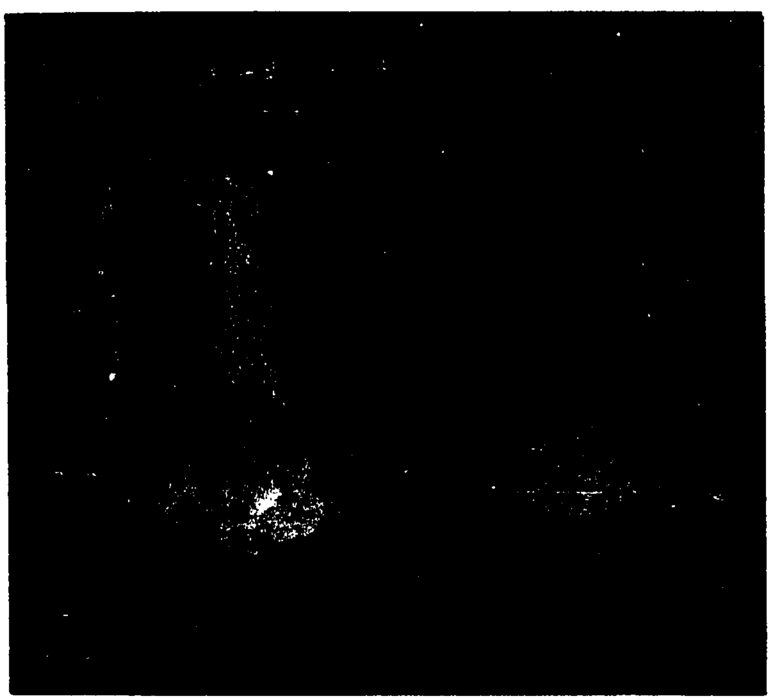


Figure 80. Unclassified handles.

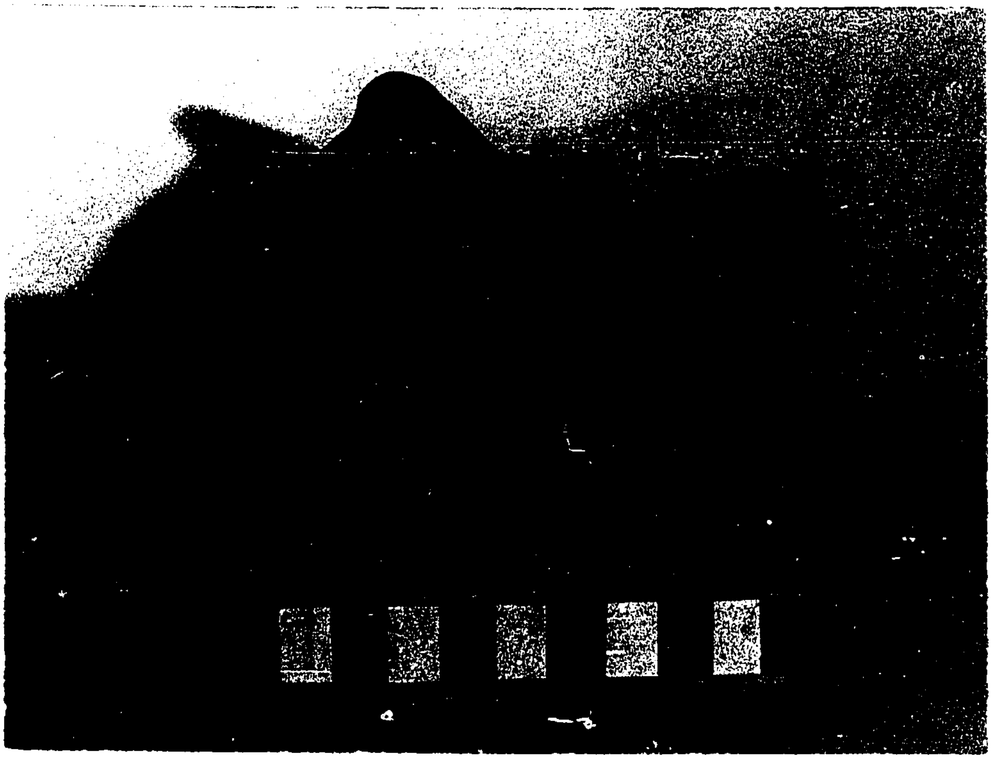


Figure 81. Figurines.

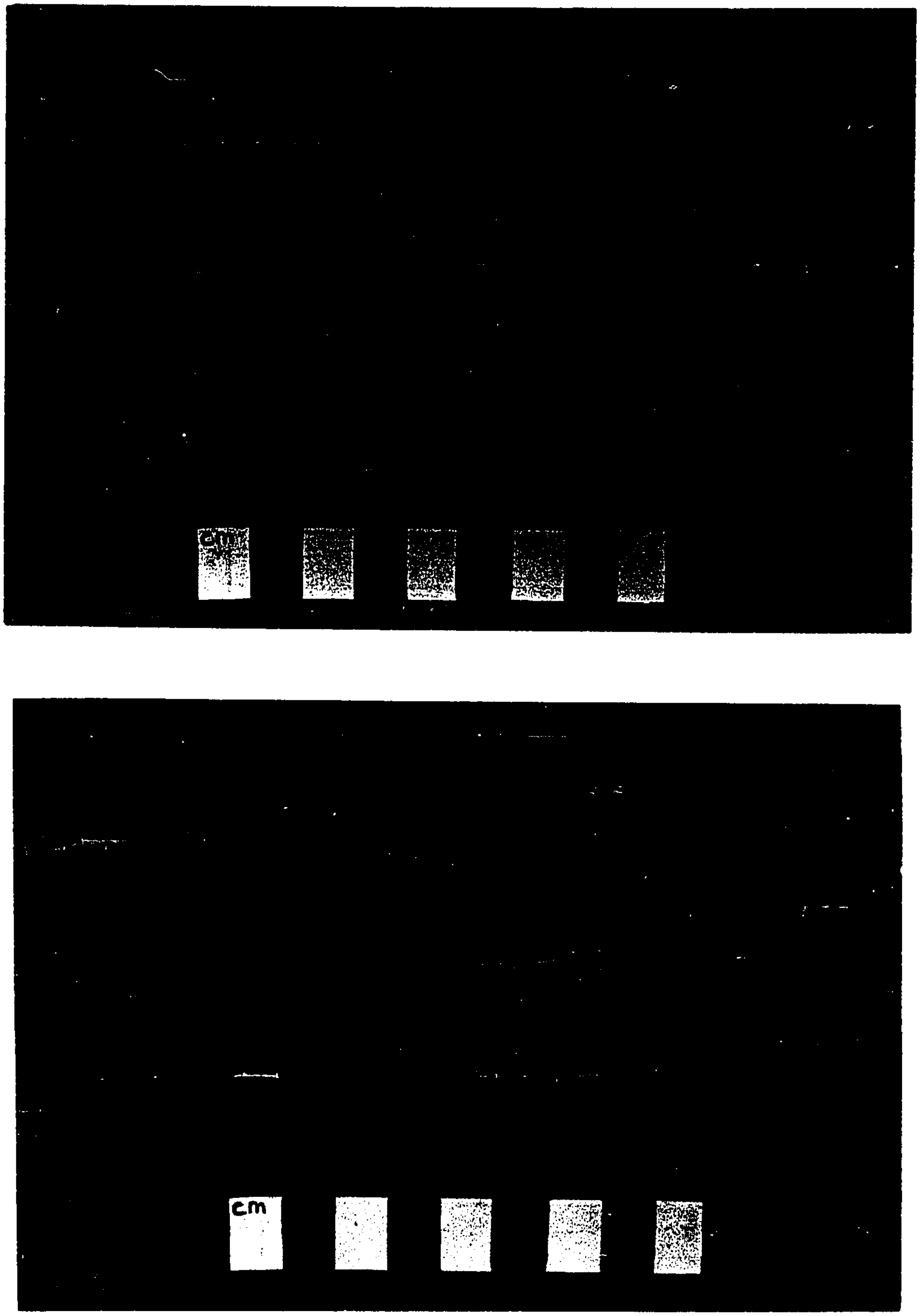


Figure 82. Perforated clay pieces.

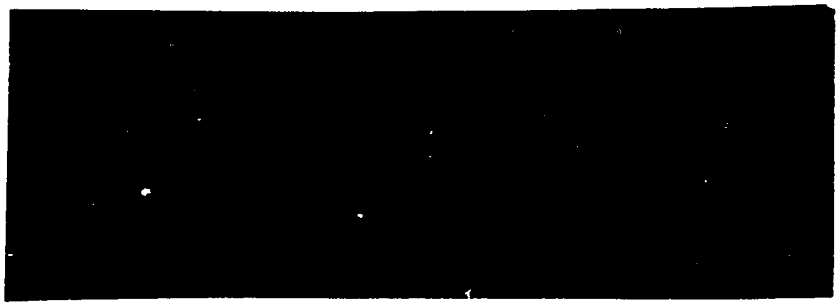


Figure 83. Ceramic disks.

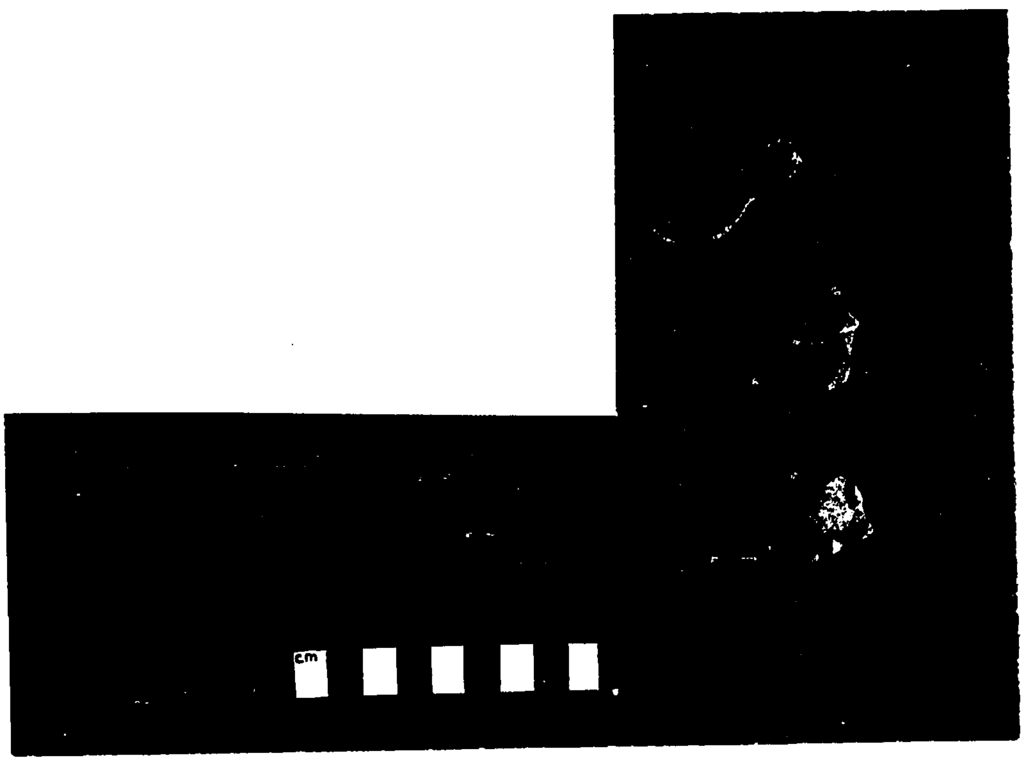


Figure 84. Annular bases.

though they would probably have been too light to have been net sinkers (Einhaus 1980:459). One miniature example was recovered which was about 1/4 the size of the others.

The 15 circular examples were not cut sherds, they were disks or beads of several sizes. Some may have been used as spindle whorls, others as beads, or as fishing line sinkers.

Ceramic Disks (Fig. 83)

There were three disks fashioned from undecorated sherds from Herramientas. These varied in diameter and thickness and their purpose is unknown.

Annular Bases

There were three fragments of perforated annular bases in the collection from Herramientas. Two were slipped black and were poorly fired. One of these was shell tempered, unlike most other sherds from the site. It also had applique nodes around the base, another unique decorative mode (Fig. 84). The third fragment was slipped light brown, with red brown paste and incomplete oxidation during firing. The oval perforations in each of these examples were apparently made with a stick pushed into the clay and then moved up and down to create an opening that was oval on the exterior and round on the interior.

Special Artifacts

One whole and seven fragmentary ocarinas, a clay ear-spool and clay beads were recovered from Herramientas.

APPENDIX 3

MOLLUSC SPECIES IDENTIFIED FROM VIGILANTE ALTA

Pelecypods

Name	Level 1	Level 2	Level 3	Level 4	Level 5
Anadara emarginata (Ark)	1	0	0	0	0
Anadara grandis (Grand Ark)	16	22	13	13	38
Anadara tuberculosa (Ark)	189	410	255	105	200
Argopecten circularis (Scallop)	112	268	66	11	189
Cardita affinis (Cardita)	0	3	0	1	0
Cardita crassicostata	1	0	0	0	0
Cardita radiata	0	2	1	0	0
Chama buddiana (Jewel box)	9	7	4	0	2
Chama mexicana	0	11	0	0	4
Chione subrugosa (Venus)	176	192	117	75	177
Dosinia dunkeri (Dosinia)	12	6	6	7	11
Mactra (micromactra)(Mactra)	2	8	9	8	2
Megapitaria aurantiaca (Giant venus)	30	17	3	3	30
Modiolus (Mussel)	0	0	1	0	0
Mytella (Mussel)	0	1	33	9	0
Ostrea corteziensis (Oyster)	1	0	13	54	26
Ostrea iridescens	1	4	0	0	1
Periglypta multicostata (Venus)	0	1	0	0	0
Pinctada mazatlanica (Pearl oyster)	2	6	1	1	0
Pitar (Venus)	0	6	1	0	2
Pitar tortuosus	1	2	0	1	0
Protothaca asperrima (Venus)	343	910	1391	845	570
Tagelus affinis (Tagelus)	0	2	0	0	0
Tellina (eurytellina) (Tellin)	7	40	7	0	8
Trachycardium consors (Cockle)	0	2	0	0	0
Trachycardium procerum	4	46	90	1	11

Appendix 3--Continued
Gastropods

Name	Level 1	Level 2	Level 3	Level 4	Level 5
Acanthina brevidentata (Thorn drupe)	1	0	2	15	0
Anachis fluctuata	0	0	2	1	0
Bursa caelata (Frog)	0	0	0	1	0
Calliostoma nepheloide (Top)	2	0	1	0	0
Cantharus panamicus (Cantharus)	0	0	0	0	1
Cerithidea valida (Horn)	27	12	123	183	23
Cerithium stercusmuscarum (Pacific fly-specked cerith)	91	445	927	395	178
Conus brunneus (Cone)	0	1	1	0	0
Conus Gn.	0	0	0	1	0
Crepidula Gn. (Slipper)	39	28	26	1	23
Crucibulum monticulus (Cup-and-saucer)	2	1	0	0	0
Crucibulum personatum	1	0	1	0	1
Crucibulum scutellatum	0	0	0	1	0
Cymatium pileare (Triton)	1	0	0	1	2
Cymia tecta	0	0	6	5	0
Cyprae annettae (Annette's cowrie)	0	0	2	1	0
Cyprae cervinetta (Little deer cowrie)	2	14	5	0	2
Fasciolaria granosa	1	0	2	0	0
Fasciolaria salmo	1	0	0	0	0
Hexaplex brassica (Cabbage murex)	0	0	0	0	1
Hexaplex erythrostomus (Pink-mouthed murex)	0	1	0	0	0
Hexaplex regius (Regal murex)	3	1	0	0	2
Hexaplex Gn.	0	1	6	0	0

Appendix 3--Continued

Name	Level 1	Level2	Level3	Level 4	Level 5
Melongena patula (Pacific crown conch)	3	0	1	1	1
Muricanthus ambiguus (Murex)	3	9	1	6	5
Nassarius leucostoma	0	0	0	1	0
Natica sp. (Natica)	1	1	0	0	3
Nerita scabricosta (Rough-ribbed nerite)	13	19	40	21	13
Oliva sGn. (Olive)	0	0	0	1	0
Polinices panamensis (Moon snail)	0	0	1	0	0
Solenosteira Gn.	0	3	0	0	0
Strombus gracilor (Fighting conch)	4	14	1	0	13
Strombus granulatus (Granulated conch)	3	0	0	0	1
Strombus (tricornis)	1	1	0	0	0
Thais kiosquiformis (Thais)	14	0	2	0	12
Triumphis distorta	4	3	3	9	4
Triumphis subrostrata	15	17	14	2	9
Turbo saxosus	1	11	3	4	6
Turritella leucostoma (Turret)	1	0	0	0	2

Abbreviations:
Gn. - genus
sGn. - subgenus
sp. - species

Appendix 3--Continued

Shells observed on San Lucas Island not present in stratified samples from Vigilante Alta

Pelecypods

Arca pacifica (Ark)
Atrina maura (Pen)
Atrina tuberculosa (Pen)
Glycymeris gigantea (Giant bittersweet)
Glycymeris inequalis (Bittersweet)
Glycymeris multicostata (Bittersweet)
Lyropecten subnodosus (Lion's paw)
Spondylus princeps (Spiny oyster)
Trachycardium senticosum (Cockle)

Gastropods

Bulla sp. (Bubble)
Calyptraea
Jenneria pustulata (Pustulate cowrie)
Malea ringens (Tun)
Muricanthus princeps (Murex)
Trivia solandri (Trivia)

Species observed on Chira Island not present in stratified samples from Herramientas

Pelecypods

Modiolus (Mussel)
Spisula adamsi (Surf clam)

Gastropods

Bursa sonorana (Frog)
Columbella aureomexicana
Conos patricius (Cone)
Crepidula (Slipper)
Melampus
Oliva incrassata (Olive)
Strombus granulatus (Conch)
Pinnidae (Pen)

APPENDIX 4

LITHIC ARTIFACTS FROM VIGILANTE ALTA AND HERRAMIENTAS

Ground Stone--Vigilante Alta

	Hammer	Anvil/ Nut Stone	Polisher	Axe	Adze	Resharp Flakes	Mano	Metate
Unit 7								
Level								
1	-	-	-	-	-	1	-	9
2	-	-	-	1	-	-	-	-
Unit 8								
Level								
1	-	-	-	-	-	-	-	1
2	-	-	-	-	-	-	-	1
3	-	-	-	-	-	-	-	2
4	-	-	-	-	-	-	-	2
5	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-
9	1	-	1	-	-	-	-	-
10	-	-	1	-	1	-	-	-
11	-	-	-	-	-	-	-	-
Unit 9								
Level								
1	-	-	-	-	-	-	-	-
2	-	-	-	-	1	-	1	3
3	-	1	1	1	-	13	3	37
Unit 10								
Level								
1	-	-	-	-	-	2	-	3
2	-	-	-	-	-	-	-	-
F.1	-	-	-	-	-	-	-	3
Unit 11								
Level								
1	-	-	-	1	-	1	-	2
2	-	1	-	1	-	1	-	-
3	-	-	-	1	1	-	-	-
F.1	-	-	-	-	-	-	1	-
Unit 12								
Level								
1	-	-	-	-	1	1	1	1
2	-	-	-	-	-	1	-	-
3	-	-	-	-	-	-	-	-
F.1	-	-	-	-	-	-	-	1

	Hammer	Anvil/ Nut Stone	Polisher	Axe	Adze	Resharp Flakes	Mano	Metate
Unit 13								
Level								
1	-	-	-	-	-	-	-	1
2	1	-	-	-	-	1	-	4
F.1	-	-	-	1	-	-	-	1
F.2	-	-	-	-	-	-	-	1
F.3	-	-	-	-	-	-	-	-
Unit 14								
Level								
1	-	-	-	-	-	3	-	1
2	-	-	-	-	-	-	-	-
Trench								
E-W	-	-	-	-	-	-	-	1
N-S	-	1	-	-	-	-	-	1
Surface	4	4	8	5	1	1	4	6
Total	5	6	12	11	3	26	10	81

Chipped Stone--Vigilante Alta

	Core	Bipolar Core	Unused Flake	Used Flake	Tool w/ Point	Obsid Flake	Serp Bead	Rock Frag
Unit 7								
Level								
1	-	-	2	-	1	-	-	-
2	-	-	-	-	-	-	-	-
Unit 8								
Level								
1	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-
4	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-
Unit 9								
Level								
1	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	1
3	-	-	1	-	-	-	-	-
Unit 10								
Level								
1	-	1	5	2	1	1	1	14
2	-	-	-	-	1	-	-	8
F.1	-	-	-	-	-	-	-	-
Unit 11								
Level								
1	-	-	-	1	-	1	-	3
2	-	-	1	-	-	-	-	5
3	-	-	-	-	-	-	-	-
F.1	-	-	-	-	-	-	-	-
Unit 12								
Level								
1	-	-	5	-	-	-	-	15
2	-	-	-	-	1	-	-	1
3	-	-	-	-	-	-	-	-
F.1	-	-	-	-	-	-	-	-

	Core	Bipolar Core	Unused Flake	Used Flake	Tool w/ Point	Obsid Flake	Serp Bead	Rock Frag
Unit 13								
Level								
1	-	-	1	-	-	-	-	5
2	1	-	4	-	1	-	-	16
F.1	-	-	-	-	-	-	-	4
F.2	-	-	1	-	-	-	-	1
F.3	-	-	1	-	-	-	-	6
Unit 14								
Level								
1	1	-	-	1	-	-	-	14
2	-	-	-	-	-	-	-	1
Trench								
E-W	-	-	-	-	-	-	-	-
N-S	-	-	-	-	-	-	-	-
Surface	10	-	12	1	1	-	-	4
Total	12	1	33	5	7	1	1	98

Ground Stone--Herramientas

	Hammer	Anvil/ Nut Stone	Polisher	Axe	Adze	Resharp Flakes	Mano	Metate
Unit 1								
Level								
1	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-
3	-	-	-	-	-	1	-	-
Unit 2								
Level								
1	-	-	-	-	-	-	-	-
Unit 3								
Level								
1	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-
F.1	-	-	-	-	-	-	-	-
F.2	-	1	1	-	-	-	1	1
Unit 3A-B								
Level								
1	-	-	2	1	-	-	-	-
2	-	-	-	-	-	-	-	-
Unit 4								
Level								
1	-	-	-	-	-	-	1	-
2	-	-	-	-	-	-	-	-
F.1	-	-	-	1	-	-	-	-
Unit 5								
Level								
1	-	-	2	-	-	-	1	2
2	-	-	-	-	-	-	-	1
F.1	-	-	-	-	-	-	-	-
F.2	-	-	-	1	1	-	-	-
Unit 6								
Level								
1	-	-	-	1	-	1	-	2
2	-	-	-	-	-	-	-	-
F.1	-	-	-	-	-	-	-	-
Unit 7								
Level								
1	-	1	-	-	-	1	1	1
2	2	-	1	1	-	4	11	-
3	-	-	-	-	-	-	-	-
3A	-	-	-	1	-	-	-	-
4	-	-	-	-	-	-	-	-
4A	-	-	-	-	-	-	-	-
5	-	-	-	1	-	-	-	-
Unit 8								
Level								
1	-	-	1	1	-	3	1	1
2	-	-	-	-	-	1	-	-

	Hammer	Anvil/ Nut Stone	Polisher	Axe	Adze	Resharp Flakes	Mano	Metate
Unit 9								
Level								
1	-	1	1	-	-	2	2	4
2	-	-	-	-	-	1	-	-
F.1	-	-	-	-	-	-	-	-
F.2	-	-	-	-	-	-	-	-
Unit 10								
Level								
1	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	1
3	-	-	-	-	-	-	-	-
F.1	-	-	-	-	-	-	-	-
Unit 11								
Level								
1	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-
Unit 12								
Level								
1	-	-	-	-	-	2	-	-
2	-	-	-	-	-	-	-	1
3	-	-	1	-	-	-	-	-
4	-	1	-	-	-	-	2	2
5	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-
7	-	-	1	1	-	-	-	-
8	-	1	-	1	-	1	-	-
9	-	-	-	-	-	-	1	-
Unit 12 A								
Level								
1	-	-	-	-	-	-	-	-
Unit 13								
Level								
1	-	1	-	1	-	3	1	3
2	1	1	-	1	-	-	-	1
3	-	2	-	-	-	-	3	-
4	-	-	-	-	-	1	-	-
5	-	-	-	-	-	-	-	-

	Hammer	Anvil/ Nut Stone	Polisher	Axe	Adze	Resharp Flakes	Mano	Metate
Unit 14								
Level								
1	-	-	1	1	-	-	2	-
2	-	-	1	-	-	-	1	-
3	-	1	-	-	-	-	1(P)	1
4	1	1	-	-	-	-	-	-
5	-	-	1	-	-	-	-	-
6	-	-	-	-	-	1	-	-
7	-	-	-	-	-	-	1	-
8	-	-	-	-	-	-	-	-
F.1	-	1	1	-	-	-	-	-
Trenches								
A	-	-	1	1	-	-	-	2
B	1	-	1	-	-	-	1	1
F.4	-	-	-	-	-	-	-	-
C	2	-	1	-	-	-	2	1
F.5	-	-	-	-	-	-	-	-
D	-	-	2	-	-	1	1	5
G	-	-	-	-	-	-	2	-
F.1	-	-	-	-	-	-	-	-
H	-	-	-	-	-	-	-	-
I	-	-	-	-	-	-	-	-
F.2	-	-	-	-	-	-	-	-
L	-	-	-	-	-	1	-	-
F.3	-	-	-	-	-	1	-	-
M	-	-	-	-	-	-	-	-
N	-	-	2	1	-	1	2	3
O	-	-	-	-	-	-	-	-
F.9	-	-	-	-	-	-	-	1
F.16	-	-	-	-	-	-	-	-
P	-	2	1	-	-	1	2	3
F.17	-	-	-	-	-	-	-	-
F.18	-	-	-	-	-	1	-	1
Q	1	-	-	1	1	-	-	1
F.13	-	-	-	-	-	-	-	-
F.14	-	-	-	-	-	-	-	-
F.15	-	-	-	-	-	-	-	-
R	-	-	1	-	-	1	-	-
S	-	-	-	-	-	-	-	-
V	-	-	1	1	-	-	4	2
F.6	-	-	-	-	-	-	-	-
F.8	-	-	-	-	-	-	-	-
W	-	-	-	-	-	-	-	-
F.7	-	-	-	-	-	1	-	1
X	1	-	3	1	-	-	1	-
Surface	3	3	5	8	1	-	7	-
Total	12	6	24	25	3	31	64	38

Chipped Stone--Herramientas

	Co	BP	CH	UmS	HT	C	We	Ci	nS	bS	CT	PP	PtT	PbP	SpS	Serp bead
Unit 1																
Level																
1	-	1	-	40	-	1	-	-	2	2	1	-	-	-	-	-
2	-	-	-	47	-	-	-	-	-	1	1	-	-	-	-	-
3	1	-	1	43	-	-	1	-	-	-	1	-	-	1	-	-
Unit 2																
Level																
1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
Unit 3																
Level																
1	-	-	-	46	-	-	7	-	-	2	2	-	-	-	-	-
2	-	-	1	21	-	1	1	-	-	2	-	-	1	-	-	-
F.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
F.2	-	-	-	24	-	-	-	-	-	1	1	-	1	1	-	5
Unit 3A-B																
Level																
1	-	-	-	76	-	-	1	1	1	2	1	-	-	-	-	-
2	-	-	-	9	-	-	-	-	-	-	-	-	-	-	-	-
Unit 4																
Level																
1	-	-	-	98	-	-	1	-	1	1	4	1	-	-	-	-
2	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-
F.1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
Unit 5																
Level																
1	-	-	-	77	-	-	-	-	-	-	1	-	1	-	-	-
2	-	-	-	15	-	-	-	-	-	-	-	3	-	-	-	-
F.1	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Unit 6																
Level																
1	-	-	-	83	-	-	-	-	-	2	2	-	-	-	-	-
2	-	-	-	19	-	-	-	-	-	1	-	-	-	-	-	-
F.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Unit 7																
Level																
1	-	-	1	123	-	-	1	-	-	2	2	1	1	-	-	1
2	1	-	-	264	-	4	1	1	1	-	6	-	1	-	-	1
3	-	-	-	26	-	-	-	-	-	1	-	-	-	-	-	-
3A	-	-	-	16	-	-	-	-	-	-	-	-	-	-	-	-
4	-	-	-	15	1	-	-	-	-	-	2	-	-	-	-	-
4A	1	-	1	2	-	-	-	-	-	-	-	-	-	-	-	-
5	-	-	-	7	-	-	-	-	-	-	-	-	-	-	-	-

	Co	BP	CH	UmS	HT	C	We	Ci	nS	bS	CT	PP	PtT	PbP	SpS	Serp bead
Unit 8																
Level																
1	2	-	-	84	-	-	1	-	-	2	1	-	-	-	1	-
2	-	-	-	12	-	-	-	-	-	-	-	-	-	1	-	-
Unit 9																
Level																
1	-	2	-	107	-	1	-	1	-	1	2	-	-	-	1	-
2	-	-	-	9	-	-	-	-	-	2	-	-	-	-	-	-
F.1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
F.2	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Unit 10																
Level																
1	-	-	-	103	-	-	-	-	-	4	1	-	-	1	-	-
2	4	-	-	37	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	22	-	-	-	-	-	-	1	-	-	-	-	-
F.1	-	-	-	8	-	-	-	-	-	-	-	-	-	-	-	-
Unit 11																
Level																
1	-	-	-	34	-	-	-	-	-	1	-	-	1	-	-	-
2	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-
Unit 12																
Level																
1	-	-	-	20	-	-	-	-	-	-	-	-	-	-	-	-
2	1	-	-	53	-	-	-	-	-	1	1	-	-	-	-	-
3	2	-	-	60	-	-	-	-	-	-	2	-	-	-	-	-
4	-	-	-	87	-	-	-	-	-	-	-	-	-	-	-	-
5	1	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-
6	-	-	-	41	-	-	-	-	-	-	-	-	-	-	-	-
7	2	-	1	35	-	1	2	-	-	-	-	-	-	-	-	-
8	-	-	-	47	-	1	-	-	1	-	1	-	-	-	-	-
9	-	1	-	14	-	-	-	1	-	-	-	-	-	-	-	-
Unit 12 A																
Level																
1	1	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-
Unit 13																
Level																
1	-	1	-	92	-	-	-	-	-	2	-	1	-	-	-	-
2	1	-	-	85	-	-	1	-	-	1	1	-	-	-	-	-
3	1	-	-	109	-	-	-	-	-	-	1	-	-	-	-	-
4	-	-	-	22	-	-	-	-	-	-	1	-	-	-	-	-
5	-	-	-	6	-	-	-	-	-	1	-	-	-	-	-	-
Unit 14																
Level																
1	-	-	-	33	-	-	-	-	-	1	-	-	1	-	-	-
2	-	-	-	29	-	-	-	-	-	1	-	-	1	-	-	-
3	-	-	-	14	-	-	1	-	-	-	-	-	-	1	-	-
4	-	-	-	26	-	-	-	-	-	-	-	-	-	-	-	-
5	-	-	-	21	-	-	-	-	-	-	-	-	-	-	-	-
6	-	-	-	24	-	1	2	-	-	-	-	-	-	-	-	-
7	-	-	-	34	-	-	-	-	-	-	-	-	1	-	-	-
8	-	-	-	8	-	-	-	-	-	-	3	-	-	-	-	-

	Co	BP	CH	UmS	HT	C	We	Ci	nS	bS	CT	PP	PtT	PbP	SpS	Serp bead
F.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trenches																
A	-	-	-	8	-	-	-	-	-	-	-	-	-	-	-	-
B	-	-	-	40	-	-	-	-	-	-	1	-	1	-	-	-
F.4	-	-	-	2	-	-	-	-	-	1	-	-	-	-	-	-
C	-	1	-	55	-	-	1	-	-	-	-	-	-	-	-	-
F.5	-	-	1	4	-	-	-	-	-	-	-	-	1	-	-	-
D	-	-	-	67	-	-	-	-	1	-	3	-	1	-	-	-
G	-	-	-	10	-	-	-	-	-	1	-	-	-	-	-	-
F.1	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-
H	-	1	-	3	-	-	-	-	-	1	-	-	-	-	-	-
I	-	-	-	10	-	-	-	-	-	-	-	-	-	-	-	-
F.2	-	-	-	15	-	-	-	-	-	-	-	-	-	-	-	-
L	-	1	-	52	-	2	-	1	1	1	-	-	-	-	-	-
F.3	-	-	-	6	-	-	-	-	-	-	-	-	-	-	-	-
M	-	-	-	10	-	-	-	-	1	-	-	-	-	-	-	-
N	-	-	-	55	-	-	-	-	-	1	1	-	-	-	-	-
O	-	-	-	16	-	-	-	-	-	-	-	-	-	-	-	-
F.9	-	-	-	11	-	-	-	-	-	-	-	-	-	-	-	-
F.16	-	-	-	7	-	-	-	-	-	-	1	-	-	-	-	-
P	-	1	-	65	-	-	-	-	-	3	2	-	-	-	-	-
F.17	-	-	-	6	-	-	-	-	-	-	-	-	-	-	-	-
F.18	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Q	-	-	-	68	-	-	1	-	1	5	-	-	3	-	-	-
F.13	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-
F.14	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
F.15	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-
R	-	-	-	30	-	-	-	-	1	-	1	-	-	-	-	-
S	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
V	4	1	-	120	-	-	1	-	-	3	2	-	1	-	-	-
F.6	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
F.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W	-	-	-	45	-	-	-	-	1	1	5	-	1	1	-	-
F.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
X	-	3	-	136	-	-	1	-	-	4	1	-	-	-	-	-
Surface	23	3	1	-	2	1	3	1	2	5	1	2	-	-	1	-
Total	47	17	6	3221	4	14	21	6	14	59	64	5	18	5	3	8

Key

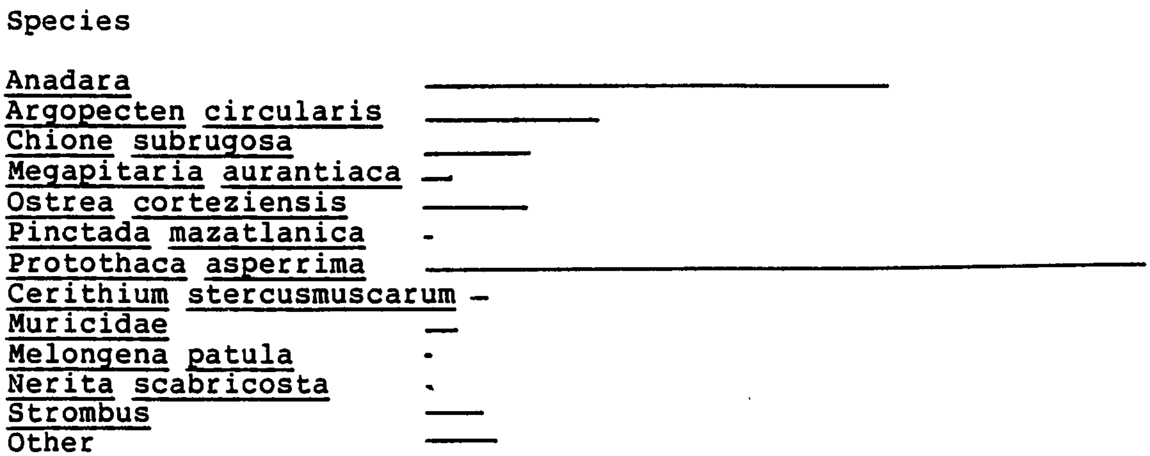
Co	Core	nS	Narrow Scraper
CH	Core/Hammerstone	bS	Broad Scraper
BP	Bipolar Core	CT	Cutting Tool
UmS	Unmodified Stone	PP	Projectile Point
HT	Heavy Tool	PtT	Pointed Tool
C	Chopper	PbP	Pebble Polisher
We	Wedge	SpS	Spokeshave
Ci	Chisel	Serp bead	Serpentine Bead

(P) Pestle

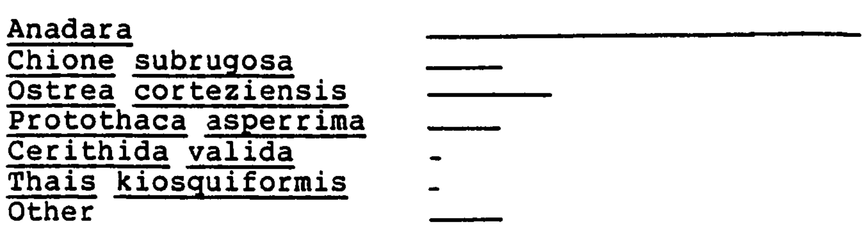
APPENDIX 5

RELATIVE CONTRIBUTION TO PREHISTORIC DIET OF MOLLUSCS FROM VIGILANTE ALTA AND HERRAMIENTAS

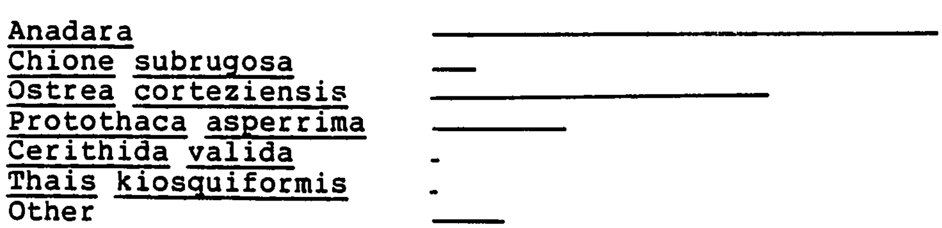
Vigilante Alta--Unit 8



Herramientas--Unit 12



Herramientas--Unit 14



APPENDIX 6

FAUNA FROM THE VIGILANTE ALTA AND HERRAMIENTAS SITES

Fauna from Vigilante Alta--Unit 8

	Level Number										
No. fragments Wt. in grams MNI	1	2	3	4	5	6	7	8	9	10	Total
Ariidae	28	43	51	23	76	43	26	17	9	11	327
	7.0	15.4	23	5.8	5.6	6.0	2.1	1.5	1.6	1.6	69.6
	3	5	3	2	1	3	2	1	1	1	13
Batracoididae	2	8	-	-	1	1	1	1	-	11	15
	1.8	3.7	-	-	.1	.1	1.0	.1	-	.1	6.9
	1	1	-	-	1	1	1	1	-	1	5
Belonidae	1	8	4	3	12	8	6	1	7	5	55
	.5	1.8	1.0	1.1	.9	.5	.5	.5	.5	.3	7.6
	1	4	2	3	2	1	1	1	1	1	17
Carangidae	1	4	-	6	2	-	2	-	-	-	15
	.6	1.0	-	11.0	.3	-	.1	-	-	-	13.0
	1	2	-	3	2	-	1	-	-	-	6
Centropomidae	22	35	23	8	21	12	2	1	1	-	125
	7.	16.5	6.1	3.0	3.5	.5	.6	.1	1.4	-	38.7
	1	3	1	1	1	1	1	1	1	-	3
Charcharinidae	2	6	-	10	-	1	1	-	10	-	30
	.8	6.4	-	1.6	-	.1	.1	-	.9	-	9.9
	1	1	-	1	-	1	1	-	1	-	1
Dasyatidae	1	-	-	-	-	-	-	-	1	-	2
	.7	-	-	-	-	-	-	-	.1	-	.8
	1	-	-	-	-	-	-	-	1	-	1
Eleotridae	-	-	1	-	-	-	1	-	-	-	2
	-	-	.1	-	-	-	.1	-	-	-	.2
	-	-	1	-	-	-	1	-	-	-	1
Lutjanidae	9	26	15	6	44	17	5	1	3	-	126
	1.3	3.7	1.3	.8	1.9	1.5	.3	.1	.5	-	11.4
	1	1	1	1	1	1	1	1	1	-	3
Myliobatidae	3	-	-	-	-	-	-	1	2	2	8
	.9	-	-	-	-	-	-	.1	.6	.7	2.3
	1	-	-	-	-	-	-	1	1	1	2

	Level Number										
	1	2	3	4	5	6	7	8	9	10	Total
No. fragments Wt. in grams MNI											
Pomadasydae	4	7	2	1	3	2	-	1	-	-	21
	1.5	.8	.7	.3	.3	.1	-	.1	-	-	3.8
	2	3	2	1	1	1	-	1	-	-	3
Scianidae	2	1	-	3	-	-	-	-	-	1	7
	.8	.4	-	.9	-	-	-	-	-	.3	2.4
	2	2	-	2	-	-	-	-	-	1	4
Scombridae	-	-	2	2	6	-	-	-	-	-	10
	-	-	.4	.3	.6	-	-	-	-	-	1.3
	-	-	1	1	1	-	-	-	-	-	1
Serranidae	4	1	-	-	1	2	-	1	2	-	11
	1.7	.2	-	-	.2	.2	-	.2	1.5	-	4.0
	3	1	-	-	1	1	-	1	1	-	7
Synbranchus	-	-	-	-	1	-	-	-	-	-	1
	-	-	-	-	.1	-	-	-	-	-	.1
	-	-	-	-	1	-	-	-	-	-	1
Tetradontidae	4	3	5	2	3	-	-	-	-	-	17
	6.0	2.8	1.3	1.9	1.6	-	-	-	-	-	13.6
	2	2	2	1	2	-	-	-	-	-	8
Unidentified	170	331	116	119	182	217	87	194	153	116	1685
Fish	22	40	21	13	10	2	7	13	9	7	144
	-	-	-	-	-	-	-	-	-	-	-
Chelonidae	-	-	-	-	-	-	-	2	-	-	2
	-	-	-	-	-	-	-	4.0	-	-	4.0
	-	-	-	-	-	-	-	1	-	-	1
crab	3	9	4	3	9	16	5	3	2	1	55
	1.3	2.6	1.5	1.8	1.6	3.2	2.8	.2	1.0	.2	16.2
	2	4	2	2	5	8	3	2	1	1	28
Emydidae	-	-	-	-	-	-	-	-	-	1	1
	-	-	-	-	-	-	-	-	-	2.1	2.1
	-	-	-	-	-	-	-	-	-	1	1
Iguanidae	2	3	-	1	-	-	-	-	-	3	9
	1.4	.9	-	.4	-	-	-	-	-	.3	3.0
	1	1	-	1	-	-	-	-	-	1	3
Rodentia											
cf. _Oryzomys_	-	-	-	-	2	-	-	-	1	1	4
	-	-	-	-	.1	-	-	-	.2	.1	.4
	-	-	-	-	1	-	-	-	1	1	2
cf. _Sigmodon_	3	-	-	3	25	-	-	-	-	-	31
	.7	-	-	.3	2.0	-	-	-	-	-	3.0
	1	-	-	1	1	-	-	-	-	-	2

	Level Number										
	1	2	3	4	5	6	7	8	9	10	Total
No. fragments Wt. in grams MNI											
Small mammal	-	1	-	-	-	-	-	-	-	-	1
	-	.1	-	-	-	-	-	-	-	-	.1
	-	1	-	-	-	-	-	-	-	-	1
Aves	3	2	5	-	1	-	-	-	-	-	11
	.9	.7	2.4	-	.1	-	-	-	-	-	4.1
	1	1	1	-	1	-	-	-	-	-	2
Odocoileus	-	-	-	-	2	-	-	-	-	-	2
	-	-	-	-	36.1	-	-	-	-	-	36.1
	-	-	-	-	1	-	-	-	-	-	1
Unidentified	-	2	-	-	-	-	-	-	-	-	2
	-	.2	-	-	-	-	-	-	-	-	.2
	-	1	-	-	-	-	-	-	-	-	1

Herramientas--Unit 7

	Level Number					
	1	2	3	4	5	Total
No. fragments Wt. in grams MNI						
Ariidae	11	116	-	1	-	134
	5.2	52.5	-	2.8	-	60.5
	1	3	-	1	-	3
Batracoididae	-	7	-	1	-	8
	-	3.4	-	.2	-	3.6
	-	1	-	1	-	1
Belonidae	2	-	-	-	-	2
	1.0	-	-	-	-	1.0
	2	-	-	-	-	2
Carangidae	-	5	-	-	-	5
	-	1.2	-	-	-	1.2
	-	2	-	-	-	2
Centropomidae	2	24	-	1	-	26
	.8	18.7	-	.1	-	19.5
	1	1	-	1	-	1
Charcharinidae	1	21	1	-	-	24
	.1	5.3	.1	-	-	5.5
	1	1	1	-	-	1
Lutjanidae	-	5	-	2	-	7
	-	1.3	-	.2	-	1.5
	-	1	-	1	-	1
Myliobatidae	-	2	-	-	-	2
	-	.2	-	-	-	.2
	-	1	-	-	-	1
Pomadasydae	1	5	-	-	-	6
	.1	4.6	-	-	-	4.7
	1	3	-	-	-	3

	Level Number					
No. fragments Wt. in grams MNI	1	2	3	4	5	Total
Scianidae	-	1	-	-	-	1
	-	.1	-	-	-	.1
	-	1	-	-	-	1
Serranidae	1	-	-	-	1	2
	.4	-	-	-	.8	1.2
	1	-	-	-	1	1
Tetradontidae	1	4	-	-	-	5
	.8	3.1	-	-	-	3.9
	1	2	-	-	-	3
cf. Pristis	-	3	-	-	-	3
	-	.4	-	-	-	.4
	-	1	-	-	-	1
Unidentified	-	145	1	1	1	148
Fish	-	30.7	.2	.1	1.0	41.0
	-	1	1	1	1	1
Bufonidae	-	2	-	-	-	2
	-	.2	-	-	-	.2
	-	1	-	-	-	1
Emydidae						
cf. Kinosternon	-	50	2	-	1	53
	-	37.2	2.0	-	.8	40.0
	-	1	1	-	1	1
cf. Chrysemmys	-	7	-	-	-	7
	-	15.4	-	-	-	15.4
	-	2	-	-	-	2
cf. Pseudemmys	6	-	-	-	-	6
	3.7	-	-	-	-	3.7
	1	-	-	-	-	1
Iguanidae	17	75	-	5	-	97
	4.6	30.3	-	1.9	-	36.8
	1	6	-	1	-	6
Rodentia						
cf. Oryzomys	-	2	-	3	-	8
	-	.5	-	.4	-	.9
	-	2	-	2	-	2
cf. Sigmodon	-	17	-	-	-	17
	-	3.2	-	-	-	3.2
	-	3	-	-	-	3
Small mammal	-	3	-	-	-	3
	-	.7	-	-	-	.7
	-	1	-	-	-	1
cf. Caluromys	-	3	-	-	-	3
	-	.3	-	-	-	.3
	-	1	-	-	-	1

			Level Number			
	1	2	3	4	5	Total
No. fragments Wt. in grams MNI						
cf. <u>Procyon</u>	1	1	-	-	-	2
	2.1	1.4	-	-	-	3.5
	1	1	-	-	-	1
cf. <u>Potos flavus</u>	-	5	-	-	-	5
	-	2.2	-	-	-	2.2
	-	1	-	-	-	1
<u>Dasypus</u>	1	6	-	-	-	7
	.1	1.2	-	-	-	1.3
	1	1	-	-	-	1
Medium mammal	2	2	-	-	-	4
	1.0	1.0	-	-	-	2.0
	1	1	-	-	-	1
<u>Cuniculus</u>	-	9	1	-	-	10
	-	8.2	.2	-	-	8.4
	-	1	1	-	-	1
Aves	19	76	-	11	-	106
	12.8	41.0	-	9.4	-	63.2
	2	2	-	1	-	2
<u>Odocoileus</u>	7	-	-	-	-	7
	8.7	-	-	-	-	8.7
	1	-	-	-	-	1
<u>Tapirus</u>	-	1	-	-	-	1
	-	156.3	-	-	-	156.3
	-	1	-	-	-	1
<u>Homo sapiens</u>	-	1	-	-	-	1
	-	.7	-	-	-	.7
	-	1	-	-	-	1
Unidentified	-	42	-	12	-	54
	-	7.0	-	6.6	-	13.6
	-	-	-	-	-	-

Herramientas--Unit 12

No. fragments
Wt. in grams
MNI

	Level Number 1	2	3	4	5	6	7	8	9	Total
Ariidae	2	4	33	36	31	34	40	59	126	365
	.8	.7	7.9	16.	11.	6.7	21.	31.	66.2	160.1
	2	1	3	3	4	1	6	5	3	16
Batracoididae	-	-	1	-	1	2	1	2	-	7
	-	-	.1	-	.2	.8	.2	.9	-	2.2
	-	-	1	-	1	2	1	2	-	4
Carangidae	-	-	-	-	-	-	-	1	6	7
	-	-	-	-	-	-	-	1.7	12.2	13.9
	-	-	-	-	-	-	-	1	3	3
Centropomidae	-	2	18	11	1	7	10	26	34	119
	-	2.0	4.3	5.2	.9	6.0	9.5	19.5	37.6	85.0
	-	1	1	1	1	1	1	1	1	3
Charcharinidae	1	2	1	1	-	-	1	2	14	22
	.3	.7	.8	.1	-	-	.4	1.1	8.5	11.9
	1	1	1	1	-	-	1	1	1	1
Lutjanidae	-	-	4	2	-	-	-	-	3	9
	-	-	.5	.2	-	-	-	-	.8	1.5
	-	-	4	2	-	-	-	-	3	9
Myliobatidae	-	-	-	3	1	-	1	2	-	7
	-	-	-	.3	.1	-	.6	.7	-	1.7
	-	-	-	1	1	-	1	1	-	2
Pomadasydae	-	-	1	-	1	1	-	-	3	6
	-	-	.1	-	.2	.1	-	-	.8	1.2
	-	-	1	-	1	1	-	-	1	3
Scianidae	-	-	1	-	-	-	-	-	7	8
	-	-	.1	-	-	-	-	-	2.8	2.9
	-	-	1	-	-	-	-	-	1	2
Scombridae	-	-	-	-	-	-	-	-	4	4
	-	-	-	-	-	-	-	-	1.0	1.0
	-	-	-	-	-	-	-	-	1	1
Serranidae	-	-	-	-	-	-	-	3	2	5
	-	-	-	-	-	-	-	2.3	1.8	4.1
	-	-	-	-	-	-	-	2	1	2
Synbranchus	-	-	-	6	-	-	-	-	-	6
	-	-	-	.4	-	-	-	-	-	.4
	-	-	-	1	-	-	-	-	-	1
Tetradontidae	2	-	-	3	-	-	1	2	2	10
	1.9	-	-	1.9	-	-	.7	1.6	2.5	8.6
	1	-	-	2	-	-	1	1	1	5
Unidentified Fish	-	1	67	63	31	37	28	18	107	352
	-	.1	7.1	20.	3.3	6.5	6.9	6.2	21.	70.6
	-	-	-	-	-	-	-	-	-	-

Herramientas--Unit 12

	Level Number									
	1	2	3	4	5	6	7	8	9	Total
No. fragments Wt. in grams MNI										
Chelonidae	-	-	-	1	-	-	-	-	-	1
	-	-	-	2.8	-	-	-	-	-	2.8
	-	-	-	1	-	-	-	-	-	1
Bufonidae	-	-	-	-	2	-	-	-	3	5
	-	-	-	-	.2	-	-	-	.44	.64
	-	-	-	-	1	-	-	-	2	2
Ranidae										
cf. *Leptodactylus*	-	-	-	1	-	-	-	-	1	2
pentadactylus	-	-	-	.1	-	-	-	-	.4	.5
	-	-	-	1	-	-	-	-	1	2
Emydidae										
cf. *Kinosternon*	-	-	-	-	-	3	-	-	2	5
leucostoma	-	-	-	-	-	1.7	-	-	1.5	3.2
	-	-	-	-	-	1	-	-	1	1
cf. *Kinosternon*	1	-	1	2	-	-	-	3	-	7
scorpiodes	1.3	-	.8	2.4	-	-	-	2.7	-	7.2
	1	-	1	1	-	-	-	1	-	1
cf. *Rhinoclemmys*	-	-	-	-	2	-	-	-	-	2
	-	-	-	-	2.4	-	-	-	-	2.4
	-	-	-	-	1	-	-	-	-	1
Iguanidae	1	2	7	3	3	3	4	5	10	34
	.4	1.0	2.3	.8	.7	1.6	4.1	2.7	4.0	17.6
	1	1	2	1	1	1	1	1	1	5
Rodentia										
cf. *Sigmodon*	-	-	1	3	2	2	-	4	8	20
	-	-	.2	.3	.4	.3	-	.9	1.2	3.3
	-	-	1	1	1	2	-	2	1	4
cf. *Procyon*	-	-	4	-	-	-	-	-	-	4
	-	-	3.1	-	-	-	-	-	-	3.1
	-	-	1	-	-	-	-	-	-	1
Dasypus	-	-	-	-	-	-	1	-	1	2
	-	-	-	-	-	-	1.9	-	.3	2.2
	-	-	-	-	-	-	1	-	1	1
Tayassu	-	-	15	-	-	-	-	-	-	15
	-	-	56.2	-	-	-	-	-	-	56.2
	-	-	1	-	-	-	-	-	-	1
Aves	-	1	6	1	7	5	23	12	51	106
	-	.7	3.6	.3	1.5	2.1	14.3	8.4	41.1	72.0
	-	1	1	1	2	2	2	1	5	5
Odocoileus	-	-	-	-	-	-	1	-	-	1
	-	-	-	-	-	-	2.3	-	-	2.3
	-	-	-	-	-	-	1	-	-	1

Level Number
1 2 3 4 5 6 7 8 9 Total

No. fragments
Wt. in grams
MNI

Large mammal	-	-	-	-	-	2	1	2	-	5
	-	-	-	-	-	1.6	2.3	5.1	-	9.0
	-	-	-	-	-	1	1	1	-	2
Unidentified	-	-	-	5	-	-	-	15	8	28
mammal	-	-	-	2.6	-	-	-	1.6	2.3	6.5
	-	-	-	2	-	-	-	1	1	-

APPENDIX 7

COMPARISON OF CONTRIBUTION TO DIET (MEAT WEIGHT) AND BONE WEIGHT OF FAUNAL SAMPLES

Vigilante Alta--Unit 8

Marine Fauna	% Contribution to Diet	% Weight of Total Bone
Rock/Reef Fish	15.68	8.15
Estuarine Fish	22.12	36.55
Pelagic Fish	1.52	2.25
Marine Turtle	33.70	1.01
Anguiliforms	-	.025
Unidentified	-	36.57
Terrestrial Fauna		
Reptiles and Amphibians	2.72	3.0
Dasypus (Armadillo)	-	-
Small mammal	1.74	.885
Dasyprocta (Agouti)	-	-
Cuniculus (Paca)	-	-
Tayassu (Peccary)	-	-
Large mammal	-	-
Odoicoileus (Deer)	14.41	9.14
Tapirus (Tapir)	-	-
Aves (Bird)	2.89	1.04
Unidentified	-	.25

Herramientas--Unit 7

Marine Fauna	% Contribution to Diet	% Weight of Total Bone
Rock/Reef Fish	5.25	1.69
Estuarine Fish	10.48	18.98
Pelagic Fish	.12	.20
Marine Turtle	-	-
Anguiliforms	-	-
Unidentified	-	8.30
Terrestrial Fauna		
Reptiles and Amphibians	15.39	19.6
Dasypus (Armadillo)	1.96	.26
Small mammal	8.9	1.88
Dasyprocta (Agouti)	1.02	.26
Cuniculus (Paca)	2.86	1.70
Tayassu (Peccary)	-	-
Large mammal	-	.7
Odoicoileus (Deer)	16.70	1.76
Tapirus (Tapir)	33.40	31.63
Aves (Bird)	3.45	12.79
Unidentified	-	-

Herramientas--Unit 12

Marine Fauna	% Contribution to Diet	% Weight of Total Bone
Rock/Reef Fish	5.92	3.78
Estuarine Fish	16.05	49.74
Pelagic Fish	.53	.18
Marine Turtle	28.76	.51
Anguiliforms	-	.07
Unidentified	-	12.89
Terrestrial Fauna		
Reptiles and Amphibians	6.21	5.75
Dasypus (Armadillo)	1.60	.4
Small mammal	1.5	1.17
Dasyprocta (Agouti)	-	-
Cuniculus (Paca)	-	-
Tayassu (Peccary)	8.48	10.26
Large mammal	12.30	1.64
Odoicoileus (Deer)	12.30	.42
Tapirus (Tapir)	-	-
Aves (Bird)	6.36	13.15
Unidentified	-	1.19

Key

Rock/Reef Fish:
- Carangidae (jack)
- Lutjanidae (snapper)
- Pomadasydae (grunt)
- Serranidae (sea bass or grouper)

Estuarine Fish:
- Ariidae (marine catfish)
- Batracoididae (toadfish)
- Centropomidae (snook)
- Charcharinidae(shark)
- Dasyatidae (sting ray)
- Eleotridae (sleeper)
- Myliobatidae (eagle ray)
- Scianidae (drum or corvina)
- Tetradontidae (puffer)

Pelagic Fish:
- Belonidae (needlefish)
- Scombridae (mackerel or tuna)

Small mammals:
- cf. *Oryzomys talamancae* (rice rat)
- cf. *Procyon lotor* (raccoon)
- cf. *Potos flavus*
- cf. *Sigmodon hispidus* (cotton rat)

Large mammal:
- cf. *Odocoileus virginianus*

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