

PREHISTORIC SUBSISTENCE PATTERNS
AND SITE ECONOMICS IN THE
MOCHE VALLEY, PERU

by

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CHAPTER I

A MOCHE VALLEY SUBSISTENCE STUDY

Introduction

This study is an evaluation of subsistence components of ten prehistoric sites in the Moche Valley on the North Coast of Peru. For the purpose of this study, subsistence is seen as the set of interrelated systems dealing with the procurement and processing of resources necessary for the maintenance of individual or group livelihood. It is reflected archaeologically by plant and animal remains and artifacts which directly suggest procurement and processing activities. Within the site, subsistence evidence is most often encountered in the context of domestic refuse--either in the form of middens or as cultural debris within residential areas.

A thorough investigation of subsistence necessarily begins on a very specific level, with the collection of data through archaeological excavations. A quantitative evaluation of plant and animal species from each site allows for the reconstruction of major procurement and processing systems operating on a local level.

Subsequent evaluations of features common to sites within a single period make possible generalizations about subsistence patterns characteristic of a chronological unit within a given area.

At this point the subsistence history of a confined region has been reconstructed and more far-reaching inferences are possible. By pinpointing major economic shifts chronologically and, when possible, spatially, it becomes possible to evaluate the immediate adjustments and ultimate manifestations which characterize the economic and cultural units involved. Also, the known subsistence history of a single region can be compared with data from analogous areas in an effort to assess the reconstructed patterns as typical or atypical of a larger geographical area.

The Moche Valley Study

The Moche Valley (Figure 1), one of nine valleys on the North Coast of Peru, is well suited to a study focusing on subsistence. This is true for several reasons. First, the arid climate of coastal Peru allows for optimum preservation of organic material. Consequently, plant and animal remains can be recovered archaeologically in amounts which are usually adequate

for a quantitative evaluation. Second, the Moche Valley is an easily defined ecological unit. It is separated from other ecologically similar valleys by strips of arid and barren desert on both the north and south.

Finally, the Moche Valley is relatively well known archaeologically. Many of the sites there were recorded or excavated by earlier scholars, and in 1969 an intensive study was undertaken by the Chan Chan Moche Valley Project of which I was a part. Excavation data accumulated by fellow project members were vital to this study because they facilitated the location of refuse within large sites, and provided a social and political context for an interpretation of subsistence patterns.

Spatial Parameters and the Ecological Settings of the Study

The set of subsistence systems under consideration within the Moche Valley are part of an essentially coastal phenomenon since none of the sites studied is located more than 20 kilometers inland. However, three major ecological zones, each with a number of subdivisions, are present within this relatively small area of the lower Moche Valley. Perhaps more important than the variety of these zones is the tremendous economic

potential of the valley once the local resources were recognized and used.

Premountainous Desert Thicket

Within the Moche Valley, the Premountainous Desert Thicket, also called the Subtropical Desert Thicket (Tosi 1960: 31-36), begins about 30 kilometers inland at an elevation of 1600 meters above sea level. It extends west to the area about 20 kilometers inland which has an elevation of 500 meters except for a small area very near the river (Oficina Nacional de Evaluación de Recursos Naturales [ONERN] 1973: 59, Map 1). This region can be subdivided into the hill/quebrada subzone and the river subzone.

The hill/quebrada subzone, with its irregular terrain, receives only small amounts (50 to 200 mm.) of rainfall annually and is therefore largely barren of vegetation except for occasional plants of cactus and hardwoods such as algorroba. These factors combine to make the zone generally uninhabitable, but useful as a source for wood fuel and possibly occasional game animals (Tosi 1960: 35-6; ONERN 1973: 59).

Within the river subzone of the Premountainous Desert Thicket, water is available only for narrow strips of land along each bank. Although the climate and

rainfall are comparable to that of the hill/quebrada subzone, the increased water allows for more vegetation of useful types. These include cane, reeds, willow, and oleander (Tosi 1960: 35). Through the construction of short canals, available water can be channeled to the few small plots of level land where agriculture is possible (ONERN 1973: Map 1). Small numbers of wild animals such as deer, bear, or fox may have frequented this zone in prehistoric times. The only natural animal protein sources currently exploitable are fish and crustaceans which inhabit the river and canals.

Premountainous Desert

A thin finger of the Premountainous Desert, or Subtropical Desert (Tosi 1960: 14-20), extends further inland, but most of this major zone lies between an area 20 kilometers inland and the coast, therefore the elevation varies from 500 meters at points inland to sea level at the coast. Because of the cool Humboldt Current offshore, rainfall in this zone is extremely limited (7 to 50 mm. per year) (ONERN 1973: 54, Map 1). Within the Moche Valley, the desert, the river floodplain, and the river delta are subzones recognized as part of the Premountainous Desert.

The desert is the largest subzone of the

Premountainous Desert. Much of it is an arid region of sand largely barren of vegetation except for epiphytic plants such as Tillandsia sp. which can subsist on fog-derived surface moisture. Where small amounts of water are available nearer the river, scrub bushes such as sapote can be sustained. Since they represent the only natural vegetation within this subzone, such plants were much collected for use as fuel (ONERN 1973: 57; Moseley 1972: 26; 1975b: 15). The real potential of the desert subzone is realized only when it is developed for agriculture through irrigation. Large tracts of excellent sandy soil on either side of the river are amenable to irrigation, and can be used for virtually any crop.

Nearer the river mouth where the valley slope is more gradual, the Moche River probably once was associated with a sizable floodplain. Subsequent channeling off of water into canals for irrigation and more recent reshaping of the river bed with heavy equipment has left little but a well-entrenched stream. When the floodplain was intact and water was not taken for irrigation, small-scale plant cultivation was possible in areas which were seasonally inundated during the sierra rainy season. Also in times of high water, freshwater fish and crustaceans were present. Now these occur more frequently in large canals and drainage ditches. Wild

game animals were probably also abundant in natural vegetation areas near the river. Useful plant species in the immediate vicinity of the lower river are much the same as those described for the Premountainous Desert Thicket region. These include cane, reeds, willow, as well as various bushes and grasses (ONERN 1973: 57; Moseley 1972: 26; 1975b: 15). Hardwoods, such as algorroba, and other plants characteristic of zones with some rainfall may also have grown along the lower river.

In the immediate vicinity of the river mouth and for a distance along the coast, a low marshy delta subzone can be distinguished within the Moche Valley. Prominent natural vegetation is confined largely to species such as sedges or salt grass which are well-adapted to salty soil (ONERN 1973: 56; Towle 1961: 25-26). In late prehistoric times these areas of high water table were altered to form sunken gardens where agriculture based on subsurface moisture was possible (Moseley 1969; Parsons 1968; Parsons and Psuty 1974; 1975; Rowe 1969). Many areas now appear marshy as a result of this alteration, but were not naturally very low areas.

Pacific Littoral

At the mouth of the Moche River and the entire Moche Valley, the sand of the Premountainous Desert

comes in contact with the Pacific Ocean. The same cold Humboldt Current which makes the land arid helps generate an extremely rich marine fauna (Ancieta 1963; Moseley 1975b: 9-11; Schweigger 1964: 33-102). Along the part of the coastline formed by the mouth of the Moche Valley, the Pacific Littoral is made up of rocky littoral, sandy littoral, mixed rock and sand littoral, as well as neritic, or offshore, subzones.

The only area of rocky littoral within the Moche Valley is the Salaverry Point rockmass at the southern edge of the valley. Recent use of the area by a naval station has destroyed much of the natural flora and fauna, however such outcrops generally support a rich biomass. Sea birds and mammals use such areas for rookeries. Intertidally, rock-perching invertebrates and marine plants abound, and fish are attracted to this zone to feed. All marine products of this subzone can be easily exploited with minimal technological know-how (Moseley 1972: 27; 1975b: 14).

Except for a small stretch of beach near Huanchaco Bay, the remainder of the Moche Valley mouth is part of the sandy littoral subzone. Sea mammals and foraging birds occur along the beach, and shallow water fish species are present just offshore. A few species of hardy sand-dwelling mollusks and crustaceans inhabit

the intertidal substrate, while more live buried in the sand of calmer subtidal depths. Mammals and birds could be taken along the beach with clubs or nets, while fish are easily taken with seines used near shore. Mollusks and crustaceans are easily captured with the bare hand or with simple digging sticks (Moseley 1972: 27; 1975b: 13-14)

A short stretch of coastline in the vicinity of Huanchaco Bay forms the mixed rock and sand littoral subzone. Large boulders are strewn densely on a sand and gravel substrate. The result is a set of adjacent habitats suitable for most species of both sand- and rock-dwelling intertidal invertebrates which are easily collected. The same mammals, birds, and fish described for rocky and sandy littoral subzones are also characteristic of the mixed subzone.

Further offshore, in the slightly deeper water, or neritic, subzone, a greater variety of fish species abound. This subzone is generally uniform along the entire Moche Valley coastline. Although the Salaverry rock mass extends into deeper water, simple watercraft provide the only access to this subzone along the remainder of the coast (Moseley 1972: 27; 1975b: 13).

Prehistoric Use of the Ecological Zones

During the prehistoric occupation of the Moche Valley, all local ecological zones and subzones were utilized to some extent. The Pacific Coast represented a very rich fauna and flora which was easily exploited. Similarly, riverine zones were easily used, but the potential was limited. At the other extreme, the Pre-mountainous Desert is a naturally impoverished zone which has tremendous potential when cultivated. However, effective use of the desert depended on a suitable crop inventory as well as an efficient large-scale irrigation system. The net result is a resource continuum ranging from the high-yield, easily exploited marine biomass through zones intermediate in both productivity and ease of use, to the coastal desert in which considerable effort is required to make use of an extremely productive resource.

Within this continuum, the juxtaposed resource zones forming the two extremes were most important in the prehistoric development of the Moche Valley. The rich marine resources both allowed for a rapid transition to settled life and served to maintain sizable and socially complex settlements. With the advent of irrigation, organizational principles developed at earlier marine-oriented sites made its acceptance and implementation

rapid and efficient. As a result, much of the potential of the coastal desert was quickly realized.

Temporal Parameters of the Study

The earliest data from Moche Valley sites are from the Cotton Preceramic Period which began about 2500 B.C. (Willey 1971: 83). The valley was inhabited earlier in the Preceramic by nomadic hunters, but it was not until the final phase of the Preceramic that local permanent settlements appeared. The portion of this study dependent on archaeological material ends with a consideration of evidence from sites dating to the Late Intermediate Period and Late Horizon, shortly before the Spanish conquest in 1532. To supplement the archaeological evidence, data were collected on subsistence activities currently practiced in contemporary traditional communities.

Many features characteristic of Peruvian coastal Preceramic sites were noted by Bird as a result of his work on the North Coast and by Willey and Corbett, who worked on the Central Coast (Bird 1948a; 1948b; Bennett and Bird 1949; Willey and Corbett 1954: 21-30). However, Engel (1957b: 139) first discussed a commonality of cultural traits among such sites and postulated that the

presence of cotton could be used archaeologically as a horizon marker for designating the Cotton Preceramic Stage. Subsequently, numerous coastal Cotton Preceramic settlements were described (Craig and Psuty 1971; Engel 1957a; 1963; 1966; 1967; 1970; Kelley and Bonavia 1963; Lanning 1967; Moseley 1968; 1972; 1975b; Moseley and Willey 1973; Patterson and Moseley 1968; Wendt 1964). These sites were consistently permanent or semi-permanent coastal settlements with a marine subsistence focus reflected by both the faunal remains and the artifact inventory. Varying species and amounts of plant cultigens, always including cotton, were also described for Cotton Preceramic sites.

As more data became available, chronological and cultural changes within the Cotton Preceramic Stage were documented. Moseley pointed out the existence of very early Peruvian Cotton Preceramic sites with inventories that included cotton, but not as twined textiles, and also postulated different phases for sites with textiles based on changes in twining techniques (Moseley 1968; 1975b: 20, 29-34; Moseley and Barrett 1969). More important was the realization that sites dating to the later part of the Cotton Preceramic were characterized by special traits including plant cultivation, permanent settlements, and ceremonial architecture which ultimately

figured prominently in the development of the Peruvian coast (Lanning 1967: 57-79; 1974: 71-75; Moseley 1975b: 79-102, 111-114; Moseley and Willey 1973: 462-467; Patterson 1971: 194-199; Willey 1971: 91).

An evaluation of the current data reveals that (1) the Cotton Preceramic Stage as defined by Engel (1957b: 139) is a valid and widely accepted means for designating a group of sites which share many traits, and (2) many traits common to Preceramic sites continued to be important in later Peruvian Coastal development. My subsistence study within the Moche Valley began with a consideration of Preceramic sites in an effort to document the change to a sedentary settlement and to define features which continued to be important after the introduction of pottery.

Subsistence data from sites dating to subsequent periods were evaluated to both trace continuities and detect new developments. All major time periods were represented by one or more sites. Archaeological material from the Late Intermediate Period and Late Horizon formed the Most recent sample considered, and it dates just prior to the arrival of the Spanish in 1532.

In addition to the archaeological data which were used to reconstruct major subsistence patterns for the over 4000 years between the early Cotton Preceramic

and the Late Horizon, supplemental evidence was secured from contemporary traditional communities on the Peruvian North Coast. Few of these remain, therefore, settlements outside the Moche Valley were also visited and studied. Data from such small villages proved to be a valuable aid for evaluating evidence obtained archaeologically and as a clue to continuity in subsistence patterns.

CHAPTER II

SITES SELECTED FOR EXCAVATION

To secure subsistence data, a number of very different sites within the valley were excavated. It was necessary first to determine which sites within the valley were most likely to yield the desired organic remains. To follow a research design which encompassed both spatial and temporal variables in subsistence systems one would ideally deal with sites from all major time periods and, within these time periods, with sites from a number of geographically diverse resource areas of the valley. Yet the very restrictions which made the realization of this ideal impossible at the same time made such a study a manageable undertaking. The foe and friend in the broadest sense was differential preservation.

The dry climate of coastal Peru is notorious for its incredible conservation of even the most fragile plants over as much as several thousand years, hence preservation was not as crucial a problem there as in many areas. This relatively frequent near-perfect preservation is exactly what made a quantitative study of subsistence a realistic undertaking. The usefulness

and reliability of such data is directly related to the degree of preservation at each site. Yet this fortuitous natural phenomenon has not blessed all areas equally. Sites very near the coast are victims of both wind erosion from the seaward side and generalized salitre formation, during which a salt crust up to 15 cm. thick forms, often incorporating subsistence remains (especially bone and shell) into a conglomerate much harder than the inclusions. At the other extreme, as one progresses upvalley away from the coast and higher in altitude, the amount of occasional rainfall increases and the degree of preservation decreases proportionately.

The final selection of sites to be excavated represented a compromise between the key variables: preservation and an attempt to deal with a full range of sites both temporally and with respect to resource orientation. Most desirable were sites exhibiting optimum preservation of large amounts of domestic refuse, but occasionally sites with less than excellent preservation were considered in order to fill gaps in space and time. The final inventory of sites which seemed adequate for a qualitative and quantitative subsistence study was far from ideal, yet complete enough to constitute an adequate sample. Most major time periods are represented by at least one site, and some by as many as four,

therefore the chronological coverage is generally good, while the potential for evaluating aspects related to spatial distribution depends on the number of sites suitable for study within a given period.

Subsistence data were collected by excavation at 11 sites. Arranged according to Rowe's (1962) classification, two fall in the Cotton Preceramic, two are Initial Period or Early Horizon, one is Early Intermediate Period, two date to the Middle Horizon, and four belong in the Late Intermediate Period and Late Horizon (Table 1). Within the valley, seven lie very near the coast, one site is in the lower valley near the river, and two are well upvalley (Figure 1).

Sites of the Cotton Preceramic

Padre Aban and Aito Salaverry are the only two sites in the Moche Valley known to date to the Cotton Preceramic time period. Therefore both were excavated to gain subsistence data.

Padre Aban

Padre Aban is located due west of the city of Trujillo, above the easternmost portion of the modern settlement of Huanchaquito, and about 170 meters north of a ridge overlooking the Pacific Ocean (Figure 1). The

TABLE 1
CHRONOLOGY WITHIN THE MOCHE VALLEY

Major Chronological Units ¹	Dates	Moche Valley Ceramic Sequence	Moche Valley Sites ² Tested
Late Horizon	1476	Inca Chimu-Inca	Caracoles
Late Intermediate Period	1000	Chimu	Rivero Reuse Chan Chan SIAR Co. 1a Virgen Choroval
Middle Horizon	600	Early Chimu Moche V	Huaca del Sol (Early Chimu) Gallindo
Early Intermediate Period	AD-BC	Moche IV Moche III Moche II Moche I Gallinazo Salinar	Huaca del Sol (Moche)
Early Horizon	200	Coastal Chavin	
Initial Period	1100	Initial Period	Hereaderos Chica Gramalote
Cotton Preceramic	1800		Aito Salaverry Padre Aban
	2500		

¹Follows schemes used by Rowe (1967) and Willey (1971).

²Chronological placement is based on ceramics and available absolute dates.

site is quite small and covers only about 100 square meters on the leeward (north) side of a dune which forms the bank of a small quebrada, or gully. No architecture is present. The only cultural component is abundant refuse of a stratified midden deposit which is a maximum of 140 cm. in depth. Padre Aban was discovered and tested in 1969 by members of the Chan Chan Moche Valley Project, and their pit was used as a starting point to remove a one meter square quantitative sample of the deep refuse (Figure 2).

Fragments of cotton cord and net were recovered from the site, but no cotton textiles were found. Moseley (1975b: 22) has argued for the placement of such sites very early in the Cotton Preceramic. Subsistence data suggest that the site was transitional in the change to sedentary life, and this feature would also tend to place it quite early. Samples taken from three levels rich in plant material were submitted to the Radiocarbon Laboratory at the University of Texas at Austin for dating. The following absolute dates were received: 1720 \pm 260 B.C. (sample Tx-1935 from natural level 5), 1900 \pm 210 B.C. (sample Tx-1933 from natural level 5), 1980 \pm 120 B.C. (sample Tx-1934 from natural level 7), and 3470 \pm 140 B.C. (sample Tx-1936 from natural level 3). The earliest date was based on a very small sample and

may therefore be atypical. Though not in stratigraphic order, the other dates fall more closely together and therefore probably more securely generally date the beginnings of sedentary life within the Moche Valley.

Alto Salaverry

The second Cotton Preceramic site, Alto Salaverry, south-southeast of the city of Trujillo, is located about 1.65 kilometers from the ocean at an elevation of about 120 meters on a ridge overlooking the ocean (Figure 1). It is perched atop several stabilized dunes and covers an oval area roughly 180 meters north-south by 120 meters east-west (Figure 3). In addition to midden areas, there is considerable well-built wet laid adobe, cobble, and boulder architecture which was both formal (non-domestic) and residential, or domestic, in function. This architecture was excavated by Thomas Pozorski. The refuse component is preserved as a stratified midden deposit on the leeward side of the main occupied dune and in the immediate vicinity of other residential structures and portions of formal structures. Midden is deepest in areas between units of domestic architecture where it reaches a maximum of 155 cm. in depth. After extensive testing, two controlled cuts were made in the refuse: one in deep

midden near domestic structures and one near a formal structure (S. Pozorski 1975).

Although no radiocarbon dates are available, several features of the site argue for its chronological placement later than Padre Aban and near the end of the Cotton Preceramic. Twined textiles are abundant; plant cutigens are varied and occasionally frequently represented; and portions of the formal architectural complexes resemble early ceramic period units within the valley (T. Pozorski 1976).

Sites of the Initial Period and Early Horizon

On the basis of ceramics and radiocarbon dates, the sites assigned to this combined time period are seen to share traits common to both the Initial Period and the Early Horizon. One site, Gramalote, is located on the coast, while the remaining sites, which make up the Caballo Muerto Complex, are situated well inland.

Gramalote

Gramalote is located due west of the city of Trujillo some 50 meters northeast of the tiny coastal settlement of Huanchaquito on a series of bluffs overlooking the ocean (Figures 1 and 4). Refuse and vestiges of architecture are spread irregularly over a series of

dune tops, covering a total area of approximately 16,500 square meters. The architecture, investigated by Donald Weaver, is generally deeply covered by refuse, but exposed areas revealed elaborate structures of wet laid double faced cobble and boulder walls with rubble fill. Most of the architecture was filled in, and often covered over by, refuse. This, combined with its form, suggests that the architecture was largely domestic in function. An abundant stratified midden deposit, the only other site component, reaches a maximum depth of 195 cm. and is spread over the entire area. It was the basis for the definition of the site boundaries.

After extensive testing, two controlled excavations were made in areas of especially deep and rich midden. At this time radiocarbon samples were collected which yielded dates of: 1100 \pm 110 B.C. (sample Tx-1930 from natural level 2), 1120 \pm 90 B.C. (sample Tx-1929 from natural level 3), 1300 \pm 120 B.C. (sample Tx-1929 from natural level 3), 1430 \pm 60 B.C. (sample Tx-1931 from natural level 1), 1580 \pm 130 B.C. (sample Tx-1931 from natural level 1), and 1590 \pm 80 B.C. (sample Tx-1930 from natural level 2). Though not in agreement with the stratigraphic order of the levels, the absolute dates cluster well enough to suggest the general time period when Gramalote was occupied. These dates also serve to

further correlate the Gramalote occupation with the construction and use of the earliest group of mounds within the Caballo Muerto Complex.

Caballo Muerto

The Caballo Muerto Complex is a group of eight platform mounds located east-northeast of the city of Trujillo about 17 kilometers inland on the north side of the valley (Figure 1). The eight mounds are spread over an area of about two square kilometers (Figure 5). Several were excavated in 1972 by Luis Watanabe of the Chan Chan Moche Valley Project as part of a study of early ceramics (Moseley and Watanabe 1974). More intensive excavations by Thomas Pozorski in 1973 and 1974 focused on other non-ceramic features of the Caballo Muerto Complex (T. Pozorski 1975, 1976). Each mound is a U-shaped structure, constructed of cobbles and boulders wet laid in a clay matrix. Exterior surfaces were generally plastered and occasionally painted. One mound was ornamented with friezes. In the course of intensive excavations, scattered subsistence evidence was uncovered during architectural clearing, and a concentrated 80 cm. band of refuse was encountered very deep in the fill of Huaca Herederos Chica. This huaca lies near the southwestern edge of the Caballo Muerto Complex. According to

the sequence established by T. Pozorski (1976) it was among the first mounds constructed.

Sites of the Early Intermediate Period

On the North Coast, the Early Intermediate Period consists of the phases of Salinar, Gallinazo, and Moche which are defined mainly on the basis of ceramics. Within the Moche Valley, the only site with adequate refuse from this period dates to the Moche Phase. This resulted in a considerable time gap between the data from Caballo Muerto and Gramalote and the data from the Moche Phase.

The Moche Huacas

Early Intermediate Period data come from the site of Moche which was among the first North Coast sites to be investigated in detail (Kroeber 1926; Uhle 1913). The site features two very large corporate labor adobe mounds (Huaca del Sol and Huaca de la Luna), an underground burial platform, and both high and low status adobe domestic architecture (Kroeber 1926; Uhle 1913; Theresa Topic, personal communication). The maximum area occupied was about 4.25 square kilometers on the south bank of the Moche River, southeast of the city of Trujillo and about 5 kilometers from the ocean (Figure 1).

Moche ceramics have been finely seriated, and it is possible to place our sample in the Moche III-IV phases of a five phase sequence (Iarco Hoyle 1948: 28-36).

The vicinity of the site was in use for some time, and the refuse component sampled dates to the later period when the main mounds were in use (Moseley 1975c; Hastings and Moseley 1975). At this time, adobe structures were fashioned on top of Huaca del Sol, and considerable refuse was deposited, especially in areas from which bricks had been taken for reuse. The deepest stratified deposit, located on the second section of the Huaca del Sol, was a maximum of 280 cm. deep (Figure 6). The lower 220 cm. date to the Moche III and IV portion of the Early Intermediate Period.

Sites of the Middle Horizon

The final, or fifth, phase of the ceramically defined Moche sequence extends into the Middle Horizon. Within the Moche Valley, the dominant site during this time period was Galindo. Early phases of the Chimú ceramic sequence are also considered as part of the Middle Horizon and may be partially contemporary with the fifth Moche phase. An Early Chimú component at Huaca del Sol was one of the more substantial occupations dating to

this part of the Middle Horizon.

Galindo

Galindo is located east-northeast of the city of Trujillo on the slopes of two rugged hills on the north side of the valley and about 20 kilometers inland (Figure 1). Its area of about two square kilometers makes it one of the largest sites preserved within the Moche Valley. Formal (non-domestic) architecture present at the site ranges from an adobe walled compound with a central mound to a seven-meter-thick stone and adobe wall encircling one hill and serving to reinforce social distinctions. Domestic architecture is generally of angular cobble and boulder construction with walls that are double-faced, rubble filled, wet laid, and finished with clay plaster. Both high and low social status is represented in the domestic architecture.

The preservation at Galindo was the poorest encountered, probably because the refuse was shallow and therefore more susceptible to small amounts of surface moisture. No stratified midden deposits were detected at the site. Virtually all refuse is concentrated in a single 5 to 25 cm. layer above the floor near hearths in food preparation areas of residential structures. Seven such deposits were sampled (Figure 7).

The largest of these ash-bearing refuse concentrations excavated was about 18.5 square meters in area.

The Early Chimu Occupation, Huaca del Sol

The refuse deposit dated ceramically as Early Chimu overlies a portion of the Early Intermediate Period Moche III-IV refuse on top of Huaca del Sol at Moche. Apparently the Early Chimu people used the top of the huaca in somewhat the same manner as their predecessors. They removed bricks for reuse in simple domestic structures built atop the huaca. The only other local evidence of Early Chimu occupation is a cemetery on the plain between the huacas. On top of Huaca del Sol, the Early Chimu portion of the deposit consists of four levels of stratified refuse about 30 to 65 cm. deep. At the point where ceramic change was documented, a thin, compact, near-sterile level was encountered which may have been an exposed surface for some time before the first Early Chimu refuse was deposited.

Sites of the Late Intermediate Period and Late Horizon

On the North Coast, the Late Intermediate Period and much of the Late Horizon was a time of cultural domination of the region by the Chimu who

established a large geographic-political state organization with Chan Chan as the capital. Inca influence in the Moche Valley was both weak and short-lived therefore many features of the Chimu state continued unchanged until after the Spanish conquest. Four sites with abundant refuse date to this time period. One is the capital, Chan Chan, and the remaining three are the sustaining communities, Caracoles, Cerro la Virgen, and Choroval.

Chan Chan

Central Chan Chan, about six square kilometers in area, lies west-southwest of the city of Trujillo and borders on the ocean (Figure 1). Like the site of Moche, Chan Chan was described very early and has been intermittently studied by numerous investigators working on the North Coast (Bennett 1939; Horkheimer 1944; 1945; Hutchinson 1873; Kosok 1965; Kroeber 1926; Martínez-Compañón 1936; Rodríguez Suy Suy 1968; 1973; Schaedel 1951; Squier 1877; Weiner 1874; West 1970). The site can be broken down generally into adobe or tapia walled compounds, adobe intermediate architecture in the area between the compounds, and small irregular agglutinated rooms (abbreviated SIAR) of adobe and cobble construction on the edges of the site. Investigations by Chan Chan Moche Valley Project members have led to the conclu-

sion that the compounds served mainly as administrative and redistributive centers rather than residential areas, with most of the population housed in the intermediate architecture and SIAR (Andrews 1972; 1974; Day 1972; 1974; Keatinge and Day 1974; Klymyshyn 1974; McGrath 1973; Moseley 1975a; Moseley and Mackey 1974). This is reinforced by the nature and distribution of artifacts and refuse in the non-compound areas. Calculated from maps and aerial photographs, the total area of SIAR preserved at Chan Chan is about one square kilometer. Components present in the SIAR areas include domestic structures, workshops, walk-in wells, and occasional cemeteries.

In the SIAR section which lies just north of the compound Rivero, stratified refuse deposits were encountered in filled alleyways and filled rooms interspersed with the remainder of the architecture. In a second section of SIAR west of the compound Laberinto, stratified refuse deposits were encountered both isolated as middens on the western edge of these SIAR and dumped in unused areas of the site between sections of domestic architecture. Refuse from each of these contexts was tested (Figure 8).

Within the compound Rivero, an area designated as a kitchen by earlier investigators was tested in an

effort to collect subsistence material from this portion of Chan Chan (Day 1974; Keatinge and Day 1974) (Figure 9). The refuse tested was found to have resulted from local Chimu squatter reuse of the compound and not from primary occupation. Ceramic evidence indicates that this population entered Chan Chan almost immediately after the Inca conquest of the Chimu.

Caracoles

Caracoles lies northwest of the city of Trujillo in a depression between dunes on a bluff overlooking the ocean near the Moche-Chicama Valley border (Figure 1). It may have been associated with a cemetery and two roadside structures as well as the nearby inter-valley road which linked the Moche and Chicama Valleys. The site is oval in shape, covers about 2250 square meters, and consists exclusively of low mounds of stratified refuse which is rarely more than one meter in depth (Figure 10). Ceramics from the site are a combination of Chimu with some Inca, therefore the site dates to relatively late in the Late Intermediate Period to Late Horizon time span.

Cerro la Virgen

One of the largest and best preserved Chimu satellite communities is Cerro la Virgen, named for a

nearby hill. It lies northwest of the city of Trujillo, about five kilometers north of Chan Chan along a road which connected it with the Chimu capital and about three kilometers from the ocean (Figure 1). The habitation area of the site is about 14 hectares. In addition to the domestic and refuse components of the habitation area; a cemetery, the aforementioned road, and regularly laid out extensive field and canal systems were all within access of the site. The central habitation area and refuse were excavated in 1970 by Richard Keatinge and myself respectively (Griffis 1971; Keatinge 1973; 1974). Although refuse was fairly abundant in the domestic structures, most of it was concentrated in middens on the northeast and southwest edges of the site. These varied in depth from one half to 2.5 meters and covered an area about 200 to 250 meters square. After much testing, a controlled cut was made in one of these middens. The sample collected was processed differently from samples collected later, therefore data for Cerro la Virgen is not always complete. The exact procedure followed is discussed in Chapter III.

Choroval

Choroval is one of a series of small sites located near the remnants of prehistoric sunken gardens

in marshy areas near the coast. The largest such sunken gardens within the Moche Valley lie between Chan Chan and the ocean, but the fields and sites of which Choroval is a part lie southeast of the city of Trujillo, between the modern settlements of Las Delicias and Salaverry (Figure 1). The four sites in the series range in size from 165 meters by 35 meters to 135 meters by 35 meters. Only three, including Choroval, have refuse deposits over 30 cm. in thickness. Other than the sunken garden remnants with which the sites are associated, few surface features are evident. Very little architecture is present. One excavation at Choroval (Cut 1) exposed an adobe hearth, but no permanent constructions were present (Figure 11). The refuse, which forms the main component, is not stratified at any of the sites. Ceramics from the site are Chimu and date to the later portion of the Late Intermediate Period.

CHAPTER III

FIELD AND LABORATORY TECHNIQUES

Within each of the Moche Valley sites selected for excavation, one or more controlled stratigraphic cuts were made in carefully selected areas of refuse. Several factors governed the decisions of exactly where to excavate within a site and how large a sample to collect. Subsequent excavations followed one of two relatively standardized procedures which were adapted to the nature of the deposit. At all times, the main objective was to recover samples of organic material suitable for quantitative evaluation. During analysis, floral and faunal material was first identified and then, through a series of several quantifications, converted into values meaningful for interpretations.

Sampling Procedure

The general location of areas of refuse at each site was discussed in Chapter II. At the larger, more complex sites of Galindo, Chan Chan, and Moche, the location of this refuse was known because other

Chan Chan Moche Valley Project archaeologists had carried out earlier excavations at each of the sites. Consequently, minimal testing was necessary to locate specific deposits which were best suited for a subsistence study. The smaller sites had usually not been excavated previously. Therefore considerably more testing was required to ascertain both the distribution of the refuse and the optimum location for a closely controlled cut. When other components, such as architecture, were present, as at Alto Salaverry and Gramalote, a second project member supervised excavations in these components and thus provided valuable background data.

The actual selection of a good location for controlled excavation within each site was predicated on a number of factors. Paramount in this study of subsistence was the location of refuse in proportions which were both quantitatively and qualitatively significant. Preservation varied widely over a site, hence it was necessary to note both the absolute amount of refuse present and the inventory of biological species and artifacts encountered. Areas with clear, natural strata were selected. It was especially important that strata be unaffected by later looting and redistribution activities or the unforeseen presence of cultural components such as burials or architecture. Special

consideration was given to areas where the refuse was deepest and most extensive. A large absolute area was desirable in order to facilitate further testing and expansion of the cut when necessary to insure an adequate sample. Reorientation of controlled excavations was occasionally necessary as unpredictable obstacles, usually architectural, were encountered. Rarely were all these ideal conditions met. However, when these variables were taken into consideration and carefully weighed, it was possible to determine a suitable area of the deposit for careful excavation.

The size of the sample of refuse excavated was dependent on a number of variables including excavation, sample processing (screening and bagging) time, available deposit volume, deposit context, and the nature of the deposit. Independent of these, one consistent limiting factor at every cut reflected my belief that natural strata could not be followed effectively over a distance of more than one meter when only one face was exposed. Therefore, all cuts but one had a minimal width dimension of one meter or less. The only exception was the north cut (Cut 2) at Huaca del Sol which was 120 cm. by 170 cm., but had the strata exposed on two faces instead of one. Finally, wherever feasible, at least two distinct areas at each site were sampled in order to better evaluate

subsistence data as typical or atypical of the site as a whole.

Available deposit volume was the prime limiting factor at Padre Aban, at Huaca del Sol, and within the compound Rivero at Chan Chan. In all three cases the suitable refuse was present only in a very small area. The sample size from Gramalote, and to a certain extent from Padre Aban, was restricted by the amount of time needed to process a deep deposit so rich in shell. At least three times as much time was required to process the Gramalote sample as was necessary for a comparable volume at Chan Chan. This relatively slow processing time reflects the fact that large amounts of material per volume were being recovered, therefore the sample of organic material in a given volume was greater, and presumably less volume was necessary for an adequate sample.

At the other sites sampling was relatively unrestricted. No excessive amount of time was necessary to process a given volume so relatively large cuts or numerous small cuts were feasible.

Sampling in the SIAR at Chan Chan represented an attempt to excavate refuse from all the known contexts. In one unit, cuts were made in both an isolated midden mound and in an area of refuse near architecture, but between structures. In the second unit, where refuse

was used to fill alleys and some rooms, a sample was taken from each context. The absolute sample size here was also dependent on the architecturally finite volume of the room or alley. This aspect was mediated by my choosing areas which would yield at least a cubic meter of refuse.

As at Chan Chan, the sampling procedure employed at Galindo was designed to collect data from different contexts. The nature of these contexts had been revealed by previous excavations. An analysis of artifacts from these excavations revealed the presence of distinct social classes which were seen to distribute geographically at the site. The large size of Galindo in combination with the compactness and discreteness of subsistence refuse deposits within food preparation areas made it an excellent site for an investigation of social or status differences in diet. A relatively large number of hearth areas was excavated because each food preparation area yielded relatively little subsistence material per unit volume.

Excavation Procedure

The areas of refuse within sites selected for this study could be separated easily into two groups:

(1) relatively deep deposits with evident natural stratification and (2) shallow deposits consisting of a single homogeneous refuse-bearing layer. The excavation methodology deemed most appropriate was determined by which of these two types of refuse deposit was characteristic of a particular site. All of the sites studied contained refuse of the first type except Galindo and Choroval.

In view of the similarity of both refuse deposits and the details of the methodology applied at each site, it would be repetitious to discuss in great detail the mechanics of excavations carried out at each site. Therefore a summary of specific information is presented in Table 2, and one example of the excavation of a refuse deposit of each type is described in considerable detail. Subsequently, unusual cases are dealt with separately in terms of how they deviated from the standardized procedure. The preceramic site, Padre Aban, was selected as representative of sites with stratified deposits, while Galindo is used as an example of the second type.

Deep Deposits with Natural Strata

Padre Aban was chosen as typical primarily because the only site component present was a deep midden deposit. This eliminated the need to deal with

TABLE 1
EXCAVATIONS TO OBTAIN SUBSISTENCE DATA

Stratified Deposits	Cut	Size in cm	Depth in cm	Volume in cm ³	Levels	Location
Padre Aban	1	100 x 100	140	1.4	9	midden
Alto Salaverry	2	100 x 200	115	2.3	11	midden
	2	100 x 175	105-150	2.1	20	midden
Gramalote	1	100 x 50	195	1.0	3	midden
Moche (H. del Sol)	1	100 x 240	100	2.4	12	pit into huaca
	2	120 x 170	210	4.2	12	pit into huaca
Early Chimú (Sol)	1	100 x 240	30-65	1.1	5	midden
Chan Chan (SIAR)	1	100 x 200	70	1.4	7	midden
	2	100 x 200	110	2.2	12	midden
	3	100 x 100	105	1.0	9	filled room
	4	100 x 130	100	1.3	11	alley
Chan Chan (Rívero)	1	300 x 50	45	0.7	10	room
Caracoles	1	100 x 100	35-55	0.3	9	midden
	2	100 x 100	45-60	0.5	11	midden
	3	100 x 100	65-80	0.7	10	midden
	4	100 x 100	35-70	0.4	9	midden
Cerro la Virgen	1	100 x 100	130	1.3	22	midden
Homogeneous Deposits						
Galindo	1	250 x 200	10-15	0.6	1	food prep. area
	2	300 x 200	10-26	1.1	1	food prep. area
	3	100 x 250	5	0.1	1	food prep. area
	4	300 x 150	10-15	0.6	1	food prep. area
	5	200 x 80	28	0.4	1	food prep. area
	6	800 x 200	5-23	2.4	1	food prep. area
	7	400 x 500	7-20	2.7	1	food prep. area
Choroval	1	250 x 250	17-27	1.6	1	campsite
	2	300 x 400	7-35	1.4	1	hearth area

disturbances due to aspects such as architecture. When the area was surveyed, the distribution of midden (ashy earth with shell) at Padre Aban provided a good indication of the area of the site. Due to its extremely small size (100 square meters) very little testing was necessary to discover the deepest and most refuse-rich areas of the deposit. Stratified refuse 140 cm. in depth was exposed on the leeward side of the dune which the site covered, and no better location was subsequently discovered. This test pit was cleaned and faced with the intention of extending the cut south into the deep central part of the deposit.

When the south face was examined, nine natural strata (including mixed surface topsoil and sterile basal dune sand) were defined and profiled (Figure 12). Levels were consistently numbered in arabic numerals from the surface down in the order of excavation. The following description of each level was made to supplement the notation in symbols on the profile.

Level 1: Surface yellow-tan to gray fine silt and sand with some visible ash and shell.

Level 2: Light gray soft silt and sand with considerable ash and shell.

Level 3: Yellow to tan soft silt and sand

with abundant plant remains, considerable bone and shell, and some rocks.

- Level 4: Light gray soft silt and sand with considerable ash and shell. Virtually identical to Level 2.
- Level 5: Yellow-tan to tan soft silt and sand with abundant plant remains, considerable shell and bone, and some rocks. Virtually identical to Level 3.
- Level 6: Light gray soft silt and sand with considerable ash and shell. Similar to Levels 2 and 4.
- Level 7: Yellow to tan soft silt and sand with abundant plant remains, considerable shell and bone and some rocks. Similar to Levels 3 and 5.
- Level 8: Yellow to tan compact sand with small amounts of plant remains, shell, and bone. Probably represents a mixture of sterile basal sand with the refuse-filled level above.
- Level 9: Very light gray to yellow loose sterile sand which closely resembles the modern beach.

After the levels were drawn and described, a

square, one meter on each side, was marked off in the area south of the test pit. The square had as its north face the south face of the test pit. Within this square, excavation proceeded by natural levels. At Padre Aban, the main difficulty encountered was the bedding of the layers of the deposit on the side of the dune at angles of up to 30° at times. Therefore, it was not reasonable to suppose that an excavation which progressed horizontally would follow the natural levels. Instead, every effort was made to follow the natural strata by observing the angle of bedding in the east and west sides of the test pit and by noting soil color changes. By beginning the removal of each level at the south face where it was exposed in cross-section, it was possible to take advantage of both types of available clues.

Within each level, the earth was loosened by slow troweling and transferred by metal scoop to plastic buckets which were used to carry it to the screen. All earth was passed through a 1/4 inch mesh screen placed approximately horizontal. In order to ease the passage of fine earth, material in the screen was slowly scraped back and forth with trowels. All artifacts as well as all plant and animal remains were collected, and preliminary sorting was done directly from the screen. This field sorting procedure involved a separation into categories of

washable (generally shell and bone), non-washable (plants, dung, and soft-bodied animals), and ceramics, each of which was bagged separately and assigned a distinct specimen number. Other artifacts or especially interesting items were bagged and tagged separately. In the case of Padre Aban, ceramics, of course, were not part of the artifact inventory, but otherwise the procedure was identical. In the field, while excavations were in progress, a preliminary list of species present was continuously kept.

After the final natural level--a small amount of sterile sand--had been processed, several other procedures were implemented. First, a profile was drawn of the new south face of the cut which corresponded to the south face of the meter square which had just been excavated (Figure 13). This provided a record of any variation in the levels over the area encompassed by the square. Second, a series of pollen samples were taken from the cleaned face, one from each natural level. Samples were removed with a freshly washed trowel beginning with the lowest level (9) and moving up, thus avoiding contamination of the lower levels before they were reached. All samples were sealed immediately in two zip-lock plastic bags. Third, also beginning from the bottom, a series of radiocarbon samples were taken from levels

3, 5, and 7 which contained abundant plant remains. The face was carefully cleaned, and the material picked out with metal forceps and placed in aluminum foil packets. Samples were of a salt grass (1 sample from level 5) and Tillandsia sp. (1 sample each from levels 3, 5, and 7) since these are annuals and should date more reliably than wood or wood charcoal which, in coastal sites, is often driftwood and therefore may already be several hundred years old. Finally, a series of soil samples, approximately one shovel full in size, was taken--one from each level.

These final steps varied somewhat from site to site. Pollen samples were always taken, but radiocarbon samples were not taken from sites such as Chan Chan and Moche which had been sampled adequately by earlier investigators. The soil sample collection method was modified so that at sites excavated later this sample was taken from the level as it was being excavated. A shovel was placed under the screen and allowed to fill with earth which passed through.

As indicated, this basic procedure was followed in the excavation of all sites with stratified refuse. Any deviation reflected adaptations to an unusual set of conditions or attempts to experiment methodologically. Only those aspects which were different are dealt with

for each site individually.

Other Sites with Deep Stratified Refuse

Excavations at Alto Salaverry differed only in one respect. Since this subsistence study was designed to explore quantitative differences in plant and animal remains, an experiment was done to check variation in the refuse within a small area. The procedure was simple: a large one by two meter cut was excavated one half at a time. Each level was removed first from the north meter square and then from the south meter square, and the material collected from each was kept separate. The resulting samples could be checked against each other, thus providing controls which helped in distinguishing culturally significant differences from those due to sampling.

The controlled stratigraphic excavations carried out at Gramalote differed from those at Padre Aban in several respects. Two controlled cuts were made at the site, and during the northernmost of these (Figure 4) the material was screened through one half inch mesh rather than one fourth inch mesh. At the time, this gross screening was initiated to check the artifact inventory more closely because an underlying preceramic component was suspected (but not found). However, all subsistence

material was also collected for use in this study.

Salitre (salt-hardened crusts) was an important factor because many extremely hard lumps contained appreciable quantities of subsistence material. When attempts were made to free this material, the inclusions often fractured more easily than the matrix. A second significant aspect of this cut was the evidence that screening through 1/2 inch mesh screen is not adequate for the collection of a quantifiable sample of subsistence material. Not only do most seeds and many plant parts fall through, but also many samples retained are deceptively biased. For example, one mollusk (Tegula atra) was greatly under-represented in the sample from this cut because it was almost always badly broken up for meat extraction and therefore present in pieces too small to be caught by the screen. Because of the obvious inadequacies of this method, no other refuse deposits were processed in this manner, and data from this cut were not included in this study.

The second controlled cut at Gramalote was made in a deep part of the midden where salitre formation was minimal. Although the deposit was a total of 195 cm. in depth, only three natural strata could be distinguished. Because of the grossness of these natural levels, each was divided into 10 cm. arbitrary levels in an effort not

to miss possible variations that were not evident in the profile. The plane of the distinguishable levels suggested that there was virtually no bedding, thus making the excavation by 10 cm. levels a relatively straightforward procedure. At all sites, if a level was unusually thick, it was similarly divided as a precaution.

In addition to complications brought about by the grossness of the natural levels, two other features within the second cut at Gramalote made excavation difficult. First, at a depth of between 65 and 95 cm. below the surface, a low boulder wall, part of some buried architecture, was encountered cutting across the pit diagonally from northeast to southwest. A plan was made of its exact location, and its effect on the volume of surrounding artificial levels was recorded before the wall was removed to allow excavation to continue. Near the end of the excavation, at a depth of about 165 cm., a flexed burial wrapped in woven textiles was encountered which was miraculously within the confines of the 50 by 100 cm. cut. The burial pit had been dug into the third natural level before subsequent strata were deposited. It was drawn, photographed, and removed so that work could continue. Again, its effect on the size of surrounding levels was noted. No other excavation was so plagued by what one might call cultural interference.

The richest refuse at Huaca del Sol was concentrated along the eastern edge of the second section (from the north) of the huaca and extended down into a pit left after adobes had been removed from the huaca (Figure 6). The excavation for subsistence data used a 240 cm. long strip of the south face of an earlier trench as a starting point (Figures 14, 15). The earlier trench had not exposed the full depth of the deposit, therefore excavations were undertaken to expose the face to be taken back along its entire length. During this process, a huaca seam was discovered flush with the face being cleaned, indicating that the refuse selected did not overlie the pit into the huaca, but instead, just missed it (Figures 14, 15). The seam in line with the proposed cut face also formed the south wall of the pit. This meant that plans had to be amended to insure that refuse within the pit was also excavated. For the sample within the pit, it was decided to use a rectangular block in the northwest corner of the main trench which had been left standing as attention was focused on the south face of the trench (Figure 14). Unfortunately, some 60 cm. of the top of this block had been removed earlier as the trench was being cleaned and when plans favored placing the controlled cut in the north face.

The final excavation procedure employed at

Huaca del Sol involved two steps: (1) the excavation of the south area selected earlier as far down as it continued (to base huaca), followed by (2) the excavation of the semi-isolated block in the northwest corner. Fortunately the top of the block as it remained, though truncated, was still about 70 cm. above the base of the deposit to be used for the south cut. Therefore some of the natural levels in the two cuts could be correlated. This correlation was recorded by means of a series of profiles which diagrammed the faces of the trench that separated the two areas to be excavated and showed how different strata had been matched up (Figure 15). When deposits were excavated, material from matched levels was bagged separately for each cut. This was to enable a check of the compositions of the levels against each other to provide controls on both the validity of the level correlations and areal variation of quantifiable subsistence remains. Levels 1 through 4 contained Early Chimu ceramics (Figure 14, Profile I). Level 5 is a very thin compact level virtually free of cultural debris and therefore probably represents a weathered surface. Levels 6 through 19 contained Moche III-IV phase ceramics (Figure 15, Profiles I, III, and IV).

For the purpose of this study, subsistence data from the Moche III-IV phase levels in both cuts at Huaca

del Sol were ultimately combined. This decision was based on the combined physical proximity of the cuts to each other and the uniformity of level distributions which made possible the sampling of a full complement of the Moche III-IV strata in the vicinity of the pit.

Due to the truncated condition of the semi-isolated block excavated by Cut 2 at Huaca del Sol, Early Chimu refuse was sampled only by Cut 1 (Figure 14). Of the strata removed during this excavation, only the upper four levels, which had a total depth of 30 to 65 cm. were associated with Early Chimu ceramics (Figure 15, Profile I).

Refuse dating to the Late Intermediate Period was excavated in two areas of SIAR on the western edge of Chan Chan. The refuse deposits in the first unit, just northwest of the compound Rivero (Figure 8), were concentrated both in alleys and in rooms which had been filled with garbage until their floors were as much as a meter higher than adjoining structures. Subsistence remains in the second unit, west of compound Laberinto (Figure 8), were concentrated in a series of low mounded midden deposits on the western edge of the architecture and in areas between architectural units. These particular patterns of refuse distribution were well documented as a result of earlier excavations in the associated

architecture, therefore the problem was not one of actually locating the refuse, but rather one of deciding which areas of refuse would be most amenable to controlled stratigraphic excavations.

In order to select areas for excavation in the alleys, trenches were placed across the more promising alley areas. When a location was selected, one face of the trench was profiled, and a cut was made one meter into the long axis of the alley using the profiled face as a guide to the natural strata. Rooms which had been filled with refuse were quite small, often only about 1.5 meters in area, therefore care was necessary during the initial testing to insure that enough of the deposit remained to provide an adequate sample for a controlled excavation with a quantitative focus. To provide maximal strata exposure with a minimal removal of refuse, a narrow, approximately 50 cm., trench was placed across one end of the room tested. Because of the narrow width of the alleys and the small size of the rooms, individual cuts were only slightly more than a square meter in area.

In the second Chan Chan unit, the best-preserved mounded midden had been trenched across its entire width during earlier excavations. This trench was faced and profiled in anticipation of a meter-wide cut into the north face. A second controlled cut in this unit was

made off one face of an expanded test pit. There a procedure identical to that used at Alto Salaverry was followed: the two by one meter square cut was taken down one half at a time to check for localized variation.

Excavations were carried out in a room of the compound Rivero which an earlier project member had suggested was a kitchen (Figure 9). In the course of my excavations it was established that much of the ash and accompanying material were not part of the primary occupation of Chan Chan, but refuse left by Chimu squatters who moved in soon after the Inca conquest of the Chimu. A sample was excavated to use for comparison with Chimu SIAR material. Refuse had accumulated to a depth of 45 cm. in a low area between the room wall and a central platform, and a 50 by 300 cm. strip was taken out following the usual procedures.

When the midden component at Cerro la Virgen was sampled in 1970, special care was taken to trace the large number (22) of natural strata visible within the 130 cm. deep deposit (Griffis 1971). The mounded midden was trenched and then cuts were made on either side of a central area in order to expose a meter-square block of refuse on three sides. The three faces were profiled, and the square was excavated one half at a time following

the procedure described for Alto Salaverry and one cut in Chan Chan. All earth was screened through finer 1/8 inch mesh.

Four meter-square cuts were made off test pits at Caracoles. No architecture was present. Therefore strata disturbances were confined to occasional pits which were readily detected in the exposed profile.

Shallow Deposits with a Single Homogeneous Layer

Refuse at Galindo was concentrated in food preparation areas within larger multiple room structures. As in the case of the Chan Chan SIAR, the exact location of this refuse was known through previous excavations and was clearly indicated on individual structure maps (Figure 16). The actual deposits consist of fine silt and sand with much fine ash and charcoal plus plant remains, bone, and shell. This is distributed in shallow (5 to 25 cm.) homogeneous levels across room floors and generally radiates irregularly out from stone-lined hearths.

A short survey was done using unit and structure maps to decide which food preparation areas had the most appropriate deposits. After an area was selected for excavation the exact distribution of the easily detectable ash level was determined by careful probing with trowels.

Accumulated overburden was removed down to the first indications of this ash level, and a plan was made of the refuse location. This plan, and the deposit within the room, were divided into a series of 50 cm. squares, each of which was assigned a letter (Figure 17). Excavation proceeded one square at a time by slow troweling, and all earth was passed through a 1/4 inch mesh screen. All artifacts and subsistence material which did not pass through were collected and bagged according to the procedure used for sites with numerous natural levels. Fractions of less than one half a square were generally lettered the same as the nearest whole square, and both were processed as a unit. Depth measurements were taken at the corners of successive squares after each was removed. Features such as hearths or large rocks not visible on the surface were added to the plan as they were encountered. A total of seven such excavations were carried out at Galindo. In each case, all ash-containing earth was removed and processed in order to provide a complete sample. During the course of the excavation, pollen samples and other soil samples were collected from approximately one of every six to eight squares.

Another Site with a Shallow Homogeneous Deposit

Of the sites excavated, only Choroval contained homogeneous deposits comparable to those of Galindo. Within Choroval, refuse was encountered in scattered concentrations on several low ridges which were the by-products of local sunken garden construction. Entire ridges have been excavated (Parsons and Psuty 1974: 457; 1975: 277-278), but my study focused on the small areas of human habitation. Two of these areas were sampled. At the site of the first cut, no special features were detected, therefore an area 2.5 by 2.5 meters was marked off in 50 cm. squares and excavated unit by unit following the procedure described for Galindo. The second cut at Choroval collected refuse from the vicinity of an adobe hearth. The distribution of ash radiating from the hearth was plotted, and it was excavated separately from the non-ash matrix. Occasional looter's pits had disturbed the deposit, and material from such areas was also processed separately.

Analysis of Subsistence Data

The study of material collected during my excavations focusing on subsistence data involved an evaluation of two types of data: artifacts related to subsis-

tence and the actual plant and animal remains recovered. Artifacts were relatively easily evaluated, while the analysis of floral and faunal material was a more complicated process. Therefore, only the procedures followed in dealing with organic remains are considered here in detail. Such procedures include identification of plant and animal species present, initial quantification of the samples collected, and finally, the conversion of data into amounts meaningful for interpretations.

Plant and Animal Species Identification

Many of the identifications were made more difficult by the general lack of comparative collections when this study was undertaken. This problem was eventually largely solved in ways which differed depending on the distinct classes of material to be analyzed.

Plant remains were quite easily typed. The excellent preservation in the area resulted in material in such good condition that categorization was simple once it was possible to recognize the locally common species. My own competency was developed in 1970 when my work involved subsistence studies at the Chimu satellite community of Cerro la Virgen (Griffis 1971). My initial clues were from workmen who recognized many of the common species and provided Spanish names. Confirma-

tions of the identifications and correct scientific terms were supplied first by Maria Guevara, a botanist from the University of Trujillo, and finally by Margaret Towle of Harvard's Botanical Museum, who also provided much additional ethnobotanical data. Consequently, my knowledge of domesticated species was quite good, but many of the less common wild species remained totally unfamiliar. Fortunately, during the long-term subsistence study, I was able to consult with Dr. A. Segastegui of the University of Trujillo, an authority on wild plants of the Peruvian North Coast (Segastegui 1973). Not only was he easily able to identify unfamiliar cultivated species, but he also was able to recognize a number of the minor wild species recovered archaeologically.

Of the animal species, invertebrates were more easily dealt with than vertebrates. The main class of invertebrates encountered was marine mollusks, especially in the coastal sites. These were sorted and tentatively identified in Peru, and representative samples of each type were sent to Dr. Stillman Berry, an authority on Pacific species, who performed the actual species identifications and supplied data on aspects such as habitat. Other invertebrate species were few in number and therefore easily classified. These included mainly

crustaceans and echinoderms.

With respect to vertebrates, mammal and fish remains were most common, while bird remains were present, but not abundant. My approach to the identification of fish bone was three-fold. First, fishermen could often supply a common name when presented with only skeletal remains, therefore they proved a useful resource where fishing is still such an important activity. Second, a type collection of fishes from the local market was amassed. Third, help was solicited from University of Trujillo faculty members who were able to deal only with live or conserved specimens, not skeletal material. They were able to identify freshly purchased specimens as well as to suggest the probably species indicated by a particular common name. Thus, by using all three resources, accuracy of identifications was reinforced.

Comparative material for more common species made possible the identification of virtually all mammal bone. A llama skeleton at the Lima Natural History Museum was generously made available by Dr. Hernando Macedo of that institution who also arranged for the laboratory space necessary for me to review the large quantities of bone. Melody Shimada of the Royal Ontario Museum Project based further north loaned a fox skeleton. Finally, dog, guinea pig, mouse, and rat skeletons were

available at the Chan Chan Moche Valley Project laboratory in Trujillo. The only other mammals represented by substantial quantities of bone were pinnipeds. Preliminary tentative identification of this material was confirmed by Elizabeth Wing of the Florida State Museum during a visit to the Trujillo laboratory. She also generously agreed to identify the few other mammal species not covered by the small type collection available.

The only bird skeleton available was a pelican at the Lima Natural History Museum, therefore it was not possible to identify most of the bird remains in Peru. However, E. Wing also agreed to identify a representative sample of bird bone from each cut, but the results of her work are not yet available.

Quantification of Subsistence Data

Plant and animal remains from each site were consistently counted as well as weighed. For some plant and shell species, measurements were made in an effort to document size changes. At the same time, special features which could be correlated with cultural practices were also recorded. With the exception of Cut 1 at Huaca del Sol where Early Chimu strata overlay Moche III-IV levels, none of the refuse sampled represented deposition spanning great lengths of time. Thus, for the purposes

of this study, which is general in scope, data from different strata within each cut were combined to give a total for the cut. In the case of the sample from Huaca del Sol, subsistence data from the Early Chimu strata were treated as a unit, and similarly, data from the Moche III-IV levels from both Cuts 1 and 2 were treated as a unit. The values obtained through these procedures are presented in Appendix I.

Counts were made of virtually all portions of species present which represent meaningful amounts. In the case of plants, parts such as seeds, stems, or cobs were counted. However, it was not considered meaningful to count plant material such as grass stems, cane stalk fragments, or peanut shell pieces.

Animal remains were much more susceptible to quantification by counting. Ultimately, counts of unduplicated parts made possible a reconstruction of the minimum number of individual animals of each species represented by a given faunal sample. Mollusks were very easily evaluated. Each pair of whole valves or unbroken hinge regions present for a bivalve species was considered as representing a whole animal. Gastropods were quantified by counting both whole shells and shell apices. Counts for the purple crab, the only crustacean present in a significant quantity, were accomplished by equating

the archaeological presence of four claws with one whole animal.

A simple version of the minimum number method has been commonly used to quantify archaeological vertebrate faunal material (See for example: Clark 1971; Daly 1969; Parmalee 1962; 1963; 1965; and White 1952; 1953a; 1953b; 1955). For mammals, more elaborate methods have been proposed which involve adding variables such as size or age to that of bone types (Bokonyi 1970: 291) or a preliminary pairing of the bones (Chaplin 1971: 70-79).

Bird and fish species within the Moche Valley sample were quantified using the simple minimum number method, while mammal bone was evaluated using a slightly more sophisticated procedure. First, for each cut, the bone occurring most frequently was determined. Then the age (fused or unfused) grouping for each of the most common bones was considered, and often the minimum number of individuals was raised slightly. The Cerro la Virgen mammal bone sample studied in 1970 was not so thoroughly studied, and quantification was limited to an assessment of bone weight.

Weights for plant and animal material were recorded in order to quantify data for which counts were not meaningful. This made possible the inclusion of

shaft fragments in the bone sample of a species or uncountable shell fragments in the quantified sample of a shell species. Since many shellfish were broken open to extract the meat, weighing whole shells and fragments proved to be the best manner of correctly assessing shell size. For some plants, such as cane, reed, and grass, without countable parts, weights were important indicators of gross quantities present.

As counts and weights were being recorded, selected measurements and other quantitative assessments were made on a number of species. Length and width measurements were taken on whole shells of several molluscan species, and the seeds of all cultivated plant species. Maize cobs were also measured and kernel row numbers were determined. Data for several plant species proved valuable in later interpretations and are presented in Appendix I, Tables 56 through 61. In such a simple tabular form, the data are adequate for the general conclusions made during this study. However, a statistical evaluation would provide more control over the significance of any changes observed. Although there was too little time to perform such evaluations in the course of this study, it is clear that they are necessary before additional use is made of the data.

Finally, as plant and animal material was being

handled at length during the varied quantification procedures, special features reflecting cultural practices were often noted. These range from regular shell fracture patterns documented for Gramalote to butchering marks on llama bone from the Moche Huacas. Such data are discussed as part of the whole set of subsistence systems described for each site.

Conversion to Meaningful Amounts

To facilitate an interpretation of the Moche Valley subsistence data, it was necessary to convert basic counts and weights into more meaningful amounts. This involved a reconstruction of the total food contribution of each species and the expression of these quantities in values which made possible comparisons between species. Only then could species frequencies be readily evaluated both within and between sites. The method actually employed was a modified version of the procedure used by MacNeish (1967: 296-297) to evaluate the total Tehuacan plant and animal sample. Essentially, he reduced the total food contribution of each species to a quantity expressed as a standard (liter) unit volume and then used these quantities, expressed as percentages, to document major features of Tehuacan subsistence.

My procedure for evaluating the Moche Valley

data differed from the methods employed for Tehuacan in two important respects. First, some of the basic equivalents used to convert Tehuacan organic remains into representative quantities of food could not be used for the same species of the Peruvian sample. Also many species were not the same, therefore new equivalents had to be determined. More importantly, my method for ultimately determining the relative contribution of each species differed from the procedure employed by MacNeish.

Conversion equivalents were easily established for most species using data on live weight or through actual experimentation. Most of the values for mammals came from the Tehuacan study (MacNeish 1967: 296) and work by White (1953a: 397-398), but other sources were consulted to obtain information on exclusively Andean animals (Cardoza 1954: 64; Kostritski 1963: 35, 36). Fish, shellfish, and most plants were quantified experimentally. All of the values used are presented in Appendix I, Tables 1 and 2.

This analysis of subsistence data from controlled samples was based on the assumption that plant and animal remains within an excavated volume occur in frequencies which are indicative of their importance to the people at the site. Therefore it was very important not to grossly overrepresent or underrepresent the total

contributions of each species. Many animal species are easily quantified. Within a sample volume, a gastropod shell directly reflects the consumption of the animal inside just as a maize cob is the evidence left after the kernels are eaten. However, a single llama bone within this volume cannot be quantified as if it represents a whole animal. Generally, animal contributions are over-emphasized while the importance of plants is often minimized. Certainly this is frequently due to differential preservation, but it may also result from the misuse of conversion factors.

In dealing with faunal material, Grayson (1973: 432-438) has pointed out how frequently minimum number of individual determinations are abused when excavation units are assumed to be mutually exclusive entities with respect to constituent faunal remains. It is readily apparent that if minimum number of individual counts are begun anew for each such unit, frequencies of rare species can become multiplied disproportionately. Therefore, for the purpose of this study, all faunal material from each cut was evaluated as a unit (as were the other remains). Even by working with samples from whole cuts as basic units, overrepresentation of animal species is possible. The final minimum number of individual determination is the same for a species represented by one

unduplicated bone as for one represented by 100 unduplicated bones, but neither sample equals a whole animal. This frequently leads to an overestimation of the contribution of all species, especially rarer ones. Shotwell (1955: 331) and Perkins (1964: 1566) have suggested a means for controlling this variable by calculating the relative completeness of each animal. This involves dividing the observed number of diagnostic skeletal elements per individual by the expected number of diagnostic skeletal elements. Diagnostic skeletal elements include the significant portions of a skeleton which are both readily preserved and readily identifiable. For example, the maxilla is considered a diagnostic element while nasal bones are not.

While quantifying the Moche Valley faunal sample, I carried these modifications of the minimum number method a step further to devise a method for making conversions to meaningful amounts and dealing with parts of animals. For example, consider the llama bone sample from the Early Intermediate Period refuse on Huaca del Sol. Based on the frequency of both the tibia and femur, five individual animals were found to be represented by a total of 136 diagnostic bone elements. This amounts to only 27.2 bones per animal of a possible 120 diagnostic llama bone elements. Applying the formula to

evaluate relative completeness, the result is five animals which are each about 22.6% complete. Since a llama yields about 50,000 cm³ of meat, the total contribution of the llamas at Moche is represented by the number of llamas times their percentage of completeness times the meat value for one llama or $5 \times .226 \times 50,000$ which equals 56,500 cm³ of llama meat. A quicker method which achieves a comparable result involves the determination of a constant meat quantity per diagnostic unit, or 50,000 cm³ divided by 120, which equals about 416.5 cm³. This value can be directly multiplied by the number of diagnostic elements identified for a given cut to more quickly evaluate the total meat contribution. For Moche 136×416.5 cm³ equals 56,644 cm³ is much more easily calculated. This procedure was applied to all faunal material to establish meat unit constants for use in reconstructing amounts furnished by each species (Appendix I, Table 1). When faunal remains were quantified only by weight, such as unidentified fish, comparable calculations were performed to establish meat unit constants which could be used for the conversion of bone weights. The advantage of this method is that it makes possible rapid conversion of faunal skeletal material into meaningful amounts without overrepresenting any of the faunal species.

Plant remains are generally readily converted to meaningful units. However, even where preservation is excellent, most species are probably underrepresented relative to bone and shell, and several species are consistently underemphasized. Cohen (1975) has dealt at length with this problem. This is due largely to what might be called cultural factors affecting preservation. Plants such as maize with inedible cobs and husks or peppers which leave uneaten stems can usually be quantified. However, species such as tubers which are completely consumed, or peanuts which leave only uncountable shells are more difficult to reliably evaluate. It is often possible, however, to use the consistency of occurrence of scant remains of such species as a general indication of the plants' importance. For example, peanut shells were present in all 12 levels of Early Intermediate Period refuse at Moche, while avocado remains could be identified from only 2 levels. Therefore, even though the avocado remains could be more easily expressed as a quantifiable amount, it was also possible to comment on the very high frequency of peanut shells--a factor which suggests peanuts were the more important species. Even taking such frequencies of non-quantifiable species into consideration, plants such as tubers cannot be evaluated. Therefore the plant diet can probably never

be reconstructed as consistently as the animal diet.

After the floral and faunal food remains were quantified and their total contributions assessed in terms of a unit volume, these values were expressed as percentages (Appendix I, Tables 2 through 55). Generally plant food values were expressed as percentages of the total plant contribution, and animal food was likewise evaluated as part of the faunal contribution. Meat amounts from different classes of animals (fish, shellfish, mammals, and birds) and from different broad ecological zones (inland and marine) were also expressed as percentages of the total animal food (Appendix I, Tables 62, 63). Calculations of the percentage of animal vs. plant food represented at each cut were also made (Appendix I, Table 64), but samples from several sites (such as Galindo) were too badly affected by poor plant preservation to be significant. Comparisons of plants only to plants and animals to other animals, and as percentages, were more meaningful both within and between sites. These values formed the bases for interpretations presented in Chapters IV through VIII.

CHAPTER IV

THE COTTON PRECERAMIC

Within the Moche Valley, Padre Aban and Alto Salaverry are the only known sites dating to the Cotton Preceramic. By definition, Cotton Preceramic sites share the important features of the absence of pottery coupled with the use of cotton. Equally important is the coastal location and resulting marine orientation of both sites. However, upon close examination, the sites are seen to differ in many important aspects. Padre Aban and Alto Salaverry are best visualized as lying at the beginning and end of a continuum, the Cotton Preceramic.

Padre Aban

The preliminary description of Padre Aban in Chapter II characterized the site as transitional in the process toward sedentism as local inland hunting and gathering activities were being phased out. Three such sites, including Padre Aban, are known (Moseley 1975b: 22). All share a coastal location and orientation, but more specifically, all yielded substantial evidence of the presence of cultivated cotton (Gossypium barbadense),

but not its manufacture into twined textiles.

The small size of Padre Aban and the absence of architecture indicate the semipermanent or seasonal nature of the site. At the same time these very factors substantiate the inference that food procurement was the activity component of paramount importance. At this site, which was economically intermediate between hunting and gathering and systematic marine collecting supplemented by floodplain agriculture, one would expect evidence of (1) the remnants of familiar traditional procurement systems such as hunting and (2) incomplete adaptability to the new environment being exploited. Subsistence data from the stratigraphic excavation at Padre Aban conform to these predictions.

Animals utilized at Padre Aban

Since the land in the immediate vicinity of the site is too dry to support more than epiphytic plants and an occasional lizard, the inhabitants of Padre Aban depended ultimately on the ocean for the animal protein which constituted the bulk of their diet. The only mammal recognized as a potential food animal is the sea lion, or lobo del mar, and the remains are few (Appendix I, Table 5). It is possible that the single individual represented in the excavated sample was the

only one stranded or washed up in the vicinity of Padre Aban.

Shore birds figured much more prominently in the faunal inventory. Pelicans, possible cormorants, and other gull-sized species account for about 20% of the total meat consumed (Appendix I, Table 5). This unusually high frequency of bird consumption far exceeds that of any other site studied, and may reflect a continuation of the old familiar hunting activities. Shore birds represented the only large class of coastal animals which the people of Padre Aban could deal with in a traditional manner.

Fish taken near the site provided more animal protein than shore birds, about 27% in total (Appendix I, Tables 5, 62). The main species taken reflect both the procurement method used and the water depth reached. Among the numerous species represented, shark (Mustelus sp.), ray (Myliobatis peruvianus), mullet (Mugil cephalus), and a single species of croaker (Sciaena deliciosa) are most common. All of these species, but especially the shark, ray, and mullet, frequent shallow water near shore where they are easily surrounded and dragged ashore using a simple haul seine (Evermann and Radcliffe 1917; Hildebrand 1946). Tiny fragments of

small-mesh (4 to 5 mm.) cotton netting recovered during excavation provide evidence for this mode of procurement.

Shellfish, mainly mollusks, furnished slightly more than half of the total animal protein consumed (Appendix I, Tables 5, 62). The total molluscan species inventory reflects access to both rock and sand littoral zones. The sedentary mussels (Choromytilus chorus and Semimytilus algosus) require a solid substrate for attachment, while the numerous gastropods (Thais chocolata, Thais delessertiana, Tegula atra, Turbo niger, and Crepidula dilatata) prefer such a surface. The clams (Protothaca thaca, Eurhomalea rufa, Mesodesma donacium, Donax peruvianus, and Semele corrugata), on the other hand, require a penetrable surface such as sand or fine gravel. On the rock-strewn sandy shore in the vicinity of Padre Aban both habitats are juxtaposed.

The strong dietary emphasis on mollusks at Padre Aban would suggest systematic procurement methods. However, a comparison of the shellfish inventory of the site with the later marine-oriented settlement of Gramalote in the same vicinity revealed that collecting by the people from Padre Aban was relatively ineffective--perhaps because marine species and habitats were unfamiliar. The old adage "What you see is what you get" could well be applied to the inhabitants of Padre Aban

because the mollusks most frequently taken were the species which are most visible and accessible. Mussels and other rock-perching species are easily seen and collected on rocks at low tide. The small coquina or bean clam (Donax peruvianus) inhabits the active tide zone where it is frequently washed out by waves and easily collected with the bare hand (Carson 1955: 137; Fitch 1953: 84-85). However, the larger clams (Eurhomalea rufa, Protothaca thaca, and Semele corrugata) which yield more meat per animal lie buried more deeply, often in gravel under rocks (Fitch 1953: 65-66, 68, 83; Keen 1971: 193, 250-255; Olsson 1961: 305-306). The abundance of these larger species at the later local site from which they were systematically exploited suggests that even their most frequent occurrences at Padre Aban represent fortuitous finds.

When the mollusk shells from Padre Aban were identified and studied, several significant patterns emerged. First, shells from the large purple species of mussel (C. chorus) were found to be larger than average and also heavily riddled by shell parasites in the posterior region. Very few juvenile individuals were recorded. This indicates that the mussel colonies were certainly not yet being exploited systematically enough or by enough people that normal growth and maturation

processes were interfered with significantly. It is even possible that colonies collected by people from Padre Aban were being taken regularly for the first time-- thus accounting for the large numbers of very old individuals.

From the close examination of shells, it was also evident that all the larger species of bivalves as well as many large gastropods had been broken open to extract the meat. Unnatural, but consistent fracture patterns producing breaks at right angles were noted near the hinges of bivalves. Chunks of whorl sections had been chopped away to facilitate access to retracted gastropods. Such shell cracking could have been performed easily using a beach cobble. Dead or cooked shellfish are easily opened, therefore the species taken near Padre Aban were probably cracked and eaten while still raw. A number of whole or near-whole large mussel valves were extremely worn along the posterior margin. This suggests that they had been used as scrapers. However, none had been fashioned into fishhooks.

In addition to mollusk shells, large numbers of tunicate tests (leathery outer coverings) were recovered from the refuse. These invertebrates were identified in the field by Moseley (personal communication) who, along with Thomas Patterson, found them in large

quantities in early sites along the central Peruvian coast (Moseley 1975b: 22-23). Moseley assumed the soft internal parts were eaten much as sea urchins are consumed, however, they are not generally considered edible. It is also possible that they were carried to the site accidentally as other sessile rock-perching species were gathered. Barnacles were frequently incidentally collected along with the mussels to which they adhere.

Plants Utilized at Padre Aban

The beginnings of plant cultigen use occurred concurrently with early efforts toward systematic marine resource use by Padre Aban's small population. Only three cultivated species: squash (Cucurbita sp.), gourd (Lagenaria siceraria), and cotton (Gossypium barbadense) were recovered from the Padre Aban refuse (Appendix I, Table 6). These plants were probably cultivated in seasonally inundated plots on the Moche River floodplain, as cultivation would have been impossible in the arid vicinity of the site. A perforated stone from the refuse may have served as a digging stick weight, but such stones probably had a number of generalized functions.

Although immature gourds may have been eaten, squash is the only plant of the three cultigens which is

used exclusively for food. Thus, two of the three cultivated plants from Padre Aban are industrial rather than food species. There is no evidence for the extraction of oil from cotton seed. Rather, the fiber was spun into cord or yarn which could be knotted into net. For people without pottery, gourd containers must have been indispensable. Therefore, plant cultigens emerge as most important to the people of Padre Aban as a source of raw materials, with their food potential secondary in importance.

A very few wild plants were identified from Padre Aban. An epiphytic desert plant (Tillandsia sp.) and a locally occurring grass (Panicum sp.) were certainly collected near the site, or accidentally included. Tillandsia is a commonly used fuel on the treeless coastal plain, and the burned condition of many fragments suggests it served such a function at Padre Aban. Engel (1970: 32) discusses the preceramic use of Tillandsia fiber on the north central coast for textiles and net, but there is no evidence that it served a similar function in the Moche Valley. Cane (Gynerium sagittatum) was common in the refuse, while tatora reed (Scirpus tatora) was rare. Both plants would have been readily available near the river where they could be gathered

for use in construction. According to Yacovleff and Herrera (1934: 294) the root stocks of a related species of Scirpus are edible, but it is more likely that the tatora reeds brought to Padre Aban were used industrially as was the cane.

Padre Aban Summarized

Considered from an economic point of view, Padre Aban emerges as one intermediate step in the process of changing adaptation toward permanent settlements. The site's small size and the absence of architecture suggest that it was occupied seasonally on a temporary basis. The population of Padre Aban may have moved according to a scheduled cycle which included floodplain cultivation and hunting and wild plant gathering. Since marine resources are non-seasonal, Padre Aban would have been occupied when other alternatives, because of their seasonal nature, were not available. Later in the Cotton Preceramic, coastal marine-oriented settlements became more permanent; and while all animal protein was still essentially marine, plant cultigens increased in importance. Alto Salaverry is such a late Preceramic permanent settlement.

Alto Salaverry

Located near the southern extreme of the Moche Valley mouth, Alto Salaverry lies across the river and well away from Padre Aban (Figure 1). Although the location of Alto Salaverry was predicated on the nearby marine resources, it gives every indication of being a permanent settlement of substantial size and complexity for the Preceramic. Major areas of dense refuse associated with domestic structures reflect the importance of subsistence-related activities at the site. Additional architectural elements are ceremonial or public in function (Figure 3). The chronological placement of Alto Salaverry late in the Cotton Preceramic is based on architectural and economic similarities with immediately later sites.

Two stratigraphic excavations in dense refuse areas provided data for this study. Complementary clearing within architectural units revealed other important site components and provided contextual information for associated refuse. One controlled cut sampled refuse near a series of small domestic structures while a second sampled midden just outside the wall of a public structure (Figure 3). Resulting subsistence data do not suggest dietary differences between persons in these

functionally distinct site units.

Animals Utilized at Alto Salaverry

Like the inhabitants of Padre Aban, the people of Alto Salaverry were almost entirely dependent on the nearby ocean for animal protein (Appendix I, Table 63). The location of the site reflects the importance of coastal resources in their diet, and the species inventory for the site details the group of animals upon which exploitation focused. Both a sandy beach immediately in front of the site and the rock promontary of Salaverry Point south of the site were easily accessible.

Unlike Padre Aban where they were rare, marine mammals, specifically the sea lion, contributed substantially to the meat protein consumed at Alto Salaverry. While the contribution of these animals to the diet (about 7%) (Appendix I, Tables 7, 9) falls far short of that of both fish and shellfish, it is sufficient to indicate that these animals were regularly killed and not fortuitous finds. Sea lions probably frequented the Salaverry rock mass where they could be taken by small hunting parties. Occasional whale bones from animals stranded or washed ashore, one near-whole viscacha (Lagidium peruanum) skeleton probably from a hunt up-valley, and remains of a single rat complete the

mammalian faunal inventory.

Shore birds were insignificant at Alto Salaverry--a marked contrast to their high frequency at Padre Aban. Perhaps this can be explained as dietary preference, or more likely differential availability since the later site near Padre Aban also yielded much bird bone. However, the Salaverry rock mass may have been a nesting area.

Over half of the total animal protein consumed at Alto Salaverry was supplied by fish, and material remains of fishing gear are prominent among the artifacts (Appendix I, Tables 7, 9, 62). Major species closely parallel those taken at Padre Aban. Two members of the croaker or drum family (Paralonchurus peruanus and Sciaena deliciosa) plus sharks (Mustelus sp.), rays (Myliobatis peruvianus), and mullet (Mugil cephalus) supplied most of the fish meat. Most of these main species, especially sharks and mullet, are known to occur near shore (Evermann and Radcliffe 1917; Hildebrand 1946). Small-mesh (5 to 20 mm.) cotton net fragments and grooved stone net sinkers confirm the continued use of haul seines which were also documented for Padre Aban. Sharks, rays, guitarfish, mullet, and to some extent, the croakers, are easily trapped with these seines as they feed near shore. Bony fishes, mainly

croakers, may have been taken off the Salaverry rock mass which afforded access to deeper water.

Shellfish, mainly mollusks, were second only to fish as an animal protein source (Appendix I, Tables 7, 9, 60). Species which figure prominently in the refuse include mussels (Choromytilus chorus, Semimytilus aligosus, and Brachidontes purpuratus), gastropods (Tequila atra, Turbo niger, Thais delessertiana, and Thais chocolata), limpets (Fissurella honduranensis, Fissurella crassa, and Fissurella peruviana), chitons (Mesotomura echinata and Enoplochiton niger), and an abalone-like creature (Concholepas concholepas). All are types which require the rocky littoral habitat available at Salaverry Point (Keen 1971; Olsson 1961). Clearly, the inhabitants of Alto Salaverry chose to exploit the more distant, but richer biomass of the rocky point instead of the sand beach only half as distant. The large clams taken by the people of Padre Aban and the later site from the rock-strewn coastline and sheltered waters of Huanchaco Bay were apparently absent from the sandy open beach near Alto Salaverry.

Unlike the large mussel (C. chorus) shells from Padre Aban which were consistently large and riddled by parasites, most of the mature C. chorus shells from Alto Salaverry were relatively smaller and generally

unmarked by parasites. Juvenile individuals were proportionately much more common at Alto Salaverry. This evidence suggests that shellfish collecting by people based at Alto Salaverry put much more pressure on mussel, and possibly other mollusk populations than collecting by people from Padre Aban. Certainly, the larger population of Alto Salaverry was a major factor, but it is also possible that mollusk populations were smaller in the Alto Salaverry vicinity and therefore more susceptible to pressures of overexploitation. Extremely large numbers of shellfish, including C. chorus, were taken in the Huanchaco area into early ceramic times, suggesting that populations of shellfish there were relatively larger and perhaps more stable.

Evidence in the form of shell breakage patterns reveals systematic procedures for shellfish procurement and processing. Mussels and most gastropods are easily gathered at low tide, but chitons, limpets, and Concholepas offer more physical resistance. Regularly occurring nicks were noted in the same position on whole shells of some species. On limpets, nicks were found along the narrow ends of the oval shell. On shells of C. concholepas, nicks were consistently at the point where a hinge-like bulge in the shell provided additional leverage for prying. These data reflect a simple, but

systematic procurement procedure during which a simple prying tool was used to detach certain species.

Finally, larger shells, especially the large purple mussel (C. chorus), exhibit a consistent fracture pattern comparable to the pattern observed in Padre Aban material. Other examples show evidence of having been used as crude scrapers. As was the case for Padre Aban, none of the Alto Salaverry shell studied had been made into fishhooks.

Plants Utilized at Alto Salaverry

Food plant evidence from Alto Salaverry refuse was evaluated in terms of the total quantity of food represented, and plant foods were found to constitute about 30% by volume of the total diet (Appendix I, Table 64). Since certain species are consistently underrepresented archaeologically, it is possible that this figure should be higher, but even uncorrected it serves to point out the tremendous increase in cultivated plant use at Alto Salaverry compared to Padre Aban.

The plant cultigens present at Alto Salaverry are unusually numerous and varied. Cotton, gourd, and squash are present and far surpass other species in abundance (Appendix I, Tables 8, 10). Other cultivated species include pepper (Capsicum sp.), the lima bean

(Phaseolus lunatus), possibly the common bean (Phaseolus vulgaris, pacae (Inga feuillei), lúcuma (Lucuma obovata), quayaba (Psidium quajava), avocado (Persea americana), and the plum-like cansaboca (Bunchosia armeniaca) also called ciruela del fraile (Towle 1961: 60-61). Of these additional species, beans and pepper were probably cultivated, while the fruits were from tended plants. The Alto Salaverry refuse produced the first recorded evidence of avocado, pacae, and possibly the common bean for the Cotton Preceramic. All the species were probably brought from the valley bottom where floodplain cultivation was possible and where moisture was available for wild or tended plants.

The three cultigens documented for Padre Aban are most abundant in the Alto Salaverry material. Again, industrial plants are extremely important, indicating a prevailing attitude toward plant cultivation as a means for obtaining essential raw materials. However, food production was increasing in importance. Though well behind squash, cansaboca, lúcuma, and avocado contributed substantially to the vegetable diet. Cultivated beans were probably more common than their calculated frequency would indicate, and a few examples of wild legumes were identified from the site (A. Segastegui,

personal communication). The occasional presence of grinding implements at Alto Salaverry suggests that wild plant collecting and processing still formed a part of subsistence-related activities.

In addition to the wild legumes, several other wild plant species were identified from Alto Salaverry. Tillandsia sp., a grass-like plant with burrs (Cenchrus echinatus), and algorroba (Prosopis chilensis) were moderate in frequency while cane (Gynerium sagittatum) was rare. Since Tillandsia sp. is an epiphytic plant, dependent only on condensed surface moisture, it was available locally and probably used as fuel. The grass-like plant with burrs probably arrived accidentally. Both seeds and wood of algorroba were recovered. Towle (1961: 56) mentions historic references to the use of algorroba seeds for food, and they are still occasionally eaten today (Richard P. Schaedel, personal communication). Algorroba grows well in marginal areas which receive infrequent water while cane would have been available nearer the Moche River.

Alto Salaverry Summarized

Alto Salaverry represents a final step in the Preceramic process of adaptation. Site data reveal a complex permanent settlement featuring functionally

differentiated architecture indicative of simple societal ranking. Food procurement and processing were no longer the only important site activities. Marine products figured prominently in the site economy, yet plant cultigens, especially industrial plants, were of considerable importance.

Cotton Preceramic Subsistence

A comparison of the two Moche Valley Cotton Preceramic sites of Padre Aban and Alto Salaverry reveals both consistencies and differences which are significant in a general evaluation of local subsistence. Often similarities point to characteristics applicable to the period as a whole while contrasting elements are indicative of important changes within the period.

A dependence on marine resources for virtually all animal protein is one of the most important features common to both sites. At both, shellfish gathering and fishing were the most productive activities with respect to the ultimate animal protein yield. Discrepancies in the faunal inventories are largely explained by either differences in local technologies or the availability of particular species in the vicinity of each site. The increased incidence of bony fishes,

especially two species of croaker, at Alto Salaverry correlates well with the local access to deeper water near the Salaverry rock mass. The overall increase in the proportion of fish compared to mollusks at Alto Salaverry may reflect a change of focus with respect to procurement activities because shellfish had been over-exploited and were smaller and harder to find. The high proportion of bird remains at Padre Aban is seen primarily as resulting from holdovers of the hunting technology characteristic of a group in the process of adapting to a marine focus. However, birds may have been more common in the Padre Aban region in the same way that sea lions may have been more common nearer Alto Salaverry. Dietary preference is a final factor which may also have been significant.

Discrepancies in the molluscan inventories of the two sites provide the best evidence of differences in the fauna inhabiting the coastal areas easily accessible from each site. Certain rock-perching species such as two of the mussels (C. chorus and S. alqosus), most of the gastropods, and two clams (Mesodesma donacium and D. peruvianus) are common to both sites (Appendix I, Tables 5, 7, 9). However, the large clams (S. corrugata, P. thaca, and E. rufa) were recovered only from Padre Aban. Tunicates also seem to be

restricted in distribution to the Huanchaco Bay area. Similarly, one mussel species (Brachidontes purpuratus), the abalone-like C. concholepas, chitons, and limpets are either restricted to or much more common in the Alto Salaverry refuse. The differences in species distribution can ultimately be correlated with slight differences in the marine habitats for each site. Types common to both sites are apparently equally at home on the single Alto Salaverry rock mass and the scattered boulders of the Huanchaco Bay area. Large clam species are restricted to the quieter waters of the bay where both gravel and sand substrates occur. The few rock-perching species confined to the Salaverry area must find a large rock mass essential for proper growth and development and small boulders generally untenable.

This examination of species variation between two sites at opposite edges of the Moche Valley suggests two important patterns. First, in the pursuit of animal food, the inhabitants of both Alto Salaverry and Padre Aban frequented only shore areas very near their respective sites. Second, and perhaps ultimately more important, the distribution of certain molluscan species can be correlated with specific portions of the Moche Valley on either side of the river.

Cotton, gourd, and squash are the only plant

cultigens common to both sites. They represent the only cultivated species from Padre Aban and the dominant species in the Alto Salaverry inventory. Other food plants represented in Alto Salaverry refuse reflect an increased emphasis on plant cultivation coupled with tree fruit tending. Since plant cultivation was not possible in the arid locales of both Alto Salaverry and Padre Aban, all these plant species were probably cultivated or tended in seasonally flooded areas along the lower Moche River.

It is significant that two of the three main species at both preceramic sites are industrial plants: cotton and gourd. To people without pottery and with a marine focus, gourd containers and floats and cotton net and cord would have been extremely important--more important than plant food since animal protein was so readily available. As a result, people viewed plant cultivation essentially as a means for obtaining necessary raw materials. Such a bias in favor of industrial plant cultivation could easily have resulted in the neglect and limited production of most food species. However, another factor, the areal limits on floodplain land suitable for cultivation may have ultimately been a key variable. With usable land in short supply and

and the resulting limited production concentrating on industrial plants, food plant production would have been small and secondary. The Alto Salaverry plant inventory supports this interpretation.

CHAPTER V

THE INITIAL PERIOD AND EARLY HORIZON

Technologically, this period began with the introduction of pottery and the change from twined to woven textile production. Within Moche, it was the time when a complex settlement first appeared in the valley interior--a relocation correlated with the beginnings of irrigation agriculture.

Data on subsistence activities in early ceramic times come from the coastal site of Gramalote and the inland mound complex of Caballo Muerto (Figure 1). Based on ceramic evidence and radiocarbon dates, the sites appear generally contemporary. More specifically, the occupation at Gramalote was contemporary with the earliest phase defined for Caballo Muerto, when the Herederos and Cortada mounds were in use. Differences between the sites are necessarily correlated with two dependent variables: location and function. When these variables are considered, the coastal, marine-oriented site of Gramalote contrasts markedly with the inland religious center of Caballo Muerto. When the sites are examined from an economic point of view, with an

emphasis on subsistence, major common and complementary features become evident.

Gramalote

The early ceramic site of Gramalote lies very near preceramic Padre Aban in the vicinity of Huanchaco Bay (Figure 1). The settlement was marine in orientation and probably was permanently occupied. The same rock-strewn beach and nearby bay exploited by the people of Padre Aban were easily accessible from Gramalote. An investigation of the architectural component revealed complexes which were both domestic and public in orientation (Figure 4). Rich areas of midden which cover virtually all of the site reflect local procurement and processing activities. A single stratigraphic excavation in an area of unusually deep refuse yielded the main data on which this evaluation of site subsistence activities is based.

Animals Utilized at Gramalote

In keeping with the pattern already observed for early maritime sites, all the animal protein consumed at Gramalote derived ultimately from the nearby ocean (Appendix I, Table 63). As might be anticipated,

because of its location, the site shares most elements of the faunal species inventory with Padre Aban.

Again, at Gramalote, the only mammal of dietary significance was the sea lion, which was taken and consumed in a quantity comparable to that observed for Alto Salaverry (Appendix I, Tables 7, 9, 11). Disarticulated skeletal elements of other mammals add up to considerably less than one rat and one mouse which were probably attracted to the decaying garbage.

Although not as common as remains from Padre Aban, bird bones from Gramalote indicate that several species were taken with some regularity. The relatively high proportion of bird remains at both sites near Huanchaco suggests that they were locally abundant. However, cultural factors, such as those discussed in Chapter IV, must be taken into account in order to explain differences in the bird consumption for Padre Aban compared to Gramalote.

At Gramalote, less than 10% of the total meat protein was derived from fish (Appendix I, Tables 11, 62). This contrasts markedly with the Padre Aban situation in which almost 30% of the meat protein was fish-derived and especially the Alto Salaverry situation in which over 50% was fish-derived. Shark (Mustelus sp.) provided more meat than all other fish species combined.

Rays (Myliobatis peruvianus), guitarfish (Rhinobatos planiceps), and three members of the croaker family (Sciaena gilberti, S. deliciosa, and Paralanchurus peruanus) were also represented. Of this group, the three non-bony fishes and mullet (Mugil cephalus) frequent shallow water near shore, and the members of the croaker family are occasionally also caught there (Evermann and Radcliffe 1917; Hildebrand 1946). Fishing implements recovered during excavations include three stone net sinkers (two grooved and one perforated) and several small-mesh (6 to 15 mm.) cotton net fragments, therefore most fishing was probably done using simple haul seines.

Clearly, the major subsistence activity at Gramalote involved the procurement and processing of Shellfish. Virtually all the species identified at Gramalote were also collected by the inhabitants of Padre Aban who occupied the region at an earlier date. Such coincidences further document the consistent localization of some shellfish species within restricted areas along the coast. Quantitative differences in the species taken by people from Gramalote compared to Padre Aban can be attributed to the more efficient procurement systems in operation at Gramalote. In Chapter IV it

was pointed out that shellfish gathering by the people of Padre Aban focused on the more visible, easily gathered species. Except for the coquina clam (D. peruvianus), which has a very low meat yield per individual (Appendix I, Table 3), most of the accessible species of gastropods and mussels were also collected by persons based at Gramalote (Appendix I, Table 11). However, shellfish gatherers from Gramalote also collected the deeper burrowing clams (P. thaca, E. rufa, S. corrugata, and Gariet solida), which supply more meat per individual than all but the large mussel (C. chorus). It appears that once a method was established for taking these large mollusks efficiently, procurement activities focused on shellfish collection.

Specimens of the large mussel (C. chorus) recovered from the Gramalote refuse were usually large adult individuals. Very few juveniles were recorded. Overall, the shells were smaller than the average observed for Padre Aban, but larger than most Alto Salaverry specimens. Like many of the examples from Padre Aban, some of the Gramalote mussel shells were affected by parasites.

The same breakage pattern observed for Padre Aban and Alto Salaverry was documented for Gramalote shellfish. Large mussels and large clam species, as well

as many gastropods, had been bashed open in a consistent manner to extract the meat. Many large bivalve shells, especially the purple mussel, had been used as crude scrapers.

Tunicates were recovered from all but one of the 20 arbitrary levels of the Gramalote stratigraphic excavation. However, they were proportionately much less common at Gramalote than Padre Aban.

Plants Utilized at Gramalote

Plants contributed considerably less to the total quantity of food consumed at Gramalote than at Alto Salaverry (Appendix I, Table 64). However, two important species not recorded for Alto Salaverry were present at Gramalote. Cultivated species identified include the same plants identified for Alto Salaverry plus the newly introduced peanut (Arachis hypogaea) and maize (Zea mays). Lima beans, pacaes, and quayaba, which were rare at the Preceramic site, were not found at Gramalote, but this may reflect sampling procedures.

Cotton, gourds, and squash continued to be abundant, but food species other than squash were also present in substantial amounts (Appendix I, Table 12). Lúcuma, avocado, the common bean, and pepper had become especially important elements in the vegetable diet.

Maize was very scarce. Only two cobs and a single husk fragment were recovered from the entire site, indicating it was not yet an important food plant.

Most of the wild plant species identified for the Preceramic sites were also present in the Gramalote sample. Locally available Tillandsia sp. and grass were common, and much of the Tillandsia sp. was apparently burned as fuel. From the river, cane was brought in substantial quantities, and totorá reeds in lesser amounts. Algorroba seeds are present, but rare.

Gramalote Summarized

In many ways, Gramalote very closely resembles the two earlier marine-oriented coastal sites, Padre Aban and Alto Salaverry, especially Alto Salaverry. However, it is the differences which are most significant. In contrast to the generalized procurement systems documented for Padre Aban, shellfish collection at Gramalote had become systematized and was apparently pursued at the expense of other subsistence activities such as fishing and possibly plant cultivation. With respect to plant species, Gramalote differs quantitatively from both Preceramic sites. Despite the varied plant inventory at Alto Salaverry, only squash emerges as an important food plant relative to other species. At Gramalote,

several food plants equal squash in importance. These special features of Gramalote are discussed further after the Caballo Muerto material has been considered and subsistence systems for this time period are discussed as a whole.

The Caballo Muerto Complex

The Caballo Muerto Complex, a series of eight early ceramic mounds, is the first inland area to be dealt with by this study, and within it is the earliest known inland ceramic site within the Moche Valley. The Complex is located about 17 kilometers from the ocean at a point where the Moche Valley begins to narrow sharply (Figure 1). Elements of the site's layout, architecture, and ceramics indicate a variety of local activity components, only a few of which were concerned with subsistence (T. Pozorski 1976).

Most of the subsistence data from Caballo Muerto come from a series of test pits within Huaca Herederos Chica, one of the earliest mounds of the Caballo Muerto sequence. These excavations encountered bands of refuse concentration well below the modern ground surface. Apparently the living surface in use when Caballo Muerto was occupied has been covered by alluvium over a period

of many centuries. Therefore the local domestic component is inaccessible, and much specific contextual information for the refuse is lacking. Finally, virtually no plant remains are preserved because the area has been kept moist by prehistoric and modern irrigation systems.

Within the complex, only the mound of Herederos Chica yielded enough quantitative subsistence data for extensive comparisons. The period when this mound was used is contemporary with the occupation of Gramalote on the coast. In view of these factors, with respect to Caballo Muerto, the evaluation of Initial Period and Early Horizon subsistence will focus on the Herederos material. Relevant data from other mounds within the complex are used where possible.

Animals Utilized at Caballo Muerto

At Caballo Muerto, for the first time, land mammals figure significantly in the faunal inventory (Appendix I, Table 63). However, marine resources continue to be slightly more important. The unique combination of local and imported coastal faunal resources used by the people of Caballo Muerto makes the site especially important in an investigation of changing subsistence patterns.

In the material from Herederos, almost 20% of the total meat volume was supplied by deer (probably Odocoileus virginianus) (Appendix I, Table 13). Up-valley and near the river in the area of Caballo Muerto, wild plants were probably sufficiently dense to provide food and protection for a small population of these animals. The only other bone identified as deer came from Huaca Cortada, another mound in the earliest group. The absence of deer at the later mounds suggests that the small population of deer which local vegetation could have supported was hunted to near extinction or largely displaced by land alteration for agriculture early in the history of the complex.

One of the camelids, probably the domesticated llama (Lama glama), supplied a slightly smaller volume of meat than deer. Relying on data from 25 sites in the Peruvian and Ecuadorian sierra, E. Wing has suggested that camelids may have been domesticated as early as 4400 to 3150 B.C., and by 1000 B.C. domesticated forms are fully developed. Her evaluation of the very early sample, which comes from Pikimachay Cave in the Aya-cucho Valley, is based on the presence of two sizes which parallel modern camelid varieties, the relative abundance of the remains, and the high proportion of

juvenile individuals of approximately 18 months which were butchered during the highland dry season when charqui, the sun-dried meat, is usually made (Wing 1973b: 11-12). By 100 B.C., data from several sites document increased size and variability among the camelid remains (Wing 1973a: 6, Tables pp. 32-46). These data suggest that the camelid identified at Caballo Muerto was probably initially introduced into the Moche Valley from the sierra in a domesticated form.

In addition their obvious use as food, llamas might also have served a ceremonial function, supplied medium quality wool, and served as beasts of burden. Camelid remains were also identified from Huaca Cortada, Huaca de los Reyes, Huaca la Cruz, and Huaca Guavalito. The continuous presence of these animals suggests that, unlike deer, camelids persisted as a meat source through the duration of the Caballo Muerto occupation.

Four of the total bones identified as camelid and two of the bones identified as deer showed evidence of cuts made during the process of butchering. Marks occur on rib heads, thoracic vertebrae, and tarsal bones. The sample is too small to suggest a pattern, but all the cuts probably resulted from efforts to disarticulate the skeleton.

The only other land mammal of potential food

value was the dog (Canis familiaris), but in the case of Caballo Muerto, the amount of meat represented is insignificant. Sporadic rodent bones adding up to one mouse and two rats are probably from animals attracted to the decaying refuse.

The single marine mammal of economic significance is the sea lion. Only the excavations at Huaca Cortada and Huaca la Cruz yielded bones of this animal. The infrequency of its occurrence plus the time difference between the huacas where remains were found argue against the sea lion as an important food animal. However, it is important as evidence of continued coastal contact.

Both birds and fish were very minor elements in the faunal inventory (Appendix I, Tables 13, 62). They too are important, however, as further evidence of connections between Caballo Muerto and the seacoast.

A large number of shells from Scutalus, a local land snail, were identified in the Caballo Muerto material. These animals are common upvalley in areas of sparse vegetation and in lomas (fog vegetation) areas which are rare in Moche. They generally may be found adhering to rocks and shrubs. Although not a major meat-producing item, the frequency of Scutalus in the Caballo Muerto material suggests that they were

collected for food.

Marine shellfish, mainly mollusks, were the largest single source of animal protein (Appendix I, Tables 13, 62). They constituted over 50% of the meat volume consumed at Herederos and thus establish a firm link between the inland complex and the coast. Their abundance suggests that they represent the marine resource in greatest demand during at least the earliest period of the Caballo Muerto occupation. Shellfish were recovered in substantial quantities from all the mounds, indicating that they persisted as an important part of the diet as long as the complex was occupied.

Major meat-producing species include the large mussel (C. chorus) and three large clams (P. thaca, E. rufa, and S. corrugata). Other bivalves and gastropods are present, but their total dietary contribution is minor. The range of species identified from Caballo Muerto correlates well with the species inventories of Gramalote and Padre Aban. This indicates that the Caballo Muerto shellfish were collected in the vicinity of Huanchaco Bay.

Plants Utilized at Caballo Muerto

No securely dated food plant material was preserved in the Caballo Muerto Complex. Therefore,

evidence for plant cultivation is necessarily indirect. The varied species inventories for both Alto Salaverry and Gramalote indicate that techniques of plant cultivation were well-developed by late Cotton Preceramic and early ceramic times within the Moche Valley. At least a comparable collection of skills and species can be assumed for the Caballo Muerto area. The variety and relative quantities of plants identified for Gramalote are probably good indications of the species utilized within Caballo Muerto.

The inland location of the Caballo Muerto complex argues for increased land use through irrigation. At the point where the valley narrows, access to the river would have been more easily controlled. Because of the increased gradient upvalley, canals diverting water from the river could be short, but still irrigate substantial land areas.

Caballo Muerto Summarized

The presence of substantial amounts of marine-derived animal protein in the Caballo Muerto refuse links the complex with the coast and some of the continuities observed for marine-oriented sites. However, much animal protein was supplied to Caballo Muerto from inland meat sources, mainly wild deer and a domesticated

camelid. Such a combination of meat protein sources is one aspect of the transitional nature of the Caballo Muerto subsistence pattern as more and more emphasis is placed on inland-derived products.

Despite the absence of preserved plant remains, the inland location of the complex predicated on irrigation agriculture is extremely revealing. Most important, such a move inland correlates with an emphasis on plant food production at the expense of the traditional coastal focus which stressed animal food availability.

Initial Period and Early Horizon Subsistence

General trends in subsistence during early ceramic times can only be properly evaluated by considering data from both Gramalote and Caballo Muerto as complementary parts of a complex economic system. As an isolated site, Gramalote can be summarized as a marine-oriented site where (1) shellfish procurement was extremely systematic and (2) several food plants equalled industrial species in importance among the cultigens. Caballo Muerto stands alone as an inland mound group where (1) animal protein was supplied by contributions from marine and inland sources and (2) increasingly efficient and productive irrigation

agricultural systems were in operation. Viewed together, the sites emerge as two parts of an economic unit: one with an inland agricultural focus and one with a coastal marine focus.

Assuming the location of Caballo Muerto was predicated on water control, the move inland represented by the peopling of the Caballo Muerto area reflects a change in subsistence priorities. During the Cotton Preceramic, the coastal location of Padre Aban and Alto Salaverry could be correlated with the marine subsistence focus of each site. In contrast, the inland location of Caballo Muerto reflects an emphasis on inland procurement systems, especially irrigation agriculture, and a corresponding deemphasis of marine products.

Using data from Padre Aban and Alto Salaverry, it was argued in Chapter IV that plant cultivation during the Cotton Preceramic focused on industrial plants. It was suggested that the cultivated plant inventory of Alto Salaverry represented the effect of such an emphasis on industrial plants when cultivation was limited both spatially and seasonally to the small Moche Valley floodplain. Despite great species variability, the quantity of food plants grown remained small because most of the limited land area was devoted to cotton and gourd production.

By early ceramic times, areas of coastal desert were opened to agriculture year-round through irrigation. The control and maintenance of these early irrigation systems necessitated relocation inland to be near canals and irrigated fields. With potentially vast areas open to continuous cultivation, crop restrictions which were in operation earlier on the floodplain were no longer applicable. The quantity and relative frequency of cultivated plants used by the people of Gramalote indicate that they are the product of irrigation agriculture near sites such as those in the Caballo Muerto area, many of which may now be largely destroyed. Compared to the species from Alto Salaverry, plants from Gramalote are much more abundant. Also, and perhaps of greater significance, the frequency of different plants within the site at Gramalote differs markedly from Alto Salaverry frequencies.

Finally, an increase in plant seed size when Preceramic and early ceramic samples are compared can also be correlated with certain features of irrigation agriculture. Average length and width measurements for seeds from Alto Salaverry and Padre Aban (when available) were compared with similar data from Gramalote for two plant species: squash and gourd (Appendix I, Tables 56,

57). These are the only plants for which even a small number of measurable seeds was available and measurements were significant. The best evidence for seed size increase comes from squash and secondly from gourd. A comparison of samples for the two periods reveals that the early ceramic squash material is significantly (over 10%) larger. Due to the small sample sizes, data for gourd seeds offer less conclusive evidence. Taken together, gourd and squash seed size averages are larger in early ceramic material, suggesting a trend that may be significant. This increase in seed size is probably largely a result of the regular and adequate water supply that irrigation provided. Annuals like gourd and squash received no additional water after the seasonal flooding had subsided, and under such unfavorable conditions, plant growth and development was retarded. With a regular irrigation system and schedule, cultigens received adequate water and therefore attained their full potential size.

For the inhabitants of Caballo Muerto, an inland location meant location at some distance from the abundant marine resources--resources which were traditionally the most stable and most abundant. Certainly through the earliest phase and possibly

during the entire occupation, the inhabitants of Caballo Muerto continued to rely heavily on marine products.

While the irrigated inland fields were supplying both Caballo Muerto locally and Gramalote on the coast with cultivated plant food and products, the marine products collected in the area of Huanchaco Bay were supplying all the animal protein consumed at Gramalote and well over half the protein volume consumed during the earliest period when Caballo Muerto was occupied. The collection of shellfish for exchange by the people of Gramalote with the inland group is documented by the large proportion of marine-derived species in the faunal portion of the inland diet. The dominant species at Caballo Muerto are essentially the same species which were the focus of the efficient Gramalote procurement system. The specific orientation of this procurement system plus the narrow range of non-subsistence site activities at Gramalote suggest that the site might have been a subsidiary community or a colony established to insure a continuous supply of marine products for the inland complex.

Within Caballo Muerto, data from Huaca Herederos reveal that the marine protein supplied by Gramalote was supplemented by meat from local inland

sources. Local alternatives to the large-scale importation of marine protein were apparently being explored.

Deer contributed a substantial amount at first, but these animals were probably soon severely depleted in the Caballo Muerto area. More important were the domesticated camelids which appear for the first time in the Caballo Muerto material. The use of camelids as food was an important feature of the Caballo Muerto subsistence pattern because such large domesticated animals can potentially provide a stable protein source for inland people that is as reliable as shellfish.

In summary, early ceramic period subsistence in the Moche Valley is marked by the establishment of inland settlements correlated with canal irrigation systems. Despite the change in subsistence priorities implied by an agricultural rather than marine emphasis, the inland population continued to rely heavily on coastal food products. Marine animal protein was supplied by a coastal population of systematic shellfish collectors in exchange for industrial and food plant products from the irrigated areas. Supplemental meat for inland sites from deer and domesticated camelids revealed that alternative animal protein sources were also being exploited.

CHAPTER VI

THE EARLY INTERMEDIATE PERIOD

The Early Intermediate Period within the Moche Valley was a time of continued political and economic development. Large, permanent inland settlements, the product of advanced ranked societies, were increasingly complex. Extensive canal irrigation systems dating to this period imply highly organized food production systems.

During the earlier portion of the Early Intermediate Period, valley population was generally concentrated at Cerro Arena, located about six kilometers inland and south of the Moche River. The Salinar ceramic style is associated with this settlement. Unfortunately, no subsistence data are available from this site.

Much of the time span designated as Early Intermediate Period saw the valley dominated by a group producing Moche, or Mochica, ceramics and centered at the large complex settlement known as the Moche Huacas. This center formed the capital of an advanced polity which included in its domain the series of valleys

outside Moche north to Lambayeque and south to Nepeña. Refuse associated with the Moche Huacas provides the only data on Early Intermediate Period subsistence available for this study.

The Moche Huacas

Two monumental adobe mounds, or huacas, are the outstanding preserved features of this large settlement very near the Moche River (Figure 1). The refuse analyzed in this study was taken from a prehistoric pit on top of Huaca del Sol, the structure nearer the river. Ceramics associated with the refuse-bearing strata were used to correlate the occupation with phases III and IV of the Moche sequence.

Animals Utilized at the Moche Huacas

Animal bone taken from the cut on Huaca del Sol indicates that land animals had become the predominant dietary protein source. This represents the culmination of a trend which was first suggested by data from the inland Caballo Muerto complex. Marine resources were relegated to a minor position in the diet at Moche.

More than 90% by volume of the animal protein

consumed at Moche was supplied by a domesticated camelid species (Appendix I, Table 14). Camelid dung was also extremely abundant in the refuse. This species can be reliably identified as llama (Lama glama) in Moche times because the animals are frequently depicted in the realistic molded and painted ceramic art. They are often shown wearing halters and are occasionally portrayed laden with sacks (Horkheimer 1973: plate facing p. 80; Benson 1972: 91-92).

It has been suggested that llamas are not well-adapted to the climatic conditions of the Peruvian coast, yet much of the evidence at hand is conflicting. For example, Cardoza (1954: 65) argues that the soft vegetable diet of the coast fosters abnormal dental growth which is normally absent when llamas graze on the tougher plants of sierra pastures. Wing, on the other hand, affirms that only the vicuña (Vicuugna vicuugna or Lama vicuugna) has continually growing incisors, thus implying that the teeth of other camelid species should not be greatly affected by the physical nature of food consumed (Wing 1973a: 9). Clearly much more evidence must be reviewed before the general issue can be resolved. The archaeological camelid material from the Moche Valley provides such additional evidence.

The near-total reliance of the inhabitants of the Moche Huacas on llamas for meat plus the abundance of dung suggests that substantial numbers of these animals were kept in the vicinity of the site. However, the principle herds from which the animals consumed at Moche were drawn may have been maintained in areas much further inland and higher in altitude where land than was not easily farmed could support substantial pasturage. In keeping with data presented below documenting Moche polity management of agricultural production, it seems probable that the herds which supplied meat to the people of the Moche Huacas were ultimately controlled by this polity.

Due to the large size of the llama bone sample from Moche, a number of cultural factors relating to llama husbandry and meat processing can be assessed. Animal age, burned bone frequency, bone type frequencies, and man-made marks on bones are some forms of data upon which such evaluations are based.

A partial evaluation of the age structure of the llama population was made on the basis of whether each bone was fused or unfused. Wing (1972: 330) has determined a series of camelid age stages based on the sequence of epiphyseal fusion. The sixth stage is

correlated with a teeth eruption schedule established by Cardoza (1954: 91) to give a chronological age equivalent of 36 months. However, all other stages are relative since they have not yet been tied to chronological ages. When bone data from Moche were organized according to progressive fusion stages, and the results (expressed as percent unfused) were graphed, a partial age structure was reconstructed for the llama population (Appendix II, Figure 18). Most significant is the large proportion of unfused bones even for the later fusion stages. Such a distribution indicates that animals consumed at Moche were generally very young adults.

According to Uerpmann (1973: 315-316) and Perkins and Daly (1961: 101), methodical exploitation of a specific age group is expected among people who keep herds of domesticated animals for specific purposes.¹ Age data from Moche indicate that the animals consumed came from herds kept primarily for meat. In such a situation, after animals are selected for breeding

¹The use of data revealing methodical exploitation of age or sex groups to argue for early animal domestication has recently been criticized by Collier and White (1976: 96-102). Since the domesticated status of the llama is not in question here it is possible to use age data as an indication of herd use.

stock, it is most efficient to butcher meat animals soon after they reach adult size. At this point they no longer gain substantial weight, but do consume valuable fodder. The high proportion of young adult animals in the Moche sample fits this situation well.

Bone type frequencies within a sample can occasionally be used to infer animal processing methods, but the best direct evidence comes from grooves and bashes on the bones present. Both types of data are evaluated for the Moche sample in an effort to reconstruct procedures followed from the time a llama was killed until it was used. At sites in which people relied primarily on llamas for meat, a consistent and standardized processing procedure was followed. Using data from all the sites, the procedure is reconstructed in detail in Appendix II. After the animal was skinned, the carcass was disarticulated--usually by cutting through the joints. While many of the smaller units were probably cooked whole with the bone, meat was cut from the larger skeletal units to make manageable portions. Finally, larger bones were broken open to extract the marrow.

The frequency of burned bone in the Moche Huaca sample was evaluated in terms of specific bone

types grouped according to body section (Appendix II, Table 65). Generally less than one third of the bones of a given body section were burned. Highest frequencies were recorded for ribs and vertebrae and may reflect cooking by roasting. On the other hand, lower frequencies for other bones may be correlated with cooking in containers.

Occasionally portions of dense bones, especially long bones, were fashioned into tools. Two proximal metapodial fragments in the Moche sample were deeply grooved where the shaft was severed in an early stage of tool manufacture.

A second domesticated species consumed by the people of the Moche Huacas is the guinea pig (Cavia porcellus). These animals were probably kept in and around houses where they could be maintained on scraps. While not a major dietary item, their frequency indicates guinea pigs were a popular alternative to llama meat. Small amounts of dog bone identified in the Moche material indicate another minor source of animal protein. Relative to earlier sites, rodent bones were unusually common. Minimum number of individual counts added up to seven rats and six mice that had once infested the garbage. The inner portions of many plant

seeds, especially gourd, had clearly been eaten by these rodents.

Sea lion bones were also identified in the Moche Huaca material, but the total dietary contribution from these animals was quite small (Appendix I, Table 14). This evidence is important, however, because it documents contact with the coastal zone.

Both birds and fish were also consumed in small numbers by the Moche people. Bony fish occur much more frequently than shark or related species in the small fish sample. The pelican (Pelecanus sp.) was the only bird identified.

The shells of Scutalus, the terrestrial snail, occur in substantial numbers in the refuse (Appendix I, Table 14). They were probably collected off rocks and shrubs in sparse vegetation areas near the site for use as food.

In contrast to the situation at earlier sites, marine mollusks were a very minor protein source for the people of Moche. Well under 5% of the total animal protein was derived from this source. Most of this came from a single species, the small, tide zone clam (Donax peruvianus) (Appendix I, Table 14). Virtually none of the high-meat-yield species documented for

earlier sites were consumed by the people of Moche, and the same is true for later sites. Apparently, by Moche times, these large species had all but disappeared from the Moche Valley coast. Subsistence data from Alto Salaverry provided evidence that the molluscan populations near Salaverry point were being gathered faster than they could fully regenerate. The evidence from Moche suggests that by the Early Intermediate Period the remaining areas may have been greatly over collected as well. Consequently shellfish collecting was a minor activity which focused on the tiny tide zone clam, the most abundant remaining species.

The presence of rock-perching species of chitons, limpets, and a small striated mussel (Brachidontes purpuratus) peculiar to Salaverry Point indicates that the shellfish consumed at Moche were probably collected south of the river mouth toward the rocky point.

Plants Utilized at the Moche Huacas

In the interim between the occupation of Gramalote and the occupation of the Moche Huacas, there was no change in the total inventory of cultivated plant species used within the Moche Valley. Instead, changes occurred in species frequencies, especially

for food plants, and these changes provide evidence of a different dietary emphasis.

All the cultivated species identified for the earlier sites were present at the Moche Huacas. These include cotton, gourd, squash, peanut, maize, common beans, and pepper. Tended trees include lúcuma, avocado, paca, cansaboca, and quayaba. The single species which changed most in frequency between early ceramic times and the Moche portion of the Early Intermediate Period is maize. The sample from the entire site of Gramalote was two cobs, while the cuts on the Moche Huaca produced almost 200 whole cobs and fragments (Appendix I, Table 15). Maize was a close second to squash, the most abundant plant food by volume. One fragment of a small round metate, or grindstone, from the Moche midden also reflects this increased emphasis on maize.

Other plant cultigens retain their importance at Moche. An examination of the combined reconstructed contribution and the persistent frequency of plant species reveals that the crop plants cotton, gourd, squash, peanuts, beans, and, to some extent, pepper, were the dominant food species. With the exception of lúcuma, tended fruits are much less frequently represented.

When measurements made on Moche plant material were compared with data from earlier sites, substantial size increases were documented for a few species. The near 25% change in squash seed size is the most dramatic (Appendix I, Table 56), but gourd seed size also shows a slight increase (Appendix I, Table 57). Corn cobs from the Moche refuse sampled are all quite large, and kernel row numbers are also large as well as varied (Appendix I, Tables 59, 60, 61). Cobs with 8, 10, 12, and 14 rows are present in substantial numbers, but 10 row cobs are most frequent.

Cane from the nearby Moche River was the most commonly used wild plant species at the Moche Huacas, probably because of its value as a construction material (Appendix I, Table 15). Totora reeds were also useful plant products, but other wild plant parts such as grass burrs and the few algorroba seeds probably represent accidental inclusions. The moderate amounts of marine algae were brought inland for food, or more probably packed around the few shellfish to keep them fresh.

Early Intermediate Period Subsistence

Since the only local data on Early Inter-

mediate Period subsistence come from a single site, a summary of general subsistence trends documented for the Moche Huacas also constitutes a review of Early Intermediate Period subsistence evidence. Two inter-related features of this generalized pattern are especially significant. First, early efficient food sources had become efficiently organized food production systems. Second, with this increased organization, food production was both greater and ultimately more reliable.

An examination of animal protein sources documented for Moche revealed a focus on the domesticated llama to the extent that other potential meat sources were of minor importance. This suggests that the source of llamas was being controlled and maintained ultimately by the head of the Moche polity for the purpose of supplying meat and possibly labor and wool. The age structure of meat animals and patterns of butchering marks suggest standardized processing procedures--another possible feature of this control. Such an organized inland system for meat production resulted in a degree of control and reliability of the meat supply not possible for earlier inland groups dealing with several meat sources.

The extremely small amounts of other animal food consumed are probably the result of sporadic individual or small-group collecting and animal tending ventures. Perhaps the increased emphasis on llama is to some extent correlated with the decreased shellfish populations documented for the Early Intermediate Period. The consumption of substantial amounts of llama meat during the Initial Period and Early Horizon when large shellfish were still available in Huanchaco Bay would suggest that a declining shellfish population was not the only factor involved. More likely, inland-derived meat was quickly adopted into the animal inventory very early and became popular even more rapidly as traditional marine resources became less available.

Several features of the Moche Huaca plant species data provide evidence of efforts to increase agricultural production. Areas of large regular fields contemporary with the Moche Huaca occupation discovered during an independent Chan Chan Moche Valley Project survey indicate that new and larger areas were being opened to irrigation. These represented a considerable investment, particularly of labor, and they were probably also controlled ultimately by the Moche polity head. Cotton, gourd, squash, maize, peanuts, and common

beans have emerged as major crop plants because they could be produced in great quantity on such large irrigated fields, while fruits seem to have decreased in importance. All of the dominant cultigens except squash could be easily reduced to forms suitable for storage thereby facilitating an accumulation of surplus agricultural products. Finally, a further increase in cultigen seed size may indicate differential selection. The final manifestation of all these combined factors was an extremely efficient agricultural system with each step, beginning with the opening of new lands to irrigation, subject to constant control.

Since fruits are relatively unsuited to mass production and storage, they were deemphasized relative to crop plants during the Early Intermediate Period. Possible exceptions were lúcuma and avocado which yield a large amount of food per fruit. Other fruit species consumed, such as pacae and quayaba, probably came from occasional trees along canals and field borders that were tended and harvested on an individual basis.

In summary, Early Intermediate Period subsistence activities were dominated by efforts aimed at systematically increasing production. By the time the Moche Huacas had emerged as the capital of a near-state-

level polity, a compatible subsistence system had developed which essentially freed the inland community from dependence on the coast. Unlike Caballo Muerto where much animal protein was marine-derived, Moche was supported almost exclusively by inland llamas. Comparable control over agricultural production assured the polity of the remaining dietary necessities.

Yet, contrary to the force implied by Moche polity control of major production systems, Early Intermediate Period Moche subsistence data also document a more human element still functioning. Individuals or small groups were still consuming minor species apparently outside of polity jurisdiction. They probably tended pacae or quayaba near the fields and traveled to the nearest coastal zone to fish and gather shellfish.

CHAPTER VII

THE MIDDLE HORIZON

For much of Peru, sites dating to the Middle Horizon are characterized by foreign elements attributed to the Huari expansion. However, direct Huari influence was only very weakly felt within the Moche Valley. During the Early Intermediate Period, the Moche Valley housed the capital of the multi-valley Moche polity. After the end of phase IV of the Moche ceramic sequence, this capital was largely abandoned, and a new large center correlated with Moche phase V ceramics was established further north in the Lambayeque Valley. This center, Pampa Grande, was the capital of an advanced polity with a domain which encompassed the Moche Valley. Included in this domain were a number of other subsidiary Moche V sites in valleys along the North Coast. Within the Moche Valley, the Moche V site of Galindo is the dominant site dating to the Middle Horizon, and it shares many characteristics with Pampa Grande. Refuse from Galindo provided most of the data used to reconstruct Middle Horizon subsistence patterns.

A small number of sites and occupations

designated as Early Chimu are also considered as part of the Middle Horizon development within the Moche Valley. While possibly partially contemporary with the Galindo occupation, Early Chimu sites generally immediately predate the establishment of Chan Chan, the Chimu capital, within the Moche Valley during the Late Intermediate Period. A small amount of subsistence data are available from one such Early Chimu occupation on top of the Moche Huaca del Sol.

Galindo

The large, complex site of Galindo, ceramically dated to the fifth Moche ceramic phase, lies well inland, about 20 kilometers from the coast and north of the Moche River (Figure 1). Both public structures such as huacas and large walls and domestic dwellings are easily visible on the surface. Unlike most refuse evaluated in this study, food remains at Galindo were restricted to hearth areas within domestic structures. Such a close association between food species and the structures where they were consumed made possible an evaluation of intrasite variables affecting subsistence. For this reason, data from separate excavations at Galindo are often considered individually. Unfortunately-

ly, preservation in the Galindo area is poor, therefore only a very small quantity of plant remains were collected.

Animals Utilized at Galindo

Data from all seven hearths excavated at Galindo indicate a dependence on land mammals for most animal protein (Appendix I, Table 63). This correlates well with the inland location of the site and suggests continuities with meat procurement patterns observed for the earlier Moche Huaca. In comparison to the vast amount of meat supplied by inland sources, marine resources constituted a very small portion of the total animal protein consumed.

Domesticated llamas were the main meat source for the site (Appendix I, Tables 16, 18, 20, 22, 24, 26, 28). In each cut, bones from these camelids far outnumbered the remains of all other species. For Galindo the unidentified mammal category is unusually large because, due to its location within a hearth, much bone had been burned beyond recognition. However, a large proportion of this burned material is probably llama bone.

Direct evidence for the keeping of small llama herds at the site of Galindo consists of a corral

discovered by Garth Bawden during his extensive excavations at the site (Personal communication). The structure is a stone enclosure free of architectural features located adjacent to a ceramic workshop on the western edge of the site. Within the structure, llama dung covered the floor to a depth of 20 cm. Other associated material included numerous rope segments and ceramic fragments as well as some gourd rind and cane walling material.

Llama dung was an important fuel for the hearths. Concentrations of dung in the vicinity of several of the excavated hearths were probably stockpiles to be burned, and burned dung within these hearths provided direct evidence of its use.

As a result of the emphasis on domesticated camelids for food, the sample of llama bone collected from Galindo is adequate to allow a tentative reconstruction of llama husbandry, meat processing, and meat distribution systems within the site. Factors such as animal age, man-made marks on bones, burned bone frequency, and bone type frequencies were evaluated. The close correlation between food remains and specific house structures at Galindo occasionally made the llama bone distribution data especially meaningful.

In an effort to partially reconstruct the age structure of herds which supplied meat for Galindo, the total sample of bone from the site was evaluated according to the series of age stages defined by Wing (1972: 330) on the basis of epiphyseal fusion. When the results were graphed, it was evident that about half of the animals killed for meat were fully adult (Appendix II, Figure 18). This suggests an older general age structure for llamas available to the people of Galindo than was indicated for the Moche sample. Despite this slightly older age structure, a large proportion of animals were still apparently butchered for meat at the optimum young adult age. The older age structure may reflect the additional use of these herd animals for wool and labor.

The distribution and frequency of actual cut marks left on bones by butchering and other processing practices does not differ significantly from data observed for the Early Intermediate Period sample (Appendix II, Table 66). This suggests that efficient methods of skinning and disarticulating llamas were types of processing procedures which persisted through time. Using data available from all sites with substantial llama bone collections, this procedure was

reconstructed in detail and is presented in Appendix II.

Galindo provided a unique opportunity for evaluating the distribution and frequency of bone types with respect to specific structures. Certainly, many samples are quite small. However, each represents the total camelid inventory from a given hearth and therefore is the most nearly complete sample available. First, meat-bearing bones are examined in an effort to reconstruct meat consumption units and distribution practices. Second, non meat-bearing bone frequencies are evaluated in terms of whether these body parts occur in expected numbers.

Data from Cuts 2, 3, and 4 came from three separate food preparation areas within a single complex residential structure. The sample from Cut 2 (Appendix II, Table 67) contains a large proportion of foreleg (or front body) parts, especially the radius-ulna and scapula, as well as a moderate amount of hind limb parts. This indicates that the shoulder girdle and foreleg was the meat unit most often consumed in this area of the complex. Cut 3 data indicate an emphasis on hind limb parts (femur, tibia, and innominate) and a lesser consumption of meat from the vertebral column. Foreleg parts are conspicuously rare. At the site of

the Cut 4 hearth, evidence points to a heavier reliance on body parts in the skull-vertebrae-innominate region as well as some hind limb sections.

Two aspects of the meat distribution data for hearths within this complex are especially significant. First, the general animal body portions most frequently represented for each food preparation are different, and to some extent, mutually exclusive. Second, meat elements, as represented by bone types, are seen to cluster in units which are meaningful in light of reconstructed butchering procedures. Such clustered units include the forelimb-shoulder girdle, the hind limb-pelvic girdle, and the skull-vertebrae-innominate section. The systematic meat distribution procedure documented here may reflect meat divisions based on the established hierarchy within a social group, such as an extended family, occupying the complex structure.

Other data from Galindo come from simple structures with a single hearth (Appendix II, Table 67). Evidence from Cut 1 suggests a reliance on the forelimb almost to the exclusion of other body parts. Again for Cut 5, one body portion is very well represented. In this case it is the neck and shoulder girdle region. Cut 6 revealed a hearth area where emphasis is again on

forward body parts as reflected by the high frequency of skull, thoracic vertebrae, and humerus sections. However, these units are not so easily correlated with butchering divisions. Finally, data from Cut 7 reveal a considerable emphasis on the hind limb-lumbar vertebrae-pelvic area, but the high frequency of an element such as the radius-ulna suggests that substantial amounts of meat came from other body portions as well.

When the frequency of non-meat bearing foot bones in the Galindo sample is considered, third phalanges are consistently absent or occur in less than the expected frequencies (Appendix II, Table 68). This scarcity of toe bones may correlate with skinning procedures during which the toe bones remain with the skin. Metapodials and first and second phalanges occur in generally increased frequencies. The substantial percentages of metapodial fragments reflects their usefulness as raw material for tool manufacture. One proximal metapodial fragment from Galindo is deeply grooved where the shaft was being severed for this purpose. High frequencies of first and second phalanges are unusual since they are not generally considered useful. They probably represent a by-product of metapodial collection for tool manufacture.

When the frequency of burned bone in the

Galindo sample was evaluated, a high incidence of burned bone was observed for most cuts (Appendix II, Table 65). This is certainly largely due to the refuse context because all of the Galindo material was taken from hearth areas where it may have been thrown in an effort at disposal. Within the site, Cut 7 yielded the least burned material, and this sample came from a structure which also contained unusually high status artifacts. The high percentage of burned bone for most cuts may also reflect cooking practices. Much of the Galindo sample was probably deliberately burned after the meat was eaten. However, some bone may also have become accidentally charred during meat roasting, a cooking procedure which exposes meat and some bones directly to flames.

Finally, within the confines of a given hearth area, bone distribution was examined with respect to the arbitrary 50 cm. square excavation units. When the relative abundance of all types of bone fragments was considered, two patterns emerged. At all times the bones were confined to the floor area where ash was also present, but bone distribution within this ash was patchy. Bone concentrations were discernible, but not directly associated with hearth areas. The second pattern is characterized by a concentration of bone

fragments in the immediate vicinity of the hearth. Differences between the two patterns probably reflect hearth cleaning practices. The predominant patchy pattern of scattered concentrations probably resulted from scraping of residue and ashes from the hearth area in order to rebuild the fire. This would have scattered both bones and ashes, with the bones frequently remaining in concentrations.

Such detailed evaluation of llama bone material was possible because of the quality and nature of contextual information available from Galindo and the relatively large bone sample. However, many basic cultural factors in operation at Galindo can probably also be attributed to situations in which data are less complete.

A second domesticated species identified from most of the cuts at Galindo is the guinea pig (Appendix I, Tables 16, 18, 20, 22, 24, 26, 28). Generally these animals are only sparsely represented, and they are absent from the Cut 5 and Cut 3 samples. Cut 6 yielded a relatively large amount of guinea pig bone, but even this quantity represents a very small amount of meat. Dog bone formed part of the sample from four of the seven cuts and was generally present in very small

amounts. Both these animals were probably kept on an individual basis in or near the local houses.

The only other food mammal documented for the Galindo sample is the sea lion. A small number of bones were collected from one cut, but again, the total meat contribution was very small relative to that of llama. The presence of sea lion at Galindo does verify continued, though infrequent, contact with the coast. A small number of rats and mice were also identified at Galindo.

Fish, mainly ray, or members of the croaker family (Sciaena deliciosa and Paralichthys peruana) were represented in material from all but one cut (Appendix I, Tables 16, 18, 20, 22, 24, 26, 28). Pelican remains were identified from Cut 7, and other bird bones were noted from a second cut. Both classes of vertebrates are coastal in origin, but neither constituted a large portion of the diet.

Land snail shells were found in every cut in varying frequencies ranging from 1 to almost 100. Despite their minor dietary importance, these shells do provide evidence of inland gathering activities.

The remaining meat protein source documented for Galindo is marine shellfish--mainly mollusks. The

frequency of each species varied from cut to cut (Appendix I, Tables 16, 18, 20, 22, 24, 26, 28), but none was a major item. The presence of C. concholepas, limpets, and the small striated mussel species (Brachidontes purpuratus) indicates that most marine collecting was probably done south of the Moche River mouth toward Salaverry Point.

Plants Utilized at Galindo

Preservation at Galindo is poor, therefore much of the plant material did not survive. Many recognizable plant parts had been burned, and certainly many more had been completely destroyed by fire. For these reasons, a quantitative evaluation of plant species used at Galindo is less reliable and revealing than similar studies for other sites. However, due to the large number of hearths sampled, it was still possible to reconstruct the basic species inventory.

Plant species which were cultivated by people from Galindo include cotton, gourd, squash, maize, common beans, lima beans, and peanuts. Lúcuma, avocado, cansaboca, quayaba, and pacae were tended (Appendix I, Tables 17, 19, 21, 23, 25, 27, 29). This total inventory is consistent with plant species identified at the Moche Huacas and earlier sites. No new plant species were

identified.

Despite the poor condition of many of the plant remains, the frequency of a few species does provide clues to their relative importance at the site. In general, field grown cultigens are much more abundant in the sample than any of the tended fruits. In comparison to other plant cultigens the common bean and especially maize figure prominently, perhaps indicating a special focus on these two storable crops. Squash and gourd are only moderately well represented, and cotton and peanut occur in very small quantities. Lúcuma, the most common fruit, also occurs in very small quantities, and other fruit species are quite rare.

When measurements made on plant material from Galindo were compared with data from early sites, two inconsistencies were observed (Appendix I, Tables 56 through 61). Both squash and gourd seeds are smaller in average size than earlier Moche material. Perhaps this correlates with the apparent deemphasis on these plant species suggested by their only moderate frequency in the site sample. Measured examples of common beans from Galindo could only be compared with small amounts of Preceramic data, but the evidence available suggests a size increase. Finally, a comparison of burned maize

cob measurements from Galindo with earlier data revealed that Galindo material was not significantly different in size when its burned condition was taken into consideration. Cob row numbers are less variable in the Galindo sample. Over 90% of the cobs are either 8 or 10 row, and 8 row cobs are slightly more frequent.

Wild plant remains were infrequently preserved at Galindo. The remains of Tillandsia and espino (Acacia macracantha) occur most frequently, reflecting their easy availability very near the site. Both were apparently used as fuel. Small amounts of algorroba were also identified. A single seed from the soap berry (Sapindus saponaria) documents the earliest use of this plant recorded by this study. A small sample of marine algae, probably brought in with live shellfish, completes the wild plant inventory.

Galindo Summarized

Subsistence systems in operation at Galindo closely parallel earlier systems reconstructed for the Early Intermediate Period. Data from cuts within hearths suggest a continuation of the trend which saw production processes and methods increasingly controlled. Such control is reflected in the generally standardized diet documented for both Galindo and the Moche Huacas.

Animal protein consumed at Galindo was almost exclusively inland in origin, and much of this was supplied by the domesticated llama. The total contribution of marine products was generally less than 5% (Appendix I, Table 63). Because of the abundant llama remains and excellent contextual data, it was possible to reconstruct many specific meat processing and distribution methods. Small numbers of other species were eaten by the people at Galindo. These animals were probably raised or collected on a small scale to provide a supplement or alternative to the llama meat supply.

Data from the plant material preserved at Galindo indicate a concentration of field grown cultigens, especially maize and common beans. Other cultigens were less frequent, and tree fruits rare. Like the infrequently represented animal species, rare plants probably reflect individual efforts at tree fruit tending and harvesting.

The Early Chimu Occupation of the Moche Huacas

A study of ceramics from the cut on top of Huaca del Sol revealed that the upper four natural strata from the first cut post-date the Early Intermediate Period Moche refuse. These upper strata were

deposited during a later Middle Horizon Early Chimu occupation of the area. Very little data are available pertaining to this occupation within the Moche Valley. At the site of the Moche Huacas, there is no architecture which can be reliably correlated with the Early Chimu refuse. The net result is minimal contextual information to accompany the subsistence evidence.

Animals Utilized During the Early Chimu Occupation

The collection of animal bone from the Early Chimu refuse yielded evidence of meat procurement systems which differ substantially from the well-controlled inland oriented systems reconstructed for both Galindo and Moche. Although most of the animal protein consumed by the Early Chimu people was of inland derivation, a substantial proportion was supplied by marine products (Appendix I, Table 63).

The greatest single source of meat for the Early Chimu occupation was domesticated llama. However, this contribution accounted for less than half the animal protein consumed (Appendix I, Table 30). The total sample of llama bone was not large enough for the type of detailed analysis possible for Moche and Galindo. Cut marks were recorded for only three bones: a rib, a radius-ulna, and an isolated shaft fragment.

All of these are compatible with the general butchering procedure outlined in Appendix II.

A small amount of meat was supplied by two other domesticated species: the guinea pig and dog. Neither figured prominently in the diet. Bones from two rats and one mouse complete the land mammal faunal inventory.

Most of the marine-derived animal protein came from sea lion. Meat from this animal was only slightly less important than llama in the local diet (Appendix I, Table 30). Certainly, in the small sample of Early Chimu refuse, sea lion may be overrepresented. However, the frequency of several other species reflect an increased marine focus as well.

Marine fish, especially two members of the croaker family, supplied a small amount of animal protein. Their slightly higher frequency indicates an increased dietary emphasis on fish compared to earlier inland sites.

In keeping with the large amount of llama consumed at the site, Scutalus shells, the other marker for inland-based subsistence, occur in substantial numbers. Apparently they were still being gathered in areas of marginal vegetation near the site.

Marine mollusk remains in the Early Chimu refuse accounted for only about 6% of the total animal protein consumed during this occupation of the Moche Huacas (Appendix I, Tables 30, 62). The tide zone clam (D. peruvianus) was the most frequently collected species and, despite its small size, supplied the most meat. The small striated mussel and a limpet are among the shellfish species identified, and this suggests that the mollusks collected for use by the Early Chimu were probably taken south of the river and near Salaverry Point.

Plants Utilized During the Early Chimu Occupation

All plant material in the Early Chimu refuse was very well preserved, thus a quantitative evaluation was feasible. The species inventory is generally consistent with data from the Early Intermediate Period and Middle Horizon Galindo samples. No major new species are present, and the absence of some species known from earlier sites is probably due to the small sample size.

Cotton, gourd, squash, peanut, maize, common beans, and pepper form the cultivated plant inventory reconstructed for the Early Chimu (Appendix I, Table 31). Tended fruits include cansaboca, lúcuma, and pacaë.

The emphasis on field crop plants observed for the Early Intermediate Period and Galindo samples is also characteristic of the Early Chimu material. Maize, common beans, gourd, and peanuts are all very high in frequency. In contrast, all fruits are very rare or absent.

Measurements made on Early Chimu plant remains align more closely with Early Intermediate Period Moche data than with the results from Galindo (Appendix I, Tables 56, 57, 59, 60). Both squash and gourd seed measurements resulted in average sizes roughly equal to or slightly larger than Moche averages, but consistently greater than averages for material from Galindo. When cob diameter was compared, taking the burned condition of Galindo material into account, no consistent average size differences could be documented. However, when cob row number was evaluated for the Early Chimu sample, it was found to be highly variable. This contrasts with the more uniform Galindo sample, but conforms closely with the variable Moche sample.

Wild plant remains were abundant in the Early Chimu refuse. Cane and totorá reed, important construction and weaving materials, reflect the proximity of the Moche River. Small amounts of other wild species such as grass, burrs, and algorroba are probably accidental

inclusions. Seaweed specimens reflect efforts to keep shellfish fresh during transport inland.

Early Chimu Occupation Summarized

In many ways, subsistence systems reconstructed for the Early Chimu occupation of the Moche Huacas parallel systems postulated for the other Middle Horizon site, Galindo. However, Early Chimu data also reveal important connections with earlier Early Intermediate Period Moche subsistence patterns. At the same time, significant discontinuities are also evident.

An evaluation of animal protein sources exploited by the Early Chimu people indicates a subsistence pattern with a much greater marine emphasis than was documented for either Moche or Galindo. Certainly, the continued dominance of llama meat in the Early Chimu diet also provides evidence of common ties with earlier inland-oriented systems. It appears that the strongly controlled and highly efficient meat production and distribution system suggested by Moche and Galindo data did not dominate meat procurement by the Early Chimu. As a result, alternative sources, usually tapped on a small scale by individuals, were exploited to a much greater degree.

Field grown cultigens were the most common

agricultural plants in the Early Chimu refuse. All species were present in high frequencies, especially maize, squash, gourd, and common beans. Very few tending fruits were identified, and all remains of these plants were quite rare.

Middle Horizon Subsistence

Data from both the large, complex site of Galindo and the small Early Chimu occupation overlying Early Intermediate Period refuse on Huaca del Sol are essential to an understanding of Middle Horizon subsistence patterns within the Moche Valley. The dominant pattern is typified by systems documented for Galindo, but Early Chimu data indicate that the efficient inland system was not functioning in the entire Moche Valley for the duration of the Middle Horizon. Instead, several procurement and production methods practiced by the Early Chimu were outside the more restricted domain of Moche and Galindo subsistence systems.

Faunal remains from Galindo, and to a lesser extent the Early Chimu occupation, indicate domesticated llamas still supplied the largest portion of animal protein. At Galindo llama use was especially prevalent, and all other animal species were incidental in the

diet. Such a focus on a single meat source closely parallels the Early Intermediate Period Moche situation, and the same type of llama herd control and maintenance can be postulated.

Evidence from the Early Chimu occupation indicates that this system for supplying meat was only partially or unreliably operative in areas outside the main valley center. Therefore, meat derived from domesticated llamas was necessarily supplemented by animal protein from other sources--in this case, the ocean. As a consequence, procurement systems which had been in operation on only an individual, optional level increased in importance. In the case of the Early Chimu material, marine-derived protein figured largely in the diet.

Plant remains from both Galindo and the Early Chimu refuse point to a continued emphasis on field crop cultigens to the extent that tending fruits were relegated to a very minor dietary position. In many ways patterns documented for the Early Intermediate Period can be seen to continue. Data from Galindo indicate that Moche priorities concerned with increased production of storable plant products were essentially maintained. However, unequal cultigen frequencies and

seed size changes observed for Galindo suggest that this agricultural outlook had become more narrow. Consequently, maize and common bean production was emphasized at the expense of other cultigens, especially gourd and squash. Such trends do not necessarily reflect a change from the highly controlled agricultural production system reconstructed using Early Intermediate Period Moche data. Rather, within this system it reflects a change in focus through a concentration on fewer species.

Plant species information for the Early Chimu occupation also suggests a continued emphasis on field grown cultigens and the produce from irrigated fields. However, a close examination of the plant remains reveals more continuities with the earlier Moche plant inventories than with the Middle Horizon Galindo material. First, the narrowed focus on maize and the common bean inferred from Galindo plant frequencies is not evident for the Early Chimu sample. Second, seed size and maize cob quantifications point to a close relationship with the Moche material. Such localized continuities are seen as further evidence of the diminished control exerted over sites outside the valley center during the Middle Horizon.

In summary, evidence from the large Middle

Horizon center of Galindo suggests that most Early Intermediate Period subsistence patterns continued largely unchanged and probably were dominant within the valley. These patterns were characterized by strict controls over both animal and plant food production ultimately aimed at increasing overall yield. Concurrently, independent efforts at plant tending and small animal keeping or shellfish collecting continued and are confirmed by the minor species present.

Early Chimu data from a small site outside Galindo provide information on subsistence systems in operation at sites outside the dominant center within the valley. Central controls were apparently not so strongly asserted over such outlying areas. Consequently, alternative procurement and processing methods were explored, and some subsistence systems evolved independently.

CHAPTER VIII

THE LATE INTERMEDIATE PERIOD

AND LATE HORIZON

On the North Peruvian Coast and especially within the Moche Valley, the Late Intermediate Period was characterized by the development and spread of the Chimu state. During this time Chan Chan, the Chimu capital, was established in the Moche Valley. Many sites within the valley and in other northern and central coast valleys reflect this domination through Chimu ceramics. Subsequent to the Inca defeat of the Chimu state, Inca influence in the Moche Valley was both short-lived and weak, therefore many Chimu political and economic patterns were not greatly changed.

Information concerning subsistence patterns during this time comes from Chan Chan and three satellite communities which performed specialized functions for the Chimu state. Despite their general contemporaneity, the locations of these sites within the valley vary greatly. Two of the satellite communities are situated near resources they were established to exploit while

the third lies near construction projects for which it supplied the labor. Taken together, the network of sites provides substantial data on the functioning of the Chimu economic system both within the capital center and in outlying communities.

Within Chan Chan, most of the population was concentrated in areas of small irregular agglutinated rooms (SIAR) which fringe the central area of compounds and in intermediate architecture which fills the areas between compounds. Excavations designed to recover subsistence data concentrated on the SIAR portion of the site. A single sample was also collected from a possible food preparation area, or kitchen, within one of the walled compounds (Day 1974; Keatinge and Day 1974: 230), but the refuse excavated post-dated the main period of compound use.

The SIAR Artisan Sector of Chan Chan

An earlier intensive excavation program within the SIAR by John Topic (1970) provided excellent contextual data for a subsistence study in the same part of Chan Chan. Topic established that these structures housed artisans who practiced a form of cottage industry in order to supply high-ranking personages with

products such as metal objects and textiles both for their own use and for redistribution. Therefore, this sector of the population of Chan Chan was essentially non-agricultural, and necessarily dependent mainly on food brought into the city. The remains of this food were dumped into alleyways or small rooms in densely settled SIAR areas nearer the core or in heaps on the site periphery, forming middens. Refuse from all three contexts was sampled during this study.

Animals Utilized in the Artisan Sector

Faunal remains analyzed from all four cuts within the Chan Chan SIAR indicate a dependence on land animals for most of the dietary protein. This correlates well with meat procurement patterns documented for the earlier population centers of Moche and Galindo. About 20% of the animal protein consumed in Chan Chan was marine-derived (Appendix I, Table 63).

Domesticated llamas provided most of the meat consumed in the Chan Chan SIAR (Appendix I, Tables 32, 34, 36, 38). Their dietary contribution consistently comprised between 55% and about 80% of the total protein. Such an emphasis on a single species is reflected in the large sample of bone collected during SIAR excavations. In addition to the bone sample recovered during my

excavations to recover subsistence data, llama bone from the earlier excavations by John Topic in the same units was also available for inclusion in this study. Both my excavations and those of Topic discovered substantial quantities of llama dung in stratified deposits as well as within SIAR structures. Like the samples from Moche and Galindo, llama bone from Chan Chan was often adequate for a more detailed analysis aimed at reconstructing meat processing and procurement systems and animal husbandry practices. This was accomplished through an evaluation of animal age, butchering marks, burned bone frequency, and bone type frequencies in light of available contextual data.

The relative age of animals killed for meat was evaluated by quantifying amounts of fused and unfused bone by type within the SIAR sample. This data was arranged according to the age stages defined by Wing (1972: 330) and graphed (Appendix II, Figure 18) in an effort to partially reconstruct the age structure of the herd which supplied meat. The resulting age structure for the Chan Chan sample correlates closely with results from Galindo and differs somewhat from the Moche results. Again at Chan Chan, about half the animals killed for meat were fully adult instead of at

the optimum young adult age. This would suggest that at Chan Chan, llamas were also important for wool production and labor. At the same time, many animals were killed for meat at the optimum age, reaffirming the third important function of the llama, which was to supply meat.

When cut marks on bones were evaluated, the frequency and pattern of distribution did not differ significantly from data from earlier sites where llama was the main meat source (Appendix II, Table 66). The single possible exception is discussed as part of the detailed reconstruction of skinning and processing described in Appendix II.

At Chan Chan, contextual information is less precise than the data available for Galindo, but the distribution of different bone types can be evaluated spatially with respect to general SIAR areas (Appendix II, Table 67). When the sample from the first unit is examined, elements of the forward body portion predominate, with hind limb elements secondary. Skull and vertebral sections are well represented as are forelimb segments. An examination of the second Chan Chan SIAR unit tested reveals a generally uniform access to all body parts, but a slightly greater representation of

limb bone portions. The consistencies in meat used at Chan Chan are less marked than was the case for Galindo, yet patterns can be detected which suggest systematic distribution.

When the frequency of meatless foot and lower leg bones is considered, third phalanges are absent, indicating they were lost during skinning (Appendix II, Table 68). First and second phalanges are well-represented as are metapodials. Metapodials were probably collected for use in tool manufacture, and the high frequency of first and second phalanges may be a by-product of this metapodial collection.

The burned bone frequencies established for Chan Chan SIAR material provide the best evidence of cooking practices (Appendix II, Table 65). The Chan Chan llama sample shows a very low incidence of charred meat-bearing bones. This suggests that most cooking was done in containers. The practice of cooking in containers correlates well with both frequent finds of fire-blackened vessels and the nature of the local hearths--deep oval pits containing only vegetable fuel residues.

In addition to llama bone, dog bones in all four SIAR cuts and guinea pig bones in three cuts

indicate that these domesticated animals may have been kept locally (Appendix I, Tables 32, 34, 36, 38).

Relative to the llama, neither was an important protein source, but meat from both could have served to supplement or break the monotony of llama meat. A single dog cervical vertebra showed evidence of butchering marks. The only other land mammals identified were mice and especially rats which were common in the SIAR refuse.

A small amount of sea lion bone was recovered from both cuts in the first unit, and the meat represented comprises about 10% of the total meat for each cut. Apparently these marine animals were still occasionally available along the coast.

Bird bone was present in only two of the four excavations, while fish, especially one croaker species (Paralichthys peruanus) were more substantially represented. The proportion of fish protein documented for each cut varied from just over 3% to over 5% (Appendix I, Table 62). This suggests that fish comprised one of the more important groups of minor dietary items. The prevalence of a single fish species indicates that either specialized methods for capture were employed or this species was supplied in considerable quantity

to SIAR workers from fishing communities--or perhaps both. The virtual absence of any shallow-water species of sharks and rays indicates that reed boats were probably used to reach the areas off shore where bony fishes were more common.

The total contribution of marine shellfish to the SIAR diet varied widely--from over 30% documented for one cut to less than 5% for another (Appendix I, Table 62). Data from all excavations reveal that the tiny tide zone clam was the main molluscan staple. A variety of other species were collected, but none approached Donax in frequency. The few examples of large clam species such as S. corrugata and P. thaca in the Chan Chan SIAR refuse suggest that the shellfish were being collected north of the river mouth toward Huanchaco Bay. Cut shell fragments of a number of exotic species such as the pearl oyster (Pinctada mazatlanica) were identified. They were by-products of cottage industry rather than food animals.

Plants Utilized in the Artisan Sector

An analysis of plant material from the SIAR excavations revealed many coincidences in plant frequencies for the four cuts. Compared to earlier samples, the proportions of some species had changed markedly.

Perhaps more significant, a new species had been added to the inventory and had become very important.

All of the plant cultigens identified for earlier periods were still part of the total inventory during Chimu times. These include maize, common beans, squash, gourd, cotton, peanuts, and pepper. Tended fruits include cansaboca, lúcuma, avocado, and pacaé identified for earlier periods plus a new species, guanábana (Annona muricata). When species frequencies are considered, several features are evident which make the Chimu sample different from the earlier data from Galindo and Moche (Appendix I, Tables 33, 35, 37, 39). First, the field crop cultigens which dominated earlier inventories are less frequent. Only maize is present in even moderate amounts. Second, tree fruits, which were consistently underrepresented in earlier inventories, are extremely abundant in the Chan Chan SIAR sample. Lúcuma leads all species in abundance except the new plant, guanabana. The condiment, pepper is also unusually frequent in two of the cuts.

Measurements were made on SIAR plant materials (Appendix I, Tables 56 through 61). Very few squash seeds were found, therefore the measured samples are quite small. However, it appears that the Chan Chan

Chimu specimens are slightly smaller than averages determined for the Moche and Early Chimu material yet larger than the Galindo averages. An examination of average measurements for the common bean revealed no significant difference from comparable averages for Galindo. A comparison of maize cob size, both whole cob size and average diameter, also indicated that the Chan Chan material was slightly smaller than Early Chimu and Moche specimens. Finally, a consideration of cob row numbers for the Chan Chan maize revealed close correlations with Galindo frequencies. Over 90% of the cobs were either 8 or 10 row, with 8 row being slightly more frequent.

Wild plant remains were common in the Chimu refuse (Appendix I, Tables 33, 35, 37, 39). Important species include cane, which was used in construction and Tillandsia, a major source of fuel. Algorroba seeds and local grass and burrs may have been accidentally brought into the site. The small amount of seaweed probably accompanied fresh live mollusks. Several examples of an exotic wild species, commonly called mishpingo (Nectandra sp.), were also collected at Chan Chan. These single cotyledons had been perforated for stringing, a procedure which served to hold large

quantities together. Schaedel (1966: 441-442) reports seeds strung to form necklaces which accompanied burials at Huaca el Dragón. According to Herrera (1935: 89), Nectandra plants grow only in tropical areas of Peru. Dried seeds are reputedly valuable for curing dysentery and nervous disorders.

Artisan Sector Occupation Summarized

Many characteristics of the subsistence patterns observed for the Chan Chan SIAR closely parallel earlier developments observed at the centers of Moche and Galindo. This is especially true of systems which supply animal protein. However, plant frequencies calculated for the Chan Chan material reveal marked differences in the amounts of many plant species consumed in the SIAR compared to earlier centers. Many of the special features noted for Chan Chan data may be correlated with the essentially non-agricultural nature of the SIAR artisan community. As full-time craftsmen, SIAR personnel would have been supported by the Chimú state, presumably with products brought into the capital from outlying specialized communities.

Parallels between the emphasis on llama documented for the SIAR and a similar focus for the sites of Moche and Galindo are evident. This indicates that

suppliers of meat for the Chan Chan SIAR appreciated the stability and high animal protein yield that llamas represented. Substantial percentages of fish and shellfish plus the predominance of a single species of each class (Paralonchurus peruanus and Donax peruvianus) suggests that these products were also being collected systematically and supplied to the city. Rare species may have resulted from local individual collecting efforts.

The unusually large amount of fruits consumed at Chan Chan relative to crop plants is the feature which most sets the SIAR apart from Galindo and Moche. The high proportion of field crops documented for earlier centers probably reflects the proximity and general importance of irrigated fields. At such centers as Moche and Galindo, the local plant inventory and frequency directly reflected what was grown by a sector of the sites' inhabitants who were largely agriculturalists. However, in the case of Chan Chan, agricultural products were brought to the center from satellite communities with a specialized agricultural function. The increased frequency of fruits, plus the immediate popularity of the new species, suggests that either local lands had been converted into orchards, or, more prob-

ably, new areas where fruits were produced in quantity had become accessible through the expansion of the Chimú state.

Reoccupation of Compound Rivero

After the walled compound of Rivero was no longer in active use as a redistribution center, small numbers of Chimú people reoccupied portions of the front sector (Figure 9). This reoccupation probably occurred soon after the Inca conquest of the Chimú state. A portion of the compound was designated as a possible kitchen area on the basis of excavations which encountered primary refuse (Day 1974; Keatinge and Day 1974: 230). However, the refuse tested during my excavations was clearly not associated with original compound use because the hearths were very small and had been cut into portions of plastered floors and benches. There is no indication that the reoccupation post-dates primary compound use by a great length of time. Ceramics and subsistence remains are consistent with data from much of the Chan Chan SIAR.

Animals Utilized During the Rivero Reoccupation

The general frequencies of animal species

consumed by the Rivero squatters point to similarities with the Chan Chan SIAR as well as Galindo and Moche. Again, most meat was supplied by land mammals while marine resources were much less significant.

Also in keeping with earlier data from large centers and the SIAR information, domesticated llamas were the main protein source during the compound Rivero reoccupation (Appendix I, Table 40). The total bone sample was inadequate for detailed analysis, but scattered evidence, such as cut marks on two vertebrae and one rib, suggest continuities with practices observed for other centers where llamas were especially important. Guinea pig and dog bones were also identified in the refuse, but their dietary contribution was minor. Remains of a very young dog were found wrapped in a textile and buried within the refuse. Bones of one rat and one mouse complete the mammal bone inventory.

No bird bone was recovered, but the same fish species which dominated the SIAR fish inventory also supplied most of the fish protein during the Rivero reoccupation. However, the total contribution was minimal (Appendix I, Table 40).

A number of shellfish species were identified in the Rivero squatter inventory (Appendix I, Table 40).

The species which contributed the most meat is a large clam S. corrugata, but the number of animals actually taken was quite small. In fact, the total amount of meat furnished by shellfish was insignificant. The presence of two large clam species (S. corrugata and P. thaca) in the refuse reflects access to the beach north of the river near Huanchaco Bay, yet the number of small striated mussels (B. purpuratus) may also indicate that portions of the sample were derived from beaches further south toward Salaverry Point.

Plants Utilized During the Rivero Reoccupation

The frequencies and types of plants present in the squatter refuse link this occupation most closely with the Chan Chan SIAR sector. Including the continued use of the new fruit, guanábana, the basic plant inventory was essentially unchanged.

An examination of plant frequencies and estimated food yield revealed that, with the exception of maize, field crop cultigens were underrepresented while tended fruits occurred consistently in significantly greater amounts (Appendix I, Table 41). Lúcuma and the new fruit, guanábana, were especially substantial contributors to the total plant food diet.

Very few plant parts were present in quantities

which allowed for measurement comparisons with other available data (Appendix I, Tables 58 through 61). A small sample of common bean seeds measured indicates an average slightly smaller than comparable averages for Chan Chan SIAR and Galindo material. Measurements of unburned maize cob diameters yielded an average size which may be slightly smaller than earlier cob sizes. However, comparable data on burned cobs places River squatter material nearly equal to Moche and Galindo cobs in size and very slightly larger than Chan Chan SIAR specimens. When cob row number frequencies were tabulated, Rivero data indicated a very high percentage of 8 and 10 row cobs, with 10 row types occurring slightly more often. Such a distribution is generally consistent with Galindo and SIAR cob frequencies.

Wild plant remains present in the Rivero squatter material include small amounts of algorroba, grass, and seaweed. Cane, an important construction material, and possibly Tillandsia, were the only plants regularly brought into the compound. A single seed of the exotic plant maichil (Thevetia peruviana) was found near the dog burial.

Compound Rivero Reoccupation Summarized

General consistencies with SIAR data from Chan Chan characterize the subsistence systems documented for the reoccupation of compound Rivero. The amount of llama meat consumed by the squatters was quite large, and over 90% of the total animal protein was derived from inland systems. Conversely, the amount of marine resources consumed within the compound was very small--much smaller than most comparable amounts for the SIAR. The vegetal diet reconstructed for the squatter settlement fits in well with trends observed in SIAR data. Important features, such as the high frequency of certain fruits, which distinguish Chan Chan data from earlier samples, are common to both squatter and SIAR collections. These internal correspondences recorded for Chan Chan refuse samples indicate that similar subsistence systems were ultimately supporting the inhabitants of both sites.

Caracoles

A second Late Intermediate Period and Late Horizon settlement composed largely of non-agriculturalists is the site of Caracoles located along the non-arable northern margin of the Moche Valley (Figure 1).

The site's inhabitants may have been relocated for the purpose of constructing nearby roadside structures as well as a local walled cemetery. Late Horizon elements in the site's ceramic assemblage place it late in the time span under consideration here. No architecture was present, therefore excavations within the site focused on areas of concentrated midden. Four such site areas were carefully sampled to provide data used in this study (Figure 10).

Animals Utilized at Caracoles

Virtually every aspect of the faunal inventory defined for Caracoles contrasts with the prevailing systems for procuring and processing animal protein reconstructed for the centers of Moche, Galindo, and Chan Chan. Two major differences are especially important. First, reconstructed total quantities of animal products consumed fall far below the proportion of food supplied by plants (Appendix I, Table 64). Second, in contrast to the essentially inland focus of the major centers, virtually all animal protein consumed at Caracoles was marine in origin (Appendix I, Table 63).

The domesticated llama was of minor importance at Caracoles. Remains were encountered in three of the four cuts, but only one cut yielded an appreciable

amount (Appendix I, Tables 42, 44, 46, 48). A small amount of dog bone was identified in two of the four cuts, but this mammal was also unimportant as a food source. Even rodents were absent from the Caracoles midden. The only other mammal bone present was sea lion, and the small sample was restricted to a single cut.

Shore birds, specifically pelican and gull-sized species, consistently accounted for between about 5% and almost 10% of the total animal protein (Appendix I, Tables 42, 44, 46, 48). Even this relatively small quantity represents a substantial increase relative to bird protein consumed at other post Early Intermediate Period sites.

Fish were the main animal protein source (Appendix I, Table 62). Data from the four cuts indicate that the percentage of meat supplied by fish ranged from just over 70% to just under 45%. Numerous species were identified, but three members of the croaker family (Paralichthys peruanus, Sciaena gilberti, and Sciaena deliciosa) were especially well represented. The low frequencies for non-bony fishes suggests that reed boats were being used to reach the slightly deeper neritic zones frequented mainly by these fishes.

The molluscan inventory for Caracoles provides clear evidence of a singularly unproductive subsistence system. The site surface is crowded with thousands of gastropod shells--hence the name Caracoles. Every test excavation and major cut hit thick bands in which these mollusks were concentrated. However, a close examination revealed that a large proportion still contained the bodies of hermit crabs which had reoccupied empty shells. Hermit crabs are not considered edible, and the quantities of shells at Caracoles with intact crabs indicate they were not used for food there, either. Apparently the people of Caracoles had hauled immense quantities of these crab-infested shells up to the site without realizing they were worthless as food! The frequencies of these species are tabulated as part of the total faunal inventory (Appendix I, Tables 42, 44, 46, 48), but they are not considered in the reconstruction of the total animal protein consumed.

Richard Schaedel (Personal communication) has suggested that such a concentration of uneaten shellfish may reflect efforts to extract lime by burning sea shells. However, the unburned condition of virtually all the shells at Caracoles suggests that such a process was not carried out locally.

Without the gastropod species, the total shellfish inventory is greatly reduced. However, marine mollusks and occasional crustaceans still account for between 16% and about 30% of the total protein consumed. The small tide zone clam (D. peruvianus) and the small thin-shelled mussel (S. alcosus) far surpassed other species in total meat yield.

Plants Utilized at Caracoles

In contrast to the disparity between reconstructed animal procurement systems for Caracoles compared to Chan Chan, the types and frequencies of plant species at the two sites are very similar. Despite the fact that plant remains are often under-represented and hard to quantify, data from Caracoles indicate that the site inhabitants relied so much more on plants than animals for food that it was detectable in the reconstructed ratios (Appendix I, Table 64).

The cultivated plant inventory is essentially consistent with data from both earlier sites and other Late Intermediate Period sites (Appendix I, Tables 43, 45, 47, 49). Cultigens include squash, gourd, cotton, peanut, maize, common beans, lima beans, and pepper. A single seed of a new cultigen, caigua (Cyclanthera pedata), was also identified in the Caracoles plant

material.¹ Cansaboca, lúcuma, guanábana, avocado, pacaes, and guayaba compose the inventory of tended fruits consumed at the site. Compared with data from Chan Chan, several field crop cultigens occurred more frequently at Caracoles. Squash was noticeably more abundant as were gourd and cotton, and all were present in amounts comparable to maize. One fruit species, lúcuma, consistently dominated the inventory in frequencies ranging from 45% to over 80% of the reconstructed plant food quantities. Guanábana continued as an important food plant, but the reconstructed frequencies are highly variable. Lower overall percentages suggest it was less significant in the Caracoles diet than in the Chan Chan diet.

When measurements of plant parts collected at Caracoles were compared with similar information from other Late Intermediate Period and Late Horizon or earlier sites, a few substantial size differences could be detected (Appendix I, Tables 56 through 61). Squash seeds from the large Caracoles sample had average

¹Larco Hoyle (1941: 145-146) tentatively identified a group of fruits on a single Cupisnique ceramic vessel as caigua or aji (pepper). On the basis of this, Early Horizon people were credited with the use of caigua in later publications (See Larco Hoyle 1946: 150; Towle 1961: 92). An examination of the vessel cited by Larco Hoyle (1941: 146, Figure 205) revealed that it is clearly not the caigua species common on the North Coast.

dimensions very close to average dimensions for the largest sample from Chan Chan. When gourd seed average measurements were compared with Moche and Early Chimu averages, very little size difference was evident. Data on the common bean suggests a slightly reduced size for the Caracoles material. Yet measurements on whole and fragmentary maize cobs indicate a slight increase when compared to Chan Chan Chimu material. Finally, when cob row numbers for Caracoles specimens were evaluated, over 95% of the cobs were determined to be either 8 or 10 row, with slightly more having 10 rows. This parallels very closely the Chan Chan material, especially the collection from the Rivero reoccupation.

Wild plant species identified in the Caracoles material were both abundant and varied. Among the more useful species, cane and tотора reed were probably brought from low coastal areas or near the river for use in construction, while algorroba and espino plants were probably available locally. Grass plant parts and burrs were certainly accidentally brought in as was the seaweed which probably accompanied live mollusks. Important rare species include wild tomato (Solanum peruvianum), which may have been collected

for food, and the imported medicinal seeds of maichil and mishpingo.

Caracoles Summarized

When subsistence patterns reconstructed for Caracoles are compared with functionally equivalent systems for Chan Chan, consistencies and inconsistencies are evident. Similarities are to be expected between the subsistence systems and inventories defined for two essentially non-agricultural populations serving the Chimu state and in return, presumably supported largely by the state. At the same time, differences between the subsistence inventories and systems documented for the two sites serve to point out other important features of Chimu economic organization.

Since the plant species inventory of Caracoles has much more in common with Chan Chan material than the animal species inventory, it is considered first. Most significant are coincidences in the high frequency of lúcuma, and to some extent, guanábana, in contrast to the much lower maize frequency at both sites. Such consistencies observed for non-agricultural sites suggest that a state-controlled redistribution system was in operation to supply plant foods necessary to support these communities.

Certainly the most significant single aspect of the Caracoles subsistence data is the virtually complete reliance of the site population on marine animals for protein. This is true for two reasons. First, the sudden appearance of even a temporary site with such an overwhelmingly complete marine focus that essentially no land animals are consumed, runs contrary to trends observed in subsistence patterns as early as the Initial Period and Early Horizon. There is no Moche Valley precedent for this kind of behavior once llamas emerged as the major meat source. Second, the population appeared to be unaccustomed to exploiting a marine environment. No experienced marine fisherman or shellfish collector would harvest such a vast quantity of hermit crabs before realizing they were worthless as food--much less drag them a kilometer back to the site.

These two important characteristics of Caracoles animal protein procurement systems reveal that the local population was generally ill-equipped to exploit the marine littoral, but was apparently forced to do so simply because very little other animal protein was available. This would indicate that the Chimú state elected to provide no animal food for the

site. This contrasts markedly with Chan Chan where llama meat was apparently readily available.

Data from Caracoles provide major insights into the operation and domain of Chimú systems for food resource redistribution. Failure by the Chimú state to provide animal protein to Caracoles looks, at first glance, like neglect, but may in fact represent the more sensible choice between two options. In the eyes of the Chimú state, the concept of a reliable protein source had become virtually synonymous with domesticated llama. Since the Caracoles area was too dry and barren to support even a few llamas temporarily, the traditional Chimú method of guaranteeing meat could not be implemented. Their allowance of plants was apparently increased to compensate. This is reflected in a comparison of the total animal and total plant food quantities consumed at Caracoles. Consistently, an average of almost 80% of the diet was vegetal in origin.

Cerro la Virgen

The Cerro la Virgen village lies about five kilometers northwest of Chan Chan near Huanchaco Bay (Figure 1). The settlement was apparently established by the Chimú state to maintain and farm the extensive

areas of regularly laid out irrigated fields in the vicinity of the site (See Johnson 1930: 44). Major components of Cerro la Virgen include agglutinated rooms with storage facilities, alleys, midden accumulations, and a road through the site connecting it with Chan Chan.

Cerro la Virgen middens were sampled in 1970 to provide subsistence data complementary to information resulting from major excavations by Richard Keatinge within the architecture. More specific aspects of both the site and subsistence data have been described elsewhere (Griffis 1971; Keatinge 1973; 1974; 1975). However, as part of this study, Cerro la Virgen is evaluated in terms of its place in the Chimú economic system.

Animals Utilized at Cerro la Virgen

The faunal inventory of Cerro la Virgen generally reflects the proximity of the site to the coast. Much of the animal protein consumed was marine in origin. However, more traditional inland systems were also in operation to supply a substantial portion of the meat consumed.

The domesticated llama was the greatest single meat source for Cerro la Virgen, but the animal protein supplied by this species constituted only about 35% of the total meat consumed (Appendix I, Table 50). A

small sample of guinea pig bone recovered indicates that this domesticated species was also present in small amounts. Occasional rat bones were the only other mammal remains identified within the midden.

Cerro la Virgen refuse contained very few bird bones, and most of these were from gull-sized coastal species.

Fish contributed nearly one third of the total meat protein consumed at Cerro la Virgen (Appendix I, Tables 50, 62). The dominance of members of the croaker family parallels the situation at Chan Chan and especially Caracoles. However, several other species were also identified from the refuse. The virtual absence of shark and other cartilaginous fishes from the Cerro la Virgen species inventory is noteworthy because these shallow water fishes dominated species inventories of early sites in the vicinity of Huanchaco Bay. This change reflects the use of reed boats by the later people to reach deeper portions of the neritic zones off shore.

Artifacts recovered at Cerro la Virgen also reflect the importance of fishing (Keatinge 1975: 223; Griffis 1971: 71-73). Small-mesh (8 to 11 mm.) cotton net and stone net weights, which were often unshaped

rocks tied with string, document the continued use of haul seines along the nearby sand beach. Net fragments of very large mesh (85 to 115 mm.) indicate that gill nets were also used. Finally, several copper fishhooks provide evidence of a fishing technique not documented for other sites.

Shellfish, especially marine mollusks, also provided about one third of the total animal protein consumed at Cerro la Virgen. Most of this was supplied by the tiny tide zone clam which was brought to the site in immense quantities (Appendix I, Table 50). Considerable amounts of meat were also furnished by two mussel species (C. chorus and S. algosus), a large clam species (S. corrugata), and the purple crab (Platyanthus orbignii), but none approached Donax in total yield. Many of the large bivalve shells and a number of gastropod shells exhibited regular breakage patterns resulting from systematic meat extraction procedures. The presence of large clams (S. corrugata and P. thaca) among the Cerro la Virgen species correlates well with the site's proximity to Huanchaco Bay where most fishing and shellfish collecting was probably done.

Plants Utilized at Cerro la Virgen

Two aspects of the Cerro la Virgen plant

inventory and species frequencies are especially significant. First, the consistent abundance and generally high frequency of several field crop cultigens correlates well with the generally agricultural function of the site. Second, the plant species assemblage for Cerro la Virgen also shares several important features with inventories for the non-agricultural communities of Chan Chan and Caracoles, and therefore also reflects the site's participation in the Chimu plant redistribution system.

Field crop plants identified at Cerro la Virgen include squash, gourd, cotton, pepper, maize, common beans, and lima beans. A single shriveled tuber was tentatively identified as sweet potato (Ipomoea batatas). The range of tended tree fruits present includes cansaboca, lúcuma, avocado, guanábana, and the tree-legume, pacaé. Several field crop species were especially abundant at Cerro la Virgen while other species were underrepresented (Appendix I, Table 51). Remains of cotton in all forms (seeds, bolls, and fiber) were extremely abundant. Both bean species are difficult to quantify, but their consistent frequent occurrence in the Cerro la Virgen midden argues for relative frequencies much higher than those documented for Chan

Chan or Caracoles. Pepper also occurred in an unusual amount. Maize is consistently present, but does not account for much of the total diet, and squash and gourd occur in greatly reduced amounts. The high frequency of lúcuma and guanábana in the Cerro la Virgen inventory correlates well with data from Chan Chan and Caracoles. Cansaboca is also consistently present, but the overall yield was quite low.

Cane and totorá reeds were the most widely used wild plants at Cerro la Virgen (Appendix I, Table 51). Both are important construction materials. Other useful species include Tillandsia, an important fuel, and algorroba, valued for its wood. Both were probably available near the site. Seaweed certainly came in with other marine products, and small amounts of local grass are also accidental inclusions.

Cerro la Virgen Summarized

The establishment of the Cerro la Virgen community was certainly correlated with the opening of new areas of farm land in the region by the Chimu state. A portion of the site's plant inventory reflects this agricultural focus. However, Cerro la Virgen was above all a satellite community of Chan Chan and therefore part of the Chimu economic system. Several aspects of

both the floral and faunal inventories of the site reflect the position of Cerro la Virgen in this economic system.

The total faunal component of the diet at Cerro la Virgen consisted of approximately equal proportions of fish, shellfish, and llama meat. Such a high proportion of marine products in the faunal inventory suggests that the exact location of Cerro la Virgen near areas of irrigated fields, but off useful land, may also have been predicated to some extent on the availability of fish and shellfish at Huanchaco Bay. While a large portion of the animal protein was provided by llamas, presumably furnished by the Chimu state, much more of the meat consumed was obtained locally through specialized procurement activities of the Cerro la Virgen population. Material remains of the fishing technology provide the best evidence of such specialized procurement systems in operation. At the same time they also furnish further proof that the systematic exploitation of marine resources was an important and state-sanctioned facet of the local economy. Since the dominant fish and shellfish species documented for Chan Chan are the same as species most frequently taken near Cerro la Virgen, it is possible that the small amount

of marine products consumed at Chan Chan was supplied by the people of Cerro la Virgen.

Despite the efficient marine exploitation systems reconstructed for Cerro la Virgen, the site was still essentially agricultural in orientation. Because of this, plant species frequencies are more indicative of how Cerro la Virgen functioned within the Chimu economic system. Of the field crop cultigens documented for the site, cotton was the most abundant. This suggests that much of the state land near Cerro la Virgen was devoted to cotton production. Both bean species were also especially abundant at Cerro la Virgen relative to non-agricultural Late Intermediate Period and Late Horizon sites and therefore were possibly grown there as well. Maize, as well as other less abundant species such as squash and gourd, may have been grown nearby in small amounts adequate for only the site, but these plants were not grown in quantity on the state fields. Since the frequency of squash and gourd in particular are below frequencies observed for non-agricultural communities, it is probable that the less abundant species were brought into the site rather than produced locally. Coincidences in the high

frequency of lúcuma and guanábana consumed at both agricultural and non-agricultural sites provide more substantial evidence of a state-controlled redistribution system in operation to supply necessary items not produced at Cerro la Virgen.

In summary, Cerro la Virgen is best characterized as a state-controlled agricultural community responsible for maintaining nearby expanses of state fields which were devoted to cotton production. While other agricultural food plants may have been grown near the site, there is no indication that local tracts of state land produced significant amounts of food crops. Instead, many food plants, especially fruits, were probably supplied by the Chimu state through the complex redistribution system. Also through this system, some llama meat was furnished. However, through efficient marine resource exploitation, two thirds of Cerro la Virgen's meat was locally supplied, and some of these coastal products may ultimately have reached Chan Chan.

Choroval

The site of Choroval lies in a low coastal area between Las Delicias and Salaverry, south of the Moche River (Figure 1). It forms part of a series of

small sites established to maintain and farm large-scale sunken garden constructions in low areas of the valley mouth. Sunken gardens supplemented canal irrigation by bringing slightly more land area under cultivation. Sites such as Choroval sit atop ridges formed by earth piled up during excavation of the garden areas to a depth where moisture was supplied by ground water seepage. None of the sites had a significant architectural component, therefore testing and ultimate controlled excavations focused on areas of dense refuse. Within a single elongated site, two such areas were sampled to obtain data on local subsistence (Figure 11).

Animals Utilized at Choroval

Over two thirds of the animal protein consumed by the people of Choroval came from the ocean, a fact easily explained by the site's coastal location. The remainder, a substantial portion, was furnished by land mammals, the meat source characteristic of inland systems. However, no single species dominated the inventory. These data parallel closely the proportions reconstructed for Cerro la Virgen.

The amount of meat supplied by domesticated llamas represents a substantial contribution for a single species, but many marine products approach it

in meat-yield frequency (Appendix I, Tables 52, 54). Cut marks on a llama ilium and cervical vertebra from one cut were the only evidence of butchering procedures. Cuts in these locations are frequent in the larger bone samples, therefore the small Choroval sample is consistent with this data. Cooking practices may be reflected in the burned condition of all but two bone fragments. The condition of bone from the second cut is probably due to its confinement to hearth ash, but bone from the first cut lacked this association and was also burned. Therefore, this sample may show the effects of cooking by roasting rather than boiling in containers.

No other domesticated animals were documented from Choroval. Even rodents were so rare that only a single rat bone was collected. The only other mammal identified at the site was the sea lion, and bones from this animal were present in both cuts (Appendix I, Tables 52, 54). Such evidence indicates that these animals were still taken along the coast near Salaverry Point.

Shore birds, including pelican, were consumed in small amounts. Scattered fragments of a small lizard were the only other land vertebrate remains.

Fish supplied a substantial amount of animal

protein for the site (Appendix I, Tables 52, 54, 62). Three members of the croaker family were again the dominant species. These bony fishes may have been taken using reed boats or with gill nets staked away from the shore. However, the presence of mullet, a vegetarian, as well as the three cartilagenous inshore species also documents the use of haul seines. Archaeological remnants of the local fishing technology include a copper fishhook and small-mesh (8 mm.) cotton net.

Shellfish, especially mollusks, contributed a portion of the dietary protein equal to that of fish. Most by far came from the tide zone clam which was especially abundantly represented in the vicinity of the second cut (Appendix I, Tables 52, 54). However, limpets and crab were present in small, but significant amounts in the collections from both cuts while the thin-shelled mussel and the striated mussel were substantially represented only in the first and second cuts respectively. Variations in the frequencies of these minor species may reflect fortuitous concentrations resulting from a single collecting foray or even a single meal. The general species inventory, especially the inclusion of C. concholepas, the striated mussel,

and limpets, reflects exploitation of the adjacent southern portion of coast by the site's inhabitants.

The only other invertebrate material identified was part of a starfish which was probably accidentally brought into the site.

Plants Utilized at Choroval

Data from Choroval indicate that the frequency of several species differs from amounts observed for other Late Intermediate Period and Late Horizon sites. However, this deviation is still consistent with the predominantly agricultural function of the site. In general, field crop species were very well represented and probably reflect the manner in which the local sunken gardens were used.

Cultigens identified at Choroval are generally consistent with the species present at other contemporary sites. Squash, cotton, gourd, maize, common beans, lima beans, pepper, and caiqua are these cultigens. Other tended plants include the fruits lúcuma, quanábana, avocado, and the tree-legume, pacaé. Within the Choroval sample, squash and especially maize are consistently abundant (Appendix I, Tables 53, 55). The industrial plants, cotton and gourd, as well as two food plants, peanut and pepper, also occur in unusually

large amounts, though not in quantities approaching maize or squash. Relative to the increased crop plant frequencies, fruits appear less significant in the diet. However, lúcuma and guanábana are still the dominant fruit species and occur in frequencies comparable to those of most crop plants.

When plant part measurements on Choroval material were compared with data from contemporary sites, the results were varied (Appendix I, Tables 56 through 61). Specimens of squash seeds have a slightly smaller average size than was documented for other Late Intermediate Period and Late Horizon samples. Measurements of common bean cotyledons indicate a general consistency with data from Chan Chan, Galindo, and to a lesser extent, Caracoles. When gourd seed sizes were compared, the average size of Choroval specimens was slightly larger than specimens from other Late Intermediate Period and Late Horizon sites or earlier sites. Both whole and fragmentary maize cobs from Choroval are also larger in average size than examples from any of the other sites. Row number frequencies correlate fairly well with contemporary sites. Over 90% of the Choroval sample has 8 or 10 rows, and 10 row cobs are the more abundant type.

Among the wild plants identified, seeds of algorroba were the most consistently abundant. These trees may have grown naturally in the vicinity. Cane was also very common and may have been used to construct small dwellings at the site. The small amount of tatora reed may have been similarly used. Additional high frequencies of grass and burrs and the presence of a wild flower, all of which still grow on the nearby ridges, certainly reflect their proximity in prehistoric times as well. Wild tomatoes may also have been available locally. People of Choroval also brought in considerable seaweed with their shellfish. The only other wild species identified was a single soap berry seed.

Choroval Summarized

Choroval shares many features with the other agricultural settlement of Cerro la Virgen. Choroval and similar sites within the community were established as part of the Chimu state effort to open new areas to agriculture by constructing sunken gardens. As part of the system, both Choroval and Cerro la Virgen received supplementary portions of plant and animal food that was not generally available locally. Differences between the two sites reflect the nature of local crops as well as agricultural methods employed. Unlike the

Cerro la Virgen fields where production focused on a single industrial plant, cotton, the sunken gardens near Choroval were largely devoted to food crops, and industrial plants were less important.

The relatively small, but significant, amount of llama meat consumed at Choroval was probably furnished by a few state-supplied llamas. Much more animal protein is accounted for by local marine resources. The quantities of some shellfish species probably are an indication of systematic collecting. The importance of fish in the diet together with archeological evidence of the local fishing technology also document specialized procurement activities at the site.

An examination of the food plant frequencies for Choroval reveal that squash, and especially maize, dominate the inventory and occur in relative quantities not documented for any other contemporary site. In fact, these high maize and squash frequencies are reminiscent of plant proportions for the centers of Galindo and Moche with their large agricultural populations. Other crop cultigens, namely cotton, gourds, pepper, and especially peanut also occur in generally large amounts and may have been grown locally as well. Slightly increased sizes documented for seeds and parts of a few plant species suggest possible local efforts at

selection to improve production.

Other food plants, especially fruits and common beans, were less frequent or rare at Choroval compared to other sites. The relative frequency of tended tree products varied between the two cuts, but lúcuma and guanábana still dominate this portion of the food plant inventory. It is unlikely that any of these species were produced locally. Instead, they probably represent products brought to the site in accord with the Chimu system of redistribution.

When the subsistence patterns documented for Choroval are evaluated in terms of the site as a whole, it seems to benefit less from the Chimu economic system than any other Late Intermediate Period and Late Horizon site considered. However, at the same time, the procurement and production systems reconstructed for the site indicate that Choroval was potentially the most self-sufficient of the Chimu satellite communities examined. The tendency of the Chimu state to adapt their redistributive operation to such situations was demonstrated in the case of Cerro la Virgen where the inland-derived meat supply was a reduced amount perhaps because of the supplemental marine protein available. Similar allowances were made at Choroval for both the

marine resources and plant foods already available. As a result, both the llama meat and fruits so dominant in the Chan Chan inventories were supplied to Choroval only in greatly reduced quantities.

Late Intermediate Period and

Late Horizon Subsistence

Evidence from the Chimú capital of Chan Chan and three dependent, or satellite, communities was used to reconstruct subsistence patterns characteristic of the Late Intermediate Period and Late Horizon within the Moche Valley. Though this sample was incomplete, the data available reveal both general and specific features of the economic organization of the Chimú state which dominated the valley during this time. This is true on two levels. On a specific level, differences observed in local subsistence data from site to site reflect facets of the internal economic functioning of the Chimú state. On a general level, subsistence systems common to a majority of sites studied probably represent patterns characteristic of the Late Intermediate Period and Late Horizon as a whole.

Many features of the Chimú state provide evi-

dence of an internal economic organization which was largely dependent on efficient systems of redistribution. For example, the architectural plan of the Chan Chan compound reflects the need for generous storage facilities to which access could be easily controlled. On another level, the existence of highly specialized satellite settlements, both agricultural and non-agricultural, argues conclusively for such a redistribution system because no such community could benefit the state and some could not even exist if goods and services did not move within the state.

In an attempt to partially reconstruct the redistribution system central to Chimú economy, the capital city of Chan Chan and the three satellite communities were evaluated in terms of their component subsistence activities. Working under the assumption that animal and plant remains from sites with a non-subsistence focus were products of the Chimú redistribution system the Chan Chan SIAR and Caracoles were examined first in order to assess the composition of a diet provided largely by the state. Second, sites specializing in goods (agricultural products) rather than services were examined to determine which commodities were produced locally in quantities adequate

for redistribution and which produces were brought into each site.

Subsistence data from the Chan Chan SIAR best document all aspects of a diet furnished essentially by the state. Animal protein came mainly from the domesticated llama--a source well-documented as reliable and long subject to polity control. The SIAR plant inventory was dominated by two fruits, lúcuma and guanábana, while crop cultigens, including maize, were present in greatly reduced amounts. Animal and plant remains from Caracoles revealed a vegetal diet component consistent with that of Chan Chan, but a meat protein component that was locally acquired by people inept at marine exploitation. Certainly, the similarities between plant frequencies at Chan Chan and Caracoles are an indication of the type and proportions of vegetal products distributed to these populations. However, the discrepancy in the quantity, nature, and source of animal protein consumed at the two sites revealed that a modified redistribution system was in effect to supply Caracoles. In this case, presumably because llamas could not be feasibly kept near the site, no meat allotment was provided. Instead, the inhabitants of Caracoles received a larger total quantity of plant food to compensate. Therefore, the unskilled marine

exploitation probably reflects local initiative to supplement an all-plant diet.

The existence of both Cerro la Virgen and Choroval was predicated on the nearby arable land which the sites were established to maintain and cultivate. Despite its agricultural orientation, Cerro la Virgen apparently did not supply comestibles to the state. A study of plant species frequencies revealed that most local fields were probably devoted to cotton production. Food plants may have been grown locally, the the coincidence of Cerro la Virgen frequencies with comparable frequencies from both Chan Chan and Caracoles suggests that most were brought into the site. Plant data from Choroval indicate that food plants, especially maize and squash, were the main crops produced in the sunken gardens. Other plants such as peanuts, pepper, gourd, and cotton may have been grown locally, and this is reflected in the species frequencies which differ considerably from those of other contemporary sites. While some food plants, namely fruits, were probably brought to Choroval, the overall quantity was small, presumably because so much plant food was produced locally. With respect to dietary meat protein, similar allowances were also made for the marine resources locally available to both Cerro la Virgen and Choroval.

As a result, neither site received large amounts of llama for food. Instead, local marine procurement systems were sufficiently developed to provide most of the animal protein consumed at each site.

Unfortunately, the restricted sample of sites tested does not allow a complete reconstruction of the more specific workings of the system. For example, while it is evident that Choroval ultimately furnished maize and squash to other sites within the Chimu system, it could not have been the only source of these commodities. However, the sites studied were sufficiently varied to document many aspects of Chimu economic organization. The production and movement of some specific goods could be traced, and by following the course of such products, it was often possible to discern more general features of the system.

A consideration of the specific evidence available concerning Chimu redistribution revealed portions of a complex valley-wide network of sites which provided both goods and services. Chimu control was exerted over long distances to govern the establishment, maintenance, and operation of these satellite communities. The sample of settlements considered here confirms that many of these sites performed highly specialized functions, and at the same time were pro-

vided with commodities not within the realm of their production. Yet the Chimu system for compensation was neither indiscriminate nor inefficient. The potential of an area was evaluated in terms of resources available locally, and the quantity and nature of goods distributed to the site were adjusted accordingly.

When the features of subsistence common to a majority of Late Intermediate Period and Late Horizon sites are grouped, it is possible to characterize subsistence patterns for this time span on a general level. This facilitates a focus on factors unique to the period of Chimu domination and makes possible comparisons with subsistence patterns documented for earlier periods.

Data from the two agricultural sites and especially Chan Chan indicate that the butchering of llamas was still the officially sanctioned and most reliable manner of insuring a meat supply during the Late Intermediate Period and Late Horizon. In this respect the main animal protein source for Chan Chan and the earlier centers of Galindo and Moche is identical. However, the meat production system employed to supply non-subsistence oriented Chan Chan was not established indiscriminately with the founding of satellite communities. Instead, some llamas were provided, but the

development of local procurement systems was encouraged to the extent that some sites, such as Choroval and Cerro la Virgen, became largely self sufficient in this respect. There is some evidence that relatively small amounts of marine products moved from coastal sites to Chan Chan. However, the amount of fish and shellfish consumed there is also easily accounted for by individual efforts and local forays.

A consideration of the food plant inventories of Cerro la Virgen, Caracoles, and Chan Chan revealed that the vegetal diet was dominated by fruits such as lúcuma and guanábana while maize, beans, and squash occurred in reduced amounts. This contrasts markedly with the situation documented for the centers of Moche and Galindo. At these earlier sites, maize, squash, and at Galindo, beans, were the principle dietary items, while fruits were secondary in importance. For the Late Intermediate Period and Late Horizon such dietary proportions are paralleled only at the food-producing site of Choroval. The Choroval diet, like the diets documented for Moche and Galindo, reflect both the major crops grown in local agricultural areas and the agricultural orientation of much of the population.

In the Late Intermediate Period and Late

Horizon sample, several new food species were identified. These represent the first new additions to the plant inventory since maize and peanuts were documented for the early ceramic periods. Two of the species, quána-bana and caiqua, were domesticates while the third, tomato, grew wild locally. Of the three, only guanabana attained widespread popularity, and it was apparently very widely consumed almost immediately after it joined the inventory. Guanábana probably became available when new areas were opened up during Chimu expansion. The sudden popularity suggests that areas where large amounts of guanábana, and possibly other fruits, were grown were incorporated by the Chimu and the products redistributed immediately. Once the new species was introduced, local land may have also been devoted to its production.

Considered as a whole, the more traditional diet within the Chimu state reflected a reliance on llama meat and food plants such as lúcuma, guanábana, and to a lesser extent maize, all of which were redistributed according to the Chimu system. Local diets at the satellite communities varied according to available locally produced food, both plant and animal. The type of animal protein consumed was most variable

since the amount of state-supplied meat was often matched or surpassed by protein of local origin. In contrast, the stability of plant proportions at three of the four sites suggests that the vegetal portion of the Chimu diet was much more uniform. Only at Choroval, where plants were produced locally, were the frequencies substantially different.

CHAPTER IX

CONTEMPORARY TRADITIONAL COMMUNITIES

In the almost 450 years that have elapsed since the arrival of the Spaniards in Peru, most prehistoric subsistence patterns have been drastically altered. This was especially true on the coast. Camelids were rapidly replaced by newly introduced livestock species. Cattle supplied more meat, and horses and burros were superior for work and transport. A true fishing industry developed in Peru. Cash crop plants, such as rice and sugar cane, were brought in, and these quickly supplanted many existing cultivated crops in large portions of each coastal valley.

Elements of traditional ways of life survive only in a few communities, and such settlements are frequently in marginal areas. A number of these communities within the Moche Valley and in other North Coast valleys were visited in an effort to collect contemporary data which might aid in the understanding of prehistoric subsistence systems. Additional data were gained by questioning persons familiar with an area or subsistence system. Often this ethnographic evidence

dealt with features of a subsistence system that cannot be documented archaeologically.

Animal Protein Procurement

Modern ethnographic data concerning meat procurement practices is, at best, irregular in availability. The rapid and complete local replacement of the llama as a meat source precludes any examination of its care and use through local ethnographic parallels. In contrast, some of the best modern data available on animal protein procurement come from the large number of traditional fishing villages which have survived along the Peruvian North Coast as well as occasionally from inland settlements.

Data were obtained from six of these coastal communities: Guañape in the Viru Valley, Huanchaco in the Moche Valley, Puemape and El Milagro in the Jequetepeque Valley, and Santa Rosa and San Jose in the Lambayeque Valley. All but San Jose were visited at least once, and information about San Jose came from residents of the more inland settlement of Morrope. In all areas where fishing is especially good, notably Huanchaco and Santa Rosa, mechanized modern methods exist side by side with traditional ones, and often

the same people practice both. While fishing with motorized boats, or launches, is a large-scale commercial venture, traditional methods of fishing and collecting are currently practiced on a much smaller scale. Although fish or shellfish captured by such methods are often sold, they are also frequently consumed at home by an individual and his family.

Sea lions are the only marine mammals mentioned by coastal fishermen. A launch owner from Santa Rosa claimed they were a problem because they frightened fish and tore expensive nets. This indicates that sea lions are still seen occasionally along the North Coast, but none are taken for food. Porpoise meat is available in the Trujillo market at times. It brings a poor price and is generally considered undesirable. However, a farmer from Moche proudly told of finding one stranded (dead) on the beach and taking it home where it was declared delicious when prepared with spices.

A variety of fishing equipment currently in use may reflect prehistoric technology. Several types of nets are used for fishing and others serve to capture shellfish. Hooks and lines are combined in numerous ways. And finally, much of this tackle can be used with or without a reed boat, or caballito.

An extremely simple fishing technique, and the only data available on fresh water fishing were recorded in the Lambayeque Valley slightly up river at La Puntilla near a modern dam. Local workmen were taking advantage of an unusual abundance of cascafe, a trout-like fish, in still water near the dam and catching them with bare hands.

Currently, several types of fishing nets are used along the North Coast, but only two, the haul seine and the gill net correlate with major fishing techniques which might have been practiced prehistorically. The haul seine, or chinchorro, is used for fishing off the beach by wading into the surf. Simple modern examples are 15 to 20 meters long, about 1.5 meters wide, and have a small (less than 20 mm.) mesh. The bottom is lined with small weights while the top is tied to gourd or (more recently) cork floats, and a small stick runs the width of the net at either end. Larger versions require up to five persons who guide the net into the water by walking in a wide arc. As the arc is completed, fish are trapped between the beach and the net when it is pulled toward the shore at both ends. The actual use of this net was observed in the shallow bay-like area adjacent to Guañape. The catch consisted

of small mullet, shark, and machete. Most other fishermen, when questioned, listed these plus occasional croakers as the usual chinchorro catch.

Chinchorro use by fishermen within the Moche Valley was documented by Gillin (1947: 29, Plate 8), and his description of the net agrees well with the example observed near Guañape. Hammel and Haase (1962: 216-217), however, describe a much more elaborate funnel-like chinchorro which was widely used on open beaches, but they did not record the use of the simpler type in their survey.

The gill net, or red, is comparable to the haul seine in size, shape, and position of floats and weights, but the mesh is considerably larger. It is staked near the beach or further off shore using reed boats. The vertical position is variable. The effectiveness of a gill net is dependent on fishes poking their heads into the holes, but being unable to back out as the net cord becomes wedged beneath their gill cover. An S or open 6 configuration is generally considered most efficient because fish entering curved areas feel cornered or confined and push into the net. These nets were mentioned by several fishermen in Huanchaco and in Puemape, and Gillin (1947: 29) docu-

ments their use by fishermen from Moche. They are particularly popular in the vicinity of Huanchaco and slightly south, and Hammel and Haase (1962: 225-227) report them from virtually all the valleys they visited. Large fish, especially croakers, are the most frequent types caught in gill nets.

In El Milagro, a man was observed fishing with a throw net, or atarraya. Although this net form is recently introduced, several aspects of the operation were noteworthy. The man was a mason from an inland town fishing to provide a meal for his family. Within a few meters of shore in water less than a meter deep, he was able to catch a tremendous variety of small fish, and all were kept. As part of his catch, he recognized mullet, borracho, pompanito, and trambollo.

A second basic form of fishing tackle is the hook and line, which occurs in many combinations. The simplest form, a single hook and a single line with a weight, is a handline, or cordel. Handlines can be used from shore, from a rocky outcrop, or from a reed boat. When a boat is used, the line is fitted with a gourd float and dropped over the side. In this manner, a series can be set and checked in a wide circle. Actual use of the cordel was observed in Puemape where it was

used from rocks, and in Huanchaco Bay where a series of lines were checked by boat. The fish species identified for Alto Salaverry suggest that hooks and lines may have been used in the deeper water off Salaverry Point. However, the only archaeological evidence for this fishing technique comes from Cerro la Virgen and Choroval where copper fishhooks were recovered.

More complicated hook and line combinations are also used in Huanchaco and Puemape. One such device is the trawl line, or espine1, which consists of an anchored line perpendicular to shore and a second line with hooks and a single terminal float that is held parallel to shore by the current. Gillen illustrates this type of trawl line which was also used by fishermen from Moche (Gillén 1947: 28, 29, Figure 1). Anchors are generally iron or stone. An ingenious form widely used in Santa Rosa, consists of a large stone and a short wooden pole combined in such a way that when the stone rests on the bottom, the protruding length of pole digs into the sand to offer more resistance.

A single young sport fisherman described at great length an extinct method he had seen in use on Moche beaches. The device consisted of a long pole with a large hook attached loosely to one end. The

hook was also attached to a heavy line which is held in the hand. The apparatus is used like a gaff to set the hook, at which time the hook comes free of the pole (like a harpoon) and the fish is hauled in by hand using the line. It is reputedly most effective on shallow water shore fish such as rays and guitarfish. Hammel and Haase (1962: 218-219) mention the frequent use of gaffs with stationary hooks for the capture of octopus, and the use of harpoons or spears mainly for taking flatfish, turtles, and rays.

Numerous fishermen went to great length to describe the best bait, or carnada, for hook and line fishing. Soft, freshly molted mole crabs, or muy muy (Emerito analoga), were unanimously acclaimed as most desirable. At Puemape, one fisherman also uses the tiny pejerrey fish, which is so fragile it must be tied on, because the shiny silvery body is attractive to many fish. In the same vein, a Huanchaco fisherman claimed anything white, even an empty painted hook, would attract the croaker, corvina (Sciaena gilberti)

The use of much of the fishing equipment described is greatly aided by watercraft. The use of the totora reed boat, or caballito, is documented for Late Intermediate and Late Horizon times by the off

shore fish species in coastal site refuse as well as modeled representations on Chimu pottery (Squier 1877: 118). Depictions are also documented for Moche painted and modeled ceramics (Larco Hoyle 1945: 4), but the archaeological faunal data available for the Early Intermediate Period do not suggest they were widely used within the Moche Valley. Caballitos were observed in use at Huanchaco, Puemape, and Santa Rosa. Hammel and Haase (1962: 219-220, 226-227) recorded their use at Puerto Eten and Guanape and described a slightly different form which is used in villages further south.

Each one-man craft consists of four tapered bundles of reed tied together so that the bow is pointed and slightly elevated, while the stern is blunt and square. A small hollow near the stern provides a place for the kneeling fisherman and his gear. Completed crafts are about 70 cm. wide by three to four meters long and are propelled kayak-style with a split bamboo paddle.

Reeds for boats used in Huanchaco come from an area of high water table further north and near the beach. After the reeds are dry, bundling and boat construction take about an hour. Despite the fact that they are stood on end to dry after each use, caballitos

become waterlogged and begin to deteriorate after about a month's use. During calmer times of the year, fishermen venture up to two kilometers from shore in the tiny boats. In July and August, when the water is unusually choppy (puro algodón is the local phrase), caballitos are used only near shore to set nets and tend crab traps.

A second mode of animal protein procurement which may reflect prehistoric practices is marine shellfish collecting. Techniques and equipment observed vary widely, depending on the habitat of the species captured.

Two methods of capturing fresh water crustaceans were observed. In the river and canals during high water a type of dip net, or cahuán, is used to capture crayfish-like langostinos (See Gillin 1947: Plate 8). The net portion is bag-shaped and supported on either side by a stick held in each hand. Small weights are attached along the front edge to keep the net submerged during pursuit. When these crustaceans are abundant, the farmers of Moche net them in considerable quantities for sale. Cahuán dip nets are also occasionally used to capture small fresh water fish. On several occasions, men were observed using them in

drainage ditches in an effort to catch small mullet and fresh water fish trapped in low areas near the coast. Gillin also describes their use by people from Moche in both fresh and salt water, but Hammel and Haase fail to document their use (Gillin 1947: 28-29; Hammel and Haase 1962: 218).

Further upvalley, a conical basked trap, the naza, made of bamboo or cane is also used to capture langostinos. The apparatus is about half a meter across at the mouth and slightly less than two meters long. These traps are staked in irrigation ditches or small channels and checked after several hours. Nazas are common upvalley in both the Chicama and Jequetepeque Valleys, and Gillin (1947: 29) describes their use in Moche. A very late, possibly post-conquest, ceramic depiction of one of these traps is illustrated by Carrion Cachot (1955: Plate 24).

Marine shellfish collecting varies from the simplest 'bare handed' method to complicated traps set using reed boats. Rock perching shellfish are still occasionally collected when they can be found, but continuous overcollecting has made most species quite rare. Along the rock-strewn beaches of Huanchaco, women venture among the boulders at low tide mainly

to collect seaweed which is used in soup or ceviche made from marinated fish. However, they also gather any mollusks encountered. At similar rocky beaches near Huaca Prieta in the Chicama Valley, other women were observed collecting seaweed, gastropods, and sea cucumbers, or ancocos, by wading among the boulders.

Tide zone creatures such as the coquina clam and the mole crab, are also easily taken with the bare hand, although many persons use special nets. In the bay at Guañape where a sand bar had created a strip of shallow, warm water, several of us helped a woman and her children collecting Donax peruvianus. Largely sitting in the water and filtering handfulls of sand through our fingers, we soon filled two large plastic bags. At the same beach, in an area of heavy surf, two men were capturing mole crabs by quickly grabbing individuals washed out by the surf before they could rebury in the sand.

Men who capture large amounts of Donax for sale and fishermen needing mole crabs for bait use specially constructed nets. A simple version, seen only near Huanchaco, is a short handled conventional dip net with an extra heavy circular wire frame. Sand and mole crabs were scooped up together; then loose

sand was rinsed out in the surf. Two commercial Donax collectors from Morrope in Lambayeque exploit the beaches of San Jose. They use long-handled dip nets with a semicircular opening and a rake-like wide metal strip forming the straight side. Donax are captured by raking through the sand and then rinsing sand from the net bag.

The only place where large clam species are still regularly taken is Puemape. At low tide, when the tiny local bay is nearly dry, they are detected by their water spouts and holes and dug from the gravel and sand substrate. Reputedly their capture requires hard and fast work with a shovel.

Finally, crab traps are set with boats in Huanchaco Bay to capture the large purple crab and occasionally fish. The device consists of a square wooden frame with a rock tied on each corner and a shallow net bag hanging below. A suspension cord leads from each corner to a cable which ends in a float (Gillin 1947: 35-36, Figure 3). Bait, usually discarded fish parts, is tied to the net, and the whole apparatus is lowered to near the bottom. Swimming crabs attracted to the bait are easily hauled to the surface. Like cordeles, these crab traps are set using caballitos and

checked periodically.

Women often take small amounts of fish and shellfish to the market for sale. Baskets of seaweed, live mole crabs, purple crabs, or Donax are a common sight in the Trujillo market. In the Chiclayo market in Lambayeque, shellfish are sold in greater quantities as are fresh fish. Three women from Morrope were selling their brothers' Donax catch from large plastic bags. They revealed that most Donax die by the end of one market day and are subsequently salted--a measure which keeps them usable for about a week more. The women sold equal amounts of live and salted clams and for the same price. Salting fish is a common part of both large and small commercial ventures, and is crucial when large boats are at sea for long periods. Much of the caballo catch unloaded from launches in Santa Rosa was already salted or being dried and salted. On a smaller scale, individuals often extend the storage potential of large fish by salting and drying. A potter from Morrope prepared a large ray by cutting the animal into strips radiating from near the head where all were still attached. This facilitated drying, and a little salt served to retard decomposition.

Land snails (Scutalus sp.) are still present

on rocks and scrub bushes in the vicinity of Laredo in the Moche Valley. Local persons generally agreed they could be eaten, but none had actually tried them. Gillin (1947: 26) recorded more details of their use. He describes expeditions from the Moche community to nearby mountains further east during the winter season to collect large ground snails which are common there at that time. The animals are prepared for consumption by steaming.

Plant Production and Procurement

Large-scale cash crop production within all coastal valleys has taken up the best agricultural land as well as most of the water. As a result, small-scale agriculturalists who grow a variety of food crops are relegated to a minor position and often relocated on less desirable land. Farming is done on an individual or extended family basis to provide food at home and a small surplus for sale in city markets. Despite this considerable reorganization and relocation, certain elements of the more traditional agricultural communities may reflect prehistoric practices.

All of the agricultural communities studied in detail are within the Moche Valley. In the campiña

of the small village of Moche and near the modern headquarters of the Cooperativo Laredo in the vicinity of the Caballo Muerto mound complex, irrigation agriculture is practiced on small plots, or chacras. Along the coast, between Las Delicias and Salaverry, and near the site of Choroval, men from scattered homesteads continue to farm or otherwise exploit sunken garden areas.

In both areas where irrigation agriculture is practiced, men discussed their crops at length. Near Laredo, manioc, maize, and lentils were main crops, and gourds were occasionally grown for use as containers. Maize and lentils are often planted in the same field, and manioc and pineapple are likewise frequently grown together. In Moche, maize and lentils are most frequently planted, but manioc, beans, and caigua are also grown. In these Moche fields, maize is planted with beans or lentils and caigua with manioc. Except for manioc, which requires 10 months to reach maturity, most of these field crops mature in six months or less. It was generally agreed that two crops per year is feasible when water is available, but the local crops suffer when water is scarce and most is taken up by cane. During his earlier study, Gillin (1947: 19-20) recorded

many of these same features of Moche agriculture including the frequent association of maize and lentils. He describes at length how both types of seeds were often planted together in a single hole.

In the vicinity of their houses which were located very near their fields, the farmers tend a variety of herbs and trees. A typical such house garden near Laredo contains trees of avocado, the plum-like cidueia, banana, guanábana, the citrus fruit lima, the sour yellow apple called pera, and the soap berry, or choloque. Cidueia and pacae trees are common along fences and unfarmed borders of field plots. These fruits provide a change from field crops, and are especially important when other plants are not in season. A similar house garden observed near Moche consists of numerous herb and spice bushes plus trees of mango, banana, lúcuma, guanábana, and avocado, while pacae grows along many field borders. This conforms to descriptions by Gillin (1947: 20) of a variety of plants along Moche field borders and in house gardens.

Technologically, agriculture on even small plots has changed tremendously. Tractors are rented to cultivate the fields and metal tools are within everyone's means. However, near Laredo and in Moche (Gillin

1947: 18) manioc is commonly dug with a long crow-bar like metal pole which is used much as a digging stick as well as to break up clods. A wooden club-like stick is also similarly used in Moche. Families near both Moche and Laredo use stone manos and metates to pulverize corn and other plants. Everyone agrees that the best ones are well-worn examples robbed from archaeological sites!

Sunken garden areas north of Salaverry are still inhabited by scattered families in a pattern of settlement which probably closely parallels the prehistoric one. However, no real effort is made to maintain sunken gardens, therefore much of the area has become unsuitable for agriculture. Some of the depressions contain water year-round and are therefore too moist for crops. Reeds and sedges growing in these are harvested and sold. Other sunken gardens have gradually filled in and become too dry for all but deep-rooted grasses and a few wild plants. Small numbers of cattle and goats are taken to graze in a few of these. In the sunken garden plots where moisture is present in amounts suitable for field crops, maize, squash, and occasional lentils or alfalfa are the main crops planted. Since the gardens are not really maintained, areas

often become too wet or too dry, and portions of a field must be replanted.

Contemporary Communities Summarized

The subsistence systems currently operating in contemporary traditional fishing and agricultural communities do not account for the total inventory of plant and animal food consumed. However, certain elements of the local economy are important as possible remnants of prehistoric lifeways. Such elements were the focus of this study.

Fishing villages provided the most useful data because much of the equipment still in use can be correlated directly with archaeological evidence of prehistoric technologies. Large and small mesh nets, fishhooks, and caballito boats are examples. Other devices, such as crab traps, langostino traps, or cahuán dip nets consist of materials readily available in prehistoric times and therefore may have been used, but they are not documented archaeologically.

In contrast, agricultural data are much harder to correlate with archaeological material. The technology of agriculture has changed drastically, and only a very few implements parallel archaeological remains.

However, some of the crop patterns may be old. For example, the practice of planting two crops together, such as maize and a legume, is paralleled by the high incidence of both maize and beans in the Galindo refuse. The custom of house gardens in communities which are largely agricultural could account for small quantities of fruits and condiments comparable to those observed archaeologically at Galindo and the Moche Huacas.

CHAPTER X

MOCHE VALLEY SUBSISTENCE PATTERNS COMPARED

WITH OTHER NORTH COAST VALLEYS

Through an evaluation of subsistence data from ten prehistoric settlements within the Moche Valley, a wide range of procurement, production, and processing activities was documented. Ultimately the reconstruction of general subsistence patterns was possible, and major economic shifts and efficiency changes were pinpointed chronologically and culturally. Using the general patterns established for the Moche Valley as a base for comparison, subsistence data from other prehistoric North Coast communities are examined in an effort to assess patterns documented for the Moche Valley as typical or atypical of this coastal region outside Moche. By confining such a comparison geographically to a culturally unified region, the number of variables affecting subsistence are greatly reduced.

Major Subsistence Patterns within the Moche Valley

Three major prehistoric subsistence shifts

were documented within the Moche Valley from the time of the first permanent Cotton Preceramic settlements until the Spaniards arrived. Each shift was marked by substantial changes in both the economic organization and the subsistence base of the communities involved.

The First Permanent Settlements

The beginning of the Cotton Preceramic is characterized within the Moche Valley by the change from a nomadic way of life to a settled one. An economy based on wild plant gathering, hunting and possibly shellfish collecting, was replaced by an economy based on marine resource use plus the cultivation of industrial and food plants. This shift was documented within the Moche Valley by two coastal sites, Padre Aban and Alto Salaverry.

Padre Aban dates to very early in the Cotton Preceramic when the change to settled life was in its final stages. The settlement may have been seasonally occupied, and the inhabitants were not as capable at marine resource use as later people of the area. Virtually all food consumed at the site came from the sea: small amounts of sea lion, many shore birds and shallow water fishes such as sharks, rays, and mullet, and very large numbers of the large purple mussel. Two impor-

tant industrial plants, cotton and gourd, as well as squash were cultivated on the river floodplain.

Alto Salaverry, on the other hand, was occupied near the end of the Cotton Preceramic. The site was a permanent settlement with both public and domestic architecture. At Alto Salaverry the emphasis was also on marine resources taken locally. Small amounts of sea lion and birds as well as substantial amounts of rock perching shellfish were consumed at the site, but most of the meat came from fish. Compared to Padre Aban, a more developed fish procurement system was documented for Alto Salaverry, and this increased emphasis on fishing may be correlated with the apparent decline in local shellfish populations due to overcollecting. Major fish species taken include the same shallow water sharks, rays, and mullet documented for Padre Aban plus two members of the croaker family which were probably reached largely from the Salaverry rock mass. Plants were still cultivated on the Moche floodplain, but the three cultivated species noted for Padre Aban were supplemented by pepper, lima beans, possible common beans, pacae, cansaboca, lúcuma, quayaba, and avocado. While most food plants were present in very small amounts, the industrial plants, cotton and gourd, as well as

squash, continued to dominate the inventory.

Both of the first permanent communities within the Moche Valley were characterized by an essentially marine economy complemented by small-scale floodplain cultivation. The industrial plants, cotton and gourd, were consistently among the main species because these plants were extremely important to people without pottery containers and fishermen needing nets and floats. This suggests that plant cultivation was initially viewed and accepted as a means for obtaining essential raw materials and secondarily as a source of food. Also, toward the end of the Preceramic, when floodplain land was used to its fullest extent, more of this limited area was devoted to essential industrial crops than food species. This is reflected in the Alto Salaverry floral inventory.

The Advent of Irrigation

During early ceramic times, irrigation agriculture was first practiced on a significant scale. Initially, it was more feasible upvalley where the incline was greater, and short canals were adequate. In conjunction with this, early ceramic sites were situated inland--their location predicated on water control and the use of local fields. Yet, marine

resources continued to be very important. Eventually, irrigation systems were improved and expanded, and an up-valley location was no longer deemed crucial. By then, meat from inland mammals supplied virtually all the animal protein necessary. Within the Moche Valley, the sites within the Caballo Muerto Complex provide evidence of early agricultural endeavors coupled with a heavy reliance on marine products supplied by a coastal site such as Gramalote. The later centers of the Moche Huacas and Galindo document an economy dominated almost completely by reliable local inland production systems.

With the location of Caballo Muerto inland, the shift from floodplain to irrigation agriculture was complete, yet the site still relied substantially on animal protein from the coast. In this sense, the site reveals one aspect of the transition to a predominantly inland focus. At the Early Caballo Muerto mound tested, almost half the animal protein consumed came from deer and a domesticated camelid, with deer furnishing slightly more. The remainder, slightly more than half, came mainly from large shellfish collected in Huanchaco Bay by people such as those of the coastal site of Gramalote in exchange for agricultural products. Although no plant remains were preserved at Caballo Muerto, the

generally contemporary Gramalote plant inventory indicates that two new cultigens, peanut and maize, were added to the species already identified for the Cotton Preceramic. Maize remains were rare, therefore it was apparently not an important food. Industrial plants continued to be very important, but, for the first time, several food species occur in comparable high frequencies. This increase in food plants correlates well with the cultivation of larger areas through irrigation, thereby providing sufficient space and water for both food and industrial plants. Larger seed size averages for some species may also reflect the regular and adequate water supply possible with irrigation.

By the time the polity based at the Moche Huacas dominated the valley in the Early Intermediate Period, irrigation agriculture was very well developed and administered, and an inland source for animal protein had been secured. Domesticated llamas, which were coming into importance in early ceramic times, supplied virtually the animal protein consumed at the Moche center. Numerous efforts were made to increase the efficiency and productivity of the agricultural system. More area was opened up to irrigation. Field crop species, especially storable commodities, were

emphasized at the expense of fruits. Important crops included cotton, gourd, peanuts, common beans, and especially maize and squash. Seed and plant part size changes suggest that artificial selection may have been practiced to increase overall yield. Plant species data from Moche reflect both this emphasis on agriculture and the large local population employed in agricultural activities.

The Middle Horizon site of Galindo continued to function much as the Moche Huacas had within the valley. However, the survival of a small community such as the Early Chimu occupation of the Moche Huacas indicates that the valley was only incompletely controlled. Subsistence patterns documented for Galindo are more typical of the period, and they closely parallel patterns reconstructed for the earlier Moche center. Again the domesticated llama furnished virtually all the animal protein consumed. The population of Galindo was largely agriculturalists concerned with irrigating and farming local fields. Field crop cultigens were far more abundant than fruits. Of the crop cultigens, the common bean and especially maize were most frequent, therefore agricultural production at Galindo may have focused on these two storable species.

In early ceramic times the focus on irrigation agriculture and the corresponding move inland indicates a change of economic values because plant production had become more important than the marine resources which had reliably supplied so much food. Gradually both agricultural production and animal protein production increased in efficiency until virtually all meat came from a single source, and field crop cultigens dominated the plant species inventory. After the initial increase in efficiency which saw field cultigens, especially maize, gain prominence and llamas become the reliable meat source, basic species inventories remained unchanged while the valley was dominated by a succession of centers through the end of the Middle Horizon.

Satellite Communities and State Redistribution Systems

During the Late Intermediate Period and Late Horizon, Moche Valley economy was efficiently controlled by the Chimu state centered at Chan Chan. As part of the Chimu domination, influence was exerted over greater distances, new production and procurement zones were made accessible, and communities were established strictly to provide specialized goods or services. A state redistribution system complemented

this emphasis on specific settlements with specific functions by moving products to where they could best be used.

Subsistence patterns documented for Chan Chan and three satellite communities, Caracoles, Cerro la Virgen, and Choroval, reveal much about how the Chimu economy functioned. The very nature of many satellite communities as specialized production units within the state precludes the reconstruction of a generalized Chimu pattern. However, subsistence systems present at several sites provide an indication of typical practices.

When faunal data are examined from all the sites, animal protein procurement emerges as a highly variable set of systems. Domesticated llamas provided most of the meat for the Chan Chan SIAR and substantial quantities of meat for both Cerro la Virgen and Choroval. This suggests that the traditional inland meat source largely maintained its importance, especially at larger centers. However, the fish and shellfish species which dominate the faunal inventories of Cerro la Virgen and Choroval indicate that a new marine emphasis was developed at coastal sites. Fish species taken, mainly croakers, reflect the use of reed boats to reach deeper

neritic zones. Shellfish frequencies, notably the abundance of Donax, reflect the local availability of only a few species by Late Intermediate Period and Late Horizon times. Small amounts of marine resources may have been redistributed.

Plant frequencies for the two non-agricultural populations of Chan Chan SIAR and Caracoles agree closely and are probably a good indication of state-supplied fare. Fruits, especially lúcuma and the newly introduced guanábana, dominated the plant inventories while crop cultigens, even maize, were present in greatly reduced quantities. At the agricultural settlement of Cerro la Virgen, cotton dominated the cultigen inventory while food plants were present in proportions comparable to frequencies for Chan Chan and Caracoles. This suggests that the nearby fields were devoted to cotton production and food plants were grown elsewhere and redistributed to the site. Occupants of Choroval, a site established to maintain and farm sunken gardens, were clearly dedicated to food plant production. Maize and squash were most abundant, and other crop cultigens occurred in only moderate amounts. Fruits were relatively much less important at Choroval, probably because of the large amount of food already produced locally.

During the Late Intermediate Period and Late Horizon the Chimú state established and controlled many specialized communities. These communities gave the state access to new zones and ultimately their products which were not otherwise available. Through the Chimú system of redistribution, such products benefitted much on the state.

Subsistence Patterns in other North Coast Valleys

In order to evaluate major subsistence patterns reconstructed for the Moche Valley as representative of the North Coast as a whole, subsistence data from other North Coast valleys are evaluated. For the purposes of this study, the valleys from Lambayeque through Casma are included in the North Coast region. Many sites have been recorded and described within this area, but very few published accounts include information on plant and animal remains. The most complete data for a single valley come from Viru where members of the Viru Valley Project surveyed and tested sites which varied both spatially and chronologically. Other valleys are represented by only a very few site descriptions accompanied by subsistence information. Ceramic depictions of plants and animals as well as subsistence

activities are also an important source of evidence. However, most of these vessels come from looted graves and therefore lack adequate provenience data. In this section, subsistence data are discussed in terms of their chronological placement according to Rowe's scheme (1960; 1962).

Cotton Preceramic

Within the North Coast region, only three Cotton Preceramic sites have been described in any detail: Huaca Prieta, Huaca Negra, and Las Haldas. All are on the coast. Huaca Prieta lies at the mouth of the Chicama Valley near an irregularity in the shoreline where the beach is slightly protected. Huaca Negra is located close to the modern fishing village of Guañape near the northern margin of the Viru Valley. Las Haldas is situated slightly south of the mouth of the Casma Valley near a bay with both sandy and rocky beach areas.

Huaca Prieta was excavated by Junius Bird in 1946 as part of the Viru Valley Project because the site looked more promising than early Viru settlements. The site is an oval midden 125 by 150 meters by about 12 meters high. Excavations within the ashy refuse matrix revealed a series of retaining walls and

subterranean structures built of beach cobbles (Bird 1948b: 22-23). Bird noted considerable numbers of fire-cracked rocks throughout the midden. A large amount of plant and animal remains was recovered in the course of screening much of the excavated refuse. Much plant material was analyzed by specialists, and coprolites were studied by Callen (1963). Animal remains received no specialized study, but many general classes are described in preliminary reports by Bird along with much of the plant material and artifacts (Bird 1948a; 1948b; Bennett and Bird 1949: 88-89).

At Huaca Prieta, most of the animal protein apparently came from fish, shellfish, and birds. Sealion and porpoise bone was present, but rare (Bird 1948a: 302; 1948b: 22). Bird mentions starfish, sea urchins, crab, clams, and large purple mussels as part of the shellfish inventory (1948a: 302). During several visits to the site, I identified most of the species once common near Huanchaco in the Moche Valley. The rock-strewn beach in front of Huaca Prieta could once have yielded such an inventory. In the course of the excavations Bird encountered a nearly complete haul seine with the gourd floats still intact as well as a net sinker and a single shell fishhook fragment (1948a: 302; 1948b: 25).

Cultivated plant species recovered from Huaca Prieta include: cotton, gourd, squash, pepper, Canavalia beans, and lima beans. Tended trees are lúcuma, cansaboca (called ciruela de fraile by Bird, but identified as Bunchosia armeniaca), and quayaba. The roots of wild achira (Canna edulis), junco (Scirpus sp.), and cattail were also apparently eaten (Bird 1948a: 302; 1948b: 24; Hutchison 1959; Pickersgill 1969: 55-56; Sauer 1964; Stephens 1975; Towle 1961; Whitaker and Bird 1949). Although none of the plant species were quantified, the frequency of cotton twined textiles and gourd containers and floats confirms the importance of at least these two cultigens.

Huaca Negra in Viru is a low circular conical mound about 300 meters in diameter. The site was excavated in 1946 by Strong and Evans as part of the Viru Valley Project. Semi-subterranean structures with plastered clay walls were encountered within the refuse matrix. Compared to Huaca Prieta, preservation in the Guañape area was poor, therefore few vegetal remains survived. Plant species include cotton, gourd, and cane--all generally identified from artifacts. From the test pits in the midden considerable shell and bone were collected. Strong and Evans mention clam, snail,

large mussel shells, bird bones, the sea-urchin-like pieure, and fish bones which were mostly from sand sharks or rays (Strong and Evans 1952: 17-23). Artifacts related to subsistence include a very few shell fishhooks, net fragments, a grinding stone, and fire cracked rocks, probably from cooking.

The Preceramic portion of Las Haldas is overlain by a much larger early ceramic component which consists of substantial amounts of refuse and both non-domestic and domestic architecture. This makes accurate assessment difficult. Based on reports from Lanning and the University of Tokyo expedition, Rowe (1963: 5) postulated a population of over 10,000 persons. An estimate by Moseley (1975b: 62) of about one tenth that, or 1000 to 1200, is still probably too high. Engel (1957b: 76, 87; 1970: 32) reported portions of a large preceramic building and numerous houses and estimated that a population of 1500 to 200 once occupied them. However, only one of the cuts by Fung (1969: 60) near the site center exposed a uniform preceramic deposit about 1.65 meters thick and a boulder wall. Grieder (1976) found no evidence of Preceramic architecture, but did establish the presence of a more substantial Preceramic component than Fung's testing

would seem to indicate.

Subsistence data for the Preceramic portion of Las Haldas come from reports by Engel and Fung. Engel (1970: 32) recorded sea lion bones and legumes, notably lima beans, in the refuse. The information provided by Fung (1969: 60-62) is much more extensive. She describes the refuse matrix as ashy, with many fire-cracked rocks. Almost no land snails were present, and marine mollusks were relatively scarce. These marine shellfish species include Clams (Mesodesma donacium and Eurhemalea rufa), mussels (Aulocomya ater, and Brachidontes purpuratus), gastropods (Tegula atra and Oliva sp.), limpets (Fissurella maxima, F. crassa, and others), and the abalone-like Concholepas concholepas. A mention of mammal, bird, and small-fish bones provide the only evidence of vertebrate protein sources (Fung 1969: 61). Gourd, cotton, and the epiphyte, Tillandsia, were the only plant species recorded by Fung (1969: 61). A possible grinding stone was also described.

The Initial Period and Early Horizon

Subsistence data for early ceramic sites again come largely from coastal settlements. Huaca Prieta, Huaca Negra, and Las Haldas have later ceramic components.

Like the Moche Valley situation, most of the North Coast valleys contain early ceramic sites located inland presumably to manage newly developed irrigation systems. Unfortunately, subsistence evidence is not available for these inland centers. Therefore this review focuses on early ceramic levels at Huaca Prieta, Early, Middle, and Late Guañape material from Viru, and the early ceramic component at Las Haldas.

At Huaca Prieta, Bird described a continuous sequence into early ceramic times. Houses were above ground and made of irregular adobes with mud mortar, but stone-lined subterranean structures were also still in use. Fire cracked rocks continued to be frequent within the midden matrix (Bird 1948b: 26-27).

Faunal remains described include bird bone and shell. The plant species inventory became expanded to include maize, paca, peanut, avocado, and possibly manioc (Bird 1948b: 27; Bennett and Bird 1949: 94; Towle 1961). Maize remains from two Huaca Prieta ceramic levels were analyzed by Nickerson (1953). Of samples of 604 cobs and 171 cobs from two cuts, two groups of 35 and 44 cobs were examined in detail. In the first sample of 35, seven cobs (or 20%) were 10 row and 28 (or 80%) were 12 row, and in the second

sample of 44 cobs, two cobs (or 4.5%) were 10 row while 42 (or 95.5%) were 12 row (Nickerson 1953: 87, 88, 91).

Early ceramic data for the Viru Valley come from the vicinity of Guañape and the Huaca Negra midden. Strata cuts in portions of the refuse revealed a Pre-ceramic to ceramic continuum. Much of the faunal material was concentrated in lenses, readily distinguishable because of large quantities of shell. Shellfish, especially mollusks, were consistently abundant, and Strong and Evans specifically recorded the presence of large mussels, clams, gastropods, limpets, Ci. concholepas, barnacles, crabs, sea urchins, and pieure. Fish bone, especially from sharks and rays, and bird bone were common throughout. Sea lion and porpoise bones were largely restricted to earlier levels. Cotton textiles provided the only evidence of cultivated plants, and fire cracked rocks were abundant. Near Huaca Negra, a non-domestic structure, the Temple of the Llamas, was also cleared. Four llama burials were discovered, and, although evidence of harnesses suggests they were domesticated, there was no indication that llamas were used for food. Remains of sea lion, bird, fish, and shellfish from the temple coincide with data from the Huaca Negra strata cuts (Strong and Evans 1953: 23-25, 29-31, 40-41).

The ceramic component of Las Haldas consists of a central mound and plaza complex built on a natural hill to increase the apparent height. Numerous smaller mounds, domestic structures, and rich refuse cover the remaining area of the site. Engel (1970: 32-33) mentions only maize and marine products as part of the subsistence inventory, but Fung (1969) goes into much greater detail. On the basis of ceramics she separates an earlier Las Aldas phase from a later Chavin phase. Her major excavations were located in the garbage deposited on the first temple platform and in other central site areas. The data are summarized according to general stratigraphic context. Fire cracked rocks were present in much of the matrix.

Mammal, bird, and fish bones were present in all strata containing Las Aldas phase ceramics. Marine mollusks were much more common than in the Pre-ceramic refuse, and numerous species were identified. These include: land snails, clams (Mesodesma donacium, Semele solida, Semele corrugata, Eurhomalea rufa), mussels (Choromytilus chorus, Brachidontes purpuratus, Semimytilus algosus, and Aulocomya ater), gastropods (Thais chocolata, Thais delessertiana, Oliva sp. and Polinices sp.), limpets (Fissurella maxima, F. crassa,

F. limbata, and F. peruviana), and C. concholepas. Other shellfish include sea urchins, barnacles, crabs, and cidueña de mar. Most of the species were uniformly present throughout the strata. Land snail shells increased greatly in later levels. In earlier levels, two large clams (Mesodesma donacium and Semele solida) provided most of the molluscan protein. M. donacium continued to be important throughout, while limpets and the large mussel (C. chorus) were abundant only in later levels. Fishhooks made from C. chorus shells were present in all strata but the first Las Aldas phase level (Fung 1969: 56-60).

In the portion of the deposit defined ceramically as Chavin, shellfish species common in earlier Las Aldas phases are lacking. Only small mussels and sea urchins are abundant. Fung asserts that the banks of Mesodesma donacium and populations of Fissurella sp. has disappeared by the time the group using Chavin ceramics became established at the site (Fung 1969: 195). Fragments of small-mesh (1.5 to 5 cm.) netting made from both cotton and another unidentified vegetable fiber were common in the refuse (Fung 1969: 122). The abundance of net fragments and their apparent confinement to the Chavin strata led Fung (1969: 195) to conclude

that net fishing was an innovation which facilitated the capture of large amounts of fish more quickly than the traditional hook and line method documented for Las Aldas phases. A single fishhook, made of cactus spine rather than shell, was associated with the Chavin ceramic phase (Fung 1969: 120).

Plant remains documented for the Las Aldas phases were relatively rare. Species identified within the entire component include gourd, squash, peanut, cotton, avocado, possibly lima beans, and Tillandsia sp., which was used as fuel (Fung 1969: 56-60).

There is very little data on plant species used during the Chavin phase at Las Haldas. Squash, gourds, cane, reeds, and cactus were mentioned in descriptions of wooden implements and miscellaneous artifacts (Fung 1969: 120). In a general discussion of subsistence, Fung (1969: 195) mentions that maize was present in Chavin refuse, while a variety of other cultigens occurred in quantities which demonstrate that the people were experimental agriculturalists. By this phase, dried algae had apparently replaced Tillandsia as a major fuel source.

Early Intermediate Period

The Early Intermediate Period has been divided largely on the basis of ceramics into three successive periods: Salinar, Gallinazo, and Moche. Most of the information available about this period reflects an early focus on fine ceramics excavated from graves. Consequently, very little subsistence data are available, and much of the existing evidence is from graves or from depictions on vessels taken from graves.

Very little information is available concerning Salinar subsistence. Larco Hoyle (1946: 156) reports actual remains of maize, squash, and gourds from Salinar graves, presumably from the large cemetery in the Chicama Valley. He also identified lúcuma and pepino as depicted on ceramic vessels from the graves. In addition to food plants, Salinar graves also contained shells of clams, mussels, and land snails as well as bird skeletons.

The only other Salinar subsistence data are from Viru, and these, too, come from graves. During the excavations in the Salinar (called Puerto Moorin by the Viru Valley Project) cemetery northeast of Guañape, maize gourds, peanuts, and cotton textiles formed part of the burial paraphernalia (Strong and

Evans 1952: 49, 51; Towle 1952: 353, 356).

Virtually all evidence of Gallinazo subsistence comes from work in the Viru Valley. However Bird (1948a: 299) mentions cutting into a deposit containing Gallinazo refuse near Huaca Prieta in the course of having his workmen dig a practice trench in preparation for work in the early midden. This small sample from the Chicama Valley is reported as containing abundant maize as well as common beans and a variety of other cultivated species.

In the Viru Valley, plant and animal remains associated with Gallinazo ceramics came from the Gallinazo site, the Tomoval Castillo, and Huaca de la Cruz. This material was encountered during the excavation of strata cuts which frequently discovered architecture and pits within areas of architecture to define specific features.

The Gallinazo site, part of the Gallinazo Group reported on by Bennett (1939: 54; 1950) was also tested by Strong and Evans. The site is only about four kilometers inland, north of the Viru River. No perishable material was preserved at the site and Strong and Evans (1952: 84) published only a brief list of faunal material from their strata cut. Of

17 artificial levels, five contained llama bone, eight sea lion (or porpoise), five bird, eight fish, and 14 shell. Because of the relative size differences, small species such as shellfish, birds, and fish probably did not contribute as significantly to the diet as the larger mammals. Apparently, marine mammals provided more meat than the domesticated llama--a factor which may be correlated with the site's proximity to the ocean.

The Castillo de Tomaval is an adobe pyramid which stands impressively on a rocky ridge north of the Viru River and about 18 kilometers inland. In the vicinity are numerous minor architectural features and domestic structures, and a cemetery which also form part of the site of Tomaval. Stratigraphic excavations by Strong and Evans which focused on determining major living levels yielded considerable subsistence data. Land mammal bone, probably llama, was common throughout the domestic refuse while the remains of marine mammals, birds, fish, and mollusks were quite rare. Both guinea pig and llama dung were also identified within the deposit. Plant remains present included large amounts of gourd fragments from containers, cotton textiles, and the food plants maize, peanuts, probable common

beans, squash (*Cucurbita moschata*), lúcuma, avocado, and quayaba. Based on the number of levels in which each species occurred, maize, squash, and lúcuma appear to have been the most abundant (Strong and Evans 1952: 97, 125, 126). The maize specimens from Tomaval were studied by Towle (1952: 353) who determined an average diameter of 15.9 mm. and a mean row number of 12.6.

Huaca de la Cruz lies well inland near the center of the Viru Valley and south of the river. Components of the site include adobe platforms, domestic structures, and a cemetery area. Ceramic evidence from stratified deposits revealed that the site was occupied during successive phases of the Early Intermediate Period. Therefore the Gallinazo refuse is overlain by about 1.5 meters of cultural debris containing Moche ceramics. Within the Gallinazo strata, remains of domesticated llamas in the form of hair, dung, and especially bone were very common, while no marine mammal bones were identified at the site. A single fragmentary deer antler from the site provides the only conclusive evidence of this locally rare animal. No fish bones were collected, and bird and shellfish remains were very rare. Plant remains from the Gallinazo occupation of Huaca de la Cruz include maize, squash, common beans,

and peanuts (Strong and Evans 1952: 138-190).

Moche ceramics are notorious for realistic depictions of virtually every aspect of the culture. Such representations have provided data for the reconstruction of numerous Moche activities, including those related to subsistence. In contrast, evidence in the form of actual plant and animal remains is rare. Again, the best sample known from outside the Moche Valley resulted from the work by Strong and Evans in Viru.

Larco has access to over 30,000 whole Moche vessels from graves in North Coast valleys and therefore felt qualified to comment on many cultural activities. Animals are frequently depicted, and llamas and dogs were apparently the principle domesticated species so treated. However, a number of representations portray the capture of wild animals. They reveal that birds were hunted with darts and sea lions were clubbed while deer were driven into encircling nets where they were killed with clubs or atlatls (Larco Hoyle 1938: 78-80; 1945: 8; Kauffman Doig 1973: 309; Yacovleff and Herrera 1934: 292). Larco Hoyle (1945: 9) illustrates a fisherman, complete with caballito, hauling in a large fish with a hook and line.

Plant representations are also common in Moche ceramics. Occasionally vessels were molded from actual plant parts. Larco Hoyle identified and illustrates numerous plant species which are not often preserved archaeologically. These include tubers such as potatoes, manioc, sweet potato, and ulluco as well as soft fruits such as pepino and grenadilla (Larco Hoyle 1945: 4; 1946: 163). Wild plants are also portrayed. Yacovleff and Herrera (1935: 88-89) illustrate Moche vessels depicting mishpingo (Nectandra sp.) seeds and maichii (Thevetia peruviana), and Larco Hoyle mentions such reproductions as well (1945: 4; 1946: 163).

The most complete collection of Moche plant and animal remains outside the Moche Valley comes from the upper 1.5 meters of the strata at Huaca de la Cruz in the Viru Valley. Llama remains in the form of bones, dung, and hair dominated the faunal material collected. Guinea pig dung was also present, but remains of marine animals were absent (Strong and Evans 1953: 190). Strong and Evans (1952: 135) note that some deposits of vegetal remains were so thickly packed there was little earth present. Prominent within this deposit were cobs, stalks, and husks of maize plants, peanut shells, cane, and wild plant fibers and vines. Specimens of lúcuma,

guayaba, gourd, common beans, and cotton were also encountered in the collections from the strata cut. Nearby Moche burials were occasionally accompanied by gourd containers filled with common beans, maize, and unseeded cotton. Of the food plants, maize was most frequently and consistently present. Towle (1952: 253-254) analyzed the entire collection of maize remains from Huaca de la Cruz as a single sample since all cobs in her collection came from within 1.75 meters of the surface. The mean cob diameter of only 11 cobs was 13.1 mm., while the average row number determined for an even smaller sample was 9.2 mm. Cane and reeds, which were used for construction and weaving, were the main wild plants identified.

The Middle Horizon

Information concerning Middle Horizon subsistence patterns consist of unpublished data from two Moche V sites where field work has only very recently been carried out. Pampa Grande in the Lambayeque Valley has been intensively surveyed and excavated in recent years by members of the Royal Ontario Museum Lambayeque Project, directed by Kent Day. During the summer of 1975, Richard Schaedel and Herbert Eling supervised excavations at Cañoncillo in the Jequeté-

peque Valley.

Within the large Lambayeque Valley, Pampa Grande lies about 50 kilometers inland from the ocean at a point where the river valley opens to form a broad plain. The site is situated outside the limits of cultivation at the foot of hills forming the eastern side of the valley. Within the site area of about four square kilometers are large huacas, walled enclosures, compact domestic structures, corridors, and a cemetery (Day 1975: 2-5). Plant and animal remains were recovered mainly from the refuse of residential sectors and from storage structures. Much of the refuse within residential structures had been relocated through its use as architectural fill. However, samples were excavated and screened in order to acquire subsistence data.

Animals identified include llama, deer, dog, fox, guinea pig, rodents, fish, and shellfish. Llama bone far surpassed remains of other species in number, volume, and consistent frequency of occurrence. Deer were represented only four skull caps with antlers which occurred in a ceremonial context. Plant species present include maize, common beans, squash, cotton, peanut, pepper, lúcuma, and avocado. Of these, two

species, maize and common beans, were also found in two storage structures near residential sectors. Both structures had been burned while still partially full, and thick layers of blackened maize kernels and beans were found on floors of separate rooms (Day 1975: 20, 22).

The site of Cañoncillo lies on the southern edge of the Jequetepeque Valley about 15 kilometers inland in an area which is now covered with active sand dunes and algorroba trees (Kosok 1965: 115; Ubeloide Doerring 1967: 86). Major site components currently not obscured by sand include a large adobe huaca and rectangular walled enclosures. Excavations revealed more detailed features including regular rows of round adobe depositos, or storage pits, which contained little of their original store. After a few day's work at the site, I returned to my base in Trujillo with much of the plant and animal remains to identify. Plant remains were poorly preserved, and few were found, but large amounts of faunal remains were collected.

Marine shells are thickly scattered over the site's surface, and they were also frequently encountered within the excavations. However, only selected samples of the different species present were ultimately included in the material I was asked to identify. Therefore,

quantifications of the faunal inventory are only approximate. Despite the apparent abundance of molluscan remains at Cañoncillo, shellfish probably provided no more than 10 to 20% of the total animal protein consumed. The tide zone clam (Donax peruvianus) was most frequently collected, but several gastropod species (Turbo niger, Thais delessertiana, and Polinices sp.) were also substantially represented.

Mammals contributed most of the animal protein eaten at Cañoncillo, and half or more came from domesticated llamas. The bone sample was large enough to investigate some of the cultural factors correlated with the use of llamas for meat. A consideration of the age structure of the animals consumed indicated that half or more were young adults--at the optimum age for use as meat animals. At the same time, many were older animals, and this would indicate the llama was probably valued for wool and labor as well. Cut marks made during butchering were observed on a number of bones. They were most frequent on vertebrae (8 examples), and the astragalus (3 examples), but were also noted on a rib head, a distal humerus, and a proximal femur. The nature and location of marks from butchering at Cañoncillo coincides with data from other

large samples of llama bones from the Moche Valley.

In addition to domesticated llamas; deer, guinea pig, dog, rat, and sea lion remains were part of the mammalian inventory. A worked fox mandible was also identified. The dietary value of the dog and guinea pig meat was almost insignificant, and deer apparently contributed only slightly more. However, sea lions provided substantial amounts of the meat consumed at Cañoncillo--an amount equal to about one half the llama contribution. Sea lion remains were the best evidence of the importance of marine resources to the inhabitants of Cañoncillo.

Fish were infrequently represented, and a single pelican bone was the only evidence of shore birds being brought to the site.

The only plant species identified for Cañoncillo were maize, lúcuma, and avocado. The fruit remains were very scarce while charred maize cob fragments were quite common. The four whole burned cobs averaged 44.8 mm. long by 10.5 mm. in diameter while the overall diameter of 38 cobs and fragments was 9.1 mm. The cob row number was highly variable, but most cobs had either 8 (21%), 10 (32%), or 12 (34%) rows.

Late Intermediate Period and Late Horizon

Despite the proliferation of large sites on the North Coast at this time, there is very little good evidence which bears on Chimú and later subsistence. Chimú pottery, mainly mold-made blackware, is often less realistic than Moche examples, and the fine painted details are absent. However, vessels depicting subsistence activities do exist, and a number have been described and illustrated. Actual plant and animal remains from Late Intermediate Period and Late Horizon sites outside the Moche Valley are only very rarely reported. The data reviewed here come from Chimú and Chimú-Inca sites in Viru, on the coast in Santa, and near the early site of Las Haldas, south of Casma.

Numerous plant representations have been noted on Chimú ceramics, but a thorough review comparable to Moche studies has not been published. The species inventory as documented from reliable ceramic identifications includes only maize, common beans, achira (Canna edulis), pacae, oca, potato, squash, and guanábana (Towle 1961: 25, 54, 86, 90; Yacovleff and Herrera 1934: 311-312, 275-276, figure 23e, figure 27). Several of these are tubers which are not readily found archaeologically. The remaining species, except for guanábana,

were also identified for earlier periods. The most common ceramic vessels depicting faunal procurement practices take the form of caballitos and frequently illustrate fishing practices (Squier 1877: 109; Yacovleff and Herrera 1934: 293, figure 21).

As part of the Viru Valley Project, Collier excavated at a number of Late Intermediate Period and Late Horizon sites in the valley, but subsistence data are only available for three of these sites. V-171 lies near the middle of the valley about 9 kilometers inland and just south of the river. It consists of two large rectangular enclosures accompanied by considerable refuse which occasionally forms distinct mounds (Willey 1953: 265). Collier tested two of these mounds. No plant remains were preserved. The faunal sample consisted of very few bones, and these were identified as llama and shore birds. Most meat probably came from llamas, but the bird species, especially cormorant, contributed significantly. According to Hershkovitz and Foss who identified the material, most of the cormorant bone was femora--indicating a preference for thighs (Collier 1955: 133, 213).

V-305 is a midden area without architecture which is located very near the coast and about one kilometer north of the river mouth (Willey 1953: 447).

In upper Late Intermediate Period and Late Horizon levels, no plant remains were recovered, and the very small sample of faunal material identified was all llama and cormorant bone. Llama was more abundant and certainly represents the source of the greater quantity of meat consumed locally.

La Plata Compound (V-180) lies among the sand flats and dunes behind the beach about one kilometer inland and two kilometers north of the river near its mouth. The site consists of an adobe walled compound with inner partitions and associated piles of living refuse (Willey 1953: 302-304). Both plant and animal remains were collected by Collier when he tested the site. The few bones are mainly llama, but dog, shore birds, and a rodent were also identified. Plant remains include corn cobs, squash stems (probably Cucurbita moschata), guanábana seeds, and Canavalia bean pods. Within this small sample, maize and squash were most frequent (Collier 1955: 213-214).

Willey (1953: 304) notes that a large series of sunken garden areas lie within 100 meters of the La Plata Compound. V-305 is also very near these sunken areas as defined by Parsons and Psuty (1975: 264). This association suggests that the function of the two

sites may be correlated with the administration, construction, and maintenance of the nearby sunken gardens.

Archaeological plant and animal remains were recovered from a small site at the mouth of the Santa River which apparently had a highly specialized function. The site, called Loma Lasca, lies on the leeward side of a small rock hill about 400 meters from the ocean and 2.5 kilometers north of the river mouth. It consists of a small rectangular enclosure near an area of refuse. Surface collections and excavations by Donnan and Moseley (1968: 502-503) revealed that activities at the site focused on fishing. An unusually high frequency of large primary flakes in association with abundant fish bone and scales as well as net fragments at Loma Lasca suggested that the flakes were for cleaning fish. Mammal and bird bone as well as shellfish remains were also present, but infrequent. Plant remains recorded included only maize, paca, and gourd.

During her excavations at the site of Las Haldas, Fung tested isolated areas of ash concentrations about 200 meters from the central site on the edge of the local marine terrace. Two of these cuts yielded post-Early Horizon refuse (1969: 54-55, 122-128). The first cut encountered deeper refuse and yielded the

larger sample of floral and faunal material as well as ceramics, and is therefore more securely dated as Late Intermediate Period because of possible Chimu affiliations. Faunal material collected included some camelid wool, mammal bones, probable sea lion skin, abundant bird bone, vertebra (probably fish), and fragments of dried fish meat. Shellfish include a limpet species (F. maxima), Oliya, mole crabs, purple crabs, and a starfish. Other wave-worn shells were also noted. Marine algae was present. Other plant remains include abundant gourds and maize cobs, plus avocado and what was identified as chirimoya¹ (probably guanábana), lúcuma, and paca seeds, pepper, black beans, a possible sweet potato tuber, cotton tufts, Tillandsia, and possible chewed coca leaves.

Conclusions

This review of subsistence data above all reveals the extreme paucity of such data. This is particularly unfortunate in light of the optimum

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The two species, chirimoya (Annona chirimolia) and guanabana (A. muricata) have very similar seeds which are easily confused. Although chirimoya is the more common species today, it was not detected in a prehistoric context within the Moche Valley. This correlates with Cobo's description of his discovery of chirimoya in Guatemala in 1629 and his introduction of the plant into Peru (Cobo 1964: Vol. 1, p. 240-241).

conditions for organic preservation on the Peruvian Coast. The most complete information on subsistence comes from early sites, especially Preceramic examples, because of the preoccupation of archaeologists with early cultigens and because of the predominance of the subsistence component at such sites. Descriptions of later sites, in contrast, usually focus on more spectacular components such as architecture. However, the small amount of evidence available is extremely important in this attempt to reconstruct generalized patterns for the North Coast Region.

North Coast Subsistence Patterns

Within this chapter, subsistence data for the Moche Valley were examined in terms of major changes in the local economy and their resulting archaeological manifestations. Padre Aban was seen to be transitional in the change to a sedentary life style, and Caballo Muerto sites exhibited transitional elements correlated with the advent of irrigation and the move inland. Such transitional sites are rare, and their recognition is dependent on adequate subsistence data. More common sites are ones such as Galindo, Moche, and Alto Salaverry which typify the stable lifestyle between major

economic shifts. Data from such sites also provide much of the evidence necessary to reconstruct general subsistence patterns.

Early Permanent Settlements

The three early settlements reviewed for the region outside Moche share many features with the sites of Padre Aban and Alto Salaverry. All are coastal settlements with an essentially marine orientation. Animal protein consumed was usually largely supplied by shellfish and to a lesser extent, fish, birds, and marine mammals. Molluscan species identified at Huaca Prieta and Huaca Negra are generally the larger types and consistent with early Moche Valley inventories. Differences in frequencies observed at Las Haldas probably reflect the natural ranges and distribution of molluscan species. Cotton net fragments were reported from all Preceramic sites except Las Haldas, and an example from Huaca Prieta was a nearly complete haul seine with intact gourd floats. Shell fishhooks were absent at Las Haldas, rare at Huaca Negra, absent in Moche, and represented by a single fragment in Chicama. This suggests that hook and line fishing was less common than net fishing at early sites along the North Peruvian coast. The use of nets probably represented the more

efficient procurement system in valleys with large zones of open sand beach. Fish species are rarely identified in the literature, but the mention of remains of shallow water sand sharks and rays in the Viru material correlates very well with Moche Valley data.

Plant remains were never extremely abundant, and probably reflect access to limited cultivated areas of river floodplains. Only the plant inventory documented for Huaca Prieta is comparable in species variety to Alto Salaverry. The importance of the industrial plants, cotton and gourd, documented for Moche is paralleled by data from other sites. At Huaca Prieta the frequency of cotton textiles and gourd containers and floats attests to the abundance of industrial plants relative to other cultivated or tended species. At Huaca Negra and Las Haldas, cotton and gourds were the only cultivated species present in the Preceramic refuse.

A comparison of plant and animal remains and subsistence-related artifacts from Preceramic sites outside Moche reveal that economic patterns reconstructed for Moche are probably also characteristic of other North Coast Valleys. Generally, these patterns reflect similar adaptations to a coastal environment. Procurement systems focused mainly on shellfish collecting and

fishing, and in the Chicama to Viru area, many of the shellfish and fish species taken were probably common to all the sites. Industrial plants were the only cultigens at most sites, and the dominant species at the others. This suggests, that, in early North Coast sites, industrial plants consistently were more important than food cultigens because they were essential to marine oriented peoples without ceramics. At first, crop cultivation was viewed primarily as a means for obtaining these raw materials, not food, and consequently, since floodplain land was limited in area, such a focus on industrial plants resulted in a neglect of food cultigens.

Irrigation Agriculture: Adjustment and Development

In the Moche Valley, the advent of irrigation agriculture is correlated with the appearance of a large settlement located inland where canal construction and water control were easier. Similar settlements are located in analogous areas of most North Coast valleys, and presumably their existence and location were also predicated on irrigation agriculture. Unfortunately, as in the case of Moche, the only actual plant and animal evidence comes largely from contemporary coastal settlements. Outside Moche, assessments are

further hampered because not even faunal material is available from inland sites.

At all the coastal sites, animal protein was largely marine in origin. Llamas were identified at the temple near Huaca Negra, but these animals were not used for food. Shellfish continued to be important at Huaca Prieta and Huaca Negra and increased considerably in importance at Las Haldas and Gramalote. Apparently the larger species were still the focus of most procurement activities. Bird bone was common at all sites, and fish and sea lion bones were identified at Huaca Negra, Gramalote and Las Haldas. Sand sharks and rays were among the main species identified for Gramalote and Huaca Negra. Net fragments recovered from Gramalote and shell fishhooks from Las Haldas were the only fishing implements recovered.

Plant remains were abundant at Huaca Prieta and Gramalote, not preserved at Huaca Negra, and variable in frequency at Las Haldas. Data from Huaca Prieta provide the best evidence of cultigens derived from areas of irrigation agriculture. Maize, peanuts, pacaë, and avocado were added to the Preceramic inventory there, and this enlarged species range closely parallels Moche Valley data. Maize, the only species

quantified, was represented by almost 700 cobs. Cultigens could only have been obtained in such quantities from substantial irrigated fields. At Las Haldas, the early ceramic plant cultigen inventory also represented an increase over species recorded for the Preceramic occupation, especially during the phase associated with Chavin ceramics.

The Early Intermediate Period and subsequent Middle Horizon within the Moche Valley are characterized by very similar subsistence patterns. A focus on irrigation agriculture is reflected by the high frequency of field crop cultigens within the plant species inventory. The sites are largely independent of the coast and marine resources because most animal protein is supplied by the domesticated llama. Data available from other North Coast valleys reflect the existence of similar patterns outside Moche.

Early Salinar subsistence evidence for the Early Intermediate Period comes only from graves in Chicama and Viru. It is significant, however, that all the actual plant remains encountered in graves were field crop cultigens. These include maize, squash, and gourd in Chicama, and cotton, maize, gourd, and peanuts from Viru. Shellfish remains and bird bones from

Chicama graves provide the only evidence of the animal protein source.

Subsequent Gallinazo Early Intermediate Period refuse was also sampled in Chicama and Viru. Bird noted abundant maize as well as common beans among other cultivated species in a Gallinazo deposit near Huaca Prieta. Contemporary deposits from Castillo Tomoval yielded maize, peanuts, probable common beans, squash, lúcuma, avocado, and quayaba, and Huaca de la Cruz refuse contained maize, squash, common beans, and peanuts. This reveals that field crop cultigens dominated Gallinazo inventories as well. Faunal material was identified for three sites in Viru. At Castillo Tomoval and especially Huaca de la Cruz, land mammal bone, mostly llama, was common throughout the deposit, while remains of marine-derived products were rare or absent. At the Gallinazo site nearer the coast, both marine animals, especially mammals, and inland species, usually llamas, contributed substantially to the diet.

Much of the total species inventory reconstructed for the Moche portion of the Early Intermediate Period is based on ceramic depictions identifiable as to species. However, such data cannot provide quantitative information. Upper strata at Huaca de la Cruz

in Viru yielded the only actual plant and animal remains associated with Moche ceramics. Maize plant parts were very common; and gourd, common beans, lúcuma, and quayaba were also present within the stratified refuse. Gourd containers filled with unprocessed cotton, maize kernels, and common beans were part of the grave goods in nearby Moche burials. All faunal remains recorded in the upper Moche levels came from land animals. Llama bones, dung, and hair were abundant, and guinea pig dung was also identified.

Middle Horizon subsistence data from outside Moche come from the Moche V sites of Pampa Grande in Lambayeque and Cañoncillo in Jequetepeque. At Pampa Grande, most of the meat was supplied by inland mammals, especially llama. Most of the meat consumed at Cañoncillo came from domesticated llamas, but marine animals, especially sea lion and shellfish also contributed substantially to this portion of the diet.

Maize, common beans, squash, peanut, pepper, lúcuma, and avocado remains were recovered from refuse within residential sectors of Pampa Grande. Two burned storeroom complexes, also in the residential sector, yielded large quantities of carbonized remains of the maize and beans they originally contained. Cañoncillo

refuse contained very little plant material. Only maize, lúcuma, and avocado were identified, and of these, maize was by far the most common.

Within the Moche Valley, the time between the first local occurrence of ceramics and the end of the Middle Horizon is marked economically by adjustments and developments correlated with the advent of irrigation agriculture. Data from Gramalote and Caballo Muerto reflect the period of adjustment which followed the change of values that led to a focus on agricultural production. Subsistence patterns reconstructed for Moche and Galindo reflect the efficient use of a well-developed system for irrigating large expanses of fields. Evidence from other North Coast valleys generally parallels closely information known from Moche, and occasionally suggests patterns not documented within Moche.

Since none of the other inland centers analogous to Caballo Muerto have been excavated, evidence of the period of adjustment for the North Coast region is indirect. The consistent inland location of early ceramic sites attests to their use of irrigation. However, without faunal data from inland sites, continuing dependence on coastal resources cannot be

verified. Data from coastal early ceramic sites does suggest that the interdependence documented for Caballo Muerto and Gramalote within the Moche Valley was not an isolated phenomenon. The variety and frequency of early ceramic plant material compared to the Preceramic sample at Huaca Prieta, and to some extent, Las Haldas, reflect access to larger areas of arable land opened by irrigation. Contemporary faunal data from Huaca Negra and especially Las Haldas indicate a continued or increasingly systematic exploitation of marine resources.

By Moche times within the Moche Valley, settlements were no longer necessarily located near points strategic to water control, and inland sites had become independent of the coast. Salinar and Gallinazo sites outside Moche yielded information which helps to reconstruct subsistence patterns for the earlier parts of the Early Intermediate Period. Plant remains from Salinar graves reveal that field crop cultigens had increased in importance with the development and expansion of the irrigation system. However, the bird bone and shellfish remains described in Chicama graves may reflect a continued substantial dependence on marine-derived animal protein. Gallinazo subsistence data from Chicama and Viru provide further evidence of the

emphasis on field crop cultigens. Domesticated llamas provided nearly all of the meat at inland sites, while at a site nearer the coast, the meat contribution from inland species was supplemented and perhaps equalled by marine animals.

Finally, subsistence material from Moche refuse in Viru coincides very closely with the dependence on crop cultigens and domesticated llamas documented for the Moche Huacas population. Data from North Coast Early Intermediate Period sites which antedate, or are contemporary with the Moche Huacas, reveal that patterns reconstructed for the Moche Valley were also generally characteristic of earlier Early Intermediate Period settlements and very characteristic of later Early Intermediate Period settlements.

These same patterns were largely characteristic of North Coast Middle Horizon sites as well. Plant remains recovered from Cañoncillo and especially Pampa Grande agree very well with the sample from Galindo which consisted mainly of field crop cultigens. Dependence on domesticated llamas is also common to all three Moche V sites although the people of Cañoncillo also relied heavily on marine resources.

An examination of the specific data available

concerning maize cob size and morphology reveals that several trends observed in the Moche Valley sample may be paralleled in other areas. The large size of Gallinazo and Moche cobs from Viru is comparable to Moche Valley data. A consideration of cob row number suggests that high row numbers and variable row numbers are common at least through the Early Intermediate Period and possibly into the Middle Horizon. These suggested trends can only be tentative reconstructions when based on such a few small samples.

Satellite Communities and Redistribution Systems

During the Late Intermediate Period and Late Horizon the Moche Valley economic patterns were shaped by the Chimu state based at Chan Chan within the valley. Direct economic relationships between specialized satellite communities and the center were recognized and evaluated. For North Coast regions outside Moche, data were not adequate to allow for such a detailed reconstruction of whole interrelated subsistence systems within other valleys. Therefore, the available evidence is evaluated in terms of how different sites might have functioned within the type of state-controlled economic system documented for Moche.

Of the sites which yielded subsistence data,

the only one which may have been a center rather than a satellite community is V-171 near the center of the Viru Valley. Its size and complexity relative to other contemporary sites within the valley suggest that V-171 may have functioned as something of a provincial capital. Very little subsistence data were recorded for the site, but the heavy reliance on llama meat is characteristic of a Chimu center. The predominance of cormorant femora is indicative of a restricted meat distribution system at the site. Such a collection of a single shore bird meat unit at an inland site may reflect specialized systems of procurement and processing at a coastal site plus a redistribution system to supply the center.

The remaining sites reviewed probably functioned as satellite communities, established to exploit a specific resource. La Plata Compound and V-305 near the Viru River mouth are probably analogous to Choroval within Moche. Such sites functioned to maintain and farm the sunken gardens. The small amount of plant and animal remains described for the sites correlate well with this interpretation. The concurrent use of state-supplied llama meat and locally derived marine resources is a pattern well-documented for Moche. Very little

plant material was recovered, but maize and squash remains were most abundant. This closely parallels the Choroval situation and suggests that Viru sunken gardens were similarly devoted to these food crops. A detailed analysis of the maize remains by Cutler revealed that all cobs were 8 (62.5%) or 10 (37.5%) row. Such high frequencies of 8 and 10 row cobs are also characteristic of the Late Intermediate Period and Late Horizon sample from Moche.

The Santa Valley site of Loma Lasca and the campsite near Las Haldas were settlements specializing in marine exploitation. Occupants of Loma Lasca captured and processed immense quantities of fish, while the people near Las Haldas took shellfish and shore birds as well as fish. Predictably, because of the quantities of animal protein locally available, no llama bone was identified at either site. Plants, however, were supplied to the sites. Small amounts of a few species were recovered at Loma Lasca, but at the campsite near Las Haldas, plant remains were abundant, and most species common to contemporary Moche Valley sites were present.

Conclusion

A summary of major subsistence patterns documented for the Moche Valley and a subsequent review of subsistence data from North Coast valleys outside Moche indicate that major economic patterns documented for Moche are also characteristic of the North Coast region as a whole. At the same time, this reconstruction of subsistence patterns which are typical of the North Coast can be used to suggest reasons for such consistencies over a large area.

The first major shift documented by this study was the change from a nomadic lifestyle to the establishment of permanent settlements which marked the beginning of the Cotton Preceramic. Marine procurement and floodplain cultivation were the economic patterns characteristic of this time, and all the sites studied conform to this general description. Subsistence systems documented for Cotton Preceramic sites are similar mainly because they reflect parallel, but generally independent adaptations to essentially the same environment.

The second economic shift was correlated with the advent of irrigation. Initially, during a period of adjustment to this revised economy, sites were located upvalley where canal construction and water control were

easier. Despite this new focus on irrigation agriculture, marine resources continued to be important in the diet, therefore inland sites maintained contact with the coast. Unlike the Preceramic sites which were largely independent, major early ceramic sites shared cultural features which document communication between valleys and over considerable distances. The existence of one or more substantial early ceramic sites at crucial inland points for water control in virtually all North Coast valleys attests to the rapid spread of ideas concerning irrigation. Such a rapid spread and adaptation was possible because of the marked similarity between Peruvian coastal valleys which generally contain the same ecological zones. Systems which functioned in one valley could be readily applied in the analogous niche of any valley. From early ceramic times until the Spanish conquest, the North Coast continued to be unified politically, culturally, and economically to varying degrees.

After the initial period of adjustment, irrigation systems and field systems became increasingly organized and better developed. This is reflected in the emphasis on field crop cultigens documented for Early Intermediate Period and Middle Horizon sites.

A concurrent focus on domesticated llamas to supply meat made such sites largely independent of marine resources. Settlements generally housed large agricultural populations, and the agricultural products present at each site reflected crops grown on land controlled and worked by a given site.

This developed economic system, characterized by large-scale irrigation agriculture and llama use, persisted unchanged through the several ceramically defined periods of the Early Intermediate Period and the Middle Horizon. This stability largely reflects the efficiency of such a system as a means of adapting to and exploiting a Peruvian coastal valley. However, despite its efficiency, this economic system was dependent on the recognition and use of only a very few large ecological zones within a valley. There is no indication that additional zones were systematically exploited during either the Early Intermediate Period or Middle Horizon. Consequently, to a polity such as Moche, expansion meant gaining control over only those zones which were considered useful within a series of valleys outside Moche.

In contrast, the subsistence shift and resulting economic patterns reconstructed for the Late

Intermediate Period and Late Horizon were characterized by the systematic additional exploitation of resources in zones which were not previously recognized as useful or accessible. This was accomplished through the establishment and control of highly specialized satellite communities, each of which performed a narrow range of functions, such as farming, for the state. An efficient system of redistribution was essential to the success of such an economy in order to provide a balance of goods and services among sites within the jurisdiction of the state.

Such an effort to use new resources resulted in the addition of several new species to an inventory which had persisted virtually unchanged since early ceramic times. It may also be correlated with the observed emphasis on fruits in the plant diet and the corresponding lesser use of maize. The most significant of these new plants was the fruit, guanábana, which became available and immediately popular as new land areas were opened. Also because of the recognition and use of new resource zones, Chimú expansion resulted in the incorporation and use of more resource zones in the series of valleys which came under state control.

The similarity of Late Intermediate Period

and Late Horizon subsistence patterns reconstructed for valleys on the North Coast is largely a result of this control exerted by the Chimú state.

CHAPTER XI

AN EVALUATION OF THE MOCHE VALLEY

SUBSISTENCE STUDY

Initial Goals

Data on subsistence from sites along the Peruvian coast have been largely impressionistic. This study, confined to the Moche Valley, was an attempt to quantify such evidence and then use it as a basis for reconstructing subsistence systems. These systems could in turn be used to reconstruct more generalized patterns as well as to pinpoint major economic changes through time. It was also hoped that patterns documented for Moche would prove to be generally characteristic of a larger geographical region of the coast as well.

Methodology

All aspects of this study--from choosing the sites for excavation to the final interpretations--were predicated on the assumption that the frequencies of plant and animal species within an excavated volume are indicative of their importance to the occupants of

the site. Efforts were made to choose sites for excavation which were truly representative of a given time period. Attempts were made to sample more than one site from a given period to explore variation due to a site's location within the valley. On the site level, extensive testing was done; and more than one controlled cut was usually made to be sure the sample collected was typical of the site. Finally, procedures employed to quantify plant and animal material from each volume excavated were directed at carefully reconstructing the total contribution of each species within the sample without misrepresenting any species.

Accomplishments

Overall, this subsistence study was successful. After the data were analyzed, specific subsistence systems could be documented at each site. These in turn suggested broader patterns and revealed major prehistoric economic shifts within the Moche Valley at the onset of the Cotton Preceramic, during early ceramic times, and again at the beginning of the Late Intermediate Period. A comparison of the Moche Valley data with the small amount of evidence from other North Coast valleys suggests that broad patterns documented

within Moche are typical of other North Coast valleys as well.

Limitations

Many of the major limiting factors were recognized and described at the onset of this study. These include the problems of finding representative sites and representative refuse for each major time period. Without the information accumulated through previous and concurrent excavations by members of the Chan Chan Moche Valley Project, my difficulties in overcoming these problems would have been much greater. Most important, this data saved valuable time which was used to process a larger volume of refuse.

The problem of differential preservation, even in an arid region such as Peru, has also been discussed. It is extremely important to be able to recognize relatively poor preservation. One project member who worked only at Galindo, boasted of the plant preservation, but I was able to recognize it as poor because of my work at other sites. Often, as in the case of the Caballo Muerto sample, differential preservation made the documentation of an important shift difficult, but missing data could usually be partially reconstructed as in this

case when plant material from Gramalote was available. The effects of differential preservation on a species level were most difficult to deal with. For example, tubers and such totally consumed species were next to impossible to quantify meaningfully.

Initially, the identification of floral and faunal material caused numerous problems. Animals became easier to work with as more type collections became available. Plant cultigens were very familiar, but my knowledge of most wild species is minimal. It was fortunate for my study that wild plants, except for species such as cane, did not figure largely in Moche Valley subsistence. I had help to identify the few which were collected and found they are still among the common weeds within the valley.

The difficulties of converting the remains from an excavated volume to meaningful amounts have also been considered in detail. I was determined to reconstruct values for only what the sample actually contained. Therefore, I found it necessary to modify traditional methods of dealing with larger animal species.

A final limiting factor which affected every aspect of the study was time. In order to sample so many sites, it was impossible to spend more than three to four weeks at each one. Therefore, samples such as

the ones from Gramalote and Padre Aban were often necessarily reduced because of the time required to field process immense quantities of shell. In the laboratory, analysis was also involved and lengthy. While I occasionally employed others to perform more objective tasks of recording some counts and weights, I felt that subjective evaluations were my responsibility. This portion of the analysis involved more than a year of full-time work. Consequently, no time remained for other complementary types of analysis such as the processing of soil samples using fine screening and flotation techniques.

Suggestions for Further Study

Speaking now from hindsight, there are a number of specific ways that a study of subsistence such as mine could be more efficiently implemented. I would warn anyone without both a knowledge of biology and a tolerance for mindless, tedious tasks against attempting such a study on his own. I would not suggest outright hiring of many specialists because many of my ideas grew out of the time I spent actually handling all classes of material. However, it is very important to contact specialists for help in problem areas, and,

though most are extremely generous with their time out of pure interest, it would be more considerate to be able to offer them consulting fees.

Now that I have a better perspective, I could more closely estimate the time necessary for excavation, analysis, and other special processes so that none are neglected. Perhaps a study more restricted in time or space would be a more feasible undertaking. Certainly, within the Moche Valley, more work could be done at sites not explored through this study.

On a more general level, like all archaeologists, I would like to see more similar work done in both the North Coast Region and Peru as a whole. Subsistence evidence for later ceramic times is especially inadequate. While many Moche Valley patterns seem typical of the North Coast Region, with more such data from the North Coast it would be possible to compare more specific details such as the high frequency of fruit apparently consumed in Moche during the Late Intermediate Period and Late Horizon. Similarly, with more information from other Andean regions, broader comparisons would be possible. For example, the field crop agriculture/domesticated llama economic pattern documented for Moche and the North Coast transcends several ceramically defined cultural phases; therefore

it probably reflects an efficient adaptation to coastal valley zones. However, the Late Intermediate Period and Late Horizon Chimu expansion into and organized use of additional zones seems to be largely a culturally determined feature correlated with effective long-distance control. With additional data from outside the North Coast, such relationships could be better evaluated and certainly clarified.

ILLUSTRATIONS

Figure 1: The Moche Valley, illustrating its location on the Peruvian Coast, the major topographic features, the location of prehistoric sites, and the location of modern communities.

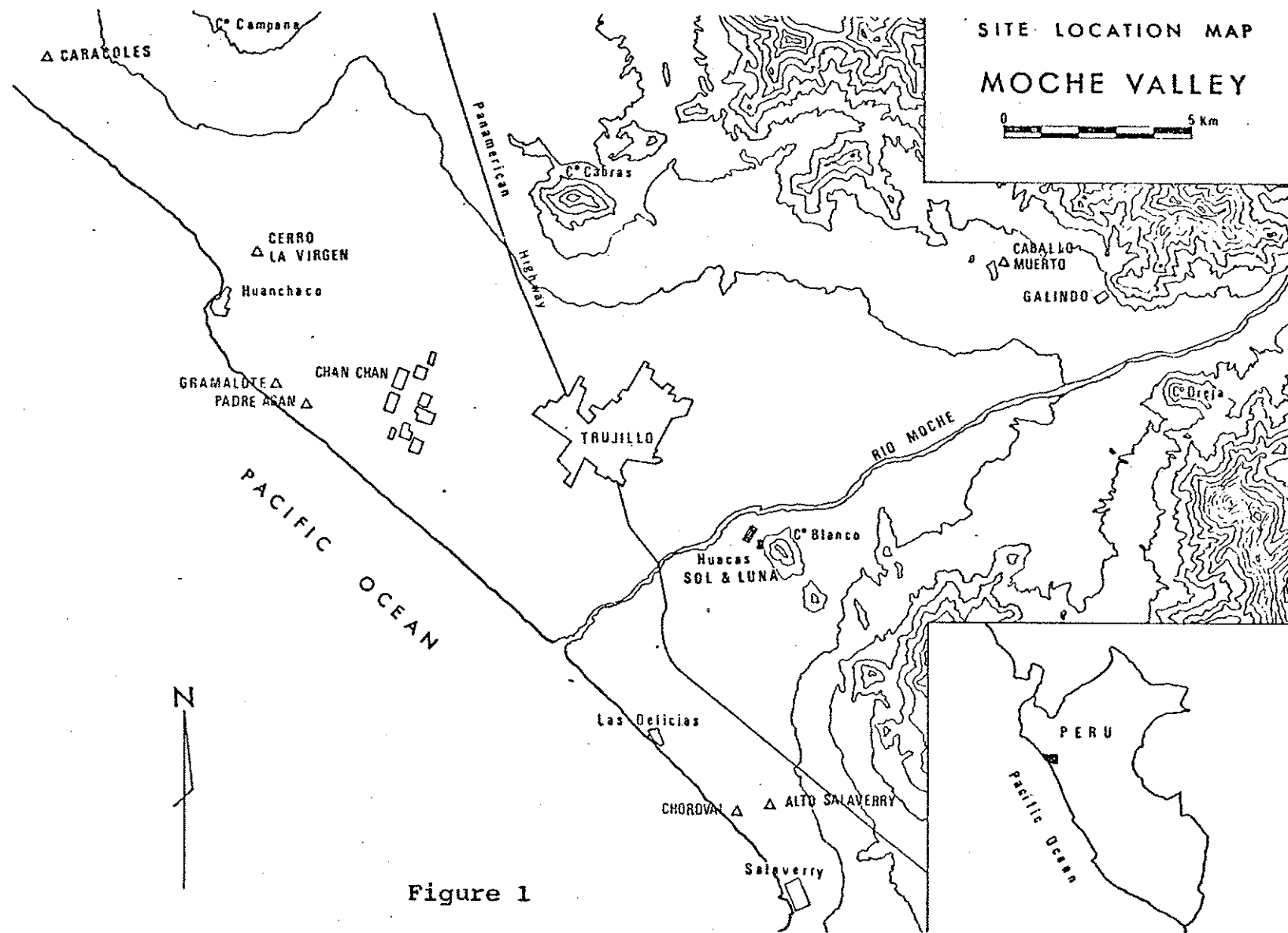


Figure 1

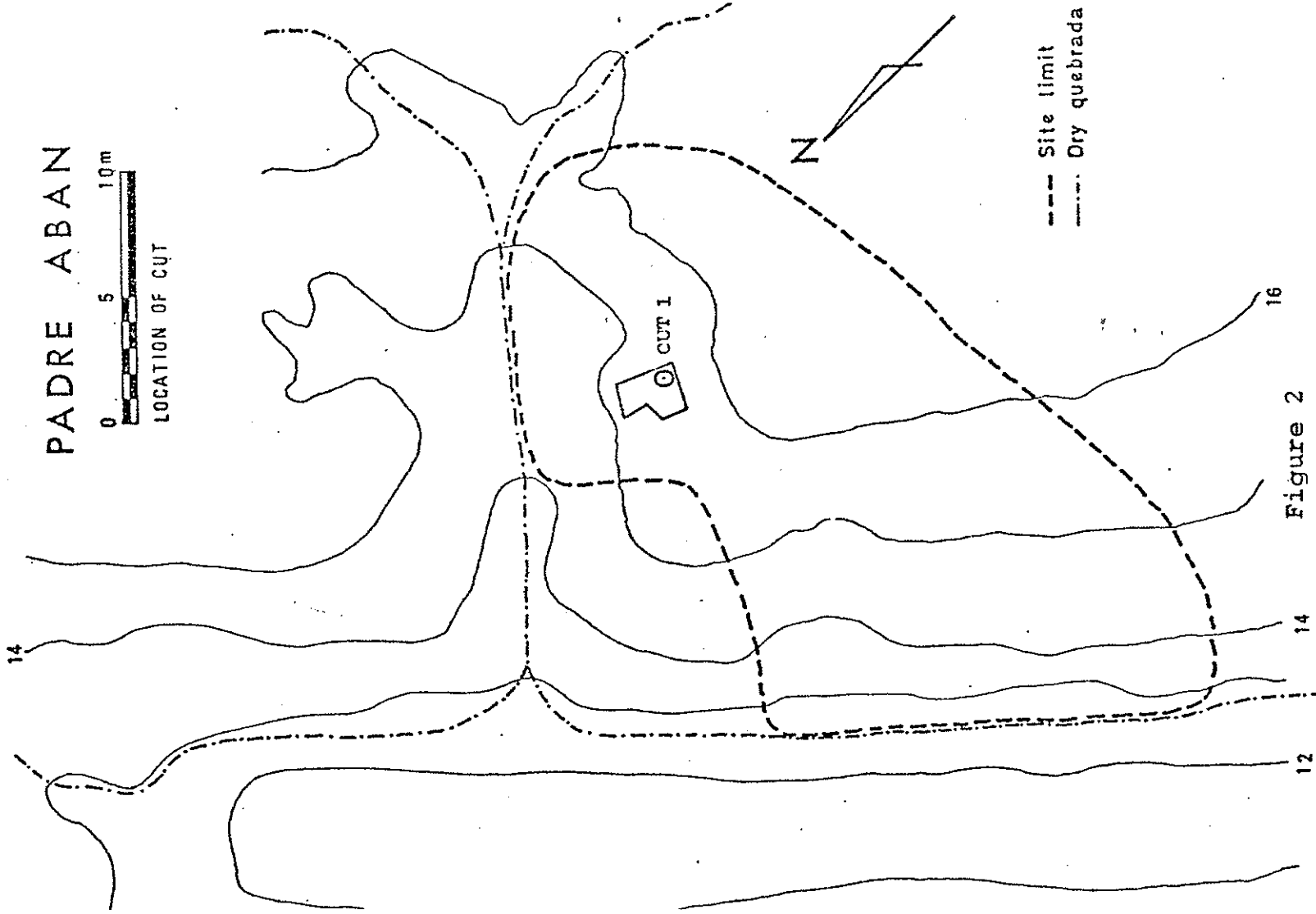


Figure 2

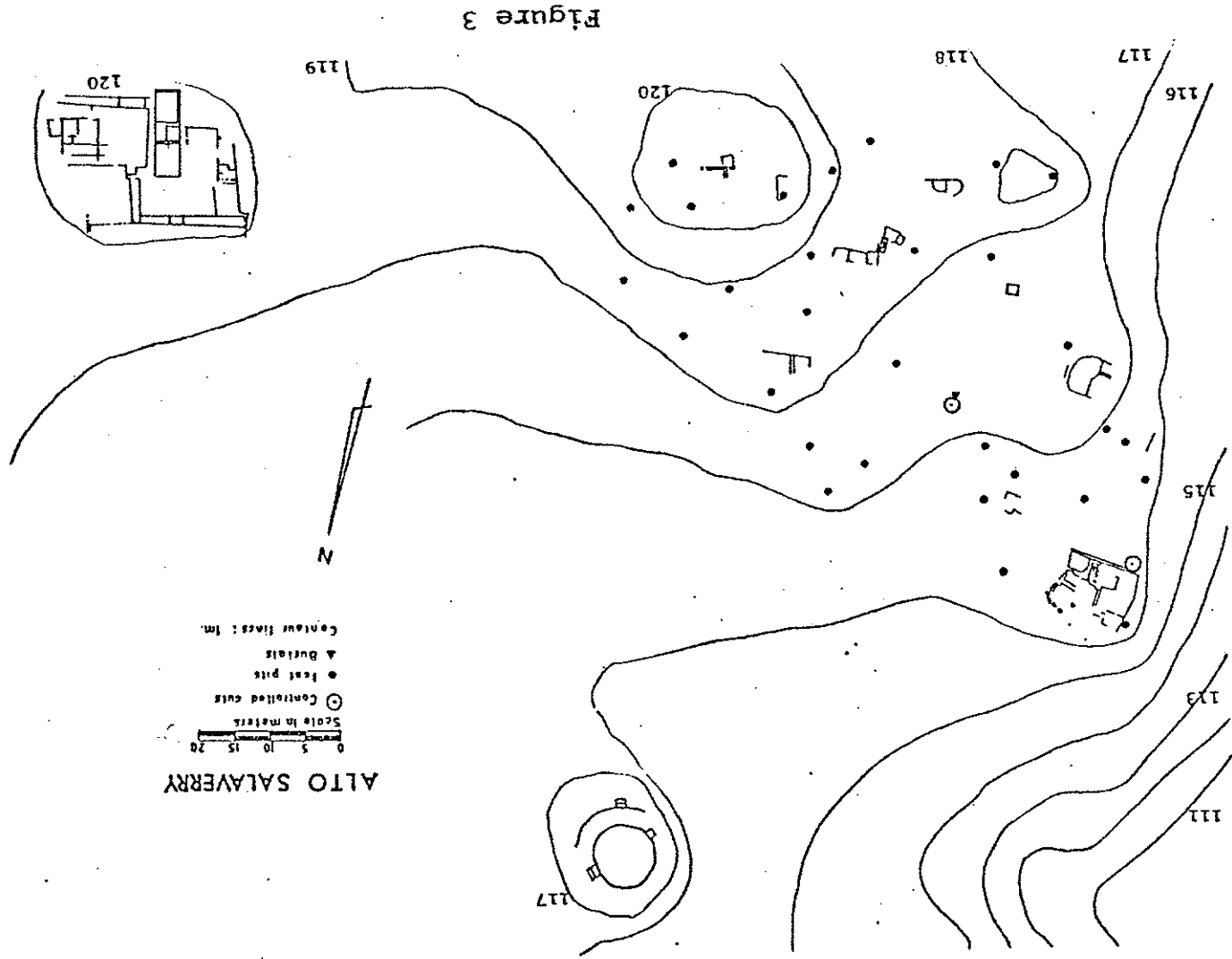


Figure 3

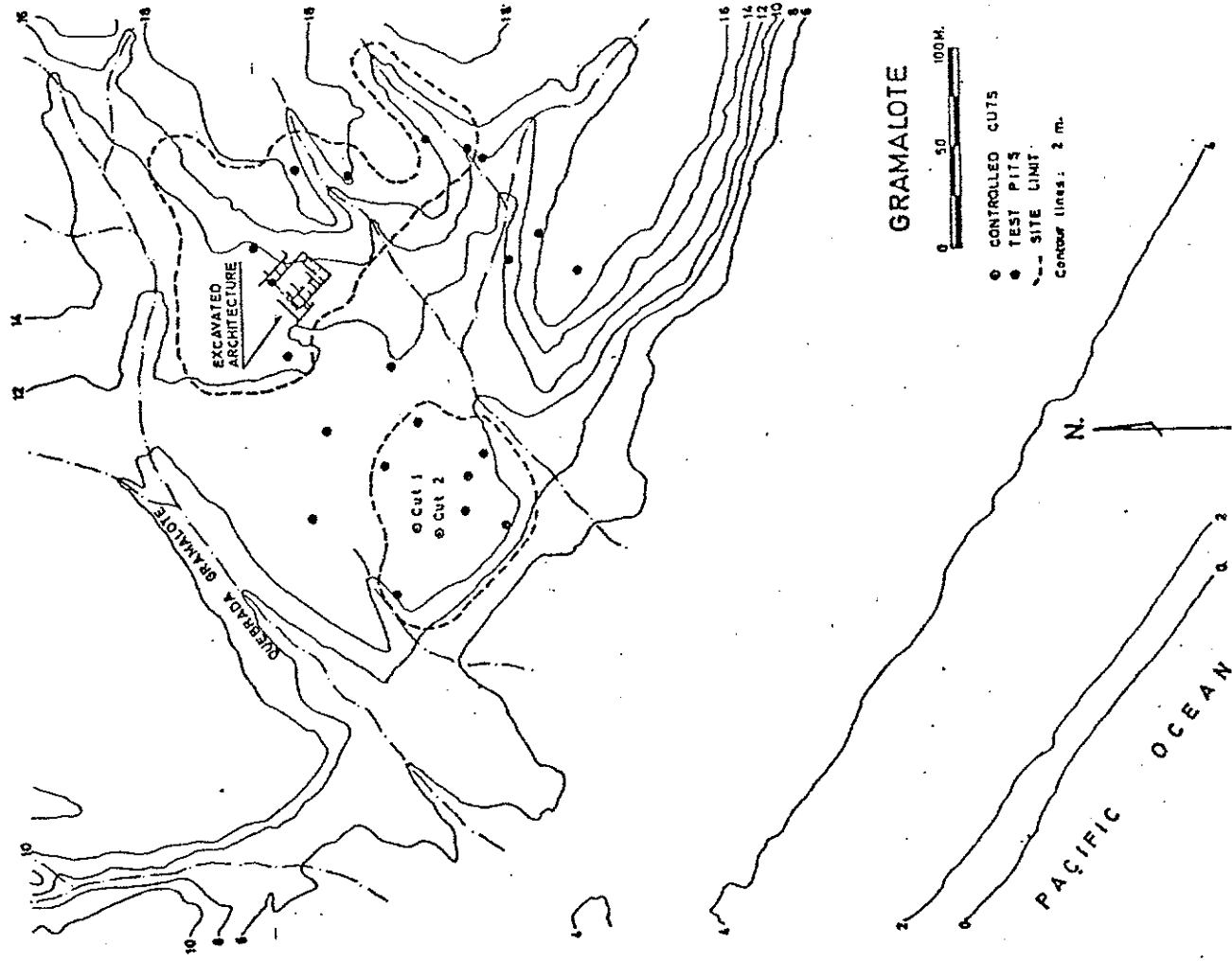


Figure 4

CABALLO MUERTO

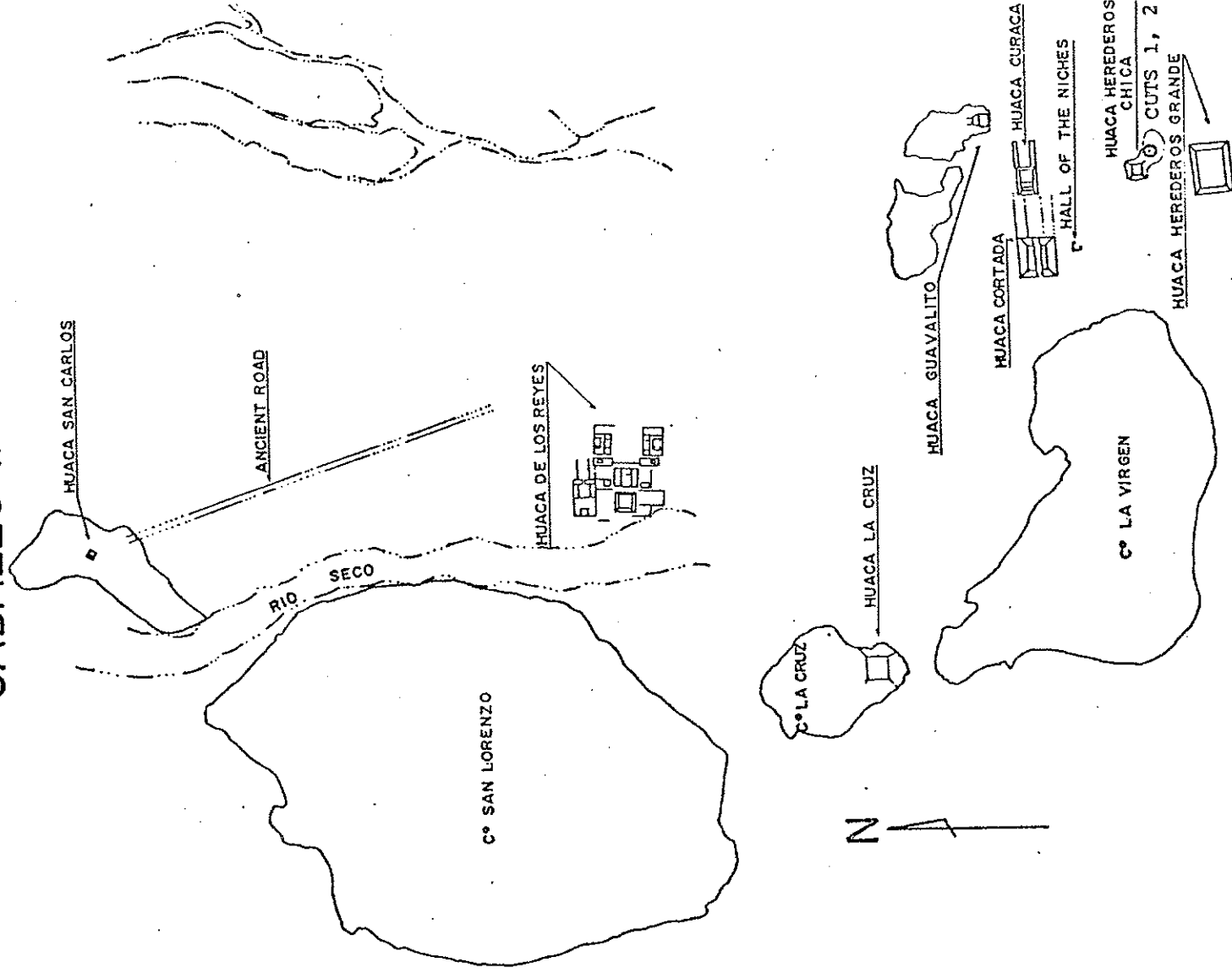
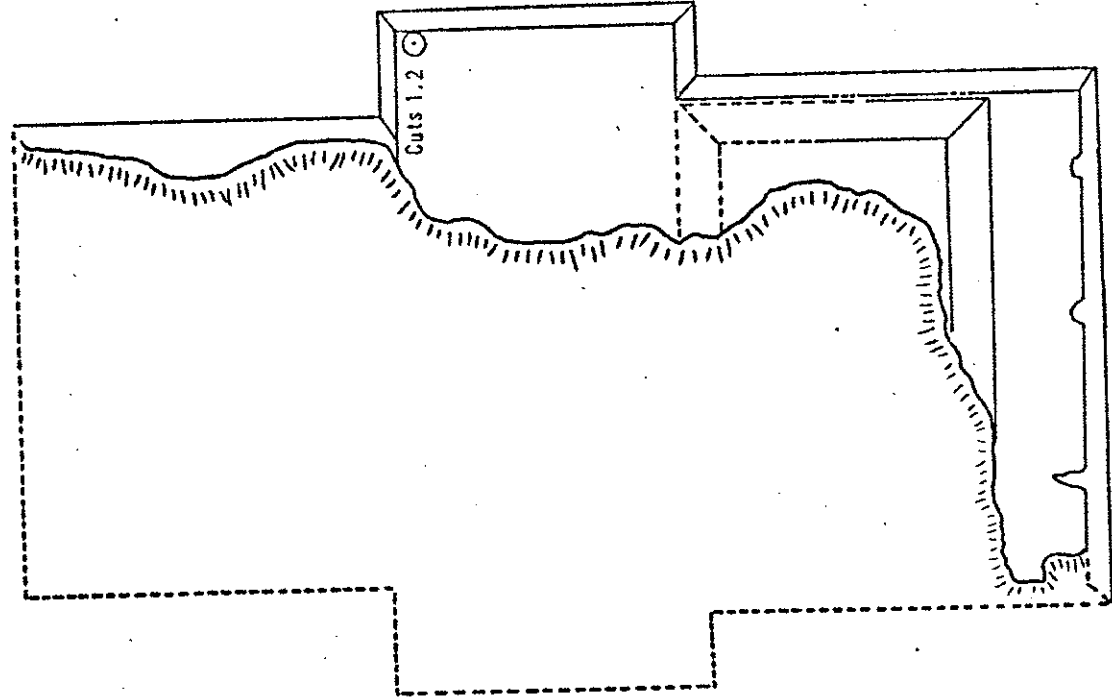


Figure 5

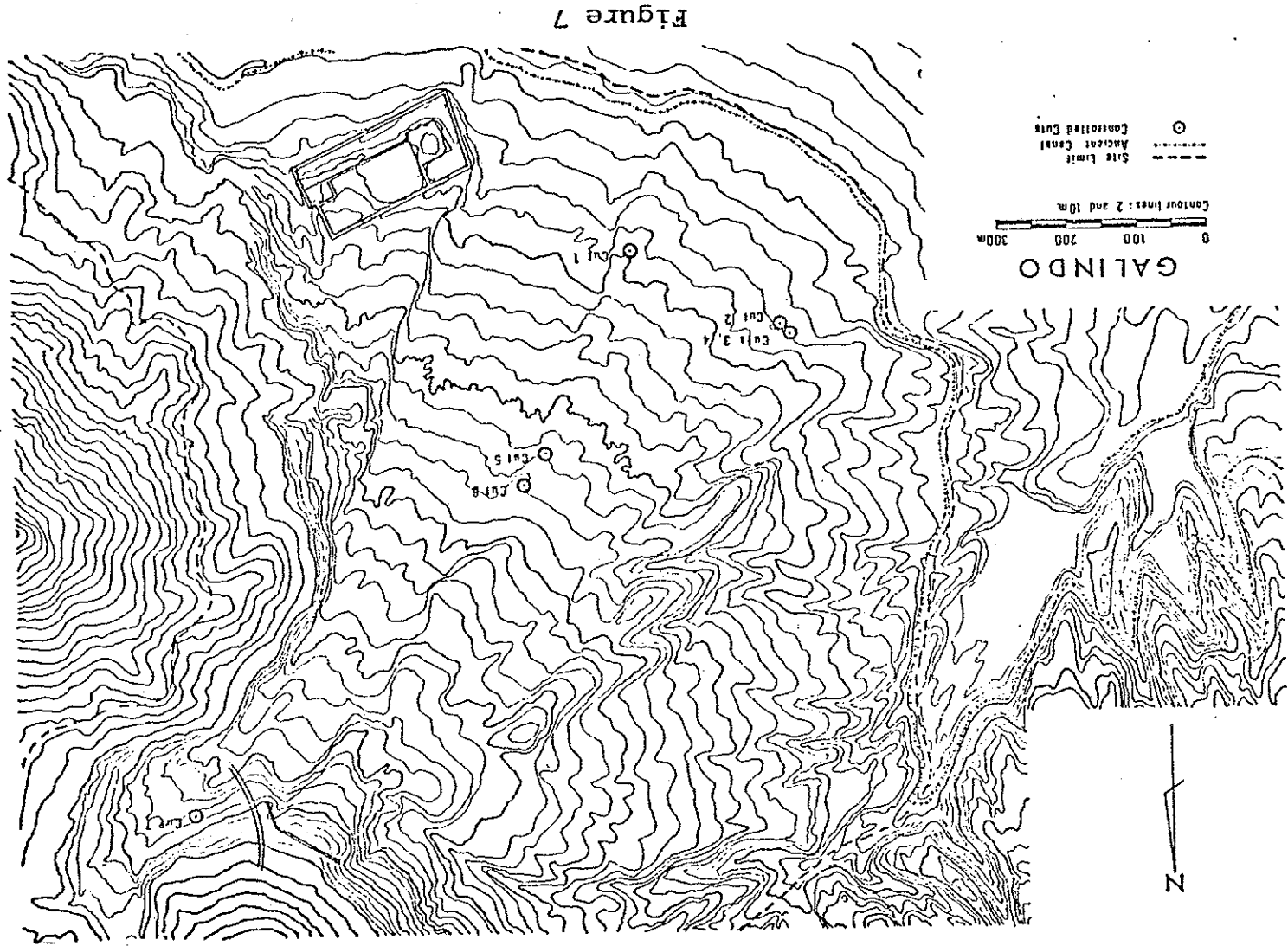
0 200 400 M
Scale in meters

HUACA DEL SOL



0 20 40 60 80
Scale in meters

Figure 6



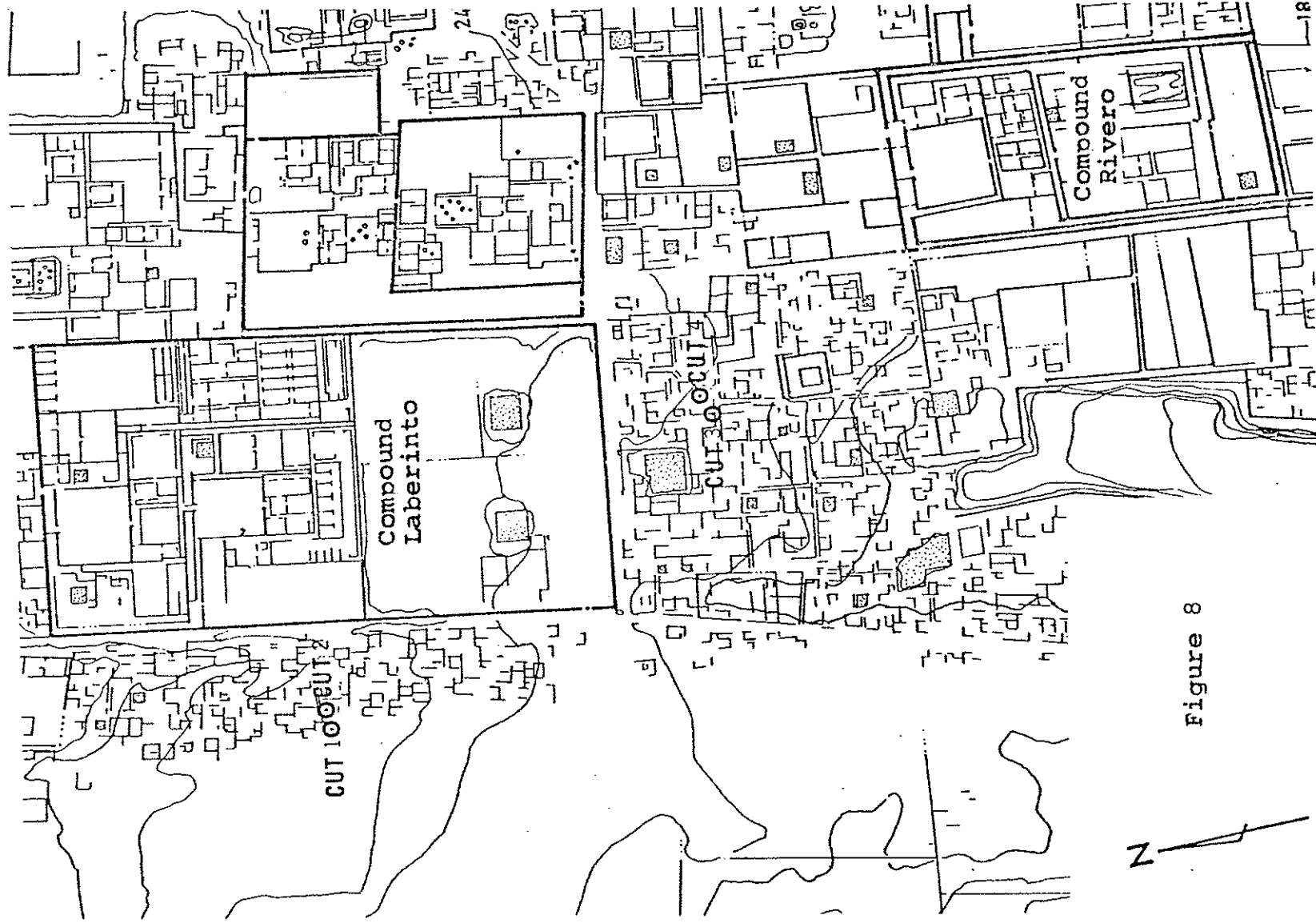


Figure 8

CHAN CHAN
COMPOUND RIVERO

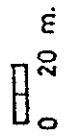
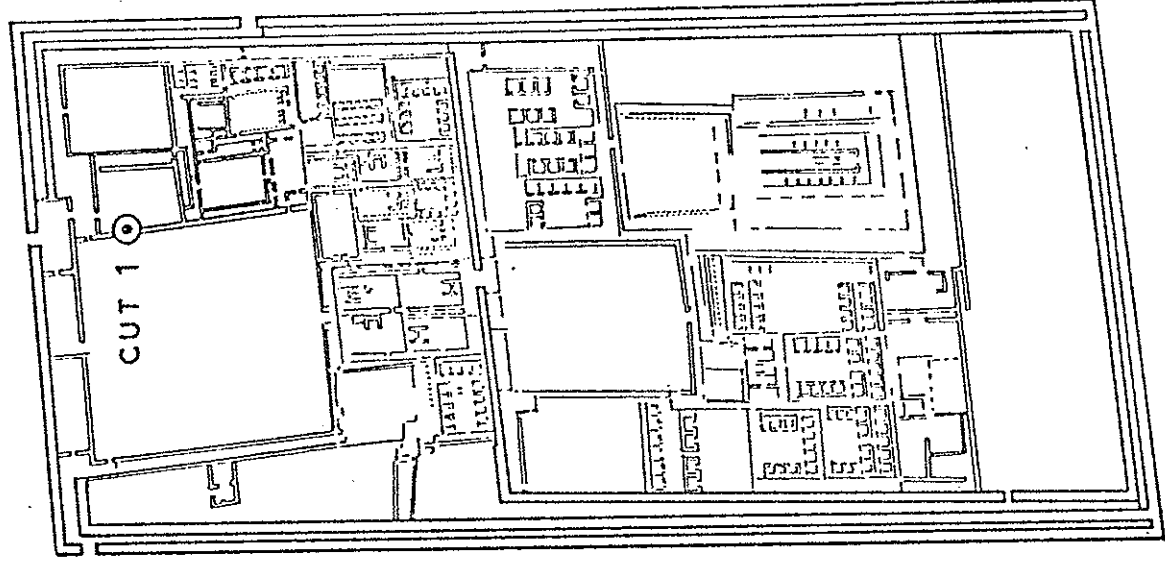
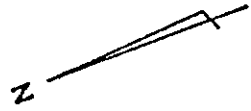


Figure 9

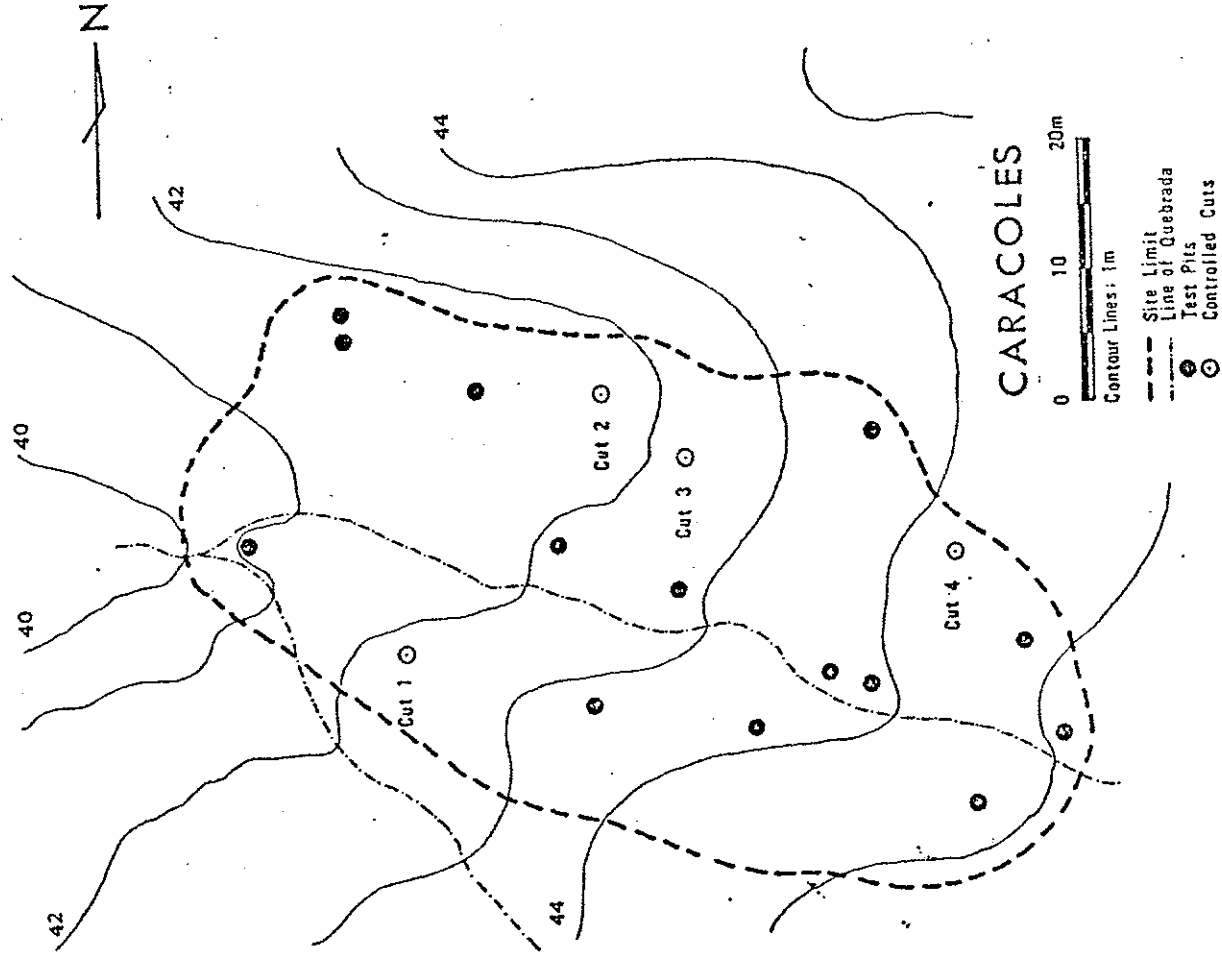
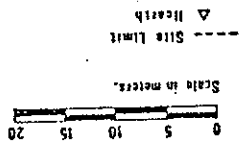
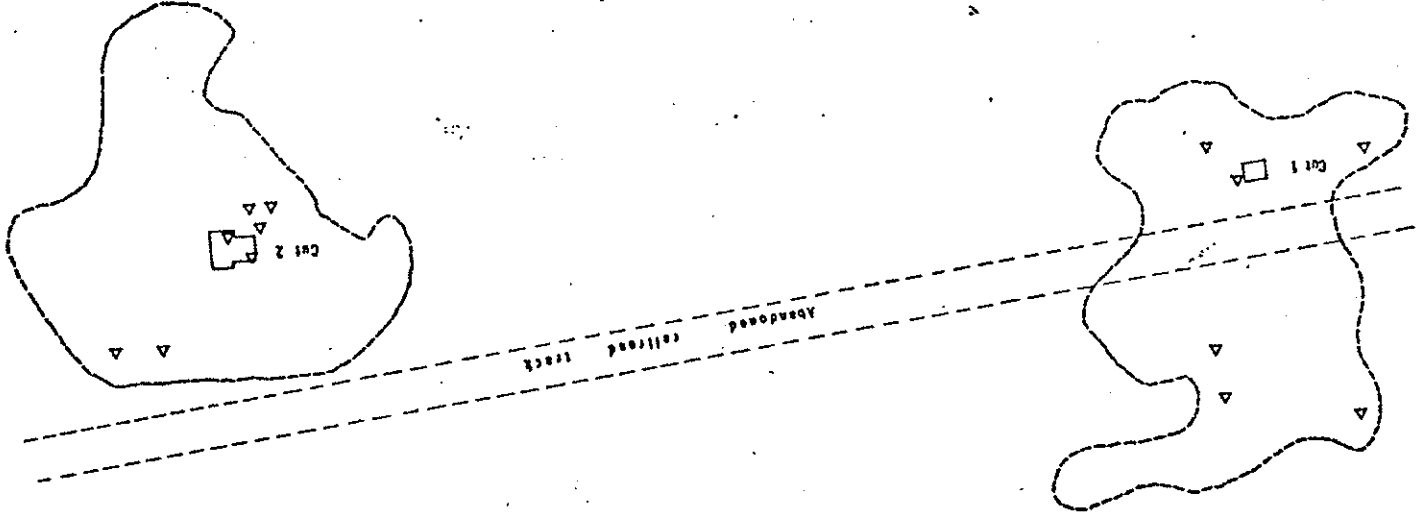
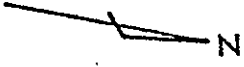


Figure 10

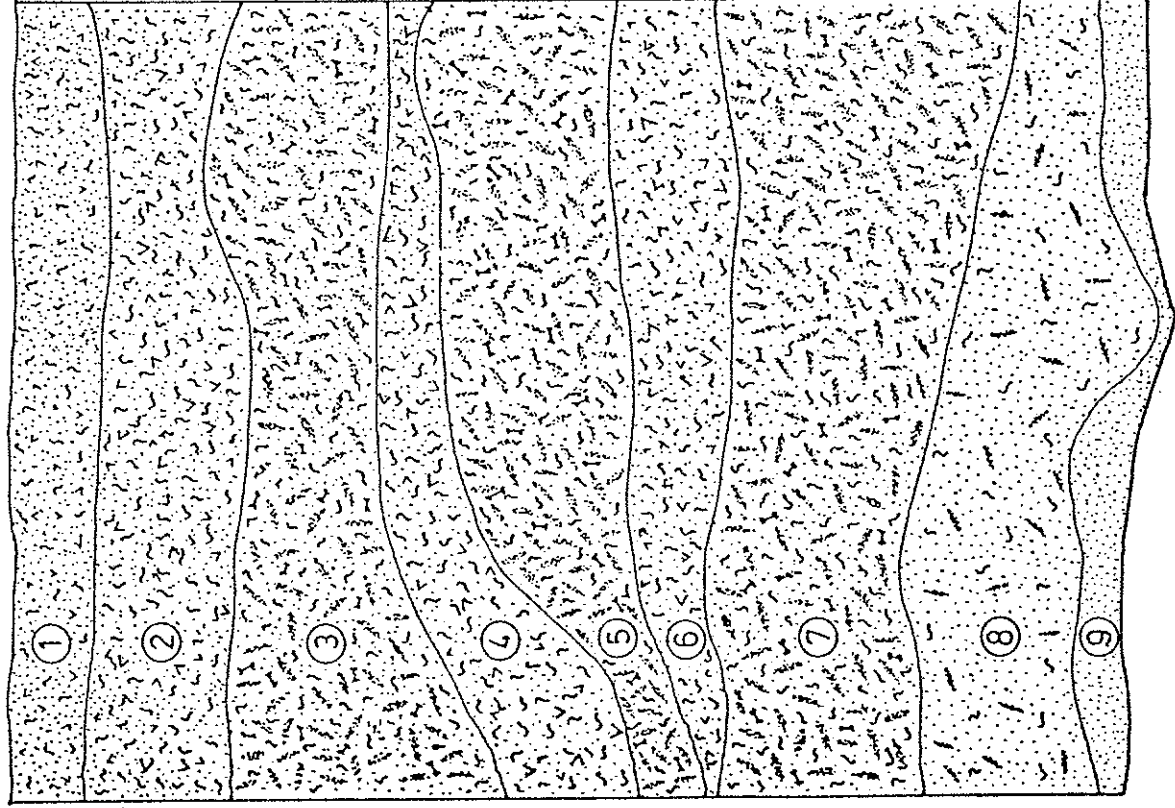
Figure 11



CHOROVAL



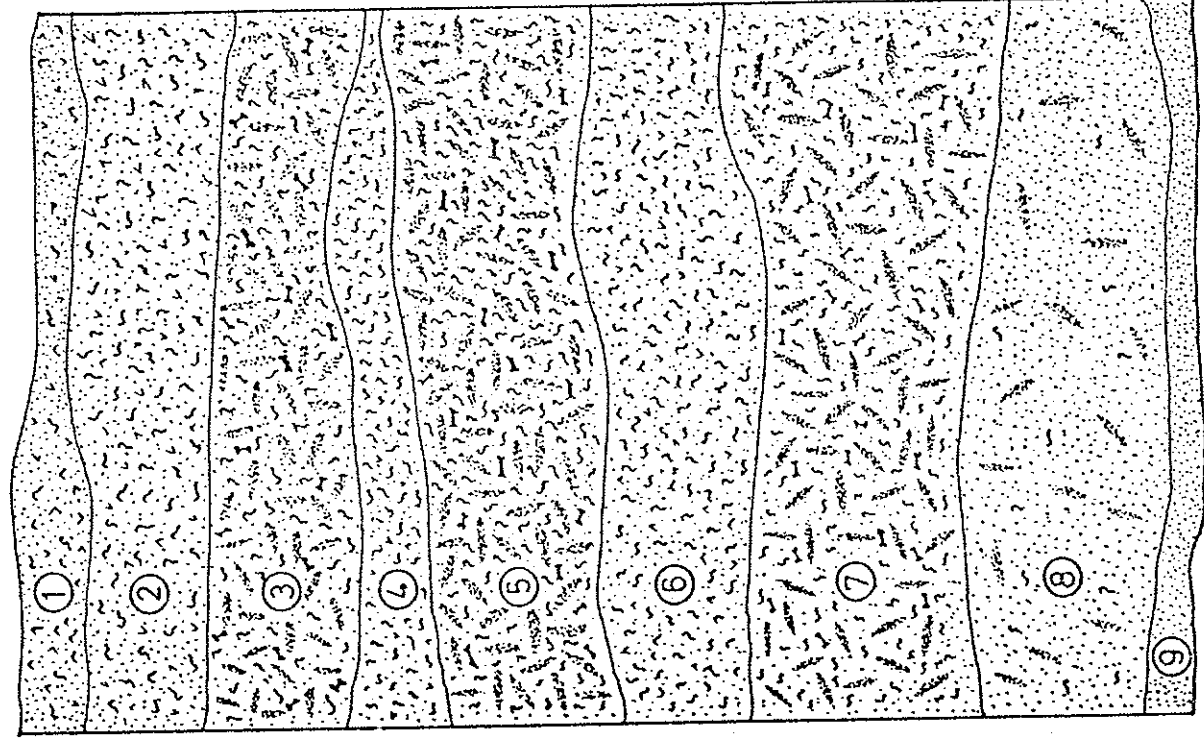
PADRE ABAN
PROFILE I



0 10 cm.

Figure 12

PADRE ABAN
PROFILE II



0 10 cm.

Figure 13

HUACA DEL SOL PLAN OF EXCAVATIONS

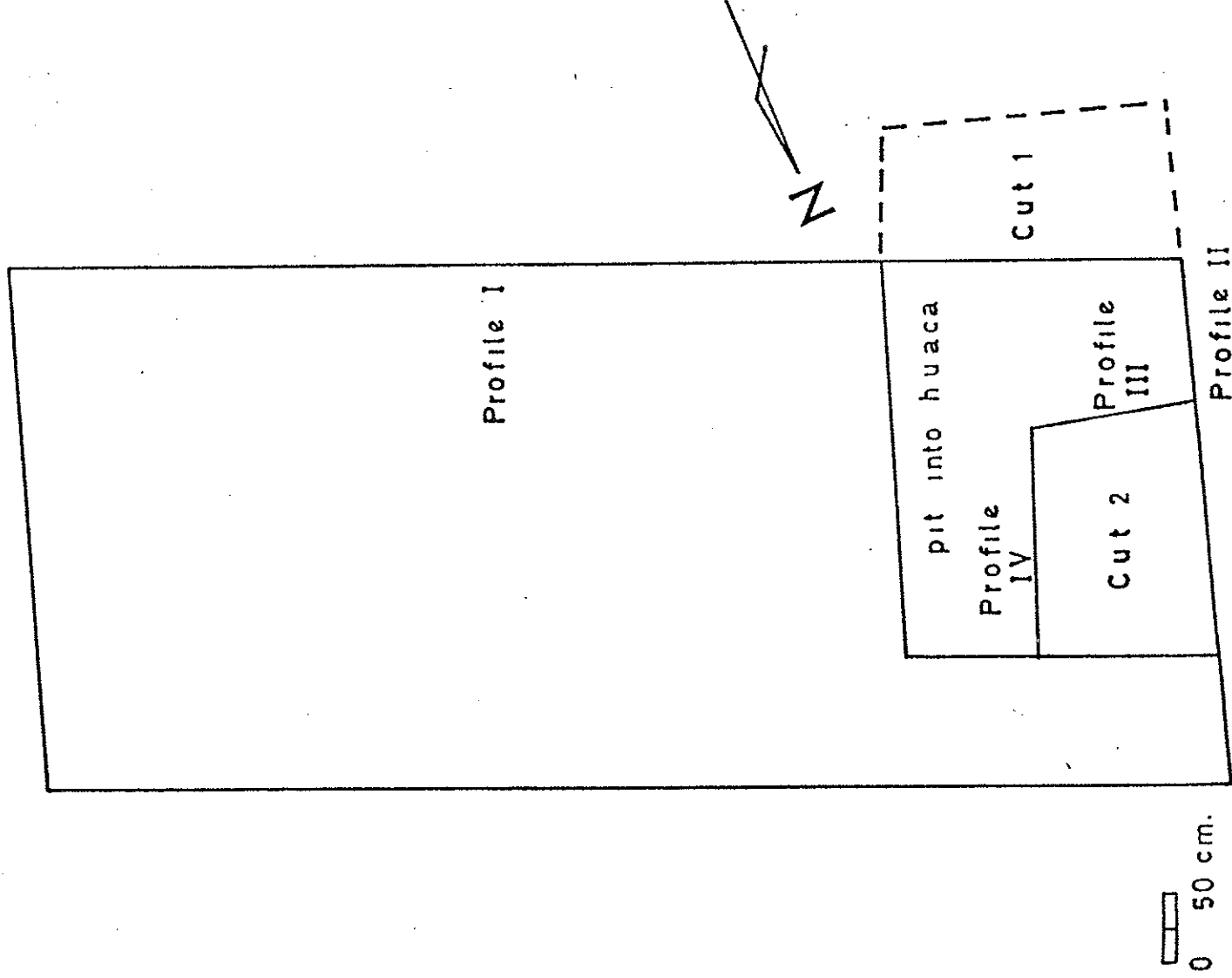
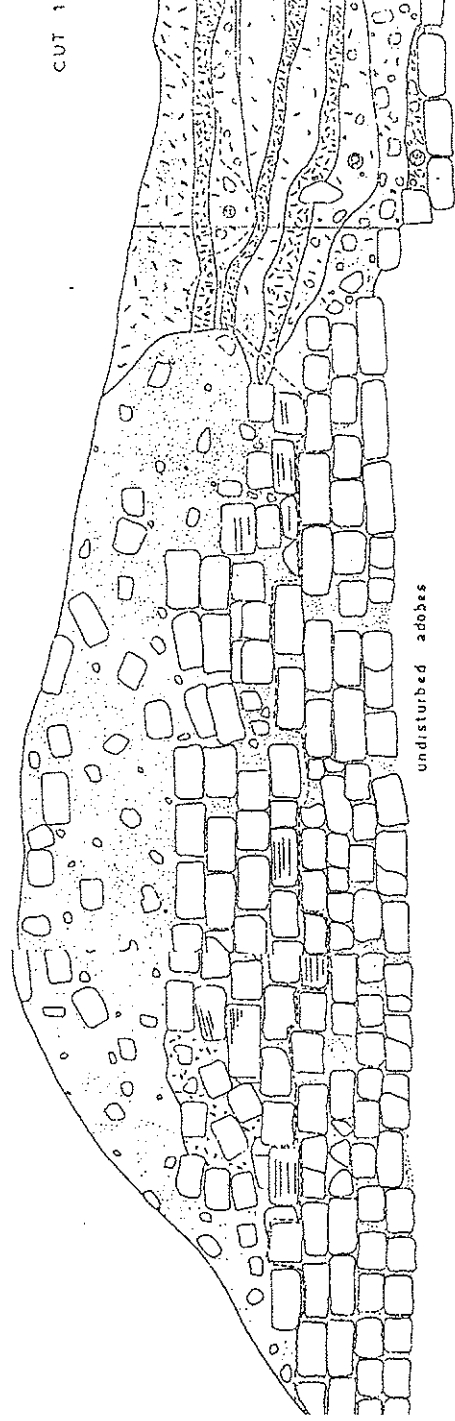


Figure 14

HUACA DEL SUL

PROFILE I

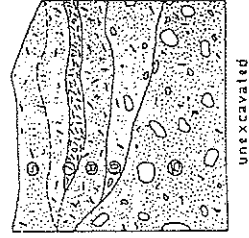


PROFILE II



PROFILE III

CUT 2



PROFILE IV

CUT 2

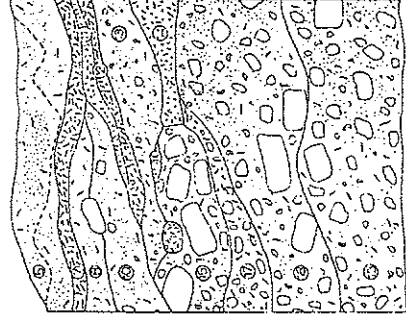


Figure 15

GALINDO
STRUCTURE II

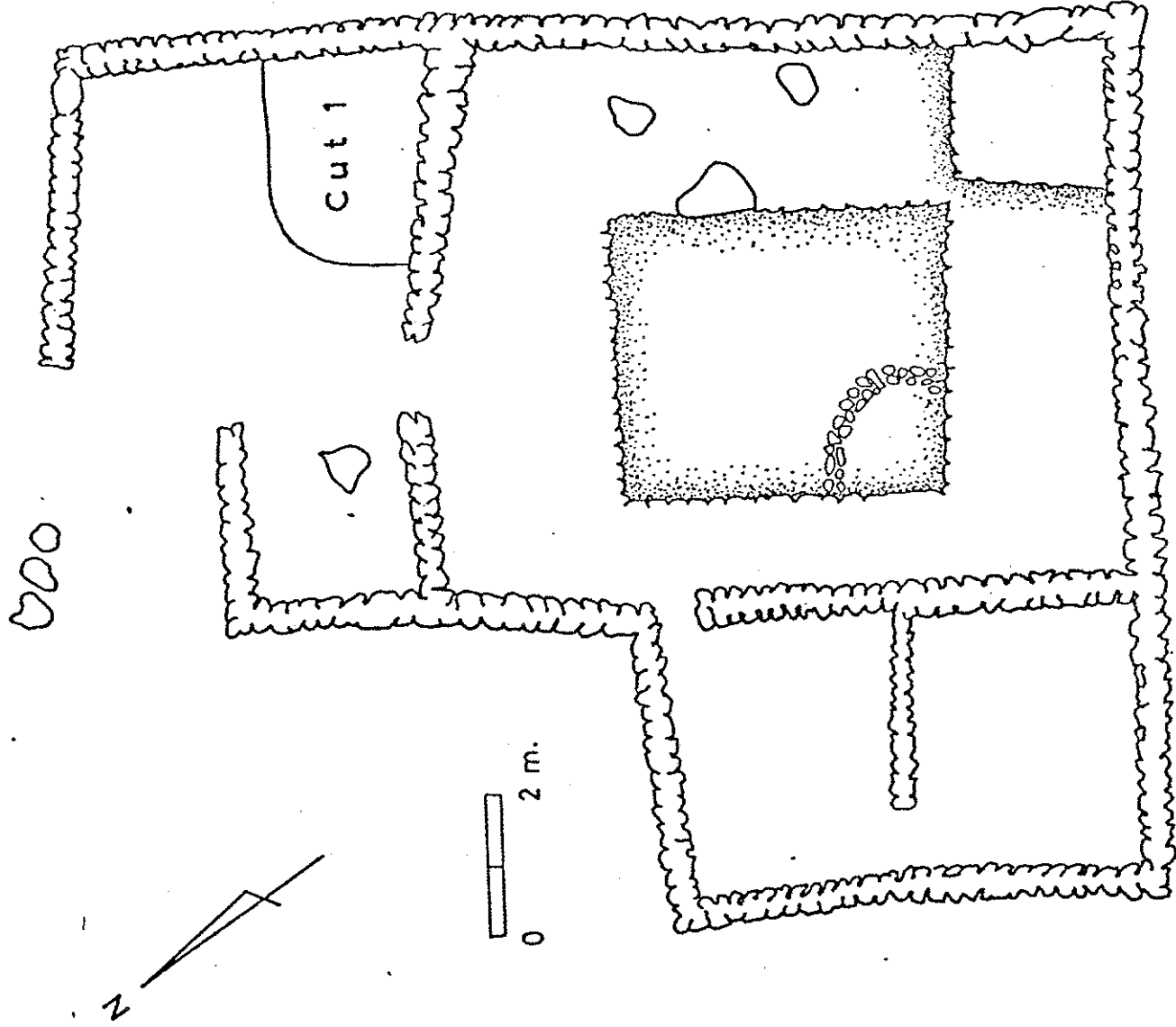


Figure 16

GALINDO

CUT 4

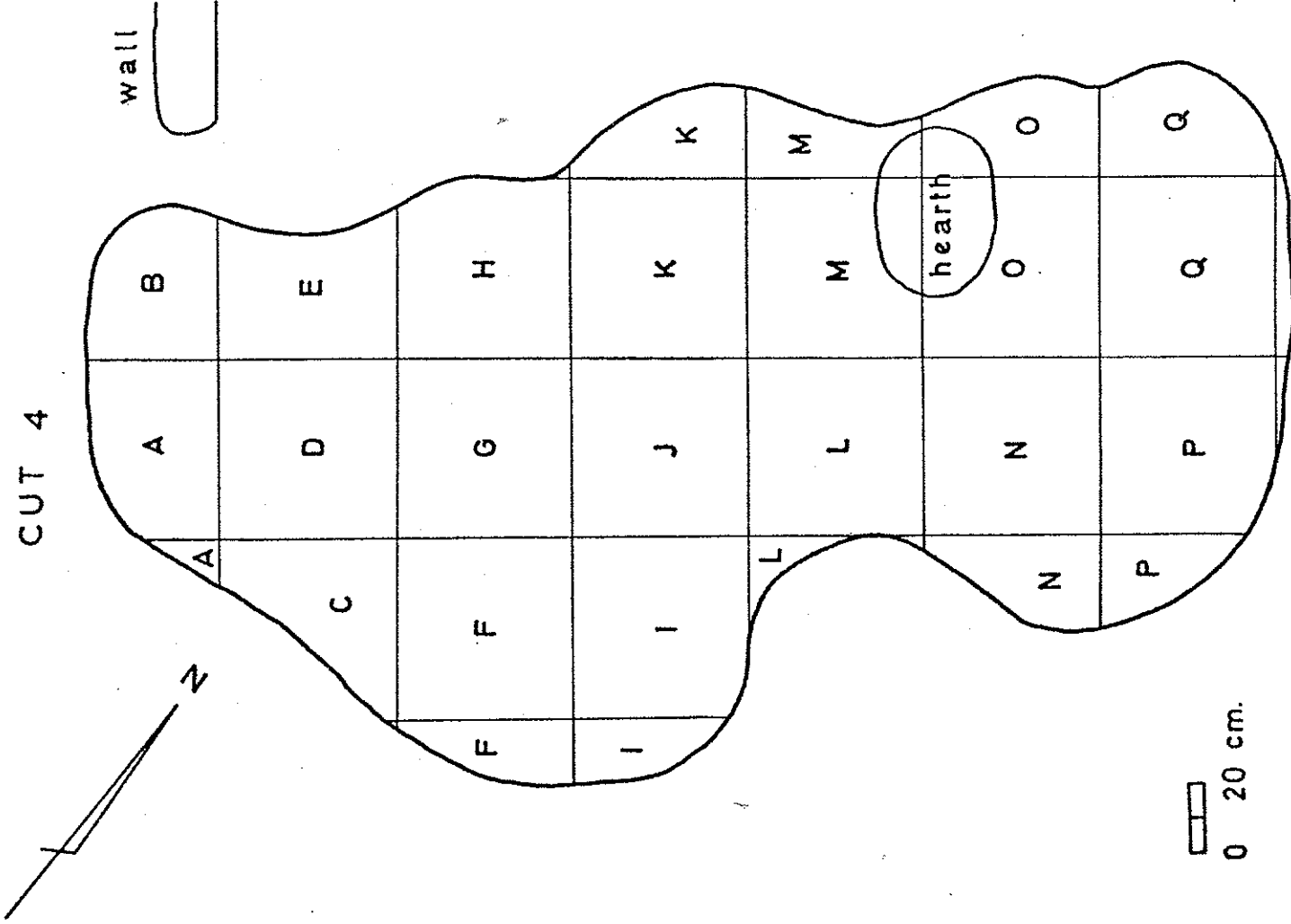


Figure 17

APPENDIX I

APPENDIX I

TABLE 3

ANIMAL FOOD SPECIES CONVERSION FACTORS

Species	Total Meat Volume in cm ³	Number of Diagnostic Elements	Meat Unit in cm ³
Mollusks			
<u>Scutalus</u> sp. (land snail)	2.0	1	2.0
<u>Choromytilus chorus</u> (purple mussel, <u>choro</u>)	50.0	2	25.0
<u>Semimytilus alcosus</u> (thin-shelled mussel)	1.0	2	0.5
<u>Brachidontes purpuratus</u> (small striated mussel)	1.0	2	0.5
<u>Protothaca thaca</u> (large clam)	20.0	2	10.0
<u>Eurhomalea rufa</u> (large clam)	40.0	2	20.0
<u>Petricola rugosa</u> (borer)	1.0	2	0.5
<u>Mesodesma donacium</u> (clam)	5.0	2	2.5
<u>Donax peruvianus</u> (tide zone clam)	0.5	2	0.25
<u>Gariet solida</u> (large clam)	20.0	2	10.0
<u>Semele corrugata</u> (large clam)	60.0	2	30.0

TABLE 3 (Continued)

ANIMAL FOOD SPECIES CONVERSION FACTORS

Species	Total Meat Volume in cm ³	Number of Diagnostic Elements	Meat Unit ₃ in cm
Mollusks (Continued)			
<u>Fissurella</u> sp. (limpet)	10.0	1	10.0
<u>Tegula atra</u> (gastropod)	1.0	1	1.0
<u>Turbo niger</u> (gastropod)	1.0	1	1.0
<u>Crepidula dilatata</u> (slipper shell)	1.25	1	1.25
<u>Polinices</u> cf. <u>cora</u> (gastropod)	0.5	1	0.5
<u>Sinum cymba</u> (gastropod)	3.75	1	3.75
<u>Thais chocolata</u> (gastropod)	2.0	1	2.0
<u>Thais delessertiana</u> (gastropod)	1.5	1	1.5
<u>Mitra orientalis</u> (gastropod)	0.5	1	0.5
<u>Concholepas concholepas</u> (abalone-like gastropod)	50.0	1	50.0
Chiton	10.0	1	10.0

TABLE 3 (Continued)

ANIMAL FOOD SPECIES CONVERSION FACTORS

Species	Total Meat Volume in cm ³	Number of Diagnostic Elements	Meat Unit ₃ in cm
Crustaceans			
<u>Platyanthus orbignii</u> (purple crab, <u>congrejo</u>) <i>Leona de la zona maris profunda</i>	20.0	4	5.0
Fish			
<u>Mustelus</u> sp. (sand shark, <u>tollo</u>)	2000.0	90	22.0
<u>Rhinobatos planiceps</u> (guitarfish, <u>guitarra</u>)	1500.0	120	12.5
<u>Myliobatis peruvianus</u> (ray, <u>raya</u>)	2000.0	56	35.5
<u>Paralichthys peruana</u> (croaker, <u>roncador</u>)	750.0	48	15.5
<u>Sciaena gilberti</u> (croaker, <u>corvina</u>)	3000.0	27	111.0
<u>Sciaena deliciosa</u> (croaker, <u>lorna</u>)	750.0	46	16.5
<u>Xenoscarus denticulatus</u> (parrot fish, <u>pococho</u>)	500.0	25	20.0
<u>Sarda chilensis</u> (bonito)	1500.0	42	35.5
<u>Lepisoma philippi</u> (trambollo)	750.0	25	30.0
<u>Genypterus maculatus</u> (eel, <u>congriso</u>)	1000.0	46	21.5

TABLE 3 (Continued)

ANIMAL FOOD SPECIES CONVERSION FACTORS

Species	Total Meat Volume in cm ³	Number of Diagnostic Elements	Meat Unit ₃ in cm ³
Fish (Continued)			
<u>Mugil cephalus</u> (mullet, <u>lisa</u>)	750.0	23	32.5
Unident. fish			25.0
Birds			
<u>Pelecanus sp.</u> (pelican)	3000.0	47	64.0
Unident. bird			14.0
Mammals			
<u>Cavia porcellus</u> (guinea pig, <u>cuy</u>)	500.0	44	11.5
<u>Canis familiaris</u> (dog)	2000.0	117	17.0
<u>Otaria byronia</u> (sea lion, <u>lobo del mar</u>)	100,000.0	138	724.5
<u>Lama glama</u> (llama)	50,000.0	120	416.5
<u>Odocoileus virginianus</u> (deer, <u>venado</u>)	50,000.0	120	416.5
Unident. mammal			42.5

TABLE 4

PLANT FOOD SPECIES CONVERSION FACTORS

Species	Units per Liter	Unit Equivalent	Food Unit ₃ in cm ³
<u>Zea mays</u> (maize, <u>maíz</u>)	2700 kernels	1 kernel	0.33
<u>Arachis hypogaea</u> (peanut, <u>mani</u>)	2000 seeds	0.5 shell	0.5
<u>Phaseolus lunatus</u> (lima bean, <u>pallar</u>)	750 seeds	1 seed	1.33
<u>Phaseolus vulgaris</u> (common bean, <u>frijol</u>)	2500 seeds	0.1 pod	0.4
<u>Capsicum sp.</u> (pepper, <u>aji</u>)	50 fruit	1 stem	20.0
<u>Cucurbita sp.</u> (squash, <u>calabaza</u>)	1 fruit	1 stem	1000.0
		50 seeds	20.0
<u>Annona muricata</u> (<u>guanábana</u>)	4 fruit	20 seeds	250.0
<u>Persea americana</u> (avocado, <u>paita</u>)	8 fruit	1 seed	125.0
<u>Inga feuillei</u> (<u>paca</u>)	10 beans	20 seeds	5.0
<u>Bunchosia armeniaca</u> (<u>cansaboca</u>)	50 fruit	2 seeds	20.0
<u>Psidium qua java</u> (guava, <u>guayaba</u>)	30 fruit	1 fruit	33.0
<u>Lucuma obovata</u> (<u>lúcuma</u>)	8 fruit	1 seed	125.0

TABLE 5
PADRE ABAN ANIMAL REMAINS
CUT 1

Species	Number of Levels Where Present	Minimum Number of Indiv.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mollusks					
<u>Scutalus sp.</u> (land snail)	2	1	+	+ ¹	+
<u>Choromytilus chorus</u> (purple mussel, <u>choro</u>)	8	257	7707.5	12825.0	37.8
<u>Semimytilus algosus</u> (thin-shelled mussel)	7	511	510.0	511.0	1.5
<u>Brachidontes purpuratus</u> (small striated mussel)	1	1	+	0.5	+
<u>Argopecten purpuratum</u> (scallop)	1	1	2.5	- ²	-
<u>Protothaca thaca</u> (large clam)	8	47	772.5	940.0	2.8
<u>Eurhomalea rufa</u> (large clam)	8	23	1282.5	920.0	2.7
<u>Petricola rugosa</u> (borer)	7	5	15.0	4.5	+
<u>Mesodesma donacium</u> (clam)	8	8	70.0	37.5	+
<u>Donax peruvianus</u> (tide zone clam)	8	1752	3292.5	875.8	2.6
<u>Gariet solida</u> (large clam)	2	1	5.0	10.0	+
<u>Tagelus dombeii</u> (razor clam)	2	3	2.5	15.0	+
<u>Semele corrugata</u> (large clam)	4	2	125.0	90.0	+

TABLE 5 (Continued)
PADRE ABAN ANIMAL REMAINS
CUT 1

Species	Number of Levels Where Present	Minimum Number of Indiv.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mollusks (Continued)					
<u>Phola chilensis</u> (angel wing)	2	2	2.5	+	+
<u>Fissurella sp.</u> (limpet)	2	1	+	+	+
<u>Tequila atra</u> (gastropod)	8	77	190.0	77.0	+
<u>Turbo niger</u> (gastropod)	8	68	62.5	68.0	+
<u>Crepidula dilatata</u> (slipper shell)	8	36	25.0	45.0	+
<u>Polinices cf. cora</u> (gastropod)	2	1	+	0.5	+
<u>Thais chocolata</u> (gastropod)	8	13	222.5	26.0	+
<u>Thais delessertiana</u> (gastropod)	8	30	80.0	45.0	+
<u>Cantharus cf. inca</u> (gastropod)	7	6	5.0	+	+
<u>Nassarius gayi</u> (gastropod)	5	6	2.5	-	-
<u>Olivella columellaris</u> (gastropod)	4	22	7.5	-	-
<u>Mitra orientalis</u> (gastropod)	4	1	2.5	+	+
Chiton (2 species)	7	3	+	30.0	+

TABLE 5 (Continued)

CUT 1

Species	Number of Levels Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mollusks (continued)					
Unident. shell	8	-	562.5	-	-
Crustaceans					
<u>Platyanthus orbignii</u> (purple crab, <u>congrejo</u>)	8	27	135.0	535.0	1.6
<u>Balanus tintinnabulum</u> (barnacle)	8	687	460.0	-	-
Echinoderms					
<u>Tetradymus niger</u> (sea urchin, <u>erizo</u>)	4	-	+	+	+
Fish					
<u>Mustelus</u> sp. (sand shark, <u>tollo</u>)	7	1	102.5	2310.0	6.8
<u>Myliobatis peruvianus</u> (ray, <u>raya</u>)	3	1	5.0	390.5	1.1
<u>Paralichthys peruianus</u> (croaker, <u>roncador</u>)	7	1	7.5	155.0	+
<u>Sciaena gilberti</u> (croaker, <u>corvina</u>)	1	1	2.5	111.0	+
<u>Sciaena deliciosa</u> (croaker, <u>lorna</u>)	7	1	7.5	495.0	1.5
<u>Lepisoma philippi</u> (trambollo)	2	1	+	105.0	+
<u>Mugil cephalus</u> (mullet, <u>lisa</u>)	7	2	5.0	1235.0	3.6
Unident. fish	8	-	180.0	4500.0	13.3

TABLE 5 (Continued)

PADRE ABAN ANIMAL REMAINS

CUT 1

Species	Number of Levels Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Birds					
<u>Pelecanus</u> sp. (pelican)	3	1	40.0	512.0	1.5
Unident. bird	8	-	447.5	6265.0	18.5
Mammals					
<u>Otaria byronia</u> (sea lion, <u>lobo del mar</u>)	1	1	5.0	724.5	2.1
Unident. mammal	3	-	2.5	97.5	+
Total				33956.3	97.4%
Combined values for percentages less than 1%					2.6
					100.0

¹- is used to indicate 'no value'

²+ designates weights less than 2.5 gms (Column 3), unreconstructed volumes (Column 4), and percentages less than 1% (Column 5).

TABLE 6
PADRE ABAN PLANT REMAINS
CUT 1

Species	Number of Levels Where Present	Seed Count	Weight in gms	Food Volume in cm ³	% of Plant Diet
Cultivated					
<u>Gossypium barbadense</u> (cotton, algodón)	2	1	+	-	-
<u>Cucurbita</u> sp. (squash, calabaza)	4	4 1 stem	+	1000.0	100.0
<u>Lagenaria siceraria</u> (gourd, mate)	7	3	5.0	-	-
Wild					
<u>Panicum</u> sp. (grass, grama)	7	-	40.0	-	-
<u>Gynerium sagittatum</u> (cane, caña brava)	6	-	52.5	-	-
<u>Scirpus tatora</u> (totora)	2	-	+	-	-
<u>Tillandsia</u> sp. (achupalla)	8	-	70.0	-	-
Mixed fibrous species ³	8	-	35.0	-	-
Total				1000.0	100.0%

³Category includes a mixture of such species as Panicum sp., Gynerium sagittatum, and Scirpus tatora.

TABLE 7
ALTO SALAVERRY ANIMAL REMAINS
CUT 1

Species	Number of Levels Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mollusks					
<u>Scutalus</u> sp. (land snail)	6	2	+	4.0	+
<u>Drymaeus verillium</u> (land snail)	1	1	+	+	+
<u>Choromytilus chorus</u> (purple mussel, choro)	14	54	942.5	2700.0	17.8
<u>Semimytilus algosus</u> (thin-shelled mussel)	14	1120	945.0	1119.5	7.4
<u>Brachidontes purpuratus</u> (small striated mussel)	13	232	152.5	231.5	1.5
<u>Protothaca thaca</u> (large clam)	9	1	5.0	10.0	+
<u>Petricola rugosa</u> (borer)	4	1	2.5	+	+
<u>Mesodesma donacium</u> (clam)	11	12	35.0	30.0	+
<u>Donax peruvianus</u> (tide zone clam)	14	394	477.5	197.0	1.3
<u>Fissurella</u> sp. (limpet)	14	30	162.5	300.0	2.0
<u>Tegula atra</u> (gastropod)	14	58	255.0	58.0	+
<u>Turbo niger</u> (gastropod)	14	71	102.5	71.0	+
<u>Crepidula dilatata</u> (slipper shell)	10	16	5.0	20.0	+

TABLE 7 (Continued)
ALTO SALAVERRY ANIMAL REMAINS
CUT 1

Species	Number of Levels Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mollusks (Continued)					
<u>Polinices cf. cora</u> (gastropod)	4	3	+	1.5	+
<u>Thais chocolata</u> (gastropod)	13	10	45.0	20.0	+
<u>Thais delessertiana</u> (gastropod)	13	27	32.5	40.5	+
<u>Cantharus cf. inca</u> (gastropod)	10	14	10.0	+	+
<u>Nassarius gayi</u> (gastropod)	8	14	+	-	-
<u>Concholepas concholepas</u> (abalone-like gastropod)	10	2	77.5	100.0	+
Chiton (2 species)	14	14	140.0	140.0	+
Unident. shell	14	-	217.5	-	-
Crustaceans					
<u>Platyanthus orbignii</u> (purple crab, <u>congrejo</u>)	14	52	215.0	1025.0	6.7
<u>Balanus tintinnabulum</u> (barnacle)	14	217	142.5	-	-
Echinoderms					
<u>Tetrapygus niger</u> (sea urchin, <u>arizo</u>)	4	-	+	+	+

TABLE 7 (Continued)
ALTO SALAVERRY ANIMAL REMAINS
CUT 1

Species	Number of Levels Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Fish					
<u>Mustelus sp.</u> (sand shark, <u>tollo</u>)	11	1	2.5	704.0	4.6
<u>Rhinobatos planiceps</u> (guitarfish, <u>guitarra</u>)	3	1	12.5	225.0	1.5
<u>Myliobatis peruvianus</u> (ray, <u>rava</u>)	5	1	2.5	248.5	1.6
<u>Paralichthys peruianus</u> (croaker, <u>roncador</u>)	12	2	7.5	728.5	4.8
<u>Sciaena deliciosa</u> (croaker, <u>lorca</u>)	14	21	45.0	3564.0	23.4
<u>Sarda chilensis</u> (bonito)	1	1	+	106.5	+
<u>Lepisoma philippi</u> (<u>trambollo</u>)	4	1	+	90.0	+
<u>Mugil cephalus</u> (mullet, <u>lisa</u>)	1	1	+	97.5	+
Unident. fish	14	-	90.0	2250.0	14.8
Birds					
Unident. bird	5	-	2.5	35.0	+
Mammals					
<u>Otaria byronia</u> (sea lion, <u>lobo del mar</u>)	2	1	65.0	1086.8	7.1
Unident. mammal	3	-	+	+	+

TABLE 7 (Continued)
ALTO SALAVERY ANIMAL REMAINS
CUT 1

Species	Number of Levels Where Present	Minimum Number of Indiv.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Total				15204.8	94.5%
Combined values for percentages less than 1%				5.5	100.0%

TABLE 8
ALTO SALAVERY PLANT REMAINS
CUT 1

Species	Number of Levels Where Present	Seed Count	Weight in gms	Food Volume in cm ³	% of Plant Diet
Cultivated					
<u>Phaseolus lunatus</u> (lima bean, <u>pallar</u>)	5	6	+	7.3	+
<u>Phaseolus vulgaris</u> (?) (common bean, <u>frijol</u>)	4	3	2.5	1.0	+
<u>Gossypium barbadense</u> (cotton, <u>algodón</u>)	13	22	50.0	-	-
<u>Capsicum</u> sp. (pepper, <u>ají</u>)	3	1 stem	+	20.0	+
<u>Cucurbita</u> sp. (squash, <u>calabaza</u>)	11	80 9 stems	+	9000.0	96.1
<u>Lagenaria siceraria</u> (gourd, <u>mate</u>)	10	27	45.0	-	-
<u>Persea americana</u> (avocado, <u>palta</u>)	2	1	2.5	62.5	+
<u>Bunchosia armeniaca</u> (cansaboca)	3	3	+	30.0	+
<u>Psidium qua java</u> (guava, <u>quayaba</u>)	4	2	+	59.4	+
<u>Lucuma obovata</u> (<u>lucuma</u>)	3	2	+	187.5	2.0
Wild					
<u>Cenchrus echinatus</u> (burr)	5	8	+	-	-
<u>Panicum</u> sp. (grass, <u>grama</u>)	10	-	32.5	-	-

TABLE 8 (Continued)
ALTO SALAVERRY PLANT REMAINS
CUT 1

Species	Number of Levels Where Present	Seed Count	Weight in gms	Food Volume in cm ³	% of Plant Diet
Wild (Continued)					
<u>Gynerium sagittatum</u> (cane, <i>caña brava</i>)	5	-	5.0	-	-
<u>Tillandsia</u> sp. (<i>achupalla</i>)	11	-	25.0	-	-
<u>Prosopis chilensis</u> (<i>algorroba</i>)	5	11	+	-	-
Mixed fibrous species	14	-	312.5	-	-
Unident. plants	12	-	30.0	-	-
Total				9367.7	98.1%
Combined values for percentages less than 1%				1.9	100.0%

TABLE 9
ALTO SALAVERRY ANIMAL REMAINS
CUT 2

Species	Number of Levels Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mollusks					
<u>Scutalus</u> sp. (land snail)	5	1	+	2.0	+
<u>Choromytilus chorus</u> (purple mussel, <i>choro</i>)	19	81	1860.0	4050.0	18.1
<u>Semimytilus alcosus</u> (thin-shelled mussel)	18	1093	1205.0	1093.0	4.9
<u>Brachidontes purpuratus</u> (small striated mussel)	19	340	162.5	340.0	1.5
<u>Protothaca thaca</u> (large clam)	13	1	2.5	+	+
<u>Eurhemalea rufa</u> (large clam)	5	1	25.0	+	+
<u>Petricola rugosa</u> (borer)	9	1	+	+	+
<u>Mesodesma donacium</u> (clam)	9	5	30.0	22.5	+
<u>Donax peruvianus</u> (tide zone clam)	19	288	312.5	144.0	+
<u>Phola chiloensis</u> (angel wing)	5	1	+	+	+
<u>Fissurella</u> sp. (limpet)	15	40	277.5	400.0	1.8
<u>Tequila atra</u> (gastropod)	18	27	125.0	27.0	+
<u>Turbo niger</u> (gastropod)	18	38	77.5	38.0	+

TABLE 9 (Continued)
ALTO SALAVERRY ANIMAL REMAINS
CUT 2

Species	Number of Levels Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mollusks (Continued)					
<u>Crepidula dilatata</u> (slipper shell)	10	31	32.5	38.8	+
<u>Pollinices cf. cora</u> (gastropod)	3	3	+	1.5	+
<u>Thais chocolata</u> (gastropod)	12	5	47.5	10.0	+
<u>Thais delessertiana</u> (gastropod)	13	14	15.0	21.0	+
<u>Cantharus cf. inca</u> (gastropod)	6	4	7.5	+	+
<u>Nassarius gayi</u> (gastropod)	7	13	2.5	-	-
<u>Mitra orientalis</u> (gastropod)	2	1	+	0.5	+
<u>Concholepas concholepas</u> (abalone-like gastropod)	9	4	325.0	200.0	+
Chiton (2 species)	18	14	100.0	140.0	+
Unident. shell	18	-	1092.5	-	-
Crustaceans					
<u>Platyanthus orbignii</u> (purple crab, <u>congrejo</u>)	19	75	260.0	1500.0	6.7
<u>Balanus tintinnabulum</u> (barnacle)	17	216	185.0	-	-

TABLE 9 (Continued)
ALTO SALAVERRY ANIMAL REMAINS
CUT 2

Species	Number of Levels Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Echinoderms					
<u>Tetrapygus niger</u> (sea urchin, <u>erizo</u>)	4	-	+	+	+
Fish					
<u>Mustelus sp.</u> (sand shark, <u>tollo</u>)	7	1	+	792.0	3.5
<u>Myliobatis peruvianus</u> (ray, <u>raya</u>)	3	1	20.0	710.0	3.2
<u>Paralichthys peruianus</u> (croaker, <u>roncador</u>)	12	2	10.0	744.0	3.3
<u>Sciaena deliciosa</u> (croaker, <u>lorna</u>)	16	23	32.5	3069.0	13.7
<u>Xenoscopus denticulatus</u> (parrot fish, <u>pococho</u>)	1	1	2.5	120.0	+
<u>Sarda chilensis</u> (bonito)	2	1	+	71.0	+
<u>Lepisoma philipoi</u> (trambollo)	10	1	+	345.0	1.5
<u>Genyoterus maculatus</u> (eel, <u>congrio</u>)	1	1	+	43.0	+
<u>Mugil cephalus</u> (mullet, <u>lisa</u>)	11	2	5.0	1950.0	8.7
Unident. fish	19	-	135.0	3375.0	15.1

TABLE 9 (Continued)
ALTO SALAVERRY ANIMAL REMAINS

CUT 2

Species	Number of Levels Where Present	Minimum Number of Indiv.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Birds					
Unident. bird	3	-	12.5	175.0	+
Mammals					
<u>Otaria byronia</u> (sea lion, <u>lobo del mar</u>)	4	1	252.5	2898.0	12.9
Unident. mammal	3	-	2.5	88.8	+
Total				22409.1	94.9%
Combined values for percentages less than 1%					5.1
					100.0%

TABLE 10
ALTO SALAVERRY PLANT REMAINS

CUT 2

Species	Number of Levels Where Present	Seed Count	Weight in gms	Food Volume in cm ³	% of Plant Diet
Cultivated					
<u>Phaseolus lunatus</u> (lima bean, <u>pallar</u>)	1	4	+	5.3	+
<u>Phaseolus vulgaris</u> (?) (common bean, <u>frijol</u>)	2	2	+	0.8	+
<u>Gossypium barbadense</u> (cotton, <u>algodon</u>)	16	44	17.5	+	-
<u>Capsicum</u> sp. (pepper, <u>aji</u>)	3	3	+	30.0	+
<u>Cucurbita</u> sp. (squash, <u>calabaza</u>)	15	61 5 stems	2.5	4500.0	91.9
<u>Lagenaria siceraria</u> (gourd, <u>mate</u>)	17	15	47.5	-	-
<u>Persea americana</u> (avocado, <u>palta</u>)	5	2	2.5	250.0	5.1
<u>Inga feuillei</u> (<u>paca</u>)	1	1	+	2.5	+
<u>Bunchosia armeniaca</u> (<u>cansaboca</u>)	5	11	2.5	110.0	2.2
Wild					
<u>Cenchrus echinatus</u> (burr)	5	7	+	-	-
<u>Panicum</u> sp. (grass, <u>grama</u>)	2	-	52.5	-	-
<u>Tillandsia</u> sp. (<u>achupalla</u>)	13	-	37.5	-	-

TABLE 10 (Continued)
ALTO SALAVERY PLANT REMAINS
CUT 2

Species	Number of Levels Where Present	Seed Count	Weight in gms	Food Volume in cm ³	% of Plant Diet
Wild (Continued)					
<u>Prosopis chilensis</u> (algorroba)	6	11	+	-	-
Mixed fibrous species	17	-	197.5	-	-
Unident. plants	13	-	17.5	-	-
Total				4898.6	99.2%
Combined values for percentages less than 1%					0.8 100.0%

TABLE 11
GRAMALOTE ANIMAL REMAINS
CUT 1

Species	Number of Levels Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mollusks					
<u>Scutaius</u> sp. (land snail)	12	9	+	18.0	+
<u>Choromytilus chorus</u> (purple mussel, <u>choro</u>)	20	167	4530.0	8325.0	7.2
<u>Semimytilus algosus</u> (thin-shelled mussel)	19	308	415.0	308.0	+
<u>Brachidontes purpuratus</u> (small striated mussel)	1	1	+	+	+
<u>Protothaca thaca</u> (large clam)	20	800	8520.0	15990.0	13.8
<u>Eurhomalea rufa</u> (large clam)	20	92	2420.0	3660.0	3.2
<u>Petricola rugosa</u> (borer)	17	22	12.5	11.0	+
<u>Donax peruvianus</u> (tide zone clam)	20	106	170.0	53.0	+
<u>Gariet solida</u> (large clam)	19	65	335.0	1710.0	1.5
<u>Tagelus dombeii</u> (razor clam)	6	4	7.5	20.0	+
<u>Semele corrugata</u> (large clam)	20	503	8277.5	30180.0	26.0
<u>Phola chilensis</u> (angel wing)	6	1	2.5	+	+
<u>Fissurella</u> sp. (limpet)	19	18	257.5	180.0	+

TABLE 11 (Continued)
GRAMALOTE ANIMAL REMAINS
CUT 1

Species	Number of Levels Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mollusks (Continued)					
<u>Tequila atra</u> (gastropod)	20	1243	4297.5	1243.0	1.1
<u>Turbo niger</u> (gastropod)	20	925	1155.0	925.0	+
<u>Crepidula dilatata</u> (slipper shell)	19	65	17.5	81.3	+
<u>Polinices cf. cora</u> (gastropod)	11	20	7.5	10.0	+
<u>Sinum cymba</u> (gastropod)	1	1	2.5	+	+
<u>Thais chocolata</u> (gastropod)	20	96	765.0	192.0	+
<u>Thais delessertiana</u> (gastropod)	20	435	1150.0	652.5	+
<u>Cantharus cf. inca</u> (gastropod)	20	162	172.5	+	+
<u>Nassarius gavi</u> (gastropod)	20	163	40.0	-	-
<u>Olivella columellaris</u> (gastropod)	1	1	+	-	-
<u>Mitra orientalis</u> (gastropod)	12	17	20.0	8.5	+
Chiton (2 species)	19	110	57.5	1100.0	+
Unident. shell	20	-	1405.0	-	-

TABLE 11 (Continued)
GRAMALOTE ANIMAL REMAINS
CUT 1

Species	Number of Levels Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Crustaceans					
<u>Platyanthus orbignii</u> (purple crab, <u>congrejo</u>)	20	297	1505.0	5935.0	5.1
<u>Balanus tintinnabulum</u> (barnacle)	20	1464	1247.5	-	-
Echinoderms					
<u>Tetraygus niger</u> (sea urchin, <u>erizo</u>)	20	-	122.5	+	+
Fish					
<u>Mustelus sp.</u> (sand shark, <u>tollo</u>)	18	2	865.0	6688.0	5.8
<u>Rhinobatos planiceps</u> (guitarfish, <u>guitarra</u>)	13	1	40.0	712.5	+
<u>Myliobatis peruvianus</u> (ray, <u>raya</u>)	9	1	2.5	639.0	+
<u>Paralonchurus beruanus</u> (croaker, <u>roncador</u>)	13	1	5.0	387.5	+
<u>Sciaena gilberti</u> (croaker, <u>corvina</u>)	9	4	90.0	777.0	+
<u>Sciaena deliciosa</u> (croaker, <u>lorna</u>)	12	4	+	643.5	+
<u>Genypterus maculatus</u> (eel, <u>congrío</u>)	1	1	+	21.5	+
Unident. fish	19	-	25.0	625.0	+

TABLE 11 (Continued)
GRAMALOTE ANIMAL REMAINS
CUT 1

Species	Number of Levels Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Birds					
<u>Pelecanus</u> sp. (pelican)	2	1	22.5	192.0	+
Unident. bird	18	-	505.0	7070.0	6.1
Mammals					
Misc. rodent	1	1	+	-	-
<u>Otaria byronia</u> (sea lion, <u>lobo del mar</u>)	7	1	280.0	8694.0	7.5
Unident. mammal	16	-	537.5	19081.3	16.4
Total				<u>116133.6</u>	<u>93.7%</u>
Combined values for percentages less than 1%					<u>6.3</u> 100.0%

TABLE 12
GRAMALOTE PLANT REMAINS
CUT 1

Species	Number of Levels Where Present	Seed Count	Weight in gms	Food Volume in cm ³	% of Plant Diet
Cultivated					
<u>Zea mays</u> (maize, <u>maiz</u>)	1	+	+	+	+
<u>Arachis hypogaea</u> (peanut, <u>mani</u>)	19	-	27.5	97.5	1.2
<u>Phaseolus vulgaris</u> (common bean, <u>frijol</u>)	13	40 pods	+	80.0	+
<u>Gossypium barbadense</u> (cotton, <u>algodon</u>)	19	102	+	-	-
<u>Capsicum</u> sp. (pepper, <u>aji</u>)	12	17 stems	+	340.0	4.0
<u>Curcubita</u> sp. (squash, <u>calabaza</u>)	18	298 5 stems	12.5	5000.0	59.3
<u>Lagenaria siceraria</u> (gourd, <u>mate</u>)	18	26	15.0	-	-
<u>Persea americana</u> (avocado, <u>palta</u>)	6	5	5.0	625.0	7.4
<u>Bunchosia armeniaca</u> (<u>cansaboca</u>)	9	10	+	100.0	1.2
<u>Lucuma obovata</u> (<u>lucuma</u>)	14	18	2.5	2187.5	25.9
Wild					
Unident. algae	12	-	15.0	-	-
<u>Cyperium sagittatum</u> (cane, <u>cana brava</u>)	20	-	67.5	-	-

TABLE 12 (Continued)
GRAMALOTE PLANT REMAINS
CUT 1

Species	Number of Levels Where Present	Seed Count	Weight in gms	Food Volume in cm ³	% of Plant Diet
Wild (Continued)					
<u>Scirpus tatora</u> (<u>tatora</u>)	6	-	+	-	-
<u>Tillandsia</u> sp. (<u>achubalia</u>)	20	-	112.5	-	-
<u>Prosopis chilensis</u> (<u>alcorroba</u>)	2	2	+	-	-
Mixed fibrous species	20	1	102.5	-	-
Total				8430.0	99.0%
Combined values for percentages less than 1%				1.0	100.0%

TABLE 13
CABALLO MUERTO HUACA HEREDEROS CHICA ANIMAL REMAINS
CUTS 1 and 2

Species	Number of Levels Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mollusks					
<u>Scutalus</u> sp. (land snail)	18	21	-	42.0	+
<u>Choromytilus chorus</u> (purple mussel, <u>choro</u>)	38	42	-	2075.0	21.9
<u>Semimytilus algosus</u> (thin-shelled mussel)	15	7	-	6.5	+
<u>Brachidontes purpuratus</u> (small striated mussel)	2	1	-	1.0	+
<u>Argopecten purpuratum</u> (scallop)	1	1	-	-	-
<u>Protothaca thaca</u> (large clam)	33	23	-	460.0	4.9
<u>Eurhomalea rufa</u> (large clam)	26	6	-	220.0	2.3
<u>Donax peruvianus</u> (tide zone clam)	23	32	-	15.8	+
<u>Semele corrugata</u> (large clam)	32	41	-	2430.0	25.7
<u>Fissurella</u> sp. (limpet)	6	2	-	20.0	+
<u>Tegula atra</u> (gastropod)	12	16	-	16.0	+
<u>Turbo niger</u> (gastropod)	2	4	-	4.0	+
<u>Crepidula dilatata</u> (slipper shell)	2	2	-	2.5	+

TABLE 13 (Continued)

CABALLO MUERTO HUACA HEREDEROS CHICA ANIMAL REMAINS

CUTS 1 and 2

Species	Number of Levels Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mollusks (Continued)					
<u>Polinices cf. cora</u> (gastropod)	2	2	-	2.0	+
<u>Thais delessertiana</u> (gastropod)	1	1	-	1.5	+
Chiton (2 species)	6	1	-	+	+
Crustaceans					
<u>Platyanthus orbignii</u> (purple crab, <u>congrejo</u>)	14	5	-	100.0	1.1
<u>Balanus tintinnabulum</u> (barnacle)	8	22	-	-	-
Fish					
<u>Sciaena deliciosa</u> (croaker, <u>lorna</u>)	1	1	+	49.5	+
Birds					
Unident. bird	1	-	2.5	35.0	+
Mammals					
Misc. rodent	2	2	+	-	-
<u>Canis familiaris</u> (dog)	1	1	-	17.0	+
<u>Lama glama</u> (?) (llama)	7	1	-	1457.8	15.4

TABLE 13 (Continued)

CABALLO MUERTO HUACA HEREDEROS CHICA ANIMAL REMAINS

CUTS 1 and 2

Species	Number of Levels Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mammals (Continued)					
<u>Odocoileus virginianus</u> (?) 4 (deer, <u>venado</u>)	1	-	-	1666.0	17.6
Unident. mammal	10	-	20.0	850.0	9.0
Total				9471.6	97.9%
Combined values for percentages less than 1%					<u>2.1</u> 100.0%

TABLE 14
HUACA DEL SOL MOCHE OCCUPATION ANIMAL REMAINS
CUTS 1 and 2

Species	Number of Levels Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mollusks					
<u>Scutalus</u> sp. (land snail)	12	59	40.0	118.0	+
<u>Choromytilus chorus</u> (purple mussel, choro)	8	1	7.5	+	+
<u>Semimytilus algosus</u> (thin-shelled mussel)	10	7	10.0	6.5	+
<u>Brachidontes purpuratus</u> (small striated mussel)	8	47	15.0	23.5	+
<u>Pinctada mazatlanica</u> (pearl oyster)	1	1	+	-	-
<u>Argopecten purpuratum</u> (scallop)	2	1	2.5	-	-
<u>Protothaca thaca</u> (large clam)	5	1	5.0	10.0	+
<u>Eurhemalea rufa</u> (large clam)	3	1	5.0	+	+
<u>Mesodesma donacium</u> (clam)	11	15	37.5	45.0	+
<u>Donax peruvianus</u> (tide zone clam)	14	4514	3460.0	2257.0	2.7
<u>Semele corrugata</u> (large clam)	2	1	2.5	30.0	+
<u>Fissurella</u> sp. (limpet)	12	11	27.5	110.0	+
<u>Tegula atra</u> (gastropod)	9	15	25.0	15.0	+

TABLE 14 (Continued)
HUACA DEL SOL MOCHE OCCUPATION ANIMAL REMAINS
CUTS 1 and 2

Species	Number of Levels Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mollusks (Continued)					
<u>Turbo niger</u> (gastropod)	12	40	55.0	40.0	+
<u>Crepidula dilatata</u> (slipper shell)	1	1	+	+	+
<u>Polinices cf. cora</u> (gastropod)	3	4	+	2.0	+
<u>Sinum cymba</u> (gastropod)	1	1	+	+	+
<u>Thais chocolata</u> (gastropod)	12	46	52.5	32.0	+
<u>Thais delessertiana</u> (gastropod)	8	22	32.5	33.0	+
<u>Cantharus cf. inca</u> (gastropod)	6	13	7.5	+	+
<u>Nassarius gavi</u> (gastropod)	6	8	2.5	-	-
<u>Olivella columellaris</u> (gastropod)	1	2	+	-	-
<u>Prunum curtum</u> (gastropod)	1	1	+	-	-
<u>Mitra orientalis</u> (gastropod)	1	1	+	+	+
<u>Concholebas concholebas</u> (abalone-like gastropod)	1	1	5.0	+	+
Chiton (2 species)	10	3	30.0	30.0	+

TABLE 14 (Continued)
HUACA DEL SOL MOCHE OCCUPATION ANIMAL REMAINS
CUTS 1 and 2

Species	Number of Levels Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Crustaceans					
<u>Platyanthus orbiculi</u> (purple crab, <u>congrejo</u>)	13	9	35.0	170.0	+
<u>Balanus tintinnabulum</u> (barnacle)	4	2	+	-	-
Fish					
<u>Mustelus</u> sp. (sand shark, <u>tollo</u>)	2	1	+	88.0	+
<u>Rhinobatos planiceps</u> (guitarfish, <u>guitarra</u>)	1	1	+	12.5	+
<u>Paralichthys peruianus</u> (croaker, <u>roncador</u>)	8	2	+	372.0	+
<u>Sciaena deliciosa</u> (croaker, <u>lorca</u>)	9	3	+	577.5	+
<u>Mugil cephalus</u> (mullet, <u>lisa</u>)	3	1	+	227.5	+
Unident. fish	8	-	+	+	+
Birds					
<u>Pelecanus</u> sp. (pelican)	1	1	+	64.0	+
Unident. bird	10	-	35.0	490.0	+
Mammals					
Misc. rodents	8	12	+	-	-

TABLE 14 (Continued)
HUACA DEL SOL MOCHE OCCUPATION ANIMAL REMAINS
CUTS 1 and 2

Species	Number of Levels Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mammals (Continued)					
<u>Cavia porcellus</u> (guinea pig, <u>cuy</u>)	8	11	10.0	483.0	+
<u>Canis familiaris</u> (dog)	6	1	+	136.0	+
<u>Otaria byronia</u> (sea lion, <u>lobo del mar</u>)	4	1	27.5	2898.0	3.5
<u>Lama glama</u> (llama)	13	5	1647.5	56644.0	68.1
Unident. mammal	13	-	430.0	18275.0	22.0
Total				83189.5	96.3%
Combined values for percentages less than 1%					3.7
					100.0%

TABLE 15
HUACA DEL SOL MOCHE OCCUPATION PLANT REMAINS
CUTS 1 and 2

Species	Number of Levels Where Present	Seed Count	Weight in gms	Food Volume in cm ³	% of Plant Diet
Cultivated					
<u>Zea mays</u> (maize, <u>maíz</u>)	13	87 cobs	195.0	3756.5	33.6
<u>Arachis hypogaea</u> (peanut, <u>mani</u>)	5	4	15.0	22.0	+
<u>Phaseolus vulgaris</u> (common bean, <u>frijol</u>)	11	1 76 pods	35.0	152.0	1.4
<u>Gossypium barbadense</u> (cotton, <u>algodón</u>)	10	45	42.5	-	-
<u>Capsicum</u> sp. (pepper, <u>aji</u>)	9	27 stems	+	540.0	4.8
<u>Cucurbita</u> sp. (squash, <u>calabaza</u>)	12	89 4 stems	25.0	4000.0	35.8
<u>Lagenaria siceraria</u> (gourd, <u>mate</u>)	14	-	895.0	-	-
<u>Persea americana</u> (avocado, <u>palta</u>)	5	4	15.0	500.0	4.5
<u>Inga feuillei</u> (pacaé)	4	-	2.5	+	+
<u>Bunchosia armeniaca</u> (cansaboca)	2	2	+	20.0	+
<u>Psidium quajava</u> (guava, <u>quayaba</u>)	4	4	5.0	132.0	1.2
<u>Lucuma obovata</u> (<u>lúcuma</u>)	6	17	5.0	2062.5	18.4

TABLE 15 (Continued)
HUACA DEL SOL MOCHE OCCUPATION PLANT REMAINS
CUTS 1 and 2

Species	Number of Levels Where Present	Seed Count	Weight in gms	Food Volume in cm ³	% of Plant Diet
Wild					
Unident. algae	5	-	+	-	-
<u>Cenchrus echinatus</u> (burr)	4	15	+	-	-
<u>Panicum</u> sp. (grass, <u>grama</u>)	1	-	+	-	-
<u>Gynerium sagittatum</u> (cane, <u>cana brava</u>)	14	-	895.0	-	-
<u>Scirpus tatora</u> (<u>tatora</u>)	5	-	2.5	-	-
<u>Prosopis chilensis</u> (<u>algorroba</u>)	10	103	+	-	-
Mixed fibrous species	14	-	1182.5	-	-
Unident. plants	11	-	2.5	-	-
Total				11185.0	99.7%
Combined values for percentages less than 1%					0.3 100.0%

TABLE 16
GALINDO ANIMAL REMAINS
CUT 1

Species	Number of Squares Where Present	Minimum Number of Indiv.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mollusks					
<u>Scutalus sp.</u> (land snail)	14	57	57.5	114.0	+
<u>Drymaleus verillum</u> (land snail)	1	1	+	+	+
<u>Semimytilus alcosus</u> (thin-shelled mussel)	4	1	+	1.0	+
<u>Brachidontes purpuratus</u> (small striated mussel)	10	43	62.5	43.0	+
<u>Protothaca thaca</u> (large clam)	1	1	+	+	+
<u>Mesodesma donacium</u> (clam)	2	2	5.0	5.0	+
<u>Donax peruvianus</u> (tide zone clam)	4	1	+	0.5	+
<u>Fissurella sp.</u> (limpet)	5	1	17.5	+	+
<u>Tequila atra</u> (gastropod)	8	5	12.5	5.0	+
<u>Turbo niger</u> (gastropod)	7	9	5.0	9.0	+
<u>Thais chocolata</u> (gastropod)	12	5	95.0	10.0	+
<u>Thais delessertiana</u> (gastropod)	2	2	+	3.0	+
<u>Nassarius gayi</u> (gastropod)	1	1	+	-	-

TABLE 16 (Continued)
GALINDO ANIMAL REMAINS
CUT 1

Species	Number of Squares Where Present	Minimum Number of Indiv.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mollusks (Continued)					
<u>Mitra orientalis</u> (gastropod)	1	1	+	+	+
Chiton (2 species)	1	1	5.0	10.0	+
Crustaceans					
<u>Platyanthus orbignii</u> (purple crab, <u>congrejo</u>)	12	4	10.0	80.0	+
Fish					
<u>Myliobatis peruvianus</u> (ray, <u>raya</u>)	4	1	+	142.0	+
Unident. fish	2	-	+	+	+
Mammals					
Misc. rodent	2	2	+	-	-
<u>Cavia porcellus</u> (guinea pig, <u>cuy</u>)	3	1	+	34.5	+
<u>Canis familiaris</u> (dog)	1	1	+	17.0	+
<u>Lama glama</u> (llama)	12	3	240.0	11245.5	55.6
Unident. mammal	14	-	200.0	8500.0	42.0
Total				20219.5	97.6%
Combined values for percentages less than 1%					2.4 100.0%

TABLE 17
GALINDO PLANT REMAINS
CUT 1

Species	Number of Squares Where Present	Seed Count	Weight in gms	Food Volume in cm ³	% of Plant Diet
Cultivated					
<u>Zea mays</u> (maize, maíz)	9	22 9 cobs	7.5	273.0	47.2
<u>Phaseolus vulgaris</u> (common bean, frijol)	1	1	+	0.4	+
<u>Cucurbita sp.</u> (squash, calabaza)	6	9	+	180.0	31.1
<u>Lagenaria siceraria</u> (gourd, mate)	1	-	+	-	-
<u>Lucuma obovata</u> (lúcuma)	1	1	+	125.0	21.6
Wild					
Unident. plants	4	-	2.5	-	-
Total				578.4	99.9%
Combined values for percentages less than 1%					0.1 100.0%

TABLE 18
GALINDO ANIMAL REMAINS
CUT 2

Species	Number of Squares Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mollusks					
<u>Scutalus sp.</u> (land snail)	18	47	42.5	94.0	+
<u>Semimytilus algosus</u> (thin-shelled mussel)	3	1	+	+	+
<u>Brachidontes purpuratus</u> (small striated mussel)	12	10	5.0	9.5	+
<u>Mesodesma donacium</u> (clam)	1	1	+	+	+
<u>Donax peruvianus</u> (tide zone clam)	17	9	10.0	4.5	+
<u>Fissurella sp.</u> (limpet)	4	2	5.0	20.0	+
<u>Tegula atra</u> (gastropod)	10	5	5.0	5.0	+
<u>Turbo niger</u> (gastropod)	4	3	+	3.0	+
<u>Thais chocolata</u> (gastropod)	8	1	12.5	+	+
<u>Thais delessertiana</u> (gastropod)	2	1	2.5	1.5	+
<u>Cantharus cf. inca</u> (gastropod)	1	1	+	+	+

TABLE 18 (Continued)
GALINDO ANIMAL REMAINS
CUT 2

Species	Number of Squares Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Crustaceans					
<u>Platyanthus orbignii</u> (purple crab, <u>congrejo</u>)	10	1	2.5	20.0	+
Fish					
Unident. fish	1	-	+	+	+
Bird					
Unident. bird	2	-	+	+	++
Mammal					
Misc. rodent	1	1	+	-	-
<u>Cavia porcellus</u> (guinea pig, <u>cuy</u>)	3	1	+	34.5	+
<u>Lama glama</u> (llama)	19	5	600.0	27072.5	55.2
Unident. mammal	19	-	512.5	21781.3	44.4
Total				49045.8	99.6%
Combined values for percentages less than 1%					0.4 100.0%

TABLE 19
GALINDO PLANT REMAINS
CUT 2

Species	Number of Squares Where Present	Seed Count	Weight in gms	Food Volume in cm ³	% of Plant Diet
Cultivated					
<u>Zea mays</u> (maize, <u>maíz</u>)	18	35 21cobs	20.0	626.0	99.4
<u>Phaseolus lunatus</u> (lima bean, <u>pallar</u>)	1	1	+	0.7	+
<u>Phaseolus vulgaris</u> (common bean, <u>frijol</u>)	8	2	+	0.8	+
<u>Cucurbita</u> sp. (squash, <u>calabaza</u>)	1	1	+	+	+
<u>Inga feuillei</u> (<u>pacaé</u>)	1	1	+	2.5	+
Wild					
<u>Sapindus saponaria</u> (soap berry, <u>choloque</u>)	1	1	+	-	-
Mixed fibrous species	3	-	10.0	-	-
Unident. plants	3	-	+	-	-
Total				640.0	99.4%
Combined values for percentages less than 1%					0.6 100.0%

TABLE 20
GALINDO ANIMAL REMAINS
CUT 3

Species	Number of Squares Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mollusks					
<u>Scutalus</u> sp. (land snail)	11	7	10.0	14.0	+
<u>Choromytilus chorus</u> (purple mussel, <u>choro</u>)	1	1	2.5	+	+
<u>Semimytilus alcosus</u> (thin-shelled mussel)	5	1	+	1.0	+
<u>Brachidontes purouratus</u> (small striated mussel)	4	3	2.5	2.5	+
<u>Protothaca thaca</u> (large clam)	1	1	+	+	+
<u>Mesodesma donacium</u> (clam)	1	1	+	+	+
<u>Fissurella</u> sp. (limpet)	2	1	80.0	10.0	+
<u>Tegula atra</u> (gastropod)	5	1	+	1.0	+
<u>Turbo niger</u> (gastropod)	11	13	15.0	13.0	+
<u>Thais chocolata</u> (gastropod)	2	2	7.5	4.0	+
Chiton (2 species)	1	1	+	+	+

TABLE 20 (Continued)
GALINDO ANIMAL REMAINS
CUT 3

Species	Number of Squares Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Crustaceans					
<u>Platyanthus orbignii</u> (purple crab, <u>congrejo</u>)	14	3	15.0	60.0	+
Fish					
<u>Myliobatis peruvianus</u> (ray, <u>rava</u>)	1	1	+	35.5	+
Birds					
Unident. bird	1	-	+	+	+
Mammals					
<u>Lama glama</u> (llama)	12	2	40.0	7080.5	84.4
Unident. mammal	12	-	27.5	1168.8	13.9
Total				8390.3	98.3%
Combined values for percentages less than 1%					1.7
					100.0%

TABLE 21
GALINDO PLANT REMAINS
CUT 3

Species	Number of Squares Where Present	Seed Count	Weight in gms	Food Volume in cm ³	% of Plant Diet
Cultivated					
<u>Zea mays</u> (maize, <u>maíz</u>)	6	6 1cob	+	33.5	34.4
<u>Arachis hypogaea</u> (peanut, <u>mani</u>)	1	1	+	0.5	+
<u>Phaseolus vulgaris</u> (common bean, <u>frijol</u>)	2	3	+	1.0	1.0
<u>Lagenaria siceraria</u> (gourd, <u>mate</u>)	7	-	+	-	-
<u>Persea americana</u> (avocado, <u>paita</u>)	1	1	5.0	62.5	64.1
Wild					
<u>Tillandsia</u> sp. (<u>achupalla</u>)	6	-	+	-	-
<u>Acacia macracantha</u> (<u>espino</u>)	3	-	+	-	-
<u>Prosopis chilensis</u> (<u>algorroba</u>)	3	2	+	-	-
Unident. plants	12	-	20.0	-	-
Total				97.5	99.5%
Value for percentage less than 1%				0.5	100.0%

TABLE 22
GALINDO ANIMAL REMAINS
CUT 4

Species	Number of Squares Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mollusks					
<u>Scutalus</u> sp. (land snail)	14	11	22.5	22.0	+
<u>Drymaeus verillum</u> (land snail)	1	1	+	+	+
<u>Choromytilus chorus</u> (purple mussel, <u>choro</u>)	1	1	5.0	25.0	+
<u>Semimytilus alcosus</u> (thin-shelled mussel)	8	14	15.0	13.5	+
<u>Brachidontes purpuratus</u> (small striated mussel)	6	38	22.5	38.0	+
<u>Argopecten purpuratum</u> (scallop)	1	1	+	-	-
<u>Protothaca thaca</u> (large clam)	1	1	+	+	+
<u>Mesodesma donacium</u> (clam)	5	3	2.5	15.0	+
<u>Donax peruvianus</u> (tide zone clam)	5	1	2.5	0.5	+
<u>Fissurella</u> sp. (limpet)	1	3	20.0	30.0	+
<u>Tegula atra</u> (gastropod)	9	2	5.0	2.0	+
<u>Turbo niger</u> (gastropod)	10	20	35.0	20.0	+
<u>Thais chocolata</u> (gastropod)	5	3	7.5	6.0	+

TABLE 22 (Continued)
GALINDO ANIMAL REMAINS
CUT 4

Species	Number of Squares Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mollusks (Continued)					
<u>Thais delessertiana</u> (gastropod)	9	6	12.5	9.0	+
<u>Cantharus cf. inca</u> (gastropod)	4	2	2.5	+	+
<u>Mitra orientalis</u> (gastropod)	2	2	2.5	1.0	+
Chiton (2 species)	1	1	2.5	+	+
Unident. shell	2	-	+	-	-
Crustaceans					
<u>Platyanthus orbignii</u> (purple crab, <u>congrejo</u>)	13	3	30.0	50.0	+
<u>Balanus tintinnabulum</u> (barnacle)	1	3	+	-	-
Fish					
<u>Paralichthys peruianus</u> (croaker, <u>roncador</u>)	1	1	+	15.5	+
Birds					
Unident. bird	1	-	+	+	+

TABLE 22 (Continued)
GALINDO ANIMAL REMAINS
CUT 4

Species	Number of Squares Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mammals					
Misc. rodent	1	1	+	-	-
<u>Cavia porcellus</u> (guinea pig, <u>cuy</u>)	1	1	+	11.5	+
<u>Canis familiaris</u> (dog)	1	1	+	+	+
<u>Lama glama</u> (llama)	12	3	322.5	19159.0	95.0
Unident. mammal	14	-	17.5	743.8	3.7
Total				20161.8	98.7%
Combined values for percentages less than 1%					1.3
					100.0%

TABLE 23
GALINDO PLANT REMAINS
CUT 4

Species	Number of Squares Where Present	Seed Count	Weight in gms	Food Volume in cm ³	% of Plant Diet
Cultivated					
<u>Zea mays</u> (maize, <u>maíz</u>)	10	12 2 cobs	+	60.0	32.5
<u>Phaseolus vulgaris</u> (common bean, <u>frijol</u>)	6	5	+	1.8	1.0
<u>Cucurbita</u> sp. (squash, <u>calabaza</u>)	1	3	+	60.0	32.5
<u>Lagenaria siceraria</u> (gourd, <u>mate</u>)	1	-	+	-	-
<u>Lucuma obovata</u> (<u>lúcuma</u>)	1	1	+	62.5	34.0
Wild					
Unident. algae	2	-	+	-	-
<u>Tillandsia</u> sp. (<u>achupalla</u>)	8	-	7.5	-	-
<u>Acacia macracantha</u> (<u>espino</u>)	9	-	22.5	-	-
Mixed fibrous species	3	-	+	-	-
Unident. plants	1	-	+	-	-
Total				184.3	100.0%

TABLE 24
GALINDO ANIMAL REMAINS
CUT 5

Species	Number of Squares Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mollusks					
<u>Scutalus</u> sp. (land snail)	2	1	+	2.0	+
<u>Drymaeus verillum</u> (land snail)	1	1	+	+	+
<u>Choromytilus chorus</u> (purple mussel, <u>choro</u>)	1	1	+	+	+
<u>Semimytilus alcosus</u> (thin-shelled mussel)	2	1	+	+	+
<u>Brachidontes purpuratus</u> (small striated mussel)	2	1	+	0.5	+
<u>Argopecten purpuratum</u> (scallop)	1	1	+	-	-
<u>Mesodesma donacium</u> (clam)	1	1	+	2.5	+
<u>Donax peruvianus</u> (tide zone clam)	9	16	7.5	7.8	+
<u>Fissurella</u> sp. (limpet)	2	1	2.5	10.0	+
<u>Tequila atra</u> (gastropod)	10	29	52.5	29.0	+
<u>Turbo niger</u> (gastropod)	9	25	10.0	25.0	+
<u>Thais chocolata</u> (gastropod)	7	5	15.0	10.0	+
<u>Thais delessertiana</u> (gastropod)	9	8	15.0	12.0	+

TABLE 24 (Continued)
GALINDO ANIMAL REMAINS
CUT 5

Species	Number of Squares Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mollusks (Continued)					
<u>Cantharus cf. inca</u> (gastropod)	1	1	2.5	+	+
Unident. shell	1	-	+	-	-
Crustaceans					
<u>Platvanthus orbignii</u> (purple crab, <u>congrejo</u>)	5	1	+	+	+
<u>Balanus tintinnabulum</u> (barnacle)	1	1	+	-	-
Fish					
<u>Sciaena deliciosa</u> (croaker, <u>lorna</u>)	1	-	+	16.5	+
Unident. fish	2	-	+	+	+
Mammals					
<u>Lama glama</u> (llama)	9	2	132.5	6664.0	86.1
Unident. mammal	9	-	22.5	956.3	12.4
Total				7735.6	98.5%
Combined values for percentages less than 1%					1.5 100.0%

TABLE 25
GALINDO PLANT REMAINS
CUT 5

Species	Number of Squares Where Present	Seed Count	Weight in gms	Food Volume in cm ³	% of Plant Diet
Cultivated					
<u>Zea mays</u> (maize, <u>maíz</u>)	10	20 20 cobs	17.5	606.0	72.7
<u>Phaseolus vulgaris</u> (common bean, <u>frijol</u>)	8	8	+	3.0	+
<u>Gossypium barbadense</u> (cotton, <u>algodón</u>)	3	-	+	-	-
<u>Cucurbita</u> sp. (squash, <u>calabaza</u>)	4	5	+	100.0	12.0
<u>Lagenaria siceraria</u> (gourd, <u>mate</u>)	1	-	+	-	-
<u>Psidium guajava</u> (guava, <u>quayaba</u>)	1	+	+	+	+
<u>Lucuma obovata</u> (<u>lucuma</u>)	2	1	+	125.0	15.0
Wild					
Unident. algae	1	-	+	-	-
<u>Acacia macracantha</u> (<u>espino</u>)	5	-	+	-	-
Unident. plants	4	-	+	-	-
Total				834.0	99.7%
Combined values for percentages less than 1%					1.3 100.0%

TABLE 26
GALINDO ANIMAL REMAINS
CUT 6

Species	Number of Squares Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mollusks					
<u>Scutalus sp.</u> (land snail)	44	29	27.5	58.0	+
<u>Drymaeus verillum</u> (land snail)	2	1	+	+	+
<u>Choromytilus chorus</u> (purple mussel, <u>choro</u>)	2	1	+	+	+
<u>Semimytilus alcosus</u> (thin-shelled mussel)	14	2	+	2.0	+
<u>Brachidontes purpuratus</u> (small striated mussel)	11	8	2.5	8.0	+
<u>Argopecten purpuratum</u> (scallop)	1	1	+	-	-
<u>Protothaca thaca</u> (large clam)	9	1	+	+	+
<u>Eurhomalea rufa</u> (large clam)	1	1	+	+	+
<u>Mesodesma donacium</u> (clam)	31	1	20.0	+	+
<u>Donax peruvianus</u> (tide zone clam)	44	29	17.5	14.3	+
<u>Fissurella sp.</u> (limpet)	8	3	22.5	30.0	+
<u>Tegula atra</u> (gastropod)	51	446	425.0	446.0	1.1
<u>Turbo niger</u> (gastropod)	42	171	40.0	171.0	+

TABLE 26 (Continued)
GALINDO ANIMAL REMAINS
CUT 6

Species	Number of Squares Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mollusks (Continued)					
<u>Crepidula dilatata</u> (slipper shell)	2	1	+	1.3	+
<u>Polinices cf. cora</u> (gastropod)	2	2	+	2.0	+
<u>Thais chocolata</u> (gastropod)	42	28	140.0	56.0	+
<u>Thais delessertiana</u> (gastropod)	48	111	177.5	166.5	+
<u>Cantharus cf. inca</u> (gastropod)	8	4	+	+	+
<u>Nassarius gayi</u> (gastropod)	3	2	+	-	-
<u>Mitra orientalis</u> (gastropod)	1	1	+	+	+
<u>Concholepas concholepas</u> (abalone-like gastropod)	2	1	2.5	50.0	+
Chiton (2 species)	7	1	5.0	10.0	+
Unident. shell	5	-	+	-	-
Crustaceans					
<u>Platyanthus orbignii</u> (purple crab, <u>congrejo</u>)	40	8	27.5	150.0	+
<u>Balanus tintinnabulum</u> (barnacle)	4	2	+	-	-

TABLE 26 (Continued)
GALINDO ANIMAL REMAINS
CUT 6

Species	Number of Squares Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Echinoderms					
<u>Tetrapygus niger</u> (sea urchin, <u>erizo</u>)	2	-	+	+	+
Fish					
<u>Paralichthys peruianus</u> (croaker, <u>roncador</u>)	2	1	+	46.5	+
<u>Sciaena deliciosa</u> (croaker, <u>lorca</u>)	1	1	+	16.5	+
Unident. fish	1	-	+	+	+
Birds					
Unident. bird	8	-	7.5	105.8	+
Mammals					
Misc. rodent	1	2	+	-	-
<u>Cavia porcellus</u> (guinea pig, <u>cuy</u>)	6	3	5.0	195.5	+
<u>Canis familiaris</u> (dog)	6	1	+	34.0	+
<u>Otaria byronia</u> (sea lion, <u>lobo del mar</u>)	1	1	+	1449.0	3.6
<u>Lama glama</u> (llama)	34	4	705.0	33320.0	82.3
Unident. mammal	40	-	97.5	4143.8	10.2

TABLE 26 (Continued)
GALINDO ANIMAL REMAINS
CUT 6

Species	Number of Squares Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Total				40475.4	97.2%
Combined values for percentages less than 1%					2.8 100.0%

TABLE 27
GALINDO PLANT REMAINS
CUT 6

Species	Number of Squares Where Present	Seed Count	Weight in gms	Food Volume in cm ³	% of Plant Diet
<u>Zea mays</u> (maize, <u>maíz</u>)	41	94 49 cobs	40.0	1485.0	82.4
<u>Arachis hypogaea</u> (peanut, <u>mani</u>)	4	-	+	0.5	+
<u>Phaseolus lunatus</u> (lima bean, <u>pallar</u>)	1	-	+	+	+
<u>Phaseolus vulgaris</u> (common bean, <u>frijol</u>)	9	15	+	6.0	+
<u>Gossypium barbadense</u> (cotton, <u>algodón</u>)	3	-	+	-	-
<u>Cucurbita</u> sp. (squash, <u>calabaza</u>)	3	14	+	60.0	3.3
<u>Lagenaria siceraria</u> (gourd, <u>mate</u>)	3	1	+	-	-
<u>Lucuma obovata</u> (<u>lúcuma</u>)	3	2	+	250.0	13.9
Wild					
<u>Tillandsia</u> sp. (<u>achupalla</u>)	2	-	+	-	-
<u>Acacia macracantha</u> (<u>espino</u>)	7	-	+	-	-
Unident. plants	8	-	+	-	-
Total				1801.5	99.6%
Combined values for percentages less than 1%					0.4 100.0%

TABLE 28
GALINDO ANIMAL REMAINS
CUT 7

Species	Number of Squares Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mollusks					
<u>Scutalus</u> sp. (land snail)	63	95	102.5	190.0	1.3
<u>Semimytilus algosus</u> (thin-shelled mussel)	42	16	5.0	16.0	+
<u>Brachidontes purpuratus</u> (small striated mussel)	12	6	+	5.5	+
<u>Pinctada mazatlanica</u> (pearl oyster)	1	1	+	-	-
<u>Argopecten purpuratum</u> (scallop)	4	1	+	-	-
<u>Protothaca thaca</u> (large clam)	1	1	+	+	+
<u>Eurhomalea rufa</u> (large clam)	1	1	+	+	+
<u>Mesodesma donacium</u> (clam)	44	55	105.0	275.0	1.8
<u>Donax peruvianus</u> (tide zone clam)	68	542	770.0	270.8	1.8
<u>Fissurella</u> sp. (limpet)	7	1	5.0	+	+
<u>Tequila atra</u> (gastropod)	14	8	2.5	8.0	+
<u>Turbo niger</u> (gastropod)	15	12	5.0	12.0	+
<u>Thais chocolata</u> (gastropod)	41	25	80.0	50.0	+

TABLE 28 (Continued)
GALINDO ANIMAL REMAINS
CUT 7

Species	Number of Squares Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mollusks (Continued)					
<u>Thais delessertiana</u> (gastropod)	40	49	55.0	73.5	+
<u>Cantharus cf. inca</u> (gastropod)	6	6	2.5	+	+
<u>Nassarius gayi</u> (gastropod)	3	3	+	-	-
<u>Mitra orientalis</u> (gastropod)	2	1	+	0.5	+
<u>Concholepas concholepas</u> (abalone-like gastropod)	1	1	2.5	+	+
Chiton (2 species)					
Crustaceans					
<u>Piatyanthus orbignii</u> (purple crab, <u>congrejo</u>)	30	4	+	65.0	+
<u>Balanus tintinnabulum</u> (barnacle)	4	2	+	-	-
Fish					
<u>Myliobatis peruvianus</u> (ray, <u>raya</u>)	1	1	+	35.5	+
<u>Paralichthys peruianus</u> (croaker, <u>roncador</u>)	1	1	+	15.5	+
<u>Sciaena deliciosa</u> (croaker, <u>lorna</u>)	1	1	+	16.5	+
Unident. fish	7	-	+	+	+

TABLE 28 (Continued)
GALINDO ANIMAL REMAINS
CUT 7

Species	Number of Squares Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Birds					
<u>Pelecanus sp.</u> (pelican)	1	1	2.5	64.0	+
Unident. bird	16	-	7.5	105.0	+
Mammal					
Misc. rodent	4	2	+	-	-
<u>Cavia porcellus</u> (guinea pig, <u>cuy</u>)	1	1	+	11.5	+
<u>Canis familiaris</u> (dog)	6	1	2.5	136.0	+
<u>Lama glama</u> (llama)	25	2	177.5	7080.5	47.5
Unident. mammal	63	-	152.5	6481.3	43.5
Total				14912.1	95.9%
Combined values for percentages less than 1%					4.1
					100.0%

TABLE 29
GALINDO PLANT REMAINS
CUT 7

Species	Number of Squares Where Present	Seed Count	Weight in gms	Food Volume in cm ³	% of Plant Diet
Cultivated					
<u>Zea mays</u> (maize, <u>maíz</u>)	48	49 21 cobs	5.0	636.0	38.6
<u>Arachis hypogaea</u> (peanut, <u>mani</u>)	1	-	+	0.5	+
<u>Phaseolus vulgaris</u> (common bean, <u>frijol</u>)	14	23	5.0	2.0	+
<u>Gossypium barbadense</u> (cotton, <u>algodón</u>)	1	-	+	-	-
<u>Cucurbita</u> sp. (squash, <u>calabaza</u>)	14	159 1 stem	10.0	1000.0	60.7
<u>Lagenaria siceraria</u> (gourd, <u>mate</u>)	9	4	5.0	-	-
<u>Bunchosia armeniaca</u> (cansaboca)	1	1	+	10.0	+
Wild					
Unident. algae	1	-	+	-	-
<u>Tillandsia</u> sp. (<u>achupalla</u>)	2	-	+	-	-
<u>Acacia macracantha</u> (<u>espino</u>)	3	-	2.5	-	-
Unident. plants	8	-	+	-	-
Total				1648.5	99.3%
Combined values for percentages less than 1%					0.7 100.0%

TABLE 30
HUACA DEL SOL EARLY CHIMU OCCUPATION ANIMAL REMAINS
CUT 1

Species	Number of Levels Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mollusks					
<u>Scutalus</u> sp. (land snail)	4	51	37.5	102.0	1.1
<u>Choromytilus chorus</u> (purple mussel, <u>choro</u>)	2	1	2.5	+	+
<u>Semimytilus alcosus</u> (thin-shelled mussel)	4	5	2.5	4.5	+
<u>Brachidontes purpuratus</u> (small striated mussel)	3	3	+	2.5	+
<u>Spondylus</u> sp. (thorny oyster)	1	1	+	-	-
<u>Mesodesma donacium</u> (clam)	4	2	17.5	7.5	+
<u>Donax peruvianus</u> (tide zone clam)	4	761	870.0	380.3	4.3
<u>Fissurella</u> sp. (limpet)	4	1	7.5	10.0	+
<u>Tegula atra</u> (gastropod)	4	1	+	1.0	+
<u>Turbo niger</u> (gastropod)	4	8	12.5	8.0	+
<u>Thais chocolata</u> (gastropod)	3	2	7.5	4.0	+
<u>Thais delessertiana</u> (gastropod)	3	4	5.0	6.0	+
<u>Cantharus</u> cf. <u>inca</u> (gastropod)	1	1	+	+	+

TABLE 30 (Continued)

HUACA DEL SOL, EARLY CHIMU OCCUPATION ANIMAL REMAINS

CUT 1

Species	Number of Levels Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mollusks (Continued)					
<u>Nassarius gavi</u> (gastropod)	2	2	+	-	-
<u>Mitra orientalis</u> (gastropod)	1	1	2.5	0.5	+
Chiton (2 species)	2	1	+	+	+
Unident. shell	1	-	+	-	-
Crustaceans					
<u>Platyanthus orbignii</u> (purple crab, <u>congrejo</u>)	4	2	15.0	35.0	+
<u>Balanus tintinnabulum</u> (barnacle)	2	1	2.5	-	-
Echinoderm					
<u>Tetrapygus niger</u> (sea urchin, <u>erizo</u>)	1	-	+	+	+
Fish					
<u>Nyliobatis peruvianus</u> (ray, <u>raya</u>)	1	1	+	35.5	+
<u>Paralichthys peruanus</u> (croaker, <u>roncador</u>)	3	1	+	124.0	1.4
<u>Sciaena deliciosa</u> (croaker, <u>lorna</u>)	2	3	+	66.0	+
<u>Mugil cephalus</u> (mullet, <u>lisa</u>)	2	1	+	65.0	+

TABLE 30 (Continued)

HUACA DEL SOL, EARLY CHIMU OCCUPATION ANIMAL REMAINS

CUT 1

Species	Number of Levels Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Fish (Continued)					
Unident. fish	3	-	+	+	+
Birds					
Unident. bird	4	-	+	+	+
Mammals					
Misc. rodent	2	4	+	-	-
<u>Cavia porcellus</u> (guinea pig, <u>cuy</u>)	2	1	+	23.0	+
<u>Canis familiaris</u> (dog)	2	1	12.5	68.0	+
<u>Otaria byronia</u> (sea lion, <u>lobo del mar</u>)	1	1	22.5	2898.0	32.7
<u>Lama glama</u> (llama)	4	1	142.5	3332.0	37.6
Unident. mammal	4	-	40.0	1700.0	19.2
Total				8872.8	96.3%
Combined values for percentages less than 1%					3.7
					100.0%

TABLE 31
HUACA DEL SOL EARLY CHIMU OCCUPATION PLANT REMAINS
CUT 1

Species	Number of Levels Where Present	Seed Count	Weight in gms	Food Volume in cm ³	% of Plant Diet
Cultivated					
<u>Zea mays</u> (maize, <u>maiz</u>)	4	38 cobs	35.0	1172.0	47.3
<u>Arachis hypogaea</u> (peanut, <u>mani</u>)	4	7 pods	2.5	3.5	+
<u>Phaseolus vulgaris</u> (common bean, <u>frijol</u>)	4	+ pods	12.5	20.0	+
<u>Gossypium barbadense</u> (cotton, <u>algodon</u>)	4	13	2.5	-	-
<u>Capsicum sp.</u> (pepper, <u>aji</u>)	3	14 stems	+	280.0	11.3
<u>Cucurbita sp.</u> (squash, <u>calabaza</u>)	4	73 1 stem	12.5	1000.0	40.4
<u>Lagenaria siceraria</u> (gourd, <u>mate</u>)	4	53	60.0	-	-
<u>Inga feuillei</u> (<u>paca</u>)	1	-	+	+	+
<u>Lucuma obovata</u> (<u>lucuma</u>)	1	-	+	+	+
Wild					
Unident. algae	2	-	-	+	-
<u>Cenchrus echinatus</u> (<u>burr</u>)	2	6	-	+	-
<u>Panicum sp.</u> (grass, <u>grama</u>)	4	-	-	+	-

TABLE 31 (Continued)
HUACA DEL SOL EARLY CHIMU OCCUPATION PLANT REMAINS
CUT 1

Species	Number of Levels Where Present	Seed Count	Weight in gms	Food Volume in cm ³	% of Plant Diet
Wild (Continued)					
<u>Gynerium sagittatum</u> (cane, <u>cana brava</u>)	4	-	95.0	-	-
<u>Scirpus tatora</u> (<u>tatora</u>)	3	-	2.5	-	-
<u>Prosois chilensis</u> (<u>algorroba</u>)	4	96	7.5	-	-
Mixed fibrous species	4	-	295.0	-	-
Unident. plants	4	-	7.5	-	-
Total				2475.5	99.0%
Combined values for percentages less than 1%					1.0 100.0%

TABLE 32
CHAN CHAN SIAR ANIMAL REMAINS
CUT 1

Species	Number of Levels Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mollusks					
<u>Scutalus sp.</u> (land snail)	7	6	7.5	12.0	+
<u>Choromytilus chorus</u> (purple mussel, <u>choro</u>)	1	1	+	+	+
<u>Semimytilus algosus</u> (thin-shelled mussel)	6	11	7.5	10.5	+
<u>Brachidontes purpuratus</u> (small striated mussel)	6	4	+	4.0	+
<u>Spondylus sp.</u> (thorny oyster)	1	1	+	-	-
<u>Protothaca thaca</u> (large clam)	2	1	+	+	+
<u>Eurhomalea rufa</u> (large clam)	2	1	+	+	+
<u>Mesodesma donacium</u> (clam)	1	1	+	+	+
<u>Donax peruvianus</u> (tide zone clam)	7	521	740.0	260.5	3.3
<u>Fissurella sp.</u> (limpet)	1	2	2.5	20.0	+
<u>Tegula atra</u> (gastropod)	5	2	7.5	2.0	+
<u>Turbo niger</u> (gastropod)	7	32	32.5	32.0	+
<u>Crepidula dilatata</u> (slipper shell)	1	1	+	+	+

TABLE 32 (Continued)
CHAN CHAN SIAR ANIMAL REMAINS
CUT 1

Species	Number of Levels Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mollusks (Continued)					
<u>Polinices cf. cora</u> (gastropod)	2	2	+	1.0	+
<u>Thais chocolata</u> (gastropod)	7	9	25.0	18.0	+
<u>Thais delessertiana</u> (gastropod)	7	9	17.5	13.5	+
<u>Cantharus cf. inca</u> (gastropod)	3	3	+	+	+
<u>Nassarius gavi</u> (gastropod)	4	8	+	-	-
<u>Mitra orientalis</u> (gastropod)	3	4	7.5	2.0	+
Crustaceans					
<u>Platyanthus orbignii</u> (purple crab, <u>congrejo</u>)	7	1	2.5	10.0	+
<u>Balanus tintinnabulum</u> (barnacle)	1	1	+	-	-
Fish					
<u>Paralichthys peruianus</u> (croaker, <u>roncador</u>)	5	1	2.5	186.0	2.3
<u>Sciaena deliciosa</u> (croaker, <u>lorna</u>)	1	1	+	16.5	+
<u>Muqil cephalus</u> (mullet, <u>lisa</u>)	1	1	+	65.0	+
Unident. fish	6	-	+	+	+

TABLE 32 (Continued)
CHAN CHAN SIAR ANIMAL REMAINS

CUT 1

Species	Number of Levels Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Birds					
Unident. bird	2	-	+	+	+
Mammals					
Misc. rodent	4	2	+	-	-
<u>Cavia porcellus</u> (guinea pig, cuy)	1	1	+	11.5	+
<u>Canis familiaris</u> (dog)	4	1	17.5	102.0	1.3
<u>Otaria byronia</u> (sea lion, lobo del mar)	1	1	2.5	724.5	9.1
<u>Lama glama</u> (llama)	7	1	147.5	4581.5	57.4
Unident. mammal	5	-	45.0	1912.5	24.0
Total				7985.0	97.4%
Combined values for percentages less than 1%					2.6 100.0%

TABLE 33
CHAN CHAN SIAR PLANT REMAINS

CUT 1

Species	Number of Levels Where Present	Seed Count	Weight in gms	Food Volume in cm ³	% of Plant Diet
Cultivated					
<u>Zea mays</u> (maize, maíz)	7	207 45 cobs	85.0	1196.0	22.3
<u>Arachis hypogaea</u> (peanut, mani)	1	-	+	+	+
<u>Phaseolus vulgaris</u> (common bean, frijol)	5	36 1 pod	15.0	14.2	+
<u>Gossypium barbadense</u> (cotton, algodón)	7	27	17.5	-	-
<u>Capsicum</u> sp. (pepper, ají)	5	38 stems	2.5	760.0	14.2
<u>Cucurbita</u> sp. (squash, calabaza)	6	10	+	200.0	3.7
<u>Lagenaria siceraria</u> (gourd, mate)	6	2	17.5	-	-
<u>Annona muricata</u> (guanábana)	7	99	45.0	1250.0	23.3
<u>Persea americana</u> (avocado, palta)	5	5	52.5	562.5	10.5
<u>Inga feuillei</u> (paca)	1	-	+	+	+
<u>Bunchosia armeniaca</u> (cansaboca)	5	12	5.0	120.0	2.2
<u>Lucuma obovata</u> (lúcuma)	6	10	22.5	1250.0	23.4

TABLE 33 (Continued)
CHAN CHAN SIAR PLANT REMAINS

CUT 1

Species	Number of Levels Where Present	Seed Count	Weight in gms	Food Volume in cm ³	% of Plant Diet
Wild					
Unident. algae	2	-	+	-	-
<u>Cenchrus echinatus</u> (burr)	6	135	7.5	-	-
<u>Panicum</u> sp. (grass, grama)	7	-	67.5	-	-
<u>Gynerium sagittatum</u> (cane, cana brava)	7	-	42.5	-	-
<u>Tillandsia</u> sp. (achupalla)	7	-	37.5	-	-
<u>Nectandra</u> sp. (mishpingo)	1	1	+	-	-
<u>Frosopis chilensis</u> (algorroba)	6	221	15.0	-	-
Mixed fibrous species	6	-	225.0	-	-
Unident. plants	6	-	27.5	-	-
Total				5352.7	99.6%
Combined values for percentages less than 1%				0.4	100.0%

TABLE 34
CHAN CHAN SIAR ANIMAL REMAINS

CUT 2

Species	Number of Levels Where Present	Minimum Number Of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mollusks					
<u>Scutalus</u> sp. (land snail)	6	11	22.0	22.0	+
<u>Choromytilus chorus</u> (purple mussel, choro)	3	1	+	25.0	+
<u>Semimytilus alcosus</u> (thin-shelled mussel)	7	2	+	1.5	+
<u>Brachidontes purpuratus</u> (small striated mussel)	3	1	+	0.5	+
<u>Pinctada mazatlanica</u> (pearl oyster)	1	1	+	-	-
<u>Argopecten purpuratum</u> (scallop)	2	1	2.5	-	-
<u>Mesodesma donacium</u> (clam)	1	1	+	2.5	+
<u>Donax peruvianus</u> (tide zone clam)	12	1753	2342.5	876.3	5.5
<u>Semele corrugata</u> (large clam)	7	1	2.5	30.0	+
<u>Fissurella</u> sp. (limpet)	4	1	2.5	+	+
<u>Tequila atra</u> (gastropod)	6	4	2.5	4.0	+
<u>Turbo niger</u> (gastropod)	8	14	10.0	14.0	+
<u>Folinices</u> cf. <u>cora</u> (gastropod)	8	11	7.5	5.5	+

TABLE 34 (Continued)
CHAN CHAN SIAR ANIMAL REMAINS

CUT 2

Species	Number of Levels Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mollusks (Continued)					
<u>Thais chocolata</u> (gastropod)	6	6	20.0	12.0	+
<u>Thais delessertiana</u> (gastropod)	7	10	10.0	15.0	+
<u>Cantharus cf. inca</u> (gastropod)	4	5	2.5	+	+
<u>Massarius gavi</u> (gastropod)	3	3	+	-	-
<u>Olivella columellaris</u> (gastropod)	1	1	+	-	-
<u>Mitra orientalis</u> (gastropod)	4	1	+	0.5	+
Crustaceans					
<u>Platyanthus orbignii</u> (purple crab, <u>congrejo</u>)	7	2	5.0	30.0	+
<u>Balanus tintinnabulum</u> (barnacle)	4	3	2.5	-	-
Fish					
<u>Mustelus sp.</u> (sand shark, <u>tollo</u>)	1	1	+	+	+
<u>Paralichthys peruanus</u> (croaker, <u>concador</u>)	9	1	15.0	620.0	3.9
<u>Sciaena deliciosa</u> (croaker, <u>lorna</u>)	3	1	+	82.5	+
Unident. fish	10	-	5.0	125.0	+

TABLE 34 (Continued)
CHAN CHAN SIAR ANIMAL REMAINS

CUT 2

Species	Number of Levels Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Birds					
Unident. bird	8	-	20.0	280.0	1.8
Mammals					
Misc. rodents	1	2	+	-	-
<u>Cavia porcellus</u> (guinea pig, <u>cuy</u>)	2	1	+	23.0	+
<u>Canis familiaris</u> (dog)	2	1	+	51.0	+
<u>Otaria byronia</u> (sea lion, <u>lobo del mar</u>)	1	1	2.5	1449.0	9.1
<u>Lama glama</u> (llama)	10	2	257.5	10412.5	65.1
Unident. mammal	12	-	45.0	1912.5	12.0
Total				15994.3	97.4%
Combined values for percentages less than 1%					2.6
					100.0%

TABLE 35
CHAN CHAN SIAR PLANT REMAINS
CUT 2

Species	Number of Levels Where Present	Seed Count	Weight in gms	Food Volume in cm ³	% of Plant Diet
Cultivated					
<u>Zea mays</u> (maize, <u>maíz</u>)	10	66 19 cobs	27.5	503.0	9.8
<u>Arachis hypogaea</u> (peanut, <u>mani</u>)	4	-	+	+	+
<u>Phaseolus vulgaris</u> (common bean, <u>frijol</u>)	6	7	+	2.6	+
<u>Capsicum</u> sp. (pepper, <u>ají</u>)	1	2 stems	+	40.0	+
<u>Cucurbita</u> sp. (squash, <u>calabaza</u>)	3	8	+	160.0	3.1
<u>Lagenaria siceraria</u> (gourd, <u>mate</u>)	4	1	7.5	-	-
<u>Annona muricata</u> (<u>guanábana</u>)	9	179	35.0	2250.0	43.7
<u>Persea americana</u> (avocado, <u>paita</u>)	1	1	2.5	62.5	1.2
<u>Inga feuillei</u> (<u>pacae</u>)	1	2	+	+	+
<u>Bunchosia armeniaca</u> (<u>cansaboca</u>)	1	1	+	10.0	+
<u>Lucuma obovata</u> (<u>lúcuma</u>)	8	17	7.5	2125.0	41.2

TABLE 35 (Continued)
CHAN CHAN SIAR PLANT REMAINS
CUT 2

Species	Number of Levels Where Present	Seed Count	Weight in gms	Food Volume in cm ³	% of Plant Diet
Wild					
Unident. algae	1	-	+	-	-
<u>Panicum</u> sp. (grass, <u>grama</u>)	1	-	2.5	-	-
<u>Gynerium sagittatum</u> (cane, <u>cana brava</u>)	5	-	20.0	-	-
<u>Tillandsia</u> sp. (<u>achupalla</u>)	12	-	140.0	-	-
<u>Prosopis chilensis</u> (<u>algarroba</u>)	4	6	+	-	-
Mixed fibrous species	12	-	115.0	-	-
Unident. plants	5	-	5.0	-	-
Total				5153.1	99.0%
Combined values for percentages less than 1%					1.0 100.0%

TABLE 36
CHAN CHAN SIAR ANIMAL REMAINS
CUT 3

Species	Number of Levels Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mollusks					
<u>Scutalus</u> sp. (land snail)	8	10	10.0	20.0	+
<u>Drymaeus verillum</u> (land snail)	1	1	+	+	+
<u>Choromytilus chorus</u> (purple mussel, <u>choro</u>)	4	1	7.5	50.0	+
<u>Semimytilus algosus</u> (thin-shelled mussel)	6	2	2.5	1.5	+
<u>Brachidontes purpuratus</u> (small striated mussel)	6	2	+	1.5	+
<u>Pinctada mazatlanica</u> (pearl oyster)	1	1	+	-	-
<u>Argopecten purpuratum</u> (scallop)	2	1	+	-	-
<u>Protothaca thaca</u> (large clam)	6	1	+	10.0	+
<u>Eurhomalea rufa</u> (large clam)	1	1	7.5	+	+
<u>Petricola rugosa</u> (borer)	3	1	+	+	+
<u>Donax peruvianus</u> (tide zone clam)	9	2013	2397.5	1006.3	9.7
<u>Semele corrugata</u> (large clam)	8	1	5.0	60.0	+
<u>Tequila atra</u> (gastropod)	4	7	5.0	7.0	+

TABLE 36 (Continued)
CHAN CHAN SIAR ANIMAL REMAINS
CUT 3

Species	Number of Levels Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mollusks (Continued)					
<u>Turbo niger</u> (gastropod)	7	15	10.0	15.0	+
<u>Polinices cf. cora</u> (gastropod)	3	5	5.0	2.5	+
<u>Thais chocolata</u> (gastropod)	9	6	10.0	12.0	+
<u>Thais delessertiana</u> (gastropod)	5	4	5.0	6.0	+
<u>Cantharus cf. inca</u> (gastropod)	2	1	2.5	+	+
<u>Nassarius gayi</u> (gastropod)	2	1	+	-	-
<u>Mitra orientalis</u> (gastropod)	1	1	+	0.5	+
<u>Concholepas concholepas</u> (abalone-like gastropod)	1	1	+	+	+
Crustaceans					
<u>Platyanthus orbignii</u> (purple crab, <u>congrejo</u>)	9	7	27.5	130.0	1.3
<u>Balanus tintinnabulum</u> (barnacle)	6	5	+	-	-
Fish					
<u>Mustelus</u> sp. (sand shark, <u>tollo</u>)	1	1	+	+	+

TABLE 36 (Continued)
CHAN CHAN SIAR ANIMAL REMAINS
CUT 3

Species	Number of Levels Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Fish (Continued)					
<u>Paralichthys peruanus</u> (croaker, <u>roncador</u>)	8	1	7.5	279.0	2.7
<u>Sciaena deliciosa</u> (croaker, <u>lorna</u>)	4	2	+	82.5	+
Unident. fish	7	-	2.5	62.5	+
Birds					
Unident. bird	4	-	10.0	140.0	1.4
Mammals					
Misc. rodents	4	3	+	-	-
<u>Cavia porcellus</u> (guinea pig, <u>cuy</u>)	2	1	+	34.5	+
<u>Canis familiaris</u> (dog)	4	1	12.5	51.0	+
<u>Lama glama</u> (llama)	7	2	124.5	8330.0	80.0
Unident. mammal	4	-	2.5	106.3	1.0
Total				10408.1	96.1%
Combined values for percentages less than 1%					3.9 100.0%

TABLE 37
CHAN CHAN SIAR PLANT REMAINS
CUT 3

Species	Number of Levels Where Present	Seed Count	Weight in gms	Food Volume in cm ³	% of Plant Diet
Cultivated					
<u>Zea mays</u> (maize, <u>maiz</u>)	7	3	7.5	343.5	3.0
<u>Arachis hypogaea</u> (peanut, <u>mani</u>)	5	-	2.5	+	+
<u>Gossypium barbadense</u> (cotton, <u>algodon</u>)	4	14	5.0	-	-
<u>Capsicum</u> sp. (pepper, <u>aji</u>)	2	26 stems	2.5	520.0	4.6
<u>Cucurbita</u> sp. (squash, <u>calabaza</u>)	3	2	+	40.0	+
<u>Lagenaria siceraria</u> (gourd, <u>mate</u>)	3	2	5.0	-	-
<u>Annona muricata</u> (guanábana)	7	119	32.5	1500.0	13.2
<u>Persea americana</u> (avocado, <u>paita</u>)	2	2	7.5	250.0	2.2
<u>Bunchosia armeniaca</u> (<u>cansaboca</u>)	5	21	7.5	210.0	1.8
<u>Lucuma obovata</u> (<u>lucuma</u>)	6	68	87.5	8500.0	74.8
Wild					
Unident. algae	4	-	+	-	-
<u>Cenchrus echinatus</u> (burr)	1	2	+	-	-

TABLE 37 (Continued)
CHAN CHAN SIAR PLANT REMAINS
CUT 3

Species	Number of Levels Where Present	Seed Count	Weight in gms	Food Volume in cm ³	% of Plant Diet
Wild (Continued)					
<u>Panicum</u> sp. (grass, grama)	2	-	2.5	-	-
<u>Gynerium sagittatum</u> (cane, <u>cana brava</u>)	7	-	22.5	-	-
<u>Tillandsia</u> sp. (achupalla)	5	-	5.0	-	-
<u>Nectandra</u> sp. (mishpingo)	4	2	+	-	-
<u>Prosopis chilensis</u> (ajgorroba)	4	12	+	-	-
Mixed fibrous species	9	-	77.5	-	-
Unident. plants	5	-	12.5	-	-
Total			11363.5		99.6%
Combined values for percentages less than 1%					0.4 100.0%

TABLE 38
CHAN CHAN SIAR ANIMAL REMAINS
CUT 4

Species	Number of Levels Where Present	Minimum Number of Individ.	Weight in gms	Heat Volume in cm ³	% of Meat Diet
Mollusks					
<u>Scutalus</u> sp. (land snail)	7	4	+	8.0	+
<u>Choromytilus chorus</u> (purple mussel, <u>choro</u>)	6	2	22.5	75.0	+
<u>Seminvtilus algosus</u> (thin-shelled mussel)	3	1	+	+	+
<u>Brachidontes purpuratus</u> (small striated mussel)	3	1	+	1.0	+
<u>Pinctada mazatlanica</u> (pearl oyster)	1	1	+	-	-
<u>Protothaca thaca</u> (large clam)	3	1	+	10.0	+
<u>Donax peruvianus</u> (tide zone clam)	10	4597	5757.5	2298.3	28.4
<u>Semele corrugata</u> (large clam)	6	3	7.5	150.0	1.9
<u>Fissurella</u> sp. (limpet)	2	2	+	+	+
<u>Tequila atra</u> (gastropod)	4	2	2.5	2.0	+
<u>Turbo niger</u> (gastropod)	6	15	12.5	15.0	+
<u>Strombus peruvianus</u> (conch)	1	1	+	-	-
<u>Crepidula dilatata</u> (slipper shell)	1	1	+	+	+

TABLE 38 (Continued)
CHAN CHAN SIAR ANIMAL REMAINS
CUT 4

Species	Number of Levels Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mollusks (Continued)					
<u>Polinices cf. cora</u> (gastropod)	3	6	5.0	3.0	+
<u>Thais chocolata</u> (gastropod)	4	1	5.0	2.0	+
<u>Thais delessertiana</u> (gastropod)	5	5	5.0	7.5	+
<u>Cantharus cf. inca</u> (gastropod)	1	2	2.5	+	+
<u>Nassarius gavi</u> (gastropod)	2	2	+	-	-
Crustaceans					
<u>Platyanthus orbignii</u> (purple crab, <u>congrejo</u>)	7	3	2.5	55.0	+
<u>Balanus tintinnabulum</u> (barnacle)	2	1	+	-	-
Fish					
<u>Paralichthys peruanus</u> (croaker, <u>roncador</u>)	7	1	5.0	248.0	3.1
<u>Sciaena deliciosa</u> (croaker, <u>lorca</u>)	2	1	+	33.0	+
<u>Lepisoma philippi</u> (<u>trambolio</u>)	1	1	+	15.0	+
Unident. fish	4	-	+	+	+

TABLE 38 (Continued)
CHAN CHAN SIAR ANIMAL REMAINS
CUT 4

Species	Number of Levels Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mammals					
Misc. rodents	5	2	+	-	-
<u>Cavia porcellus</u> (guinea pig, <u>cuy</u>)	1	1	+	11.5	+
<u>Canis familiaris</u> (dog)	3	1	+	68.0	+
<u>Lama glama</u> (llama)	7	2	172.5	4581.5	56.6
Unident. mammal	4	-	12.5	531.3	6.6
Total				8115.1	96.6%
Combined values for percentages less than 1%					3.4
					100.0%

TABLE 39
CHAN CHAN SIAR PLANT REMAINS
CUT 4

Species	Number of Levels Where Present	Seed Count	Weight in gms	Food Volume in cm ³	% of Plant Diet
Cultivated					
<u>Zea mays</u> (maize, maíz)	3	1 4 cobs	2.5	106.5	3.6
<u>Arachis hypogaea</u> (peanut, mani)	2	-	+	+	+
<u>Gossypium barbadense</u> (cotton, algodón)	1	-	+	-	-
<u>Capsicum</u> sp. (pepper, ají)	1	2 stems	+	40.0	1.3
<u>Cucurbita</u> sp. (squash, calabaza)	3	10	+	200.0	6.7
<u>Lagenaria siceraria</u> (gourd, mate)	3	-	7.5	-	-
<u>Annona muricata</u> (guanábana)	9	95	22.5	1187.5	40.0
<u>Persea americana</u> (avocado, palta)	4	1	10.0	62.5	2.1
<u>Lucuma obovata</u> (Lucuma)	7	11	10.0	1375.0	46.2
Wild					
Unident. algae	2	-	+	-	-
<u>Cenchrus echinatus</u> (burr)	1	2	+	-	-
<u>Panicum</u> sp. (grass, grama)	1	-	2.5	-	-

TABLE 39 (Continued)
CHAN CHAN SIAR PLANT REMAINS
CUT 4

Species	Number of Levels Where Present	Seed Count	Weight in gms	Food Volume in cm ³	% of Plant Diet
Wild (Continued)					
<u>Gynerium sagittatum</u> (cane, caña brava)	1	-	5.0	-	-
<u>Tillandsia</u> sp. (achupalla)	4	-	97.5	-	-
<u>Nectandra</u> sp. (mishpingo)	1	1	+	-	-
<u>Prosopis chilensis</u> (ajgorroba)	1	47	2.5	-	-
Mixed fibrous species	8	-	52.5	-	-
Total				2971.5	99.9%
Combined values for percentages less than 1%					0.1 100.0%

TABLE 40
CHAN CHAN COMPOUND RIVERO ANIMAL REMAINS
CUT 1

Species	Number of Levels Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mollusks					
<u>Scutalus</u> sp. (land snail)	7	3	+	6.0	+
<u>Choromytilus chorus</u> (purple mussel, <u>choro</u>)	7	1	+	+	+
<u>Semimytilus aligosus</u> (thin-shelled mussel)	7	5	+	4.5	+
<u>Brachidontes purpuratus</u> (small striated mussel)	4	6	+	5.5	+
<u>Protothaca thaca</u> (large clam)	3	2	+	30.0	+
<u>Donax peruvianus</u> (tide zone clam)	10	132	125.5	66.0	+
<u>Semele corrugata</u> (large clam)	7	4	+	210.0	2.8
<u>Tegula atra</u> (gastropod)	6	19	+	19.0	+
<u>Turbo niger</u> (gastropod)	10	29	+	29.0	+
<u>Folinices</u> cf. <u>cora</u> (gastropod)	5	18	+	9.0	+
<u>Thais chocolata</u> (gastropod)	3	2	-	4.0	-
<u>Thais delessertiana</u> (gastropod)	5	11	+	16.5	+
<u>Cantharus</u> cf. <u>inca</u> (gastropod)	1	1	+	+	+

TABLE 40 (Continued)
CHAN CHAN COMPOUND RIVERO ANIMAL REMAINS
CUT 1

Species	Number of Levels Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mollusks (Continued)					
<u>Nassarius gavi</u> (gastropod)	2	3	+	-	-
<u>Concholepas concholepas</u> (abalone-like gastropod)	2	1	+	+	+
Crustaceans					
<u>Platyanthus orbionii</u> (purple crab, <u>congrejo</u>)	7	1	+	15.0	+
<u>Balanus tintinnabulum</u> (barnacle)	3	3	+	-	-
Fish					
<u>Paralichthys peruianus</u> (croaker, <u>roncador</u>)	3	1	2.5	93.0	1.2
<u>Sciaena deliciosa</u> (croaker, <u>lorna</u>)	1	1	+	+	+
Unident. fish	3	-	+	+	+
Mammals					
Misc. rodents	3	2	+	-	-
<u>Cavia porcellus</u> (guinea pig, <u>cuy</u>)	3	2	+	57.5	+
<u>Canis familiaris</u> (dog)	5	2	5.0	68.0	+
<u>Lama glama</u> (llama)	6	1	90.0	4165.0	55.1

TABLE 40 (Continued)
CHAN CHAN COMPOUND RIVERO ANIMAL REMAINS
CUT 1

Species	Number of Levels Where Present	Minimum Number or Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mammals (Continued)					
Unident. mammal	11	-	77.5	2762.5	36.5
Total				7560.5	95.6%
Combined values for percentages less than 1%					4.4
					100.0%

TABLE 41
CHAN CHAN COMPOUND RIVERO PLANT REMAINS
CUT 1

Species	Number of Levels Where Present	Seed Count	Weight in gms	Food Volume in cm ³	% of Plant Diet
Cultivated					
<u>Zea mays</u> (maize, maiz)	9	20 26 cobs	20.0	692.5	16.7
<u>Arachis hypogaea</u> (peanut, mani)	6	-	+	+	+
<u>Phaseolus vulgaris</u> (common bean, frijol)	5	5	+	2.0	+
<u>Gossypium barbadense</u> (cotton, algodón)	2	19	+	-	-
<u>Capsicum sp.</u> (pepper, ají)	4	7 stems	+	140.0	3.4
<u>Cucurbita sp.</u> (squash, calabaza)	2	3	2.5	60.0	1.5
<u>Lagenaria siceraria</u> (gourd, mate)	2	-	+	-	-
<u>Annona muricata</u> (guanabana)	8	147	22.5	1875.0	45.4
<u>Persea americana</u> (avocado, palta)	4	2	10.0	187.5	4.5
<u>Inga feuillei</u> (paca)	1	-	+	+	+
<u>Bunchosia armeniaca</u> (cansaboca)	2	5	+	50.0	1.2
<u>Lucuma obovata</u> (lucuma)	7	9	10.0	1125.0	27.2

TABLE 41 (Continued)

CHAN CHAN COMPOUND RIVERO PLANT REMAINS

CUT 1					
Species	Number of Levels Where Present	Seed Count	Weight in gms	Food Volume in cm ³	% of Plant Diet
Wild					
Unident. algae	8	-	+	-	-
<u>Panicum</u> sp. (grass, grama)	1	-	5.0	-	-
<u>Gynerium sagittatum</u> (cane, cana brava)	8	-	22.5	-	-
<u>Tillandsia</u> sp. (achupalla)	1	-	+	-	-
<u>Prosopis chilensis</u> (algorroba)	4	9	+	-	-
Mixed fibrous species	9	-	32.5	-	-
Unident. plants	3	-	+	-	-
Total				4132.0	99.9%
Combined values for percentages less than 1%					0.1 100.0%

TABLE 42
CARACOLES ANIMAL REMAINS

CUT 1					
Species	Number of Levels Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mollusks					
<u>Semimytilus algosus</u> (thin-shelled mussel)	8	52	70.0	52.0	4.5
<u>Brachidontes purpuratus</u> (small striated mussel)	1	1	+	+	+
<u>Protothaca thaca</u> (large clam)	3	1	+	+	+
<u>Petricola rugosa</u> (borer)	1	1	+	+	+
<u>Mesodesma donacium</u> (clam)	1	1	+	2.5	+
<u>Donax peruvianus</u> (tide zone clam)	8	219	205.0	109.5	9.5
<u>Tegula atra</u> (gastropod)	5	27	12.5	-	-
<u>Turbo niger</u> (gastropod)	8	2946	3967.5	-	-
<u>Crepidula dilatata</u> (slipper shell)	1	1	+	1.3	+
<u>Polinices cf. cora</u> (gastropod)	7	41	40.0	-	-
<u>Sinum cymba</u> (gastropod)	3	1	2.5	-	-
<u>Thais chocolata</u> (gastropod)	8	2219	5960.0	-	-
<u>Thais delessertiana</u> (gastropod)	8	968	1477.5	-	-

TABLE 42 (Continued)
CARACOLES ANIMAL REMAINS
CUT 1

Species	Number of Levels Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mollusks (Continued)					
<u>Cantharus cf. inca</u> (gastropod)	8	447	445.0	-	-
<u>Nassarius gavi</u> (gastropod)	8	317	90.0	-	-
<u>Mitra orientalis</u> (gastropod)	7	30	25.0	-	-
Crustaceans					
<u>Platyanthus orbignii</u> (purple crab, <u>congrejo</u>)	6	2	+	25.0	2.2
<u>Balanus tintinnabulum</u> (barnacle)	7	123	37.5	-	-
Fish					
<u>Mustelus sp.</u> (sand shark, <u>tollo</u>)	1	1	+	22.0	1.9
<u>Paralichthys peruianus</u> (croaker, <u>roncador</u>)	3	2	20.0	341.0	29.5
<u>Sciaena deliciosa</u> (croaker, <u>lorna</u>)	1	1	+	49.5	4.3
<u>Mugil cephalus</u> (mullet, <u>lisa</u>)	2	1	12.5	162.5	14.1
Unident. fish	7	-	10.0	250.0	21.6

TABLE 42 (Continued)
CARACOLES ANIMAL REMAINS
CUT 1

Species	Number of Levels Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Birds					
Unident. bird	3	-	2.5	35.0	3.0
Mammals					
<u>Lama glama</u> (llama)	1	1	+	+	+
Unident. mammal	3	-	2.5	106.3	9.2
Total				1156.6	99.8%
Combined values for percentages less than 1%					0.2 100.0%

TABLE 43
CARACOLES PLANT REMAINS
CUT 1

Species	Number of Levels Where Present	Seed Count	Weight in gms	Food Volume in cm ³	% of Plant Diet
Cultivated					
<u>Zea mays</u> (maize, <u>maiz</u>)	2	5 cobs	+	153.0	5.9
<u>Gossypium barbadense</u> (cotton, <u>algodon</u>)	4	7	+	-	-
<u>Capsicum</u> sp. (pepper, <u>aji</u>)	2	2 stems	+	40.0	1.6
<u>Cucurbita</u> sp (squash, <u>calabaza</u>)	5	7	+	140.0	5.4
<u>Lagenaria siceraria</u> (gourd, <u>mate</u>)	3	5	+	-	-
<u>Annona muricata</u> (<u>guanabana</u>)	6	75	15.0	937.5	36.4
<u>Inga feuillei</u> (<u>pacae</u>)	1	1	+	2.5	+
<u>Bunchosia armeniaca</u> (<u>cansaboca</u>)	3	5	+	50.0	1.9
<u>Lucuma obovata</u> (<u>lucuma</u>)	6	10	15.0	1250.0	48.6
Wild					
<u>Panicum</u> sp. (grass, <u>grama</u>)	5	-	15.0	-	-
<u>Syntherisma sagittatum</u> (cane, <u>cana brava</u>)	5	-	10.0	-	-
<u>Acacia macracantha</u> (<u>espino</u>)	3	-	+	-	-

TABLE 43 (Continued)
CARACOLES PLANT REMAINS
CUT 1

Species	Number of Levels Where Present	Seed Count	Weight in gms	Food Volume in cm ³	% of Plant Diet
Wild (Continued)					
<u>Prosonis chilensis</u> (<u>algorroba</u>)	1	1	+	-	-
Mixed fibrous species	4	-	10.0	-	-
Unident. plants	1	-	+	-	-
Total				2573.0	99.8%
Combined values for percentages less than 1%					0.2 100.0%

TABLE 44
CARACOLES ANIMAL REMAINS
CUT 2

Species	Number of Levels Where Present	Minimum Number of Indiv.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mollusks					
<u>Semimytilus alcosus</u> (thin-shelled mussel)	11	364	385.0	364.0	9.6
<u>Protothaca thaca</u> (large clam)	9	2	2.5	30.0	+
<u>Petricola rugosa</u> (borer)	5	1	+	+	+
<u>Donax peruvianus</u> (tide zone clam)	11	931	1060.0	465.3	12.3
<u>Semele corrugata</u> (large clam)	2	1	+	+	+
<u>Phola chilensis</u> (angel wing)	2	1	+	+	+
<u>Fissurella</u> sp. (limpet)	2	3	+	30.0	+
<u>Tequila atra</u> (gastropod)	7	107	95.0	-	-
<u>Turbo niger</u> (gastropod)	11	13530	19120.0	-	-
<u>Crepidula dilatata</u> (slipper shell)	4	5	+	6.3	+
<u>Polinices</u> cf. <u>cora</u> (gastropod)	11	241	242.5	-	-
<u>Sinum cymba</u> (gastropod)	4	7	10.0	-	-
<u>Thais chocolata</u> (gastropod)	11	8950	21175.0	-	-

TABLE 44 (Continued)
CARACOLES ANIMAL REMAINS
CUT 2

Species	Number of Levels Where Present	Minimum Number of Indiv.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mollusks (Continued)					
<u>Thais delessertiana</u> (gastropod)	11	4315	6022.5	-	-
<u>Cantharus</u> cf. <u>inca</u> (gastropod)	11	1763	1867.5	-	-
<u>Nassarius gavi</u> (gastropod)	11	1132	387.5	-	-
<u>Olivella columellaris</u> (gastropod)	4	5	+	-	-
<u>Mitra orientalis</u> (gastropod)	10	118	152.5	-	-
Unident. shell	7	-	225.0	-	-
Crustaceans					
<u>Platyanthus orbicollis</u> (purple crab, <u>congrejo</u>)	8	9	+	180.0	4.7
<u>Balanus tintinnabulum</u> (barnacle)	11	466	142.5	-	-
Fish					
<u>Myliobatis peruvianus</u> (ray, <u>raya</u>)	2	1	7.5	177.5	4.7
<u>Paralichthys peruanus</u> (croaker, <u>roncador</u>)	4	1	+	217.0	5.7
<u>Sciaena deliciosa</u> (croaker, <u>lorna</u>)	5	3	15.0	775.5	20.4

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TABLE 44 (Continued)
CARACOLES ANIMAL REMAINS
CUT 2

Species	Number of Levels Where Present	Minimum Number of Indiv.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Fish (continued)					
<u>Xenoscopus denticulatus</u> (parrot fish, <u>pococho</u>)	3	1	+	60.0	1.6
<u>Sarda chilensis</u> (bonito)	1	1	+	35.5	+
<u>Lepisoma philippi</u> (trambolio)	1	1	+	15.0	+
<u>Cenipterus maculatus</u> (eel, <u>congrio</u>)	2	1	+	64.5	1.7
Unident. fish	9	-	20.0	500.0	13.2
Birds					
<u>Pelecanus</u> sp. (pelican)	1	1	2.5	64.0	1.7
Unident. bird	6	-	25.0	350.0	9.2
Mammals					
<u>Canis familiaris</u> (dog)	2	1	10.0	17.0	+
<u>Otaria byronia</u> (sea lion, <u>lobo del mar</u>)	1	1	+	+	+
Unident. mammal	1	-	12.5	443.8	11.7
Total				3795.4	36.5%
Combined values for percentages less than 1%					<u>3.5</u> 100.0%

TABLE 45
CARACOLES PLANT REMAINS
CUT 2

Species	Number of Levels Where Present	Seed Count	Weight in gms	Food Volume in cm ³	% of Plant Diet
Cultivated					
<u>Zea mays</u> (maize, <u>maiz</u>)	11	16 20 cobs	15.0	612.5	2.1
<u>Phaseolus lunatus</u> (lima bean, <u>pallar</u>)	1	1	+	1.3	+
<u>Phaseolus vulgaris</u> (common bean, <u>frijol</u>)	1	1	+	0.4	+
<u>Gossypium barbadense</u> (cotton, <u>algodon</u>)	10	311	50.0	-	-
<u>Capsicum</u> sp. (pepper, <u>aji</u>)	4	7 stems	+	140.0	+
<u>Cucurbita</u> sp. (squash, <u>calabaza</u>)	10	63 1 stem	2.5	1000.0	3.5
<u>Cyclanthera pedata</u> (caigua)	1	1	+	+	+
<u>Lagenaria siceraria</u> (gourd, <u>mate</u>)	8	38	2.5	-	-
<u>Annona muricata</u> (guanábana)	11	107	62.5	1375.0	4.8
<u>Inga feuillei</u> (paca)	6	4	+	20.0	+
<u>Bunchosia armeniaca</u> (cansaboca)	8	22	+	220.0	+
<u>Lucuma obovata</u> (lúcuma)	11	202	232.5	25250.0	88.2

TABLE 45 (Continued)
CARACOLES PLANT REMAINS

CUT 2					
Species	Number of Levels Where Present	Seed Count	Weight in gms	Food Volume in cm ³	% of Plant Diet
Wild					
Unident. algae	1	-	+	-	-
<u>Cenchrus echinatus</u> (burr)	4	4	+	-	-
<u>Panicum</u> sp. (grass, grama)	8	-	25.0	-	-
<u>Gynerium sagittatum</u> (cane, cana brava)	9	-	32.5	-	-
<u>Nectandra</u> sp. (mishpingo)	1	1	+	-	-
<u>Acacia macracantha</u> (espino)	8	-	17.5	-	-
<u>Prosopis chilensis</u> (algorroba)	9	93	+	-	-
Mixed fibrous species	9	-	85.0	-	-
Unident. plants	7	-	10.0	-	-
Total				28619.2	98.6%
Combined values for percentages less than 1%				1.4	100.0%

TABLE 46
CARACOLES ANIMAL REMAINS

CUT 3					
Species	Number of Levels Where Present	Minimum Number of Indiv.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mollusks					
<u>Choromytilus chorus</u> (purple mussel, choro)	2	1	+	+	+
<u>Semimytilus algosus</u> (thin-shelled mussel)	8	484	605.0	484.0	15.4
<u>Protothaca thaca</u> (large clam)	6	2	7.5	30.0	1.0
<u>Petricola rugosa</u> (borer)	3	1	+	+	+
<u>Mesodesma donacium</u> (clam)	1	1	+	+	+
<u>Donax peruvianus</u> (tide zone clam)	8	597	615.0	298.5	9.5
<u>Pholia chiloensis</u> (angel wing)	1	1	+	+	+
<u>Fissurella</u> sp. (limpet)	2	2	+	20.0	+
<u>Tequila atra</u> (gastropod)	6	29	22.5	-	-
<u>Turbo niger</u> (gastropod)	8	3999	4967.5	-	-
<u>Crepidula dilatata</u> (slipper shell)	3	3	2.5	3.8	+
<u>Polinices cf. cora</u> (gastropod)	8	78	80.0	-	-
<u>Sinum cymba</u> (gastropod)	2	1	2.5	-	-

TABLE 46 (Continued)
CARACOLES ANIMAL REMAINS
CUT 3

Species	Number of Levels Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mollusks (Continued)					
<u>Thais chocolata</u> (gastropod)	8	2423	4477.7	-	-
<u>Thais delessertiana</u> (gastropod)	8	1405	1560.0	-	-
<u>Cantharus cf. inca</u> (gastropod)	8	617	600.0	-	-
<u>Nassarius gayi</u> (gastropod)	7	358	132.5	-	-
<u>Mitra orientalis</u> (gastropod)	7	47	55.0	-	-
Unident. shell	7	-	372.5	-	-
Crustaceans					
<u>Platvanthus orbignii</u> (purple crab, <u>congrejo</u>)	7	7	10.0	130.0	4.1
<u>Balanus tintinnabulum</u> (barnacle)	7	166	90.0	-	-
Fish					
<u>Paralichthys peruanae</u> (croaker, <u>roncador</u>)	3	1	+	124.0	3.9
<u>Sciaena gilberti</u> (croaker, <u>corvina</u>)	1	1	+	222.0	7.1
<u>Sciaena deliciosa</u> (croaker, <u>lorna</u>)	6	2	5.0	627.0	20.0

TABLE 46 (Continued)
CARACOLES ANIMAL REMAINS
CUT 3

Species	Number of Levels Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Fish (Continued)					
<u>Mugil cephalus</u> (mullet, <u>lisa</u>)	3	1	+	357.5	11.4
Unident. fish	7	-	22.5	562.5	17.9
Birds					
Unident. bird	8	-	12.5	175.0	5.6
Mammals					
<u>Lama glama</u> (llama)	1	1	+	+	+
Unident. mammal	3	-	2.5	106.3	3.4
Total				3140.6	99.3%
Combined values for percentages less than 1%					0.7
					100.0%

TABLE 47
CARACOLES PLANT REMAINS
CUT 3

Species	Number of Levels Where Present	Seed Count	Weight in gms	Food Volume in cm ³	% of Plant Diet
Cultivated					
<u>Zea mays</u> (maize, <u>maíz</u>)	7	11 41 cobs	40.0	1245.5	3.3
<u>Arachis hypogaea</u> (peanut, <u>mani</u>)	2	-	+	+	+
<u>Phaseolus lunatus</u> (lima bean, <u>pallar</u>)	1	1	+	1.3	+
<u>Phaseolus vulgaris</u> (common bean, <u>frijol</u>)	1	1	+	0.4	+
<u>Gossypium barbadense</u> (cotton, <u>algodon</u>)	6	372	17.5	-	-
<u>Capsicum</u> sp. (pepper, <u>ají</u>)	4	10 stems	+	200.0	+
<u>Cucurbita</u> sp. (squash, <u>calabaza</u>)	6	39	+	780.0	2.1
<u>Lagenaria siceraria</u> (gourd, <u>mate</u>)	7	21	+	-	-
<u>Annona muricata</u> (guanabana)	8	94	55.0	1125.0	3.0
<u>Persea americana</u> (avocado, <u>paíta</u>)	1	1	+	+	+
<u>Inga feuillei</u> (pacaé)	4	2	+	5.0	+
<u>Bunchosia armeniaca</u> (cansaboca)	6	98	32.5	980.0	2.6

TABLE 47 (Continued)
CARACOLES PLANT REMAINS
CUT 3

Species	Number of Levels Where Present	Seed Count	Weight in gms	Food Volume in cm ³	% of Plant Diet
Cultivated (continued)					
<u>Lucuma obovata</u> (<u>lucuma</u>)	7	267	237.5	33375.0	88.5
Wild					
Unident. algae	1	-	+	-	-
<u>Cenchrus echinatus</u> (burr)	3	6	+	-	-
<u>Panicum</u> sp. (grass, <u>grama</u>)	7	-	60.0	-	-
<u>Gynerium sagittatum</u> (cane, <u>cana brava</u>)	7	-	47.5	-	-
<u>Scirpus tatora</u> (<u>tatora</u>)	2	-	+	-	-
<u>Tillandsia</u> sp. (<u>achupalla</u>)	2	-	+	-	-
<u>Acacia macracantha</u> (<u>espino</u>)	5	-	12.5	-	-
<u>Prosopis chilensis</u> (<u>algorroba</u>)	5	160	5.0	-	-
<u>Solanum peruvianum</u> (?) (tomato, <u>tomatillo</u>)	3	8 fruit	+	+	+
Mixed fibrous species	6	-	165.0	-	-

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TABLE 47 (Continued)
CARACOLES PLANT REMAINS
CUT 3

Species	Number of Levels Where Present	Seed Count	Weight in gms	Food Volume in cm ³	% of Plant Diet
Wild (Continued)					
Unident. plants	3	-	7.5	-	-
Total				37712.2	99.5%
Combined values for percentages less than 1%				0.5	100.0%

TABLE 48
CARACOLES ANIMAL REMAINS
CUT 4

Species	Number of Levels Where Present	Minimum Number of Indiv	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mollusks					
<u>Scutalus</u> sp. (land snail)	1	1	+	+	+
<u>Choromytilus chorus</u> (purple mussel, <u>choro</u>)	1	1	+	+	+
<u>Semimytilus algosus</u> (thin-shelled mussel)	6	114	162.5	114.0	4.4
<u>Brachidontes purpuratus</u> (small striated mussel)	1	1	+	+	+
<u>Aulocomya ater</u> (large striated mussel)	1	1	+	+	+
<u>Spondylus</u> sp. (thorny oyster)	1	1	+	-	-
<u>Protothaca thaca</u> (large clam)	5	5	20.0	100.0	3.9
<u>Donax peruvianus</u> (tide zone clam)	6	708	877.5	353.8	13.7
<u>Phola chilensis</u> (angel wing)	2	1	+	+	+
<u>Fissurella</u> sp. (limpet)	2	2	+	20.0	+
<u>Tecula atra</u> (gastropod)	4	26	15.0	-	-
<u>Turbo niger</u> (gastropod)	6	3498	4157.5	-	-
<u>Polinices</u> cf. <u>cora</u> (gastropod)	5	79	70.0	-	-

TABLE 48 (Continued)
CARACOLES ANIMAL REMAINS
CUT 4

Species	Number of Levels Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mollusks (Continued)					
<u>Sinum cymba</u> (gastropod)	3	2	10.0	-	-
<u>Thais chocolata</u> (gastropod)	6	2613	5782.5	-	-
<u>Thais delessertiana</u> (gastropod)	6	1192	1502.5	-	-
<u>Cantharus cf. inca</u> (gastropod)	6	462	430.0	-	-
<u>Nassarius gayi</u> (gastropod)	6	354	122.5	-	-
<u>Olivella columellaris</u> (gastropod)	2	3	+	-	-
<u>Mitra orientalis</u> (gastropod)	5	33	30.0	-	-
Unident. shell	5	-	280.0	-	-
Crustaceans					
<u>Platyanthus orbignii</u> (purple crab, <u>congrejo</u>)	5	6	5.0	105.0	4.1
<u>Balanus tintinnabulum</u> (barnacle)	6	288	127.5	-	-
Fish					
<u>Rhinobatos planiceps</u> (guitarfish, <u>guitarra</u>)	1	1	+	25.0	1.0

TABLE 48 (Continued)
CARACOLES ANIMAL REMAINS
CUT 4

Species	Number of Levels Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Fish (Continued)					
<u>Paralonchurus peruanus</u> (croaker, <u>roncador</u>)	4	1	12.5	263.5	10.2
<u>Sciaena gilberti</u> (croaker, <u>corvina</u>)	1	1	2.5	166.5	6.4
<u>Sciaena deliciosa</u> (croaker, <u>lorna</u>)	4	1	2.5	214.5	8.3
<u>Xenoscarus denticulatus</u> (parrot fish, <u>pococho</u>)	2	1	+	40.0	1.6
<u>Genypterus maculatus</u> (eel, <u>congrico</u>)	1	1	+	21.5	+
Unident. fish	5	-	15.0	375.0	14.6
Reptiles					
Unident. lizard	1	1	+	+	+
Birds					
<u>Pelecanus sp.</u> (pelican)	1	1	27.5	192.0	7.5
Unident. bird	5	-	2.5	35.0	1.4
Mammals					
<u>Canis familiaris</u> (dog)	2	1	7.5	34.0	1.3
<u>Lama glama</u> (llama)	1	1	12.5	416.5	16.2

TABLE 48 (Continued)
CARACOLES ANIMAL REMAINS
CUT 4

Species	Number of Levels Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mammals (Continued)					
Unident. mammal	1	-	2.5	97.5	3.8
Total				2573.8	98.4%
Combined values for percentages less than 1%				1.6	100.0%

TABLE 49
CARACOLES PLANT REMAINS
CUT 4

Species	Number of Levels Where Present	Seed Count	Weight in gms	Food Volume in cm ³	% of Plant Diet
Cultivated					
<u>Zea mays</u> (maize, <u>maiz</u>)	5	18 28 cobs	32.5	852.5	15.4
<u>Phaseolus lunatus</u> (lima bean, <u>paliar</u>)	1	1	+	1.3	+
<u>Phaseolus vulgaris</u> (common bean, <u>frijol</u>)	1	2	+	0.8	+
<u>Gossypium barbadense</u> (cotton, <u>algodon</u>)	4	34	+	-	-
<u>Capsicum</u> sp. (pepper, <u>aji</u>)	1	2 stems	+	40.0	+
<u>Cucurbita</u> sp. (squash, <u>calabaza</u>)	6	51 1 stem	+	1000.0	18.1
<u>Lagenaria siceraria</u> (gourd, <u>mate</u>)	5	64	20.0	-	-
<u>Annona muricata</u> (<u>guanábana</u>)	6	78	27.5	1000.0	18.1
<u>Persea americana</u> (avocado, <u>palta</u>)	1	1	2.5	62.5	1.1
<u>Inga feuillei</u> (<u>paca</u>)	1	3	+	15.0	+
<u>Bunchosia armeniaca</u> (<u>cansaboca</u>)	3	4	+	40.0	+
<u>Psidium guajava</u> (guava, <u>guavaba</u>)	1	1 fruit	+	16.5	+
<u>Lucuma obovata</u> (<u>lúcuma</u>)	6	20	17.5	2500.0	45.2

TABLE 49 (Continued)

CARACOLES PLANT REMAINS

CUT 4

Species	Number of Levels Where Present	Seed Count	Weight in gms	Food Volume ³ in cm ³	% of Plant Diet
Wild					
<u>Cenchrus echinatus</u> (burr)	1	1	+	-	-
<u>Panicum</u> sp. (grass, grama)	5	-	22.5	-	-
<u>Gynerium sagittatum</u> (cane, <u>cana brava</u>)	5	-	20.0	-	-
<u>Acacia macracantha</u> (espino)	5	-	2.5	-	-
<u>Prosopis chilensis</u> (algorroba)	5	39	+	-	-
Mixed fibrous species	5	-	45.0	-	-
Unident. plants	5	-	12.5	-	-
Total				5528.6	97.9%
Combined values for percentages less than 1%				2.1	100.0%

TABLE 50

CERRO LA VIRGEN ANIMAL REMAINS

CUT 1

Species	Number of Levels Where Present	Minimum Number of Indiv.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mollusks					
<u>Scutalus</u> sp. (land snail)	3	3	+	6.0	+
<u>Choromytilus chorus</u> (purple mussel, <u>choro</u>)	12	6	23.7	350.0	1.0
<u>Semimytilus algosus</u> (thin-shelled mussel)	20	465	91.0	465.0	1.4
<u>Protothaca thaca</u> (large clam)	10	6	12.2	120.0	+
<u>Donax peruvianus</u> (tide zone clam)	22	17194	20414.4	8596.8	25.0
<u>Semele corrugata</u> (large clam)	16	14	65.1	810.0	2.4
<u>Phola chiloensis</u> (angel wing)	3	1	1.5	+	+
<u>Fissurella</u> sp. (limpet)	3	3	1.1	30.0	+
<u>Tequila atra</u> (gastropod)	13	25	21.7	25.0	+
<u>Turbo niger</u> (gastropod)	21	132	89.1	132.0	+
<u>Crepidula dilatata</u> (slipper shell)	1	1	0.1	1.3	+
<u>Sinum cymba</u> (gastropod)	3	3	0.8	11.3	+

TABLE 50 (Continued)
CERRO LA VIRGEN ANIMAL REMAINS
CUT 1

Species	Number of Levels Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mollusks (Continued)					
<u>Thais chocolata</u> (gastropod)	4	11	12.1	22.0	+
<u>Thais delessertiana</u> (gastropod)	21	99	182.3	148.5	+
<u>Nassarius gayi</u> (gastropod)	8	21	5.0	-	-
<u>Olivella columellaris</u> (gastropod)	1	1	+	-	-
Crustaceans					
<u>Platyanthus orbignii</u> (purple crab, <u>congrejo</u>)	22	60	115.0	1190.0	3.5
<u>Balanus tintinnabulum</u> (barnacle)	13	33	5.0	-	-
Fish					
<u>Mustelus sp.</u> (sand shark, <u>tollo</u>)	2	-	0.2	1.5	+
<u>Paralichthys peruianus</u> (croaker, <u>roncador</u>)	18	-	81.3	1522.5	4.4
<u>Sciaena gilberti</u> (croaker, <u>corvina</u>)	9	-	34.8	334.3	1.0
<u>Sciaena deliciosa</u> (croaker, <u>lorna</u>)	18	-	51.7	2499.0	7.3
<u>Sarda chilensis</u> (bonito)	2	-	0.6	13.8	+

TABLE 50 (Continued)
CERRO LA VIRGEN ANIMAL REMAINS
CUT 1

Species	Number of Levels Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
<u>Lepisoma philippi</u> (<u>trambollo</u>)	6	-	3.1	76.3	+
<u>Mugil cephalus</u> (mullet, <u>lisa</u>)	2	-	0.4	18.8	+
Unident. fish	22	-	222.6	5563.8	16.2
Reptiles					
Unident. lizard	1	1	+	+	+
Birds					
Unident. bird	12	-	4.8	67.3	+
Mammals					
Misc. rodents	4	-	+	-	-
<u>Cavia porcellus</u> (guinea pig, <u>cuy</u>)	8	-	+	11.5	+
<u>Lama glama</u> (llama)	21	-	290.1	12327.0	35.9
Total				34343.7	98.1%
Combined values for percentages less than 1%					1.9
					100.0%

TABLE 51
CERRO LA VIRGEN PLANT REMAINS
CUT 1

Species	Number of Levels Where Present	Seed Count	Weight in gms	Food Volume in cm ³	% of Plant Diet
Cultivated					
<u>Zea mays</u> (maize, <u>maíz</u>)	19	466 77 cobs	242.5	2304.5	7.2
<u>Phaseolus lunatus</u> (lima bean, <u>pallar</u>)	9	16	12.5	21.3	+
<u>Phaseolus vulgaris</u> (common bean, <u>frijol</u>)	18	281 pods	60.0	188.0	+
<u>Gossypium barbadense</u> (cotton, <u>algodon</u>)	22	2636	292.5	-	-
<u>Ipomoea batatas</u> (sweet potato, <u>camote</u>)	1	-	+	+	+
<u>Capsicum</u> sp. (pepper, <u>ají</u>)	19	142 stems	12.5	2840.0	8.9
<u>Cucurbita</u> sp. (squash, <u>calabaza</u>)	11	23	5.0	460.0	1.4
<u>Cyclanthera pedata</u> (caigua)	1	1	+	+	+
<u>Lagenaria siceraria</u> (gourd, <u>mate</u>)	7	-	5.0	-	-
<u>Annona muricata</u> (guanábana)	22	1080	492.5	13500.0	42.1
<u>Persea americana</u> (avocado, <u>palta</u>)	7	11	45.0	1375.0	4.3
<u>Inga feuillei</u> (paca)	14	38	30.0	190.0	+

TABLE 51 (Continued)
CERRO LA VIRGEN PLANT REMAINS
CUT 1

Species	Number of Levels Where Present	Seed Count	Weight in gms	Food Volume in cm ³	% of Plant Diet
Cultivated (Continued)					
<u>Bunchosia armeniaca</u> (cansaboca)	21	79	17.5	790.0	2.5
<u>Lucuma obovata</u> (lucuma)	22	83	130.0	10375.0	32.4
Wild					
Unident. algae	2	-	+	-	-
<u>Panicum</u> sp. (grass, <u>grama</u>)	4	-	2.5	-	-
<u>Gynerium sagittatum</u> (cane, <u>cana brava</u>)	22	-	1752.5	-	-
<u>Scirpus tatora</u> (tatora)	22	-	(combined with <u>G. sagittatum</u>)	-	-
<u>Tillandsia</u> sp. (<u>achunalla</u>)	13	-	20.0	-	-
<u>Acacia macracantha</u> (espino)	15	-	20.0	-	-
<u>Prosopis chilensis</u> (<u>algorroba</u>)	11	-	2.5	-	-
<u>Sapindus saponaria</u> (soap berry, <u>choloque</u>)	2	-	+	-	-
<u>Juglans neotropica</u> (walnut, <u>nocai</u>)	3	-	+	-	-
Unident. plants	8	-	57.5	-	-

TABLE 51 (Continued)

CERRO LA VIRGEN PLANT REMAINS

CUT 1

Species	Number of Levels Where Present	Seed Count	Weight in gms	Food Volume in cm ³	% of Plant Diet
Total				32043.8	98.6%
Combined values for percentages less than 1%				1.2	100.0%

TABLE 52

CHOROVAL ANIMAL REMAINS

CUT 1

Species	Number of Squares Where Present	Minimum Number of Indiv.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mollusks					
<u>Scutalus sp.</u> (land snail)	7	1	+	2.0	+
<u>Choromytilus chorus</u> (purple mussel, <u>choro</u>)	12	1	+	+	+
<u>Semimytilus alcosus</u> (thin-shelled mussel)	25	686	490.0	685.5	4.7
<u>Brachidontes purpuratus</u> (small striated mussel)	25	67	25.0	67.0	+
<u>Protothaca thaca</u> (large clam)	21	2	12.5	30.0	+
<u>Eurhomalea rufa</u> (large clam)	3	1	40.0	20.0	+
<u>Petricola rugosa</u> (borer)	11	1	+	+	+
<u>Mesodesma donacium</u> (clam)	9	3	7.5	12.5	+
<u>Donax peruvianus</u> (tide zone clam)	24	2710	2260.0	1354.8	9.2
<u>Phoia chiloensis</u> (angel wing)	9	1	+	+	+
<u>Fissurella sp.</u> (limpet)	15	26	72.5	260.0	1.8
<u>Tequila atra</u> (gastropod)	25	108	155.0	108.0	+
<u>Turbo niger</u> (gastropod)	21	62	10.0	62.0	+

TABLE 52 (Continued)
CHOROVAL ANIMAL REMAINS
CUT 1

Species	Number of Squares Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mollusks (Continued)					
<u>Crepidula dilatata</u> (slipper shell)	15	16	+	20.0	+
<u>Polinices cf. cora</u> (gastropod)	2	2	+	1.0	+
<u>Sinum cymba</u> (gastropod)	3	2	2.5	7.5	+
<u>Thais chocolata</u> (gastropod)	5	2	10.0	4.0	+
<u>Thais delessertiana</u> (gastropod)	25	41	87.5	61.5	+
<u>Cantharus cf. inca</u> (gastropod)	9	5	+	+	+
<u>Nassarius gavi</u> (gastropod)	3	3	+	-	-
<u>Mitra orientalis</u> (gastropod)	3	1	2.5	0.5	+
<u>Concholepas concholepas</u> (abalone-like gastropod)	4	1	22.5	50.0	+
Chiton (2 species)	18	3	10.0	30.0	+
Unident. shell	25	-	145.0	-	-
Crustaceans					
<u>Platyanthus orbignii</u> (purple crab, <u>congrejo</u>)	25	34	232.5	665.0	4.5

TABLE 52 (Continued)
CHOROVAL ANIMAL REMAINS
CUT 1

Species	Number of Squares Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Crustaceans (Continued)					
<u>Balanus tintinnabulum</u> (barnacle)	25	33	25.0	-	-
Echinoderas					
Unident. starfish	2	1	+	-	-
<u>Tetrapyqus niger</u> (sea urchin, <u>erizo</u>)	2	1	+	+	+
Fish					
<u>Mustelus sp.</u> (sand shark, <u>tollo</u>)	5	1	+	110.0	+
<u>Rhinobatos planiceps</u> (guitarfish, <u>guitarra</u>)	1	1	+	12.5	+
<u>Myliobatis peruanus</u> (ray, <u>raya</u>)	2	1	+	53.3	+
<u>Paralonchurus peruanus</u> (croaker, <u>roncador</u>)	18	4	10.0	1379.5	9.4
<u>Sciaena gilberti</u> (croaker, <u>corvina</u>)	1	1	+	111.0	+
<u>Sciaena deliciosa</u> (croaker, <u>lorna</u>)	17	3	+	1237.5	8.4
<u>Lepisoma philippi</u> (<u>trambollo</u>)	7	1	+	225.0	1.5
<u>Mugil cephalus</u> (mullet, <u>lisa</u>)	10	1	+	682.5	4.6
Unident. fish	24	-	27.5	687.5	4.7

TABLE 52 (Continued)
CHOROVAL ANIMAL REMAINS
CUT 1

Species	Number of Squares Where Present	Minimum Number of Individ.	Weight in gms	Heat Volume in cm ³	% of Heat Diet
Reptiles					
Unident. lizard	3	1	+	+	+
Birds					
<u>Pelecanus</u> sp. (pelican)	1	1	+	64.0	+
Mammals					
Misc. rodents	1	1	+	-	-
<u>Otaria byronia</u> (sea lion, <u>lobo del mar</u>)	2	1	+	1449.0	9.8
<u>Lama glama</u> (llama)	6	1	85.0	2082.5	14.1
Unident. mammal	23	-	65.0	2535.0	17.2
Total				14735.6	94.4%
Combined values for percentages less than 1%				5.6	100.0%

TABLE 53
CHOROVAL PLANT REMAINS
CUT 1

Species	Number of Squares Where Present	Seed Count	Weight in gms	Food Volume in cm ³	% of Plant Diet
Cultivated					
<u>Zea mays</u> (maize, <u>maíz</u>)	25	761 382 cobs	867.5	14456.5	50.0
<u>Arachis hypogaea</u> (peanut, <u>mani</u>)	22	-	+	+	+
<u>Phaseolus lunatus</u> (lima bean, <u>pallar</u>)	4	5	+	5.8	+
<u>Phaseolus vulgaris</u> (common bean, <u>frijol</u>)	17	23	2.5	9.2	+
<u>Gossypium barbadense</u> (cotton, <u>algodón</u>)	25	1253	150.0	-	-
<u>Capsicum</u> sp. (pepper, <u>aji</u>)	21	57 stems	2.5	1140.0	3.9
<u>Cucurbita</u> sp. (squash, <u>calabaza</u>)	25	431	35.0	3000.0	10.4
<u>Cyclanthera pedata</u> (caigua)	1	1	+	+	+
<u>Lagenaria siceraria</u> (gourd, <u>mate</u>)	24	519	140.0	-	-
<u>Annona muricata</u> (<u>guanábana</u>)	25	307	155.0	3875.0	13.4
<u>Inga feuillei</u> (<u>pacaé</u>)	17	13	37.5	62.5	+
<u>Lucuma obovata</u> (<u>lúcuma</u>)	23	51	92.5	6375.0	22.0

TABLE 53 (Continued)
CHOROVAL PLANT REMAINS
CUT 1

Species	Number of Squares Where Present	Seed Count	Weight in gms	Food Volume in cm ³	% of Plant Diet
Wild					
Unident. algae	20	-	+	-	-
<u>Cenchrus echinatus</u> (burr)	17	51	+	-	-
<u>Panicum</u> sp. (grass, grama)	25	-	560.0	-	-
<u>Gynerium sagittatum</u> (cane, cana brava)	25	-	520.0	-	-
<u>Scirpus tatora</u> (totora)	4	-	2.5	-	-
<u>Tillandsia</u> sp. (achucalla)	1	-	+	-	-
<u>Prosopis chilensis</u> (algorroba)	25	5910	325.0	-	-
<u>Sapindus saponaria</u> (soap berry, choloque)	1	1	+	-	-
<u>Solanum peruvianum</u> (?) (tomato, tomatillo)	5	23 fruit	+	+	+
Mixed fibrous species	25	-	1320.0	-	-
Unident. plants	25	-	117.5	-	-
Total				28924.0	99.7%
Combined values for percentages less than 1%				0.3	100.0%

TABLE 54
CHOROVAL ANIMAL REMAINS
CUT 2

Species	Number of Squares Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mollusks					
<u>Scutalus</u> sp. (land snail)	3	1	+	+	+
<u>Choromytilus chorus</u> (purple mussel, chore)	7	1	+	+	+
<u>Semimytilus alcosus</u> (thin-shelled mussel)	43	41	27.5	41.0	+
<u>Brachidontes purpuratus</u> (small striated mussel)	39	118	57.5	117.5	1.1
<u>Protothaca thaca</u> (large clam)	4	1	+	20.0	+
<u>Mesodesma donacium</u> (clam)	5	1	2.5	+	+
<u>Donax peruvianus</u> (tide zone clam)	57	6483	7712.5	3241.3	31.2
<u>Phola chiloensis</u> (angel wing)	5	1	+	+	+
<u>Fissurella</u> sp. (limpet)	35	34	82.5	340.0	3.3
<u>Tegula atra</u> (gastropod)	14	3	+	3.0	+
<u>Turbo niger</u> (gastropod)	5	7	+	7.0	+
<u>Crepidula dilatata</u> (slipper shell)	8	3	+	3.8	+
<u>Thais chocolata</u> (gastropod)	5	1	15.0	2.0	+

TABLE 54 (Continued)
CHOROVAL ANIMAL REMAINS
CUT 2

Species	Number of Squares Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Mollusks (Continued)					
<u>Thais delessertiana</u> (gastropod)	11	8	15.0	12.0	+
<u>Cantharus cf. inca</u> (gastropod)	4	1	+	+	+
<u>Nassarius gavi</u> (gastropod)	1	1	+	-	-
<u>Mitra orientalis</u> (gastropod)	1	1	+	+	+
Chiton (2 species)	28	9	77.5	90.0	+
Unident. shell	29	-	20.0	-	-
Crustaceans					
<u>Platyanthus orbignii</u> (purple crab, <u>congrejo</u>)	48	9	67.5	175.0	1.7
<u>Balanus tintinnabulum</u> (barnacle)	20	1	+	-	-
Fish					
<u>Myliobatis peruvianus</u> (ray, <u>raya</u>)	1	1	+	35.5	+
<u>Paralichthys peruanus</u> (croaker, <u>concaador</u>)	14	1	15.0	418.5	3.9
<u>Sciaena gilberti</u> (croaker, <u>corvina</u>)	9	3	55.0	777.0	7.2

TABLE 54 (Continued)
CHOROVAL ANIMAL REMAINS
CUT 2

Species	Number of Squares Where Present	Minimum Number of Individ.	Weight in gms	Meat Volume in cm ³	% of Meat Diet
Fish (Continued)					
<u>Sciaena deliciosa</u> (croaker, <u>lorca</u>)	9	2	7.5	214.5	2.0
<u>Xenoscopus denticulatus</u> (parrot fish, <u>pococho</u>)	6	1	+	100.0	+
<u>Lepisoma philippi</u> (<u>trambollo</u>)	1	1	+	15.0	+
<u>Mugil cephalus</u> (mullet, <u>lisa</u>)	1	1	+	32.5	+
Unident. fish	29	-	32.5	812.5	7.5
Birds					
Unident. bird	33	-	42.5	595.0	5.5
Mammals					
<u>Otaria byronia</u> (sea lion, <u>lobo del mar</u>)	3	1	+	724.5	6.7
<u>Lama glama</u> (llama)	3	1	25.0	2082.5	20.0
Unident. mammal	11	-	25.0	975.0	9.0
Total				10835.1	99.1%
Combined values for percentages less than 1%					0.9
					100.0%

TABLE 55
CHOROVAL PLANT REMAINS
CUT 2

Species	Number of Squares Where Present	Seed Count	Weight in gms	Food Volume in cm ³	% of Plant Diet
Cultivated					
<u>Zea mays</u> (maize, <u>maiz</u>)	47	119 74 cobs	117.5	2800.0	46.2
<u>Arachis hypogaea</u> (peanut, <u>mani</u>)	20	-	+	+	+
<u>Phaseolus vulgaris</u> (common bean, <u>frijol</u>)	7	8	+	3.0	+
<u>Gossypium barbadense</u> (cotton, <u>algodon</u>)	23	38	12.5	-	-
<u>Capsicum</u> sp. (pepper, <u>aji</u>)	18	22 stems	+	440.0	7.3
<u>Cucurbita</u> sp. (squash, <u>calabaza</u>)	46	336 2 stems	10.0	2000.0	33.0
<u>Cyclanthera pedata</u> (<u>caigua</u>)	1	1	+	+	+
<u>Lagenaria siceraria</u> (gourd, <u>mate</u>)	19	19	7.5	-	-
<u>Annona muricata</u> (<u>guanábana</u>)	25	41	12.5	500.0	8.3
<u>Persea americana</u> (avocado, <u>palta</u>)	1	1	10.0	62.5	1.0
<u>Inga feuillei</u> (<u>paca</u>)	5	1	5.0	5.0	+
<u>Lucuma obovata</u> (<u>lúcuma</u>)	11	2	2.5	250.0	4.1

TABLE 55 (Continued)
CHOROVAL PLANT REMAINS
CUT 2

Species	Number of Squares Where Present	Seed Count	Weight in gms	Food Volume in cm ³	% of Plant Diet
Wild					
Unident. algae	8	-	2.5	-	-
<u>Cenchrus echinatus</u> (burr)	4	4	+	-	-
<u>Panicum</u> sp. (grass, <u>grama</u>)	26	-	57.5	-	-
<u>Gynerium sagittatum</u> (cane, <u>cana brava</u>)	27	-	135.0	-	-
<u>Scirpus tatora</u> (<u>tatora</u>)	3	-	+	-	-
<u>Prosopis chilensis</u> (<u>algorroba</u>)	53	806	57.5	-	-
<u>Solanum peruvianum</u> (?) (tomato, <u>tomatillo</u>)	1	1 fruit	+	+	+
Mixed fibrous species	53	-	557.5	-	-
Unident. plants	23	-	10.0	-	-
Total				6060.5	99.9%
Combined values for percentages less than 1%					<u>0.1</u> 100.0%

TABLE 56
SQUASH SEED SIZE

Site	Sample	Length in mm.		Range	Sample	Width in mm.		
		Average Size	Median Size			Average Size	Median Size	
Padre Aban	9	11.2	11	10-13	9	6.2	6	5-7
Alto Salaverry	122	11.0	11	8-14	136	6.6	7	5-8
Gramalote	98	12.5	12	9-17	101	7.7	7	5-12
Moché	65	16.3	16	11-18	78	9.3	9	7-12
Galindo	177	13.4	14	11-18	173	7.7	8	6-9
Early Chimu	45	17.2	17	14-21	59	9.1	9	7-12
Chan Chan SIAR	19	15.6	15	12-19	21	8.1	8	7-11
Chan Chan Rivero	1	17.0	17	17	1	10.0	10	10
Caracoles	133	15.5	15	12-24	141	8.6	8	7-13
Choroval	547	14.6	15	9-21	609	8.3	8	5-13

TABLE 57
GOURD SEED SIZE

Site	Sample	Length in mm.		Range	Sample	Width in mm.		
		Average Size	Median Size			Average Size	Median Size	
Padre Aban	-	-	-	-	4	6.5	6	6-7
Alto Salaverry	47	15.6	15	12-18	75	7.1	7	5-9
Gramalote	9	16.1	16	15-18	10	7.4	7	7-8
Moché	107	16.4	16	14-20	115	8.0	8	6-12
Galindo	4	14.5	14	14-15	6	7.3	7	6-8
Early Chimu	50	16.1	16	13-21	31	8.3	8	7-11
Chan Chan SIAR	4	15.0	15	12-17	5	8.8	10	6-11
Caracoles	105	16.6	17	11-20	108	8.8	9	6-12
Choroval	253	17.5	18	10-21	256	9.8	10	6-14

TABLE 58
COMMON BEAN SEED SIZE

Site	Sample	Length in mm.		Range	Sample	Width in mm.	
		Average Size	Median Size			Average Size	Median Size
Alto Salaverry	1	11.0	11	11	1	7.0	7
	4*	10.3	10	8-12	4*	7.0	7
Galindo	58*	11.7	12	7-18	76*	6.8	7
	36	11.9	12	7-16	47	7.5	7
Chan Chan STAR	17*	11.7	11	9-14	22*	7.4	7
	8*	10.9	10	9-13	11*	6.7	7
Caracoles	4	10.5	9	9-13	5	7.4	7
	5	10.2	10	9-11	6	6.2	6
Choroval	29*	11.7	12	8-16	30*	6.7	7

* Burned examples

TABLE 59
WHOLE MAIZE COB SIZE

Site	Sample	Length in mm.		Range	Sample	Diameter in mm.	
		Average Size	Median Size			Average Size	Median Size
Gramalote	1	55.0	55	55	1	15.0	15
	35	54.1	52	30-116	35	15.0	14
Moche	1*	29.0	29	29	1*	8.0	8
	6*	27.2	25	24-32	6*	9.3	9
Galindo	12	38.0	35	22-50	12	10.8	10
	18	42.3	36	27-72	18	12.4	14
Chan Chan STAR	42	47.6	43	27-89	42	11.6	11
	2*	29.5	29	29-30	2*	7.0	5
Caracoles	216	53.7	53	17-104	216	13.1	13
	16*	33.6	31	21-57	16*	8.4	8

* Burned examples

TABLE 60
MAIZE COB FRAGMENT SIZE

Site	Sample	Diameter in mm.		Range
		Average Size	Median Size	
Gramalote	1	13.0	13	13
Moche	133	10.8	10	5-19
	26*	7.1	7	4-11
Galindo	2	7.5	7	7-8
	336*	7.2	7	3-12
Early Chimu	71	10.9	9	5-15
	1*	9.0	9	9
Chan Chan SIAR	85	8.6	8	4-15
	102*	6.7	7	4-10
Chan Chan Rivero	54	7.6	7	4-13
	30*	7.0	7	4-10
Caracoles	106	9.8	10	5-16
	42*	7.5	7	5-11
Choroval	362	11.4	11	4-20
	378*	7.9	8	4-13

* Burned examples

TABLE 61
MAIZE COB ROW NUMBER

Site	Sample	Percent of Each Row Number									
		6	8	10	12	14	16				
Gramalote	2	0	0	100.0	0	0	0	0	0	0	0
Moche	189	0	20.6	39.7	27.0	12.2	0.5				
Galindo	344	0	49.1	43.0	4.4	1.7	0				
Early Chimu	81	0	11.1	62.9	19.8	6.2	0				
Chan Chan SIAR	204	1.0	48.0	47.0	1.5	0.5	0				
Chan Chan Rivero	84	0	44.0	46.4	8.3	1.2	0				
Caracoles	195	0.5	45.1	51.3	2.6	0	0				
Choroval	969	0.4	38.1	56.3	4.4	0.1	0				

TABLE 62
PERCENT OF MEAT FROM EACH ANIMAL CLASS

Site	Sample	Mammal	Bird	Fish	Shellfish
Padre Aban	33956.3cm ³	2.4%	20.0	27.4	50.2
Alto Salaverry	15204.8	7.4	+	52.7	39.9
	22409.1	13.3	+	50.1	35.8
Gramalote	116133.6	23.9	6.3	9.0	60.8
Caballo Muerto	9471.6	42.1	+	+	57.0
Moche	83189.5	94.3	+	1.5	3.5
Galindo	20219.5	97.9	-	+	1.4
	49045.8	99.7	-	-	+
	8390.3	98.3	-	+	1.2
	20161.8	98.8	-	+	1.1
	7735.6	98.5	-	+	1.3
	40474.4	96.7	+	+	2.9
	14912.1	91.9	1.1	+	6.5
Early Chimú	8872.8	90.4	-	3.3	6.3
Chan Chan SIAR	7985.0	91.8	-	3.4	4.8
	15994.3	86.5	1.7	5.3	6.5
	10408.1	81.9	1.3	4.1	12.7
Chan Chan Rivero	8101.0	64.1	-	3.7	32.2
	7560.5	93.3	-	1.2	5.5
Caracoles	1156.6	9.2	3.0	71.3	16.5
	3795.4	12.1	10.9	48.6	28.4
	3140.6	3.4	5.6	60.3	30.7
	2573.8	21.3	8.8	43.0	26.9
Cerro la Virgen	34343.7	35.9	+	29.2	34.7
Choroval	14735.6	41.2	5.0	30.6	23.2
	10853.1	34.9	5.5	22.2	37.4

TABLE 63
PERCENT OF MEAT FROM MAJOR PROCUREMENT ZONES

Site	Cut	Total Meat	Inland	Marine
Padre Aban	1	33956.3 cm ³	0	100.0%
Alto Salaverry	1	15204.8	0	100.0
	2	22409.1	0	100.0
Gramalote	1	116133.6	0	100.0
Caballo Muerto	1	9471.6	42.1	57.9
Moche	1	83189.5	90.8	9.2
Galindo	1	20219.5	97.9	2.1
	2	49045.8	99.7	+
	3	8390.3	98.3	1.7
	4	20161.8	98.8	1.2
	5	7735.6	98.5	1.5
	6	40474.4	93.1	6.9
	7	14912.1	91.9	8.1
Early Chimú	1	8872.8	57.7	42.2
Chan Chan SIAR	1	7985.0	82.7	17.3
	2	15994.3	77.5	22.5
	3	10408.1	82.1	17.9
Chan Chan Rivero	4	8101.0	64.1	35.9
	1	7560.5	93.3	6.7
Caracoles	1	1156.6	9.2	90.8
	2	3795.4	+	99.5
	3	3140.6	3.4	96.6
	4	2573.8	21.3	78.7
Cerro la Virgen	1	34343.7	35.9	64.1
Choroval	1	14735.6	31.4	68.6
	2	10835.1	28.2	71.8

TABLE 64
ANIMAL AND PLANT FOOD VALUES COMPARED

Site	Cut	Food Volume		% of Total Food	
		Animal	Plant	Animal	Plant
Padre Aban	1	33956.3	1000.0	97.1%	2.9
Alto Salaverry	1	15204.8	9367.7	61.9	38.1
	2	22409.1	4898.6	82.1	17.9
Gramalote	1	116133.6	8430.0	93.2	6.8
Moche	1	83189.5	11185.0	88.1	11.9
Galindo	1	20219.5	578.4	97.2	2.8
	2	49045.8	640.0	98.7	1.3
	3	8390.3	97.5	98.9	1.1
	4	20161.8	184.3	99.1	0.9
	5	7735.6	834.0	90.3	9.7
	6	40474.4	1801.5	95.7	4.3
	7	14912.1	1648.5	90.0	10.0
Early Chimu	1	8872.8	2475.5	78.2	21.8
Chan Chan SIAR	1	7985.0	5352.7	59.9	40.1
	2	15994.3	5153.1	75.6	24.4
	3	10408.1	11363.5	47.8	52.2
	4	8101.0	2971.5	73.2	26.8
Chan Chan Rivero	1	7560.5	4132.0	64.7	35.3
Caracoles	1	1156.6	2573.0	31.0	69.0
	2	3795.4	28619.2	11.7	88.3
	3	3140.6	37712.2	7.7	92.3
	4	2573.8	5528.6	31.8	68.2
Cerro la Virgen	1	34343.7	32043.8	51.7	48.3
Choroval	1	14735.6	28924.0	33.8	66.3
	2	10835.1	6060.5	64.1	35.9

APPENDIX II

APPENDIX II

BUTCHERING PRACTICES

Some faunal material from almost all the excavations containing llama was marked with grooves or bashes made by prehistoric knives as the carcasses were processed. Although such tools were not encountered during excavations in the refuse, it seems most likely that most of these cuts were made using metal knives. Both the Moche and Chimu people used a wide variety of metal utensils made from a naturally occurring copper alloy.

Interpretations of meat processing techniques proposed here are based almost exclusively on the direct evidence provided by actual marks on bones (Table 66). When the cut bones from each cultural and chronological context were examined, there were virtually no indications of butchering techniques that varied through time. The one possible exception is discussed below.

The most detailed studies to date on prehistoric butchering techniques deal with large wild North American Mammals: bison, deer, elk, and antelope

(See for example Gilbert 1969; Hill 1966; Parmalee 1965; Parmalee et al 1972; Wheat 1967; 1972; White 1952; 1953a; 1953b; 1955). Two such studies based in North America differentiated two functional types of cut marks: marks due to skinning and marks resulting from butchering (Parmalee 1965; Parmalee et al 1972). In this paper marks are further distinguished functionally depending on whether they were made during the process of skinning, disarticulation of the skeleton, or removal of the meat from the bone.

Skinning marks are the most rare type in the Moche Valley sample. Parmalee (1965) found skinning marks on deer skulls around antler bases and along the jaw at the gum line as well as on the extremities encircling foot and lower leg bones. My evidence for skinning is from two mandibles as well as lower leg and foot bones, and several of these cuts may correlate with disarticulation activities as well as the removal of the pelt from the legs. The most reliable evidence for skinning are marks on two mandibles and two phalanges (one first and one second). Marks are also present on a number of carpal and tarsal bones, but these are more likely to have been associated with the disarticulation procedures.

After skinning was begun (and possibly completed) the carcass was disarticulated--usually by cutting through the joints (Table 66). The foreleg was cut away from the scapula and also cut apart at the joint between the humerus and radius-ulna. Cuts on carpal bones were discussed as possibly due to skinning, but probably reflect efforts to disarticulate the radius-ulna from the metacarpal.

Data on the disarticulation of the hind leg provide the only apparent indications of chronological differences in butchering techniques. In the Moche sample from Huaca del Sol, two cases of cut marks on the pelvis suggest that the hind quarter was separated from the body by cutting through the thinner portions of the innominate near the acetabulum. This is reinforced by the absence of cuts on proximal femora. In the case of Chimu material from Chan Chan, 10 proximal femora exhibit cut marks while the only cuts (4 examples) affecting the pelvic area are on the acetabulum.

The hind leg was also severed at the knee. Cut marks in this region are on both the anterior and posterior surfaces of the bones--suggesting repeated efforts from both directions until the joint was located and cut through. Further disarticulation of the hind limb at the ankle is suggested by cut marks on 10 tarsals

and a proximal metatarsal.

Separation of various parts of the spinal column seems least methodical. Most marks on vertebrae are on the vertebral arches, especially in the overlapping areas where these portions articulate. All the classes of vertebrae had been cut. Of the 38 vertebrae with marks, 16 are cervical, 12 thoracic, and 10 lumbar. In all classes, marks on both dorsal and ventral surfaces again suggest multidirectional efforts to locate the joint which was then cut. The relatively high frequency of cut marks on vertebrae is certainly due to the physically overlapping arrangement of the joints. There is some indication that the neck was consistently severed at the same point. Four marks were noted on the atlas and one of the several basioccipitals encountered is marked. Most butchering evidence for the vertebrae probably reflects the dividing of the spinal column into convenient lengths for transport or cooking.

A number (23) of the ribs have cuts near the heads which are a result of their separation from thoracic spinal column. Occasional (5) cuts near the rib articulation areas of thoracic vertebrae also reflect this disarticulation procedure. Although cuts were discovered on all surfaces near the rib head,

most were found to be distributed cranially and ventrally.

Little can be said about the order of butchering procedures, especially limb disarticulation. Our data on this aspect come from the location of marks on some ribs and vertebrae. The presence of cut marks on the ventral surfaces of both the ribs and thoracic vertebrae indicates that the body cavity had been split and the internal organs completely removed before at least this phase of butchering was begun. Also, this procedure indicates that a considerable portion of the operation was executed with the animal on its back. This differs from the methods described by investigators such as White (1953) for North American Indians. These butchers apparently placed the animal on its belly and split the skin down the back. Back meat was then removed to expose the ribs which were cut through near the spine to reach the internal organs.

Cut marks near articular surfaces seem to be of two general types. One is a narrow slit, often repeated for several strokes, that is concentrated in the area of the ribs and vertebrae, but also occurs frequently on the long bones. The second, less common type more resembles a bash, as if the action involved were more a chopping than cutting motion. These marks are wider and often in the form of dents. One set was

discovered on an atlas, but the remainder occur on long bones. Often they seem to be associated with cuts through bone or fractures of the bone. These differences in cut types may reflect the use of different tools in one or both of two ways. Depending on the nature of the joints (vertebra vs. femur-tibia, for example) fine or forceful cutting procedures might be necessary to sever the articular connection. It is also possible that the two tool types and their respective cuts correlate with first a generalized preliminary or centralized butchering procedure followed by the use of finer tools on a local or individual level to prepare meat for cooking. Bash marks on shafts also correlate with marrow extraction procedures.

The final type of cut marks--marks reflecting removal of meat from bones--may also be correlated with preparation for cooking. This function is attributed to marks in locations that do not reflect either disarticulation or skinning efforts, but which are in known areas of muscle attachment (Lesbre 1903). Marks on three vertebrae are probably a result of removing meat from the spinal column. One lumbar vertebra is marked above and below the left lateral spine while another has cut marks laterally along both sides of the body.

A thoracic vertebra has lateral cuts at the base of the caudal spine. The removal of meat from the shoulder is indicated by marks on a scapula blade just on the caudal side of the spine. Finally, a transverse cut on the ilium probably served to free some of the thick pelvic muscles.

The final aspect of butchering--marrow extraction--is reflected in the nature and quantity of bone fragments as well as bash marks on long bone shafts. In Table 67, the category of shaft fragments is consistently large and reveals that virtually all long bones were deliberately broken to extract the marrow. This procedure may also have affected the number of long bone ends, but it is assumed that their relative frequency is not significantly altered. A number of North American faunal studies, as well as a few from other parts of the world, cite marrow extraction as an explanation for the very fragmentary condition of long bones at many sites (See Degerbol 1929; Hill 1966; Parmalee 1965; Uerpmann 1973). Using ethnographic data, others elaborate on the process as a systematic procedure for extracting bone grease through fracturing and boiling (Leechman 1951; Gilbert 1969). Such a procedure would have greatly affected butchering and food preparation practices since all meat would have been removed

from the long bones before cooking. Data from the Moche Valley suggest that marrow extraction was an important part of llama butchering and consumption, but with only the fragmented bone as evidence, little of the operation can be reliably reconstructed.

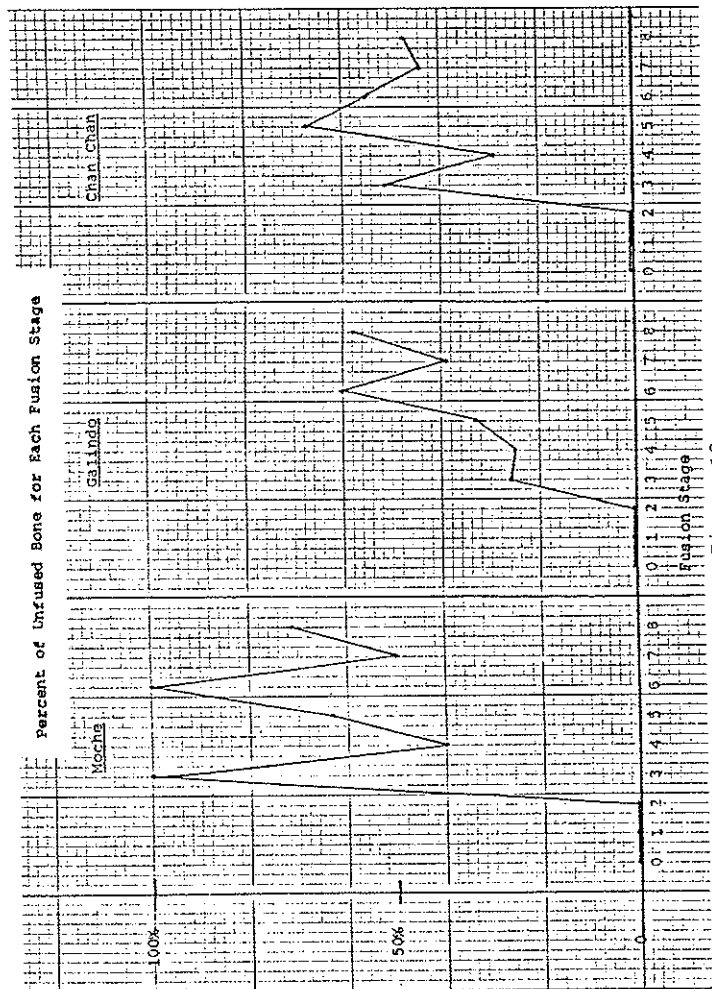


Figure 18

TABLE 65
FREQUENCY OF BURNED BONE

	Skull	Vertebra	Rib	Foreleg	Hindleg	Phalange/ Metapodial	Skirt Fragments	% of Total
Hoche	1/23 4.3%	28/100 28.0	31/79 39.2	9/52 17.3	5/50 10.0	9/35 25.7	136/243	55.5
Calindo								
Cut 1	2/3 66.7	2/7 28.5	3/6 50.0	6/13 46.1	2/8 25.0	7/13 53.8	8/35	22.8
Cut 2	8/9 88.8	13/18 72.2	7/10 70.0	17/29 58.6	14/22 63.6	16/23 72.7	26/50	52.0
Cut 3	0 0	2/8 25.0	2/2 100.0	0/1 0	6/11 54.5	6/6 100.0	14/27	51.8
Cut 4	7/11 63.6	18/29 62.0	8/27 29.6	2/5 40.0	6/15 40.0	14/25 60.8	52/112	46.4
Cut 5	2/3 66.7	6/11 54.5	8/9 88.8	3/4 75.0	3/5 60.0	2/5 40.0	40/45	88.8
Cut 6	4/21 19.0	8/40 20.0	17/40 42.5	9/22 40.9	3/22 13.6	10/24 41.6	43/170	25.2
Cut 7	0/4 0	1/7 14.2	3/7 42.8	2/5 40.0	1/9 11.1	1/9 11.1	0/6	0
Chan Chan								
Unit								
Cut 1	1/1 100.0	1/10 10.0	0/12 0	1/1 100.0	0/3 0	1/5 20.0	5/36	13.8
Cut 2	1/6 16.6	3/10 30.0	11/29 37.9	2/8 25.0	2/5 40.0	1/5 20.0	30/64	46.8
Unit 2								
Cut 3	2/5 40.0	0/6 0	0/3 0	0/7 0	2/6 33.3	1/2 50.0	25/50	50.0
Cut 4	0/7 0	0/9 0	0/6 0	1/3 33.3	0/2 0	0/4 0	2/24	8.3

TABLE 66
CUT MARKS FOR BONE DISARTICULATION

Joint	Moche	Galindo	Chan Chan
Skull-Atlas	0	1 mark	0
	0	0	4
Cervical Vertebra	5	4	7
Thoracic Vertebra	1	3	8
Lumbar Vertebra	4	0	6
Thoracic vt.-Rib	1	1	3
	8	3	12
Scapula-Humerus	1	1	2
	1	0	1
Humerus-Radius-ulna	0	0	3
	1	4	4
Radius-ulna-Carpal-Metacarpal	0	1	0
	2	1	0
	0	0	0
Innominate	2	1	0
Innominate-Femur	0	0	4
	0	3	10
Femur-Patella-Tibia	0	1	3
	1	1	0
	1	1	3
Tibia-Tarsal-Metatarsal	0	0	3
	0	4	9
	0	0	1

TABLE 67
FREQUENCY OF MEAT-BEARING BONE TYPES

	Moche	Galindo	Chan Chan	Total	Sample
Skull	21.5%	7.5	14.0	4.5	100.0
Cervical Vertebra	7.5	14.0	4.5	13.0	93
Thoracic Vertebra	15.0	0	7.5	22.0	14
Lumbar Vertebra	15.0	0	7.5	22.0	14
Rib	0	0	0	0	36
Scapula	0	0	0	0	9
Humerus	0	0	0	0	26
Radius-ulna	0	0	0	0	11
Innominate	0	0	0	0	11
Femur	0	0	0	0	52
Tibia	0	0	0	0	9
Tibia	0	0	0	0	9
Tarsal	0	0	0	0	9
Metatarsal	0	0	0	0	9
Chan Chan Unit 1	34.0	16.5	16.5	0	18
Chan Chan Unit 2	4.5	13.5	9.0	13.5	22
General	31.0	6.5	12.5	0	16
Unit 2	11.5	4.5	10.0	4.0	224
General	12.5	8.5	16.0	9.0	2.5
Expected					2.5

TABLE 68
FREQUENCY OF FOOT BONES AND SHAFT FRAGMENTS

	Metapodial		Phalange 1		Phalange 2		Phalange 3		Shaft	
	No.	%	No.	%	No.	%	No.	%	No.	%
Moche	5	3.6%*	10	7.3	6	4.4	2	1.4	245	41.9 ⁺
Galindo										
Cut 1	4	14.8	3	11.1	2	7.4	0	0	35	41.1
Cut 2	2	3.0	6	9.2	1	1.5	5	7.6	50	31.2
Cut 3	2	11.7	1	5.8	1	5.8	0	0	27	49.0
Cut 4	4	8.6	5	10.8	3	6.5	3	6.5	112	50.0
Cut 5	1	6.2	1	6.2	1	6.2	0	0	45	54.8
Cut 6	6	7.5	6	7.5	6	6.2	0	0	170	50.1
Cut 7	0	0	3	17.6	3	17.6	0	0	6	12.7
Chan Chan										
Unit 1										
Cut 1	0	0	2	18.1	2	18.1	0	0	36	52.9
Cut 2	0	0	1	4.0	2	8.0	0	0	64	50.3
General	5	10.2	10	20.4	2	4.0	0	0	---	---
Unit 2										
Cut 3	2	18.1	1	9.0	1	9.0	0	0	50	63.2
Cut 4	2	10.0	0	0	0	0	0	0	24	43.6
General	49	13.6	16	4.4	6	1.6	0	0	---	---
Expected	8 ^o	6.6	8	6.6	8	6.6	8	6.6	---	---

*Percent of total number of identifiable bones

⁺Percent of total number of bones: fragments + identifiable bones

^oBecause of the fragmentary nature of most bones, proximal and distal metapodials were counted separately, hence the double expected number.

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