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Early Settlement at Chiripa, Bolivia: Research of the Taraco Archaeological Project

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Edited by

Christine A. Hastorf

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Cover photo: South-facing oblique view of the Llusco enclosure.

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ACKNOWLEDGMENTS

During May-July of 1996 the Taraco Archaeological Project (TAP), directed by Dr. Christine Hastorf and Matthew Bandy, conducted research at Chiripa, a site on the southwest shores of Lake Titicaca in Bolivia. The core team members are Dr. Lee Steadman, ceramicist and laboratory director, Emily Dean, David Kojan, Bill Whitehead, and José Luis Paz. Additional help in the field came from Amanda Cohen, Melissa Goodman, and Ian Hodder, with Mario Montaño Aragón as the Institute of Archaeology's co-director.

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Kate Moore would like to acknowledge the important contributions made to this study by members of the Taraco Project, in particular by Matthew Bandy and Susan deFrance. In her paper Moore makes repeated comparisons with the Pachacamac bone tool assemblage; she would like to thank Clark Erickson and Lucy Fowler Williams for access to this collection at the University of Pennsylvania Museum of Archaeology and Anthropology as well as conservator Nancy Love for many helpful discussions concerning her work with the Pachacamac material. Elsie Sandefur first identified the bone tools from the screened bone samples from the 1992 excavations (locus numbers from 1-999). The faunal authors would like to thank members of the Taraco Archaeological Project, David Browman, Jonathan Kent, and Fredrik Hiebert for valuable assistance and comments. In addition we would like to acknowledge preliminary work by Elsie Sandefur, George Miller, and Karen Weinstein on material from the 1992 season at Chiripa. Ramiro Matos M. kindly allowed access to the Laboratorio de Paleoetnozoologia in Lima.

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Finally, we want to thank John Southon of the Lawrence Livermore National Laboratory-Center for Accelorator Mass Spectrometry who has participated with us to complete an important dating sequence to clarify the seriation and the timing of the cultural changes during the Formative at Chiripa.

1

An Introduction to Chiripa and the Site Area

CHRISTINE A. HASTORF

THIS MONOGRAPH reports on the first phase of the Taraco Archaeological Project (TAP) at the site of Chiripa (the field seasons were in 1992 and 1996). From the work of Wendell Bennett and Max Portugal Zamora in the 1930s, Alfred Kidder III and Gregorio Cordero Miranda in the 1950s, and David Browman in the 1970s we have learned about the central mound of the site. This mound has at least three levels of building and probably was in use between 1500 B.C. on up into the Tiwanaku times. The architecture that is visible on the surface of the mound today is an early Tiwanaku monolith-lined courtyard. Chiripa is especially important to Andeanists because it is close to the major imperial center of Tiwanaku, which became an important center for almost 1000 years and was a major political entity in Andean history. Chiripa is considered one of Tiwanaku's primary precursors. Chiripa must have been an important center during the early Formative phase of Bolivian prehistory, with its large ritual center overlooking the shores of Lake Titicaca and the eastern string of snow-peaked mountains. The Formative phase, as it is called in Bolivian archaeology, spans 1500-100 B.C. This is the time of the onset of permanent settlement and agriculture throughout the Andes; and it is the elaboration of these social processes that have drawn us to study this early center and its evidence of daily life.

This Formative-Initial/Early Horizon period in the altiplano of the south-central Andes was a time of increased human evidence on the high altiplano landscape. We see communities for the first time, domesticated plants, new pottery technologies, metallurgy, and architecture. This same region became the locus for the longest-lived center in the pre-Colombian Andes, Tiwanaku. While archaeological work has been completed in and around the Titicaca Basin for over one hundred years, many questions still remain. The previous studies at Chiripa provide us with an outline of the major cultural trajectories and phases of the Formative (e.g., Bennett 1936; Browman 1978, 1980, 1991; Chávez 1988; Kidder 1956; Mohr 1966; Ponce 1970; Portugal Ortíz 1992). These inhabitants surely initiated many of the major cultural trajectories that have continued in the highlands up until today. Recent studies have been initiated in several areas within the Titicaca Lake Basin (figure 1), including

Tiwanaku and its valley (e.g., Kolata 1993, 1996; Albarracin-Jordan and Mathews 1990), Lukurmata (Bermann 1994), Wankarani (Bermann and Estevez 1995), and more recently on the Isla del Sol (Stanish and Bauer 1996), the Copacabana Peninsula (Chávez and Mohr Chávez, pers. comm.), on the eastern shores of Lake Titicaca (Faldín 1985; 1991; Lémuz pers. comm.; Paz S. pers. comm.), on the western slopes of the lake (Aldenderfer, pers. comm.), Tumatumani in the Juli-Pomata region (Stanish and Steadman 1994), and Camata in the Chucuito region of the Department of Puno, Peru (Steadman 1995). It is the Formative times, at the onset of these traditions, upon which we focus our investigations on the Taraco Peninsula. This is where the earliest fluorescence of ritual centers and probably sedentism for the region are found. We chose to look for how daily life and ritual practice are woven together.

This period in the southern Titicaca Basin prehistory is of special interest for we know that after the end of this sequence Tiwanaku became a major political, social, and religious center for the region, during the Tiwanaku III and IV times (Albarracin-Jordan and Mathews 1990; Janusek 1992; Kolata 1993; Ponce Sanginés 1981, 1989). In addition, by this time massive and well-organized intensive agricultural systems extend from the southern shores of the lake (Kolata 1986, 1991, 1996). Surely the Formative people participated in the development of these large scale production changes. Through detailed excavation and recording, we hope to gain further insights into the development of what ultimately became the Tiwanaku polity.

Chiripa is one of the earliest sites with architecture in the region. How did such a large and long-lived complex come about and what did it look like politically and socially? How did the ritual acts occurring at such a center as Chiripa relate to the economic activities of daily life? The debate as to why and how these economic, social, and political changes came about is especially apt in the Andean region of South America, where important and seemingly long-term cultural structures of meanings have existed both in the egalitarian concepts of reciprocity and balanced opposition (*yanantin*; Platt 1986, 1987), as well as in hierarchy and stratification (integrated nested hierarchies; Platt 1987; Pärssinen 1992). We know that hierarchical structures within the Andean world exist in the nested, ever larger and more important mountain deities (*wamanis*, Reinhard 1990) just as in nested *ayllu* (Aymara) communities. There are hints of the existence and manipulation of these ideas in the past, for example, by the Inka who exploited local production using 'reciprocal exchange' strategies to gain labor (Wachtel 1981). How did such concepts form and develop at the onset of permanent community?

The Taraco Archaeological Project's Field Research

This project's research addresses questions about the onset of political elaboration with a special interest in daily use of things and spaces. Our research plan builds on what we have learned from the house excavations by the Chavezes on the Copacabana Peninsula (pers. comm.), Bermann (1990 and 1994) and Janusek (1992, 1994) at Lukurmata, but also the Tiwanaku IV-V sequence at Tiwanaku itself (Janusek 1994). Furthermore we now have some detailed house and ritual comparisons from La Joya during the same Formative times (Bermann and Estevez 1995). It is hoped that our excavations will uncover earlier phases than the nearby Lukurmata excavations, thus extending the region's habitation evidence back in time. Our research plan has been to sample intact Formative contexts in addition to the Tiwanaku I phase to link into Bermann's Lukurmata material, and Kolata's Catari Basin material, while collecting detailed spatial and temporal artifact distributions that will allow us to chart social and economic changes. To do this we have excavated in several locations across the site (figure 2).

We began this task in 1992 at Chiripa with excavations to the north and south of the mound and have found these archaeological deposits to be very complex and disturbed, making the task of exposing intact areas challenging. While we have sought Formative domestic areas, we have uncovered areas that had been completely excavated for wall building by the *hacienda* (the Escolar area on figure 2). In the areas we did open up, we found strata that span the earliest Formative material through Tiwanaku IV-V. For example in the

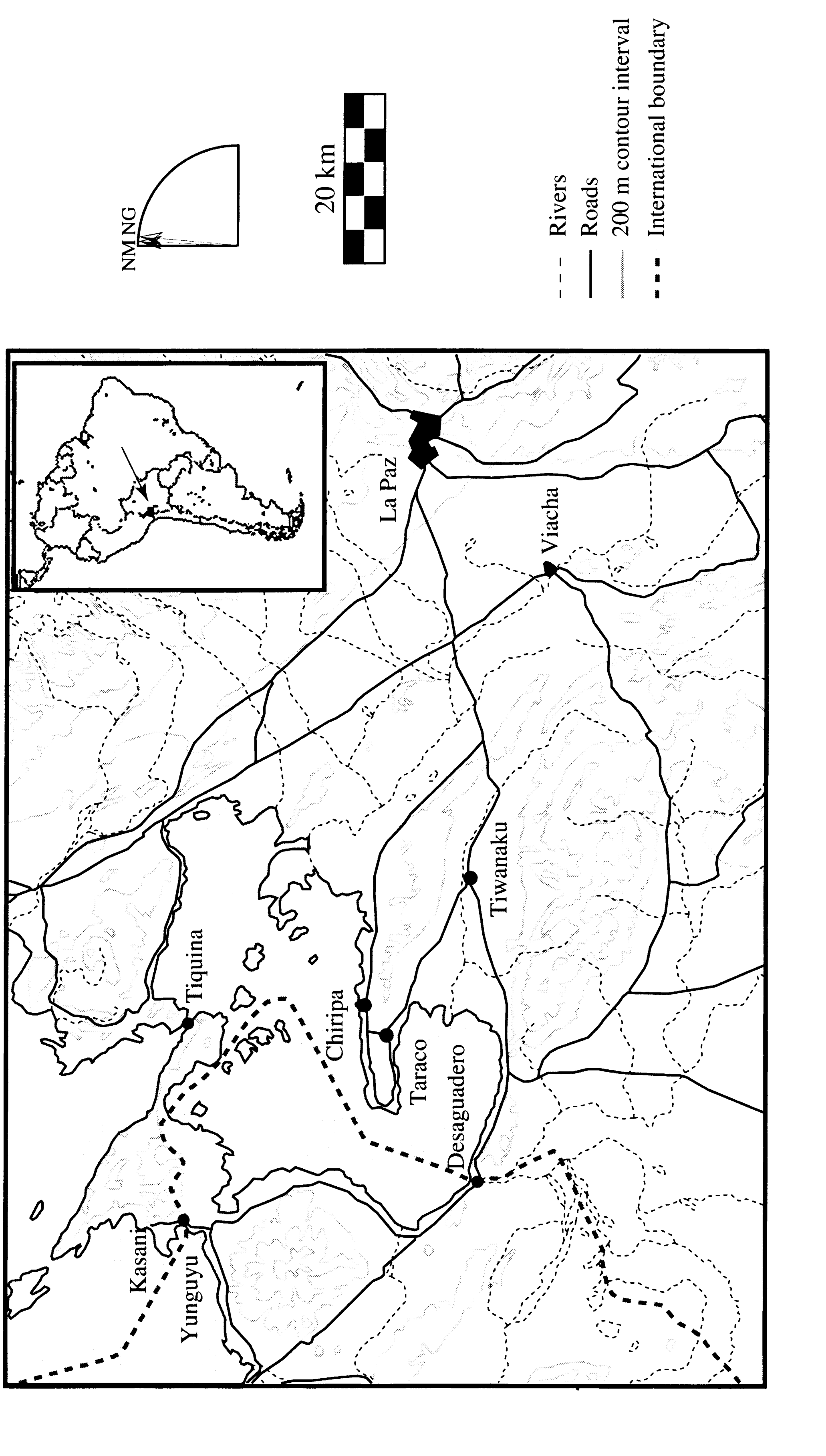


FIGURE 1 Southern Lake Titicaca Basin region.

Santiago area, a sector of the site that is northwest of the mound (see figure 2), due to its extremely complex stratigraphy, we identified the Formative levels only after much post-excavation artifact analysis and absolute dating. We believe now that we have identified some of the better preserved areas at the site in which to pursue these questions.

We had several goals for phase I: 1) to complete the site topographic map and make a systematic surface collection of the site that would define the extent of the Formative site, 2) to clean a profile of the mound and collect micromorphological samples as well as define and date the intact use layers, 3) to return to the southernmost excavation sector in 1992 called Llusco and finish defining the extent of this semi-subterranean walled enclosure, and 4) to return to the northern Santiago area to extend our previous excavations in pursuit of intact Formative levels, including defining the Formative wall we uncovered in 1992.

In 1996 we concentrated excavations on the Llusco and Santiago areas, but also opened up a small excavation, Yujra, located west of Santiago, near the *quebrada* (figure 2). The Llusco area was an (early) Late Chiripa semi-sunken walled courtyard-plaza, based on the large 13 by 13 meter wall foundation cut into sterile in addition to its white plastered floor and the highly selective ceramic assemblage in its fill (Rivera in Hastorf et al. 1992). The Santiago area has both early and late phases within it, with a series of floors and use-surfaces. This includes a Middle Chiripa use-surface below the plow zone containing many Middle Chiripa and later intrusive tombs and refuse pits. Under this surface is a thick layer of Middle and Early Chiripa refuse. The southernmost part of Santiago contained a Tiwanaku IV-V structure with a series of prepared plaster floors on the interior. This structure was associated with a large number of contemporary tombs, and seems to have had a civic or religious function. Beneath this structure was a layer of intentionally deposited fill that contained a Tiwanaku III burial. This fill was placed on top of an Early Chiripa surface that displays traces of floors and outdoor activity areas called event B16. This surface is of special interest for it seems to be cut by the construction of a semisubterranean enclosure wall that was built during the Middle Chiripa phase. This retaining wall was plastered when it was in use, and fragments of white and yellow plaster have been recovered on its floor and wall (figure 3).

On the basis of analysis of ceramics from the 1992 and 1996 field seasons, Lee Steadman has defined three ceramic phases at the site, which we have termed Early, Middle, and Late Chiripa. Bill Whitehead clarifies the refinement of the phases in chapter 4. Although some ceramics predating the Late Chiripa mound level were previously recovered by Kidder (1956; Mohr 1966) and Browman (1978, 1980), their samples were very small, and consequently their ceramic phases have been hard to work with. One of the major goals of our work in 1996 has been to expand our samples of these earlier phases. The definition of the Early and Middle Chiripa ceramic phases has been a major contribution of the Taraco Archaeological Project.

The Study Area

The Taraco Peninsula (figure 1) juts into the small, southern part of Lake Titicaca called Lake Wiñaymarka, its southwestern portion (16 degrees 15 minutes S latitude and 68 degrees 30 minutes longitude). This region sits below the eastern Cordillera Royal, the large glaciated mountain chain leading to the eastern Andean slopes. It is a peninsula bounded by water to the west, south, and north, by the Tiwanaku Valley to the southeast and the broad Pampa Koani to the northeast. Both of these terrestrial areas have prehistoric agricultural raised fields, making this region a focus for past intensive food production (Kolata 1996). The peninsula is created by a small mountain range called the Taraco mountains. The Taraco Formation is an eroded conglomerate with volcanics and a sandy-clayey matrix. This lies over the Miocene Kullo Kullo Formation of conglomerates, red sandstone, clayish mudflows, and alluvial clays (Argollo et al. 1996:69). Lower, along the lake shoreline, are recent alluvial fans eroding off the upper hills. The peninsula is watered by springs evident at the break in slope of the Taraco Formation that flow into seasonal streams. Seasonal rains that can be torrential also provide water rejuvenating the water table. Erosion is the major geomorphological action in the region. The altiplano climate is a two season regime of wet and dry. The significant fluctuations are diurnal

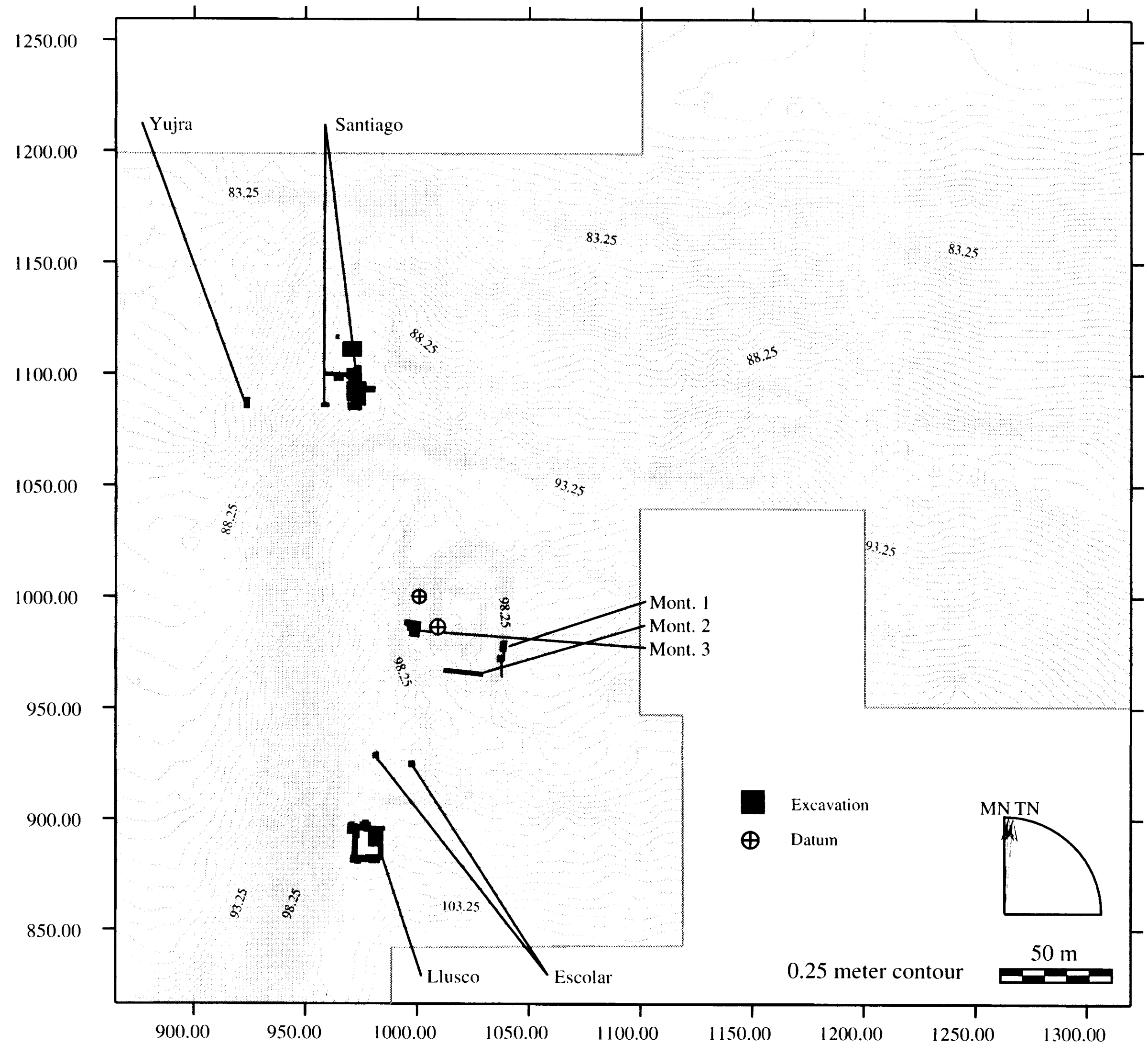


FIGURE 2 Plan of Chiripa with the Taraco Archaeological Project's 1992 and 1996 excavation locations.

FIGURE 3 Santiago ASD 18 plastered wall.

with freezing night time temperatures during the dry season and milder temperatures throughout the rainy season. The precipitation comes mainly from the northeast, moving in from the Amazon Basin. The mean annual rainfall on the lake today is 690 mm, 581 mm at Guaqui along the lakeshore like Chiripa (Binford and Kolata 1996:26, 31). Most of the rain falls between December and March.

The lakeshore elevation today is 3810 m. Thirty percent of Lake Wiñaymarka is less than 10 meters deep, which is mainly in the southern part of the lake, where the peninsula is located. Just before the site seemed to be occupied, around 2050 B.C., the lakeshore was about 1-2 km out from where it is today, approximately 10 meters below its present level (Binford and Kolata 1996:36-37). After this time the lake gradually rose to its present level by about 50 B.C. (Binford and Kolata 1996:37). Since then there has been a series of fluctuations determined by drier and moister conditions in the region.

The site of Chiripa lies on the northern shore of the peninsula, on a slope rising up from the lake basin; the slope formed by several older lacustrine terraces, still visible along the peninsula (Argollo 1996:75) (figure 1). The site is now within the community of the same name, having evidence of the past *hacienda* scattered amongst the prehistoric material. With the earliest habitation at about 1500 B.C., people settled there during a time of increasing precipitation, although the lakeshore seems to have been quite a bit farther away from where it is today. All evidence suggests that people have continuously occupied the area since this first habitation.

2

A Toponymic Study of the Chiripa Locality

MARIO MONTAÑO ARAGÓN

PARALLELING THE SITE surface survey and excavations, as a linguistical anthropologist I spent two months making a detailed toponymic survey of 9 square kms in and around Chiripa. My goal was to learn the names of every topographic locale as well as their meanings from the mountain top to the lake. In this search I found a series of languages represented in the place names. One assumption I use is that cultures are perpetuated in the names of their lived world. I assume that the longevity of people's languages in their associated world view will be seen in the number of place-names in their environment. In regions like the Titicaca Basin this becomes particularly interesting due to the multiple languages that co-reside there now, as also happened in the past. Part of this project's goal was to see if socio-cultural structures were evident in the names. The languages that are represented in the Chiripa place-names are Uru, Aymara, Quechua (Kichua), and Spanish (but no Pukina).

In all I have 126 place-names for this small area (Bertonio 1956; Metraux 1936). Besides talking with people throughout the designated region, I also consulted a series of old and new maps, publications, and dictionaries, including the files of the Agrarian Reform (Paredes 1931; Polo 1910). None of these maps were as detailed as I would have liked. As I collected these place names, I tried, whenever possible, to confirm the names with as many people as possible, especially the elders of the region. I coded each place name by meaning, such as human anatomy, minerological, botanical, musical, and agricultural; using 20 codes in all. I also described the location and translated the use-meaning into Spanish when I could. I believe that the name Chiripa is either Aymara or Uru; the Uru meaning is associated with fish.

The Taraco Peninsula was in the Umasuyu division of the Pacajes during the Late Intermediate and Inka times (the last 1000 years). During the early Colonial period, the Taraco Peninsula was divided into 10 small ranches. These still can be seen in the community boundaries today. This local regional name Pacajes was changed to Ingavi in 1842 after the independence of Bolivia, with the canton becoming Taraco in 1880. This canton had ten sections, with Chiripa being the central area in Peqeri. After the agrarian reform of 1952, Peqeri - Chiripa became the center of this section. The community itself is divided into two sections, an upper and a lower one, laying east-west along the shoreline.

I have found a startling loss of cultural history memory among the people I spoke with. I found that residents associated themselves with the Inka, which archaeology tells us is not correct. I found 17 family names that I consider to be old, *ayllu* (Aymara) families of the region. There are also Spanish family names in the region. Chiripa today has 100 families, with about 500 inhabitants. I think that the ancient name of the area is Peqeri, which means stone grinder in Aymara. I think they might have made these stone artifacts to the east of the modern community of Chiripa.

I estimate from the origins of the 126 toponyms I have located in the region that 75% are Aymara, 2.5% are Uru origin and the rest, 22.5%, are Spanish with a small hint of Quechua in some of them. Some of the names reflect geological or biological features, others identify archaeological locales. This distribution suggests that the Uru lived in the area first, with the Aymara entering, and then of course much later, the Inka and then the Spanish.

3

History of Investigations at the Site of Chiripa

MATTHEW S. BANDY

THE FIRST MENTION OF Chiripa as an area of archaeological or antiquarian interest seems to have been by Padre Pedro Marabini in a short piece in the *Boletín de la Sociedad Geográfica de La Paz* in 1920. Marabini described the mound at the site in the following terms:

> Se trata aquí de un pequeño cerrito o en su circular enteramente rodeado de menhires profundamente plantados en el suelo del que sobresalen medidas desiguales, debido quizás a la desigualidad de la erosión por las diferentes clases de piedras. (cited in Ponce 1957)

He also described another 'cerrito' about 2 kilometers away, in the direction of the lake. Given that the mound is currently less than 1 kilometer from the lake, it is not clear to what he was referring. Such a feature has not been located or noted since. Marabini makes no mention of looting or destruction of the mound, though it may have been present.

He concludes with a suggestion that scientific work be conducted on the mound:

> ...no dudamos de que también aquí como en Huacullani una excavación metódica pudiera ser de muy buenos resultados para la ciencia arqueológica. (cited in Ponce 1957)

WENDELL BENNETT

It would be fourteen years before this suggestion was to be taken up, though probably unknowingly, by Wendell Bennett (1936), employed at the time by the American Museum of Natural History in New York. In 1934 Bennett excavated at Chiripa after he concluded his season in Tiwanaku in which the Bennett Monolith was unearthed. This was the same season in which he excavated at Lukurmata and Pajchiri. He stayed in Chiripa for five weeks, living in the now-ruined *hacienda* house.

Bennett excavated one large trench, two structures and four smaller trenches in the mound, and six other trenches nearby. Figure 4 displays his and others' excavations on the mound. Of the non-mound trenches, he has little to say. Three were apparently located 'in the field to the north of the mound', where the parking lot for the mound is currently located (two of these are indicated on his published site plan and on figure 4). Another trench was located "near the road just east of the house" and another "in a low mound to the southeast of the house" (probably under the school by this point). Finally, one small trench (CH-11) was excavated "at the old Chiripa ranch, about one mile east of the present hacienda," a site we have not yet been able to locate with certainty.

In the mound, he placed a trench in the center of the central sunken court, another in the center of the east wall, and another along the southern portion of the west wall. The walls of the court had already been heavily disturbed by the *hacienda* landowners who extracted building stone for the *hacienda* house and church. Quarrying marks are still visible on a number of the exposed stones of this central court. He thus was excavating basically the looters' backdirt. Some portions of the walls were preserved intact and were drawn. In addition, he excavated a long east-west trench on the north side of the mound, exposing a badly disturbed section of the facing wall of the Tiwanaku period "temple" platform.

The bulk of Bennett's efforts, however, were devoted to the excavation of a very large (2 m wide by 30 m long) trench from the northwest interior corner of the Tiwanaku sunken court to the northern edge of the mound. This trench was excavated in places to a depth of five meters, and collapsed only minutes after the profile drawing was finished. Fortunately, no one was injured. Through an analysis of his drawing of the profile of this trench, Bennett defines four stratigraphic units in the mound's history.

1. A pre-mound stratum, characterized as reflecting remains of domestic habitation. It contained remains of walls, ash lenses, middens, and so forth. This stratum extends beyond the limits of the mound, and so he believes it to predate mound formation.
2. A house stratum, containing the well-known double-walled houses. These houses were built upon a layer of artificial fill, and were associated with a stone-walled sunken court with a yellow clay floor. The houses were destroyed by fire.
3. A depositional episode associated with the construction of the Tiwanaku sunken court. Artificial fill was placed on top of the ruins of the houses, and the central court and facing wall were constructed. A large number of burials were associated with this activity.
4. A post-temple period, represented by 'Decadent Tiahuanaco' burials.

Houses 1 and 2 were discovered while excavating this trench. It is to these structures that Chiripa owes the modest fame that it has achieved. The west wall of House 1 was destroyed in the process of trench excavation. After it was realized that these houses were present, Bennett expanded his trench and completely excavated both structures.

In all, Bennett excavated twenty-eight burials and five fragmentary deposits of human bone. The Chiripa burials were clearly distinguished from the Tiwanaku ones by types of grave goods and cranial deformation.

Bennett notes some evidence of disturbance that was present before his arrival. Most obvious was the looting of the Tiwanaku sunken court for architectural stone. He also notes, however, that the eastern portion of the exterior mound facing wall had been disturbed, and that construction of adobe corrals (the *chancheria*) to the south had removed part of the mound in that area.

Maks Portugal Zamora y María Luisa Sánchez Bustamente de Urioste

There is some confusion as to the exact date when these two carried out excavations at Chiripa. This confusion is compounded by the almost anecdotal evidence that their project did, in fact, take place. This work is known, to my knowledge, only through a four-page 1940 report to the Bolivian Minister of Education entitled *Los Hallazgos de la Hacienda Chiripa*. This report was used by Portugal Ortíz (1992) in an article published in the Universidad Mayor de San Andres' journal, *Textos Antropológicos*. In addition, Javier Escalante has published a plan derived from these excavations (1994, fig. 56). The work is also referenced in an unpublished report by Gregorio Cordero Miranda (n.d.).

According to the Portugal Z. report, he and Sra. Bustamente were sent on a reconnaissance expedition to the Taraco Peninsula by the Bolivian Ministry of Education. They were charged

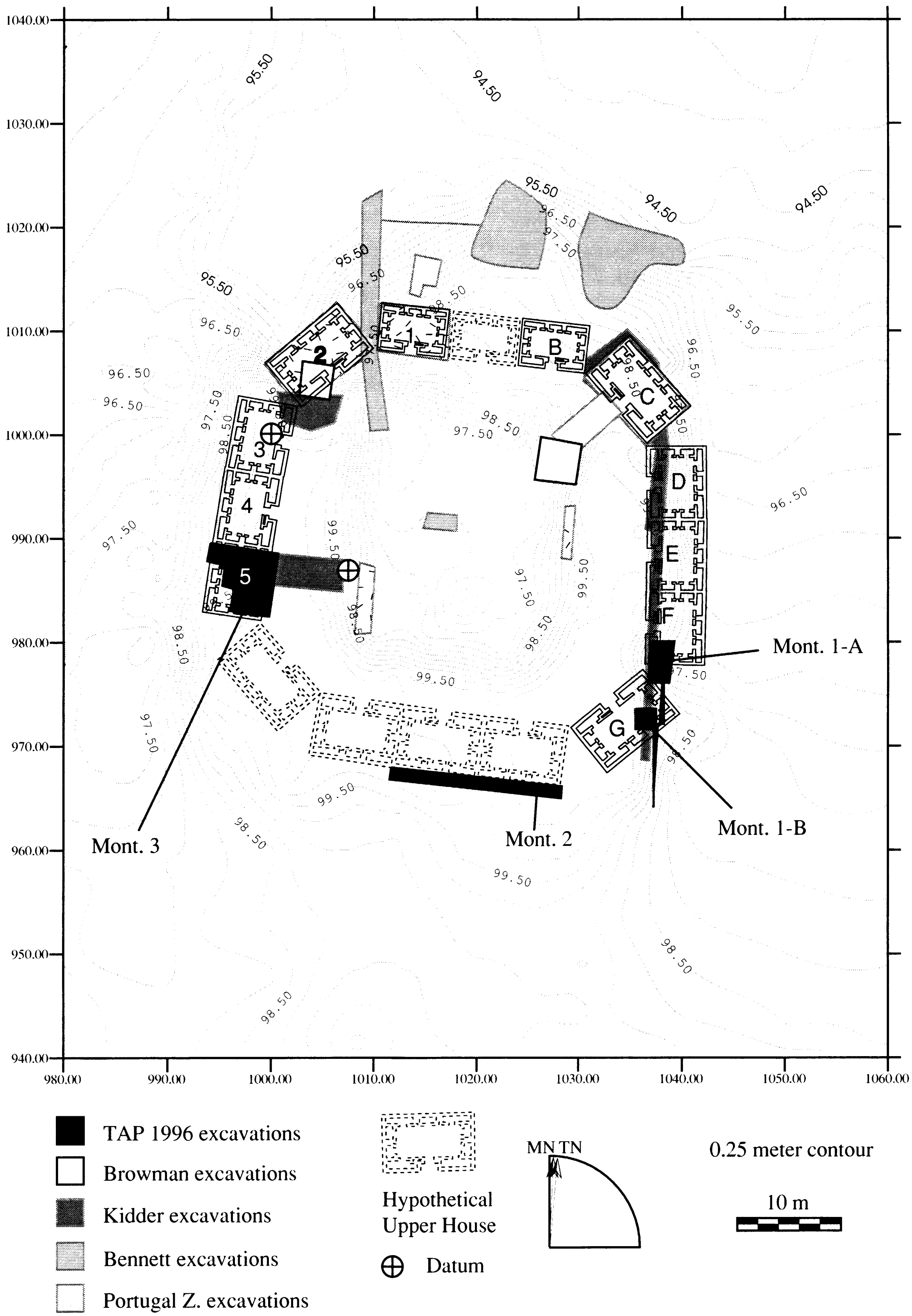


FIGURE 4 Plan of Montículo excavations with all previous excavations.

specifically with investigation of Chiripa and Huacullani, and of prospecting for additional sites in the area. Indeed, Portugal Z. is the first to mention the site of Chiaramaya, near Chiripa, which is only mentioned again by Erickson (1975). Portugal O., who obviously is in possession of the Portugal Z. report and quotes from it at length and verbatim (1992), states that the work took place in 1940. Cordero (n.d.), on the other hand, states that Portugal Z. and Bustamente were present in Chiripa in 1937. Given that Cordero's report was probably written in 1955 or 1956, I am inclined to credit his date and to assume that Portugal O. simply took the date of Portugal Z.'s report to be the year of the excavations.

Whatever the case, Portugal Z. stayed 'algunas dias' with Srta. Sara Peña, sister of the owner of the hacienda. He notes that some disturbance had taken place on the mound since the work of Bennett, only three years earlier.

> ...es triste decirlo ha desaparecido el angulo N.O. del morro, quedando destruidos los importantes hallazgos del arqueologo Bennett, en la actualidad queda muy poco del famoso morro...
>
> ...la esquina N.E. del morro que ahora por su cercamiento presenta a la vista de vuelo de pajaro una linea escalonada correspóniendo la ultima parte a la cancha de tenís... (1940:2)

In the interim the *hacendados*, the Peña sisters, had constructed a tennis court on the north side of the mound. In the construction of this tennis court, they had cut into the north face of the mound, destroying Bennett's House 1 and most of House 2. Only the southwestern angle of House 2 was preserved. The construction of this tennis court was particularly egregious, as the *hacendados*, present during Bennett's excavations, clearly knew of the presence of these structures; they most likely weren't even backfilled. Seen in this light, Portugal Z.'s assertion that

> El siempre ignora el valor histórico de los monumentos y al mandato de sus superiores destruye sin piedad cuanto terreno esta al alcance de sus picotas y azadas, ha ocurrido eso con el precioso morro de Chiripa y he quedado hoy mostrando los restos del bandaje en su pared del lado Este . . . (1940:2)

seems particularly disingenuous. This passage does, however, indicate that the destruction of the eastern face of the mound, noted by Bennett as disturbance, was well-advanced by 1937, and was probably already in the state observed by Kidder in 1955, with the easternmost portion of the Chiripa houses on that side removed.

Portugal Z. and Bustamente seem to have cleaned the remains of Bennett's House 2, and then to have proceeded with new excavations. Like the year in which the project took place, the location of these excavations is a matter of some uncertainty. Escalante's redrawings of what is almost certainly one of Portugal Z. and Bustamente's excavation plans (1994, fig. 56; also Portugal O. 1992:15) clearly indicate that the house excavated corresponded to that house later termed House 3 by Kidder. That is, the excavations were located on the northwest corner of the mound, immediately adjacent to Bennett's House 2 excavations. Portugal Z.'s text, however, indicates that the house he excavated was located on the northeast corner of the mound.

> La comisión ordenó trabajar una zanja diagonal pasando por el limite del llamado "templo" por Bennett, se encontraron dos piedras con cimientos haciendo ángulo parece que este dato rectificará la hipótesis de Bennett; continuando siempre en esta zanja se encontraron los restos de una pared se continuó trabajando algunos días hasta descubrir una "casa"de 6.70 mts. por 3.40 mts. de ancho muy semejantes a las encontradas por el arqueólogo norteamericano. (1940:3)

First of all, then, the trench exited the "templo" diagonally, exposing an intact corner. This could not, then refer to the northwest corner of the mound, since Bennett's trench of three years previous had removed that corner of the "templo," and had encountered no intact corner. The house encountered could not possibly be Kidder's House 3, then, as it would have to be on the wrong side of the mound.

He continues (1940:3), in reference to this mysterious house:

> La pared S.O. dió por resultado el hallazgo de la puerta de entrada, la misma que lleva al centro de las paredes un hueco para puerta corrediza...

The door of the house, then, was located in the southwest wall of the house. Cordero (n.d.: 2) adds:

> En el sector Noreste, exactamente en este ángulo parcialmente destruido se levantan algunas paredes, según referencias de los propietarios éstas fueron limpiadas por la señora Maria S. B. de Urioste y el señor Maks Portugal en el año 1937 con excelentes resultados...

This indicates beyond doubt that the house excavated was 1) one of the corner houses of the mound complex, like House 2, and 2) that it was located in the northeast corner of the mound, assuming the door, like the doors of all the known Chiripa mound houses, faced the sunken court. All this is to say that the house excavated by Portugal Z. and Bustamente de Urioste was the one termed House C by Kidder. Escalante's identification of this structure as House 3 is apparently mistaken. The traces of their trench are, in fact, still visible on the surface of the northeast corner of the mound.

In all respects, the house seems similar to Houses 1 and 2. In addition four burials were found under the floor of the house (tombs 7-10). Six more tombs were excavated. Tombs 4, 5, and 7-10 are described by Portugal Z. (1940), while tombs 1, 2, and 3 remain something of a mystery. The burials under the house floor and others contained quite elaborate grave goods including gold plumes and plaques in two cases.

Kidder, Cordero, Sawyer, Coe y "la señora de Kidder"

In 1955 another archaeological project arrived at Chiripa. Like previous investigators, they enjoyed the hospitality of the proprietors, Sra. Hortensia Peña de Ituralde and her sister, Srta. Sara Peña during their thirty-seven days in residence. Arriving after a series of excavations at Tiwanaku, the party consisted of Gregorio Cordero Miranda, "delegado del Ministerio de Educación" (Cordero n.d.:1) and:

> ...los miembros de la Comisión Arqueológica americana presidida por el Dr. Alfred Kidder II, Subdirector del Museo de Pensilvania e integrada por el doctor Alan S. Sawyer, conservador del departamento de Artes Decorativas del Instituto de Artes de Chicago; Dr. William Coe, Arqueólogo Asistente del Dr. Kidder y la señora de Kidder. (Cordero n.d.:1)

Almost no information on the excavations of this project has been published. The only sources of which I am aware are Kidder (1956) and the very important article by Karen Mohr Chávez (1988, particularly, for our purposes, figure 3) based on the access of that author to Kidder's unpublished material. In addition, Cordero (n.d.) prepared a nine-page typewritten report on his part in the excavations, which remains unpublished, and Chávez's (then Karen Mohr) M.A. thesis (1966) contains some additional information.

Cordero indicates, and Chávez corroborates, that the work of "la Misión Kidder" was divided into three mini-projects, each investigator having a separate excavation area for which he was responsible. Thus, Sawyer constructed a map of the mound and worked on the northeastern and eastern portions of the monument. He cleared the previously excavated House C (as indicated by Cordero's remark, quoted earlier), and seemingly (according to Chávez 1988, fig. 3) discovered traces of another House on the north side of the mound and adjacent to House C; this would be House B. These walls seem to have been observed on or near the surface, and no true excavation of this house seems to have been undertaken. Additionally, Sawyer cleaned the eastern profile of the mound, already noted as much-disturbed by Bennett and Portugal Z. In this profile he discovered the remains of a number of additional houses, as Cordero (n.d.:2) recounts:

> ...esta casa *[House C]* estaba muy unida a otra que se encontraba en el lado este, parcialmente cortada muestra en sus lados laterales muros dobles y corresponde a la parte interior de una construcción, viéndose una entrada principal al centro...
>
> ...inmediatos a esta pared se notan otras paredes que posiblemente corresponden a otras casas...

Chávez (1988, fig. 3), presumably drawing from Sawyer's notes and map, indicates that four such houses were discovered in the mound's eastern profile: Houses D - G. Cordero's descriptions and a photograph published by Kidder (1956, fig. 17) show that the remaining undisturbed portion of House D, perhaps the easternmost 1/3 of the house, was excavated by Sawyer. He also seems to have engaged in some trenching to define the walls of the partially destroyed structures he observed in the mound's eastern profile. The details of Sawyer's excavations, map, and profile drawing remain to be published.

Coe, meanwhile, was engaged in investigations on the northwest corner of the mound. Kidder states that work in this area began with the cleaning of the quite substantial mound profile created by the construction of the tennis court. Cleaning of this profile revealed the surviving southwest corner of House 2, as well as a stone wall and other deposits underlying this house. According to Chávez and Cordero, Coe then proceeded to clean the corner of House 2 and excavated the northeast corner of the adjacent house to the south, House 3. Destroying the exposed portions of these houses, and thereby destroying the last traces of House 2, he deepened his excavations to expose the remains of two structures underneath the corner of House 2. This is the so-called 'Lower House Level', as opposed to the 'Upper House Level' of Houses 1-5 and B-G. Apparently the excavations went even deeper than this, to expose strata of the 'Sub-Lower House Level' (perhaps equivalent to Bennett's 'Pre-Mound strata', or perhaps simply construction fill for the Lower House Level structures). Details of these lower levels are lacking, however, though it appears that the lower excavations were quite limited in extent. Excavations in this area are illustrated in Kidder (1956, figs. 14-16) and Chávez (1988, fig. 1).

Kidder and Cordero, meanwhile, were working on the western side of the mound. Cordero himself participated in these excavations, while he only observed the others. Thus it is in connection with this area that Cordero provides the most complete and detailed information. Taking as a datum point a large upright in the western wall of the uppermost Tiwanaku "temple," they proceeded to excavate a one-meter wide trench from this stone westward. This large upright was drawn by Bennett (1936, fig. 16) and used by him as an elevation point for his temple excavations. It later served Browman as a datum also.

At a point 6 m west of the large upright, at a depth of 30 cm, a double-coursed fieldstone wall was encountered. The trench was expanded to the west of this wall and eventually revealed that this wall was part of an enclosure, the east wall of which (the wall initially encountered) had a length of 7 meters. These walls were probably at one point walls of a rectangular building—the west wall of which had been removed by recent disturbance. No interior floor surface was encountered in the excavations. Kidder and Chávez attribute this structure to the Tiwanaku period. It is possibly contemporary with the Tiwanaku period sunken temple on the mound.

Kidder and Cordero then deepened their excavations in the interior of these walls, discovering somewhat below the upper walls the remains of one of the "Upper Houses," previously unknown, which they labelled House 5. This house, all but the southwest corner that was untouched, was completely excavated, and the floor (yellow clay plaster) removed in order to search for subfloor burials. Additionally, a small portion of the southwest corner of the adjacent house to the north, House 4, was excavated, indicating that, as on the east side of the mound, adjacent houses shared a common outer bin wall. This is indicated on Chávez's map (1988, fig. 3). The House 5 excavations are depicted in Kidder (1957, figs. 12-13).

The 1955 project resulted in a three-phase history of the Formative occupation of the site of Chiripa, derived from the stratigraphy of the mound. These phases were: 1) the Upper House Level, 2) the Lower House Level, and 3) the Sub-Lower House Level. Through radiocarbon dating these phases were placed at 600-100 B.C., 900-600 B.C., and 1400-900 B.C., respectively (Chávez 1988: 18; see also Ralph 1959). These stratigraphic levels were ceramically defined by Mohr (1966). Kidder persisted in thinking of the mound as a 'village' of 15 'houses', as opposed to Bennett's proposed 14.

Kidder backfilled his excavations, a practice which we must regard as commendable. However, he still generated a formidable amount of backdirt. This soil was heaped up in the center of the mound's central sunken court, forming a sharp conical heap. This pile is visible on the aerial photos of the August 1955 flight of the Instituto Geográfico Militar, indicating that the excavation was probably com-pleted by this time. This backdirt mound was later to present an obstacle to the excavations of Browman.

David Browman and Gregorio Cordero Miranda

Browman spent two seasons working at Chiripa, in 1974 and 1975. He was accompanied by Gregorio Cordero Miranda, the same Cordero who had participated in Kidder's excavations. Also present were four of Browman's students from Washington University, Clark Erickson, Darwin Horn, Charles Miksicek, and Jonathan Kent, most of whom went on to advanced studies in Andean prehistory.

The details of these excavations are no more clear than are those of the earlier projects. The most detailed account that has appeared is Browman's (1978a). Other related documents include Browman (1978b, 1980, 1981, 1991), Erickson (1975), and Kent (1982).

According to Browman (1978a:807), the work consisted of "two seasons of clearing at the temple of Chiripa, including three stratified cuts testing earlier deposits." Interestingly, this was the first project at the site that did not excavate an Upper House Level structure. Instead the majority of time in the field was devoted to clearing the central sunken court of the mound, from which some 1450 cubic meters of fill was eventually removed (Browman 1978a:811). All of this fill seems to have been screened, representing a monumental effort. This 'temple' had been disturbed heavily , both by looting and stone-robbing on the part of the *hacendados* and by the previous excavations of Bennett. Browman was able, nonetheless, to find some "undisturbed pockets" (1978a:810) which yielded "Tiwanaku III" ceramics. This, to Browman, indicated that this late temple was constructed in the Tiwanaku III period. His late temple evidence is not presented in a form that allows us to evaluate this interpretation.

The central court was excavated in an 'ice cube tray' strategy, leaving a grid of 'witness sections' covering the temple. Sometime after Browman left the field it was decided that these balks prevented tourist access to the temple, and they were removed, with only a central witness column being left intact. This column was still standing as of June 1998.

In addition to the temple excavations, three small units were excavated in undisturbed levels. To my knowledge, the location and details of these excavations have not been published. However, a CIAT topographic map of the mound which was produced with Browman's support indicates excavations in 1) the northeast interior corner of the central sunken court; 2) at the base of the 'tennis court profile'; that is to say, under the prior location of Bennett's House 2; and 3) on the north face of the mound, immediately north of the former location of House 1. The walls of Bennett's trench and the 'tennis court profile' were also cleaned and, presumably, drawn. These locations have been confirmed by onsite discussion with persons present at the excavations.

Since we have no indication of the labels given by Browman to these excavation areas, we will refer to them simply as Pits 1-3, in the order listed above. Pit 1 apparently revealed the remains of a central sunken court predating the Tiwanaku III one, which Browman attributes to his Mamani phase, corresponding to the Upper House Level. This earlier temple had been heavily disturbed by Tiwanaku-phase robbing of stones for use in the later temple (Browman 1978:810). Browman also claims to have found evidence of an exterior mound-facing wall relating to the Upper House Level, and separate from that of the Tiwanaku phase temple. Evidence for this retaining wall could only have come from Pit 3, since in the area of Pit 2 the mound had already been removed (by construction of the tennis court) to below the level this wall would have occupied.

The contexts referred to by Browman as relating to the earlier Condori and Llusco phases could have been from any of the three pits. Further clarification of this issue must await publication of relevant data by Browman. On the basis of the excavation of these three pits, Browman elaborated a three-phase chronology of the Formative period at the site. The dates of these phases seem to change slightly between publications but are approximately (from Browman 1991): Condori (1350-850 B.C.), Llusco (850-650 B.C.), and Mamani (650-50 B.C.). Browman (1978a) believes these to be roughly equivalent to Kidder's Sub-Lower House Level, Lower House Level, and Upper House Level, respectively.

Browman's project shifted more dirt than any project at the site before or since. His disposal of backdirt has had a major effect on the contemporary topography of the mound. Backdirt, both Browman's own and that of Kidder, which had to be removed from the center of the mound, seems to have been dumped in three main locations: 1) in the area to the southwest of the *hacienda* house, providing fill for the northwest corner of the soccer field; 2) over the south face of the mound, covering the area of pig pens, by that time already abandoned and in ruins; and 3) around the northwest corner of the mound, that is in the area of the 'tennis court' cut. Dirt seems to have been removed from the center of the temple in wheelbarrows, through the gap left by the Bennett trench, and dumped on the flat surface of the now-abandoned tennis court. The dumping over the south face of the mound has prevented major slumping and erosion of the mound. The dumping in the tennis court has also prevented erosion and slumping, but has obscured the original outlines of the court in some areas.

4

Radiocarbon Dating

WILLIAM T. WHITEHEAD

RADIOCARBON DATING HAS been used at Chiripa almost since its invention in the 1950s. As of 1996, twenty-eight conventional radiocarbon dates have been completed from excavations in the mound by previous excavators (Browman 1980). In addition, the Taraco Archaeological Project has contributed 40 new AMS (Accelerator Mass Spectrometry) dates from well provenienced locations on the site (table 1). The interpretation of the temporal placing of cultural phases from earlier works were limited in scope because they only focused on one area of the site, the mound. However, the TAP excavations and our subsequent radiocarbon dating broaden the chronology at the site.

The purpose of further detailed dating at Chiripa is twofold: 1) to establish a better temporal placing of the ceramic chronology at Chiripa and 2) to establish a more refined understanding of the deposits and occupations. The material we are using for the radiocarbon dates has been almost exclusively charred *Chenopodium* sp. seeds taken from flotation samples, however where these seeds were not available, unidentified wood specimens were used. *Chenopodium* seeds were chosen preferentially over wood or other types of charcoal because they are identifiable to genus, they represent less than one year's worth of carbon accumulation, and they should eliminate the old carbon problem of sampling heart wood, which can decrease the reliability of dating cultural events with radiocarbon samples. These seeds are also more than likely to have been brought to the site as part of agricultural activities, a likelihood that links the source of this carbon more closely to human activities than to natural burning events. The samples were prepared using standard treatment techniques for AMS dating of organics (Lloyd et al. 1991).

Because the amount of ^{14}C in the atmosphere has fluctuated over time, all radiocarbon dates should be converted to calendar years by calibration. The calibrations for all dates mentioned in this report were calculated using the DOS computer program Calib 3.0.3b (Stuiver and Reimer 1993) using the decadal calibration curve for atmospheric CO_2. The ages are given in B.C. or A.D. and are displayed graphically in figure 5 with

. TABLE 1 Taraco Archaeological Project Radiocarbon Dates

N	Sample ID	Mean Calibrated Age	1 sigma error range	2 sigma error range	Radio-carbon Age	Stan-dard Error	CAMS #
1	Locus 845	1449 BC	1507-1408 BC	1675-1317 BC	3200	60	25871
2	Locus 1479	1407 BC	1433-1317 BC	1495-1195 BC	3130	500	39169
3	Locus 830	1346 BC	1433-1260 BC	1503-1112 BC	3110	70	26606
4	Locus 791	1337 BC	1427-1195 BC	1486-1110 BC	3080	60	25875
5	Locus 1338	1315 BC	1391-1134BC	1431-1109 BC	3060	50	39171
6	Locus 1316	1277 BC	1374-1131 BC	1428-1053 BC	3040	50	39116
7	Locus 1237	1277 BC	1374-1131BC	1428-1053BC	3040	50	39168
8	Locus 1315	1276 BC	1371-1112 BC	1425-1023 BC	3020	50	39167
9	Locus 891	1140 BC	1242-1012 BC	1370-932 BC	2940	60	25872
10	Locus 1322	1118 BC	1211-1012 BC	1365-939 BC	2930	50	39174
11	Locus 1305	1112 BC	1210-1009 BC	1290-921BC	2920	50	39174
12	Locus 830	1033 BC	1186-937 BC	1211-844 BC	2870	50	26612
13	Locus 1318	957 BC	1077-898 BC	1212-815 BC	2840	70	38531
14	Locus 1304	956 BC	1047-898 BC	1187-829 BC	2820	50	39173
15	Locus 1337	951 BC	1047-834 BC	1206-812 BC	2810	60	38403
16	Locus 873	951 BC	1046-839 BC	1186-827 BC	2810	50	25876
17	Locus 768	977 BC	1077-898 BC	1212-815 BC	2840	70	26607
18	Locus 15000	864 BC	970-828 BC	1047-804 BC	2760	50	38530
19	Locus 1359/1	827 BC	972-786 BC	1209-413BC	2700	130	37358
20	Locus 892	804 BC	892-770 BC	998-433 BC	2650	90	26608
21	Locus 874	801 BC	827-787 BC	900-454 BC	2540	60	25873
22	Locus 114	795 BC	808-787 BC	828-595 BC	2620	40	25874
23	Locus 67	680 BC	792-430 BC	812-404 BC	2530	70	26611
24	Locus 1364	680 BC	795-413 BC	829-396 BC	2530	90	37357
25	Locus 866	680 BC	790-433 BC	806-408 BC	2530	60	26609
26	Locus 136	655 BC	787-433 BC	797-409 BC	2520	50	38401
27	Locus 1273	642 BC	787-414 BC	800-404 BC	2510	60	38405
28	Locus 1375	577 BC	788-410 BC	808-394 BC	2500	80	37356
29	Locus 1355	552 BC	767-403 BC	796-384 BC	2460	80	37359
30	Locus 1351	403 BC	480-393BC	758-262 BC	2380	50	37361
31	Locus 1429	506 BC	764-412 BC	786-406 BC	2480	40	38402
32	Locus 885	408 BC	758-392 BC	787-233 BC	2410	80	26610
33	Locus 1432	393 BC	409-234 BC	759-172 BC	2330	80	37354
34	Locus 1430	388 BC	403-214 BC	707-172 BC	2310	70	37353
35	Locus 1353	388 BC	407-210 BC	759-124 BC	2310	90	37360
36	Locus 143	281 BC	391-174 BC	406-94 BC	2250	70	37352
37	Locus 1386	191BC	391BC-45AD	756 BC-222 AD	2160	160	37355
38	Locus 842	427AD	363AD-543AD	257 AD-640 AD	1610	80	25877
39	Locus 1511	662AD	644AD-756AD	603 AD-776 AD	1360	50	39170
40	Locus 733	662AD	644AD-756AD	603 AD-776 AD	1360	50	39175

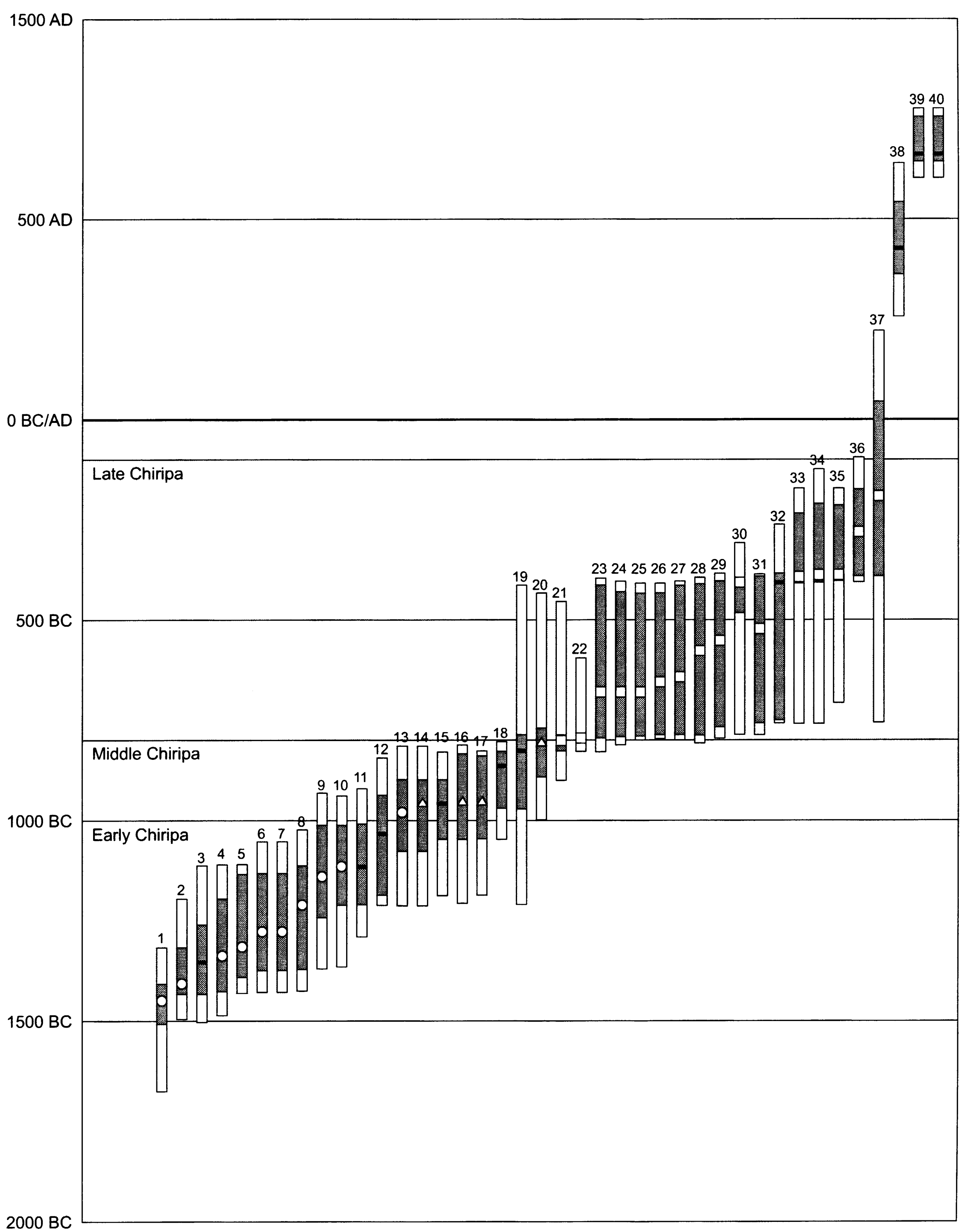


FIGURE 5 Calibrated radiocarbon dates from 1992 and 1996 excavations. Dates are represented as boxes. The central symbol equals the mean calibrated date, the dark inner box equals 1 sigma range, and the white outer box equals 2 sigma range. Numbers above the date are the same as the numbered dates in table 1. The circle equals the Early Chiripa phase, the triangle equals the Middle Chiripa phase, and the square equals the Later Chiripa phase. A bar equals a disturbed locus.

the mean radiocarbon date represented by a symbol and 1 and 2 sigma error bars given to show the range of dates possible at 66.7% and 99.7% probabilities. The raw data is in table 1 listing locus, excavation area, and carbon sample source.

Redefining the Chronology of the Chiripa Phases

The three phases defined for the Chiripa sequence are based on ceramic style and technology (see the ceramic section). We can now define the calendar year ranges of these phases based on the previous work of other researchers and the calibration of the new TAP radiocarbon dates (figure 5). At this stage in our research we have defined the following age ranges for the three Chiripa phases:

Early Chiripa: 1500 B.C.-1000 B.C.
Middle Chiripa: 1000 B.C.-800 B.C.
Late Chiripa: 800 B.C.-100 B.C.

These age ranges will be used when referring to the placement and sequence of events from the excavations where a cultural phase is given. The age ranges for the Chiripa phases that we have developed are for this site only and may not translate reliably to other sites in the region.

Discussion

The use of radiocarbon dating to date specific cultural events is not an exact science, but we feel that our phase re-definitions incorporate

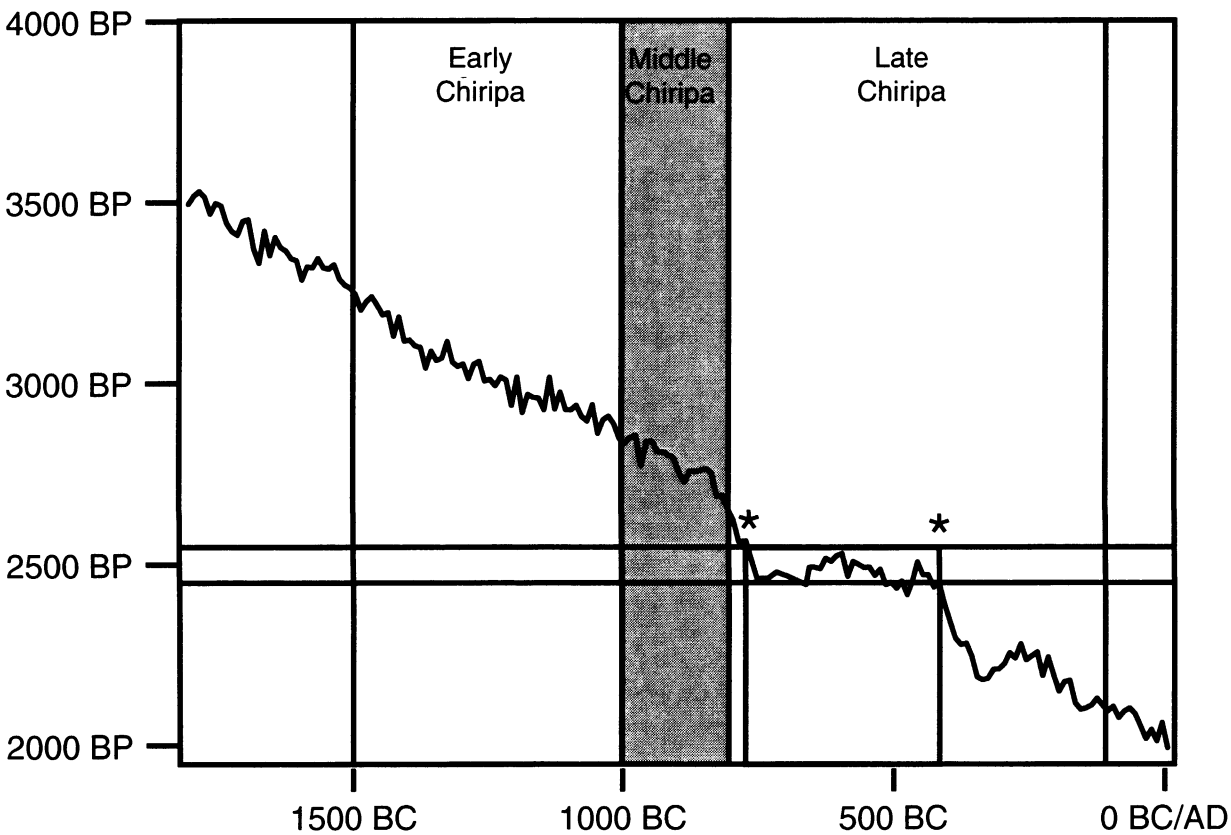


FIGURE 6 Typical calibration of a 2500 years bp radiocarbon date. The plateau between 800 and 400 B.C. in the calibration curve causes all calibrated dates in this age range to have extraordinarily large standard deviations. This effect is demonstrated by following the lines from the vertical years bp axis that intercept the calibration curve and drawing a perpendicular line to the horizontal calendar age axis.

our new data and place the Chiripa ceramic sequence more firmly in calendrical time. Although the implications of specific radiocarbon dates in reference to excavations will be presented in the excavation sections below, several general observations can be made about the site from these dates. First, occupation at Chiripa starts by at least 1500 B.C. and has lasted to the present. Second, the definition of events at the beginning and end of the Late Chiripa phase is complicated by the unfortunate presence of long plateaus in the radiocarbon calibration curve, giving the dates that range between 800 to 600 B.C. unusually large one and two sigma error ranges (see figure 6). In that time range we have up to eleven dates with extraordinarily large one sigma and two sigma calibration ranges. Figure 6 shows the area of the radiocarbon calibration curve in question. The plateau will more than likely continue to hinder future work in using radiocarbon to refine the end of the Middle Chiripa and the beginning of the Late Chiripa phases. The plateau will also limit the development of finer chronological comparisons between different areas on the site as well as between sites within the same Middle and Late Chiripa phases. This described effect can be seen in the series of dates numbered 23 to 30 on figure 5 which could all be considered the exact same date using the one sigma error range, even though they are from eight different contexts.

Third, the use of radiocarbon to define fine stratigraphic events at Chiripa was not as informative as hoped for because of the lack of undisturbed Middle Chiripa proveniences. Further work in finding and dating intact Middle Chiripa contexts should resolve the current ambiguity addressing when Early Chiripa ends and Middle Chiripa begins. Fourth, the problems of small, somewhat mobile carbon fragments in archaeological fill may not counterbalance the positive effects of dating annual plants as had been hoped for. As can be seen in figure 5 several Middle Chiripa dates fall within the middle and end of the Late Chiripa phase, even though the ceramic assemblages from these contexts were of an unmixed nature. This effect is caused by the continual reuse of the same occupation areas over a very long time span and makes dating these areas problematic. We have not yet found a complete intact stratified midden deposit. In our future work we plan to date carbon encrustations on specific ceramic styles as a way of bypassing this botanical problem. Fifth, even with all the problems encountered using radiocarbon at Chiripa we feel that the new dates are useful. Besides firming up each of the three phases, we now know that the Late Chiripa ends earlier than had been previously thought.

5

The Systematic Surface Collection

MATTHEW S. BANDY

EARLY INTERPRETATIONS OF the site of Chiripa (Bennett 1936; Kidder 1956; Browman 1977) have characterized the mound as accumulation related to a small village of 14-16 houses, arranged in a circular fashion about a central sunken court. Bennett and Kidder see no evidence of occupation beyond the mound itself, while Browman mentions the presence of a small Tiwanaku III village in the area occupied by the modern *hacienda* house and soccer field to the east of the mound. This shift in the locus of settlement was presumably based on a shift of the functional interpretation of the mound from a residential to a ceremonial space, with the construction of the uppermost sunken temple in the sequence. This theory is based on the Tiwanaku III temple that was excavated by Browman's project and which can be seen by visitors to the site today. Chávez (1988), on the other hand, interprets the Late Chiripa mound occupation (the so-called Upper House Level) as a civic-ceremonial complex, albeit of modest size, dedicated to storage of elite goods and surplus foodstuffs and presumably to ritual activity as well.

Our 1992 excavations in the Santiago and Llusco areas demonstrated unequivocally that occupation was present in all periods outside the area of the mound itself (Hastorf et al. 1992; Alconini y Rivera 1993). What remained unclear was the extent and nature of this previously unrecognized occupation.

Consequently, our first action in the field in the 1996 season was to carry out a systematic surface collection of the site of Chiripa in order to determine the size of the site and, hopefully, to detect patterns of intrasite artifact distribution. As the majority of the surface of the site is utilized for modern cultivation, and all of the site has certainly been cultivated intermittently over the past 500 years, no surface architectural indications are preserved. All of our conclusions are drawn from artifacts collected from the surface, primarily from plowed or fallow fields.

METHODOLOGY

Our methodology for the collection was determined by a number of factors. First, we had no clear idea of the boundaries of the site, and it was therefore impossible to stratify the study area as required by certain sampling methods. Our collection was, more than anything, exploratory. In addition, we needed to sample a quite substantial area in a relatively short period of time. These factors indicated to us that the most appropriate technique was systematic sampling using the site grid that had been established in 1992.

Accordingly, the concrete datum point (BM I) that we had established on the NW corner of the mound was assigned the arbitrary coordinates of 1000N/1000E. Beginning from this point, collection units were laid out in a 50 x 50 m grid pattern until the limits of the artifact distribution had been reached and well established. In this manner we were able to define the boundaries of the site.

Each of the 50 x 50 m grid points served as the central point of a surface collection unit. Initially, the unit was to be a circle with a radius of 3.99 m ($50m^2$). If this area failed to yield at least 50 sherds, then the collection was expanded to a circle with a radius of 5.64 m ($100m^2$). In order to standardize the surface visibility of the collected areas as much as possible, the team collecting the unit was permitted to move the center of the circle up to 20 m in any direction from the 50 x 50 m grid point. In cases in which it was impossible to place the entire unit within a plowed or fallow field, areas with different surface types were collected as separate loci, thus stratifying the sample according to types of ground cover. In areas of dense grass cover, grass was scraped with a shovel and passed through a 1/4" screen. This difference in collection strategy was necessary in order to offset very poor visibility in grassy units. Identification and phasing of the ceramics recovered from the surface collection was undertaken by Dr. Lee Steadman.

The total area sampled with this technique included 114 50 x 50 m grid points. This represents an area of 28.5 ha, since each unit sampled a 50 x 50 m (.25 ha) area. Four of these were not collected due to the presence of a modern house (in one case) or of thick alluvium and grass (as in the case of three points located in the *quebrada* to the west of the site). In the end, 110 grid points were collected. Of the 110 loci which yielded artifactual material, 89 (81%) were collected from plowed or fallow fields, 9 (8%) from light grass cover, and 12 (11%) from dense grass cover. The surface characteristics of most of the sample are therefore comparable, and artifact densities should largely reflect archaeological reality rather than the exigencies of surface visibility. More detailed comparisons between areas of different surface visibility will be undertaken in the future, but for now we assume that collected artifact densities may be compared across the entire site.

Results

The systematic surface collection has indeed demonstrated that prehistoric occupation at Chiripa far exceeded the limits of the mound itself, and even of Browman's Tiwanaku III village. Our results indicate that Chiripa was a major local center on the Taraco Peninsula at least from the Middle Formative period through the Middle Horizon.

Considering the surface ceramic distributions over the more than 2000-year occupation of the site, two general macro-patterns emerge. The first pattern is a relatively continuous distribution, and characterizes the Formative period and Middle Horizon occupations (figures 7a-7c and below). Pattern 2 is characterized by discrete, isolated concentrations (figures 7d-7e and below). While we recognize that a variety of site formation processes could potentially contribute to the formation of these two patterns, we nevertheless feel that the clear distinction between them indicates two general modes of occupation in the site's history. Pattern 2 corresponds to the modern settlement pattern, characterized by individual, isolated farmsteads, separated by actively cultivated agricultural fields. We interpret the first pattern, by contrast, as reflecting what we term 'nucleated habitation'. This term is meant to indicate a higher density of occupation, with no appreciable cultivated tracts interposed between habitation structures.

Early and Middle Formative Periods: The Chiripa Phases

Due to the fact that virtually all of our collections derive from plowed field contexts, sherds were generally quite broken up, and mean sherd size was small. This made it virtually impossible to distinguish Early, Middle, and Late Chiripa ceramics specifically, and thus the occupation areas dating to these phases individually across the site. The Chiripa phase was therefore

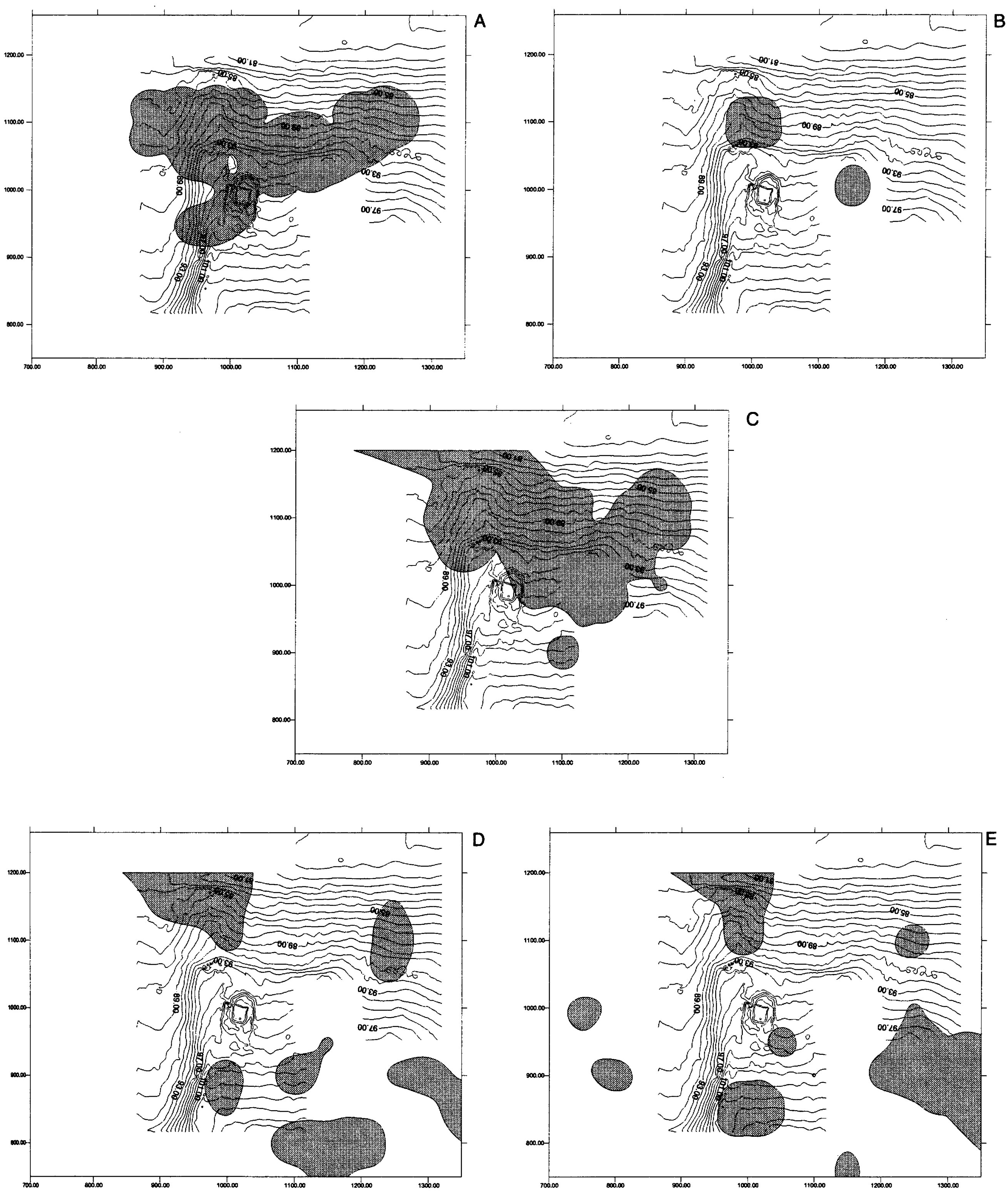


FIGURE 7 Surface ceramic distributions. a: Formative period surface ceramic distribution, b: Tiwanaku I/III surface ceramic distribution, c: Tiwanaku IV/V surface ceramic distribution, d: LIP/Inka surface ceramic distribution, e: Historic period surface ceramic distribution. The shaded contour is .1 ceramic count per square meter.

considered as one time unit. Chiripa ceramics extend over an area of 7.5 hectares (figure 7a). Of this area, the mound accounts for approximately .36 ha, or 5% of the total site. With an occupation of this size, Chiripa must be counted as one of the largest Middle Formative period sites in all of the Titicaca Basin, far exceeding any of the Formative period sites encountered in the systematic survey of the Tiwanaku Valley (Albarracin-Jordan and Matthews 1990), and comparable to the contemporary Middle Formative center of Palermo near Juli, Peru (Stanish et al. 1997). It is apparent, then, that Middle Formative Chiripa was much larger than a small village of 14-16 houses. This information supports Chávez's (1988) suggestion that the mound, in Chiripa times, was a ceremonial rather than a domestic zone. Our information firmly establishes the existence of large-scale, nucleated habitation at least by the Late Chiripa phase. The extent of the Early and Middle Chiripa occupations must, for the moment, remain a matter for speculation.

Late Formative Period: Tiwanaku I-III

As we were unable to distinguish the various Chiripa phases in the surface collection, we were likewise unable to distinguish between Tiwanaku I and Tiwanaku III occupations, particularly as the collection consisted mostly of plainwares. The Tiwanaku I/III phases are therefore treated as a single time unit in this analysis, the Late Formative. Ceramics of this period extended over an area of 4.0 ha (figure 7b). While substantially smaller than the Late Chiripa settlement, this is still a very substantial site for this time. It is also considerably larger than Browman's postulated Tiwanaku III 'village' associated with the mound. We must interpret this information as indicating that Chiripa, far from being abandoned after the burning of the Upper House level on the mound, continued to be an important center, with both residential and ceremonial functions. It is also important to note that the nucleated habitation established at least by the Middle Formative period continued in the Tiwanaku I-III period.

Middle Horizon: Tiwanaku IV-V

This nucleated settlement not only continues into the Tiwanaku IV-V period but is greatly expanded. While Chiripa is not normally considered a major Tiwanaku center, the Tiwanaku IV-V occupation extends over at least 13.0 ha (figure 7c). This means that in this period Chiripa was as large as or larger than any site in the Middle or Lower Tiwanaku Valley with the sole exception of Tiwanaku itself (Albarracin-Jordan and Matthews 1990). In the greater region of the southern Titicaca Basin, only Pajchiri, Lukurmata, and Khonko Wankani seem to be larger in this time period. In the future Chiripa must be considered not only as a Formative period center, but as a major regional Tiwanaku IV-V center as well.

Late Intermediate Period/Late Horizon: The Pacajes Phases

The Late Intermediate Pacajes Period witnessed a major shift in settlement at the site (figure 9d). Whereas we have seen that the site was characterized by large-scale nucleated habitation at least from the Late Formative, and possibly much earlier, in the Late Intermediate Period this pattern breaks down. Artifacts are distributed in small (< 1.0 ha), discontinuous concentrations, probably indicating dispersed domestic clusters. Since this same pattern is characteristic of historic and modern ceramics (figure 7e), we infer that the Late Intermediate Period settlement pattern was similar to the modern one. That is, settlement was characterized by discontinuous, isolated household units.

The evidence from the systematic surface collection of the site indicates, then, that previous interpretations of the site as a small village restricted to the area of the mound are entirely incorrect. Chiripa was a major regional center in the Late Formative period, and probably earlier as well, with the mound being the ceremonial focus of the community, and possibly of the region. Through the various phases of the Tiwanaku sequence, Chiripa continued to be an important population center, and was clearly the major Middle Horizon center on the peninsula. In the Pacajes phase, and subsequent Pacajes-Inka phase, Chiripa ceased to be a locus of nucleated settlement. The pattern of small, discontinuous habitations that appeared at this time characterizes occupation at the site up to the present day.

EXCAVATIONS

6

Excavation Methodology and Field Procedures

CHRISTINE A. HASTORF AND MATTHEW S. BANDY

IN THE 1996 FIELD SEASON, we exposed broad, previously unexcavated areas of the site in order to better understand the amorphous and complex soil deposits we had found in the 1992 field season. The areas we excavated were marked out with the units designated by their southwest corner, based on the same grid system used in the surface collection of the site. Each excavation unit begins with an arbitrary 2 by 2 m unit at 10 cm deep but switched to culturally defined areas as soon as soil matrix changes were visible. Some units have odd numbers due to a lack of theodolite access at certain times during the early excavations. All excavated soil was passed through a .635 (1/4" mesh) screen in measured buckets of 10 liters, except for the soil collected as a flotation or the archival soil (pollen-phytolith-archive) samples, both plotted on each locus excavation plan. In 1996, every tenth bucket of soil was passed through a .32 cm (1/8" mesh) screen to gain a subsample of the smaller animal bone and lithic debitage. All excavated soil is therefore measured volumetrically, allowing us to calculate the density of the artifacts within each excavated locus across the site. All artifacts were bagged and tagged (and washed) by artifact type. These artifacts are currently stored in the Tiwanaku regional museum under the auspices of the Dirección Nacional de Arqueología y Antropología (DINAAR), the official Bolivian archaeological commission. Each artifact type is processed differently post-excavation. The ceramics are soaked to extract the salts and then washed in the field. All of the lithics and the bone are also washed in Chiripa. Ceramics that had any evidence of organic encrustation are set aside and scraped to collect the organic remains before washing. All complete artifacts are photographed, all diagnostic ceramics drawn. Large and prehistorically sealed ground stone was washed using distilled water, with all of the sediment captured for pollen analysis.

We conducted water flotation soil processing to collect a systematic sub-sample of charred plants, micro-fauna, and other small artifact types. Our flotation methods included collecting at least one standard-sized soil sample from every excavated locus. Field excavators were instructed to sample each locus by collecting one 10-liter "bulk" flotation sample (Popper and Hastorf 1988), and in certain contexts, like use-surfaces or middens, we also collected a second 10-liter "scatter" or average soil sample. In addition, across certain surfaces, many bulk soil samples were taken, usually one sample every 50 centimeters. A "bulk" soil sample is a single 10-liter block of soil, with a recorded x, y, z provenience. A "scatter" sample is a collection of soil distributed from throughout the locus matrix to create an average view of what was deposited within the soil. These two strategies are implemented in parallel to provide a fuller view of the artifactual material from a specific locations (Lennstrom and Hastorf 1992) (see Whitehead, chapter 12).

Micromorphology samples were collected occasionally in vertical columns as intact solid blocks of soil approximately 20 x 10 x 10 cm. Such soil thin section analysis can present an *in situ* and detailed view of the soil matrix found in archaeological sites with more specific views of what was laid down as well as the conditions of its deposit (see Goodman below, chapter 10). A series of micromorphological soil profiles were collected from the excavations at the Montículo, Santiago, and Llusco areas. Additional off-site "natural" samples were collected as controls.

Stratigraphic Organization of the Excavations

To build a sequence of past events, and therefore a Harris Matrix of every excavation area, we use the term *locus* to denote the smallest visibly defineable and excavated unit (Harris 1979). Each locus represents an action in the past. These matrices allow us to stratigraphically reconstruct the sequence of past events. Appendices 1-3 display the three main area matrices from the 1996 excavations. On the form of each locus, we always described the soil of each excavation locus, often taking both color and black-and-white photographs. The *locus* is to be distinguished from the *stratigraphic event*, which is a unit of *stratigraphy*. The stratigraphic event is a natural property of the matrix, resulting from the processes by which the site was formed. Events were labeled by area of the site, such that all D-events are from the mound area, B-events are from Santiago, and A-events are from Llusco. The locus, by contrast, is an *archaeological* unit of provenience, formed by the manner and sequence in which the site is excavated. Ideally, each locus should belong to only one stratigraphic event, although stratigraphic events can contain many (or no) loci. An *event* is a unit of homogenous soil linked to an activity or process; for example, an ash lens, an intentional fill level, a floor, or the cut of a pit or of a foundation trench. Stratigraphic events occurred in the past in a particular and determinate sequence. One of the primary goals of our excavation was to reconstruct this sequence.

Reconstruction of a detailed stratigraphic sequence allows for fine chronological control, as well as a more detailed understanding of the processes, both natural and cultural, that are responsible for the formation of the site as it exists today. *Features* were also assigned when identified. We define a *level* by culturally visible changes in the deposits. We use the term *architectural sub-division* (ASD) for an architectural feature such as a structure. These identities are all recorded on every appropriate locus form and on our database. While analysis occurs at the locus level, interpretation is at the event level.

7

Excavations in the Llusco Area

José Luis Paz Soría

The first excavations in the area known as Llusco (in recognition of the owner of the property), located 200 m south of the mound, were in 1992 (figure 2). Claudia Rivera Casanovas directed the excavations in this area in 1992 (Hastorf et al. 1992). This work resulted in the discovery of a semisubterranean walled enclosure with a white plaster interior floor dating to the Late Chiripa phase, 800-750 B.C. (figure 8). Its subterranean construction, together with the elaboration of its plaster floor, is the principal evidence for suggesting a possible special function for the Llusco structure (Hastorf and Bandy 1996; Steadman 1996). With this background, the goal of the 1996 season was to define the dimensions of the stone walls, obtain additional samples for radiocarbon dating, and further investigate its form and function.

This enclosure (which from this point onward will be referred to as Llusco), is clearly defined by the cut made into the local sterile soil which was then filled with lines of stone (figure 9). In general, the intact cultural deposits in the Llusco area are shallow (an average of 10 cm below the surface) so much of the enclosure is gone. The soils within the enclosure are loose silty clay loams with a higher humus and moisture content than the surrounding sterile soil. The exterior, "sterile" soils are an orange color (2.5 YR 5/6) while the interior fill is dark brown (7.5 YR 3/4). This color contrast served as a guide to identify the foundation cut of the enclosure. Since our main goal in 1996 was to identify the size and shape of the enclosure, the excavations extended only to the base of the plow zone where these soil contrasts were visible. In locations where greater stratigraphic control was required, a further soil layer was excavated. This strategy permitted us to identify the dimensions of the four walls: east wall 13.5 m; north wall 11.5 m; west wall, 12.5 m; and south wall, 11 m (see figure 9). The most destroyed wall was the south wall where the stones were intentionally removed by later midden pits and plowing. These intrusive pits are irregular in form and depth and are found to lie over the interior fill of the structure (which contains Formative materials), making clear stratigraphic separation of the two levels difficult.

At a later date, during the Republican period (A.D. 1825-present), the west wall of Llusco was

FIGURE 8 South-facing oblique view of the Llusco enclosure.

destroyed to construct an adobe *hacienda* wall, its stones being employed for the construction of the base of the wall which runs parallel to the ancient structure and its soil collected to make adobes (see figure 9). Additionally, the excavation of various adobe borrow pits, associated with construction of this later historic wall, disturbed this area still further. Both the plow and more recently the tractor, have contributed to the destruction of the structure, especially in the northern area.

Despite these limitations, the construction techniques of Llusco are still recognizable. The first step in the construction was to make a nearly vertical cut into sterile soil (giving the structure its semisubterranean character) forming a U-shaped linear trough. Then, the base of the wall was constructed of local, rounded cobbles up to 70 cm in size and clay. Above these base stones, it seems that stones and adobe were added to enclose the space, although we do not know the resulting height. Periodic foundation cut evidence shows that the cut was gently sloping in some areas, resulting in a slope that covers 15 cm, which was filled with other materials (possibly from earlier deposits; see below) in order to stabilize the wall. It is also likely that the upper parts of the wall would have included mud bricks, and that the subsequent melting of these combined with the effects of plowing would have blurred still further the depositional processes in this area.

Other significant architectural evidence includes a drainage canal in the northwest corner of the structure and a white plaster floor in the interior of the structure (figure 9). The canal is located in the lowest corner, draining the structure toward the nearby stream basin. The canal section that was excavated was 4 m long, 24 cm wide and 30 cm high, with a fine layer of compact clay in its base. This canal, like the walls of Llusco, cuts into the sterile soil. It is very probable that it was completely covered with capstones, because several were still in place when uncovered. Unfortunately, the later *hacienda* wall construction destroyed much of this area. In the interior of the canal we encountered Late Chiripa materials and frequent white clay particles which appear to represent the erosion of the white plaster floor inside the Llusco structure. There is a second row of stones in the same northwestern corner (labelled secondary wall in figure 9), parallel to the canal. This could be the entrance to the Llusco structure, occurring in the northwestern corner on an earlier canal (figure 9). The foundation of this secondary stone wall cuts an earlier Chiripa fill (see below). Its construction is similar to the other Llusco walls. In the area between the canal and this angled wall (1.1 m), there are many loose stones that seem to be wall collapse.

One of the greatest surprises of the Llusco excavation was the discovery of two series of pit fills, located just outside the north and northeastern walls (labeled as fill in figure 9). These contained Early and Middle Chiripa materials, respectively, dated by ceramic analysis. Their contents appear to be mixed midden. The soil of these pits had a sandy clay loam texture and a dark brown color (7.5 YR 3/4). The pits themselves are amorphous in shape and apparently represent various superimposed actions which were cut by the construction of the Llusco enclosure. The Harris Matrix for Llusco is seen in appendix 1.

The Function of Llusco: Domestic or Ritual?

At this time there are two models for the function of Llusco based on the excavation evidence and on comparisons with other Formative sites in the circum-Titicaca area. One is that the Llusco enclosure represents a largely domestic or group structure, constructed by an *ayllu* or similar social group, and that it is one of presumably several which was placed near the Chiripa mound. James Matthews excavated a similar sunken courtyard, approximately 10 x 10 meters in size, cut into sterile and having cobble and fieldstone walls, at the site of T'ijini Pata in the Middle Tiwanaku Valley. This structure had two periods of occupations, one during the Late Chiripa phase and the other somewhat earlier. Matthews interprets this structure as having primarily a domestic habitation use, based on artifact density and the presence of domestic debris in its fill (Matthews 1992:69-72). Similarly, Juan Albarracin-Jordan's (1992, 1996) excavations at the site of Allkamari in the Lower Tiwanaku Valley uncovered a sunken enclosure that he also interprets as having a communal domestic function, serving as a common residential locus of an extensive social group that he postulates resembled ethnographic and ethnohistoric *ayllus*.

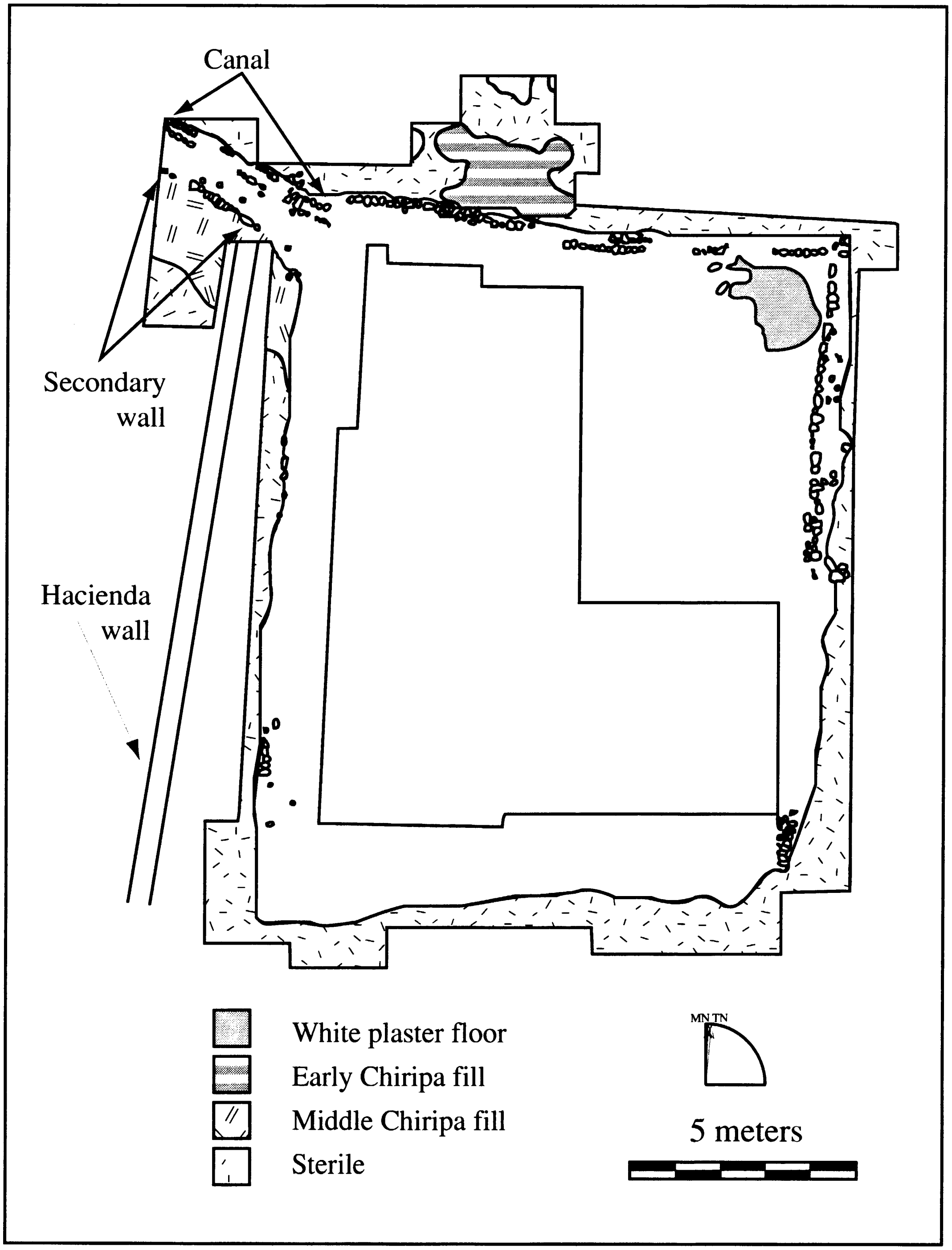


FIGURE 9 Llusco excavation plan with major phases marked.

The second model for the Llusco enclosure, favored by most members of the Taraco Archaeological Project, is that it represents a group enclosure, but with a more ceremonial and periodic communal use, along the lines of the later semi-subterranean enclosures both at Tiwanaku and at other sites around the basin. Several other Late Chiripa semi-subterranean enclosures clearly have ritual or ceremonial functions, including the fieldstone courtyard on the mound at Chiripa itself (Browman 1978:809; Chávez 1988), the semi-subterranean courtyard at Ch'isi on the Copacabana peninsula (K. and S. Chávez pers. comm.), and the semi-subterranean enclosure at Titimani (Portugal et al. 1993). Although our analysis of the artifacts recovered from the Llusco structure, including the faunal and botanical evidence, is not complete, the information we have so far suggests to some, especially when compared to other data populations at the site, that the Llusco structure was primarily used for ceremonial purposes, with other activities taking place within the enclosure as well. There is a higher than average number of decorated sherds, including trumpet fragments. These trumpets have been associated with ceremonial activities throughout the Titicaca Basin (fig. 27d). This does not rule out what are often called domestic activities from taking place inside the courtyard. A similar pattern of mixed use zones has also been proposed for the Santiago area. Dense domestic activity refuse is lacking from the Llusco floor and fill, as are domestic features such as hearths, middens, etc. In contrast, the percentage of decorated ceramics found on the Llusco plaster floor is significantly higher than in any other Late Chiripa context at the site, with the exception of the Lower Houses on the mound itself. As most of the stones from the Llusco structure walls are missing or robbed, possibilities for the comparison of stone construction technique and style with the other Late Chiripa sunken courtyards are unfortunately limited. As in all archaeology, careful identification of context, especially secondary fill or floors, will cause problems in getting the best understanding of such structures' use and meaning.

Comparison with other sunken enclosures in the southern Titicaca Basin show several similarities in construction, such as the rectangular plan, the use of cobble, fieldstone, or undressed stones for the wall construction, and the cutting of the courtyard into sterile soil or bedrock. What is exciting is that this enclosure could be contemporaneous with the Upper House Levels of the mound. Because this is the period of the least precise dating, at this time we cannot be certain about their contemporaneity. This enclosure does suggest that there at least two large architectural constructions in use at one time at Chiripa, however. The earlier pit fills further note that these enclosures were built on and near earlier use areas.

8

Santiago

EMILY DEAN AND DAVID KOJAN

THE SANTIAGO AREA IS located in an agricultural field on a sloping terrace, 20 meters north of the main Chiripa road and about 500 meters south, up from the shore of Lake Titicaca. Santiago lies downslope (north) of the Montículo and Llusco areas and just east of a large seasonal riverbed (figures 2 and 10). It was named after the field owner in 1992 when TAP first excavated in that area. The Santiago I and II areas were first opened up in 1992 (Alconini and Arnott in Hastorf et al. 1992). Intrigued by the presence of Early Chiripa ceramics, early radiocarbon dates, and complex deposits, we decided to reopen and expand these two areas in the 1996 field season. During the second week of excavations the areas of Santiago I and II were joined together and excavated as one unit, called Santiago. By the end of the 1996 field season the Santiago area measured 19 by 23 meters at its widest points and reached depths ranging between 60 to 170 cms below the surface (figure 10). In general, Santiago is characterized by a series of cultural surfaces, a few of which have been significantly excavated at this point; although many are only visible in profile from test excavations and intrusive pits.

Most of the excavated cultural surfaces date to the Early and Middle Chiripa phases, which is what we were purposefully searching for. During our 1996 excavation we exposed one of the occupation surfaces, stratigraphic event B16, over a wide area. Based on ceramic and radiocarbon evidence, we determined that it lies securely within the Early Chiripa phase. The result of an AMS radiocarbon assay run on Locus 1316 of Santiago event B16 is calibrated to 1374-1131 B.C. (see figure 5 in chapter 4). With the exception of some intrusive Tiwanaku burials and pits, the Chiripa-period levels were relatively undisturbed with very good preservation. One of the most important questions being addressed at Santiago has been the depositional history of these surfaces. We know that these strata are cultural in origin, but there are several possible explanations as to how they may have been deposited.

THE STRATIGRAPHY

The stratigraphy at Santiago is deep and finely laminated (see appendix 2). A test excavation at N1100/E970 conducted in 1992 revealed nearly two meters of cultural deposits with at least

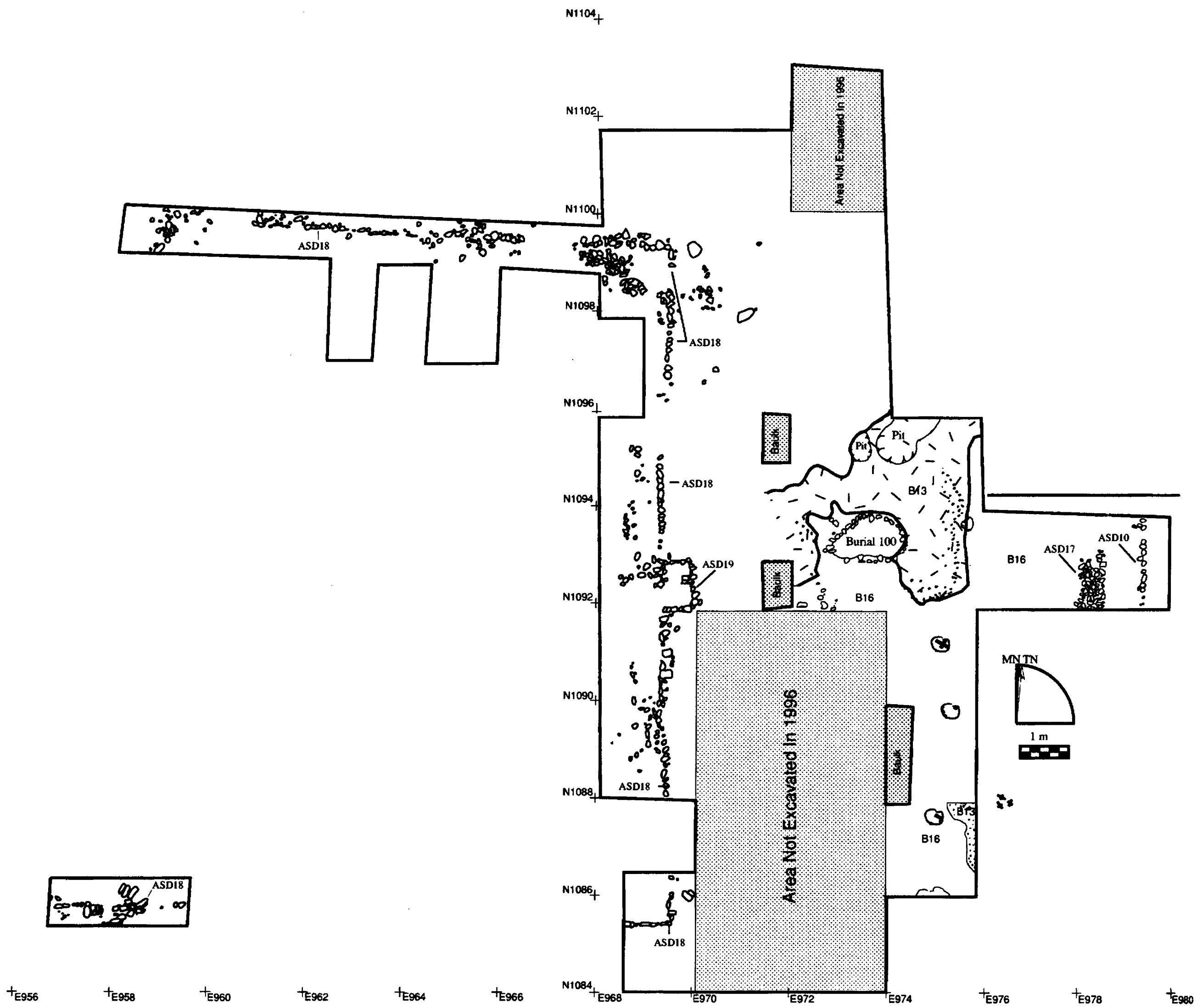


FIGURE 10 Santiago schematic excavation plan.

15 distinct occupation events. Ceramic analysis and radiocarbon dating indicates that the deposits at Santiago below the upper 50 cm date to the Early Chiripa phase.

Excavating a well-defined Early Chiripa occupation surface at Santiago was one of our main goals during the 1996 field season. We found this in event B16, a compact-textured, dark-colored (7.5YR 2.5/l), silty clay loam, characterized by finely laminated carbon layers, a heavy artifact density, and the presence of numerous associated ash and bone filled pits. We excavated B16 across a 10 meter by 5 meter area. One of the most notable features about the B16 event is its variability. In some areas it is well defined and stratigraphically distinct, while in adjoining areas, it is indistinct from the strata above and below it. B16 tended to be most intact and easy to define in the central and southern sections of the unit (figure 10).

In conjunction with the B16 surface there is a wall, ASD 17, uncovered in the 1996 season in the N1090-1092/E976-978 corridor (figure 10). The fill to the east of ASD 17 is stratigraphically undifferentiated with mixed Tiwanaku and Chiripa ceramic assemblages (this mixing could be explained by the presence of an intrusive Tiwanaku pit visible in the 1092 N/978 E east side wall). The fill to the west of the wall, however, is characterized by Middle Chiripa sherds in the upper levels and Early Chiripa sherds in the lower levels.

Based on ceramic evidence, the depth of the wall beneath the surface (considerably lower than any of the Tiwanaku walls excavated at Santiago in 1992), and the associated radiocarbon dates (Locus 1322 calibrated to 1211-1012 B.C.), western ASD 17 appears to date to the Early Chiripa phase.

Another interesting aspect of the Santiago stratigraphy is the presence of the B13 event, (what we call "Orange Granola") seen across this same central area (figure 10). Without exception, it manifests itself as a sterile, orange, silty clay loam matrix with numerous gravel inclusions (5YR 5/6). Its gravel inclusions tend to be clustered near the top of the layer while the bottom consists of a finer-grained matrix, reminiscent of a water-transported alluvium. Very few artifacts were recovered from this deposit in either the screen or the floated heavy fractions. The B13 matrix lies immediately above the Early Chiripa occupation surface (B16). A notable feature of the "Orange Granola" is that it occurs in amorphous, homogeneous patches ranging from approximately one to four meters in diameter (figure 10). It is distinct from all other types of soil that occurred in the Santiago excavation. From observation of the surrounding soil it is clear that the B13 material is imported, possibly from one of the nearby creek beds or other exposed "sterile soils" whose color and texture it strongly resembles. Based on its spatial distribution and consultation with soil micromorphologist Melissa Goodman, we interpret the B13 patches as a highly eroded adobe brick matrix. The eroded adobe hypothesis is supported by the presence of identical material at Montículo associated with ASD 14 which is more obviously the result of adobe wall fall. Similar material also can be seen in the construction (and destruction) of modern adobe houses throughout the Chiripa community.

Perhaps the most significant feature to date in the Santiago area is the "semi-subterranean enclosure," called ASD 18 (figure 3). This structure's walls have only been partially exposed on three sides. From the 1992 excavations we know that the stratigraphy on the inside of the wall (south-west side) has only four to five discernible levels throughout one meter of deposit. The fill sits on sterile soil; with gray clay fill that has thin yellow floor layer. Above that is a thick amorphous fill. The ceramic analysis of the 1992 assemblages indicates that this fill is chronologically stratified, with Middle Chiripa wares at the bottom in contact with sterile soil, up through the floor. All layers above this are Late Chiripa wares up to the top. The west face of the wall was plastered, suggesting that it was the inside of the structure (figure 3). Stratigraphic and ceramic evidence suggests that the semisubterranean structure was constructed during the Middle Chiripa phase, cutting through the earlier strata including the B-16 surface.

The fill, excavated west of the wall, is full of chronologically stratified Late and Middle Chiripa artifacts. The deposition pattern of this fill suggests dumping episodes that took place after the wall was constructed.

Domestic or "Special Purpose" Space?

There are some indications that the exposed Early Chiripa surfaces to the east of ASD 18, the semi-subterranean structure, reflect domestic living surfaces. Both the 1992 and 1996 excavations uncovered prepared plastered floors (the stratigraphic event B30 in 1996, for example) and other levels that appear to be occupation zones due to their thick, finely laminated carbon lenses. In addition to ASD 17, the stone wall associated with our early Chiripa occupation zone (event B16) in the eastern portion of the unit (figure 10), we encountered patches of an "Orange Granola" adobe melt (event B13) sitting across the top of the B16 layer. Both ASD 17 and our patches of melted adobe suggest rather simple Early Chiripa domestic structures.

Artifactual evidence also lends credence to a domestic occupation at Santiago. According to Dr. Lee Steadman, the ceramic assemblages from most of the Early Chiripa levels, which are plain and undecorated, appear to be domestic wares. The high percentage of worked bone awls and needles recovered during excavation; the discovery of a bone weaving comb and ceramic spindle whorls; and Matthew Bandy's lithic analysis indicating that primary lithic reduction and production of stone tools was taking place at this area, also suggest domestic activities. Additionally, the high density of fish bone recovered may be associated with "every day" food preparation. Finally, *in situ* burned areas, ash pits, and ash dumping episodes further support the domestic hypothesis.

Other evidence supports the idea that this was a ritual or "special" area. From the high number of interments excavated in 1992, it is clear that Santiago served as a burial ground during Chiripa through Tiwanaku eras. The 1996 excavations uncovered one stone-lined pit burial containing the flexed body of a woman facing north and buried with blue sodalite beads and a 'killed' broken metate—Event B11—that lies beneath Late Chiripa levels rather than cutting through them. Moreover, ceramics recovered from the 1992 excavation of a Santiago Early Chiripa level are characterized by a higher percentage of red slips than those found in other areas of the site, possibly indicating a special use function for this area, since cooking wares are usually self-slipped. The recovery during the 1992 excavations of large and small cooking vessels in association with *in situ* burnt areas suggest that feasting may have occurred in this area as well.

One of the main features in the Santiago area supporting a ritual or special purpose use of the area is ASD 18, the "semi-subterranean enclosure" (figure 3). Excavation thus far indicates that this structure was a four-sided, approximately 14 m, trapezoidal, plaster-walled, yellow-floored, stone enclosure, many courses high (figure 11). We are probably seeing the interior of a sunken special purpose area, later filled in. Several animal offerings (guinea pig and camelid) recovered at the northeast corner of the wall strengthen the case for ritual use of this structure. While the radiocarbon date of at least one of these offerings post-dates our Early Chiripa occupation at the area, the presence of offerings in conjunction with ASD 18 once again indicates the ritually charged nature of the area.

In approximately the middle of the North-South wall there is a small stone extension that measures roughly 50 x 50 cms (figure 11). The stonework of this "box" matches the rest of ASD 18. Based on this and a close examination of its stratigraphic profile, the extension's construction appears to have been contemporaneous with the rest of the wall. The ASD 18 box may have been a niche, a storage area, or a space for stairs leading down into the open "courtyard." It is well made and unique in such rectangular structures, suggesting a very special carving up of space and use for the larger structure.

Conclusion

Although the analysis and interpretation of the Santiago data is ongoing, this area of the site has already raised some interesting questions about Formative domestic life at Chiripa and its relationship to the ritual world. Most importantly, the proximity of the excavated occupation surfaces to and with the semi-subterranean enclosure indicates that there was not a clear spatial separation between ritual and domestic structures and activity areas at this Formative site. Llama bone concentrations, burials, guinea pig offerings, 'fine' domestic wares, burials with offerings, sodalite

FIGURE 11 Wall of Santiago semi-subterranean structure (ASD 18) with niche.

beads, and ochre-painted 'killed' metates co-exist with evidence of everyday food preparation, lithic tool production, and textile and farming implements.

Ethnographic and ethnohistoric research from the region by anthropologists such as Denise Arnold (1991) has shown that even the 'common' adobe household, from its walls to its rafters and thatch, is imbued with ritual and symbolic significance, creating and reflecting the Aymara cosmological order. Strict divisions between the sacred and the mundane did not necessarily apply in the past either. We encounter evidence of domestic structures in association with 'temple-like' structures at other early Andean sites such as El Paraiso (Quilter et al. 1991). It would be very interesting to examine the evidence of domestic ritual activity (off mound) at other early sites, such as La Galgada and Kotosh. Because households have not received much attention in Andean archaeology until recently, it is difficult to make broad spatial comparisons in our fine-resolution domestic activity questions. The archaeological remains from Santiago blur the division between ritual and domestic, between places of worship and places of daily life at Formative Chiripa.

9

Montículo Excavations

MATTHEW S. BANDY

WORK WAS CONDUCTED in three separate areas on the Chiripa mound in the 1996 field season. These were designated Montículo 1, 2, and 3 (see figure 2). Montículo 1 is located along the southern one-third of the preserved eastern face of the mound. A seventeen-meter section of the mound profile was cleaned and drawn, and limited excavations were carried out in two sections of this profile. Numerous historic disturbances were noted, and remains of six Formative period structures were identified, portions of five of these being excavated. The Harris Matrix of the observed areas of the mound is shown in appendix 3.

Montículo 2 is located on the southern portion of the mound, along the line of the old retaining wall constructed with the pig farm (*chanchería*). In this area, we excavated a trench approximately 1.3 m wide by 16.8 m long along the exterior face of the upper *chanchería* retaining wall. In the trench we found indications of Upper House Level structures, though the evidence remains difficult to interpret.

MONTÍCULO 1

Five major stratigraphic horizons were identified in the cleared profile from the eastern mound (figure 12). These correspond roughly, in the terminology employed by Kidder (1956) to the 1) Sub-Lower House Level, 2) Lower House Level, 3) Upper House Level, 4) Tiwanaku Level and 5) Historic Level. Portions of five Lower House Level structures were excavated. These deposits were located in two separate areas, Montículo 1-A and Montículo 1-B. Three superimposed structures, ASD-13, 14, and 15, were located in Montículo 1-A, and two superimposed structures, ASD-12 and ASD-16, in Montículo 1-B.

MONTÍCULO 1-A

This excavation area is located in the northern portion of the cleared profile area. When this portion of the profile was cleaned, a series of three superimposed structures became visible. Above these structures was a large pit, which contained iron, glass, and porcelain and clearly represents modern disturbance (D-1/D-2). Since this pit

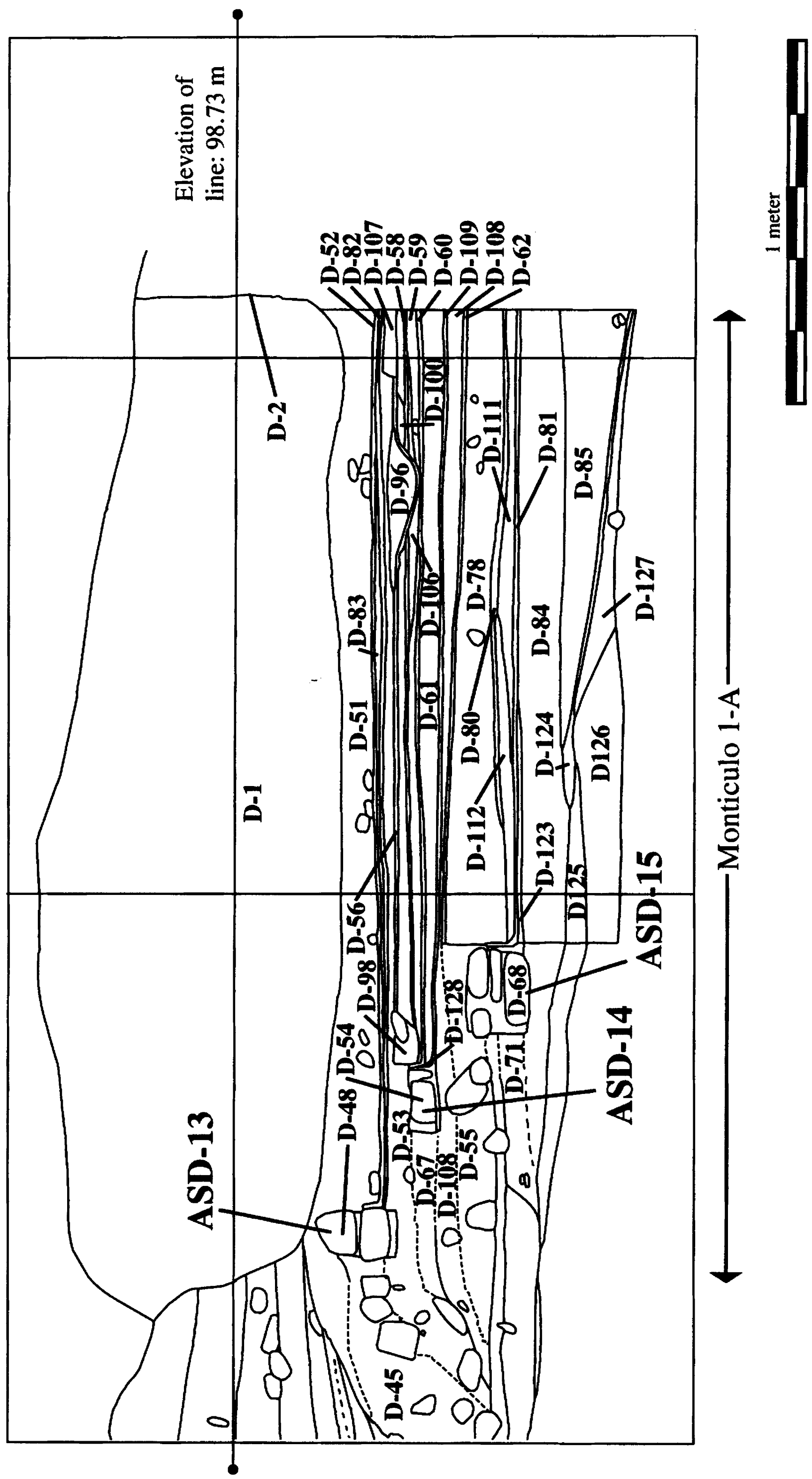


FIGURE 12 Profile of Montículo 1-A excavations. ASD's are structures. D's refer to stratigraphic events.

contained disturbed soil, it was decided that it would be justifiable to remove the fill without screening, in order to arrive at the buried structures. The bottom of the pit was located only 10-12 cm above the uppermost floor of the uppermost structure, and so very little overburden had to be cleared away.

The excavated area is a rough rectangle, approximately 2.6 by 0.6 m. In this area, within a vertical span of 60 cm, the remains of three superimposed structures were encountered. The earliest of these was ASD 15, the most recent ASD 13. The structures all shared a common orientation to the cardinal directions and all were plastered, wall and floor, with a yellow clay plaster, similar to that employed in the Upper House Level structures.

The lowermost structure in the sequence, ASD 15, contained two superimposed yellow clay floors. The interior walls of the structure were also covered with yellow clay plaster. There is evidence that both walls and floor were coated with a thin wash of red clay, on top of the plaster. Interestingly, the floors of this structure are much more coarse than the wall plaster. This is not the case in the later structures, in which the floor and wall plasters are indistinguishable.

After ASD 15 was intentionally dismantled, ASD 14 was built on its rubble. The latter structure contained four superimposed yellow floors, and, again, the walls were plastered with the same material. The walls of this structure were of adobe and seem to have few if any stones.

ASD 13 was constructed on the rubble of the dismantled ASD 14. It contained two yellow plaster floors, and the walls were likewise plastered. The walls of this structure are distinguished by the use of large cobbles set in a mortar of red clay. Finally, ASD 13 was abandoned and dismantled, and a thick layer of intentional fill was placed over the rubble. It was on this fill level that the Upper House Level structures were built.

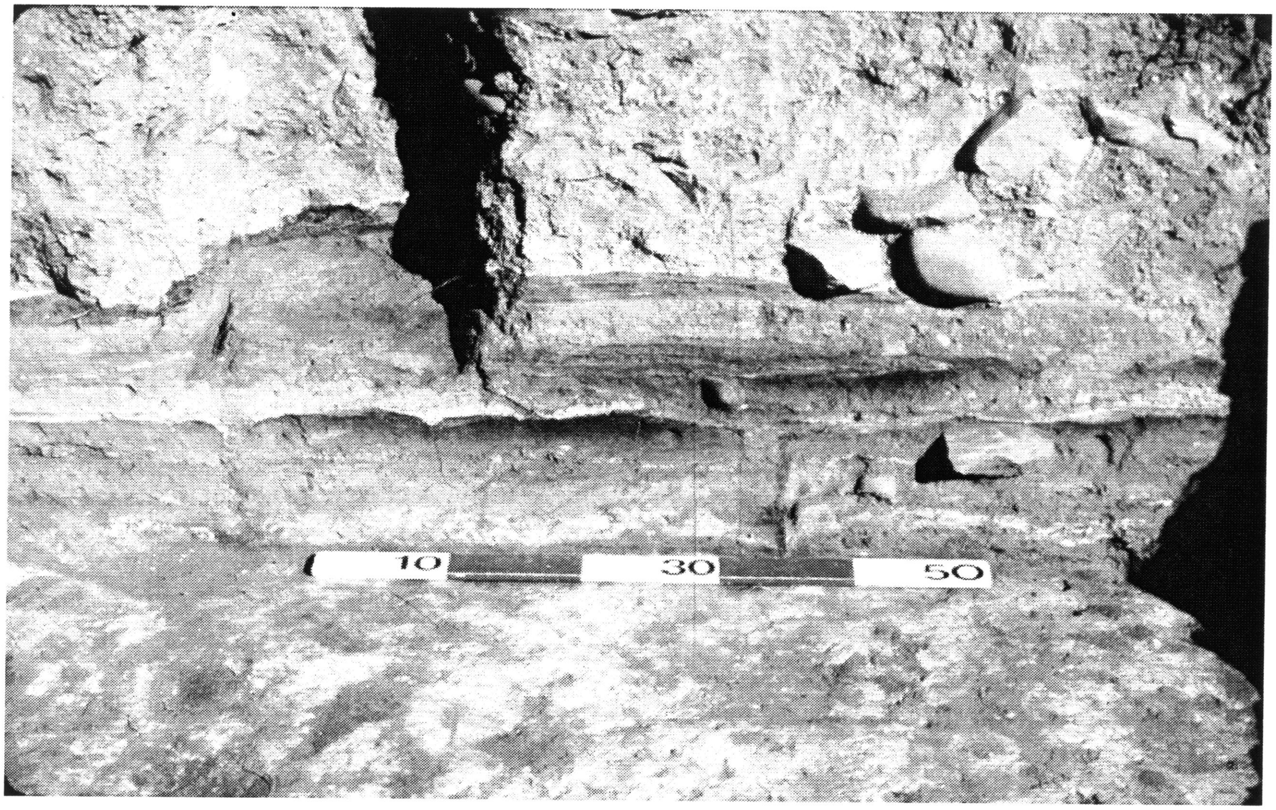
The Montículo 1-A structures, as described, were built one on top of the other, the upper portion of the existing structure being destroyed in order to make way for the walls of the new one. The resulting rubble was used to create a platform for the construction of the new structure. Apparently, the abandonment of one floor and the construction of another were accompanied by a specific ritual practice. First, a thin cap of fill—generally derived from midden or other cultural deposits, in one case sterile sand—was placed over the old floor. On top of this fill level, a fire was kindled (see figure 13a, b). Evidence of fire is present on top of the fill levels covering at least six of the eight floors in the sequence. For the moment, I interpret these burning events as elements of a standardized ritual practice associated with the closing, or "killing," of an old floor, and the construction or opening of another. Immediately following the termination of this "burning ritual," a new floor was constructed of clean yellow clay. The floor was placed immediately on top of the ash deposit resulting from the burning episode. This cycle was repeated at least eight times in the sequence of structures we have exposed, and would seem to indicate a long-term ritual use of the Montículo area long before the building of the Upper House Level structures.

The Lower House Level structures ASD 15 through 13 were built, used, and abandoned sometime between 800 and 400 B.C. This is based on a series of six radiocarbon dates taken from the Lower House Level sequence (figure 5, samples 24, 26, 28, 29, 30, and 31). Unfortunately, with the exception of sample 30, these dates are all essentially contemporary at one standard deviation, as they all fall within a plateau in the radiocarbon calibration curve (see Whitehead, chapter 4). It is not possible to be more specific, then, than to say that the Lower House Level structures were occupied for no more than 400 years, and perhaps for less.

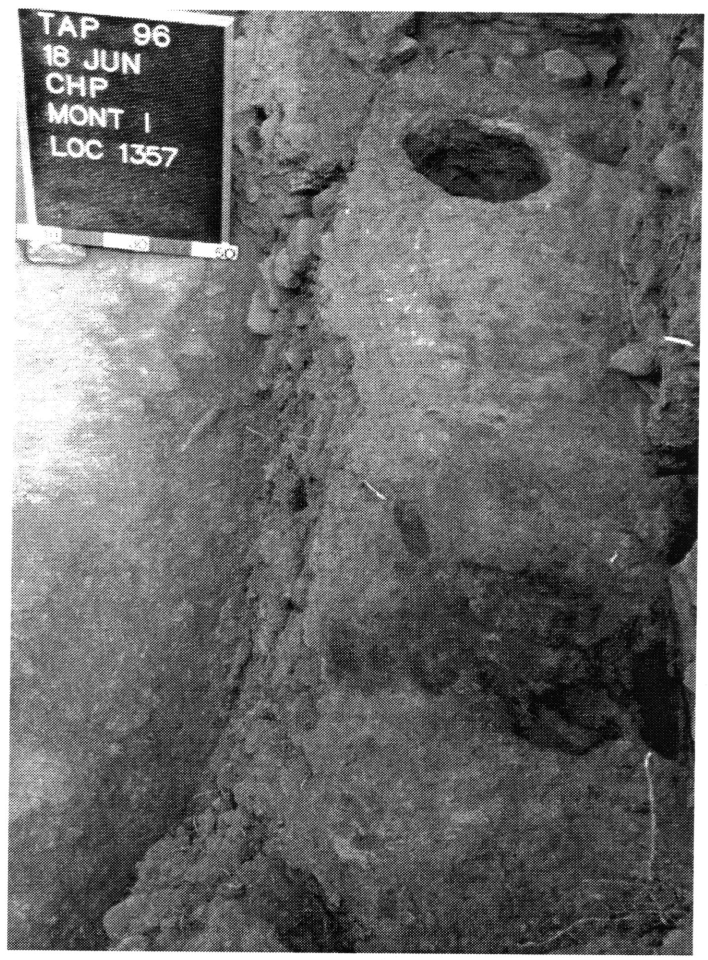
At any rate, the Lower House Level is much more complicated than we had supposed before our excavations. The finding of numerous superimposed structures in the Montículo 1-A excavations would seem to suggest that, unlike the Upper House Level complex, the Lower House Level was not constructed in a single, large-scale event, but rather accumulated gradually through continuous use. This interpretation accords well with the independent micromorphological observations of Melissa Goodman (chapter 10).

Montículo 1-B

This area is located approximately five meters to the south of Montículo 1-A on the same exposed profile. The excavated area begins just to



a



b

FIGURE 13 a) Layer of clean sand fill between floors, b) *in situ* burning on floor.

the north of the exposed wall fragment of House G (ASD 11). Due to recent disturbance in this area (D-93), Lower House Level walls, relating to ASD 12 and ASD 16, were located quite near to the surface. This excavation was carried out by José Luís Paz. The final plan of this excavation area is shown in figure 14.

On the basis of stratigraphic evidence, ASD 12 seems to be contemporary with the occupation of ASD 15 in the Montículo 1-A area. The eastern corner of this structure was excavated. The walls (D-35) were composed of large rounded cobbles set in an organic, dark mud mortar. In this they resemble most the wall of ASD 15 (D-68). The northeastern wall was double-coursed while the southeastern had but a single row of stones. Unlike the Montículo 1-A structures, however, no trace of a prepared floor was encountered in the interior of ASD 12, the interior surface being simply of earth, the almost uncompacted upper surface of D-89. Neither was there any evidence of plastering of the lower portions of the wall, though related wall collapse (D-33/D-44) does contain yellow plastered adobes. Perhaps the upper portion of the walls was plastered.

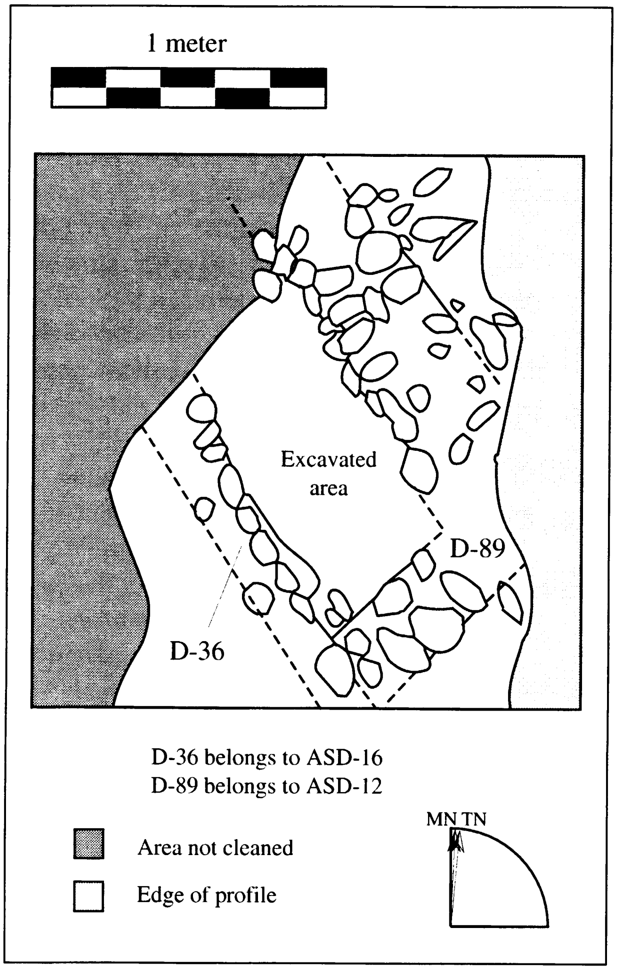


FIGURE 14 Plan of Montículo 1-B area.

While all three of the Montículo 1-A structures were oriented to the cardinal directions, ASD 12 is oriented at a 45 degree angle from North. When we consider the fact that ASD 12 is located directly beneath one of the corner houses of the Upper House Level (House G), we must conclude that the idea advanced by Browman and Kidder—that the Lower House Level was, like the later complex, arranged as a ring of structures about a central sunken court—is strongly supported.

ASD16 was constructed on top of the rubble of ASD 12 and has the same orientation. Its construction seems to be basically similar to that of the earlier structure, but as only one wall was excavated, we cannot be certain of this. What is certain is that it was unplastered. It seems to have been contemporaneous with the occupation of ASD 13 and ASD 14. After its abandonment, ASD 16 was covered by the same fill level which covered ASD 13, and an Upper House Level structure, House G, was built above it.

Montículo 2

A trench approximately 1.2 m wide, 16.8 m long, and 2 m deep was excavated along the line of the old *chanchería* retaining wall (D-9) on the south side of the mound. No intact prehistoric deposits were excavated, the only soil removed being Browman's backdirt (D-129) and deposits relating to the collapse of the *chanchería* wall (D-7). The West profile of this trench is shown in figure 15.

The Montículo 2 excavation was undertaken in order to seek evidence of Upper House Level structures along the southern length of the mound. All prior investigators at the site have speculated that such structures had once existed, but no work had been done to establish their presence or absence.

As we were excavating in disturbed deposits, we thought it unnecessary to screen, and work proceeded rapidly. The trench was excavated until undisturbed deposits were located. Thus, the D-9

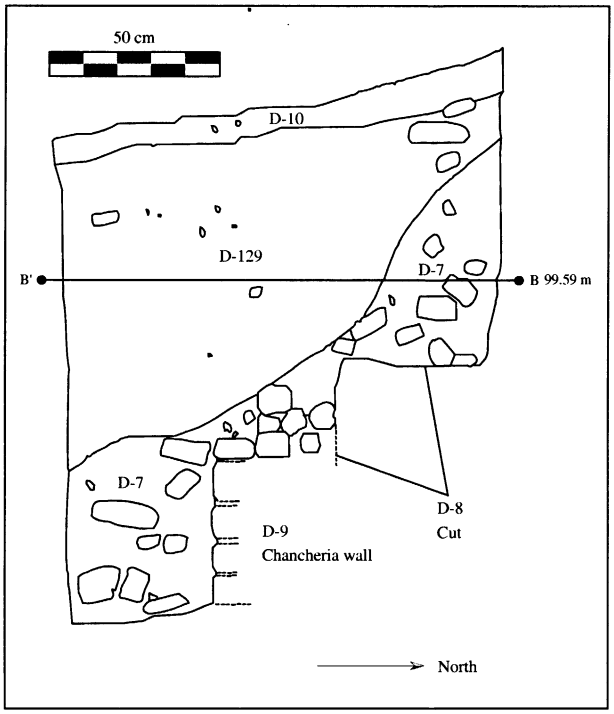


FIGURE 15 Montículo 2 West Profile.

wall was exposed for the entire length of the trench, as was the narrow terrace created by the D-8 cut. The *chanchería* floor was located at an elevation of approximately 98.60 m while the surface of the narrow terrace was at about 99.00 m.

The elevation of the floor of House G (ASD 11), the closest of the observed Upper House Level structures to the Montículo 2 area, is approximately 98.75 m. We may therefore infer that if Upper House Level structures were present in the Montículo 2 area that their floors would lie at an elevation between the floor of the *chanchería* and the narrow terrace created by the D-8 cut. Indeed, red adobe and cobble walls were visible in plain view on the undisturbed narrow terrace. Upon removing portions of the lower segment of the D-9 wall, we also observed yellow plaster floors in profile. These floors were covered by a dense layer of ash and charcoal, in turn overlain by house collapse rubble. On the basis of this admittedly meager evidence, we suggest that Upper House Level structures were indeed present on the south face of the mound, and that their construction was roughly similar to that of the excavated Upper Houses. A burning event seems to have accompanied their collapse, as was the case with Houses 1, 2, and 5.

At present I would suggest that three such structures were present on the south side of the mound, indicating that the Upper House Level complex was composed of fifteen structures and probably opened to the north. This reconstruction is obviously provisional, and the question will be resolved by excavation of the remains of these structures. The Montículo 2 trench was not sufficiently deep to provide information on the Lower House Level deposits on this face of the mound.

Montículo 3

This excavation was located on the west side of the mound, and consisted in clearing the backfill from the portion of House 5 excavated by Kidder and Cordero. This was undertaken in order to assess the state of preservation of its walls and floor and to evaluate its potential for later restoration and conservation. No undisturbed deposits were excavated in the Montículo 3 area, with the exception of 6 flotation samples taken from undisturbed deposits overlying the floor of the structure (1432/1, 1432/2, 1430/1, 1430/2, 1431/1, 1431/3). Analysis of these samples will hopefully clarify the function of the bins and of the structure as a whole. This work was undertaken by José Luís Paz in collaboration with the author.

In general, House 5 is in an excellent state of preservation. Figure 16, a photograph of House 5, illustrates this. In all the areas observed, the burned plaster is still on the walls. The sliding door slot is well preserved, as is the entrance in general, and portions of the distinctive double-stepped jambs are still visible on some of the bin niches. Unfortunately, most of the floor of the structure has been destroyed. A restoration and conservation of the structure would be valuable both for scientific reasons and to enable the residents of Chiripa, tourists, and other visitors to the site to view this unique and important aspect of the region's history.

Conclusion

All of the opened areas were carefully backfilled in order to prevent further damage from natural or cultural factors. Portions of Tyvek bags

FIGURE 16 Montículo 3 House 5.

were placed on the sides and bottoms of excavated areas in order to facilitate subsequent work in these zones. Further, an adobe wall was constructed along the Montículo 1 profile and screened soil placed between it and the archaeological deposits for protection. This will prevent slumping and collapse of the profile, and we hope will also provide a buffer against further root damage.

DATA

10

Soil Micromorphology of Depositional Sequences from the Montículo and Santiago Excavations

MELISSA GOODMAN

INTRODUCTION

THIS CHAPTER DETAILS preliminary results from thin section analysis (soil micromorphology) of soil stratigraphy from excavated areas at Chiripa. Soil samples for microscopic analysis were collected from the Montículo, Santiago, and Llusco areas at Chiripa during the 1996 excavation season. Preliminary results are available from some of the Montículo and the Santiago samples. A series of samples was analyzed from the fine lenses on Montículo (called the ML thin sections) and from the house floor sequence (called MH thin sections) (figure 17). From the Santiago area, a soil column was analyzed from the southern extent of the excavations (called S2 thin sections) and three samples from the central balk (called S3 thin sections) were selected to help characterize the distribution of specific stratigraphic events (figure 18). A mudbrick from Montículo, a large aggregate from Santiago, and natural soil samples were also included in these analyses.

This discussion records observations according to the categories outlined by Bullock et al. (1985). Material in soils appear under the light microscope as particulate (e.g., mineral grains, organics, microartifacts) or as amorphous material. These are referred to as the fine groundmass. The composition of these soil constituents reflects a number of post-depositional processes active in Chiripa soils that will be discussed below. Details of the characteristics of construction materials seen in the thin sections are also summarized followed by a review of observations from the Montículo and Santiago sites. Appendix 4 contains abbreviated descriptions of all thin sections.

METHODOLOGY

Samples were collected in vertical columns as a series of intact blocks of soil, approximately 20 x 10 x 10 cm. These blocks were air dried and sent to Spectrum Petrographics of Winston, Oregon, for processing into five by seven centimeter resin impregnated thin sections. These thin sections were analyzed as hand specimens and under the petrological microscope at magnifications from 5.8 to 100 power at the McBurney Geoarchaeology Laboratory in Cambridge, England, using plane polarized, cross polarized, and reflected light. A fluorescence microscope (UV range) was used to

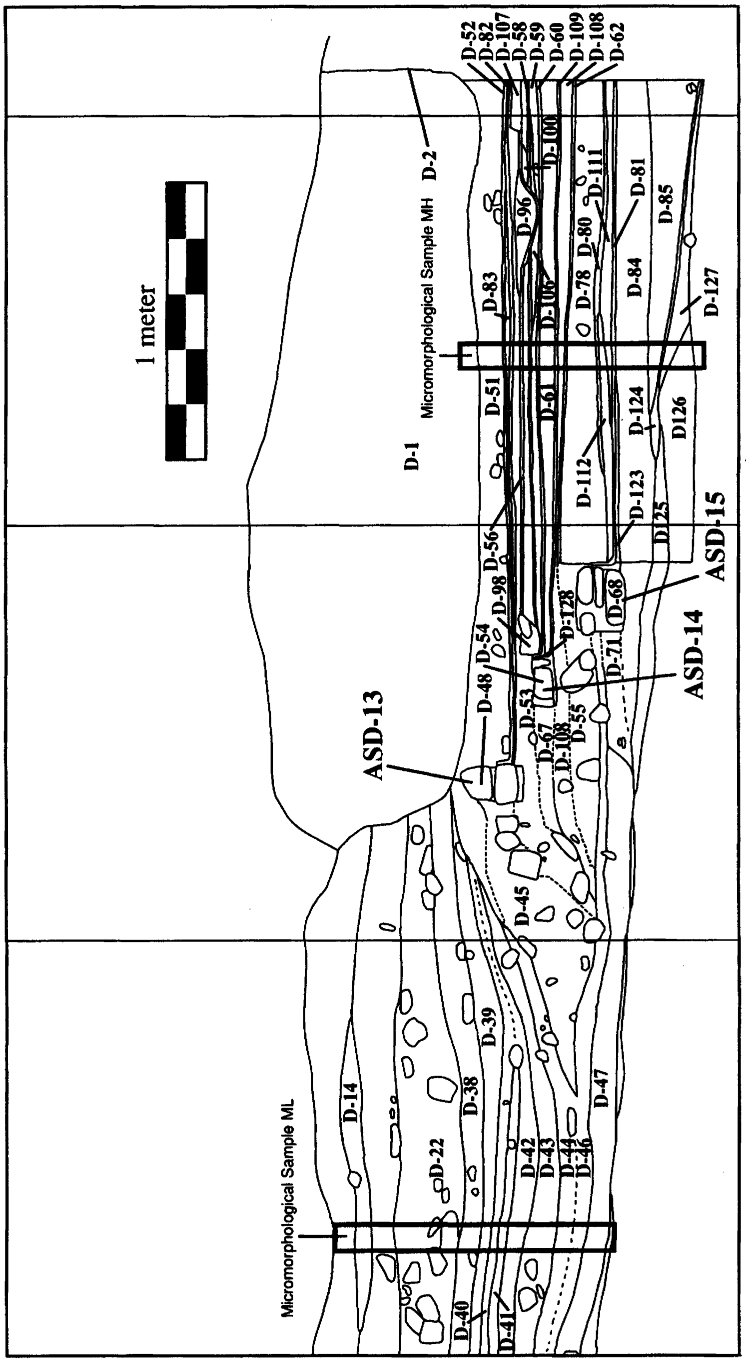


FIGURE 17 Micromorphological Montículo floor sequence thin sections.

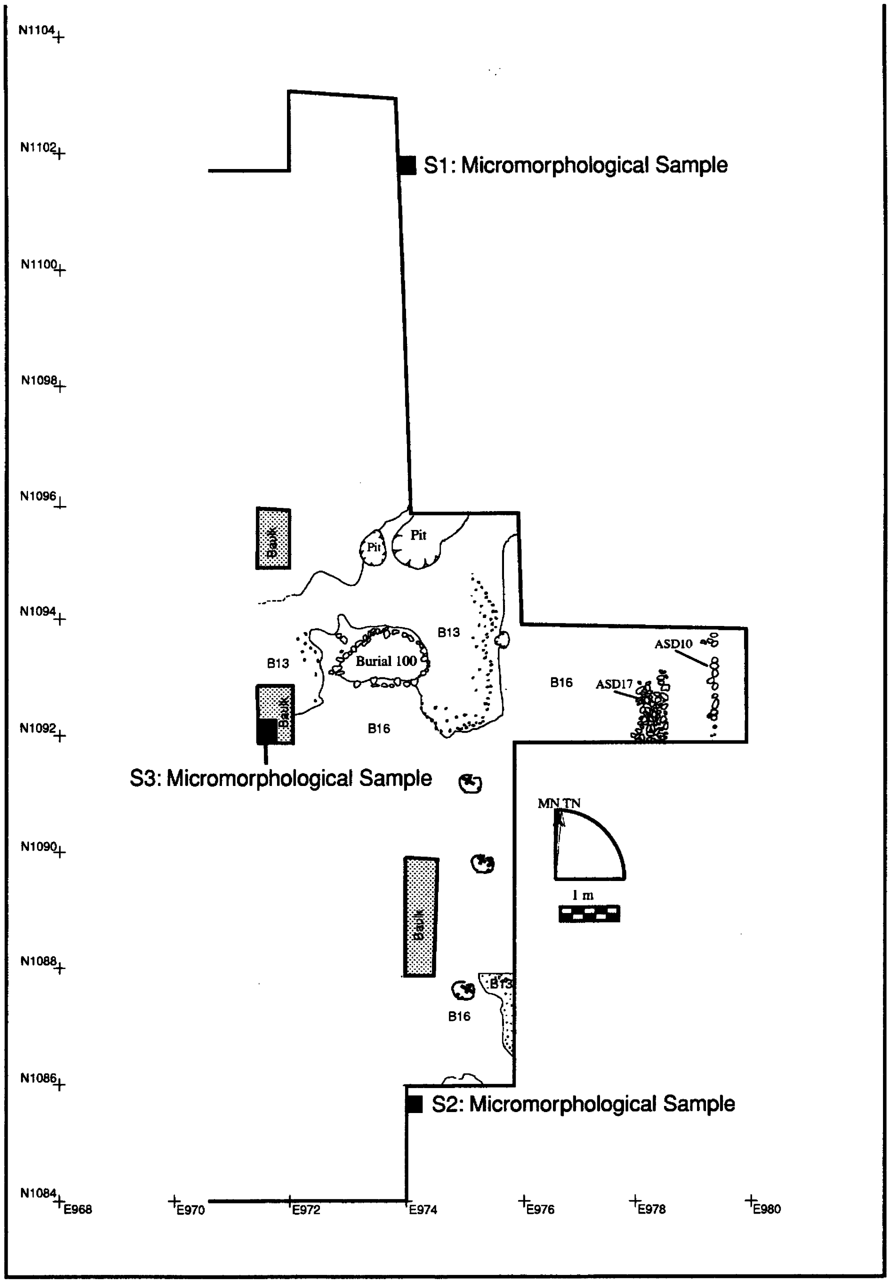


FIGURE 18 S1-S3 thin sections from the Santiago area.

help identify organics, phosphates, and coprolites (Altemuller & Van Vliet-Lanoe 1990). The composition, form, and orientation of soil components are described according to internationally recognized terminology (Bullock et al. 1985; Courty et al. 1989; FitzPatrick 1993).

The present study appears to be the first soil micromorphological project from Andean occupational surfaces, and therefore comparative materials are not available. Dr. Wendy Matthews, however, has analyzed thin sections from occupational surfaces at several sites in the Near East (Gé et al. 1993; Matthews 1992, 1995; Matthews et al. 1997; Matthews & Postgate 1994), and this material was used as a basis for comparison. The lack of local reference material and small sample size of this study contribute to the preliminary nature of this report.

Controls

Natural profiles were exposed at two locations. The first profile was situated in shallow soils approximately 100 m above the Llusco sector of the site. This matrix is composed of a thin soil that developed on gravels. Because the soils were shallow, no thin section samples were analyzed from this context. The second profile was taken from an untilled balk due west of the mound about 200 meters, at approximately the same elevation and distance from the lake as the mound. The balk is adjacent to modern agricultural fields and is covered by uncultivated grasses. Three thin sections (called N thin sections) from this profile were processed and analyzed as controls for natural processes operating in the soil. The analyzed samples are from depths of approximately 40 cm, 60 cm, and 80 cm. The natural samples reflect normal soil profile development with well-defined horizon formation and a decrease in pore size from top to bottom. A moderate level of soil fauna activity and roots are present. No microartifacts were identified in the control samples.

Minerals

The soils and geomorphological processes of the Taraco Peninsula were the focus of a recent study by Argollo et al. (1996). In accordance with their findings, our Montículo and Santiago thin sections show soils to be characterized by a predominance of fine sands and silts derived from carbonate and igneous rocks, most likely from the Taraco Mountain range. A larger rock found in the Montículo mudbrick may have been imported. Full mineralogical analysis has not been performed on thin sections from Chiripa sites.

Organic Remains and Inorganic Minerals of Organic Origin

Fragments of bone were found in all samples from both site areas. The mudbrick sample from Montículo forms the only exception. Fine fish bone, often in a weathered and broken state, is most abundant. One well-preserved spongy mammal bone is visible (in thin section S2B). The Santiago south profile contains the highest concentration of bone and a small amount of eggshell and snail shell fragments. The Montículo lenses have noticeably fewer fish bones.

Although small charcoal fragments are found in most Montículo and Santiago samples, intact seeds are rare. Plant cells are visible in several slides, with the highest abundance being found in the fill over the upper floor in Montículo ASD 13 (thin sections MH3 and MH4). Live and decayed roots are well represented in the upper levels of both areas. Coprolite fragments are present in both profiles at Santiago and at Montículo in the house fill from ASD 13 and the corresponding upper lenses. A whole coprolite was found in the Santiago south balk (thin section S2C). Associated rare spherulites indicate a herbivore source for this context (Canti 1997). Spherulites were not found at Montículo or Santiago south profile and the small coprolite fragments noted there do not suggest a source. Pseudomorphic voids of plant matter, which may be interpreted as grasses used as organic temper (Matthews & Postgate 1994), were identified in ceramics and mudbricks. Dense amorphous organic staining from decayed organic material is characteristic of the fill between the Montículo floor layers and, to a lesser degree, all of the Santiago contexts. Possible organic sources are discussed in the summaries of each site.

Post-depositional Features

A number of features associated with post-depositional disturbances were noted including more visible biological processes and microscopic mineralization of soils (table 2). Root, soil fauna, and other insects are the primary biological agents seen in thin section. Root is ubiquitous in the upper levels, and relic root channels are present but in low concentration in all of the slides. Soil fauna activity is seen in the organic-rich fill beneath the Montículo floors (see table 2) but does not appear to transverse the plaster floors. All Santiago deposits demonstrate a high degree of reworking by soil fauna. Under the microscope, the insect burrows seen in the slides appear infilled with microartifact-free soil translocated from above, suggesting that the burrows post-date Santiago's occupation. The combined effects of these biological processes are to substantially mix the soil, encourage soil movement, and aerate soils.

Three main types of pedogenic processes are at work in the samples from Chiripa. First, there is secondary mineral formation of amorphous calcium carbonate distributed in the soil. Neoformation of calcite crystals on pores is clearly seen in the Santiago event B-13 fabric (the melted adobe "orange-granola"). The second process, clay alluviation, forms coatings on pores in the upper layers at Montículo. Third, sesquioxide (iron and manganese) impregnation is well distributed in all slides, suggesting that these metals are leaching into soil waters. Freeze-thaw and shrink-swell action of clays are also likely to have contributed to the reworking of soils identified in thin section.

Overall, post-depositional processes at Montículo were localized primarily to the subfloor fills and the uppermost deposits that have been more recently disturbed. Both biological and mineralization processes were more pronounced at Santiago than at Montículo, with soil fauna being the primary agent.

TABLE 2 Micromorphological summary of natural post-depositional features.

DISTURBANCE	CHARACTERISTICS IN THIN SECTION	DISTRIBUTION
Root	Oriented channels containing root fragments or if relic, infilled with moderately sorted mudbrick	Upper samples all profiles, especially Santiago; Montículo silt and sand
Soil fauna	Randomly oriented channels with rounded termini, dark lining on channel walls, dark organic-rich infilling, characteristic void patterns	Upper samples all profiles and through most Santiago slides; Santiago mudbrick
Burrowing insects	Round to oval voids up to 5 cm in diameter, infilled by well-sorted, clean deposits	Lower slide Santiago south profile (S2F)
Crystalline pedofeatures	Visible crystals (at high magnification) coating pores, light birefringence pattern in fine groundmass	Especially noted in Santiago balk (S3A)
Textural (clays) and amorphous (sesquioxide) pedofeatures	Coatings on pores and mineral grains and small aggregates in the fine groundmass; dark (sesquioxide) or yellow to red birefringent (clays)	Present in different proportions in all slides

Construction Materials

Mudbrick, plaster, and fill are the primary construction materials identified in thin sections from both sites (table 3). The intact mudbrick (thin section MB) had features comparable to samples from the Near East including pseudomorphic voids of decayed organic matter, b-fabric (fine groundmass exhibiting a bright pattern of minerals under crossed polarized light), and mixed but not homogenous fabric (Matthews 1992; 1995; Matthews et al. 1997). Fragments possessing similar features were found in the fill above ASD 13 at Montículo. Rounded aggregates of high clay and carbonate content were found in the lower deposits of the Santiago south balk. These aggregates appear to represent eroded mudbrick fragments in the process of decomposition. Montículo plasters have a characteristic yellow b-fabric and are readily identified in thin section. Subhorizontal voids have been associated with trampling floors and intentional compaction of fills (Davidson et al. 1992; Gé et al. 1993, Matthews & Postgate 1994). Voids of this type are found in several contexts from Montículo. Unfortunately, although the yellow plaster floors are clearly identifiable, they are too heavily disturbed to make observations on specific use or passive/active zones of flooring (Gé et al. 1993). A more intensive sampling strategy, such as sampling every 50 cm, would have permitted a closer assessment of the use of space. Both Floor 4 of ASD 14 and Floor 2 of ASD 15 appear to have been water-lain in a single layer. No intact floors were sampled at Santiago, but small aggregates of a yellow soil fabric similar to Montículo plasters were identified. This suggests that plastered surfaces did exist but have subsequently been reworked and destroyed.

Three fill types were analyzed at Montículo, including the foundation deposit below ASD 15, sub-floor fills, and the "hacienda fill" above the archaeological sequence. The foundation deposits contain microartifacts in an organic-rich matrix. The soil structure contains angular aggregates suggesting placement by human agency such as dumping and packing. The sub-floor fills are of a relatively even thickness, exceptionally rich in amorphous organics, and contain few microartifacts. This suggests a natural origin such as

Table 3 Summary of construction materials and occupational events.

Construction material	Location	Characteristics
Mudbrick	ASD 13 thin section S2F	Well-sorted with high clay content, pseudomorphic voids, parallel-striated b-fabric and no microartifact inclusions
Plasters	ASD 13 D-52 & D-83 ASD 14 D-109 ASD 15 D-62 Santiago south balk thin sections	Dense yellow birefringent fabric sandwiched between (and reworked by) an organic-rich fabric
Wall fill	ASD 18 B-71	Charcoal, bone, coprolite, laminated aggregate, ceramic; mosaic b-fabric; reworked by soil fauna
Sub-floor fill	ASD 14 D-61 & D-108 ASD 15 D-84	Highly organic-rich, very few anthropogenic inclusions, reworked by soil fauna
Foundation fill	ASD 15 D-85	Disturbed organic-rich fabric with anthropogenic inclusions, especially charcoal and fish bone

cut turf. Phytolith analysis of the thin sections, which has not been attempted at this preliminary stage, may illuminate this possibility. The hacienda fills reflect their recent disturbance and deposition. An additional fill was analyzed from Santiago from the wall behind ASD 18 (B-75). This sample appeared in the field to be a mudbrick, but its lack of characteristic mudbrick features and its high concentration of microartifacts suggest that it is a clod of midden material.

Montículo

The area of Montículo from where the lens series was collected (thin sections ML1-3) was interpreted in the field as an enclosed, unroofed area outside of the structures. The samples analyzed are parallel to structures ASD 13 and ASD 14. The layers are remarkably undisturbed by anthropogenic activity, although soil fauna have disrupted the upper layers. They are very dense, exceptionally well sorted, and contain a low concentration of microartifacts (figure 19). The orientation, small size, and weathered appearance of microartifacts indicates that they were carried in with the lens material. The particle size sorting and fine clay coatings on coarse sand grains suggest deposition by water and may represent fine matrix flowing down into this area. The clean, sandy silt composition of the mudbrick is similar to that of the lenses and erosion of mudbricks may have contributed to their formation. The base of this series is not laminated and the anthropogenic, mixed composition is more representative of occupational fill.

In Near Eastern sites, Matthews (1992) found that similar artifact-sparse contexts studied under the microscope revealed ample evidence of human activity including imported small aggregates and microartifacts. The absence of similar features with such excellent preservation in the Montículo sequence suggests that these areas were scrupulously maintained, selectively used, or not used at all.

The thin section series from the Montículo house sequence is incomplete as several floor samples were damaged in transport. However, the samples analyzed provide a good range of the floors and fills excavated in 1996. The foundation deposit in this sequence (ASD 15, D-85) is composed of well-mixed soils containing small fragments of anthropogenic materials (e.g., bone, charcoal) and appears to be midden. In contrast, the overlying fill (D-84) is exceptionally rich in decomposed organics and contains very few anthropogenic inclusions. This soil composition characterizes the deposits below all the floors examined: ASD 14 (D-61, D-108) and ASD 15 (D-78, D-84). These dark organic deposits probably originate from decayed plant matter used in the preparation of floors such as turf, reeds, or matting. Phytolyth analysis would help clarify their origin.

The three plaster floors examined show greater variation than the sub-floor fills. Floor two of ASD 15 (D-62) was an uneven yellowish plaster with very few anthropogenic inclusions. The floors were disturbed and partially mixed with adjacent soils. Floor four of ASD 14 (D-61) was of a similar composition but was thinner and more ephemeral. Both floors appear in thin section to have been water-lain in a single layer. The uppermost floor examined (ASD 13 D-52) is exceptionally high in organics with abundant charcoal of probable grassy plant origin. Coprolites and spherulites, the products of dung, are scarce, and this may suggest the use of plants rather than dung as fuel. The thin section of this floor revealed that the burning event was situated between two fine layers of plaster (figure 20). The upper layer was too fine to see in the field and under the microscope had clay coatings on the sandy plaster suggesting that it was water lain. Similar deposits from Near Eastern contexts were interpreted as part of floor maintenance (Matthews et al. 1997:298). This may be due to activities such as intentional dampening of fires, wet washing the floors, or a very thin re-plastering of the floor after the burning event.

The deposit above the floor (D-51) was rich in aggregates of construction materials, charcoal, and fragments of bone and clay. The orientation and condition of construction materials suggest that the house was burned and then collapsed. The composition of microartifact inclusions appears to represent midden deposits. The top of the Montículo house series contains a thick, poorly sorted layer with abundant, thick clay coats, some of which are laminated, indicating extensive mechanical disturbance. These features reflect recent soil translocation consistent with fill from hacienda and previous excavation activities.

Although abandonment is difficult to ascertain, it is interesting that no features indicative of periodic abandonment were observed in this house sequence up to the top of ASD 13. In other contexts abandonment of structures is characterized by the formation of generally sterile layers transported by wind and water (Matthews et al. 1997). This negative evidence may be an indication that Montículo deposits built up through continuous use. There is also no conclusive evidence of microdebitage from food preparation or craft activities in the small sample collection analyzed. This suggests that the range of activities practiced in Montículo structures was limited or that cleaning practices were exceptionally rigorous.

Santiago

The deposits at Santiago were all highly disturbed by post-depositional processes and do not display as clear microstratigraphy as the Montículo layers. To summarize briefly, extensive earthworm activity and roots contributed greatly to the disruption of Santiago deposits. Intrusive burials may have encouraged these developments as did exposure. Burrowing creatures and inorganic processes also contributed to the disruption. Disturbance like burials and soil fauna activity increase the organic content of the soils and probably contributed to the high amorphous organic staining seen in thin section. Dung and charcoal indicate other organic sources.

Even with such marked disturbance, microscopic analysis of specific deposits did provide insight into their formation and nature. The most notable feature of the south balk profile is thin section S2E which contains two distinct soil fabrics: one dark, organic rich and the other light and calcite rich. The dark soil continues as a matrix throughout the other samples of the profile and contains a mixture of amorphous organics and microartifacts. In contrast, the light soil is in rounded aggregates without microartifacts but with a concentration of salt crystals and clays. This composition is similar to that of mudbricks and these aggregates might be decomposing mudbricks. Fine, plaster-like aggregates were also observed in the south balk profile.

B-13 (thin section S3A) deposits also contain a high concentration of calcium carbonates and show impregnation/cementation by iron and clays which are likely to have contributed to the dense, broken-up nature of this deposit. The neoformation of carbonate crystals and mineralization of soils imply a strong influence of subsurface water flow. A possible source is the spring to the southeast of the excavations. The unusual composition of B-13 suggests that it was imported to the site as a construction material such as in mudbricks and/or coarse-textured flooring. No undisturbed aggregates were identified in this section that would further clarify the nature of B-13; hence, observations were made from a single sample.

The ample evidence of earthworm activity from two samples of the ashy B-16 deposits (thin sections S3B & S3C) suggests that soil fauna activity is largely responsible for the variable appearance of B-16 across the site. Burning events are high in organics and are thus attractive to soil fauna; the "spongy" texture of this part of B-16 appears to reflect soil fauna activities. These areas are also adjacent to intrusive burials that allowed soil fauna easy access to deeper deposits. A more intensive sampling strategy is required to test this suggestion.

A sample collected from ASD 18 B-75 (thin section SB) was identified in the field as a possible eroded mudbrick due to its aggregate nature. The sample contained abundant microartifacts and a small patch of an ephemeral occupational surface. Features specific to mudbricks, however, were not found. Due to the absence of these features, the aggregate is probably not a mudbrick but more likely midden material deposited in clods.

A sequence of mudbrick decomposition is suggested from the patterns found in the thin sections. Structural collapse is suggested by the presence of fractured mudbricks (e.g., in ASD 13 house fill). The intact mudbrick was in the process of breaking up from the roots present. At Santiago, coarse fragments that appear to derive from mudbricks have rounded edges suggesting weathering and translocation. Aggregates were disturbed by intrusive minerals including calcium carbonate and sesquioxides. Soil fauna action translocated the fine mudbrick fragments to the

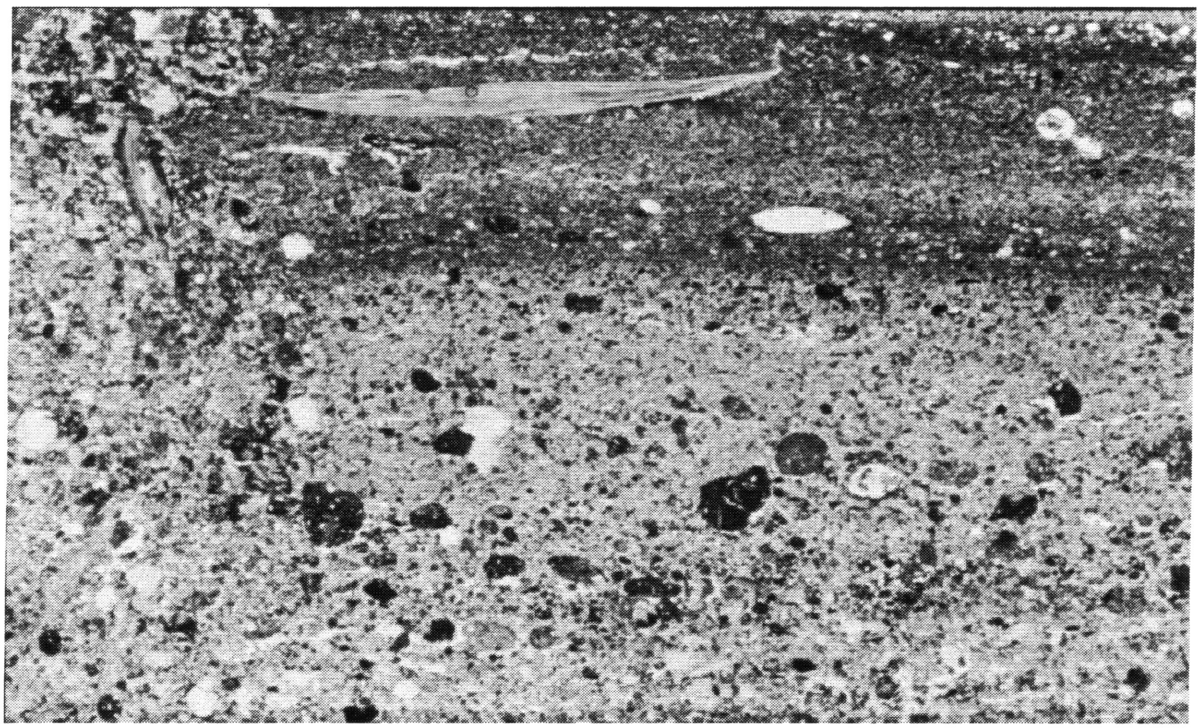


FIGURE 19 Thin section of outside lenses on Montículo in plane polarized light. Note the fine bone at top. The field is 2.9 cm. long.

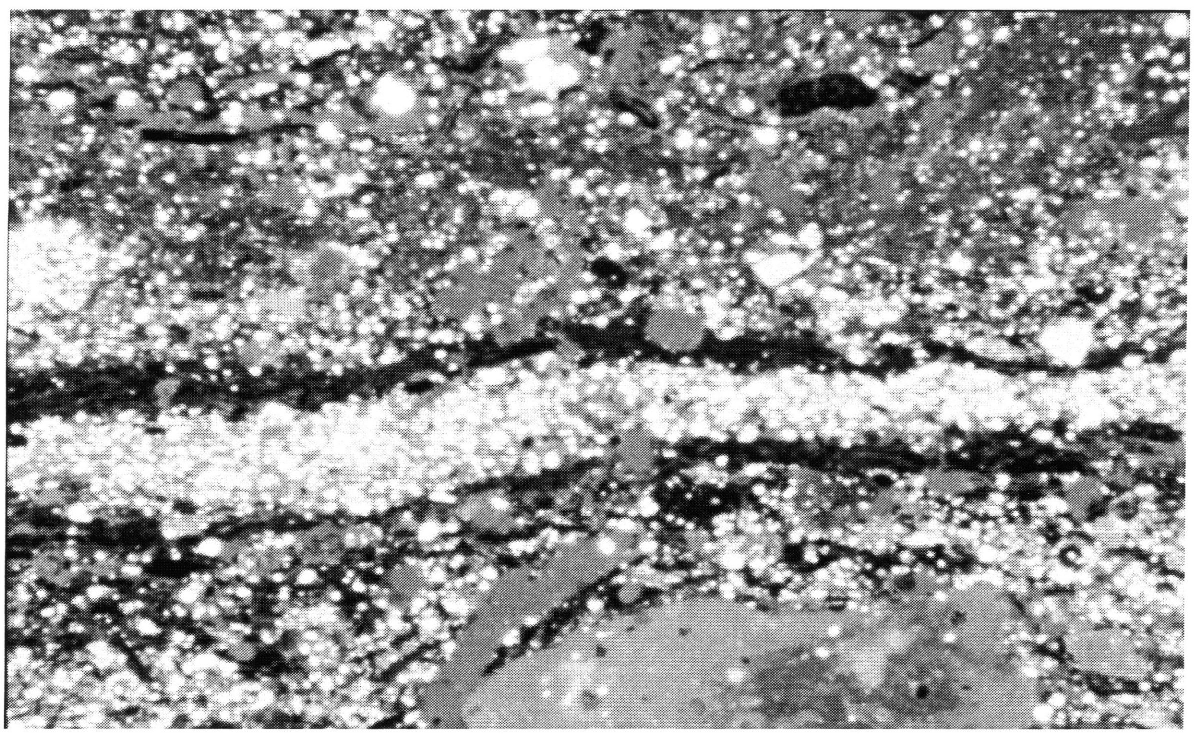


FIGURE 20 Thin section Montículo ASD13 D-52 (MH4) in crossed polarized light. The round microartifact at bottom is burnt ceramic. The field is 2.6 cm. long.

point that buildings were no longer discernible. Santiago residents may also have aided the destruction of standing structures. Matthews & Postgate (1994:201) found that the upper portions of mudbricks exploded by the post-depositional recrystallization of salts. Such processes may have been active in the comparably semi-arid Chiripa region.

Conclusion

Preliminary analysis of soil thin sections from Chiripa provided insights into the formation and preservation of both well-preserved and reworked deposits. At Montículo, soil micromorphology was able to confirm ideas about the fine lens formation in the area between structures. Observations on the house sequence support other lines of archaeological evidence that indicate uninterrupted use with maintenance of similar construction methods and a limited range of domestic practices. The initial results indicate that more intensive sampling of the mound by taking additional columns from structures and sampling selected features such as additional mudbricks will be quite productive. Sadly, Santiago does not offer this level of resolution. However, soil micromorphology has furthered the understanding of how the Santiago deposits became reworked with obvious implications for the analysis of other data sets. Thin sections of specific deposits at Santiago such as B-13 and B-16 were the most fruitful. In addition, reference samples from modern mudbrick structures should be collected and analyzed to provide comparative materials from local contexts. Overall, the initial results from Chiripa are very promising and provide a good basis for future soil micromorphological investigations in the region.

11

The Ceramics

LEE STEADMAN

CERAMIC ANALYSIS AND PHASE DEFINITION

ANALYSIS OF THE MAJORITY of ceramic artifacts recovered from the Taraco Archaeological Project excavations is completed, and samples are now large enough to define three Chiripa phases at the site with some confidence. Currently, 5587 ceramic specimens (excluding sherds less than 1 cm^2) have been analyzed from unmixed Chiripa levels, 3530 from Chiripa levels with some intrusive material, and 25,216 from the mixed, Tiwanaku fill, and plow zone levels. Further analysis and excavation will serve to refine the ceramic definitions and change some percentages, but should not result in any major revisions of the ceramic assemblages as presented here.

The goal in undertaking this phase of the Chiripa ceramic analysis is to create a comprehensive and detailed description of the ceramic assemblage from each phase in the Chiripa sequence through an attribute analysis of the ceramic material. This analytical method has been used productively for the definition of ceramic sequences elsewhere in the Titicaca Basin (Steadman 1995; Chávez 1992; Chávez 1980/81), and involves the observation and recording of individual ceramic attributes (paste, color, finish, shape, etc.) rather than the definition of a fixed set of attributes, such as is used in a typological classification (Rowe 1959; Shepard 1956:307-318; see Steadman 1995:48-50 for further discussion of differences in ceramic analysis). Individual attribute analysis is a more sensitive and effective means of studying changes through time than a typological approach (Plog 1983:131-32; Plog and Hantman 1990:441-42) that necessarily stresses the similarities among ceramics rather than their differences. This type of analysis also permits the independent study of individual ceramic attributes, some of which may change through time more rapidly than others, or be affected by different social, economic, or political factors. The ceramics from the mixed and plow zone levels of the Chiripa excavations were not subjected to a detailed attribute analysis, as this material could not be securely used for the definition of the individual ceramic phases. This material was therefore generally classified by ware and phase only. Detailed attribute analyses were also conducted on some of the Tiwanaku material; discussion of the Tiwanaku phases at Chiripa, however, will not be included here.

Three ceramic phases were defined for the Chiripa occupation at the site, which we have called Early Chiripa, Middle Chiripa, and Late Chiripa (see chapter 4). These phases were based on the stratigraphic information provided from the excavations and the observable differences between the ceramic samples from the different stratigraphic levels of the site. Radiocarbon dates were obtained later, placing absolute dates on the ceramic sequence. The terms Early, Middle, and Late Chiripa have been used before, by Karen Chávez (1988), who suggested them as a renaming of Alfred Kidder's three-part sequence of sub-Lower House Level, Lower House Level, and Upper House Level (Kidder 1956). The Early, Middle, and Late Chiripa phases defined by the Taraco Archaeological Project are not intended to be equivalent to the Early, Middle, and Late phases of Chávez, nor to the Chiripa Condori, Llusco, and Mamani sequence of David Browman (1978, 1980, 1981), but rather constitute a new definition of these phases based on our enlarged ceramic sample.

Early Chiripa

Early Chiripa ceramics are found in the fill levels cut by the construction of the Late Chiripa semi-subterranean courtyard in the Llusco area, and under, associated with, and in the fill levels of the Early Chiripa occupation surface in the Santiago area of the site.

One hundred percent of the Early Chiripa ceramic assemblage is fiber-tempered, as are the entire Middle Chiripa and Late Chiripa samples. The Early Chiripa assemblage is characterized by the popularity of two specific pastes, which together make up 56% of the sample analyzed so far. Both of these have a large quantity of mica temper and mica visible on the surface of the vessel. While 59% of the assemblage has some sort of burnishing on the exterior, fewer of these have a fine, high luster burnish than in the Middle and Late Chiripa phases; simple smoothed, rubbed, or wiped finishes are also more common in this phase than subsequently. The majority (68%) of the sample is unslipped, mostly a black, gray, or dark brown color. Of the slipped ceramics, red, red brown, and brown slip colors are about equal in popularity. Red slips in the Early Chiripa phase tend to be brighter, in the 7.5R range, than the browner 10R reds of the Middle and Late Chiripa phases. Figure 21 provides a key to the slip colors of the illustrated ceramics.

The most common vessel shapes in the Early Chiripa assemblage are short-necked ollas and neckless ollas, each representing about 29% of the shape sample. The short-necked ollas (fig. 22a-b) have straight or slightly flared necks of 2 cm or less in height, with plain rounded or sometimes everted rims. Medium-necked ollas (with necks of 2 to 4 cm, fig. 22c-d, fig. 23a) also occur but are not as common as the short-necked forms. These generally have slightly flared rather than straight neck angles, and plain rims only. Most ollas in this phase are believed to have globular bodies and rounded bases, such as the complete vessel shown in fig. 23a. Early Chiripa neckless ollas (fig. 22e-h) have a slightly inclined, oval, rather than spherical body, with a variety of interior and exterior thickened rim shapes, as well as simple rounded rims. Both ollas and neckless ollas are found with horizontal or semi-circular lugs and rounded nubbins. The two complete Early Chiripa ollas recovered from the excavations (fig. 23a) have three of these lugs, arranged equidistantly around the circumference of the vessel above the shoulder. Rectangular, flat lugs are also found in the Early Chiripa sample (fig. 22i), and are unique to this phase. Early Chiripa bowls (fig. 22j-l, fig. 23b-c) represent about 19% of the shape sample, and most commonly have straight, vertical sides, although convex and slightly flared bowl forms are also present. Rim shapes for the bowls tends to be quite varied, with beveled (fig. 22k) and everted rims (fig. 23b), and rims with a wide band of exterior thickening (fig. 22-l). Flat bases for the bowls appear to be rare; most have round bases including vessels with a fairly sharp angle, or carination, between wall and base (fig. 23c). No decorated specimens were found in our Early Chiripa sample.

Kidder's sample from his earliest sub-Lower House levels, consisting of only 39 sherds (Mohr

1966:12,113), is unfortunately not large enough to compare to the ceramics described here. In addition, these ceramics may actually pertain to the Lower House levels above (Mohr 1966:8). The Early Chiripa ceramic assemblage as defined here, however, appears to be comparable in several attributes to the Condori assemblage, the earliest ceramic phase defined by Browman. Attributes in Browman's descriptions which have parallels in our Early Chiripa assemblage include the use of mica temper and the diagnostic neckless olla form of the Condori ceramics (Browman 1980:110; 1991), as well as the distinctive interior and exterior thickened rims of the neckless ollas and the short-necked olla shapes (Browman 1991). Although the exact figures may vary, an increase in red brown oxidized wares through time was also noted in our ceramic sample (Browman 1980:110). Browman's Condori ceramics, however, are not fiber-tempered in the first two levels, and only partially so in the third level (ibid:110), contrasting with the entirely fiber-tempered Chiripa ceramics described here. Given the early radiocarbon dates for the Early Chiripa phase, and the fact that Early Chiripa ceramics were found overlying sterile, it is unlikely that further excavations will uncover an earlier phase where fiber temper may not have been in use. It is possible, however, that the ceramics from the mound, where Browman excavated, differ from those of the surrounding occupation area, where our Early Chiripa sample was recovered. This may account for the fact that a limited number of decorated ceramics were present in Browman's earliest phase, while none were found in our excavations; Early Chiripa phase decorated wares may have only been used and/or disposed of in the mound area, with surrounding occupation zones lacking fancy ceramics. Decorated wares are found at other contemporary sites in the Titicaca Basin (Steadman 1995; Chávez 1980/81), and so could be expected to occur at Chiripa as well.

Middle Chiripa

Middle Chiripa ceramics are found in the fill levels cut by the construction of the Late Chiripa semi-subterranean courtyard in the Llusco area, and in the fill levels, in a number of pits within this fill, and associated with the ASD 10 wall (B94) in the Santiago sector.

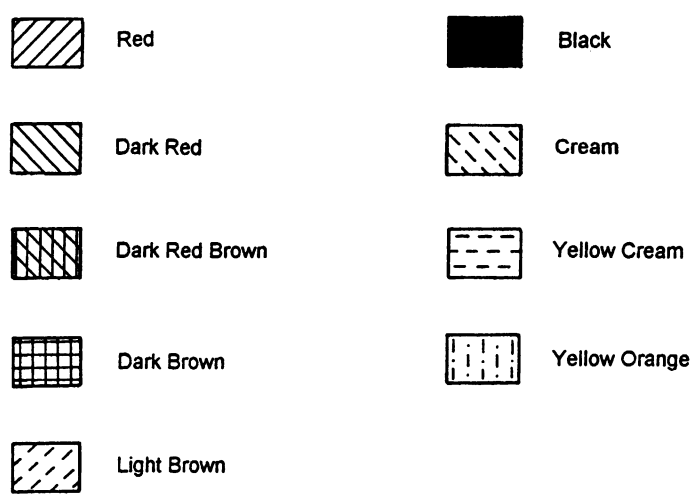
The Middle Chiripa phase is characterized by wares tempered with translucent, rounded inclusions. The two versions of this paste, one with medium and one with fine-sized inclusions, form 58% of the sample (inclusion size is given with reference to the Wentworth scale). The micaceous ware of the Early Chiripa phase now represents only about 13% of the sample, maintaining this level through the Late Chiripa phase. The percentage of burnished ceramics remains unchanged, but more of these are burnished on both sides of the vessel, and the simple smoothed and wiped finishes are now less common. The use of a stucco finish, an extra layer of daubed clay applied onto the exterior bottom of cooking vessels, probably to improve their thermal shock resistance, becomes more common in the Middle Chiripa phase. Three-quarters of the Middle Chiripa ceramics are unslipped, an increase from the Early Chiripa phase. A larger proportion of these have an oxidized red brown color than previously, and fewer are black or gray, although unslipped brown ceramics are still the single most common group. The different slip colors are again found in approximately equal percentages. A new ware occurs in the Middle Chiripa phase, one that has not been previously reported in the literature. These ceramics, which form about 8% of the sample, are manufactured in a dense, fine-textured paste, and tend to have thin walls, oxidized cores and surfaces, and a distinctive burnished finish with fine striations within the burnishing strokes. The great majority of vessels manufactured in this ware are ollas.

The most common vessel shape in the Middle Chiripa assemblage is a medium-necked olla with a plain rounded or slightly rounded rim, this shape forming about 48% of the sample (fig. 24b-e). The straight necks popular in the Early Chiripa phase are replaced by a predominance of slightly flared necked forms, and a new flared necked shape is added. Short-necked ollas, while still present, are less common (fig. 24f). A new necked shape appears in this phase, the short-necked jar (with a neck of 4 to 6 cm in height, fig. 24a), although it is rare. Horizontal oval-shaped lugs and circular nubbins continue to be common on Middle Chiripa ollas, and vertical strap handles appear for the first time. Bases for the ollas are again predominately rounded, although flat bases also occur. Neckless ollas are present but very rare in the Middle Chiripa assemblage. Approximately 15% of the Middle Chiripa shapes are bowls (fig. 24g-h), generally with slightly flared straight walls, although convex (fig. 24i) and carinated forms still occur. As with other shapes in the Middle Chiripa phase, bowl rims are less elaborated than their Early Chiripa counterparts, and are generally without thickening. Base shapes for the bowls include both round and flat forms. Finally, the first decorated ceramic specimen is found in the Middle Chiripa assemblage. Decorated wares are extremely rare in the sample recovered so far and consist, to date, of only one body sherd (fig. 24j), painted with a rectilinear design in red slip on an unslipped dark brown background.

The Middle Chiripa assemblage as defined here represents a new ceramic assemblage and phase, not comparable to any previously reported. As stated above, the term Middle Chiripa is not meant to be a synonymous with the Lower House levels of Kidder, Chávez's Middle Chiripa, or Browman's Chiripa Llusco phase. In fact, most of the ceramics from these phases would appear to belong to the Late Chiripa phase as we define it (see discussion of Late Chiripa below), and are not comparable to our Middle Chiripa sample. Particularly, we may note that the Chiripa Llusco assemblage contains cream on red, and black and cream on red decorated ceramics, as well as incised wares and ring bases (Browman 1980:111; 1981:413), all of which pertain only to the Late Chiripa phase in our definition. Moreover, half of Kidder's sample from the Lower House levels is manufactured in a paste common only in our Late Chiripa phase (Mohr 1966:110). It is possible that this Middle Chiripa assemblage is not represented in the mound construction sequence or, conversely, it may not have been recognized as a separate assemblage in the small samples recovered by previous investigations.

Late Chiripa

Late Chiripa ceramics are found in the Llusco sector of the site in the fill above the floor



Munsell colors corresponding to slip color key. Red: 10R 3.5/4-6, 4/6. Dark red: 10R 3/4, 3.5/3. Dark red brown: 2.5YR 3/3. Dark brown: 5YR 2.75/2, 3/1.5-2.5; 7.5YR 2/2. Light brown: 7.5YR 5.5/4. Black: 2.5YR 2.5/0; 5YR 2.5/1. Cream: 7.5YR 7-7.5/4; 10YR 6.5/3-4, 7/3. Yellow cream: 7.5YR 6.5/6. Yellow orange: 5YR 6-7/6.

FIGURE 21 Key to slip colors for the ceramic figures.

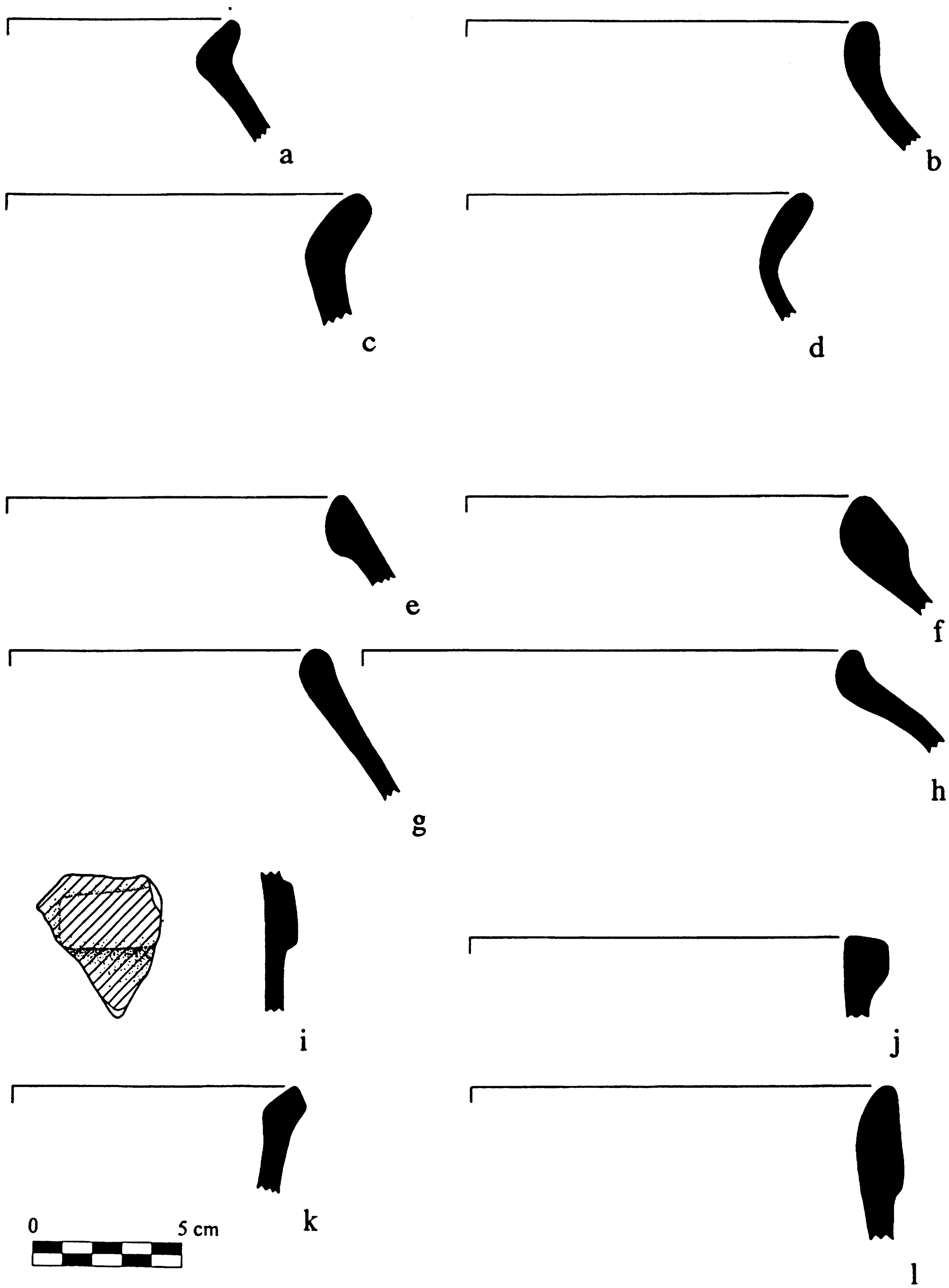


FIGURE 22 Early Chiripa ceramics: (a-b) short-necked ollas, (c-d) medium-necked ollas, (e-h) neckless ollas, (i) lug, and (j-l) bowls.

of the semi-subterranean structure, as well as on and below the floor itself; in the Santiago area in fill levels to the west of the ASD 18 wall; and in all levels of our 1996 Montículo excavations.

Late Chiripa ceramics are most commonly manufactured in a paste tempered with very coarse, chunky white quartz inclusions, easily visible to the naked eye on the broken edge of a sherd, and sometimes on the surface of the vessel as well. Ceramics manufactured in this paste make up 48% of the Late Chiripa sample. The popularity of burnished finishes continues to increase in this phase; 76% of the ceramics have some sort of burnish, and a full one-third have a complete coverage burnish on both sides of the vessel. The percentage of slipped specimens is also at its highest in the Late Chiripa phase; 37% of the sample is slipped, higher in some contexts, with red the most common slip color.

Medium-necked ollas are again the most common vessel shape in the Late Chiripa assemblage (fig. 25a-d), representing 41% of the vessels in the sample. A greater percentage of ollas now have slightly flared necks than in the previous phase, although straight-necked and flared-necked vessels also occur. Only 12% of the Late Chiripa shape assemblage are composed of short-necked ollas. In keeping with the increasing popularity of taller necked forms, the jars now represent 12% of the sample (fig. 25e-f), and both short and tall-necked jars (with necks over 6 cm in height) now occur. The majority of ollas continue to have plain rounded or slightly rounded rims, although a new red-slipped olla with an exterior thickened rim also appears in this phase. Although lugs and nubbins still occur, they are less common than in the Early and Middle Chiripa phases, while vertically oriented strap handles (fig. 25c) become more popular. Bowls are considerably more common in the Late Chiripa assemblage than in the previous two phases, and now form approximately 36% of the sample (fig. 25g-j, fig. 26a, b, e, fig. 27e, g). Of these, about two-thirds are slightly flared forms and one-third have vertical walls, although percentages vary by provenience, with vertical-walled specimens being more common in the Montículo levels. Both bowl forms have flat bases and a variety of new exterior thickened rim shapes. Convex (fig. 27g) and carinated bowls are still present, but rare. Several other new shapes also appear in the Late Chiripa phase, including bottles, ceramic trumpets (fig. 27d), low ring bases (with a ring height of 3-6 mm, fig. 25k), and bases thickened at the joint between base and vessel wall.

Decorated ceramics are common for the first time in the Late Chiripa phase. The percentage of decorated specimens ranges from a high of 6.5% in the Montículo deposits to a low of 0.3% in some of the fill loci, with a figure of 2.1% in the sample as a whole. The most common decorated wares are specimens painted in cream over a red-slipped background (fig. 25g, fig. 26a-d), often referred to as Chiripa cream on red. These make up 74% of the total Late Chiripa decorated sample (variations include cream on dark red, yellow cream on red, and yellow orange on red). The second most common decorated ceramics are those with black or dark brown and cream designs on a red-slipped background (fig. 26e, fig. 27a-c), representing about 9% of the sample (again with minor variations in slip color). Both cream on red and black/dark brown and cream on red painting can be combined with modeled elements such as ridges, nubbins, or zoomorphic motifs; figure 27a appears to represent a modeled anthropomorphic nose. The only other relatively common decorative technique in the Late Chiripa phase, with 6% of the sample, is incision on a single color background, either slipped or unslipped. These pieces include red-slipped bowls with wide (fig. 27f) or regular width incision, and incised trumpets, including one large blackware example with a zoomorphic modeled head and post-fire red and white paint in the incisions (fig. 27d). Other, less common, decorative color schemes include black on red, black on red with incision outlining the color areas (fig. 27h), dark brown on cream, dark brown on unslipped red brown with a red-slipped interior (fig. 27e), and red on cream/light brown painting (fig. 27g). Decoration usually occurs on bowls; the vertical-sided bowl with an exterior thickened rim has the greatest percentage of decorated examples, but slightly flared bowls, both with and without thickened rims, are also often decorated, as is the occasional olla.

The Late Chiripa assemblage defined here is comparable to the Upper House Level ceramics described by Mohr (1966), Bennett's Chiripa assemblage (1936), and Browman's Chiripa Mamani

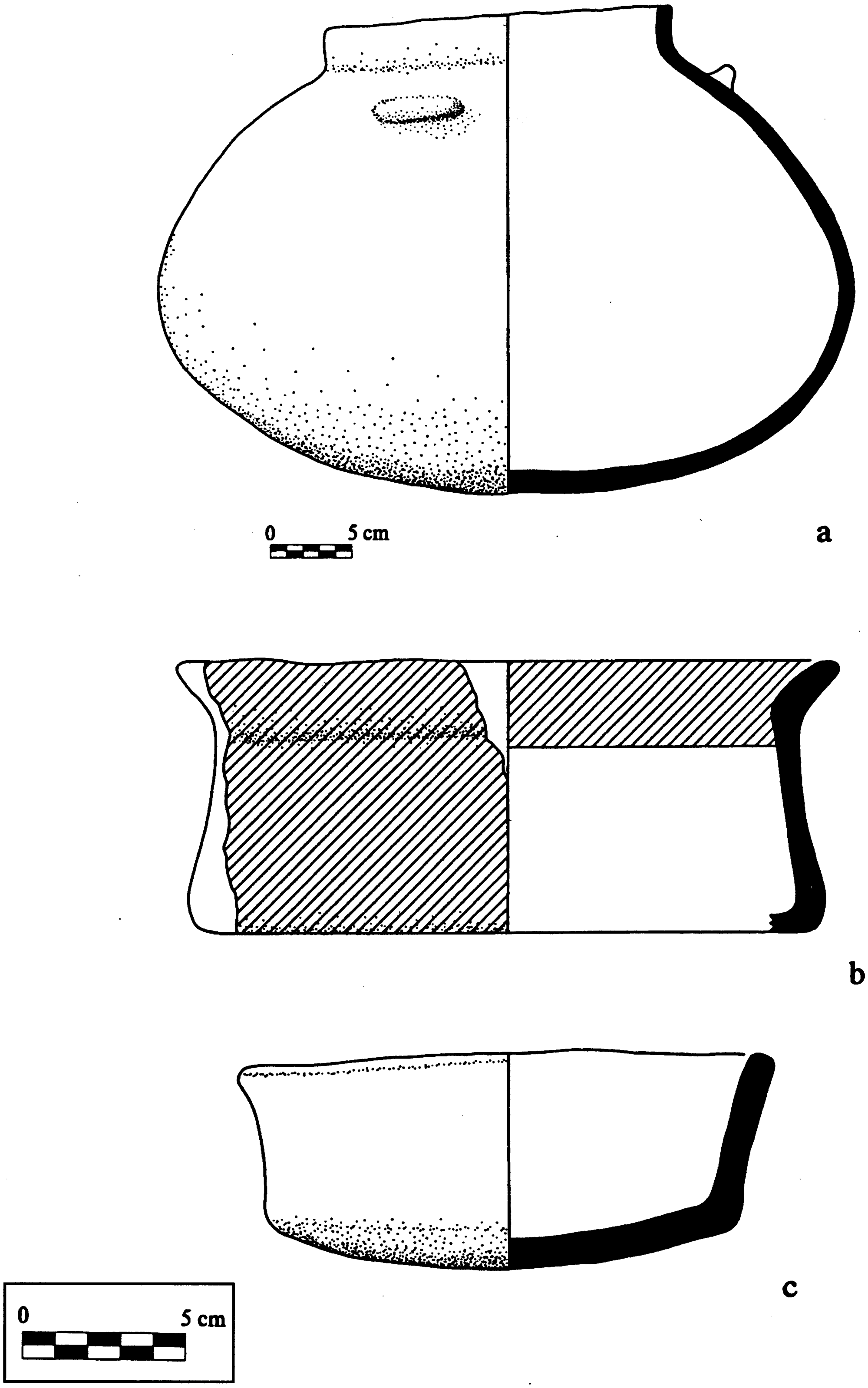


FIGURE 23 Early Chiripa ceramics: (a) medium-necked olla, and (b-c) bowls. Note fig. 23a is at a different scale.

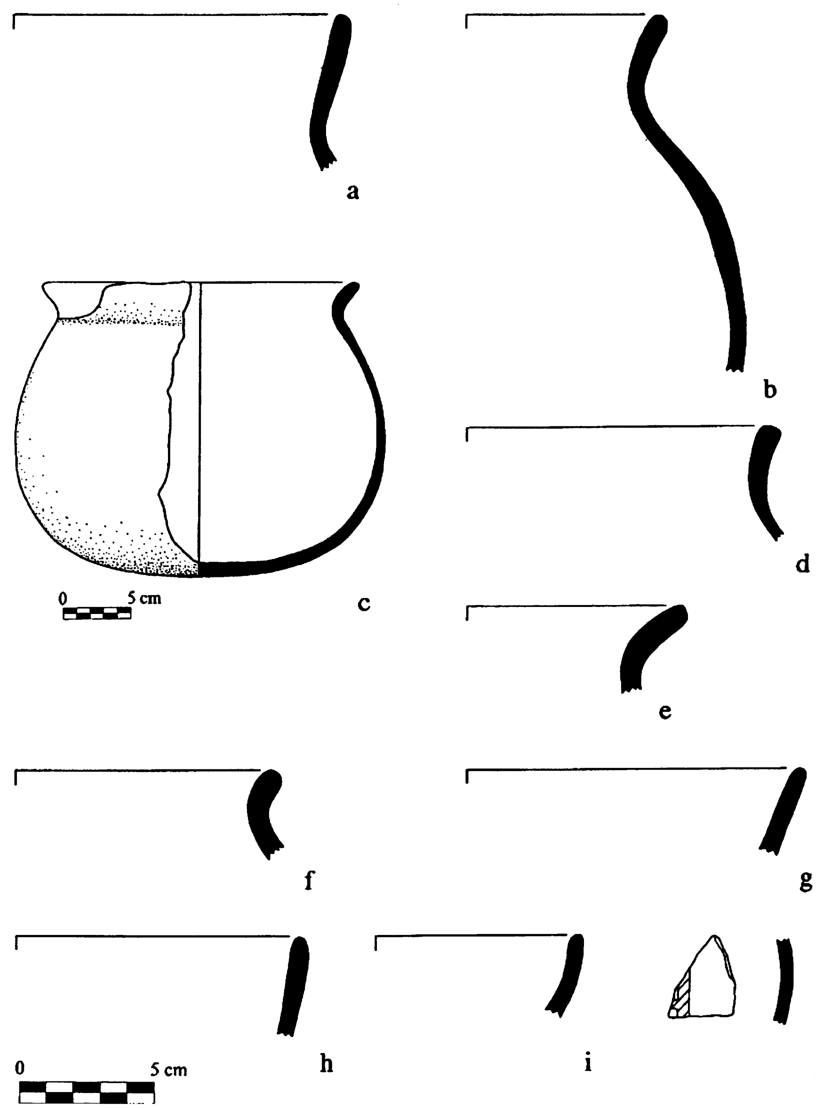


FIGURE 24 Middle Chiripa ceramics: (a) jar, (b-e) medium-necked ollas (note 24c at a different scale), (f) short-necked olla, (g-h) bowls, (i) convex bowl, and (j) red on unslipped dark brown body sherd.

(1980, 1991). Some of the most characteristic shared attributes are the slightly flared or vertical-sided bowl with a thickened rim and flat base (Bennett 1936:439, fig. 27m, o, fig. 28i; Mohr 1966:112, figs. 5, 8a; Willey 1971:fig. 3-54), the thickened rim jar (Mohr 1966:112, fig. 1), and the trumpet (Bennett 1936:fig. 28g, h; Mohr 1966:figs. 43-46). Parallels extend to paste and finish as well, and include similar percentages of red-slipped burnished ceramics (Bennett 1948:90) and specimens with chunky white quartz inclusions (Mohr 1966:110). A predominance of cream on red painted wares among the decorated ceramics has also been reported in all of the later Chiripa assemblages; 68% of the Upper House decorated specimens (Mohr 1966:133) and 81% of the Mamani sample (Browman 1980:111) compared to 74% of the assemblage reported here. The secondary decorative wares noted in our sample, such as black and cream on red, red-slipped incised, incised with post-fire paint, and red on cream, have also been reported from previous assemblages (Mohr 1966: 132-33; Browman 1980:111; Bennett 1936:441).

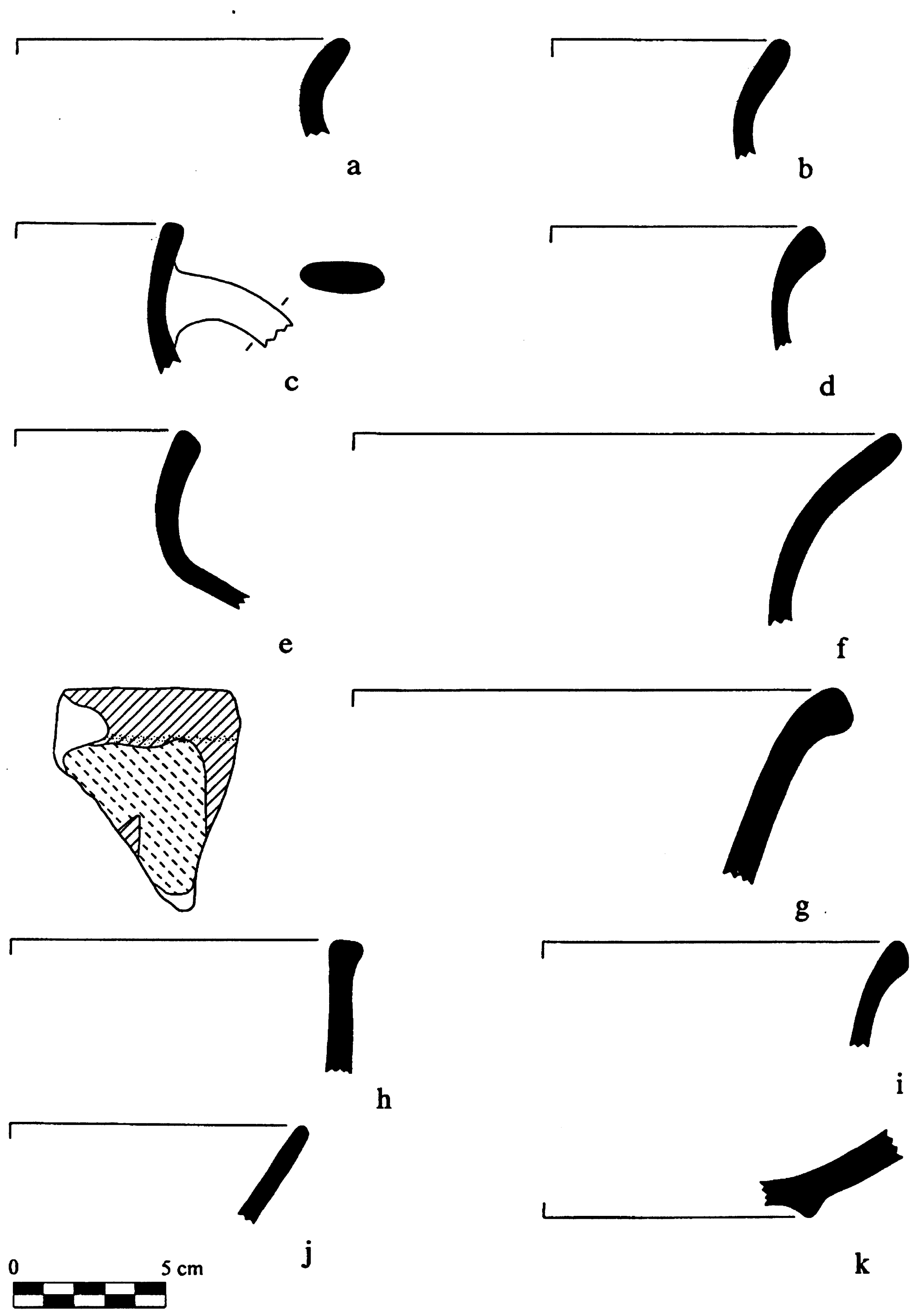


FIGURE 25 Late Chiripa ceramics: (a-d) medium-necked ollas, (e-f) jars, (g-j) bowls, and (k) ring base.

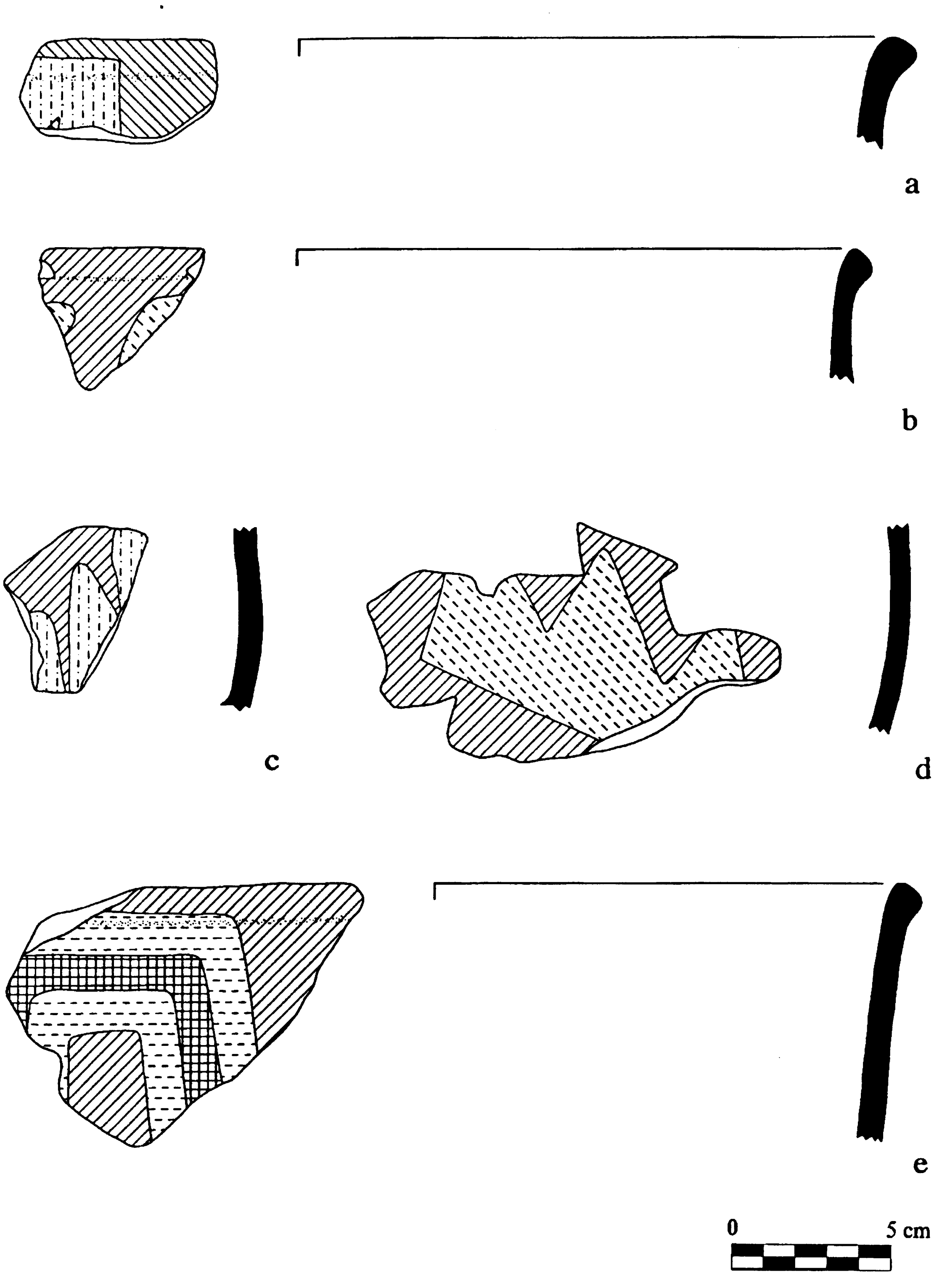


FIGURE 26 Late Chiripa ceramics: cream on red (a-b) bowls and (c-d) body sherds, (e) black/dark brown and cream on red bowl.

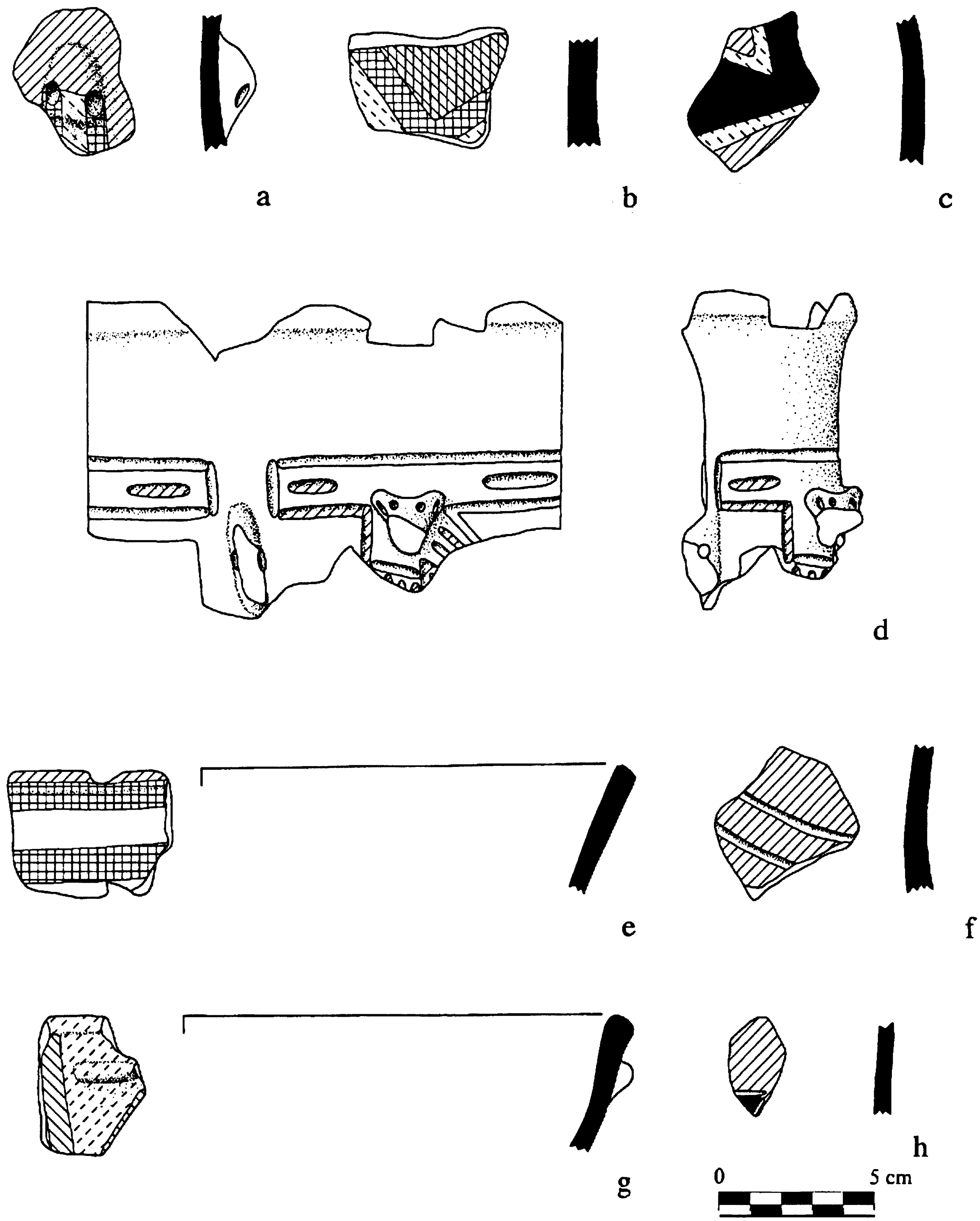


FIGURE 27 Late Chiripa ceramics: (a-c) black/dark brown and cream on red body sherds, (d) unslipped blackware trumpet with zoomorphic modeled head. Red post-fire paint in incisions where indicated; white post-fire paint in both ears and in the left eye; white outer circle and red post-fire center in the right eye, (e) dark brown and red on unslipped red brown bowl, (f) wide-line incised body sherd, (g) red on cream/light brown convex bowl, and (h) black on red incised body sherd.

The Late Chiripa phase as presented here does not, therefore, constitute a substantively new ceramic assemblage from that previously described in the literature. The most significant changes involve dating the beginning of this phase to 800 B.C., a figure based on the radiocarbon dates obtained from levels where Late Chiripa ceramics were found (figure 5, samples 21 and 22). This places the Late Chiripa phase as contemporary with part of the Middle Chiripa/Chiripa Llusco of previous investigators. The ceramics associated with our earlier dates, however, are clearly part of the Late Chiripa assemblage, directly comparable to later samples both from our excavations and from the Upper Houses, and very distinct from the Middle Chiripa assemblage as we define it.

Significantly, the structures we excavated on the Montículo that appear to correspond to the Lower Houses (see Bandy chapter 9) also yielded ceramics from our Late Chiripa phase. As discussed previously, some of the Middle Chiripa/Chiripa Llusco/Lower House ceramics of earlier investigators in fact fall within the definition of our Late Chiripa phase. The change in popularity of differently decorated wares through time noted by Browman (1978:809; 1980:111) was not identified in the material recovered in our excavations. The Late Chiripa phase as it now stands is quite long, and we expect to be able to subdivide it in the future. At present, our largest sample comes from the earlier part of this phase (see figure 5), with no material excavated systematically from the later Late Chiripa phase. With further excavation, a comprehensive definition of the temporal changes within the Late Chiripa phase will be possible.

12

Chiripa Worked Bone and Bone Tools

KATHERINE M. MOORE

INTRODUCTION

BENNETT'S ORIGINAL Chiripa report contained a short section that illustrated and described the major functional types of bone implements from the site (Bennett 1936:443-45). Bone tools collected by the Taraco Archaeological Project at Chiripa have been identified, photographed, and collected in the field during the 1992 and 1996 excavations. In addition, bone tools and bone tool fragments were identified during the sorting and examination of the bone that had been recovered in the screen. What is reported here is all the bone tool material from both sources that has been identified to date. More bone tools probably will be identified as the analysis of animal bone from 1992 and 1996 season is completed. This report provides a brief catalog of the bone tools that have been recovered in the screen based on visual inspection of the pieces. Descriptions of the bone tools identified in the field (and stored in Bolivia) are based on notes and photographs.

In this preliminary report I focus upon descriptive measures and the development of a typology to organize a diverse set of objects (table 4). I do not consider here the chronological or spatial elements of the tools' archaeological context. The sample is an unselective one, with objects coming from poor context such as plowzone deposits as well as secure context in pits, middens, and burials. The majority of the sample comes from the Santiago area of the site (70% of 404 objects), but because of the different volumetric extent of the excavations completed thus far, this may not necessarily mean that bone tools are more common there.

IDENTIFICATION OF WORKED BONE AND BONE TOOLS

The seventy-one bone implements that were recognized in the field are large pieces with obvious modification such as perforation or serration. The additional 333 objects that make up the sample of worked bones were identified while animal bone food scrap was being cleaned and sorted. As they were recognized, the bone tools were bagged individually, and further cleaned with brushes and wooden picks. In analysis, the bones were examined with a 10 power loupe, and rare

TABLE 4 Summary of Bone Tool Types.

Tool Type	No.	Percent
Awls		
Awl	45	11.1%
Long Bone—Pointed	22	5.4%
Antler	1	0.2%
Blunt Tools and Scrapers		
Long Bone—Blunt	65	16.1%
Long Bone—Rounded	20	5.0%
Long Bone—Lateral Shaping	3	0.7%
Long Bone—Sharpened	10	2.5%
Long Bone—Indeterminate	50	12.4%
Mandible	6	1.5%
Ribs	15	3.7%
Net Gauges		
Net Gauges	57	14.1%
Weaving and Spinning Equipment		
Combs	4	1.0%
Shuttles	4	1.0%
Toggles	9	2.2%
Whorl	1	0.2%
Beads and Ornaments		
Beads	18	4.5%
Bead Blanks	4	1.0%
Tubes	11	2.7%
Plaques	9	2.2%
Spatula?	1	0.2%
Indeterminate		
Indeterminate Shaped and Worn Pieces	49	12.1%
Total	404	

decorated pieces were examined with a binocular microscope. This approach was sufficient to confirm that edges had been modified artificially after the event of the original breakage. Bone pseudotools (broken bones in tool shapes but with no traces of modification or with polish only on raised exterior surfaces as a result of trampling or pot-polish) were excluded. The presence and orientation of polish and fine striae were recorded. Since the worked bone had been found in secure archaeological contexts, no further magnification was necessary to identify humans as the modifying agent.

Only 17% of the bone tools were recognized as such in the field, and only careful examination of all bone scrap allowed the smaller, less obvious or less complete implements to be identified. Care should be taken when comparing this sample with samples from other sites where bone tools are reported but no screening or faunal analysis was undertaken. While individual pieces might be compared from a technological point of view, samples that were identified without examination of the associated bone assemblage cannot be directly compared for the study of craft organization, site function, or taphonomic history.

Bone as a Tool Raw Material

Bone is a common raw material for tool manufacturing in traditional societies and is particularly useful in an area such as the Lake Titicaca Basin where wood is likely to have been scarce. The abundant bone scrap of large mammals would have provided an unending supply of pieces from which to choose. The inhabitants of Chiripa were familiar with the different working properties of fragments of straight and curved long bones, ribs, and the irregular bones of the pelvis and shoulder blade (scapula). In addition, they selected bone carefully for ornamented tubes and beads, and they made a special effort to obtain antler, probably from the taruca deer (*Hippocamelus*). Most of the available evidence for the presence of deer at Chiripa comes from fragments of antler used as tools. Based on comparing bone tool and perishable tool samples from the Peruvian coast, one may imagine that when wood was available at Chiripa, wood could be substituted for bone and antler for many implements. Samples from the coast also show us that other perishable materials could be used to make implements that were made of bone at Chiripa. Fine needles and combs, for example, were made from thorns at Pachacamac, and we have no reason to believe that highland residents could not have done the same.

The techniques used to manufacture bone tools at Chiripa were simple. Precisely shaped implements were cut by scoring with a flake and then snapping across the score mark. Such scoring or engraving was also used to decorate bone beads and bone tubes. A few bones were notched or drilled through, probably with a heavy bifacial tool. Most common, though, was shaping by grinding against an abrasive surface, perhaps ground stone. Both edges and flat surfaces were treated in this way to produce a uniform, smooth result.

Many bone tools in this sample were identified by the traces of wear on broken or natural surfaces, not by any deliberate shaping or cutting. These "expedient" bone tools are often quite worn and polished along one edge or end, with usewear and polish rounding the original pattern of broken edges and flaking left by breaking open the bone during butchery. With the exception of the cut and polished ornaments in this collection, it seems likely that the production of bone tools could have taken place in the household for personal or domestic use.

Further modification of finished bone tools was noted in many cases. Bone is a relatively soft material with many possible pathways to decomposition, so it was usually difficult to determine when some of these types of modification took place. Most subjective was the identification of striae as representing the traces of manufacture, traces of usewear, traces of non-deliberate trampling, or post-excavation damage. Many of the broken edges and tips of tools were broken as part of the natural breakdown of bone in the deposit, but some of the broken edges appeared to have snapped off during use. Some shaped edges had been broken, and the broken edge had become rounded and polished from continued use. Occasionally the netting and weaving tools showed such lustrous polish from having been used on soft raw materials that the original marks from manufacture had been worn away.

About 12% the bone tools showed some signs of burning or heat treatment, and it may be that some of this heat treatment took place as a result of manufacturing or use. (Burning may harden bone by altering the crystal structure of the bone mineral.) The most common tool types to show burning were awls (28%), blunt and rounded end long bone tools (16%), and netting tools (14%). This assemblage of frequently burned tool types could also indicate that the use, loss, and discard of these tools took place in heavily maintained, domestic spaces. In contrast, beads, weaving tools, and bone tubes were never burned. A few bone tools had been gnawed by carnivores, but it was not possible to say if this had taken place before or after the bone had been used as a tool.

Catalog of Taraco Archaeological Project Bone Tools

Tables 5-10 catalog the bone tools and worked bone fragments from TAP excavations at Chiripa in 1992 and 1996. Individual functional and formal types are grouped into six categories: 1) awls and other pointed tools, 2) scrapers and related tools, 3) tools probably for netting, 4) tools probably for spinning and weaving, 5) worked bone for ornaments and ritual purposes, and 6) indeterminate worn or shaped fragments. Within these broad categories, the objects are listed in locus number order. For each piece, provenience or a catalog number is given, along with an identification of the bone that was used as raw material and an estimate of the portion of the tool that remains. The "Tech" columns list the processes of manufacturing (shaping, engraving) and use (wear and polish) which modified the tool in the order in which they were applied. The orientation and location of striations from manufacture or use are given where they were observed. Where they are not recorded, the piece did not show such marks, either because they had never existed or because the surface was too eroded to observe such faint traces. An asterix (*) in the "Striae" column indicates that piece was studied using a photograph only, so no observations of surface details could be made. Information in the "Modification" column refers to modification of the piece as a finished artifact, either after manufacture or after discard. Information in the "Metrics" column was recorded only when original dimensions were preserved. The "Context" column lists distinctive information about the locus in which the object was found. Where there is no information listed, the context was a relatively undifferentiated fill or midden.

Awls and other Pointed Tools

The bone awls and other perforating tools (16.8%of sample, taken together) are grouped together on presumed functional grounds (table 5). Awls (11.1% of the site sample) include finely rounded needles (figure 28i) and narrow, shaped, long bone splinters with a wider cross section. Most occurred in the deposits as broken tips or

TABLE 5 Awls and other Pointed Tools.

Site	Grid N	Grid E	Level	Locus	Tool type	Raw Mat	Fragment	Tech 1	Tech 2	Tech 3	Striae	Modified	Metrics (mm)	Context
FINELY SHAPED AWLS AND NEEDLES														
L	892	980	2	30	awl	Im Ing bn	end	shape	wear		oblique	?burned		
L	892	980	2	30	awl	Im Ing bn	complete	shape	wear	polish	*		50 x 4 x 4	
L	888	980	2	55	awl	bird lb	end	wear	polish		transverse			
L	894	982.8	2	67	awl	Im Ing bn	section	shape	wear	polish	transverse		7 x 4 w	
L	892	980	2B	71	awl	Im Ing bn	end	shape	wear	polish			6 x 1.8 th	
S III	1112	972	2	518	awl	Im Ing bn	mid	shape	wear	polish				
S III	1112	968	2	548	awl	Im Ing bn	section	shape	wear	polish	transverse		7 x 4 w	
S III	1110	966	2	576	awl	Im Ing bn	end	wear	polish		transverse		7 x 3 w	Surface
S II	1098	970	2A	581	awl	Im Ing bn	mid	shape	wear	polish	longitud		3.2 x 4 w	
S III	1108	968	2	606	awl	Im Ing bn	complete	wear	polish				57 x 7x 6	
S III	1108	968	2	606	awl	Im Ing bn	section	shape	wear	polish	transverse		6 thick	
S III	1108	968	2	606	awl	Im Ing bn	section	shape	wear	polish	longitud		4 x 3 w	
S III	1108	972	2	633	awl	Im Ing bn	complete	wear	polish				48 x 7x 4	
S III	1108	970	2	634	awl	Im Ing bn	complete	wear	polish				48 x 8 x 4	
S III	3			636	awl	Im Ing bn	complete	shape	polish	wear	*		40 x 4 x4	Ashy fill
S	1090	968	2B	674	awl	Im Ing bn	end	shape	wear		transverse	?burned	4 x 5 w	
S III	1108	970	3	699	awl	Im Ing bn	section	wear	polish		transverse	burned	6.2 x 4 w	
S	1084	972	2B	718	awl	Im Ing bn	end	wear	polish				74 x 4x 5 w	
S III	1112	966	4	837	awl	Im Ing bn	section	shape	wear				4.5 x 4.5 w	Cache?
S	1112	966	7	866	awl	Im Ing bn	end	shape	wear	polish			3.5 x 4 w	
S	1117	966	9	873	awl	Im Ing bn	end	shape	wear	polish	longitud	burned	8.3 x 4.5 w	
S	1090	972	2C	880	awl	Im Ing bn	lat	shape	wear	polish	longitud	burned		
L	886.5	978.5	2	1063	awl	Im Ing bn	mid	shape	wear	polish	transverse		67 x 2.5	
S	1092	970	2	1190	awl	Im Ing bn	mid	shape	wear	polish		burned	3.6 th	
S	1092	968	1	1225	awl	Im Ing bn	end	shape	wear	polish	*		1.5 w	Plowzone
S II	1092	970	1	1226	awl	Im	mid	shape	wear	polish	long/trans		3.9 x .8 w	Plowzone
S	1094	968	T3	1230	awl	Im Ing bn	end	shape	wear		*			
S	1094	972	2	1234	awl	Im Ing bn	complete	shape	perforate	polish	*		200 l x 8 w	Plowzone
S	1092	978	1	1246	awl	Im Ing bn	end	shape	wear	polish	transverse		7.5 wide	Plowzone
S	1084	972	3	1275	awl	Im Ing bn	end	wear	polish		long/obli	burned	8 w	Pit w/bone

Table 5 con't.

Site	Grid N	Grid E	Level	Locus	Tool type	Raw Mat	Fragment	Tech 1	Tech 2	Tech 3	Striae	Modified	Metrics (mm)	Context
S II	1046	970	3	1283	awl	lm	mid	shape	polish				9 thick	Clay pit fill
S	1092	978	3	1300	awl	lm lng bn	end	shape	wear	polish	*		4 x 4 w	
S	1092	978	E3	1302	awl	lm lng bn	complete	shape	wear	polish	*		100 x10	
S	1092	978	E3	1302	awl	indet	end	shape	wear				2 x 3 th	
S	1092	976	4	1320	awl	cam mtp	mid	shape	wear	polish		calcined	7.5 w	
L	896	975.5	2	1338	awl	lm	mid	shape	polish			burned	8.7 w	
S	1099	960	T4	1424	awl	lm lng bn	end	shape	wear	polish	*		5 w	
M	971.5	1036	4	1426	awl	lm lng bn	mid	shape	polish			burned	4 x 4.5	Wall fall
S	1100	968		1450	awl	lm lng bn	end	shape	wear	polish	*		8 w	Pit
Long Bone Tools with Pointed, Shaped Working Ends														
L	892	980	2	63	lng bn point	lm lng bn	complete	shape	wear	polish	transverse		70 x10	
L	2			65	lng bn point	lm lng bn	end	shape	wear	polish	*			Plowzone
L	888	978	2C	84	lng bn point	lm lng bn	complete	wear	polish		transverse		55 x 11x 6	
S III	1112	970	2	505	lng bn point	lm lng bn	end	wear	polish				15 w	Plowzone
S III	1112	970	2	508	lng bn point	lm lng bn	end	shape						
S III	1088	972	2B	550	lng bn point	lm lng bn	end	wear	polish				7 w	
S III	1086	972	2a	605	lng bn point	lm lng bn	complete	wear	polish		transverse		45 x 15 x 5	Pit fill
S III	1110	972	2	630	lng bn point	lm lng bn	end	wear	polish		int/ext		5 x10 w	
S III	1110	972	2	630	lng bn point	lm lng bn	end	wear	polish		transverse		6 x 4 w	
S III	1110	972	2	630	lng bn point	lm lng bn	end	shape	polish		transverse			
S III	7			636	lng bn point	lm lng bn	complete	shape	wear	polish	*			Ashy fill
S III	1108	970	3	699	lng bn point	lm lng bn	complete	wear	polish		transverse		74 x 15x 5 w	
S II	1084/86	970	2ab	703	lng bn point	lm lng bn	end	shape	wear	polish				Paved surface
S III	1108	970	3A	726	lng bn point	lm lng bn	end	shape	wear	polish	longitud	burned		
S II	1100	970	2C	741	lng bn point	lm lng bn	complete	wear	polish					Pit
S III	1112	966	3B	778	lng bn point	cam mtc	complete	wear	polish		oblique		90 x 14x 11	Cache?
S III	1112	966	4	837	lng bn point	lm lng bn	complete	wear	polish		int/ext		5 x 2.5 w	Cache?
S	1112	966	6	842	lng bn point	cam hum	complete	wear	polish		oblique		85 x 20x 15	
S	1112	966	6	842	lng bn point	lm lng bn	end	shape	wear	polish	external			
S	1094	976	3	1198	lng bn point	lm lng bn	end	shape	wear	polish	*			Pit
S	1096	972	3	1281	lng bn point	lm lng bn	complete	shape	wear	polish	*		300 l	
S	1046	972	3	1281	lng bn point	lm lng bn	end	shape	wear	polish			8 th	
Tools from Antler														
S III	1112	966	3B	778	antler	deer tine	end	cut	wear	polish			60 l x 8.4 w	Cache?

midsections. The finest awls had a cross section of 3 x 3 mm, and the heavier shaped splinters were approximately 7 x 4 mm in cross section. The "Long bone-pointed" category (5.4% of the site total) includes more generalized long bone shaft fragment tools with an acute angle and sharp point on the working end. The working end was sometimes carefully shaped and symmetrical, and sometimes simply took advantage of a naturally sharp broken end to the original fragment (figure 28a). The awls and long bone sharp categories share a common raw material (straight fragments of large mammal long bone, most likely the metapodial or cannon bones of camelids) and general manufacturing technique. None of the tools of this type in this sample showed any perforations. They have strong transverse striations probably from wear but possibly also from manufacture (see below for further information on striae patterns).

Awls are a common type of bone tool recognized in archaeological deposits. Their functions probably included perforating and sewing skins and textiles. The heavier awls may also have been used in producing twined basketry. Working with reeds and other fiber materials may well have been an important technology along the reed beds of Lake Titicaca. One of the pointed long bone tools (from Locus 630) is so symmetrical and carefully shaped that it may have been a bone projectile point.

Long Bones with Blunt or Worn Working Ends

A large category of bone tools (42% of all tools) was made from pieces of large mammal (most probably camelid) long bone (table 6). The tools of this type illustrated by Bennett (1943) are labeled "end scrapers," though relatively few of them probably served this function. Some of the tools in this sample are complete or fragmentary tools of a type attributed to loom weaving (see for example, the range of camelid metatarsal tools illustrated in Kolata 1989:fig. 32 and the discussion of the modern *wich'una* in Miller 1979:77-80). The category of long bone tools has been broken down based on examination of the working end of the tools, originally made from a broken end of a large fragment. In most cases, the bone end has been lightly shaped to blunt it, or used with the fresh edge as it was broken (the "Long bone-blunt" category, 16% of the total sample), but a minority have carefully shaped, usually rounded ends ("Long bone-round," 5.0%). A smaller number of long bone tools had been thinned and sharpened along the lateral edges of the piece ("Long bone-lateral shaping," 0.7%). The long bones chosen as raw material for these categories were most often limb elements that have a straight, even grain, in particular the metatarsal and metacarpal bones, but also including the tibia and radius. A group of long bone tool fragments with insufficient edge to make a further determination are listed here as "Long bone: indeterminate."

Also included in this category are two kinds of worked edge tools made on other types of bone. The "Rib tools" (3.7%) are ribs or rib sections with worn distal ends and use polish similar to the long bone tools. The "Mandibles with shaped edges" (1.5%) are a distinctive but poorly understood implement where the heavy, cheek tooth portion of a camelid mandible is the apparent handle. The angle of the jaw (the ascending ramus) has been broken off and shaped to form a working edge. This edge in some pieces appears to be sharp enough for scraping but in others is smoother and blunter.

"Long bone-sharp" (2.5%) tools are the best candidates in this group of long bone tools to actually have served as scrapers. These tools have sharpened, scoop-like edges and look as though they could have been used as scrapers or even spoons. They are often made on fragments of bones with a curved shaft, like the femur or humerus. Typically, the pieces are shorter than the other long bone tools.

There is considerable variation in the outline shape of the long bone tools: rounded, blunt, and squared off. There is also variation in the profile and working angle of the edge. While some have smoothly rounded edges from use or a combination of shaping and use, others are worn to a beveled edge, as though they had been worked back and forth on an angled, flat surface. Some of the heaviest, least-shaped pointed tools could have been pressure flaking tools. In contrast, the "Long bone-sharp" were thinned to a sharp edge rather than being dulled and rounded by abrasion against another material.

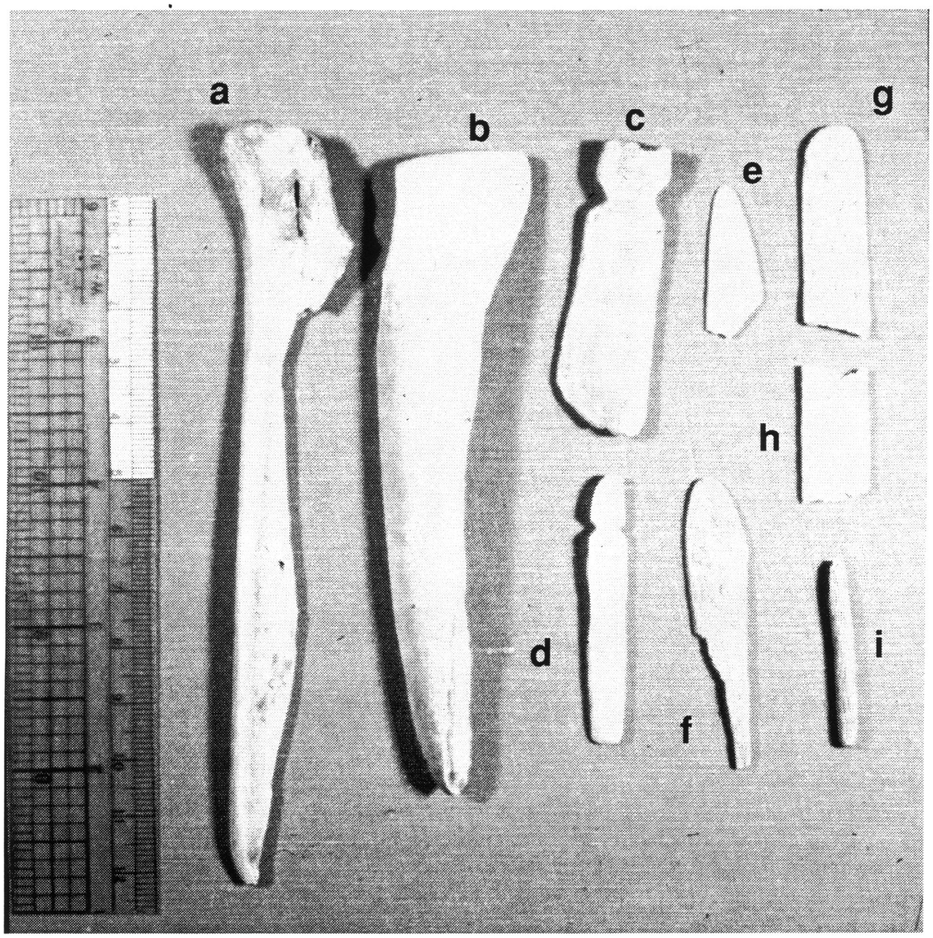


FIGURE 28 Bone tools from Chiripa. (a) Pointed long bone tool (Locus 778). (b) Blunt long bone tool (Locus 1070). (c) Toggle (Locus 839). (d) Toggle (Locus 108). (e) Netting Gauge, pointed end (Locus 1206). (f) Netting Gauge, blunt end (Locus 866). (g) Netting Gauge, blunt end (Locus 1411). (h) Netting Gauge, midsection (Locus 1336). (i) Awl, finely rounded type (Locus 866).

It is difficult to assign specific functions or type labels to these generalized implements. Certainly some of them may have been used for scraping hides, ceramics, fiber, reeds, or foods, based on the sharp shape and condition of their working edge. Some also may have been used against softer materials, such as yarn or other fibers, based on the smooth luster still preserved on blunted working surfaces. Most of them are much shorter than the classic *wich'una* and lack the handle formed by using the articular end. This shorter dimension could possibly relate to a smaller size of loom being used, as well. Analysis of usewear where it was observable on these tools does suggest that their morphological similarity is related to some aspect of their function. When the long bone tools are compared to the awls and pointed tools, strong differences in patterns of striations appear. (In this comparison, tools with multiple sets of striae running in different directions were counted for each different set: thus a tool with longitudinal and oblique striae was counted in both categories.) For the long bone tools, oblique striae were most common (61.1% of marks observed on tools of that category) followed by transverse (22.2%) and longitudinal (16.7%) striae. For the awls and other pointed tools, transverse striae were most common (59.3%), followed by longitudinal (25.9%), and then oblique marks (14.8%). The functional assignment of awl is nicely supported by the evidence for strong transverse action (the tool

TABLE 6 Scrapers and other Long Bone Tools.

Site	Grid N	Grid E	Level	Locus	Tool type	Raw Mat	Fragment	Tech 1	Tech 2	Tech 3	Striae	Modified	Metrics (mm)	Context
LONG BONES WITH BLUNTED OR WORN WORKING ENDS														
L	888	980	2	55	lng bn blunt	lm lng b	end	wear	polish		oblique		21 l	
L	888	980	2	55	lng bn blunt	lm lng b	end	wear	polish					
L	888	980	2	55	lng bn blunt	lm lng b	end	shape	wear	polish				
L	892	982	2	61	lng bn blunt	lm lng b	end	shape	wear	polish	long/obliq			
L	890	980	2	74	lng bn blunt	lm lng b	end	shape	wear	polish	oblique			
L	888	980	2B	77	lng bn blunt	lm lng b	complete	shape	wear	polish	oblique		92 x 20 x 7	
L	888	980	2B	77	lng bn blunt	lm lng b	end	shape	wear					
L	888	978	2B	82	lng bn blunt	cam tibia	complete	wear	polish				7 x 15 w	
L	3			88	lng bn blunt	lm lng bn	complete	shape	wear	polish	*		9 x 4 w	
L	890	978	2A	94	lng bn blunt	lm lng bn	end	shape	wear	polish	oblique			
L	890	978	2A	94	lng bn blunt	lm lng bn	end	wear	polish		external			
L	890	978	2A	94	lng bn blunt	lm lng bn	end	shape	wear	polish	oblique			
L	892	980	2B	109	lng bn blunt	lm lng bn	end	shape	wear	polish				
L	894	977.8	2B	121	lng bn blunt	lm long b	end	shape	wear	polish	trans/obliq	burned		
SIII	1110	972	2/3	522	lng bn blunt	cam innom	end	shape	wear	polish	oblique			
S III	1			548	lng bn blunt	lm lng bn	end	shape	wear	polish	*	burned		
S III	1110	966	2	576	lng bn blunt	lm lng bn	end	shape	wear	grooved?	transverse			Surface
S II	1096	972	2	599	lng bn blunt	cam scap	proximal	wear	polish			burned		Plowzone
S III	/4-1			606	lng bn blunt	lm lng bn	end	shape	wear	polish	*	burned		
S II	1098	968	2	648	lng bn blunt	lm lng bn	complete	shape	wear	polish	transverse		60 x 25 w	
S	9			692	lng bn blunt	lm lng bn	complete	wear	polish		*		140 x 30	Ashy fill
S III	1108	968	3	702	lng bn blunt	cam scap	complete	shape	wear	polish				
S	2			704	lng bn blunt	lm lng bn	complete	wear	polish		*		150 x 30	
S	1			730	lng bn blunt	cam mtp	complete	cut	shape	wear	*		160 x 20	
S III	1108	968	3A	736	lng bn blunt	cam scap	complete	shape	wear	polish			100 l	
S	1084	972	2B	806	lng bn blunt	ln lng bn	end	thin	shape	wear			250 thick	
S III	1112	966	4	837	lng bn blunt	cam scap	lateral	cut	wear	polish				Cache?
S	1112	966	6	842	lng bn blunt	lm lng bn	end	wear	polish					
S	1084-86	972	2B3	848	lng bn blunt	lm scap	end	wear	polish		external			Pit w/ bones
S	1088	968	3A	851	lng bn blunt	lm lng bn	end	wear	polish		longitud		105 x 35	
S	1090	968	3B	863	lng bn blunt	lm lng bn	end	shape	wear	polish	longitud	burned		
S	1112	966	10	878	lng bn blunt	lm lng bn	end	shape	wear	polish	oblique	burned	25 x 6 w	
L	886	982	2	1031	lng bn blunt	lm mtp	end	wear	polish		*		100 x 40	Surface
L	886	982.5	2	1051	lng bn blunt	cam rad	end	wear	polish				106 x 28 w	
L	886	982.5	2	1051	lng bn blunt	cam rad	end	wear	polish					
L	884	982.5	2	1053	lng bn blunt	lm lng bn	end	shape	wear	polish			21 w	

Table 6 con't.

Site	Grid N	Grid E	Level	Locus	Tool type	Raw Mat	Fragment	Tech 1	Tech 2	Tech 3	Striae	Modified	Metrics (mm)	Context
Long Bones with Blunted or Worn Working Ends con't.														
L	886.5	978.5	2	1063	lng bn blunt	cam tibia	end	shape	wear	polish				
L	880	978	2	1064	lng bn blunt	lm lng bn	end	shape	wear		oblique			
L	880.5	970.5	1	1070	lng bn blunt	cam fem	end	shape	wear	polish				Humus
S	1094	970	2	1195	lng bn blunt	lm lng bn	complete	wear	polish		*		100 x 20	Pit
S	1092	968	2	1227	lng bn blunt	lm	end	wear	polish			burned	7.5 w	
S	1092	968	T3	1228	lng bn blunt	lm lng bn	end	shape	wear	polish		burned		
S	1094	968	T2	1229	lng bn blunt	lm	end	shape	wear					
S II	1094	968	t3	1230	lng bn blunt	lm	mid	shape	wear	polish				
S	1094	976	1	1245	lng bn blunt	lm lng bn	end	shape	wear	polish	*			Plowzone
L	893.5	971.5	1	1251	lng bn blunt	lm	end	shape	polish			eroded		Plowzone
L	895.5	972	2	1255	lng bn blunt	lm	end	shape	wear	polish			13.6 w	
L	892.5	971.5	2	1263	lng bn blunt	cam mtp	end	wear	polish		oblique			Humus
L	889.5	971.5	1	1267	lng bn blunt	cam mtc	end	wear	polish		trans/obl			
S	1092	978	3	1300	lng bn blunt	lm lng bn	end	wear	polish		*			
S	1092	978	E3	1304	lng bn blunt	lm lng bn	complete	shape	wear	polish	*		200 x 6	
S	1092	976	4	1320	lng bn blunt	lm lng bn	end	shape	wear	polish	*			
L	883	971.5	2	1332	lng bn blunt	lm	end	shape	polish					
M	976	1036.7		1367	lng bn blunt	lm lng bn	complete	shape	wear	polish	*		60 x 15	
S	1097	962.5	2	1411	lng bn blunt	cam mtp	end	shape	wear	polish	oblique	burned		Plowzone
S II	1099	969		1483	lng bn blunt	cam mtt	end	wear	polish				22.8 w	
L	?	?	?	?	lng bn blunt	lm lng bn	end	shape	wear	polish				
L	893.3	979.8	?	?	lng bn blunt	lm lng bn	end	shape	wear		external			
Long Bone Tools with Shaped, Rounded Working Ends														
L	884	980	2	73	lng bn round	lm lng bn	end	shape	wear	polish	external		6 thick	
L	892	978	2	76	lng bn round	lm lng bn	lateral	shape						
L	888	978	2	81	lng bn round	cam mtp	end	shape	wear	polish	int/ext			
S III	6			565	lng bn round	lm lng bn	complete	shape	wear	polish	*		7 x 2.5	Offering ?
S II	1086	974	2	632	lng bn round	lm lng bn	complete	wear	polish		external		54 x 21 x 4	
S III	1108	972	2	636	lng bn round	cam ilium	end	shape	wear	polish	obliq/long		10 x 34 w	Plowzone Ashy fill
c	7			642	lng bn round	lm lng bn	complete	groove	snap	shape	*	burned	40 x 30	
S II	1098	968	2	648	lng bn round	lm lng bn	end	shape	wear	polish				
S	1			675	lng bn round	lm lng bn	complete	shape	wear	polish	*		80 l x 15	
S III	1110	970	3A	716	lng bn round	lm lng bn	end	shape	wear	polish				
S II	1086	972	2B	725	lng bn round	lm lng bn	lateral	wear	polish		oblique			
S III	1112	966	4	837	lng bn round	lm lng bn	end	shape	wear	polish	obliq/long	burned		Cache?
S	1112	966	6	842	lng bn round	lm lng bn	end	shape	wear	polish	oblique			
S	1117	966	9	873	lng bn round	lm lng bn	end	shape	wear	polish	oblique			

TABLE 6 Scrapers and other Long Bone Tools con't.

Site	Grid N	Grid E	Level	Locus	Tool type	Raw Mat	Fragment	Tech 1	Tech 2	Tech 3	Striae	Modified	Metrics (mm)	Context
LONG BONES WITH SHAPTED, ROUNDED WORKING ENDS CON'T.														
L	886	982.2	2	1031	lng bn round	lm lng bn	complete	shape	wear	polish	*			Surface
S	1094	970	2	1195	lng bn round	lm lng bn	end	shape	wear	polish	*			Pit
S	1094	968	T2	1229	lng bn round	lm	lateral	shape	wear		ext, obliq	burned		
L	879.5	971	2	1273	lng bn round	lm lng bn	end	shape	wear	polish	*			
S	1097	964.5	t2	1413	lng bn round	cam mtt	end	shape	wear	polish			32.5 wide	
S	1092	970		1503	lng bn round	lm lng bn	end	shape	wear	polish	*			
RIBS AND RIB SECTIONS WITH SHAPED AND WORN ENDS AND EDGES														
L	888	978	2	56	rib	lm rib	end	shape	wear		internal			
S III	1112	970	2	508	rib	cam rib	end	shape	wear	polish	oblique			
S III	1108	968	2	591	rib	lm rib	end	shape					6.8 x 2 w	
S III	1108	972	2	633	rib	lm rib	end	shape	wear	polish				
S III	1108	972	2	636	rib	lm rib	lateral	wear						Ashy fill
S III	1110	970	3	671	rib	lm rib	end	wear	polish					
S III	1110	972	3	679	rib	lm rib	end	shape	polish		trans/obliq			
S III	1108	970	3	756	rib	lm rib	complete	wear	polish		transverse		150 l	
S	1088	974	2B	835	rib	lm rib	end	shape	wear	polish	longitud			
S	1090	968	3B	868	rib	lm rib	complete	shape	wear	polish	int/ext			
S	1100	968		1298	rib	lm	end	groove	snap	waste/pre form?				Unknown
S	1099	968	T2	1403	rib	lm rib sh	mid	polish			transverse	eroded		
S	971.5	1035.5	4	1428	rib	lm rib	mid	shape	wear		transverse			
S	1099	969		1483	rib	lm rib	end	groove	snap	shape				
S	1099	969		1483	rib	lm rib	end	groove	snap	shape				
CAMELID MANDIBLES WITH SHAPED AND WORN EDGES														
L	890	982	2	49	mand	cam mand	ramus	shape	wear		external			
S III	1100	968	3	666	mand	cam mand	section	wear	polish					
S III	1108	970	3A	726	mand	cam mand	complete	shape	wear	polish	internal			
S III	1112	966	4	837	mand	cam mand	missing	no info	no info	no info				Cache?
S III	1112	966	4	837	mand	cam mand	ramus	wear	polish		external			Cache?
S	1084-86	972	2B3	848	mand	cam mand	complete	groove	snap	wear				Pit w/ bones
LONG BONE TOOLS WITH SHARP, LOW ANGLE WORKING EDGES														
L	890	980	2	52	lng bn sharp	lm lng bn	complete	wear	polish		transverse		41 l x 8 x 5	
L	892	980	2	63	lng bn sharp	cam hum	complete	shape	wear	polish	external		79 l x 32 w	
S III	1112	966	2	544	lng bn sharp	lm lng bn	end	wear	polish					Plowzone

Table 6 con't.

Site	Grid N	Grid E	Level	Locus	Tool type	Raw Mat	Fragment	Tech 1	Tech 2	Tech 3	Striae	Modified	Metrics (mm)	Context
Long Bones with Sharp, Low Angle Working Ends con't.														
S III	1108	972	2	636	lng bn sharp	cam mtc	complete	shape	wear	polish	int/ext		18 w	Ashy fill
S	1090	968	2A	670	lng bn sharp	cam hum	complete	shape	wear	polish	int/ext		82 l x 27 w	
S III	1108	968	3A	736	lng bn sharp	cam mtc	complete	shape	wear	polish	internal		150 x 17.5 x 10	
S	1112	968	8	869	lng bn sharp	cam hum	end	shape	wear	polish	oblique	burned		
S	1092	978	1	1246	lng bn sharp	lm lng bn	end	shape	wear	polish	oblique			Plow zone
L	895.5	972	2	1255	lng bn sharp	lm	complete	thin	wear	polish	external		75 l x 21w	
M			2	1352	lng bn sharp	lm lng bn	complete	shape	wear	polish	*		6 wide	
Long Bone Scrapers with Shaped Lateral Edges														
L	884	980	2	73	lng bn lat	lm lng bn	complete	wear						
S III	1108	970	3	699	lng bn lat	cam fem	complete	shape	wear					
S II	1092	968	2	1227	lng bn lat	lm	lateral	wear	polish				17.7 w	
Long Bone Indeterminate Scrapers														
L	893.2	977.8	2	23	lng bn	lm lng bn	end	shape	wear					
L	890	980	2	52	lng bn	lm tibia	lateral	polish				burned		
L	890	980	2	52	lng bn	lm lng bn	lateral	wear	polish		external			
L	892	982	2	59	lng bn	lm lng bn	lateral	shape	wear	polish	internal	burned		
L	898	982	2	69	lng bn	lm lng bn	lateral	wear	polish		oblique	burned		
L	892	980	2B	109	lng bn	lm lng bn	section	wear						
L	894	972.8	2B	111	lng bn	lm lng bn	end	wear	polish					
L	894	977.8	2B	121	lng bn	lm lng bn	end	shape	wear	cut				
S III	1112	970	2	505	lng bn	lm lng bn	lateral	wear	polish					Plowzone
S III	1112	970	2	505	lng bn	lm lng bn	sec	wear	polish		transverse			Plowzone
S III	1112	970	2	505	lng bn	lm lng bn	mid	wear	polish					Plowzone
S III	1112	966	2	544	lng bn	lm lng bn	section	wear	polish		internal			Plowzone
S III	1110	968	2	568	lng bn	lm lng bn	complete	wear	polish		longitud		110lx19w	
S III	1108	966	2	615	lng bn	lm lng bn	lateral	wear	polish		transverse			Ashy fill
S III	1110	972	2	630	lng bn	cam mtt	complete	wear	polish			gnawed		
S III	1110	972	2	630	lng bn	lm lng bn	end	wear	polish		transverse			
S III	1108	972	2	636	lng bn	lm lng bn	section	wear	polish		oblique	burned		Ashy fill
S III	1110	972	3	679	lng bn	lm lng bn	end	shape	wear	polish	int/ext	eroded		
S III	1110	970	3A	716	lng bn	lm lng bn	lateral	wear	polish					
S II	1100	968-70	2B	731	lng bn	cam tibia	section	cut	wear		oblique	gnawed		Ashy fill
S II	1100	970	2C	741	lng bn	lm lng bn	section	pigment				burned		Pit
S III	1112	966	3B	778	lng bn	lm lng bn	lateral	wear	polish					Cache?
S III	1112	966	3B	778	lng bn	lm lng bn	lateral	wear	polish					Cache?

TABLE 6 Scrapers and other Long Bone Tools con't.

Site	Grid N	Grid E	Level	Locus	Tool type	Raw Mat	Fragment	Tech 1	Tech 2	Tech 3	Striae	Modified	Metrics (mm)	Context
LONG BONE INDETERMINATE SCRAPERS (CON'T.)														
S III	1112	966	3B	778	lng bn	lm lng bn	end	wear	polish					Cache?
S II	1100	970	3D	792	lng bn	lm lng bn	lateral	shape	wear	polish		burned		
S	1112	966	6	842	lng bn	lm lng bn	lateral	shape	wear	polish				
S	1090	968	3A	849	lng bn	lm lng bn	lateral	wear	polish		transverse			
S	1112	966	7	866	lng bn	lm lng bn	lateral	wear	polish		transverse			
S	1090	968	3b	867	lng bn	lm lng bn	end	groove	snap	polish	external			
S	1112	968	8	869	lng bn	lm lng bn	lateral	polish						
S	1112	966	10	878	lng bn	lm lng bn	lateral	wear	polish		oblique	burned		
S	1112	966	10	878	lng bn	lm lng bn	section	shape	wear	polish	oblique	burned		
S	1090	970	2C	881	lng bn	lm lng bn	lateral	wear	polish		transverse			
L	886	982.5	2	1051	lng bn	cam mtc	mid	shape	wear	polish	long/obli		22 w	
S II	1094	972	1	1192	lng bn	lm	section	shape	polish		longitud	burned	9.3 w	Plowzone
L	895.5	972	2	1255	lng bn	lm	mid	shape	wear	polish	transverse		11 w	
S II	1096	969	T2	1290	lng bn	lm hum	mid	shape	polish		transverse	etched	11.5 w	
L	883	971.5	2	1332	lng bn	lm	mid	shape	polish		external			
S	1097	964.5	t3	1413	lng bn	lm	mid	shape	polish				11.5 w	
L	?	?	?	?	lng bn	cam mtp	lateral	shape	wear	polish				
S	1084	972	3	1275	lng bn	lm lng bn	mid	shape	wear	polish	trans/obli		30 x 8 th	Pit w/bone
S	1099	962.5	T3	1415	lng bn	lm lng bn	mid	shape	polish		long;trans		8.8 w	
S	1099	962.5	T4	1415	lng bn	lm lng bn	end	shape	wear	polish	transverse		6.8 w	
S	1099	962.5	T5	1415	lng bn	lm lng bn	lateral	wear	polish					
S	1086	956.9	T2	1513	lng bn	lm lng bn	mid	shape	wear	polish	trans/obli		75 l x 21	

twisting as it was inserted in rough materials). For the long bone tools, the pushing and rubbing at an angle that produced the pattern of oblique striae could be associated with weaving, as well as many other tasks.

Net Gauges

These are a group of very carefully made bone implements for which most traces of the original bone morphology have been effaced by grinding (table 7). This single category makes up 14.1% of the total sample of tools. One group (n=26, 62% of this category) of them appears to have been made by grinding away the inner table of bone on a rib midsection. Once a thinned blank about 8 mm wide and 1.2 mm thick had been prepared, the ends were carefully shaped into squared off edges or blunt points (fig. 28e-h). Others pieces of this general form appear to have been made of long bone shaft fragments that have been thinned in a similar manner to about 2 mm. With the possible exception of the incised bone tubes, these thin bone blades represent the most careful and elaborate technology of any of the bone tools, and suggest most strongly the standardization of workshop rather than home production.

These tools typically have a high polish with only faint striae, suggesting that they were used on a soft material. The care with which uniform size and shape were attained, and perfect smoothness of edge reflect their supposed purpose. It is most likely that they were netting gauges, the flat sticks which hold a uniform length of cordage in a loop as the netting shuttle pulls each knot tight. The size of the gauge determines the size of the net opening. Two general sizes are most common for the gauges in this sample (those about 11 mm wide and those about 20 mm wide). It may be that this reflects two different mesh sizes in the nets that were being produced. While these gauges match those in use today by fishermen and lacemakers, they have been described by other functional labels such as knives, spatulas, or ornaments (see Bennett 1936, for example). Their common presence at Chiripa is consistent with the economic importance of fishing and hunting birds, both of which activities probably involved nets.

Tools for Weaving and Fiber Processing

This general label has been applied to four categories of relatively rare implements to flag their possible function as having to do with cordage, fiber processing, spinning and weaving (table 8). The categories include flat, evenly serrated pieces labeled here as "combs," usually made on cut pieces of camelid scapula (n=4 including 2 from the same feature, Locus 565, see figure 29); a single spindle whorl made of a bone disk; and two very loose categories of "shuttles" and "toggles." The combs could have been used to even the packing of the weft threads as weaving progressed on a backstrap loom. The spindle whorl would have been used on a drop spindle, but, as noted below, some of the large beads also could have been used as spindle whorls and perishable spindle whorls are very common in the Andes today. The shuttles (n=4) are smooth, flat, polished pieces with perforations suitable for fastening or winding yarn around them. Both loom weaving and netting make use of shuttles to carry the twisted fiber through the work, but the many examples from the Peruvian coast indicate that simple sticks and reeds were most often used as shuttles, so this functional assignment may be difficult to support. The toggles (n=9) are smoothed pieces that have been notched or perforated with smaller holes that appeared less suitable for use passing back and forth as a shuttle (see figure 28c, d). Such pieces could have been useful to secure cordage or straps in a variety of fishing, boating, or harness equipment.

The assignment of functions to these carefully shaped pieces is speculative. Their location in a variety of offerings (Locus 565, 536) and possible caches (Locus 837) signals that they may have had multiple meanings. To understand the range of craft production at the site, we must take into account these apparent specialized tools, the more generalized tools such as the smooth, blunted long bones, and the missing perishable materials that would have been used with them.

Beads and Pendants, Plaques, Tubes

This group of objects is thought to have had special personal or ritual significance, rather than a

TABLE 7 Netting Gauges.

Site	Grid N	Grid E	Level	Locus	Raw Mat	Frag	Tech 1	Tech 2	Tech 3	Striae	Burning	Metrics (mm)	Context
NET GAUGES													
L	890	980	2	52	lm rib	section	thin	wear	polish	int/ext		1.2 th	
L	894	982.8	2	67	lm rib	section	thin	shape	polish	longitud		12 x 1.5 th	
L	894	982.8	2	67	lm rib	section	thin	shape	polish	longitud		11 x 1.5 th	
L	894	979-80	2B	108	lm	section	thin	shape	polish				
S III	1112	970	2	508	lm lng bn	complete	shape	wear	polish	external		102 x 20 x 4	
S III	2			528	rib	end	thin	shape	polish	*		8 x 3	
S III	1088	970	2	548	lm lng bn	section	thin	shape	polish	longitud		13.8 x 2.5 th	
S III	1088	92	3	555	lm lng bn	complete	thin	wear	polish			9.4 x 1.8 th	
S III	1088	92	3	555	indet	lat	thin	wear	polish		burned	1.3 th	
S III	/4-1			565	lm lng bn	complete	thin	shape	wear	*		7 x 2 th	Offering
S III	1112	966	3B	778	lm rib	end	thin	shape	polish	external			Cache?
S	1084-86	972	2B3	848	lm rib	end	thin	shape	polish	oblique		1.2 th	Pit w/ bones
S	1084-86	972	2B3	848	lm lng bn	end	thin	shape	polish	longitud	burned	2.5 th	Pit w/ bones
S	1086	970	2C	862	lm lng bn	end	thin	shape	polish			2 th	Gravel fill
S	1112	966	7	866	lm rib	end	thin	shape	waste			2 th	
S	1112	966	7	866	lm rib	lat	thin	shape	wear				
S	1112	966	7	866	lm rib	lat	thin	shape	wear				
S	1117	966	9	873	lm rib	end	thin	shape				11 x 2.5 th	
S	1090	970	2C	881	lm lng bn	end	thin	shape	polish	transverse		8.5 x 2 th	
L	884	982.5	1	1052	lm rib	mid	thin	shape	wear	ext/trans		15.6 x 1.8 th	
L	884	982.5	2	1053	lm rib	mid	thin	shape	polish			1.5 th	
L	884	982.5	2	1053	lm rib	end	thin	shape	polish			22 x 1.5 th	
S	1092	970	2	1190	lm rib	mid	thin	shape	polish			15 x 2 th	
S	1092	974	2	1194	lm rib	lat	thin	wear	polish			1.6 th	
S II	1094	972	3	1198	lm rib	mid	thin	shape	polish	ext/ obliq		11 x 1.5 th	Pit
Y	1086.76	922	2	1206	lm rib	mid	thin	shape	polish	external		1.5 thick	
S II	1094	968	t3	1230	lm rib	mid	thin	shape	polish			20 wide	
S II	1094	968	t3	1230	lm rib	mid	thin	shape	polish	longitud		10 wide	
S II	1094	974	2	1234	lm rib	mid	thin	shape	polish			16.5 x 1.5 th	
S	1086	974	3	1242	lm rib	mid	thin	shape	polish		burned	11.5 x 2 th	
S	1088	974	3	1244	lm rib	mid	thin	wear	polish			12 x 2 th	
S	1086	934	2	1247	lm indet	end	thin	shape		*			
S	1086	974	4	1248	lm rib	mid	thin	shape	polish		burned	1.5 th	
L	892.5	971.5	2	1263	lm rib	end	thin	wear	polish			14.8 x1.1 th	Humus
S	1098	972	3	1287	lm lng bn	end	thin	shape	wear	oblique		1.6 th	
S	1092	976	E-2	1294	lm rib	mid	thin	shape	polish	longitud	burned	1.2 th	
S	1092	978	3	1310	lm	complete	thin	shape	polish	transverse	discol/bur	20 x 2.5 th	
L	897	975.5	2	1334	lm rib	mid	thin	shape	polish			10 x 1.8 th	
L	897	977.5	1	1336	indet	mid	thin	wear	polish			12 x 1.5 th	Plowzone
L	889.5	976.5	2	1343	lm indet	end	thin	shape	polish	*			
L	897	909	2	1347	lm rib	mid	thin	polish		transverse		15.6 w	Plowzone
S	1097	962.5	2	1411	lm rib	end	thin	shape	polish			11.5 x 1.6 th	Plowzone
S	1099	960	T3	1416	lm lng bn	end	thin	wear	polish	long/obli		19.9 x 2.2	
M	971.5	1035.5	4	1426	indet	mid	thin	polish				9 x 1.6 th	Wall fall

FIGURE 29 Bone comb, probably for weaving, one of two from Locus 525 (cat. CH3-565/4-01).

technological function (table 9). Eighteen beads and bead fragments, and four apparent bead blanks were identified. Both camelid phalanges (mostly of the small size class of camelids, either alpaca or vicuna) and bird long bones were used as raw material for tubular beads. These natural bone tubes were scored two or more times with a stone tool and snapped to break off a section of tube. A number of the beads show several evenly spaced grooves about 5 mm apart in addition to the grooves used to cut the piece. These grooves appear to be deliberate incised decoration. The cut ends of the beads were often smoothed, and some of the beads show a high degree of wear and polish from use. One bead had heavy wear on the ends, apparently from rubbing against other beads on a cord (Locus 836). In addition to the tubular beads, one camelid phalanx was drilled through the shaft, perhaps to prepare a pendant (Locus 632). Stone beads have been found with burials at Chiripa, though none of the bone beads was directly associated with a burial. The presence of preforms or blanks and waste suggests that in contrast to the imported stone beads, bone tools were manufactured at the site. It is also possible that some of these beads may have in fact been spindle whorls for extremely fine fibers, as suggested by bone whorls (no more than 1 cm wide) still on fine spindles in the Pachacamac collection.

Eleven worked pieces appear to be fragments of long bones cut and shaped to prepare bone tubes (2.7% of total). Some of these pieces are undecorated and may have been handles or blanks for some other implement, but others appear to have been carefully finished and two are decorated. One complete but undecorated piece (Locus 1283, from a pit in the Santiago area) was made from a cut camelid metatarsal that had been highly smoothed and polished. Pieces of this type have been known as snuff tubes and are thought to have had important ritual functions.

Another fragmentary bone tube was engraved with a pattern of intersecting narrow lines (Locus 674 from Santiago) and lightly polished. The interior as well as the exterior of this piece had been polished. The size and pattern of lines suggests that the original artifact might have been as long as 15 cm.

The most spectacular find of this type, though a minute fragment (20 x 10 mm), was a finely decorated bone tube fragment from Locus 522 (the ashy fill of a pit in the Santiago III area). The engraved and polished design shows the feet

TABLE 8 Tools for Weaving and Fiber Processing.

Site	Grid N	Grid E	Level	Locus	Raw Mat	Fragment	Tech 1	Tech 2	Tech 3	Striae	Modified	Metrics (mm)	Context
Combs													
S III	/5-1			565	cam scap	complete	groove	serrate	wear	*		160 x 50	Offering
S III	/4-1			565	cam scap	mid	cut	serrate	wear	*		40 wide	Offering
S III	1112	966	4	837	lm scap	section	groove	polish					Cache?
L	895	974	1	1252	cam scap	complete	groove	serrate	polish			97 edge	Plow zone
Whorl													
S III	1			564	skull	complete	engrave	shape		*		30 diam	
Shaped Flat Pieces with Perforations: Shuttles													
L	2			62	lm lng bn	complete	shape	perforate	wear	*		15 x 15	
S III	2			505	lm lng bn	complete	shape	perforate	wear	*		200 x 40	Plowzone
SIII	1			536	lm lng bn	complete	shape	perforate	polish	*		60 x 15	Burial offering
S	/3-1			774	lm lng bn	complete	shape	polish	wear	*		45 x 20	
Shaped Flat Pieces with Notches or Perforations: Toggles													
L	894	979-80	2B	108	lm	complete	wear	polish	groove			32 x 6	
S III	1			505	lm lng bn	complete	shape	polish	polish	*		45 x 30 (perf 7)	Plowzone
S III	1			556	lm lng bn	end	shape	groove		*		30 w	
S III	1110	966	2	576	lm lng bn	lateral	wear	polish					Surface
S III	1			627	lm lng bn	complete	shape	polish		*		40 l	Plowzone
S III	1112	966	4	837	lm rib	complete	shape	groove	polish	transverse			Cache?
Y	1086	922	2	1206	lm lng bn	complete	shape	groove	polish	*		2 cm	
Y	1086	922	2	1206	lm lng bn	complete	shape	groove	polish	*		2 cm	
S	FL 11173		4	1248	lm lng bn	complete	shape	polish	perforate	*		1.5 w	

TABLE 9 Beads, Plaques, and Bone Tubes.

Site	Grid N	Grid E	Level	Locus	Raw Mat	Fragment	Tech 1	Tech 2	Tech 3	Striae	Modified	Metrics (mm)	Context
TUBULAR BEADS AND PENDANTS													
L	892	982	2	48	sm bird lb	section	groove	snap				5 w	
L	894	977.8	2B	121	bird lb	section	groove	snap	polish			15 l	
S III	1			546	smm/bird	complete	groove	snap	polish	*		20 l	
S III	1110	966	2	576	cam phal 1	proximal	groove	snap	waste				Surface
S II	1			632	cam phal 1	complete	perforate	wear		*		60 x 20	Plowzone
S III	1108	970	3	699	lm lng bn	section	groove	snap	polish	transverse		16 x 12 w	
S	1088	974	2D3	836	cam phal 1	complete	groove	snap	polish	interprox		10 x 10 x 12	
L	881.5	978.5	2	1063	lm lng bn	complete	groove	snap	polish	*		12 long	
S II	1094	970	2	1195	bird/smm	complete	groove	snap	polish			8 x 8.7 long	Pit
S	1092	968	2	1227	lm lng bn	complete	groove	snap	polish	*		10 long	
L	889.1	971.5		1273	cam phal 1	complete	groove	snap	waste				
S	1094	972	3	1276	smm/bird	complete	groove	snap	polish	*		10 long	Pit
S II	1096	970	3	1285	sm bird	complete	groove 2x	snap	polish			10.1 l	
S	1099	966	T2	1310	bird lb	complete	groove 2x	snap	polish				
M	976	1037	4	1354	smm/bird	complete	groove 2x	snap	polish	*		10 l	
M	FL 11152			1357	smm/bird	complete	shape floor	wear	polish	*		13 long	Plaster
M	976	1037	4	1361	smm/bird	complete	groove 3x	snap	polish	*		10 long	Pit
M	976	1037	4	1361	smm/bird	complete	groove 2x	snap	polish	*		13 long	Pit
BLANKS FOR TUBULAR BEADS: CUT CAMELID PHALANGES													
S	1090	968	3B	868	cam phal 1	distal	groove	snap			digested		
S	1117	966	9	873	cam phal 1	distal	groove	snap	waste			250 l	
S	1090	968	3C	874	cam phal 1	distal	groove	snap	waste				
S	1092	978	E-3	1302	bird hum	section	groove	snap	waste				
BONE TUBES													
L	1			87	cam femur	complete	groove	snap	waste	*		80 x 70	
L	888	978	2D	88	cam femur	proximal	groove	snap					
SIII	1110	972	2/3	522	lm lng bn	section	engrave pit	polish					Ashy fill/
S III	1088	972	3	555	lm lng bn	section	shape	polish	groove 3x				
S	1090	968	2B	674	lm lng bn	section	groove	snap	engrave	ext/int			
S	1090	968	3A	849	cam femur	complete	groove	snap	waste				
S	1086	974	4	1248	lm lng bn	section	groove	snap	polish	*			
S II	1046	970	3	1283	cam mtt	section	cut fill	shape	polish				Clay pit
S	1092	978	4	1321	lm lng bn	section	groove	snap		*			Unknown
L	885.25	971.5	2	1329	cam phal 1	dist	groove	snap	shape				
DECORATED BONE SPATULA OR SPOON													
S III	8			636	lm lng bn	mid	thin	shape	engrave	*		80 x 10	Ashy fill

TABLE 9 Beads, Plaques, and Bone Tubes con't.

Site	Grid N	Grid E	Level	Locus	Raw Mat	Fragment	Tech 1	Tech 2	Tech 3	Striae	Modified	Metrics (mm)	Context
SHAPED BONE PIECES/PLAQUES													
S III	1112	970	2	505	lm lng bn	complete	shape	perforate	polish			16 x 4.5 th	Plowzone
S III	1112	972	2	518	cam innom	lateral	shape	worn	polish				
S III	1108	972	2	636	lm ?skull	section	thin	groove	polish				Ashy fill
S III	1108	972	2	636	lm ?skull	section	thin	groove	polish				Ashy fill
S III	1108	972	2	636	lm scap	section	groove	shape				1.5 th	Ashy fill
S III	1108	970	3C	785	lm innom	section	shape	wear	polish				
S	1112	966	5	840	lm lng bn	end	shape	wear	polish	oblique	burned		
S	1086	970	2C	862	lm cranium	complete	shape	wear	polish			50 x 25 x 2 th	Gravel fill
S	1092/4	972/4	3	1236	lm skull	section	cut	serrate	wear				

TABLE 10 Indeterminate Shaped and Worn Fragments.

SITE	GRID N	GRID E	LEVEL	LOCUS	RAW MAT	FRAGMENT	TECH 1	TECH 2	TECH 3	STRIAE	MODIFIED	METRICS (mm)	CONTEXT
INDETERMINATE WORKED OR SHAPED PIECES													
L	893.2	977.8	2	23	lm rib*	end	shape	wear	polish	transverse			
L	893.2	977.8	2	23	cam tibia	indet	shape	polish					
L	892	980	2	30	lm rib	end	polish			int. trans			
L	892	982	2	48	lm lng bn	lateral	thin	wear	polish	oblique		1.2 th	
L	890	982	2	49	lm lng bn	section	polish						
L	890	982	2	49	lm lng bn	lateral	wear	polish		transverse			
L	1			50	lm lng bn	indet				*		20 x 25	
L	890	978	2	57	cam phal 1	complete	shape						
L	890	980	2	74	lm lng bn	mid	wear						
S III	1112	972	2	518	lm	indet	shape						
S III	1110	972	2/3	522	lm cerv v	end	shape	polish					
S III	1112	968	3	551	lm rib	mid	wear	polish		internal			
S III	1110	968	2	568	lm rib	end	shape	polish		oblique			
S III	1108	970	2	634	lm lng bn	section	wear	polish		transverse			

Site	Grid N	Grid E	Level	Locus	Raw Mat	Fragment	Tech 1	Tech 2	Tech 3	Striae	Modified	Metrics (mm)	Context
Indeterminate Worked or Shaped Pieces (con't.)													
S III	1108	972	2	636	lm rib	section	wear	polish		indef	burned		Ashy fill
S III	4			636	lm lng bn	section	shape	serrate		*		25 long	Ashy fill
S	1086	970	2A	694	lm lng bn	section	polish				burned		
S III	1110	970	3A	716	lm rib/v	end	shape	wear	polish				
S II	1100	970	2C	738	cam phal 1	complete	wear						
S III	1112	968	3D	740	lm indet	end	shape	wear	polish		burned		
S II	1100	970	2C	744	lm lng bn	section	shape	polish			burned		Pit w/ bones
S III	1112	966	3B	778	cam mtt	distal	shape						Cache ?
S III	1112	966	3B	778	lm innom	section	wear	polish					Cache ?
S III	1112	966	3B	778	lm lng bn	section	polish						Cache ?
S III	1112	966	3B	778	lm lng bn	section	polish						Cache ?
S II	1098	978	3B	800	lm innom	section	wear	polish					Plowzone
S III	1110	968	3E	824	lm lng bn	section	wear				burned		Pit fill
S III	1112	966	4	837	lm innom	section	shape	wear	polish	oblique			Cache ?
S	1084-86	972	2B3	848	lm lng bn	lateral	thin	shape	polish		burned		Pit w/ bones
S	1084-86	972	2B3	848	lm lng bn	lateral	thin	shape	polish		burned		Pit w/ bones
S	1084-86	972	2B3	848	lm cran	section	shape	wear	polish	external			Pit w/ bones
S	1088	968	3A	852	lm lng bn	lateral	wear	polish					Gravel fill
S	1086	970	2C	862	lm lng bn	section	wear	polish					Gravel fill
S	1094	970		1187	lm lng bn	end	shape	wear		*			Plowzone
S	1092	970	2	1190	lm long b	indet	thin	shape	groove			1 th	
S	1092	970	2	1190	lm	indet	shape	groove	polish				
S	1092	970	2	1190	lm	lateral	thin	groove	polish			15 l x 1.3 th	
S	1092	974	2	1194	lm	indet	shape	wear			burned	10 x 2	
S	1092	968	T4	1229	med m lb	end	shape	polish					
L	897	969	2	1341	cam mtp	indet	groove	shape	polish				

Legend

lm = large mammal
cam = camelid
smm = small mammal
medm = medium mammal
lng bn = long bone
indet = indeterminate
longitud = longitudinal
int, ext = internal and external

scap = scapula
phal = phalanx
hum = humerus
innom = innominate (e.g., a pelvis bone)
mtp = metapodial (e.g., a metacarpal or metatarsal, when they cannot be determined)
mtc = metacarpal
mtt = metatarsal
fem = femur
mand = mandible

and legs of a crouching or walking animal facing to the left, with three toes on each foot and spots on the knees. All four edges of this piece are broken (see figure 30). The animal would have been facing the end of the tube, with the scene running from end to end rather than around the piece like others that have been illustrated. The toes and square areas are a good match for those of the Pucara feline on a stele from Velille illustrated by Chavez (1988).

A category of 9 (2.2% of total) trimmed and shaped bone pieces has been tentatively identified as plaques to indicate their general shape and size. Most of these were made on naturally flat bones such as skull or pelvis which had then been thinned, shaped, and polished into pieces with rounded outlines. Few of them are complete enough to reconstruct the size or shape of the original worked piece though one was probably about 5 by 2 cm and another was larger. No traces of wear or use help us in interpreting these pieces. They could be pieces of ornaments, small dishes or palettes, offering vessels, or snuff paraphernalia. Of this small sample, most come from the Santiago sector of the site.

A single example of a bone spatula, spoon, or similar object is unique also for its elaborate surface decoration (Locus 636, from Santiago). This broken midsection of a flat piece has been examined from a photograph only, and the broken section shows a piece that was about 10 mm wide and more than 80 mm long (figure 31). One end shows where a wider section (the bowl of the spoon?) had broken off. The surface of the object was carefully prepared and had been decorated with fine (pigmented filled?) dot-in-circle incising. While this decoration is lavish by Chiripa standards, it is common in a wide range of utilitarian items in the (mostly later) Pachacamac collection.

Indeterminate Fragments

A number of worked or shaped pieces (n=49, 12.1% of total) were too fragmentary or eroded to permit any useful speculation as to the function of the tool or even, in some cases, the orientation of the working edge (table 10). About half of these pieces were fragments of long bones, while the other half was made from other large mammal elements such as pelvis or skull. The most generalized tool categories such as the long bone tools and awls are most likely to be included in this group, since such tool categories as the net gauges have such characteristic features that even tiny fragments of them were recognizable. The modification visible on these indeterminate fragments was predominately shaping and wear of a natural broken edge.

Archaeological Context of Bone Implements

The analysis of the archaeological contexts of these bone artifacts is just beginning. At this point, we can see the pattern of bone tool diversity and abundance at the level of the individual locus. Most deposits yielded one or fewer pieces of worked bone per locus. The concentration of tools in Locus 636 (an ashy pit fill with 12 bone tools including 3 plaques and the decorated spatula), Locus 837 (occupational matrix with 9 bone tools including a comb, a toggle, and 3 long bone tools), Locus 848 (a pit with a concentration of animal bones with 7 bone tools including 2 gauges and a mandible scraper) and Locus 778 (occupational matrix with 10 bone tools including the one antler tine tool and other long bone tools) may indicate caches or activity areas. Locus 536 was a burial offering that included bone shuttle; and Locus 565 was a female Early Chiripa burial offering that included 2 combs, a gauge, and a rounded long bone tool. Locus 1275 was a bone-filled pit that included 2 awls and 2 long bone tools.

The next step in this analysis will be to compare the incidence of bone tools with the volume of deposit and the overall bone density to identify concentrations in the context of the entire assemblage. This may be combined with a consideration of possible temporal change in the bone tool assemblage. We may also be able to identify spatial clustering of specific tool types or activity sets in one area of the site or between areas.

In a preliminary comparison of the Llusco and Santiago samples, most categories of bone tools occurred in roughly similar proportions. This may support a reconstruction of a similar mix of domestic and ritual activities in these two sectors of Chiripa. Bone tubes and beads are evenly distributed between the two areas, for example. Of the rarer pieces, Santiago, with its

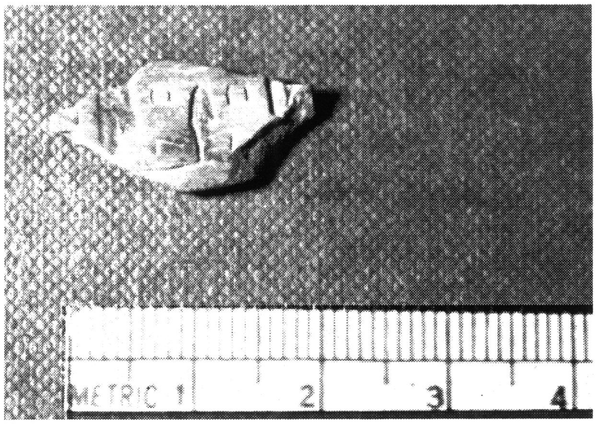


FIGURE 30 Fragment of engraved bone tube with feet of feline figure (Locus 522).

FIGURE 31 Bone spatula or spoon.

larger sample, yielded the only spatula, and had a higher proportion of the plaques (3% of the Santiago sample and 1% of the Llusco sample were plaques). Of the more general implements, the two areas differ noticeably in the incidence of awls (12% of the Santiago sample and 7% at Llusco) and the incidence of blunt long bone tools (10% of the Santiago sample and 31% at Llusco).

Craft Production and Household Organization

The analysis of bone tool production and use is in progress. The stone tool assemblage from the site that is being analyzed now will be an important set of data for understanding the production of the bone tools. Both chipped and ground stone tools appear to have been used to work the bone tools at Chiripa. Matthew Bandy (personal communication) has noted in a preliminary examination that very few burins were identified from Chiripa, despite the amount of fine scoring and engraving that was being done. The predominance of expedient bone tools over formalized bone tools at the site may match a predominance of expedient flake tools used in bone tool production.

The determination of the level of craft production is a subjective reading of the time, skill, and planning needed to produce some of the objects seen in this sample. Several types of implements, including the netting gauges, the notched and perforated pieces, the beads, and the bone tubes, represent a level of production much higher than the long bone tools and awls that make up the bulk of the sample. By tracking the manufacture and discard of these types across the site and over the periods of its occupation, we will be able to follow specialized workers, households, or activity areas.

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Paleoethnobotanical Evidence

WILLIAM T. WHITEHEAD

THE ANALYSIS OF plant materials from water flotation processing allows for the study of human plant use activities that may not be readily apparent from screened excavation materials. The primary purpose of flotation is to recover charred plant remains, however other critical classes of material are also recovered such as bone and lithic debitage. This section will outline our basic methodology, some preliminary results along with a brief disucssion of these results, and our goals for future work of paleoethnobotany at Chiripa.

METHODS

In the Field

Water flotation is implemented at Chiripa as an integral part of the excavation research design. The standard excavation practice includes the collection of at least one soil sample from every excavated locus, except for the plowzone contexts. These soil samples are processed by water flotation to recover charred organic plant remains, sub-centimeter-sized artifacts, and to provide information on the materials not recovered by the traditional screening process. Our standard field procedure requires the excavators to sample each locus by collecting one 10-liter point-provenienced "bulk" flotation sample. A "bulk" soil sample is a single 10-liter block of soil, with a recorded x, y, z provenience (Popper and Hastorf 1988). From certain contexts, such as use-surfaces or middens, another 10-liter "scatter," or average soil sample is collected. A "scatter" sample is a collection of soil from throughout the locus, creating an average view of what was deposited within the locus (Popper and Hastorf 1988).

Additionally, across occupation surfaces, many bulk soil samples are taken, usually one sample every 1 by 1 m area but at times we increase the number to one sample every 50 cms. These different sampling strategies, tallied separately but taken together, will provide a broad view of the artifact distribution from all locations and in-depth information about specific locations.

The mechanized water flotation system used at Chiripa is a modified SMAP setup (Watson 1976), with several processing steps added to the basic technique to increase the speed and amount of charred plant material recovered from each flotation sample. Shaking and bouncing the inner flotation bucket in the water, like in an unmechanized system, is performed to speed up the flow of silts through the bottom inner screen, and a siphoning procedure is done near the end of the flotation process to recover carbon in the flotation water that does not rise to the surface (Gumerman and Umeoto 1981). Christine Hastorf built the machine used at Chiripa in 1989 for the Wila Jawira project. We gratefully acknowledge Alan Kolata for granting permission to use this machine.

In the Laboratory

Once the sample is clean and dry, a crew of Chiripa workers sorts the heavy fractions in the on-site laboratory to extract cultural and ecological artifacts. Each heavy fraction is moved through a series of brass geological sieves with mesh sizes of 4 mm, 2 mm, and .5 mm, with the remaining smaller fraction caught in a lower pan. All fractions are sorted for bones, fish scales, charred plant material, ceramics, lithics, metals, and all other artifacts. There is some selectivity in the artifact removal process due to what is useful in analysis. Ceramics are removed only from the 4 mm fraction. Burned soils, adobe pieces, lithics, and bones are removed from the 4 and the 2 mm sieves. Plant remains are collected from all screen sizes of each heavy fraction. These plant remains, along with the plant remains from the light fractions, are analyzed at the University of California-Berkeley Archaeobotany Laboratory with the generous help of undergraduate and graduate students.

Previous Research at Chiripa

The current project is not the first paleoethnobotanical work completed at Chiripa. In 1934 excavations by Bennett (1936) and later excavations by Kidder (1956), report noticeable quinoa and potato fragments found in the bins of the structures on the mound. In Kidder's case, some of the botanical remains were radiocarbon dated by the University of Pennsylvania. In 1974 and 1975, David Browman (1986) floated soil samples from his excavations on the mound and presented some observations. First, the following taxa are represented: *Chenopodium*, Grass seeds, *Malvastrum* species, *Amaranthus,* Cactaceae, *Scirpus, Juncus, Carex, Lepidophyllum, Plantago, Polygonum, Vicia,* and *Sisyrinchium.* These same taxa are also represented in the TAP project flotation samples with the addition of many more species (see table 11).

Browman also found tuber and other starchy root plants, but these have not been identified to species. We also have extracted storage root tissues that are in the process of being identified. Browman observed that the *Chenopodium* seeds increased in diameter through time, but the mean sample size was not as large as modern domesticated varieties. Dung was also found in Browman's flotation samples, along with many taxa of wild or weedy seeds. This observation makes the direct link between the plant taxa in the flotation samples and human activities more complex because we must remember that the inclusion of any seed may be from human or animal dung, and other natural or unintentional processes (Miller and Smart 1983).

Browman's publication on the plants from the site notes that agricultural production is evident by the taxa representation. Further, he concludes that the diet reflected by the plants would be sufficient in protein and other nutrients when added to the faunal resources. These results and interpretations are not in question. Nonetheless, further excavation and analysis of plant remains from identifiable contexts such as domestic, ritual, and midden deposits should not only expand the taxa list that Browman documented for the site but provide new interpretations and questions to be addressed about past plant use.

Results

From the 1992 season 522 flotation samples were collected and processed and from the 1996 season 390 flotation samples were collected and processed.

Table 11 List of species recovered from Chiripa flotation samples. Taxa with stars before them are taxa not listed in previous investigations.

Taxa

Amaranthaceae
- *Amaranthus* sp.

Asteraceae
- * unknown sp.

Boraginaceae
- * unknown sp.

Cactaceae
- *Cereus* sp.
- unknown sp.

Chenopodiaceae
- *Chenopodium* sp.

Brassicaceae
- * unknown sp.
- * *Rubus* sp.
- *Lepidium* sp.

Cyperaceae
- *Scirpus* sp.

Euphorbiaceae
- * unknown sp.

Fabaceae
- * Wild Type

Rubiaceae
- * *Galium* sp.
- * *Relbunium* sp.

Labiateae
- * unknown sp.

Malvaceae
- *Malvastrum* sp.

Oxalideae
- * *Oxalis* sp.

Plantagenaceae
- *Plantago* sp.

Poaceae
- grass stalk
- * *Dactyloctenium agyptium*
- * *Stipa* sp. ichu
- * *Zea mays* kernel
- * *Zea mays* cupule
- unknown spp.

Potamogetonaceae
- * *Potamogeton* sp.

Solanaceae
- * unknown sp.
- * *Nicotiana* sp.

Verbenaceae
- * *Verbena* sp.

Floral head - unknown species
Stem
* "Kiana" unknown leaf
Lump
Tuber
Dung
Wood

Defined unknown seed types
- * unk 224
- * unk 264
- * unk 265
- * unk 270
- * unk 280
- * unk 308
- * unk 317
- * unk 318

Montículo: House 5

Six samples from House 5 were analyzed. Radiocarbon dates run on *Chenopodium* seeds from House 5 loci give a calibrated age range of 400 to 200 B.C.

To simplify the interpretation process three plant categories are presented for this house: seeds (food and non-food types), tubers (unidentified as of 1998), and fuels (wood and dung). These basic types are functionally much different, and the inclusion of each species on a pie diagram would introduce a clear view of the data. The pie charts in figure 32 show the relative proportions of these three plant types based on total adjusted observations, with the observed counts noted in the lower left of the figure. The individual pie slices represent the three basic types of charred remains, seeds, tubers, and fuel, summarizing the sorted materials. Seeds from both domestic and wild plants, tubers (whole tubers and tissue fragments that derive from starchy storage plant parts), and fuels/construction material (wood, dung, grass stalks) were all found in these bin samples.

With 20 identified plant taxa, the majority of the plant material found in this area's flotation samples are seeds. *Chenopodium* seeds make up the bulk of the counted items. One of the ongoing problems with the Chiripa flotation materials is the high number of grass seed taxa that are as yet unidentifiable to genera or species. We also have similar problems of species identification with the Cyperaceae seed varieties in the samples. Further, this seed type can include members of not only the Cyperaceae, but also the Juncaceae and the Polygonaceae.

In the project completed by Lennstrom and Hastorf (1989), different signatures of plant deposition were found in Inka storage structures (*qollqa*) versus habitation structures. Their paper demonstrates some taxa overlap between storage areas and habitation zones, however the number of weedy species in storage areas was much lower than in houses, creating a different signature for each of these two contexts. If we assume that many taxa might reflect more activities and fewer taxa reflect fewer activities in the assemblages, we can propose some provocative interpretations of the samples from House 5. The starred taxa in table 12 are characteristic of storage areas but were found in both the bins and floor sample of House 5. Interestingly enough, the taxa diversity is much greater in the bins than on the central floor. This initially suggests that the floors do not reflect domestic material. For example, the flotation sample from Locus 1432 on the house floor (see figure 32 for location) illustrates signature of a more non-domestic or selective activity type. Here we see low diversity and few weedy taxa. This sample has a large number of *Chenopodium* seeds but relatively few other taxa compared to most of our Chiripa samples. If we allow ourselves to extend the general pattern of storage versus habitation to the Formative times, we could argue that the plant taxa frequencies from the floor of this upper house structure are more characteristic of storage or other non domestic activities rather than general domestic activities.

If we focus on the *Chenopodium* seeds themselves, we see that the ratio of large diameter seeds, those greater than 1.18 mm, is higher in the House 5 samples than in the rest of the samples from the site. This higher ratio of larger seeded *Chenopodium* and the presence of other food taxa, like tuber fragments, supports Mohr Chavez's hypothesis that the Upper House structures probably included storage activities (1988). The floor flotation sample we have analyzed suggests to us that these floors did not receive typical domestic material.

Our soil samples from the bin area are ambiguous, however, because they are not the actual residues from the bin floors but what was filled into them after the house was burned and abandoned. The bin flotation samples, e.g., Locus 1431, have many more taxa than the floor sample did, suggesting a more domestic type deposit. We believe that these samples actually come from fill above the floor, reflecting other contexts.

Montículo 1A Area

This excavation of the mound, presented by Matt Bandy in chapter 9, dates roughly to 700-400 B.C., and is a complex layering of floors and fill, with features occurring on the floors that were excavated separately. In table 13 the floors, features on the floors, and the fill levels show a much different picture of activities than the

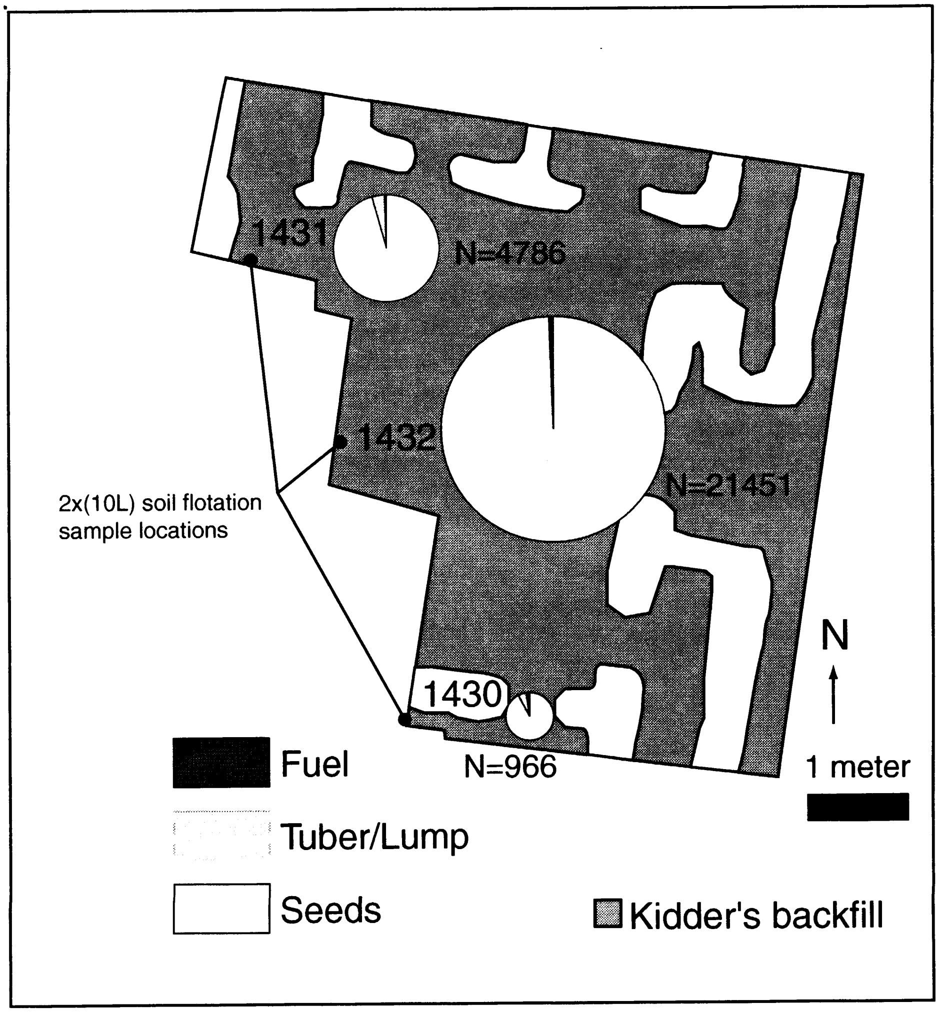


FIGURE 32 Pie diagrams of functional plant groups from House 5 on Montículo.

activities of House 5 just presented. These structures are earlier than the upper house level although they still date to Late Chiripa (see chapter 11). More taxa are represented in these house floors (26 taxa) than in House 5. The density of these remains, however, is low. Two points should be stressed about these floor data. First, the burning events that occurred on the floor have preserved a large number of grass genera with no dung found. The only identifiable dung found in the structure is from the plaster floors, and this is in small quantity (19 pieces all smaller than 2.00 mm found in one flotation sample only). Second, the taxa recovered from the floors versus from the fill between floors are similar. The density of analyzed material in these two contexts differs, with 6 observations per liter from the floors versus 13 observations per liter from the fill. With only 6 pieces of carbon per liter of soil, I would characterize these floors as sparsely covered with plants when compared to the fill between the floors. All of these mound structures seem to have sparse plant remains.

LLUSCO

Materials from the Llusco excavation area are given in table 14. The Llusco area, in comparison to the Montículo structures, is a semisubterranean structure reported on by José Luis Paz in chapter 7. This outdoor enclosure floor seems to have been kept just as clean of materials as the Montículo floors on the interior of the lower house levels. When we compare the plant evidence from the floor versus from the fill at Llusco, we find that again, the Llusco floor samples have a much lower taxa count (Floor 19 versus Fill 41). Further, the plant densities from the floor are roughly half that of the fill (Floor 14 counts/liter versus Fill 38 counts/liter). This suggests that midden was used as fill and that this

TABLE 12 Species and counts of carbon recovered from House 5 flotation samples.

Taxa	Bin Locus 1430	Bin Locus 1431	Floor Locus 1432	Taxa Total
Cactaceae *Cereus* sp.		3		3
**Chenopodiaceae Chenopodium*	785	4506	21358	26649
Cyperaceae	1			1
Cyperaceae *Scirpus* sp.	1	3		4
dung	1			1
Fabaceae wild	3			3
floral head	3			3
Galium sp.	2			2
grass stalk			3	3
Lepidium sp.	1			1
lump	48	138		186
*Malvaceae	5	39		44
*Poaceae	13	15	16	44
*Poaceae *Stipa* sp. ichu	5	6		11
Relbunium sp.	2			2
*tuber	7	55	54	116
twig	1	1		2
unidentified seeds	70	3		73
unknown	1			1
Verbenaceae *Verbena*	2			2
wood	15	17	20	52

* Starred species are characteristic of storage areas from Lennstrom and Hastorf (1989).

fill was always more dense with burned refuse than what was left on floors.

Santiago

The data from the Santiago B16 surface, reported on in chapter 8, is presented in table 15. The B16 surface is a difficult area to analyze due to the fact that the surfaces are extremely diffuse and hard to identify. Bio-turbation seems to have been more active here as well. The area has similar plant taxa representation as the other areas, however the density of the remains was much higher than in the other areas discussed (101 items/liter). The density is even higher than the midden fills from elsewhere on the site. This suggests that domestic activity involving intense burning events and leaving representations of diverse species occurred here. However, from our preliminary analysis of the plant remains, we have yet to detect a clear pattern of spatial use across B16.

Discussion

The results given so far are by taxa presence and counts per liter for the sectors we consider to be floors or surfaces from the excavated areas. Using the density of seeds as an indicator of general use of these different surfaces, we see that the B16 surface has 80 seeds per liter while the

TABLE 13 Species and counts of carbon recovered from from excavation area Monticulo 1A flotation samples. Column heading titles are as follows: plaster floors (PF), fill between floors (FF), burning events on floors (BF).

Taxa	PF	FF	BF	Taxa Total
Asteraceae			2	2
Cactaceae *Cereus* sp.		1	1	2
Chenopodium sp.	298	950	1536	2784
Cruciferae			8	8
Cyperaceae	5	9	7	21
Cyperaceae *Scirpus* sp.			12	12
dung	19		0	19
Fabaceae Wild Type	4	7	11	22
Galium sp.		2	1	3
Dactyloctenium agyptium			1	1
lump	70	30	128	228
Malvaceae	28	185	703	916
Poaceae	33	76	1025	1134
Poaceae *Stipa* sp. ichu	7	22	160	189
Zea mays cupule			1	1
Relbunium sp.		1	1	2
Solanaceae	1		27	28
Solanaceae *Nicotiana* sp.		1	0	1
tuber		9	36	45
twig	1		8	9
unidentified seeds	47	32	167	246
unk 319		1	0	1
unknown			1	1
unknown 265			32	32
Verbenaceae *Verbena*	1	1	3	5
wood	79	438	39	556
Total Count	593	1765	3910	6268

other areas, Llusco and Montículo have 13 and 4 seeds per liter. This supports the interpretation that the Llusco and Montículo areas were more likely to have been special use or irregular-use spaces. These results suggest that these two structures were kept remarkably clean of debris or that they were not used in the same ways or as often as the B16 area. We have seen this pattern in the excavations where both surfaces have looked remarkably clean of burned remains. Visual observations often do not reflect the true nature of charred macrobotanical remains in the soils, but in this case, the archaeobotanical materials support the visual excavation information.

The materials found in the Montículo and Llusco floors appear to be of no special origin or composition but seem to be of the same taxa and crude proportions as other areas of the site. The debris on the Montículo and Llusco floors are then likely to have been incorporated in the use of the structures not overtly from ritual use but from being in contact with human feet and other materials that can track and move small pieces of soil and debris from one area of the site to the other. The taxa found in the three areas are similar, with at least 20 plant types from B16, 16 from Llusco, and 9 taxa from Montículo (tables 13, 14, and 15).

What is notable from these data is that the exposed Llusco structure floor is almost as clean as the covered Montículo Lower House floors (Mont. 1). This finding enhances our interpretation that the Llusco structure is a ceremonial area and activities associated with daily living activities were not going on here.

TABLE 14 Species and counts recovered from excavation area Llusco. Column headings show counts of plant remains from the Late Chiripa plaster floor versus fill.

Taxa	Llusco Plaster Floor	Llusco Fills
Amaranthaceae *Amaranthus* sp.	2	6
Asteraceae		8
Boraginaceae		5
Cactaceae *Cereus* sp.	1661	31
Chenopodiaceae *Chenopodium* sp.	3	11649
Brassicaceae	22	12
Cyperaceae		193
Cyperaceae *Scirpus* sp.	19	1
dung	33	122
Fabaceae wild	3	290
Galium sp.		44
"Kiana"		1
Labiateae		1
Lepidium sp.		1
lump	251	4431
Malvaceae	261	2811
Oxalideae *Oxalis* sp.		4
Plantagenaceae *Plantago* sp.		2
Poaceae	251	1531
Poaceae *Stipa* sp. ichu	39	303
Poaceae *Zea mays* kernel	1	1
Potamageton sp.		2
Relbunium sp.	5	134
Rubus sp.		1
Solanaceae	4	17
Solanaceae *Nicotiana* sp.	8	35
tuber		39
twig		49
unk 264		1
unk 270		4
unk 308		1
unk 317		1
unk 318		1
unidentified seeds	302	2854
unk 224		1
unk 280		4
unk 317		1
unknown 265		1
unknown unidentified seeds	6	33
Verbenaceae *Verbena* sp.	6	126
wood	68	479
Grand Total	2945	25231

TABLE 15 Species and counts recovered from excavation area Santiago B16 surface.

Taxa	Total
Cactaceae *Cereus* sp.	14
Chenopodiaceae *Chenopodium* sp.	5897
Brassicaceae	2
Cyperaceae	67
dung	71
Euphorbiaceae	1
Fabaceae wild	72
Galium sp.	17
Lepidium sp.	4
lump	1769
Malvaceae	1670
Poaceae	377
Poaceae *Stipa* sp. ichu	102
Potamageton sp.	2
Relbunium sp.	182
Solanaceae	32
Solanaceae *Nicotiana* sp.	2
stem	4
tuber	2
twig	6
unk 317	1
unidentified Seeds	1078
unknown 265	25
Verbenaceae *Verbena* sp.	12
wood	634
Grand Total	12043

SUMMARY

Flotation materials from these three excavation areas show three general patterns. The Montículo House 5 floor and bins have different taxa composition and densities. The Llusco enclosure and Montículo 1A floor excavation areas are low in charred plant remains, almost to the point of being charred plant free, which would strengthen the interpretation of these areas as being of special use as opposed to domestic structures. The materials from the B16 surface area have a similar pattern to previously reported patterns of domestic activities in other sites.

These results are preliminary and will be modified and expanded with further excavation, analysis, and interpretation. Taxa identification and the analysis of tubers, unknown seeds, and wood will be conducted and reported on in the future. The analysis of the materials from Chiripa provides a unique opportunity to study the plant use of an early settled community; these results should prove valuable to all altiplano prehistoric research.

14

Herds, Fish, and Fowl in the Domestic and Ritual Economy of Formative Chiripa

KATHERINE M. MOORE, DAVID STEADMAN, AND SUSAN DEFRANCE

INTRODUCTION

THIS CHAPTER PRESENTS THE results of a pilot study of Early Chiripa phase bone remains from the 1996 excavations at the Santiago sector of Chiripa and describes the ongoing research program for animal bones of the Taraco Archaeological Project. Analysis of animal bone material from the 1992 season and of other components excavated during the 1996 season is in progress. Of the three authors of this work, Katherine Moore is responsible for the work on the large mammal remains, Susan deFrance for the fish remains, and David Steadman for the remains of birds, small mammals, and herps. Previous work on animal bones from the site has been undertaken by Jonathan Kent (1982) and Darwin Horn (Erickson and Horn n.d.) using material from the Montículo complex.

We approach our study with several goals. We wish to contribute to a better understanding of the daily activities and economic and ecological constraints upon the prehistoric populations of Chiripa. We hope to identify the most important animal foods and estimate their relative dietary contribution. Taking these goals together, we hope to describe the cultural ecology of the southern Titicaca lakeshore and offer insights into the ritual system that is thought to have emerged there.

MATERIALS

The total bone assemblage from the 1992 and 1996 excavations amounts to several hundred thousand specimens. The material discussed here is a small sample selected from the total. The sample selected for this pilot study was identified based on an examination of Early Chiripa ceramic samples from the Santiago sector of the site (primarily B16). This surface includes several pits, at least one burial, several hearths or dumps from hearths, and fill around a wall of a structure. We have begun our analysis of the 1996 remains by examining the bone recovered from this well-dated and relatively well-understood component. The collection includes screened samples from 36 loci; a smaller selection of 10 flotation samples from the same units was also analyzed (tables 16 and

17). In total, a sample of about 1500 mammal and bird bones was studied along with about 20,000 fish bones.

The Bone Assemblage As Dietary Remains

One of the most important goals of our work is to estimate the relative importance of dietary components at Chiripa. In previous work at Chiripa estimates of the importance of large mammals in relation to fish ranged from 2 to 12% fish (Kent 1982, 1989, Erickson and Horn n.d.). In deriving dietary information from bone remains, problems arise when standard 1/4 inch mesh screens fail to recover the bulk of a probable important dietary component, small fish. Finer scale recovery techniques were used together with this standard screening program to improve the recovery of fish and small bird and mammal remains.

Another issue is the difficulty in assigning taxa identification to large mammal bone. In the Andes, camelids (guanaco, llama, alpaca, and vicuña) are usually impossible to separate in fragmentary assemblages, and their fragmented bones are also difficult to separate from the bone of the common deer species in the region. Thus, there is a large category of unidentifiable "large mammals" whose remains clearly represented an important portion of the animal biomass obtained by prehistoric inhabitants. In this sample, 89% of fragments and 50% of the bone weight fell into an unidentifiable "large mammal" category. For the Santiago Early Chiripa phase dietary analysis, bones identified to the level of camelid were lumped with large mammal bone to give a general estimate of the importance of that ecological niche. Birds and small mammals were also lumped together, and fish remains were considered as one group.

The first step in our dietary reconstruction was to determine from the screened samples that meat from large mammals had made up about 93% of the diet (table 16). About half of the large mammal was securely attributed to camelids and the rest was assumed to be camelid (no post-cranial remains of deer appeared in the sample). The remainder of the animal economy was made up of birds and small mammals at 2.5% and fish at 3.6%.

The flotation samples from Chiripa revealed that the tiny bones of lake fish are much more common than the 1/4 inch screened samples would indicate. To improve the accuracy of our dietary and economic estimates, we worked backwards from the proportions of fish bones in carefully measured flotation samples to estimate how much fish bone had been lost from the screened samples. Proportions by weight of large mammal bone to fish bone from the flotation samples were applied to the amount of large mammal in the screened samples, producing an estimate of fish bone that had passed through the screen into the backdirt. When these missing fish bones were factored back into our dietary reconstruction, we were able to estimate that fish bone was more abundant by weight than large mammal bones for many of our test samples.

To dramatize the difference made by a full accounting of the fish, we calculated the biomass represented by the various dietary components (table 18). These estimates were made on bone weight determinations, following the techniques of Reitz et al. (1987). In a further phase of this study, we hope to refine these biomass estimates by using fish total length estimates rather than fish bone weights. Using only the sample of fish bone from the 1/4 inch screened samples, estimates for each locus for fish ranged from 2 to 30% of biomass or total meat weight. With the full sample of fish bone added to calculations of total biomass, the importance of fish in Early Chiripa fill and pits ranges from 2 to 94% of biomass. The average fish biomass becomes 67%. This finding parallels those from other sites where controlled recovery has been added to traditional excavation techniques. The proportions revealed by fine-screening force us once again to consider how important aquatic resources (marine and fresh water) have been in provisioning early sedentary societies. The importance of camelid meat in the daily diet is swamped by the use of fish as a staple. This is in line with expectations based on modeling ecological abundance and examining ethnographic accounts of how rarely Titicaca Basin herders slaughter their llamas (see Nachtigall 1966, for example; Horn 1984). We have identified small amounts of deer antler but suspect that it was obtained as a raw material for tools and not necessarily as part of a carcass.

TABLE 16 Santiago Early Chiripa Phase Animal Bone (screened sample, bone wt.)

Locus	Camelid Large Form	Camelid Small Form	Camelid Indeterm.	Large Mammal Indeterm.	Carni-vore	Small Mammal, Bird	Fish	Total wt. (g)
1198	400.1	28.1	8.6	46.2		3.4	77.2	563.6
1199				1.1		4.8	4.9	10.8
1235			1.1	33.8		0.3	2.2	37.3
1236		38.5	38.3	42.5	3.1	27.2	2.4	152.0
1238			22.5	15.4		0.7	0.8	39.4
1240				2.9				2.9
1244			3.7	25.6		0.7	0.7	30.7
1247			2.4	38.0		0.1	0.6	41.2
1248	49.5	40.6	60.1	157.1		3.7	0.8	312.0
1275		22.6	40.4	28.5		3.6	15.5	110.6
1276	66.7	6.8	23.4	17.7		31.7	15.0	161.3
1279				3.3				3.3
1281			2.3	20.3		0.2	0.2	23.0
1282	9.7		5.0	55.4		3.4	2.4	75.9
1285	66.5	10.4	31.0	61.0		1.4	1.2	171.5
1294	37.3	30.2	10.0	186.6		0.2	0.4	264.7
1301			6.1	29.6		2.3	0.6	38.7
1302	33.7	25.0	48.0	179.1		7.1	2.0	295.0
1305			1.9	64.6		1.0	0.4	67.9
1307		24.9	29.8	11.8		1.3		67.8
1316	5.9	5.7	42.0	46.1	5.5	0.2	0.5	105.9
1317	10.1		10.3	53.1		0.6	1.2	75.3
1319			2.0	38.3		1.1	0.2	41.6
1320	122.7	2.1	46.6	183.9		0.5		355.8
1322	20.0		12.2	49.3				81.5
1323	45.3	2.5	61.6	103.6		1.2	0.5	214.7
1324	26.7		0.5	57.5		0.7	0.7	86.2
1405				24.1			0.4	24.5
1406	7.8		13.5	35.0		0.4	2.2	58.9
1407	2.7		2.7	43.2		0.6		49.2
1408			1.8	3.7				5.5
1480				0.9			0.2	1.1
1483				60.7		0.9	2.0	63.5
1484		5.7	11.1	21.0		1.1	0.7	39.6
1496				0.6				0.6
1499				4.5			0.6	5.1
Total	904.7	243.1	538.9	1,746.0	8.6	100.5	136.5	3,678.5

The Camelids

The camelid remains at Chiripa are part of a remarkable archaeological and anthropological tradition. Effigies of llamas and alpacas in precious metals have been recovered from presumed offering sites around Lake Titicaca, camelid bones have themselves been recovered with associated underwater offerings in the lake, and Aymara folk practice makes use of dried fetal alpacas and llamas in several rituals. Unfortunately it is difficult even to reconstruct the basic economic patterns of hunting, herding, and caravan transport from the fragmented bones from most sites, including Chiripa.

The interpretation of camelid remains can be highly ambiguous since the skeletons of the four living species are difficult to separate objectively. The most common practice is to report the number of bones whose measurements fall above and below a series of decision rules or "cut-off points" originally provided by Wing (1972). This provides an estimate of the proportion of animals in the large size class (guanaco and llama) and the smaller size class (alpaca and vicuña), but it does not reveal whether the animals are wild or domesticated.

TABLE 17 Archaeological Context of Early Chiripa Fauna (1/4" screen only): Density, Burning, and Taphonomic Indicators.

Locus	Density L. mam. (gm/l)	Density Fish (gm/l)	Burned Bone % of wt.	Fragment wt. gm. (L. mam.)	Fragment wt. gm. Unburned	Fragment wt. gm. Burned	Fragment wt. gm. Calcined	Taphonomic History
1198	8.050	1.287	14.2%	6.0	11.5	2.4	1.9	
1199	0.037	0.163	0.0%	0.4	0.4			
1235	0.062	0.004	4.0%	1.7	1.8	0.7		
1236	0.314	0.006	8.1%	2.1	2.3	1.2		erosion, carnivore damage
1238	0.158	0.003	0.0%	7.6	7.6			
1240	0.048		0.0%	1.0	1.0			
1244	0.225	0.005	9.2%	1.3	1.4	0.7	0.8	
1247	0.238	0.004	25.7%	1.8	1.6	2.6		
1248	0.640	0.002	15.4%	2.2	2.5	1.4		erosion, rodent and carnivore damage
1275	1.144	0.194	50.3%	1.7	2.5	1.8	0.3	
1276	1.146	0.150	26.4%	3.2	3.8	2.2		
1279	0.165		0.0%	3.3	3.3			
1281	0.161	0.001	18.6%	1.6	1.7	1.4		
1282	0.539	0.018	3.3%	1.3	1.3	0.8		
1285	2.111	0.015	15.2%	3.2	3.3	2.9		
1294	1.651	0.003	41.7%	1.7	1.8	1.6	1.4	carnivore damage
1301	0.397	0.007	26.9%	1.5	1.5	1.6		
1302	0.866	0.006	19.6%	3.1	3.4	2.2		carnivore damage, digestion
1305	2.217	0.013	14.9%	1.1	1.1	1.4	0.9	
1307	1.108		59.8%	4.4	3.0	6.6		carnivore damage
1316	0.767	0.004	30.9%	1.4	1.4	1.6		carnivore damage
1317	0.525	0.009	7.5%	1.2	1.5	0.3		
1319	0.212	0.001	3.2%	1.6	1.6	1.3		
1320	1.269		13.8%	3.7	3.7	3.5	2.6	
1322	2.038		24.3%	3.3	3.6	2.5		
1323	1.065	0.002	2.6%	2.7	2.8	1.4		
1324	0.273	0.002	11.4%	1.9	1.9	0.9		
1405	0.201	0.003	23.2%	2.2	2.1	2.8		
1406	0.225	0.009	6.7%	2.6	2.6	1.9		carnivore damage
1407	0.810		10.9%	1.7	1.7	1.3		root etching
1408	0.079		0.0%	1.8	1.8			
1480	0.008	0.001	0.0%	0.9	0.9			
1483	0.319	0.010	9.6%	1.3	1.4	0.6		
1484	0.378	0.007	18.5%	2.1	2.4	1.4		
1496	0.030		0.0%	0.6	0.6			
1499	0.225	0.030	35.6%	0.9	0.7	1.6		
Averages	0.825	0.070	15.3%	2.2	2.4	1.8	1.3	

Domesticated or wild status has sometimes been inferred based on geographic range or date. The dental differences between vicuña and the other forms are also sometimes reported (see Wheeler 1984, for example). Ideally, we would like to be able to provide estimates of the proportions of the wild and domesticated species of camelids and to estimate the age and sex structures of the original herds. For the Formative periods in Bolivia, studying the appearance of domestic herds of llamas and alpacas is a key research goal. Using remains from the 1974-75 excavations at Chiripa, Kent (1982) used a discriminate function analysis to assign camelid species to measured bones. He found that 80% of the camelids were of the large form (that is guanaco or llama) and the rest the small form (alpaca with one specimen assigned to vicuña). In strata dating from about 1400 B.C., Kent identified domesticated llama.

Determinations of large and small camelid reported here come from the Wing decision rules for all the elements that have been studied (table

TABLE 18 Calculation of relative dietary importance of fish.

Locus no. of Flot Sample	Fish bone, wt. gm, 1/4" fraction from flot	Fish bone, wt. gm, < 1/4" fraction from flot	Fish bone, wt. gm, 1/4" screen sample	Fish bone, lost in 1/4" screen, re-constructed wt. gm	Total fish bone wt. gm; screened and and "missing"	Fish, % wt. in total screened sample	Fish Biomass (meat kg)	Fish Biomass, % of total meat
1238	0.1	4.6	0.76	35.0	35.7	48.5%	0.81	54.0%
1244	0.01	5.5	0.68	374.0	374.7	92.7%	5.47	90.9%
1276		0	15		15.0	11.6%	0.40	17.7%
1282	0.5	5.6	2.37	26.5	28.9	29.2%	0.69	36.3%
1302	0.1	7	2.04	142.8	144.8	33.6%	2.53	37.2%
1316	0.01	5.3	0.51	270.3	270.8	73.1%	4.20	71.8%
1404	0.8	5.9			6.7	27.3%*	0.21	26.9%*
1405	0.3	7	0.36	8.4	8.8	26.7%	0.26	36.1%
1478	0.5	3.2			3.7	21.9%*	0.13	39.8%*
1499	0.2	15.8	0.6	47.4	48.0	91.4%	1.04	91.0%

*No screened samples (100% of locus floated). Calculations based on flot samples only.

19). In addition, Moore is using here decision rules for carpal and tarsal bone (wrist and ankle) measurements based on previous work with collections in the Laboratorio de Paleoetnozoologia of the Facultad de Medicina Veternaria, Universidad N.M. de San Marcos in Lima in 1981 (see Malaga et al. 1976 for background on this sample). These auxiliary decision rules allow a significantly larger sample of measured bones to be studied, since many of the complete bones from Chiripa are not included in the Wing decision rule set. The main weakness with using carpals and tarsals for size determination is that it is impossible to securely exclude immature animals from consideration since these bones do not have multiple centers of ossification. The fusion of multiple centers of ossification at epiphysial lines is typically used to determine a bone's maturity (though it is known that these mature elements do increase in size with time after fusion has taken place). Note that such measurement schemes on mature bones provide size estimates for adults only, and provide no comparable determinations of size class for juvenile animals.

In the Early Chiripa phase Santiago sample, 65.2% of measured camelid bones were from large camelids (amounting to 80% by weight), a proportion lower but similar to that found by Kent (1982). This is concordant with data for presumed early herding communities from southern Peru reported by Miller (1979) and Wing (1972, 1977). Farther north in Peru, proportions tend to shift to a predominance of smaller forms (alpacas and/or vicuñas). At least one individual in the Early Chiripa sample was larger in most dimensions (width but not length of joints in the leg) than any comparative specimen in the collections that underlie these studies. A few loose teeth confirm the presence of the vicuña in the deposit, but dental remains are rare overall.

One archaeological measure that has been associated with herding domesticated camelids in the Andes is a high proportion of very young animals, presumably lost during the difficult wet season birthing period. Neither Kent (1982) nor I have identified this pattern at Chiripa, contrasting with the strong pattern in components of contemporary Peruvian sites such as Panaulauca (Moore 1989) and Telarmachay (Wheeler 1984, 1985). The majority of camelid remains in both studies represent animals who were older juveniles and adults. Of the 132 bones for which fusion status could be determined, 10.6% were from fetal or neonate animals, 38.6% were from unfused elements, and the remainder (50.7%) came from bones that were in the process of fusing or fused. This thumbnail sketch of the assemblage cannot be translated into estimates of the ages of the animals

TABLE 19 Early Chiripa Sample, Santiago: Camelid and Large Mammal Summary.

Identification		Total	% of Ct. and Wt.	Camelid Size Classes	
Camelid Large Form	Ct.	43	3.0%	Large form ct.	65.2%
	Wt. (g)	904.7	26.3%	wt.	78.8%
Camelid Small Form	Ct.	23	1.6%	Small form ct.	34.8%
	Wt. (g)	243.1	7.1%	wt.	21.2%
Camelid Form Indeterminate	Ct.	86	5.9%		
	Wt. (g)	538.9	15.7%		
Camelid Subtotals	Ct.	152	10.5%		
	Wt. (g)	1686.7	49.0%		
Carnivore	Ct.	2	0.1%		
	Wt. (g)	8.6	0.2%		
Large Mammal Indeterminate	Ct.	1296	89.1%		
	Wt. (g)	1746	50.7%		
Total Early Chiripa Large Mammal	Ct.	1450			
	Wt. (g)	3441.6			

since each center of ossification or bony growth has its own fusion timetable. The major impression drawn from these data is the ready availability of prime age animals. A slightly greater level of detail on camelid age structure is available for a few elements for which an adequate sample has been studied. For the first phalanx or toe bone, 1 of 14 specimens appeared to be from an animal less than three months, 2 from animals from 3 to 18 months, and 11 from animals older than 18 months. Little information can be gathered at this time on how old the adult animals might be. Once the bone of the skeleton fuses completely at about 3 years for camelids, the process of aging can no longer be tracked by this method. (Relative aging techniques for older animals rely on tooth wear observations, which we will apply to any dental remains that may be recovered.)

This pattern of adult animals could be consistent either with prime-oriented hunting or with a conservative (and fortunate in the face of usual disasters) strategy of harvesting domesticated animals as they reach their maximum weight. Abundant spinning and weaving equipment from the site indicate the importance of textile production, at least in the later periods, which we would expect to be associated with a relatively mature population of animals. No dental remains indicating advanced age (with deeply worn molars) have been observed in the sample so far. We are alert to the possibility of sacrificial slaughter but have no evidence from this sample. A faint seasonal signal can be derived from determinations of camelid age at death. Occupation during the wet season and early dry season may be inferred by the presence of the youngest age category. Occupation during the later dry and early wet season cannot be established using these data. Other seasonal data may later be available from camelid dental eruption data, from incremental structures in bones from various animals, and from bird migration and breeding patterns.

We know from other parts of the assemblage (the birds and small mammals, for example) that hunting was a persistent part of food gathering. Hunting and fishing smaller animals may have used simpler technologies and involved very different social organization than that used while hunting large game. Specifically, women and children could have collected eggs, netted fish, and set snares and traps within a short distance from the settlement along the shoreline.

Fish

As noted above, simple analysis of bulk remains indicates that fish were the major source of animal food for the site's occupants. Scales and bones of fish are common through the entire sequence. They typically represent very small species, probably less than 10 cm in length. The analysis of individual specimens of the fish bone has just begun. The modern fish fauna of Lake Titicaca is dominated by 23 endemic species of killifish in the genus Orestias, with various species being specialized inhabitants of the shallow-, mid-, and deep-waters (Parenti 1984). The great majority of fish bone appears to have come from several species of *Orestias*, though *Trichomycterus* (small, burrowing catfishes, Trichomycteridae) has also been identified. Fishing in Lake Titicaca is done with dip nets and seines today and was likely done this way in the past. Many bone tools from the site appear to relate to the tasks of net making, including finely made net gauges.

We plan to take the research on the fish bones in several directions. First, more precise identifications of species, or at the very least, determinations of the sizes of fish taken may allow us to identify specific niches or feeding conditions exploited by Chiripa residents. Second, the analysis of the density of fish remains and fish skeletal completeness will provide a picture of the daily routine of food preparation, consumption, and discard. Preliminary data on fish bone density are noted in table 17, indicating a pattern of uneven density of these remains. This level of detail is important since our concerns surround the operation of household economies within this (probably) ritual local context.

Birds

In contrast to the very low diversity of the fish and mammal remains, the bird fauna of Lake Titicaca is rich, including local species drawn to the lake margins and many migratory species (table 20). David Steadman, studying the 1992 materials, has identified an even more diverse archaeological bird fauna than is known from the area today, producing a list of 23 taxa from all components taken together. (The bird and herp sample discussed here includes later materials as well as Early Chiripa materials.) Aquatic birds are more important than terrestrial birds at Chiripa, emphasizing the economic importance of the lakeshore edge. These water birds include coots, grebes, and ducks, as well as larger birds such as the flamingo and the Andean goose. Species characteristic of both shallow and deep water are well represented. Many of these could have been taken with nets, snares, or bolas. The land birds include tinamous, doves, and flickers which were common prey for hunters throughout the Andes, and several passerines. In addition to bird bone, bird egg shell is a common find in flotation samples, indicating that lake edge nests were robbed for food.

Two bird specialists have visited the region around the site and noted the bird species and their habitats. Five of the birds represented among the bones from the 1992 excavations were not seen within 2 km of Chiripa during June-July 1996 field season (Kent et al. n.d.). These include a grebe, cormorant, goose, duck, and owl. As identification of the bird bones proceeds to more refined levels, this list of past birds is sure to grow.

Other Small Fauna

Finds of small rodents, reptiles, and amphibians are rare in this assemblage. The many hundreds of smaller mammal bones are primarily from rodents. These include caviomorphs, especially guinea pigs (two species of which potentially occur in the region; as well as cricetid rodents, such as the small mouse *Akodon* and a medium-sized mouse cf. *Phyllotis*). The small rodents include probable prey such as guinea pig-sized animals as well as owl prey such as mice. Ethnohistorically, larger rodents would have been taken in their burrows with sticks or snares. The excavators identified a number of complete rodent skeletons that have tentatively been identified as offerings or other ritual deposits (such entire or partial skeletons were recovered from loci 1194, 1276, 1292, 1487, and 1489). We cannot evaluate the possibility of the domestic guinea pig at this time.

The amphibian bones consist of what seems to be one species of small to medium-sized toad, perhaps in the widespread Andean genus *Atelopus*. The meat of these toads may be edible although their skin is toxic. The only reptiles recorded are a small species of lizard, perhaps *Tropiduros* sp., and a small colubrid snake, both of which are rarely represented in the bone at the site.

Animal Bone in the Archaeological Context

Our preliminary analysis of camelid and large mammal body parts suggests that the sample does not represent a full range of butchering waste. Weights of bone elements recovered were compared to weights of those bones from a known modern skeleton (data from Mengoni-Gonalons 1991) to examine relative skeletal completeness of the archaeological sample (table 21). Using bone weight rather than count allows us to make use of fragmented and unidentifiable bone which may still be identifiable to body part. Bones of the neck, pelvis, and lower limbs (radius, carpals, metapodials, and toes) are over-represented compared to their abundance in a whole camelid carcass; and the bones of the rib cage (in particular the meaty brisket portion carried by the sternum), back and upper limbs are under-represented. Two interpretations are possible: first, that the missing bones were discarded in another portion of the site and were not recovered; and second, that the missing bones were so fragmented by food processing and gnawing that their remains were identified as "unidentifiable" even though they were in fact recovered in this sample. These two possibilities are not mutually exclusive. Relative to the value of the meat and fat that would be associated with those skeletal parts, both high value bones (ribs and sternum) and lower value (axis and atlas) are under-represented (utility indices from Mengoni-Gonalons 1991). The majority of the high-utility parts are under-represented, suggesting that high fragmentation in cooking and consuming has destroyed them. It is difficult to account for the almost total non-representation of some very dense and resistant elements such as the distal humerus and the astragalus, however, without invoking some agent of differential transport (the part being left behind during dismemberment or carried off during distribution). Larger and more representative samples from other parts of the site should shed some light on this pattern. Small percussion flakes and abundant long bone scrap do indicate that processing of bones for marrow, a typical household activity, took place within the areas sampled.

Marks interpreted as cut marks were recorded based on visual inspection with the aid of a 10 power loupe. The surfaces of the bone were substantially intact, so this estimate of cut mark frequencies should be reliable (table 17). Nineteen cut marks were recorded, and comparisons with the rest of the assemblage reveal that 14% of the cervical vertebrae (n=3 bones with sets of cut marks recorded), 2% of the ribs (n=2), and 18% of the first phalanges were cut (n=3). Single incidences of cuts were observed on a thoracic vertebrae, a proximal radius, and a radial carpal. These were interpreted as marks left by skinning (radial carpal and phalanges) and dismemberment (vertebrae and radius). Seven cut marks were observed on the exterior of unidentifiable long bone shaft fragments; these cuts were likely to have been made while scraping long bones before cracking to remove marrow. In addition to these cut marks, remains of percussion fracture were also recorded (n=4). These sharp, hacked bits of bone debitage are thought to have been produced when bones are struck with enough force to crack open the medullary cavity of a long bone.

In addition, many cut bones were removed from the animal bone assemblage because they were bone implements or the waste from producing them. Most of the cut marks noted on bird bones (not part of the sample reported on here) were for producing bone beads. The same simple stone tool technology seemed to have been used to produce marks for butchery and for tool manufacture (with the marks on the bone tools being much deeper, repeated, and more carefully patterned). No indication of the use of metal tools on bone has been observed in this sample.

While cut marks are the classic indication of ancient butchery, they are only a small part of the behavior revealed by fragmented bone remains. Bones may be transported from the sample, as inferred above. In addition, bones change size and shape with continued fragmentation during their use-life at the site. Bone fragmentation in a particular deposit may reveal a complex of important cultural steps (cooking, fat rendering, site maintenance), as well as non-cultural ones (trampling, gnawing, burning, weathering) (Moore 1997, Stiner et al. 1995). The uniformly small fish

TABLE 20 List of species identified taken from Steadman's report and augmented. Calculation of representation of body parts.

Family	Species	Common Name	Habitat
Fish			
Cyprinodontidae	*Orestias* spp.	Killifish	Lake shallows
Trichomycteridae	*Trichomycterus sp.*	Burrowing catfish	
Amphibia			
Atelopidae	*Atelopus* sp.	Toads	
Reptiles			
cf. Tropiduridae	cf. *Tropidurus* sp.	Lava lizards	
cf. Colubridae	Species 1	Harmless snakes	
Birds			
Tinimidae	*Nothoprota* sp. 1 (large)	Tinamou	Quail-like, ground feeder
Nothoprota sp. 2 (small)	Tinamou	"	
Podicipidae	*Podiceps* sp. (large) *	Grebes	Typically, shallow water
Rollandia sp. (small)	Grebes	"	
	Rollandia cf. *micropterum*	Grebe	Flightless/ lakeshore & reeds
Phalacrocoracidae	*Phalacrocorax* cf. *brasilianus**	Cormorant	Diving waterbird
Ardeidae	*Nycticorax nycticorax*	Black-crowned Night Heron	Reed beds
Phoenicopteridae	*Phoenicopterus* sp.	Flamingo	Shallow water
Anatidae	*Cloephaga*	Andean Goose	High lakes and marshes
	Oxyura sp. *	Ruddy duck	Lakes, including open water
	Anas sp.	Teal/pintail etc.	Lakes, ponds, streams
Accipitridae	cf. *Buteo*	Hawk	Raptor
Rallidae	*Rallus* sp.	Rail	Shorebirds
Fulica sp. 1	Coot	Nest along lake edge	
Fulica sp. 2	Coot		
Charadriidae	*Vanellus* sp.	Plovers, lapwings	Open ground, marsh, lakeshore
Laridae	*Larus serranus*	Andean Gull	Breed in reedbeds
Columbidae	cf. *Metriopelia*	Black winged dove	Groundfeeding dove
Psittacidae	cf. *Bolborynchus*	Rufous parakeet/Andean parakeet	
Strigidae	*Bubo virginianus*	Horned owl	Nocturnal raptor
cf. *Ciccaba* sp. *			
Picidae	cf. *Colaptes*	Flicker	Groundfeeding insectivore
Passeriformes	Suboscine spp.	Songbirds	
Oscine spp.	Oscine songbirds		
Mammals			
Dasypodidae	Species 1(small)	Armadillo	Burrowing insectivore
Caviidae	Species 1	Guinea pig and related forms	Many habitats including rock piles and reedbeds
Cricitidae	*Akodon* sp.	Small mouse	
cf. *Phyllotis*	Leaf-eared mouse		
Canidae	*Canis* sp.	Unid. canid	
Camelidae	*Lama glama*	Llama/Guanaco/Alpaca	Puna grazers
Lama vicugna	Vicuna		Moist puna grazers
Cervidae	cf. *Hippocamelus*	Taruca deer	Grazer/browser

*Bird species not recorded within 2 km of Chiripa during survey June-July 1996 by A. Kent and T.A. Weber

TABLE 21 Representation of camelid and large mammal body parts, Santiago Early Chiripa phase sample.

Body Part	Sum of Elements in Early Chiripa Sample (g)	% of Total Bone Wt.	Wt. of Element in Llama Skeleton	Element as % of Wt. of Total Skeleton	Observed/ Expected, % recovered/ % in skeleton	Relative Food Value of Element.* ribs = 100 **
Skull	118.8	4.96%	482.6	5.69%	0.87	12.7
Mandible	20.8	0.87%	220.5	2.60%	0.33	5.3
Axis	3.5	0.15%	72.8	0.86%	0.17	4.2
Cervical vertebrae	550.9	23.00%	569.8	6.72%	3.42	64.1
Thoracic vertebrae	86.7	3.62%	438	5.17%	0.70	61.7
Lumbar v. & Sacrum						
	81.1	3.39%	552	6.51%	0.52	78.0
Pelvis	373.2	15.58%	393.6	4.64%	3.36	40.1
Sternum	30.0	1.25%	748.8	8.83%	0.14	99.0
Ribs	175.9	7.34%	1171.2	13.81%	0.53	100.0
Scapula	14.8	0.62%	364.8	4.30%	0.14	41.6
Humerus	7.7	0.74%	630.8	7.44%	0.10	36.7
Radius	256.0	10.69%	499.2	5.89%	1.82	23.0
Carpals	71.4	2.98%	80	0.94%	3.16	11.8
Metacarpals	45.8	1.91%	288.6	3.40%	0.56	6.5
Femur	113.4	4.73%	626.4	7.39%	0.64	75.9
Tibia	39.1	1.63%	551.6	6.51%	0.25	47.0
Tarsals	134.4	5.61%	231.6	2.73%	2.05	21.8
Metatarsals	136.8	5.71%	208.8	2.46%	2.32	11.5
Phalanges, 1-3	125.3	5.23%	294.4	3.47%	1.51	37.6
Total Identifiable	2,395.6		8.4792			
Indeterminate Fragments: Bone tissue type						
Long bone shaft splinters		1,053.2				
Articular ends		116.2				
Indeterminate bone tissue		164.0				
Total		1,333.4	38.7%	of total large mammal sample		

* Calculated from data in Mengoni-G. (1991:Table 3) ** Data from Mengoni-G. (1991: Table 2A)

bone are excluded from consideration in fragment size analysis. Typically, the largest bone fragments are the least-modified, unburned, large bone scrap, those bones which are primary refuse from the dismemberment and preparation of the basic units of the carcass. Fragments in this sample ranged up to 0.5 kg for two camelid cervical (neck) vertebrae from Locus 1198, a pit with high overall density. Unburned fragments averaged 2.4 gm/fragment and burned bones averaged 1.8 gm/ fragment. This size difference is typical and is attributed to the friability of burned bones and the greater likelihood that smaller fragments will end up being burned. Even smaller fragments, which might reflect intense use of within-bone nutrients such as marrow, and/or intense site use and maintenance, occur with low density in the samples that have been examined so far. It may be that the examination of the flotation samples will reveal more of these fragments, but at this time, it appears that the intense domestic use and discard of large mammals is not represented in this portion of the site. On the other hand, intense use of fish remains is clearly attested to.

Burned bones were separated into two categories: blackened and calcined (bluish, greenish, or whitened). While burning is sometimes attributed to direct heat treatment in cooking, observations and experiment have shown that cooking rarely produces more than a faint singeing of the tips of bones. Such so-called "broiling" marks are not common in this sample. Fish bones at Santiago are rarely burned, suggesting that they were prepared by boiling or steaming. Calcined bone, the result of burning bone at the highest temperatures, is also rare in the Early Chiripa Santiago samples, but it does appear, often in deposits that had been identified as trash by excavators. Blackened burned bones are common, ranging from a few percent of the total in most units to almost 60% in Locus 1307, identified as fill around a rock wall. We feel that this blackening comes mostly from contact with heat apart from cooking, perhaps in site maintenance or during use of some substantial heat feature. Units with no burned bone seem to be either those heavy in fish bones (loci 1199 and 1408) or from deposits where accumulation of bone overall was very light (loci 1238, 1240, and 1496).

Rodent and carnivore gnawing were noted on bones in several units. It is not possible to identify the specific agents involved. Elkin and Mondini (1996) demonstrated that both humans and foxes are capable of producing scratch marks on bone that would traditionally have been attributed to dogs. Until the canids from the site can be more securely identified it is difficult to offer further interpretation. Neither carnivore- nor rodent-gnawing is inconsistent with continuous occupation of the site by humans, but such gnawing probably did result from debris being left in open trash areas.

Taken together, fragmentation, burning, and other modification can help support functional or contextual determinations made in the field; in other cases they may suggest a contrasting interpretation. The assemblages of bone from loci 1236, 1294, and 1248 seem to have been formed by a variety of discard and modification events while the bone was exposed on the surface. Bones from these units were weathered and rounded, marked by carnivore and rodent gnawing, and had often been burned. Other loci had large fragments but much less burning and other modification (for example loci 1238 and 1240, identified as eroded gravel matrix) suggesting that those bones had had less chance to be worked over by humans and other agents before final burial.

Locus 1305, which had been tentatively identified as an ephemeral burned area, was probably a dump of ash and debris from a hearth or heat feature at another location, as little of the bone was burned. The bone assemblage from this locus contained a distinctively high proportion of small, calcined, whitened bone fragments that result from high temperatures. Locus 1199, another ash filled feature, had no burned bone at all, suggesting that the ash had been mixed with fresh bone after the burning event in the original hearth.

While the assemblage of species is quite uniform across the deposit for the most part, occasional units have distinctive assemblages, in particular those heavy in fish bones. Such units as loci 1480 and 1499, which were extremely high in fish bone but low in burned fragments and larger fragments from mammal bone, may represent trash from households, or areas of the site, or meals, or even seasons, in which the staple fish was the only animal food.

Animals in the Context of the Chiripa Environment

These initial results indicate the potential complexity of analyzing the cultural ecology of the Titicaca lakeshore. This lacustrine zone has been a highly productive one for the native fauna and for the human occupants as well. The first level we can analyze is the intensive human exploitation of easy-to-collect fish, birds, eggs, and rodents along the shallow lake edge and totora reed beds. Second, we should take into account the human disruption of those resources with continued occupation and the alteration of lakeshore terrain with fields, terraces, and drainage ditches. Third, we can speculate on the impact of camelid herds on local settlements and environments, as camelids provided meat, fiber, and dung but put pressure on the supply of lake vegetation, field stubble, and natural pasture above the site. As our sample of later period remains increases, we hope to contribute to evaluating these three aspects of the Chiripa local economy through time.

15

Human Remains and Mortuary Analysis

DEBORAH E. BLOM AND MATTHEW S. BANDY

THIS CHAPTER PRESENTS the bioarchaeological analyses of the human remains from both Formative and Tiwanaku period contexts from Chiripa. The research compares mortuary practices, inherited skeletal traits, demography, markers of activity patterns and diet, and non-specific indicators of health for these populations to other populations from the Katari Basin and the Tiwanaku Valley in the altiplano and the Moquegua Valley on the western slopes in Southern Peru. We discuss variation and continuity in several biological and cultural attributes for the inhabitants of the Chiripa settlements.

While the recovery of a large mortuary sample was not one of the primary goals of the 1992 and 1996 excavations at Chiripa, some human remains were encountered in the course of the work. Human skeletal material was found in a total of sixty-two archaeological contexts. These contexts include formal burials (n=25), as well as bone dispersed throughout other contexts (n=37). For purposes of this study, a location and arrangement of remains that appear to have been the direct and intended result of human action are defined as "burials." This designation was primarily based on the relative completeness of the remains and evidence of a specially prepared, depositional environment, such as an excavated pit or an associated artifact assemblage. The additional human bone, which was not found in burials, was generally isolated teeth or bone fragments whose location and arrangement seem to be the consequences of actions directed to separate and unrelated ends, such as bone dispersed during construction episodes.

In these terms, more than half of the human remains encountered (37 loci) represented isolated finds (see appendix 5). These isolated finds were encountered in fill and midden, as well as on cultural surfaces. Such a high frequency of disarticulated and dispersed human bone is not that surprising in a site like Chiripa, with a long and intensive occupation, and a very complex deposition history. It is also very common in the site of Tiwanaku. While others have looked at the patterning in isolated remains to infer status of individuals, this can only be done through in-depth study of the overall context and the demographic profile (e.g., Storey 1992). At present, we will confine this discussion to remains identified as "burials."

Twenty-five occurrences of human remains were identified as burials during excavation. Burials were identified from all Formative and Tiwanaku phases of the site's occupation. No graves were encountered pertaining to later periods. Of the twenty-five identified burials, four could not be assigned to a definite phase, five were from the Early Chiripa phase, one each was from the Middle and Late Chiripa phases, one was from the Tiwanaku III (Qeya) phase, and thirteen pertained to the Tiwanaku IV and V phases. Therefore, our sample consists mainly of individuals from the Early Chiripa and the Tiwanaku phases. For purposes of analysis, then, we will speak simply of Chiripa/Formative vs. Tiwanaku period (Tiwanaku IV and V) burials. It should be borne in mind, however, that the Chiripa burials mainly pertain to the Early Chiripa phase.

All of the burials encountered from Chiripa were located in the Santiago area. In the Tiwanaku period, this area almost certainly was used as a formal cemetery due to the high concentration of burials. The large number of tombs of the Early Chiripa phase suggests a possible association between the burial locations and the semi-subterranean court (ASD-18) located in this area. In the Late Chiripa phase on Montículo a clear association is observed between public constructions and high tomb concentration. Such relationships may have been the case earlier in the Formative occupation as well.

Chiripa Phases

The Chiripa Formative mortuary sample consists of 7 burials containing 7 adults and 7 subadults. Of the 6 adults for whom sex could be determined, all but one are female. However, this 5:1 sex ratio on a sample of six does not different significantly from a 3:3 ratio (Pearson's χ^2, p=0.22). One of the interesting aspects of this sample is the rather large number of multiple burials. Three of the seven burials relating to this period include the remains of multiple individuals. One (Locus 843) contained the remains of two subadults, both between the ages of 2 and 5 years. Another (Locus 1236) contained the remains of four individuals, one female, another adult, a juvenile, and a fetus. In addition, the third (Locus 1404) contained a relatively complete adult female, the crania of two additional adults (likely females) and fragments of a single subadult. This observation accords well with evidence from prior excavations at the site. Both Bennett (1936) and Portugal Zamora (1940, also Portugal Ortíz 1992) note the common occurrence of multiple interments in House and pre-House strata. These include the relatively well known '*tumba de los amantes*,' excavated by Portugal Zamora near House C on the mound. Because of the arrangement and differential preservation of the individuals in the tombs, we cannot rule out the possibility that the tombs were reused over a period of time.

In terms of tomb construction, a third of the Chiripa phase sample are cobble-lined cysts, with two-thirds being plain, unlined pits, or simple fossae. In addition, half of the tombs included large fragments of heavily worn, flat grinding stones, presumably employed as capstones. It is worth noting that virtually all of the grinding stones recovered in the excavations are from tomb contexts, suggesting that use as capstones was the typical form of discard for this artifact class. One of the tombs also contained remnants of vegetal material around the skeleton, reminiscent of Bennett's (1936) 'straw-lined' graves. The vegetable material may certainly be from mats or textiles or cords that were wrapped around the corpse; most likely of lake reed. This is a common occurrence in Formative period burials elsewhere (e.g., Cardona 1997). Because the preservation is not ideal, the position of the body was not always discernible. However, a fair amount of mortuary variation is observed, with positions including facing south or north and flexed, either seated or lying on the left side. One individual was lying face down.

No tombs of the Chiripa period contained ceramic offerings. Again, this is in line with the observations of the previous investigators. The most common offering type, included in half the graves, is beads, mostly of sodalite. However, beads of a turquoise-like stone are also present. Browman (1984:125) has attributed this sodalite to the Cerro Sapo source in Cochabamba. If this is the case, the frequent occurrence of the material in

Early Chiripa graves suggests long-distance exchange networks prior to 1000 B.C. Finally, two of the Chiripa phase tombs contained traces of red pigment, which is likely hematite.

Tiwanaku Phases

The assemblage from the Tiwanaku IV and V phases consists of thirteen burials, containing the remains of nine adults and seven subadults (including skeletal remains that were not removed from Locus 816). Of the adults complete enough to determine sex, three are female, with only one male identified. In contrast to the Chiripa period tombs, multiple interments seem more rare in the Tiwanaku period, with only one clear example encountered (Locus 536), a tomb containing an adult male and an adult female.

In tomb form and construction, the Tiwanaku period burials exhibit considerable continuity with the earlier Chiripa period. Five of the 11 pit burials were stone-lined cysts, the remainder being plain, unlined fossae. Body positions include flexed and placed on the left side or seated. Grinding stones served as capstones in two of the burials, and remains of vegetal material occurred in two others, again indicating continuity of earlier practices.

The Tiwanaku period burials are distinguished from the Chiripa period principally in terms of their associated artifact assemblage. Only one Tiwanaku period burial contained beads (8% of the sample), in contrast to 57% of the Chiripa period burials containing beads. The principal mortuary offering in the Tiwanaku phases was ceramic vessels, which were present in 6 graves (46% of the sample). The types of vessels present include plainware ollas, keros, tazones, and one broken annular-base incensario.

A considerable degree of continuity in the mortuary practices at the site of Chiripa can be seen through the course of almost two thousand years of occupation. The principal changes in the Tiwanaku period seem to be the decrease in the number of multiple interments, and the substitution of ceramics for stone beads as the most common mortuary artifact type. This continuity of tomb construction practices could potentially indicate the existence of a 'local tradition' of the sort identified at Lukurmata by Bermann (1994) or *possibly a long-term altiplano burial tradition.*

Human Osteology

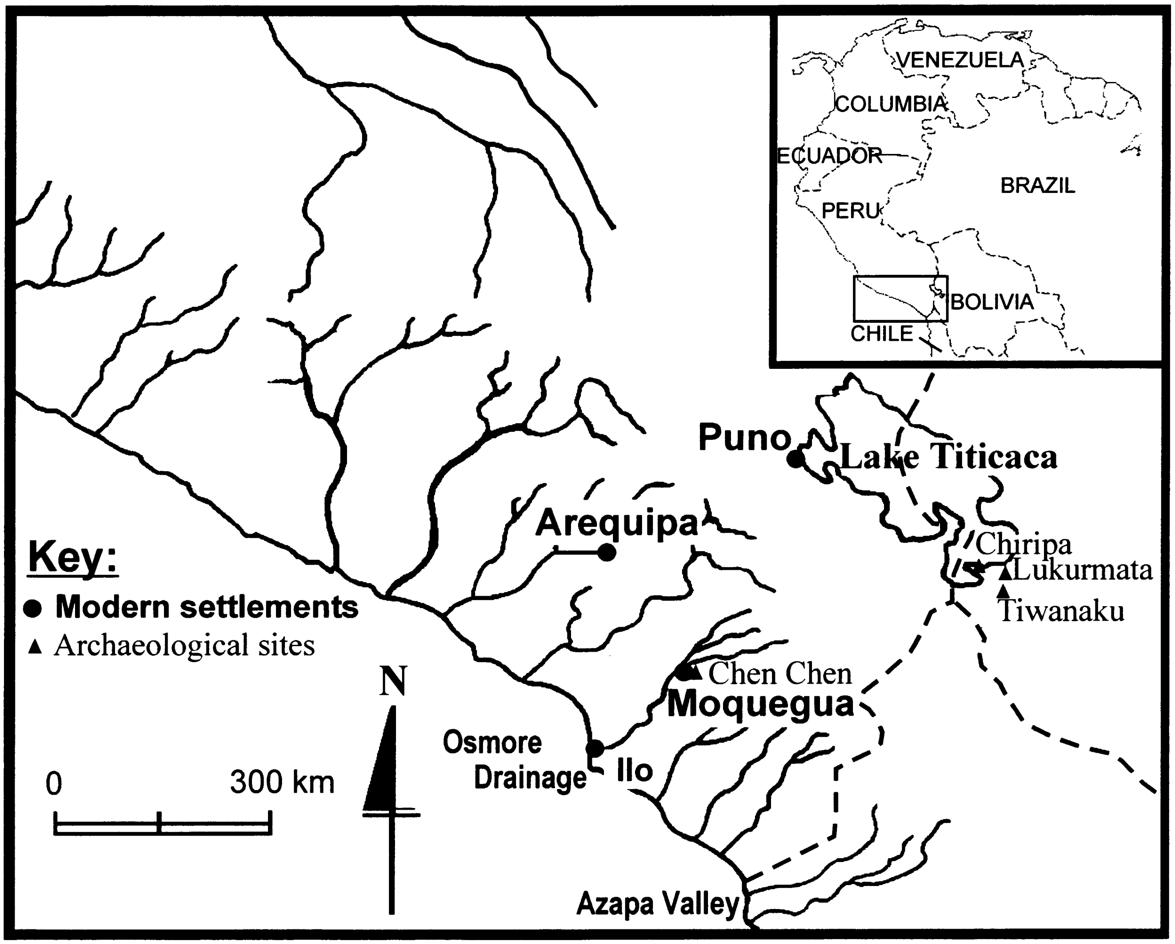
Standard inventories and demographic variables were recorded on all skeletons (see appendix 5). Determination of sex relied on pelvic and cranial morphology, while age-at-death estimates were based on dental eruption, epiphyseal and suture closure, and changes in the pubic symphyses and auricular surfaces (Brooks and Suchey 1990; Buikstra and Ubelaker 1994; Lovejoy et al. 1985; Meindl and Lovejoy 1985; Scott 1979; Smith 1984; Suchey and Katz 1986; Todd 1921a, b). In addition to that detailed in the description of the mortuary practices, the demographic profile of the sample can be broken down as follows. If we assume that the individuals do not crosscut loci, the 37 occasions of dispersed bone found in 'non-burial' contexts contain at least 22 adults and 14 subadults. At this point we do not have a count of total contexts, but it is clear that human bone appeared only rarely in non-burial contexts. Of the 25 contexts defined as burials, we have 20 adults (nine females, four males, and seven of undetermined sex) and 17 subadults. Therefore, the 1992 and 1996 excavations uncovered an estimate of 73 individuals represented by partial to complete remains.

Paleopathology and Activity Patterns

In order to analyze the changing patterns of health over time, three non-specific markers of health and disease (linear enamel hypoplasias, porotic hyperostosis, and periostosis) were measured. Comparison samples used include Tiwanaku IV/V contexts from the site of Tiwanaku, Late Formative and Tiwanaku IV/V contexts from sites in the Katari Basin such as Kirawi (CK65) and the Tiwanaku V phase site of Chen Chen in the Moquegua Valley of Southern Peru (figure 33).

Several of the individuals from Chiripa displayed porotic hyperostosis. Porotic hyperostosis is evidence of the body's response to anemia during childhood (Stuart-Macadam 1985; Stuart-Macadam and Kent 1992). These porous lesions on the skull vault are the result of pressure from within on the outer table of the skull. The pressure is caused by marrow hyperplasia in the attempt to

FIGURE 33 Map of the Southern Central Andes, and the locations from which the human data come.



dispel anemia by producing additional red blood cells. Although porotic hyperostosis does not affect the heavier bones of adults as a rule, the healed childhood lesions are visible in adult remains. Because genetic anemia is very rare in New World populations, the anemia is very likely due to iron deficiency. While it was first assumed that the deficiency was the result of an iron poor diet, Stuart-Macadam and colleagues (ibid.) have argued that more convincing causes are chronic infection and parasites. Since these pathogens often cause bleeding and/or diarrhea, they impede iron absorption since the food moves through the digestive tract too rapidly. Porotic hyperostosis was present in 40-50% of all the Chiripa remains (Chiripa phases 3/7=42.9%; Tiwanaku phases 4/4=50%). There was no significant difference over time (Pearson's χ^2=0.032, df=1, p=0.858). This is similar to the Katari Basin Formative sites (3/7=42.9%) and lower than the other Tiwanaku period samples analyzed (Katari Basin 11/14=78.6%; Tiwanaku 24/39=78.6%; Moquegua 243/315=77.1%). While many of the samples are small, and in-depth analyses considering demographic variables as factors could not be performed, these data indicate a general trend of samples from later period contexts suffering from a higher prevalence of anemia. This trend is not apparent, however, in the Chiripa sample.

Another indicator of general disease is the presence of linear enamel hypoplasias on the teeth (Goodman and Rose 1991; Rose et al. 1985).

These defects in the enamel are caused by interruptions in enamel formation during tooth development. These lesions generally are secondary to episodes of acute childhood illness, such as those resulting in a high fever. Incidences of linear enamel hypoplasia were recorded on the upper central incisors and the lower canines. Of the individuals from burials with these teeth present, linear enamel hypoplasias were present approximately 60% of the time in both the Tiwanaku (3/5=60%) and Chiripa (4/7=57.1%) period samples from Chiripa. This is similar to the percentages in the Katari Basin sites (Formative phases 5/8=62.5%; Tiwanaku phases 8/14=57.1%), higher than the site of Tiwanaku (9/21=42.9%), and lower than in Moquegua (89/119=74.8%). Linear enamel hypoplasias, like anemia, indicate that at Chiripa there was a relatively average amount of illness for these time periods and stability over time.

Likewise, periostosis, a bony growth often linked to generalized infection (Mensforth et al. 1978; Ortner and Putschar 1985), was equally common in both time periods at Chiripa, affecting 50% of the adults with observable lower limb bones (Chiripa phases = 1/2; Tiwanaku phases = 2/4). Healing or healed periostosis indicates rehabilitation from the infection while active growth indicates ongoing infection or healing of a trauma. Once again, we are dealing with a small sample, and the difficulty in interpreting these results is magnified by the fact that one case is a localized patch, likely due to trauma; one is an active case; and two cases are slight and moderate, mixed (active and healing) reactions. Specific descriptions can be found in appendix 5. This differs from Dale Hutchinson's (1997) observations at other sites with late Chiripa and Tiwanaku components on the Copacabana Peninsula. He reports an increase of lesions over time. In fact, he sees an increase over time of most indicators of illness. The collections of human remains from the site of Chiripa indicate a pattern of stability in health over time, in spite of a changing social and physical environment including an intensification of agriculture and increased urbanization.

The analysis of arthritis is also consistent with the trend of stability over time. Repetitive activities, such as carrying loads, scraping skins, using specific weapons, and planting and tending agricultural fields, often impact bone as osteoarthritis of the joint surfaces (Kennedy 1989; Merbs 1983; Tainter 1980). In the Chiripa sample we see no clear pattern of arthritis which can be used to infer behavior. The sites of arthritis include all major joints, and all adult individuals with more than three joint surfaces present from Chiripa's Chiripa (n=4) and Tiwanaku (n=3) period contexts are affected. Individuals with three or fewer joint surfaces observable did not always exhibit arthritis, but whether it was present on the missing joints is not known. Clearly a larger sample is needed to learn more about activity patterns at Chiripa.

In contrast to the paleopathological variables, we do see a change in time in dental caries and attrition, suggesting that these two temporal groups at Chiripa were engaged in different activities and diets. Tooth wear and caries can be used as indirect means of observing dietary changes (Larsen et al. 1991; Powell 1985; Turner 1979). The collection of attrition data combine the techniques of Murphy (1959a, b), Scott (1979), and Smith (1984), as recommended by Buikstra and Ubelaker (1994). Recording of caries data follows a modified version of Moore and Corbett (1971). Dental caries are commonly associated with a high carbohydrate diet, while tooth wear generally indicates dietary items which are tough or fibrous, such as *charqui* (dried meat) and potato skins, or the introduction of abrasive materials in the food, such as grit and sand that may enter when grinding or perhaps when drying food items.

The Chiripa people overall had a fairly severe amount of attrition (tooth wear). The wear is greater than that for all other samples analyzed except the Katari Basin Formative contexts (Chiripa Formative x=8.5 (n=6); Chiripa Tiwanaku x=8.8 (n=4); Katari Basin Formative x=9.0 (n=3); Katari Basin Tiwanaku x=7.3 (n=14); Tiwanaku x=6.0 (n=20); Moquegua x=5.1 (n=113)). The representation of 5-year-interval age groups across these samples was not significantly different (Pearson's C^2=46.443, df=49, p=0.577). Within the Chiripa collection, the Tiwanaku period sample has slightly more wear than during the earlier Chiripa phases. The adults from Chiripa phases were also affected with caries in their molars or premolars 57.1% of the time (4/7 individuals, 6 /54 teeth=11%), while none of the later Tiwanaku phase individuals were affected (0/4 individuals [0/34 teeth]). The caries data alone would normally indicate that the diet was composed of fewer carbohydrates over time. It should be noted, however, that we observed slightly more wear and fewer caries over time. Because the same types of food items that cause wear will reduce the caries rate because they will mechanically clean the teeth, this is consistent with either tougher or harder foods increasing in the diet or more abrasive inclusion entering the food, possibly though grinding or drying.

Other data that were not presented here include measurements of crania, postcrania, and teeth, fractures and other trauma, cranial modification through the intentional use of pads or boards, and evidence of lip plug wear and the use of the teeth as tools, as well as post-mortem dismemberment, defleshing and display. While no incidences of lip-plug use, teeth-as-tools, or post-mortem modifications of bone were seen in the Chiripa collection, the data are presented for each individual in appendix 5.

Biological Distance

Finally, genetic relationships can provide more information about local continuity and change. Many features in bone can be used to measure genetic relatedness between groups of individuals. Because the preservation of the sample is generally poor and not ideally suited to metric studies, non-metric trait analysis of teeth and bone (Berry and Berry 1967; Corrucini 1972; Finnegan 1978; Turner et al. 1991) is one of the best ways to look at these relationships in the Chiripa remains. This analysis involves inherited, discrete variations in bone, for example, one vs. multiple foramina, bony bridging within a large foramen, or the presence of ossicles, which are small bones in the sutures of the skull.

Techniques for the collection and analysis of the 'non-metric trait' data followed that described in Blom et al. (1998). When we compare the two temporal groups in the Chiripa sample, the distance measurement is not significant. Therefore, there is a high probability that the distance measure could be lower. Until we have a larger sample, we have no reason to expect that the two were not from a homogeneous population. In the Formative period comparison, Chiripa is quite distant from the other sites. A distance measurement of 0.331 is observed between Chiripa and the nearby Katari Basin sites of Lukurmata and Kirawi. The distance between the samples from the Chiripa phases and the Moquegua (Huaracane) Formative phase is also high. Overall, a pattern exists in the Formative of Chiripa as a separate group.

In the Tiwanaku phases, the data indicate a pattern of gene flow between the Tiwanaku components of Moquegua, Tiwanaku, and the Katari Basin sites. Chiripa, on the other hand, does not appear to clearly follow this pattern. Again, likely because of the small sample size, the Chiripa measurements are not significant for those with the altiplano groups. The p-values are lower than those between the two temporal components of Chiripa are, but in order to explore this further, a larger sample is necessary.

In summary, mortuary practices, paleopathological indicators, and genetic data suggest few differences between Chiripa and Tiwanaku phases at Chiripa. However, archaeological and dietary data indicate change. The lack of change in health with an increase in urbanism is unexpected. These two factors are almost invariably associated with an increase on the amount of pathological lesions seen on bone. One possible explanation for this would be an 'osteological paradox' (Wood et al. 1992). It is possible the individuals were so compromised that they were dying as soon as they contracted a disease, so there was no time for the bones to be effected. However, many of these individuals were dying in their 40s and 50s, essentially 'old age' for these populations. A more likely hypothesis is that other social or environmental conditions were insulating the populations from the common problems of urbanization. The mortuary sample from Chiripa is small. Therefore, we cannot rule out the possibility that change did occur which could be detectable with a larger sample. These findings are suggestive, however, and should provide a foundation for continued study in this area.

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Conclusions

CHRISTINE A. HASTORF

WHILE TRYING TO UNDERSTAND the Formative-Initial/Early Horizon phase in the south-central Andes, we are especially interested in the early evidence for increasing political scale and agricultural systems. We are trying to uncover evidence of the domestic areas and activities. We also realize that the Formative world included ritual as central and thus are integrating the ritual evidence into our views of Chiripa. We have excavated in two areas, above and below the mound, looking for domestic houses and middens. In both areas of the site, Llusco and Santiago, we have instead found large (approx. 13 by 13 m) semi-subterranean cobble stone-walled enclosures. At this stage in our research we believe these to be ceremonial (gathering) areas rather than habitation. The Llusco enclosure dates to the early Late Chiripa phase, we believe dating to about 800-600 B.C. The area of Santiago to the east of the enclosure directly overlooks the lakeshore. This zone is a complex of use and rebuilding layers throughout all of the Formative times and into the Tiwanaku phases. While there are surfaces, the later ones seem to be fairly clean and in some cases plastered with yellow or white, with burials throughout. The earlier surface use is not clear. Although the rubbish suggests daily life tasks were performed, there is no evidence for houses as we understand them in the Andes. At some point the walls were collapsed and a mound of rubble was formed running north-south in this area. What these different surfaces mean is still very hard to determine. This area of the site is extremely important yet still quite mysterious as to the types of activities that occurred there. More analysis must be done there to explain this sector.

To the west of these surfaces and cuts, at the end of the 1996 season, we discovered a 14 by 14 m stone-walled enclosure that we think is another of these semi-subterranean enclosures. This one could date as early as 1300 B.C. Because we only outlined this structure in the last few days of excavation, we do not know the details of its construction, but we do know that its east wall had a small stone niche that had nothing visible in it. This could be what we see in later Tiwanaku and even Inkaic enclosures, niches that held important sacred objects.

The research on the mound provides us with a much better view of its history. We now know that there were a series of house and floor rebuildings during the Formative times, as well as several reorientations of the structures. The painstaking work on the profiles has led to a map of the actual measurements as well as an understanding of what is left of the Formative site. Sadly, no structure remains untouched, although some are in quite good shape.

The Llusco and Santiago enclosures are the earliest in this region. Previously investigated structures such as these have dates in the 400-200 B.C. range. This evidence suggests that Chiripa had some of the earliest ceremonial sectors in the region. Its importance is further seen in the systematic surface collections that were completed this year. The Formative site now seems to be about 7 ha. in size. Given that the ceremonial areas, Llusco, Montículo, and Santiago only make up less than 1 ha. in area, there seems to have been substantial residence surrounding this central precinct, much larger than other Formative sites found in the nearby regional surveys. This larger area will be studied in the next field season.

Chiripa has opened up the view of early settled life in the Titicaca Basin, allowing us to begin to see how people lived in a world that was simultaneously ritualized while being routine.

APPENDIX 1

HARRIS MATRIX OF THE 1996 LLUSCO EXCAVATIONS BY STRATIGRAPHIC EVENT

A1: Surface
A2: Plow zone
A3: Humus layer, associated with the deterioration of the hacienda adobe wall.
A4: Cut for the hacienda wall.
A5: Hacienda wall.
A6: Compacted area parallel to hacienda wall.
A7: Pit cut for adobe pit, A8.
A8: Fill of pit made during adobe manufacture, parallel to hacienda wall.
A9: Foundations of hacienda wall.
A10: Cut made for the construction of the Llusco wall.
A11: Wall of Llusco structure.
A12: Fill of the Llusco structure, consisting of dark soil with high organic content.
A13: White plaster floor inside Llusco structure.
A14: Fill underneath the white plaster floor.
A15: Use-related surface, perhaps a floor, of orangish color, near west wall of Llusco structure.
A16: Fill underneath the use-related surface.
A17: Cut for the canal.
A18: Construction of the canal in the northwest corner of the Llusco structure.
A19: Soil inside the canal.
A20: Cut for A21.
A21: Early Chiripa pit fill on the north side of the Llusco structure.
A22: Cut for A23.
A23: Middle Chiripa pit fill on the west side of the Llusco structure.
A24: Smaller wall parallel to the canal.
A25: Fill between the canal and the small wall that runs parallel to it.
A26: Stones fallen from the small wall parallel to the canal.
A27: Sterile soil.
A28: Fill and/or mortar inside the cut made for the construction of the Llusco wall.
A29: Pit cut for A30.
A30: Fill of pit cut into A12, posterior to Llusco structure.
A31: Pit cut for A32.
A32: Fill of pit cut into A12, posterior to Llusco structure.
A33: Pit cut for A34.

A34: Early Chiripa pit fill on north side of Llusco structure.

Appendix 2
Harris Matrix of the 1996 Santiago Excavations with Stratigraphic Events, Including N1100 Pit

B1: Surface cover of the Santiago area. Above B2.
B2: Plow zone. Extends to all visible areas around Santiago 1 and 2. Compacted soil with many rounded and angular inclusions. Visible plow scars. Below B1, and above B3, B10, and B96.
B3: Fill over occupation surface (B16). Disturbed by intrusive burials (B8, B9, B11, B12).
B4: Pit fill.
B5: Pit cut.
B6: Fill of previously dug pit in N 1100 E970; the rest of the pit was excavated laterally in N1100 E972 and N1098 E970. Possible llama offering.
B7: Mixed locus. This is the fill above level 3 in Santiago II (excavated in 1992) which still contained artfacts in 1996. D. Kojan estimates that this matrix is 95% back dirt fill but must have contained some pit fill or other soil which was mapped incorrectly in 1992.
B8: Cut of a Middle Chiripa (?) stone-lined burial (Burial 11). Cuts into B3, but appears to sit above B16.
B9: Stone lining of a Middle Chiripa (?) stone-lined burial (Burial 11). Cuts into B3, but appears to sit above B16.
B10: Fill west of ASD 18 (the potential semi-subterranean temple wall). Formerly thought to represent filling of a "terrace trench" (Hastorf et al. 1992). The soil is stratigraphically quite undifferentiated, but there is some stratigraphic patterning of ceramics (Middle Chiripa atthe lowest levels, Late Chiripa and Early Tiwanaku in the upper levels of this fill).
B11: Fill of a stone-lined burial possibly dating to Middle Chiripa levels (Burial 100). Disturbed in upper levels. Remains of another individual (incomplete) are scattered on top of the primary burial.
B12: Burial of a child associated with a small Tiwanaku vaso and a Tiwanaku IV incensario (broken and then reused). Only a small area excavated, the rest remains under the unexcavated baulk in N1092, E 971.
B13: Culturally sterile orange gravel layer. Patchy yet wide distribution. Easily 'pops' off from underlying layer. Possible adobe melt (?). Lies below B3, B18-20, adjacent to B14 and B21, and above B16.
B14: Smooth, compact, mixed orange and organic layer that lies below B3, B26-27, above B15-16, and adjacent to B13.
B15: Culturally sterile orange gravel layer. Appears identical to B13, except for its stratigraphic position. Below B14, above B16.
B16: Early Chiripa occupation surface. Dark, organic, smooth surface widespread across Santiago. Varies from a dense, carboniferous black to a more mottled dark gray at periphery of Santiago. Below B13, B11, B12, B22, B15, B25, B31.
B17: Orange clay "cap" of smooth soil surrounded by the "orange granola" matrix (event B13). Proved not to be a pit cap as originally though, but was distinct from surrounding matrix. Above B16 , below B3.
B18: Pit cut encountered at top of B13, but intrusive from above. Top of pit cut has been eroded away. Rasgo 101. Below B2, above B13.
B19: Ashy fill in bottom of pit (Rasgo 101). Below B20, above B18.
B20: Laminated pit fill with high concentrations of carbon, camelid and fish bone. Below B2, above B19.
B21: Cultural fill. Compact, dark red-brown, silty clay loam that lies adjacent to B13 in the southwestern units of Santiago 1. Partially excavated in 1992. Below B3, above B22, adjacent to B13.
B22: Cultural fill. Fine and compact dark brown silty clay. Below B21, above B16.
B23: Pit cut of intrusive pit containing large density of ground stone. Above Locus 1292, below B24.
B24: Pit fill with ashy matrix and large concentration of ground stone. Above B23, below B2.
B25: Remains of infant skeleton (Burial 101). There is no pit cut. Below B13, B14, above B16.
B26: Pit cut. Rasgo 105. Below B27, above B13, B14.
B27: Pit fill. Rasgo 105. Below 1992 excavation of Santiago 1, above B26.
B28: Rock pile jumble in N1092 E976-8. No discernible pattern presently but may represent remains of fallen structure. Above B16, B14; below B3.
B29: The fill above, below, and surrounding the B28 cobbles. Above B16, B14; below B3.
B30: Plaster cap to black floor (B16 event). Above B16; below B22.

B31: Pit cut. Rasgo 106. Below B32, above B16.
B32: Pit fill. Rasgo 106. Below B14, above B31.
B33: Pit cut for Rasgo 107, Entierro 103. Above Locus 1405, below B34.
B34: Secondary burial, Rasgo 107. Above B33 event, below B15 event (Locus 1238).
B35-69: *B35 through B69 describe the N1100/E970 profile (Figure 13b). None of these events were excavated, hence none of the artifacts, soil samples, etc. come from them. At the moment their descriptions consist of Munsell color designations.*
B70: ASD 18 (the "terrace wall") cut. Below B2, above B13.
B71: ASD 18 fill, but east of wall, as opposed to B10, which is west of the wall.
B72 -76: *B72 through B76 also describe events only recorded in the N1100/E970 profile and not excavated. See note for B35.*
B77: ASD 18 wall. Below B2, above B13.
B78: Small offering of Tiwanaku pots and one young person's cranium in western wall trench (ASD 18). Above B10 and Locus 1416, below B3. Rasgo 138.
B79: Ash pit. Above B16, below B14.
B80: Two in-situ burned areas. Above unexcavated level 5, below.
B81: In-situ burned area. Above unexcavated Level 5, below B16.
B82: Ashy dumping event to west of ASD 18 (the terrace wall). Amid the B-10 dumping events. Above B77, below B78.
B83: Ashy lens against NE corner of ASD 18. Above B71, below B3.
B84: Hearth located against NE corner of ASD 18. Associated with B73 and B74. Above B71, below B3. Rasgo 132.
B85: Ashy pit. Rasgo 133. Above B71, below B83.
B86: Pit cut for B79, an ash pit. Rasgo 134. Above B16, below B14.
B87: A small in-situ burned area sitting within the B16 event. Marked by ash, charcoal, and burnt earth inclusions. Rasgo 112. Above B16, below B21 (loci 1240, 1241).
B88: In-situ burned area sitting on top of B16 event. Rasgo 108. Above B16, below B22 (Locus 1247).
B89: In situ burned area immediately west of ASD 10. Above Locus 1304 and B16 event, below B29 (Locus 1302).
B90: Compact fill to east of ASD 10. Above B92 (Locus 1307), below B29 (Locus 1300).
B91: Fill to west of ASD 10. Above B92 and loci 1322, 1323. Below B28 and B29 (Locus 1300).
B92: Compact clay that the ASD 10 wall stones sit upon. Above loci (1322, 1323), below B90 and Locus 1306.
B93: Fill east of ASD 17 (unmortared stone wall in N1092/E978). Above B95, loci 1491, 1492; below B92.
B94: ASD 10, a single course stone wall. Above B92, below B29.
B95: ASD 17, an umortared stone wall. Above unexcavated area, below B92.
B96: Possible adobe wall slump in N1092, E970. Below B2, above B100, adjacent to B10.
B97: ASD 19 (stone box) cut. Below B98, above B13 (?), adjacent to ASD 18 events.
B98: ASD 19 stones. Below B99, above B97, adjacent to ASD 18 events.
B99: ASD 19 fill. Below B100, above B99, adjacent to ASD 18 events.
B100: Robbed wall slot, ASD 19. Below B96, above B99, adjacent to ASD 18 events.

Appendix 3
Harris Matrix of the Montículo Excavation with Stratigraphic Events

D-1: Fill of D-2 pit. Recent, containing iron, glass, and other modern material.
D-2: Cut of Rasgo 115 pit. Probably excavated during the hacienda period.
D-7: Rubble resulting from the collapse of the D-9 chancheria wall.
D-8: Cut for placement of the chancheria wall (D-9).
D-9: Hacienda period chancheria wall along the South face of the mound.
D-10: Root zone, covering the entire mound.
D-20: Intentional fill deposited prior to the construction of Upper House G.
D-33: Rubble from structural collapse filling the ASD-12 structure, Mont. 1-B.
D-51: Intentional fill placed over the D-52 floor.
D-52: Uppermost yellow plaster floor of ASD-13 structure.
D-53: Intentional fill between the ASD-13 and ASD-14 structures.
D-54: South wall of the ASD-14 structure.
D-55: Rubble resulting from the collapse of the D-68 wall.
D-56: Uppermost yellow plaster floor of ASD-14.
D-57: Clean sand placed between the D-58 and D-56 floors.
D-58: Second-highest yellow plaster floor of ASD-14 structure.
D-59: Intentional fill between the D-58 and D-60 floors.
D-60: Third-highest yellow plaster floor of the ASD-14 structure.
D-61: Fill between the D-109 and D-60 floors.
D-62: Uppermost yellow plaster floor of the ASD-15 structure.
D-67: Intentional fill between the ASD-13 and ASD-14 structures.
D-68: South wall of ASD-15.
D-70: Small lens of pebbles related to the destruction of the D-68 ASD-15 wall.
D-78: Intentional fill between floors, ASD-15.
D-79: Block of wall plaster, ASD-15, fallen over the D-81 floor.
D-80: Layer of fine ash and charcoal over D-81 floor.
D-81: Yellow plaster floor, ASD-15. Lowest in the sequence.
D-82: Lowermost yellow plaster floor of ASD-13.
D-83: Ash lens between D52 and D-82 floors.
D-84: Intentional fill below ASD-15.
D-85: Level of adobe rubble. Below D-84. Earlier than ASD-15.
D-89: Compact, hard level of fine sediment at base of profile. Origin uncertain.
D-96: Fill of hearth, Rasgo 113. Cut is D-95.
D-98: Fill of small pit in D-56 floor, cut being D-97, Rasgo 114.
D-100: Fill of shallow fire pit, cut is D-102, between D-56 and D-58 floors, Rasgo 123.
D-101: Fill of small pit, Rasgo 118, cut into D-56 floor (cut is D-99).
D-103: Yellow plaster cap placed over fill of Rasgo 118 pit.
D-105: Fill of small ash pit, Rasgo 125, in D-58 floor (cut is D-104).
D-106: Burned area and ash lens below D-58 floor, Rasgo 126.
D-107: Small stub of adobe internal crosswall, Rasgo 122, ASD-13, associated with 56 floor.
D-108: Intentional fill between ASD-14 and ASD-15 structures.
D-109: Uppermost yellow plaster floor of ASD-14.
D-111: Intentional fill over D-81 floor.
D-112: Intentional fill of red adobe rubble placed over D-81 floor.
D-114: Fill of probable posthole, Rasgo 141, in D-81 floor (cut is D-113).D-116: Fill of possible posthole, Rasgo 142, in D-81 floor (cut is D-115).
D-118: Fill of probable posthole in D-81 floor, Rasgo 143 (cut is D-117).
D-120: Fill of probable posthole in D-81 floor, Rasgo 144 (cut is D-119).

D-122: Fill of probable posthole in D-81 floor, Rasgo 145 (cut is D-121).
D-123: Rasgo 147, ash lens below the D-81 floor.
D-124: Layer of red adobe-like material below ASD-15.
D-125: Dark, organic layer below ASD-15.
D-126: Series of thin, possibly fluvial lenses below ASD-15.
D-127: Dark, mottled layer with adobe rubble, below ASD-15.
D-128: Wall plastering event, Rasgo 121, ASD-14, associated with D-109 floor.
D-129: Screened, sterile backfill resulting from the excavations of Browman and Cordero in the center of the mound.
D-130: Cut of Kidder's 1955 excavations in House 5 (Mont. 3)
D-131: Fill of D-130, backfill of the House 5 (Mont. 3) excavations.

APPENDIX 4
SUMMARY OF THIN SECTIONS WITH BRIEF DESCRIPTIONS

Soil samples are numbered from top to bottom and described in this order. Observations are not continuous from sample to sample. Please see text for locations of profiles.

Montículo

ML1: A silty fabric with few voids; fragmented laminations of graded, clean sandy silt; little occupational debris or charcoal; much bioturbation (soil fauna); few discrete peds which could be mudbrick; asymmetrical clay coatings possibly due to slope.

ML2: Similar to ML1 but ceramic, charcoal, burnt bone and possible burnt coprolite; some features are oriented in fairly intact laminations and may have been carried in with the sediments; others appear to be secondary brought in with bioturbation.

ML3: Intact very well-sorted laminations (approximately 12) of dense fine sand and silt crowned by a disturbed layer with charcoal and oriented fine bone fragments; rare anthropogenic inclusions in layers; rare possible mudbrick fragments but highly eroded and most likely brought in with sediments.

ML4: An organic, sesquioxide-rich sandy silty fabric; fairly homogenous, unsorted layer with ceramic, bone and charcoal; fragments of laminations with dirty clays and carbon suggesting a high degree of remixing and disturbance.

Mound House Sequence

"Hacienda Fill"
MH1: A fine groundmass dominated by pure clay topsoil with ample laminated dusty clay coatings suggesting a period of intense disturbance of overburden; no anthropogenic or formed organic features; similar to N1 in structure and composition.

MH2: Similar to MH1 but crumb structure; ample mineral pedofeatures; rare charcoal and roots; no anthropogenic features; highly disaggregated structure suggests that the soil sample crumbled.

"House Fill" ASD 13 D-51
MH3: A moderately well sorted organic-rich silty soil fabric containing numerous aggregates including rounded clay-rich peds (possibly construction materials), and translocated hacienda fill and laminated coatings; contains ceramic, mammal and fish bone, coprolite and possible lithic fragment with ample pedofeatures; worm casts and root.

ASD 13
MH4: Fill above floor (D-51): fine silty soil fabric with abundant aggregated inclusions of other fabrics (e.g. burnt soil, possible mudbrick and plaster), ceramic and bone; some silty clay coats on voids; compressed subhorizontal voids at top of slide, gravels.
Floor sequence:
1) above first charcoal layer is a dense layer with subhorizontal voids, abundant charred plant remains, burnt soil, ceramic and possible mudbrick (D-51)
2) thin charcoal layer which merges into a highly organic-rich sandy/ashy layer with burnt bone, ceramic and gravel (D-52)

3) clean, yellow sandy clay layer with clay crowns on mineral grains (D-52)
4) second charcoal rich layer with coarse sand, aggregated of burnt clay, fish bone (D-52)
5) as layer 4 but highly disturbed and more organic rich with abundant charcoal (D-83)
Charcoal appears to be of plant remains not from coprolites.

ASD 14 and ASD 15
MH5: Fabric 1 dominant: dark brown organic rich soil fabric with charcoal, possible lithic fragments, rare other anthropogenic inclusions, ample clay coats on grains; random crescentic voids (possible collapsed earthworm channels); possible mudbrick fabrics of fabric similar to MB; some aggregates are fractured indicating mechanic stress (possible processing artifact); ample evidence of soil fauna.
Fabric 2 (yellow plaster floors): intrusive highly birefringent mineral fabric with high amorphous salt/clay content coated over sand
Sequence: Fabric 1 (D-61) dominates upper slide cut subhorizontally by ephemeral fabric 2 layer (D-109), second Fabric 1 layer (D-108) is followed by a second, well-developed fabric 2 layer (D-61) and then a final fabric 1 layer (D-78).

ASD 15
MH6: Fabric 3: like fabric 1 of MH5 but with more sesquioxide staining on pores.
Fabric 4: like fabric 1 of MH5 but more charcoal and amorphous organics; anthropogenic inclusions; voids subhorizontal and apparently compressed; rounded gravel inclusions; root; poorly mixed appears partially cemented.
Sequence: Fabric 3 (D-84) is superimposed on fabric 4 (D-85) and they are slightly mixed by soil fauna.

Mound Mudbrick
MB: Pale yellow, clay-rich silt and fine sand fabric; parallel-striated b-fabric in patches (abundant textural pedofeatures); coarse inclusions very rare; rare charcoal; large igneous rock flake appears imported; large woody root in horizontal channel transversing slide infilled with clean silts; pseudomorphic voids; a small oxidized copper disc was found on the bottom of the intact mudbrick.

Santiago

S2A: A spongy, organic- and carbon-rich soil fabric containing anthropogenic deposits including ceramic, charcoal, coprolite and a high concentration of fish bone splinters; parallel- and reticulate-striated aggregates suggest fragments of construction materials (mudbricks, plaster); organic-enriched earthworm trails and channels containing root.

S2B: Similar soil fabric to S2A but less dense with gravel inclusions (limestone, igneous); ceramic, fine charcoal, coprolite and bone inclusions (less fish bone, larger aggregates of spongy mammal bone); one very large (4 cm), angular aggregate of highly fluorescent fabric may be a coprolite; homogenous angular voids, appears reworked but less root than in S2A is present.

S3B: Similar soil fabric to S2A but a higher concentration of amorphous organics; anthropogenic inclusions similar to S2A but more, larger charcoal fragments, less fine fish bone, a fish vertebra, low fluorescence on coprolites, rare spherulites and burnt soil (possibly mudbrick), silty clay aggregates, no gravel; less worm disturbance than S2A-B with higher pedality and a few well developed clay coats.

S2D: Similar soil fabric to S2A but coarse sand-sized charcoal, a small amount of weathered fish bone, fine coprolite fragments; unique light yellow-gray aggregate (possibly plaster); many oriented channels; appears heavily reworked.

S2E: Two distinct fabrics are visible in hand specimen: one is light-colored and spongy, the other is dark and charcoal rich; the boundaries between these fabrics are less visible under the microscope. The light fabric is formed into rounded aggregates and contains calcitic clays and acicular calcite crystals. The dark fabric is similar to S2A and surrounds the light peds.

S2F: A silty fabric with fine charcoal, ceramic and some burnt bone fragments dominates; this fabric is cut by round pores (insect burrows) about 3 cm diameter which have been infilled firstly by clean, silty clays and then by fine sand.

Santiago Balk

S3A: Moderately fluorescent, organic-rich, silty fabric with light, clay-rich aggregates;
few bone and coprolite inclusions, little coarse charcoal or ceramic; cemented by amorphous calcite of probable water-transported origin mixed with organics, clays and sesquioxides; calcite crystals on pores; soil fauna channels.

S3B: Dark brown, organic-rich, silty fabric with ample excrement pedofeatures; large soil fauna channels; highly weathered and fragmented bone inclusions; abundant charcoal of various sizes; clays obscured by organics and sesquioxide staining.

S3C: Similar to S3B with more amorphous organic/sesquioxide staining of fine fabric obscuring clay and crystalline features.

Naturals
N1: Spongy, unsorted sandy silty fabric with gravel, root, earthworm channels and an isolated burnt seed; no microartifacts.

N2: Soil fabric as N1 but there are fewer, smaller pores, no gravel and less sand; no microartifacts.

N2: Soil fabric as N1 and N2 but denser, intergrain channel structure with smaller vughs; no gravel and less sand than N1 and N2; no microartifacts.

Appendix 5

Inventory of Human Remains from 1992 and 1996 Excavations

Human bone found in contexts not recognized as "burials" during excavation (*N*=37):

Locus 052 (N890 E980 N2a): three fragments of juvenile epiphyses
Locus 069 (N890 E982 N2): upper right permanent molar
Locus 072 (N888 E982 N2): juvenile hand phalanx
Locus 074 (N890 E980 N2): adult left cuboid
Locus 075 (N894 E979-81 N2): adult hand phalanx
Locus 111 (N894 E977.80 N2b): juvenile first metacarpal
Locus 508 (N1112 E970 N2): juvenile hand phalanx
Locus 515 (N1086 E972 N2): adult right third metatarsal
Locus 528 (N1098 E972 N2): fragments of a juvenile right sphenoid, both temporal bones, lumbar and thoracic vertebrae, cranium, left ilium, and left lower deciduous first molar
Locus 546 (N1112 E968 N2): adult hand phalanx
Locus 556 (N1112 E966 N3): adult foot phalanx
Locus 581 (N1098 E970 N2a): lower right lateral incisor, one lower and two upper molar fragments
Locus 630 (N1110 E972 N2): adult foot phalanx
Locus 669 (N1108 E970 N3): fragments of a probable adult right sphenoid and frontal, juvenile hand phalanx
Locus 685 (N1086 E974 N2a): adult phalanx
Locus 716 (N1110 E970 N3a): adult left fourth metacarpal
Locus 717 (N1110 E972 N3a: adult second vertebra fragment

Locus 719 (N1098 E968 N2b R30): permanent lower first or second molar, deciduous upper right central incisor
Locus 733 (N1100 E970 N2c): deciduous upper left first molar
Locus 756 (N1110 E970 N3b): two adult hand phalanges, 1 lower central incisor
Locus 778 (N1112 E966 N3b): adult foot phalanx; fragments of left calcaneus, right rib, and left fibula
Locus 782 (N1088 E972 N2b): adult left first metatarsal
Locus 806 (N1084 E972 N2b[2]): juvenile hand phalanx

Locus 819 (N1086 E974 N2b): two camelid or human cranial fragments
Locus 842 (N1112 E966 N6): fragments of juvenile ilium, vertebral bodies, long bones and cranium; fragments of adult left lateral cuneiform fragment and coccyx; lower right lateral permanent incisor
Locus 851 (N1088 E968 N3a): fragments of adult left calcaneus, left nasal bone

Locus 869 (N1112 E968 N8): lower second or third molar fragment
Locus 835 (N1088 E974 N2b[2]): one possibly human rib fragment
Locus 837 (N1112 E966 N4): adult foot phalanx, right clavicle, hand phalanx, left fourth metatarsal, and fragments of left patella, cervical vertebra, right foot navicular, both scapulae, right calcaneus, right tibia, and fibula shaft
Locus 840 (N1112 E966 N5): adult right trapezoid and fragments of left foot navicular and left fourth metacarpal

Locus 841 (N1112 E966 N4): adult right trapezium, two hand phalanges, and fragments of scapula, ribs, and left first metacarpal

Locus 847 (N1086 E974 N2b[3]): upper left deciduous second molar, one misc. fragment
Locus 1195 (N1094 E970 N2): adult left hamate
Locus 1230 (N1094 E968 NT3): permanent lower left first molar and deciduous lower right second molar
Locus 1245 (N1092 E976 N1): one molar fragment
Locus 1316 (N1088 E974 N4): fragment of upper right deciduous second molar of a 3-11 year old
Locus 1344 (N896 E975.5 N2): upper right lateral incisor of a 6-10 year old

Human Bone from Contexts identified as "burials" during excavation (*N*=23):
The inclusion of a particular bone here does not indicate that it was complete, only that it was represented by at least one diagnostic fragment.

Locus 496 (N1114 E963 R45 N7 Hss#14): This burial of a 2-4 year old is represented by the right arm and scapula, right femur, left tibia, both fibulae, right pelvis, ribs, hand bones and deciduous teeth. *Tiwanaku IV/V*

Locus 531 (N1088 E972 N2 Hss#9): This context contains the permanent and deciduous dentition of a 7.5-12.5 year old and a few badly eroded cranial fragments. *Tiwanaku IV/V*

Locus 536/562 (N1098 E972 R5 N3): As well as the adults listen below, the context contains a juvenile hand phalanx and lower right second deciduous molar. *Tiwanaku IV/V.*

Individual #1 (Hss#2): Individual #1 is a 30-35 year old male. Elements present include a very eroded skull and mandible, left hamate, unidentified metacarpal, both feet, pelves, and patellae, a cervical vertebra, right scapula, sternum, teeth, and ribs. Long bone fragments include both humeri and femora, left tibia, and right fibula. The distal midshaft of the left tibia displays localized and severe, healed periostosis (possibly a very healed trauma).

Individual #2 (Hss#3): Individual #2 is a 25-35 year old female with a relatively complete skull and mandible, both feet, pelves, patellae, and scapulae, the vertebral column, ribs, teeth, and sternum. Long bones include the right humerus, left radius and ulna, and both femora, tibiae, and fibulae. Linear enamel hypoplasias are present on the lower right canine and upper left central incisor. Slight arthritic changes are visible on the distal ulna, proximal and distal tibia and femur, and the proximal radius. No cranial deformation is obvious, but flattening, possibly due to a cradleboard, is present at lambda. Porotic hyperostosis is barely discernible and healed on the occipital squamous. Stature estimate: 150-157 cm.

Locus 654 (N1096 E972 R20 N2 Hss#10): This 35-45 year old probable male is represented by the mandible and maxilla, hyoid, lumbar vertebrae, sacrum, rib, teeth and both pelves, patellae, and feet. Additionally, the long bones include both femora and tibiae and the left fibula. Both lower central incisors exhibit linear enamel hypoplasias. Arthritic changes of varying degrees can be seen on the lumbar vertebrae. The right tibial midshaft is very misshapen with severe healed periostosis. A healed, dislocated fracture is likely the cause. Stature estimate: 152-158 cm.

Locus 662 (N1090 E970-2 R22 N2b Hss#8): This feature contained very poorly preserved remains of an adult. The remains include teeth and fragments of the left first rib, long bones, and misc. bones. Some of the tooth fragments may be deciduous, indicating that a juvenile was also present. *Tiwanaku IV/V*

Locus 673 (N1110 E970 R24 N3 Hss#1): The majority of the fragments in this burial were those of an adult. The bones represented include the cranium, atlas, both femora, the right tibia and foot, and teeth. A linear enamel hypoplasia was present on the lower left central incisor. The tooth wear was much more severe on right side. A subadult is represented by a petrous portion of the temporal bone and a deciduous lower lateral incisor. *Tiwanaku V.*

Locus 677 (N1098 E968 R25 N2 Hss#5): These fragmentary remains of an old adult include portions from the left femur, right foot, and teeth, as well as two unsided tarsals and numerous misc. fragments. *Tiwanaku IV/V*

Locus 683 (N1108 E966 N2 Hss#4): This context contained long bone, tooth, and misc. fragments of a 35-80 year old adult and an upper canine and a lower right lateral incisor from a subadult. *Tiwanaku V.*

Locus 684 (N1100 E970 R37): Human bone not analyzed. *Tiwanaku IV/V.*

Locus 761/768 (N1100 E970/2 R40): These remains of a 50-80 year female include a fairly complete cranium and mandible. Long bones present are both humeri, radii, ulnae, femora, tibiae, and fibulae. Additionally represented are both patellae, hands, feet, scapulae, clavicles, and pelves, as well as the sternum, ribs, teeth, and portions of all vertebralcolumn segments. The lower left canine presents a linear enamel hypoplasia. Caries are visible on the upper left first and second molars. Evidence of anemia is seen with severe to moderate, healed cribra orbitalia and moderate, healed porotic hyperostosis. The tempromandibular joints show slight arthritic changes and anterior displacement. The hip joint has slight to moderate arthritic changes. The cranium is culturally deformed. Stature estimate: 156-165 cm. *Middle Chiripa*

Locus 789 (N1086 E974 R44 N2a/b Hss#13): In addition to the two individuals below, at least one other adult is evident in an extra upper left canine and second molar.

Individual #1: These remains of a 35-55 year old male include the cranium and mandible, left clavicle and scapula, cervical vertebrae, left hand, right humerus, left radius, both ulnae, and teeth. A linear enamel hypoplasia is present on the lower left canine. The medial clavicle has severe arthritic changes. Porotic hyperostosis possibly represented by healed, porosity within muscle markings on the cranial vault.

Individual #2: These remains of a 0.7-1.3 year old child include the mandible, cranial vault, a hand phalanx, and

permanent and deciduous teeth. A linear enamel hypoplasia is present on the lower left first molar. The parietals and occipital are affected by moderate, healed and active porotic hyperostosis.
Locus 816 **(N1110 E970 R37): Adult** Human bone not excavated. *Tiwanaku IV/V.*
Locus 828 (N1110 E968 R49 N32 Hss#17): This feature contained a 35-45 year old female. The remains include the skull vault, one thoracic vertebra, and ribs. The frontal bone does not appear to be artificially deformed, but there is flattening of the planum occipitale and post-coronal constriction. Evidence of anemia includes possible porotic hyperostosis and slight, healed cribra orbitalia in both orbits. *Tiwanaku IV/V*
Locus 832 (N1100 E970 R54 N4b Hss#23): This burial of a 25-35 year old probable male contains portions of the skull and mandible. Limb bones include both humeri and the left radius and ulna. Additionally present are the left hand, both scapulae and clavicles, relatively all of the vertebral column, the sternum, and ribs. Slight arthritic changes are seen on the ribs and distal humerus. Evidence of anemia includes severe, healed cribra orbitalia of both orbits. The frontal bone does not appear to be culturally deformed. A right rib fragment is either from a juvenile or could be non-human. Stature estimate: 163-171 cm. *Early Chiripa*
Locus 841 (N1112 E966 R56 N4 Hss#18): This is a burial of a 40-44 year old female. Long bones include theright humerus and ulna and both radii, femora, tibiae, and fibulae. Additional bones include both hands, feet and pelves, the right scapula, and the sternum and ribs. Localized erosion of the anterior acetabulae indicates arthritis. Slight healed periostosis present on both tibial shafts. Stature estimate: 148-156 cm. *Tiwanaku IV*

Locus 843 (N1112 E966 R58 N6**):** The following bones pertain to either of the two individuals listed below: seven vertebral bodies and fragments of the ribs, cranium, right scapula, left clavicle, pelvis, and long bone, as well as misc. fragments, the talus, hand phalanx, foot phalanx, both proximal humerus and one distal tibia epiphyses. *Late Chiripa*

Individual #1 (Hss#21): This 3-5 year old contains significant portions of the cranium and mandible, hand bones, both feet, scapulae, clavicles, and pelves, portions of all vertebral column segments, ribs, and teeth. Long bones include the right humerus, radius, ulna and tibia, and both femora and fibulae. Evidence of anemia includes healed, slight cribra orbitalia and porotic hyperostosis. The skull is either normal or very slightly deformed.

Individual #2 (Hss#22): Individual #2 is a 2-4 year old which is represented by portions of the skull and mandible, hand and foot bones, both scapulae, clavicles and pelves, portions of all sections of the vertebral column, the sternum, ribs, and teeth. Long bones include both humeri, the right radius and ulna, and the left femur, tibia and fibula. Evidence of anemia includes healed, slight cribra orbitalia, but no porotic hyperostosis. Although the skull cannot be reconstructed enough to fully examine deformation, the frontal and occipital seem relatively normal.

Locus 860 (N1086 E970 R63 N2c Hss#20): This burial containing a 6-10 year old child includes the skull and mandible, hand bones, both feet, left patella, vertebral column, sternum, both scapulae, clavicles and pelves, ribs and permanent and deciduous teeth. Limb bones include both humeri, radii, ulnae, femora, tibiae, and fibulae. Evidence of anemia includes right, healed, slight cribra orbitalia and healed, moderate porotic hyperostosis. Cranial deformation is absent.
Locus 871 (N1086 E972 R64 N 3a Hss#19): This feature contains the remains of a 6-10 year old with fragmentsof the cranium, long bones and misc. bones and permanent and deciduous teeth. A linear enamel hypoplasia is present on the lower left canine. Ten percent of the long bone fragments have slight to moderate, healed periosteal reactions. *Early Chiripa*
Locus 885 (N1088-90 E970 R66 N3a): This burial of a 50+ year old female includes the cranium and mandible, both feet, scapulae, patellae and pelves, the right clavicle, the vertebral column, ribs, and teeth. Long bones include the right ulna, and both humeri, femora, tibiae, and fibulae. Two mid thoracic vertebrae exhibit fusion of both the bodies and arches. Evidence of anemia includes healed, slight left cribra orbitalia and porotic hyperostosis. Arthritic changes are present on the lumbar vertebrae and glenoid fossa of the scapula. The skull is artificially deformed with evidence of a thick band across the frontal, a sagittal depression that is continuous onto the occipital and likely a thin band and round pad at the planum occipitale. *Tiwanaku III Phase*

The following individuals crosscut loci 1236 (N1092.75 E913.1 N3), 1237 (N1092 E972 R102 N3 E100), and 1405 (N1092 E972 N4). All are likely part of burial # 100. Because size differences between some bones seems large, it is possible that two adults are present and mixed in "Individual #2." However, because these bones do not articulate, it can not be determined definitively. *Early Chiripa*

Individual #1 (1236/5 and /7): This individual is a 2-4 year old represented by permanent and deciduous teeth and one vertebral body. A left second metatarsal from Locus 1237 and a vertebral body from Locus 1405 could also be from this individual.

Individual #2 (1236/2 and /11): This individual is 35-80 years old and includes an ear bone, thoracic vertebrae, ribs, a fibula shaft fragment, both hands and feet (some from 1405), and teeth. Moderate to severe arthritic changes are present on the right foot and thoracic vertebrae. The right ulna and radius, femoral head, and right mandible that were too large to be from Individual #3 (1237) are likely from this individual. Fragments of the left humerus, right femur, a fibula, ribs, cervical and thoracic vertebrae from Locus 1405 could also be from this individual. Moderate arthritic changes are visible on the proximal humerus. A left fourth metatarsal that was in Locus 1237 is probably from this individual. The additional lower dentition (with caries on the lower left second molar) from Locus 1237 is likely from this individual.

Individual #3 (1237): This 45-55 year old female was relatively complete. Bones represented include the cranium and mandible, teeth, the right patella, all limb bones except the left ulna, both hands and feet, both scapulae, the left clavicle, all sections of the vertebral column, the sacrum (part from 1405), right pelvis (from 1405 and 1236/11 but fit sacrum), the sternum, and ribs. Linear enamel hypoplasias are present on both upper central incisors. Slight arthritic changes are present on the lumbar spine. The fibula shaft presents a slight periosteal reaction, which is both healing and active. The vault is unusually thick (9mm). Stature estimate: 151-159 cm. The right and left first metatarsals from Locus 1236 could be from this individual.

Individual #4 (1237): This feature also contained an occipital fragment and left scapula of a fetus.

Locus 1239 (N1096 E972 R104 N3 E102): This context contains misc. and cranial fragments and permanent and deciduous teeth of a 2-4 year old. *Tiwanaku IV*

Locus 1278 (N1094 E972 N3 E101): This is a burial of a 1.33-3 year old. Elements present are the cranium, including the left maxilla, misc. long bones, a thoracic vertebra, and one right and one left rib. Permanent and deciduous teeth are also present. *Early Chiripa*

Locus 1292 (N1092 E976 N3e): These remains of a 9-15 year old include the right mandible, 2 foot phalanges, the right femur, both tibiae, and permanent teeth. A moderate, mixed (active and healed) periosteal reaction is present on the tibial and femoral shafts. Two linear enamel hypoplasias are observed on the lower right canine.

Locus 1404 (N1092 E972 R107 N4): This locus contains the crania without mandibles of three adults. Because the cranial bones were so fragmentary and all appeared to be from adult females, they could not be separated into discreet individuals. This could be done with the teeth. In addition to the crania, there were portions of a left humerus, radius and ulna, a sacrum and right pelvis, cervical and thoracic vertebrae, and ribs. Severe, healed cribra orbitalia was present on one of the crania. Additionally, one individual had caries in the upper left second premolar, and another had a linear enamel hypoplasia of the upper right third molar and caries in both upper first molars. There are also a few fragments of subadult remains. These include two thoracic and one cervical-vertebral arch, a rib, the cranial vault, and right tibia. *Early Chiripa*

Locus 1417 (N1099 E960 R138 NT-3): These remains of a 2.5-5 year old include a few cranial and long bone fragments and permanent and deciduous teeth. *Tiwanaku V*

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