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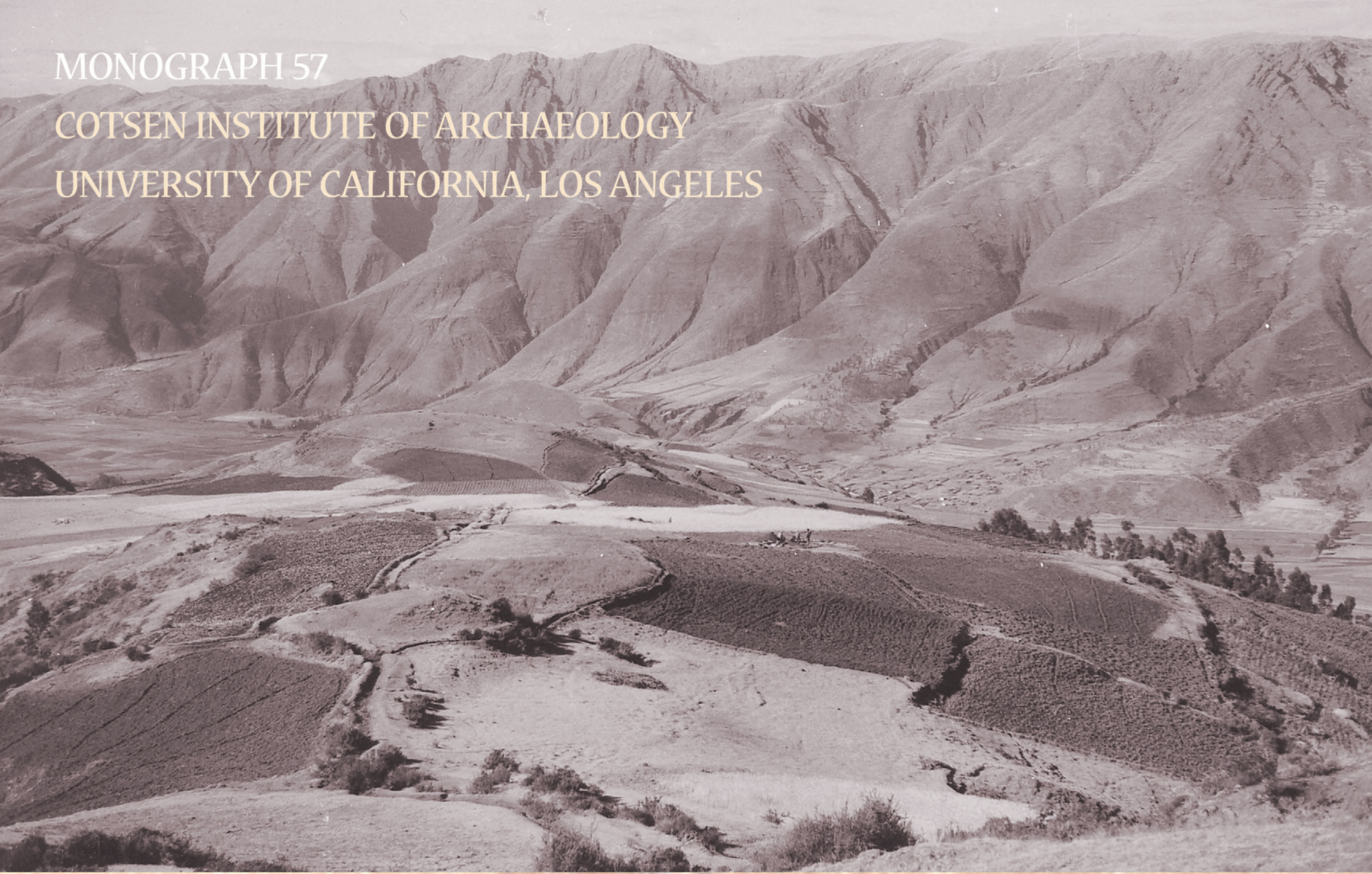

KASAPATA AND THE ARCHAIC PERIOD OF THE CUZCO VALLEY

EDITED BY

BRIAN S. BAUER

KASAPATA AND THE ARCHAIC PERIOD OF THE CUZCO VALLEY

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CHAPTER 1

RESEARCH AT THE SITE OF KASAPATA

BRADFORD JONES AND BRIAN S. BAUER

THE ARCHAEOLOGICAL SITE OF Kasapata (AN-309) was identified in 1998 during the Cuzco Valley Archaeological Project as a dense concentration of andesite debitage and projectile points. Recent plowing and the cutting of small irrigation canals at the site had also revealed several burials. Analysis of the surface collections indicated that this was one of the first Archaic Period sites to be identified in the Cuzco Valley. In 2000 we returned to the site and conducted a series of test excavations to help establish an Archaic Period projectile point sequence for the valley and to gain additional information on the Archaic peoples of the Cuzco region.[1]

This report provides an overview of our research at Kasapata and summarizes our current understanding of the Archaic Period in the Cuzco region. Chapter 1 provides an overview of the Archaic Period in the Andes and an introduction to our excavations at the site of Kasapata.[2] An analysis of the lithic materials recovered at the site is provided in Chapter 2. A discussion of the human remains is offered in Chapter 3. The results of the faunal analysis and obsidian sourcing are presented in Chapters 4 and 5. A summary of the radiocarbon samples is presented in Appendix 1. We hope that this report will provide the foundation for additional investigations at the site of Kasapata as well as at other Archaic Period sites in the Cuzco region.

OVERVIEW OF THE CUZCO ARCHAIC PERIOD

Although only a few studies have been conducted at preceramic sites in the Central Andean highlands, it is clear that hunting and foraging bands were moving through and beginning to inhabit the Andean mountains and high grassland areas (*puna*) relatively soon after the end of the glacial period (Núñez et al. 2002). Excavations in caves and rockshelters in the high-altitude areas (+4000 masl) of Junín by Rick (1980) have yielded evidence of camelid hunting perhaps as early as 9000 BC. Caves in the more montane areas of Ayacucho (MacNeish et al. 1980) and the Callejón de Huaylas (Lynch 1980) provide evidence of upland occupations dating to at least 8000 BC that were supported by a broader spectrum of plant and animal resources. Extensive research on high mountain environments and early human habitation has also been carried out in the upper Moquegua region. Aldenderfer (1998) has conducted excavations at various rockshelters as well as at the open-air site of Asana, which was first occupied by hunter-foragers just after 8000 BC.

While the relatively mild climate of the Cuzco Valley and its rich variety of plants and animals would have been attractive to preceramic hunter-foragers, until recently the Cuzco Valley was believed to be devoid of Archaic Period materials and occupations.[3] A lack of prominent caves, rockshelters, and rock art, combined with a traditional view of Archaic peoples as confined to the high grassland areas where wild camelids flourished, supported the notion that the Cuzco Valley was occupied relatively late in prehistory. In addition, since nearly 100 years had passed since the first archaeological studies were published concerning the Cuzco region and no Archaic finds had been reported, it had become the standard opinion that there were simply none to be found (Chávez 1980).

Soon after initiating a systematic survey of the Cuzco Valley, however, we began finding evidence of Archaic Period remains (Bauer 2004). The first artifacts included isolated projectile points. Later, sites marked by scatters of andesite debitage were also identified. Working in collaboration with Cynthia Klink, who was developing a projectile sequence for the Lake Titicaca region, we assigned many of our projectile points tentative temporal affiliations.[4] Then, following the general outline provided by Aldenderfer (1998:51), we provisionally divided the Cuzco Archaic into Early (10,000–8000 BP [calibrated 9500–7000 BC]), Middle (8000–6000 BP [calibrated 7000–5000 BC), and Late (6000–4000 BP [calibrated 5000–2500 BC]) phases.

We recognize that our database for the Archaic Period in the Cuzco Valley is rudimentary at best. Although during the course of the survey we found numerous sites that contained strong lithic components, the majority of these could not be definitively dated to the Archaic Period because of a lack of diagnostic artifacts, specifically projectile points. Our survey, and later our test excavations, suggested that andesite was widely used in the Cuzco Valley to make stone tools from the Middle Archaic Period through the Formative Period, and perhaps even later. Because of this, Archaic Period sites cannot simply be identified through the presence of stone tools and debris. In theory, sites with lithic materials could date to any prehistoric period. Thus, we classified a site as dating to the Archaic Period only when diagnostic projectile points were recovered from it.

Furthermore, we note that our survey methodology was not ideal for the identification and reconstruction of Archaic Period cultures. Surveys dedicated to mapping the distribution of preceramic period remains frequently involve crew members walking in lines no more than 5 m apart, rather than the wider, 25- to 50-m transects used in our research. This is because preceramic sites, frequently the remains of temporary hunting stations and base camps, are often quite small.

In addition, it should be mentioned that the landscape of the Cuzco Valley is dynamic. Millennia of erosion have undoubtedly destroyed or buried many Archaic Period sites. From their settlements and agricultural works, we know that people have been farming and reshaping the Cuzco landscape for well over 3,000 years. These activities can easily destroy or distort beyond recognition the relatively delicate remains of Archaic Period sites.

Despite these limitations, our survey did provide important information on the previously unknown preceramic cultures of the Inca heartland. The identification of Archaic Period remains in the Cuzco area more than doubles the length of known occupations in the valley and provides a foundation for larger and more systematic studies to be conducted on the first peoples of the region.

At the conclusion of our survey, we had identified more than 30 possible Archaic Period sites in the Cuzco Valley, 12 of which had yielded diagnostic Archaic Period projectile points. Because these remains represented the first evidence of Archaic activities in the Cuzco Valley, we decided to dedicate part of our 2000 field season to investigating them (Figure 1.1).

2000 FIELDWORK ON THE ARCHAIC PERIOD IN THE CUZCO VALLEY

The research design for investigating the Archaic Period during our 2000 field season in the Cuzco Valley centered on addressing several fundamental questions.[5] Our primary goal was to develop an archaeological chronology for the newly defined Archaic Period in the Cuzco Valley. This required the recovery of diagnostic artifact types associated with viable radiocarbon samples. In addition to our interest in establishing a projectile point sequence anchored on absolute dates, we wanted to enrich our understanding of the lifeways of the people living in the Cuzco region during these remote times. In doing so, we hoped to sketch a preliminary picture of the daily practices of the Cuzco Archaic peoples and be able to compare them to the better known lifeways of the Formative Period (2500 BC–AD 200) villagers of the valley (Bauer 2004).

When designing the research program, we initially considered excavating at four different Archaic Period sites. However, after return visits to the Archaic Period sites of the valley, we decided that our investigation would be best served if we concentrated our research time and resources on excavations at the site of Kasapata. This site was selected for intensive study for a number

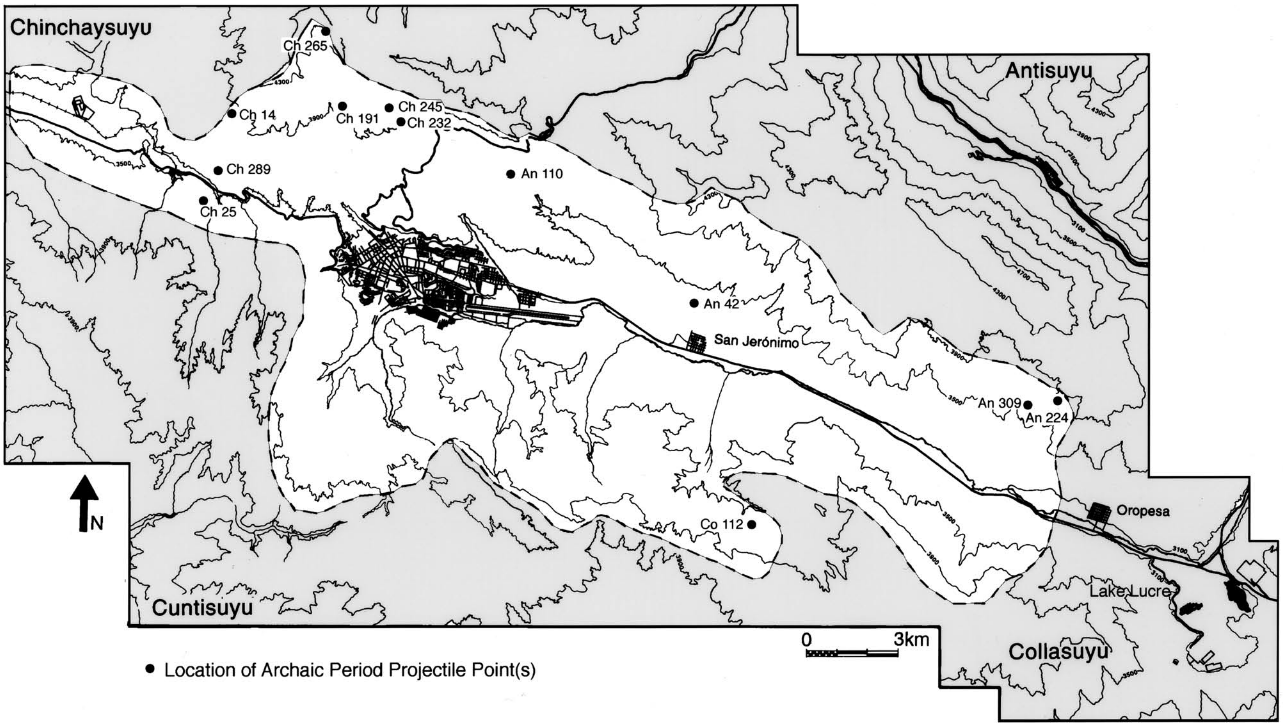

FIGURE 1.1. Locations of sites with Archaic projectile points in the Cuzco Valley.

of reasons. First, Kasapata was the largest preceramic site identified during our survey of the valley. Second, it had the highest density of lithic debris and the largest number of projectile points of any site recorded. Third, our provisional projectile point sequence suggested that the site was occupied during both the Middle and the Late Archaic Periods. Fourth, exposed burials at the site suggested that it held well-preserved osteological materials. Finally, the site appeared to be in excellent condition: it had not been deeply plowed, and it had not been disturbed by later, postceramic occupations. These observations suggested that Kasapata was a truly exceptional site in the Cuzco Valley and that additional research at it would provide critical information on the Archaic Period of the region.

The Site of Kasapata

The site of Kasapata is located at 3400 masl on a large, broad ridge of the mountain of Pachatusan, near the modern-day community of Patabamba. The ridge extends down into the Huatanay River Valley and meets the floodplain between the towns of Huasao and Quispicanchi. The site offers excellent views down the Huatanay River Valley to the Lucre Basin, 12 km to the southeast (Figure 1.2); the well-known Inca site of Tipon, approximately 3 km to the east; and the upper slopes of Pachatusan to the northwest. On clear days the city of Cuzco can also be seen in the far distance, some 20 km to the west.

The site extends across several fields along the ridge top. Since the center of the ridge forms the land boundary between the communities of Huasao and Patabamba, members of both these communities own fields at Kasapata. At the time of our work, a variety of crops were being grown at the site, including wheat, corn, and beans. Most of the site has been cultivated with traditional foot ploughs and ox-pulled ploughs, although recently the flatter sections of the ridge just below the site have been worked with tractors.

There are various water sources near the site. There is a seasonal spring at the upper edge of the site, and a long canal brings irrigation water from the slopes above the nearby village of Patabamba. There is also a year-round stream, and there are several springs beside the village.

2000 Fieldwork at Kasapata

Fieldwork at Kasapata began in early July 2000 and lasted approximately one month. The work involved three research steps. We first made a topographic map

FIGURE 1.2. The site of Kasapata (AN-309), located at 3400 masl on a ridge above the Huatanay River Valley.

of the site and conducted surface collections. Using the surface collections to define the dimensions of the site, we then dug 14 1-×-1-m units across the site. The goal of these excavations was to confirm the estimated site dimensions and to systematically test for intact archaeological deposits. Finally, two larger, 2-×-2-m units were excavated. The goals of excavating these units were to gather enough data to date the archaeological deposits observed at the site and their associated artifacts and to gain preliminary insights into the lifeways of the Archaic Period peoples of the Cuzco Valley.

THE MAPPING AND SURFACE COLLECTIONS

We began research at the site of Kasapata by making a topographic map and conducting a surface collection to more precisely determine the borders and size of the site than had been done during the general survey of the Cuzco Valley (Figure 1.3). The surface collection was also undertaken to document the distribution of diagnostic artifacts on the chance that they might reveal distinct horizontal patterning that would lend insight into the occupational history or internal organization of the site.

The surface collection involved four crew members walking the site area in parallel lines approximately 2 m apart. As diagnostic artifacts and surface features (burials) were identified, pin flags were placed next to them, and the survey line was continued. These diagnostic artifacts and features were recorded on the site map using a theodolite. The artifacts were then individually numbered and collected for analysis. Although approximately 40 projectile points and bifaces were recovered, and some differences in surface remains were noted, no clear temporal or activity patterning could be discerned from them. Concentrations of artifacts were found on the northwestern and northeastern slopes of the site. It was concluded, however, that these concentrations reflected areas of extensive erosion rather than zones of distinct prehistoric activities.

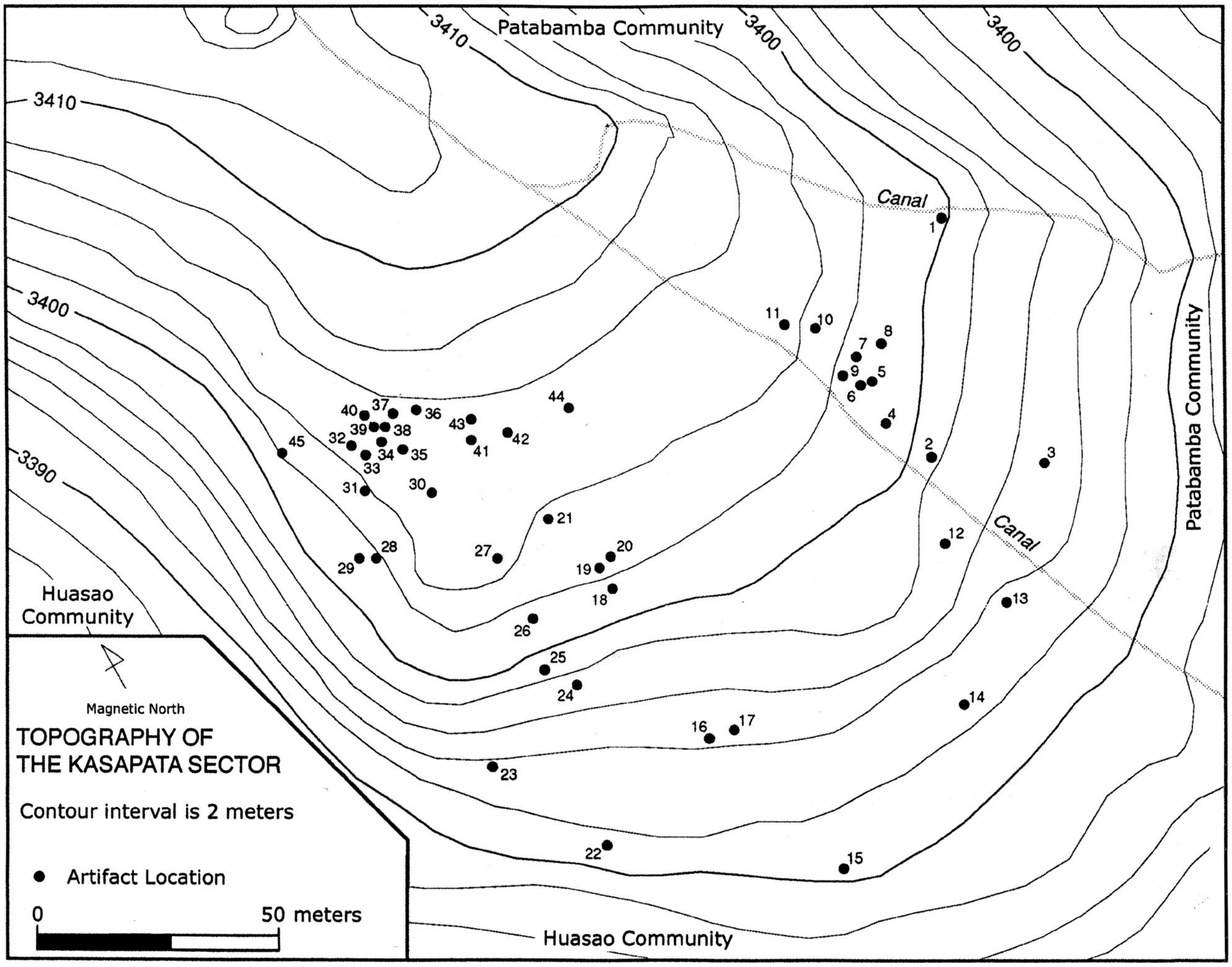

FIGURE 1.3. Results of surface collection at the site of Kasapata.

THE EXCAVATION UNITS

The second research stage at the site involved a total of 14 systematically positioned 1-×-1-m test excavations (Figures 1.4 and 1.5). These units were used to further define the site boundaries, understand the site formation processes, determine the extent and integrity of the archaeological deposits, and recover artifacts from defined archaeological contexts. They were organized into four transects across the site.

Three of the four sampling transects were situated on the southern slope of the ridge on which the survey had identified the greatest concentrations of artifacts and where site preservation appeared to be the best. Transect 1 (Units 1–4 and 13) was oriented on the site's east-west baseline and consisted of five test units placed at 20-m intervals.[6] Transect 2 (Units 5–9) was placed 20 m to the south of Transect 1 and consisted of five test units spaced at 20-m intervals. Transect 3 (Units 15 and 16) was placed 20 m to the north of Transect 1 and consisted of two units placed at an interval of 40 m. The individual excavation units on these three transect lines were offset to provide better overall site coverage.

The fourth transect (Units 12 and 14) was situated on the eastern face of the ridge. During the surface collection, we noted that this area of the site had a dense scatter of lithic materials, a single Formative pottery fragment, and a large quantity of small to medium-sized stones. Although the surface collection had recovered projectile points slightly farther downslope, the test units were placed on the upper part of the ridge in the hope of finding intact deposits.[7] These two units were separated by 10 m and ran roughly south to north.

The third research stage at the site was the excavation of two 2-×-2-m units in areas that the testing

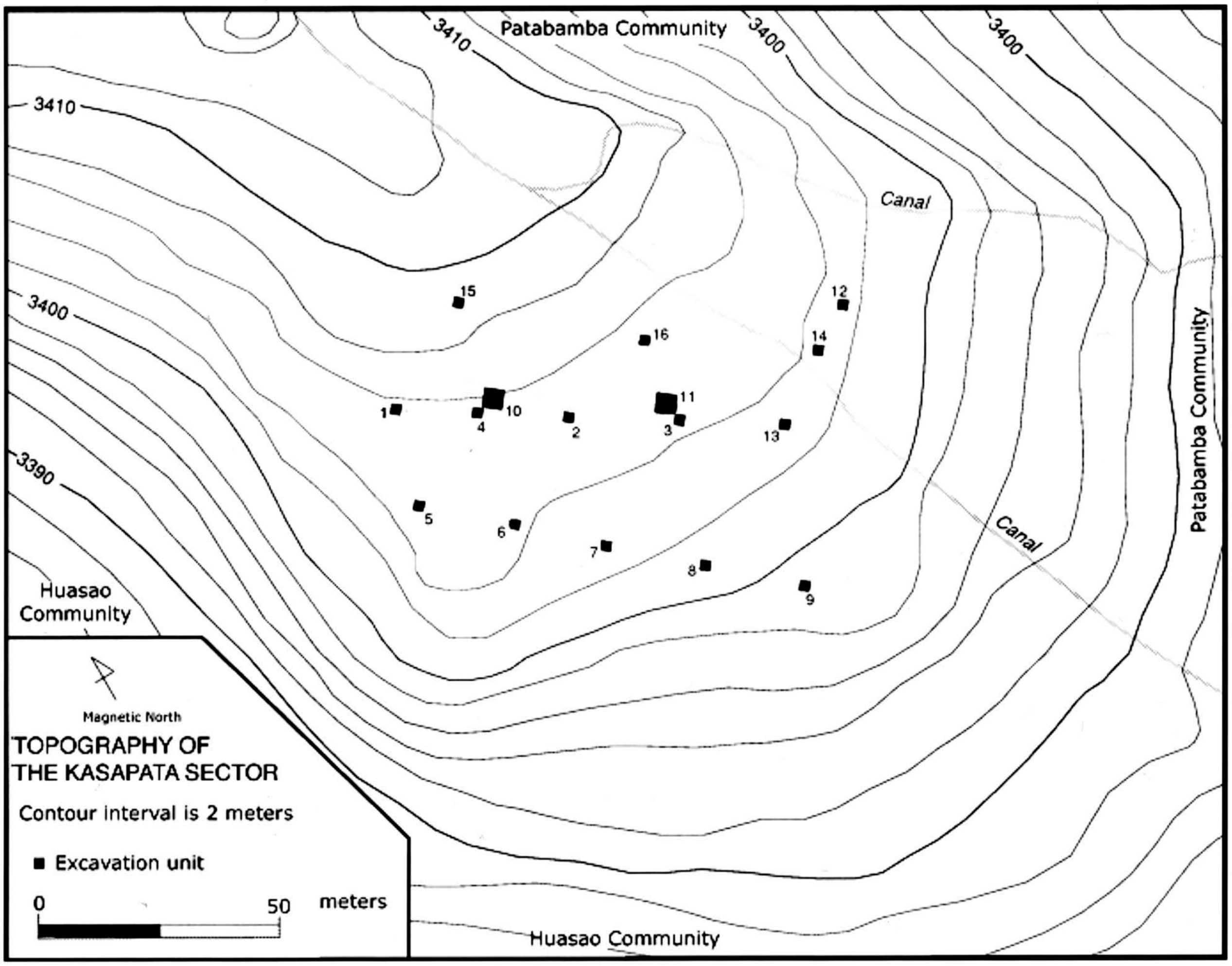

FIGURE 1.4. Locations of excavation units at Kasapata.

program suggested contained well-preserved archaeological deposits. Both of these larger units (Units 10 and 11) were placed along Transect 1. The specific goals of excavating these larger units were to gain additional information to contextualize the material recovered in the site sampling process, to increase the general sample size of recovered artifacts, to gain additional information on the site's occupational sequence, and to provide additional contexts in which associated artifacts and carbon would be found.

EXCAVATION METHODOLOGY AND FIELD PROCEDURES

All units were excavated in arbitrary levels of 10 cm as determined from a datum established in the northeastern corner of the unit, until natural levels or features were identified. These were then excavated separately in natural or arbitrary levels. The plow zone of each unit was removed using picks and shovels. The rest of the unit was excavated to sterile soil using a combination of shovels, picks, and hand trowels.

Two categories of unique contexts, lots and features, were recognized as distinct from the surrounding level series. Lots were contexts of uncertain character and were isolated and excavated separately from the surrounding level matrix. Examples of lots are areas of anomalous matrix, pits that could not be clearly defined, apparent concentrations of small rocks, and possible post molds. Features were any discrete and recognizable archaeological context and were excavated separately from the surrounding level matrix. Features included burials, floors, and hearths. Lots and features were excavated by hand trowel in 10-cm arbitrary or natural levels, depending on the exact nature of each individual case.[8]

FIGURE 1.5. A series of 1-×-1-m test excavations were dug to help define the nature of the site.

All the matrix removed in the excavation process was screened through 1/4-inch wire mesh. After the excavations were finished, profiles were made of each unit. Flotation samples were collected from pit features as well as from the profiles of the units after the excavations were completed. At the end of the field season, each unit was backfilled.

Information for each level was recorded on standardized level forms. Separate standardized forms were filled out for the excavation of lots, the excavation of features, and the collection of carbon samples. All the recovered artifacts from each level, lot, and feature were separated by type (bone, lithic, carbon) and bagged in the field for transport to the laboratory. Each category of artifact was assigned a unique bag number, and the site, level, date, and artifact type were recorded on the front of each bag. The bag numbering system was also used to designate bulk materials as well as unique items recovered in the course of the excavations. For example, projectile points were given their own individual bag number and their locations were plotted on excavation drawings and sheets, while the lithic debris recovered in a single level was placed in a single bag. In the laboratory the artifacts were washed, counted, cataloged, and marked with the site number and the bag number.

FIELDWORK RESULTS

Two surface collections have been conducted at Kasapata. The first took place in 1998, when the site was identified during our regional survey of the Cuzco Valley. This collection yielded 15 bifaces, of which four were tentatively dated to the Middle Archaic, three to the Late Archaic, and three others were classified as general Archaic (Bauer et al. 2004). The second collection occurred in 2000 as a prelude to our excavations at the site. This collection also indicated that the site was occupied in the Middle Archaic and that it continued to be visited during the Late Archaic Period (see Klink, Chapter 2).

Building on and supporting the surface collection data, 16 test units were dug at the site in 2000. These excavations identified two well-preserved cultural strata at the site. Carbon samples obtained from secure contexts dated the lowest of these two cultural strata to the early Late Archaic (Stratum 2) and the higher stratum to the late Late Archaic (Stratum 3). For simplicity's sake, we refer to these two cultural strata as the early and late occupations of the site, respectively.

In this section and the next, we provide an overview of the results of the 2000 field investigation, beginning with the surface survey. The results of the test excavations are then discussed, beginning with an overview of the site stratigraphy, the aerial distribution of the different components, and the general formation processes responsible for their deposition. We also provide a brief description of each of the excavation units. This is followed by a discussion of the site occupations as revealed by the archaeological data recovered. The features recorded during the course of the excavations document a distinct shift in the character of the site from a temporary mobile campsite during the early occupation to a larger, perhaps more sedentary occupation in the late occupation phase. The excavations also provided important data on the site formation processes.

The 2000 Surface Collection

The 2000 surface collection recorded the presence of cultural materials in an area approximately 150 × 200 m on the surface of the ridge. The majority of the materials were found spread along the gradually sloping southern, eastern, and northeastern sides of the ridge. We recorded the position of and collected more than 35 andesite bifaces in various stages of production. In addition, the locations of several obsidian flakes and an ax were recorded. The position of a burial eroding out of a small irrigation canal was also mapped, as was the location of a ground stone bowl fragment.[9] Various examples of temporally nondiagnostic cores, hammer stones, and edge-modified flakes were observed during the surface collection but were not collected.

Looking over the site from the ridge above it, one can clearly see areas of dark brown soil near the center of the ridge that fade into the more reddish soils of the ridge slopes. The dark brown soils are unusually rich in organic materials and mark areas of exceptionally concentrated prehistoric activities. The highest densities of diagnostic surface artifacts were recorded at the interface of red and dark brown sediments near the southwestern edge of the site. Other transitional areas of red and dark brown soils also contained above-average densities of lithic remains, yet excavations in these transitional areas revealed that they contained disturbed and largely secondary erosional material. These findings have two important but not surprising implications for understanding the site and its prehistoric occupations. First, the areas of highest artifact density reflect the zones of the site that have been exposed to the greatest amount of natural erosion and recent human action, principally cultivation. These actions have brought many lithic artifacts to the surface, leaving them exposed on the gently sloping sides of the ridge. Second, because of erosion, the surface scatter of artifacts exceeds the likely occupational area of the site.

SITE STRATIGRAPHY

One of the major goals of the test excavation program was to gain an understanding of the overall site stratigraphy. During the course of our research, we were able to divide the depositional strata at Kasapata into five macrostrata, each with a series of internal substrata. The macrostrata, in ascending order, include Stratum 1 (the sterile natural deposits that underlay the prehistoric occupations); Stratum 2 and Stratum 3 (two well-preserved, intact cultural strata that pertain to the prehistoric occupations of the site); Stratum 4 (higher-level deposits that have been disturbed by erosion and human activities after the formation of the prehistoric components); and Stratum 5, the modern plow zone. The characteristics of these macrostrata are described below. Localized variations are indicated with an alphabetic substratum designation.

Stratum 1

Stratum 1 represents the natural sedimentary deposits of the ridge that underlie the subsequent human occupations at the site. These sterile deposits varied sufficiently in our test excavations to warrant subdivision into four substrata based on their physical characteristics. The excavations suggest that the upper parts of the ridge are composed of a compact red clay that is underlain by deposits of sandstone and yellow clay as one moves progressively down the ridge.

Substratum 1A is a compact red clay with 5–10 percent inclusion of very small gravels. Found in Units 1, 2, 3, 4, 5, 6, 7, 10, 12, 13, 14, 15, and 16, it is the most common natural sediment encountered at the site.

Substratum 1B is an eroded form of substratum 1A that, having been subjected to sufficient weathering, has a hard, stonelike crust. The sediment material below the crust, however, remains easily excavated. The only unit in which this was encountered was Unit 11.

Substratum 1C is a compact yellow clay with a high gravel content (>50 percent). This deposit was restricted to Unit 9.

Substratum 1D is a natural yellow-cream sandstone. The material remains relatively soft and may represent a heavily eroded and hardened Substratum 1C surface. This deposit was encountered in Unit 8.

Stratum 2

Stratum 2 is a semicompact, medium brown to dark brown clay loam deposit that is the consequence of numerous short-term occupations. These episodes left low-density sheet midden deposits interspersed with lenses of more concentrated cultural artifacts, which may represent the remains of occupation surfaces. The cultural artifacts were recovered in a matrix of naturally

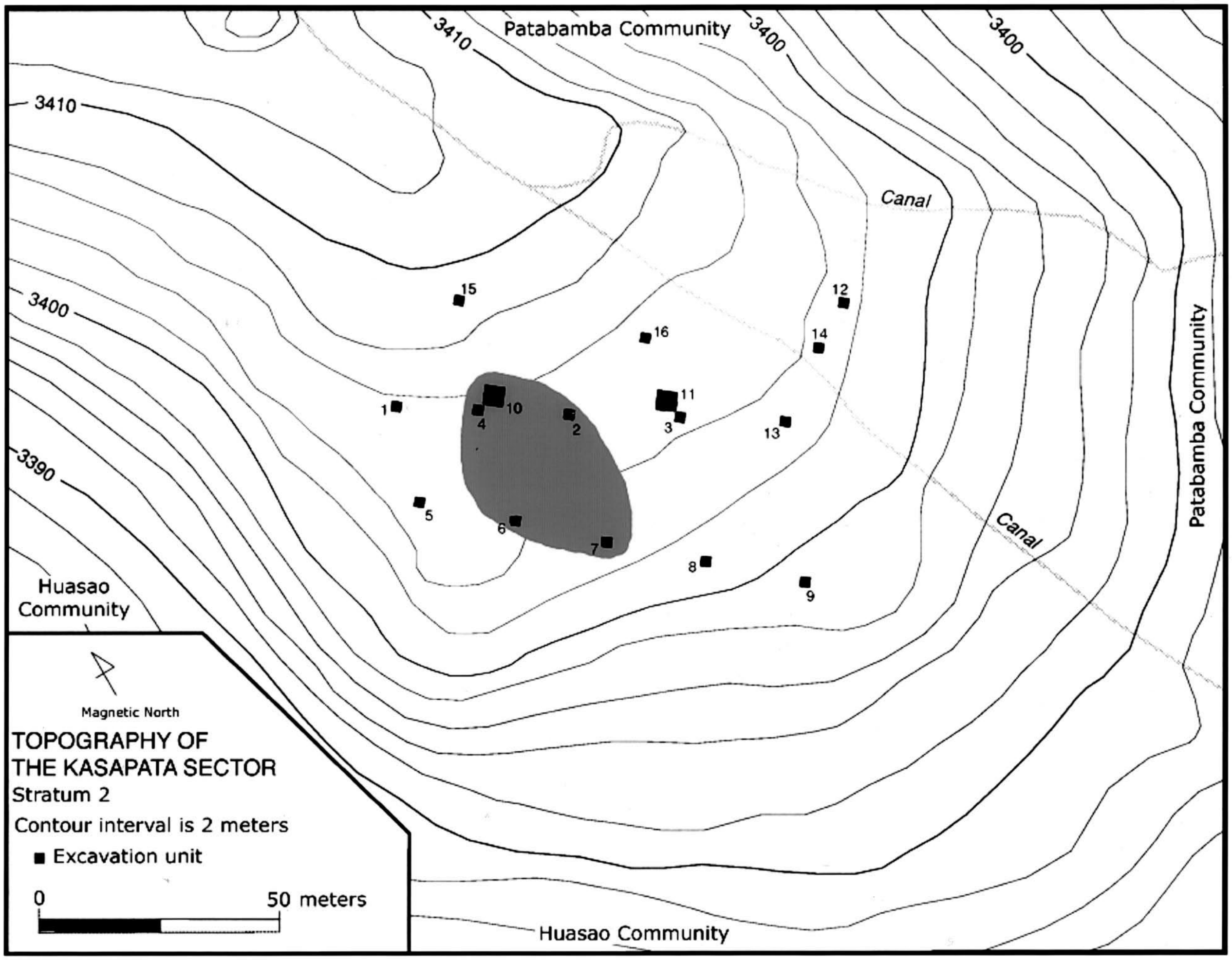

FIGURE 1.6. Area of site containing Stratum 2.

deposited materials, principally of a colluvial or aeolian nature (Figure 1.6).

The deposit is restricted to the relatively flat, upper areas of the site, including those tested by Units 2, 7, and 10. This deposit, which contains what we call the early occupation of the site, is divided into two substrata.[10]

Substratum 2A is a poorly defined substratum occurring in the lower 10–20 cm of Stratum 2 where it interfaces with Substratum 1A. Substratum 2A is a humid, semicompact to loose, medium to dark red-brown silty clay loam with minor inclusions of gravel and inclusions of red clay with provenance in Substratum 1A. The red clay inclusions mark this stratum as distinct from the majority of Stratum 2 deposits across the site. Substratum 2A appears to result from the mixing of the natural sterile subsoil with overlying cultural deposits as a consequence of human actions and natural soil formation processes.

A large carbon fragment was recovered from Substratum 2A in Unit 10. The fragment was divided into two pieces, A and B, and radiocarbon dates were run on each sample. Sample AA 39779-B provided a radiocarbon age of 5568 ± 38 BP and a calibrated date of approximately 4400 BC. Sample AA 39779-A yielded a radiocarbon age of 5645 ± 76 BP and a calibrated date of approximately 4500 BC. Since these two dates were derived from the same carbon source, a mean radiocarbon date of 5532 ± 49 BP and a calibrated date of approximately 4400 BC were calculated for the samples (See Appendix 1 for complete date calibrations.)

Substratum 2B constitutes the majority of the Stratum 2 deposits. It is a semicompact, medium brown to dark brown clay loam with a low content of gravels (5 percent) and variable density of material culture remains. Its formation is a consequence of human activity and colluvial and aeolian deposition processes.

Two radiocarbon dates were run on samples recovered in Substratum 2B. A carbon sample from Unit 4 (AA 39777) provided a radiocarbon age of 5464 ± 53 BP and a calibrated date of approximately 4300 BC. A carbon sample from Unit 2 (AA 39780) yielded a radiocarbon age of 5507 ± 61 and a calibrated date of approximately 4350 BC.

Stratum 3

Stratum 3 is a humid, loose to semicompact, very dark brown to black clay loam that varies in depth from 5 to 80 cm throughout the site. It is rich in organic materials and is the consequence of an intensive human occupation. This stratum has been identified as intact in all units with the exception of Units 5, 9, 12, 15, and 16. The composition of the deposit is distinct from that of either of the earlier occupational deposits (Stratum 2) or the surrounding natural sediments, being much richer in organic materials and having a much higher density and variety of artifacts (Figure 1.7).

In general, the deposit appears to be a large and dense midden formed during a prolonged and intensive occupation of the site. No evidence for soil formation or subdivision of the deposit was visible in the profiles, and the concentration of artifacts recovered from Stratum 3 seemed to be relatively consistent across the site area.

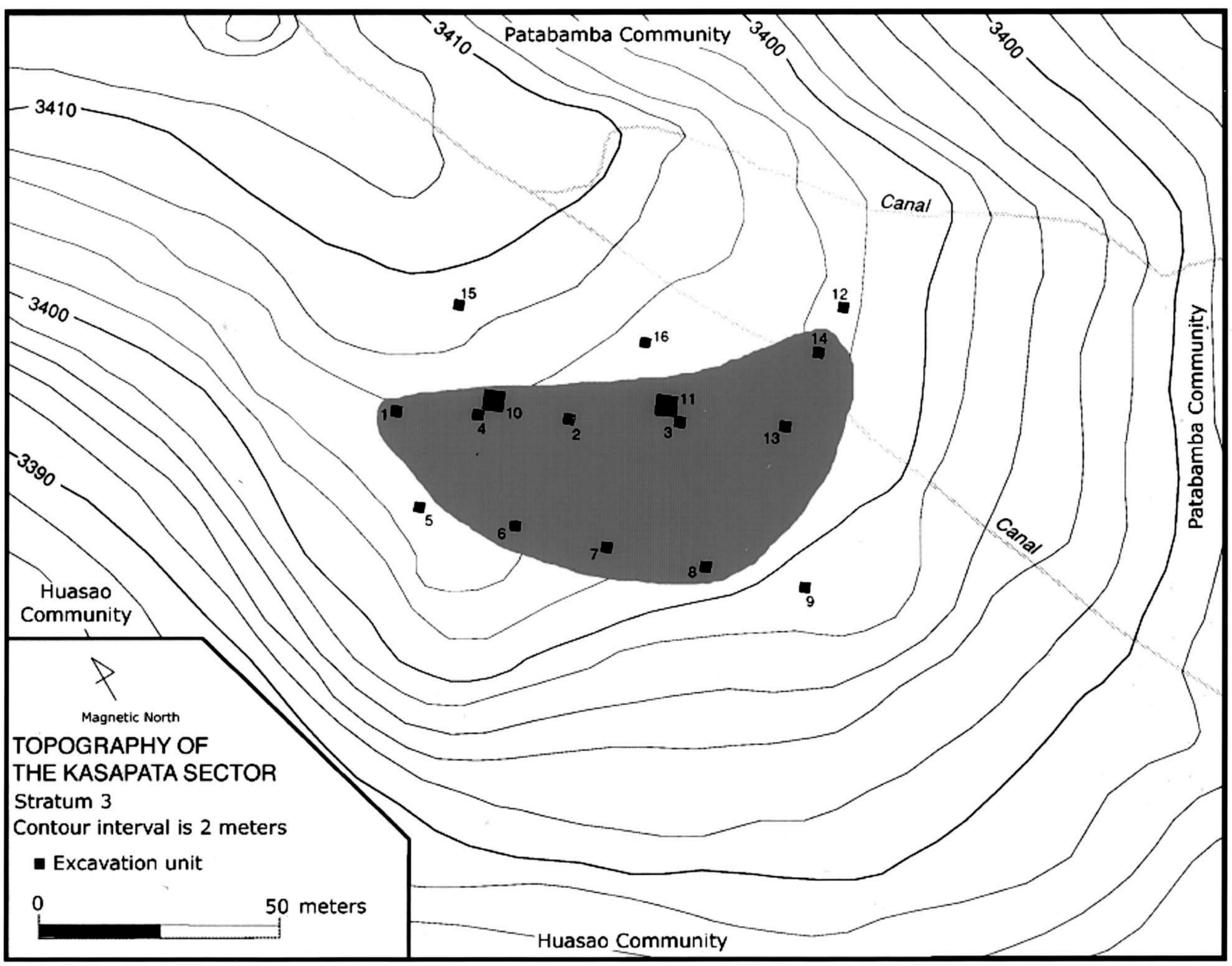

FIGURE 1.7. Area of site containing Stratum 3.

This evidence suggests that the Stratum 3 deposit, in contrast to Stratum 2, was formed relatively quickly and consistently before the site was abandoned. The Stratum 3 deposits in the profiles and the unit descriptions have been subdivided in the following manner:

Substratum 3A is a dark brown to black clay loam with red clay inclusions and a relatively low quantity of material culture. Similar to Substratum 2A, Substratum 3A appears to be the result of mixing of the underlying natural sediments with the overlying cultural deposit caused by human activities at the site and natural soil formation processes.

Substratum 3B is a loose to semicompact, very dark brown to black clay loam with a high content of cultural materials. It is the most common type of Stratum 3 deposit throughout the site. Its deposition appears to be exclusively the result of human activities.

A radiocarbon date was run on a carbon sample recovered in Substratum 3B from Unit 11. This sample (AA 39776) provided a radiocarbon age of 4428 ± 37 BP and a calibrated date of approximately 3100 B.C.

Stratum 4

Stratum 4 deposits vary across the site. Its development is the result of the colluvial redeposition of upslope materials and the redeposition of adjacent deposits caused by the construction and maintenance of agricultural fields and irrigation canals. This is the only archaeological context in which pottery sherds, and a small number at that, were recovered. Because these deposits postdate the major Archaic occupations, and there is no evidence of subsequent human habitation on the ridge, the ceramic fragments are believed to derive from later, nearby ceramic period occupations. The few Inca-style sherds that were recovered in this stratum are thought to be related to the large nearby Inca occupation at the site of Tipon.

Four substrata were defined in the excavations and are indicated on unit profiles and in unit reports in the following manner:

Substratum 4A is a compact, dark brown to black clay loam with a high content of gravels and a low to medium content of cultural material, including both andesite and obsidian lithics, bone, and a few ceramic sherds. The distribution of this deposit was confined to Units 2, 3, 11, and 13. The restricted range of this deposit may reflect the intentional redeposition of materials by local farmers to raise the surface of this particular field.

Substratum 4B is a compact to semicompact, gray-brown to red-brown clay loam with a high content of gravel (40 percent). There is a medium to low content of cultural material, including ceramic sherds. This substratum appears to be composed of colluvially redeposited, upslope materials. Its similarity in color and composition to currently plowed Stratum 3 deposits may indicate that deposits of this type are a consequence of increased erosion stemming from cultivation. It is important to note there was substantial variability in the actual character of these deposits. This substratum was identified in Units 5, 6, 7, 8, 9, 12, and 13.

Substratum 4C, found only in Unit 6, is identical to Substratum 4B, with the exception of the inclusion of white and orange mottles. These inclusions are presumed to originate in, and be eroded from, another natural deposit.

Substratum 4D is composed of a compact brown clay loam (50–60 percent clay) with inclusions of red clay and gravels (40 percent). This material appeared to be colluvially redeposited materials from Stratum 2 contexts. It was encountered only during the excavation of Unit 9.

Modern Plow Zone (Stratum 5)

At the time of our excavations the site was under cultivation. The depth of the plow zone varied across the site from 5 to 30 cm, depending on the manner of cultivation. The coloration and composition of the plow zone varied naturally, depending on the underlying deposit that was being disturbed. Sediment textures were typically loose, with modern material culture, unharvested crops, and innumerable roots.

DESCRIPTIONS OF EXCAVATION UNITS

The following is a description of the results of the 16 tests units dug during the course of the 2000 field season. The excavations yielded a wealth of information on the newly identified Archaic Period of the Cuzco region. More detailed descriptions of many of the features, burials, and cultural materials recovered during the course of the excavations are presented in other chapters of this monograph.

Unit 1 was a 1-×-1-m unit located 19 m west and 3 m south of the primary datum on Transect 1.[11] The excavation of this test unit revealed that below the 10 cm of dark brown Stratum 3 plow zone a shelf of Substratum 1A red clay was present in the northern half of the unit. While excavation stopped at the red clay shelf in the northern half of the unit, in the southern half the excavators encountered a 20-cm-thick layer of Substratum 3B matrix overlying 20 more cm of Substratum 3A deposits. These deposits pertain to intact midden contexts associated with the late occupation of the site. Moderate quantities of bone, lithics, and carbon were recovered, as well as a projectile point base and two broken bone tools. No features or lots were identified. The excavation of the unit was terminated with the appearance of red clay throughout the entirety of the unit.

Unit 2 was a 1-×-1-m unit located 20 m east of the primary datum on Transect 1. The upper 20–30 cm contained dark brown plow zone and disturbed Substratum 4A deposit (Figure 1.8). Beneath these was a 30-cm-thick Substratum 3B layer representing an intact late occupation midden context. In addition to collections of lithics, bone, and carbon, in this stratum we also identified an infant burial[12] and a possible deflated hearth consisting of a concentration of burned rocks, debitage,

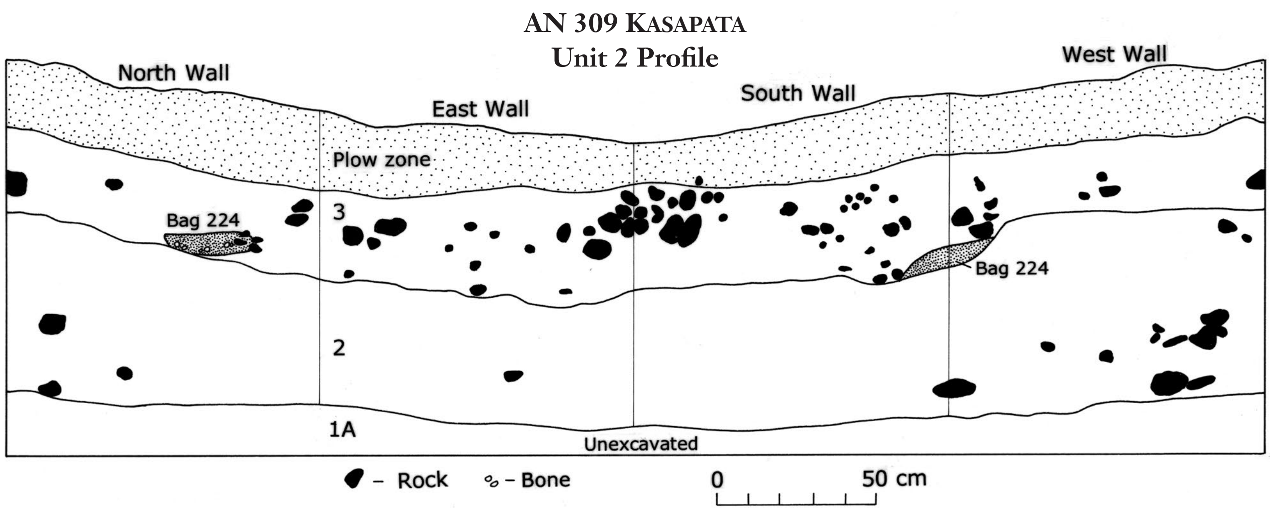

Figure 1.8. Profile of Unit 2.

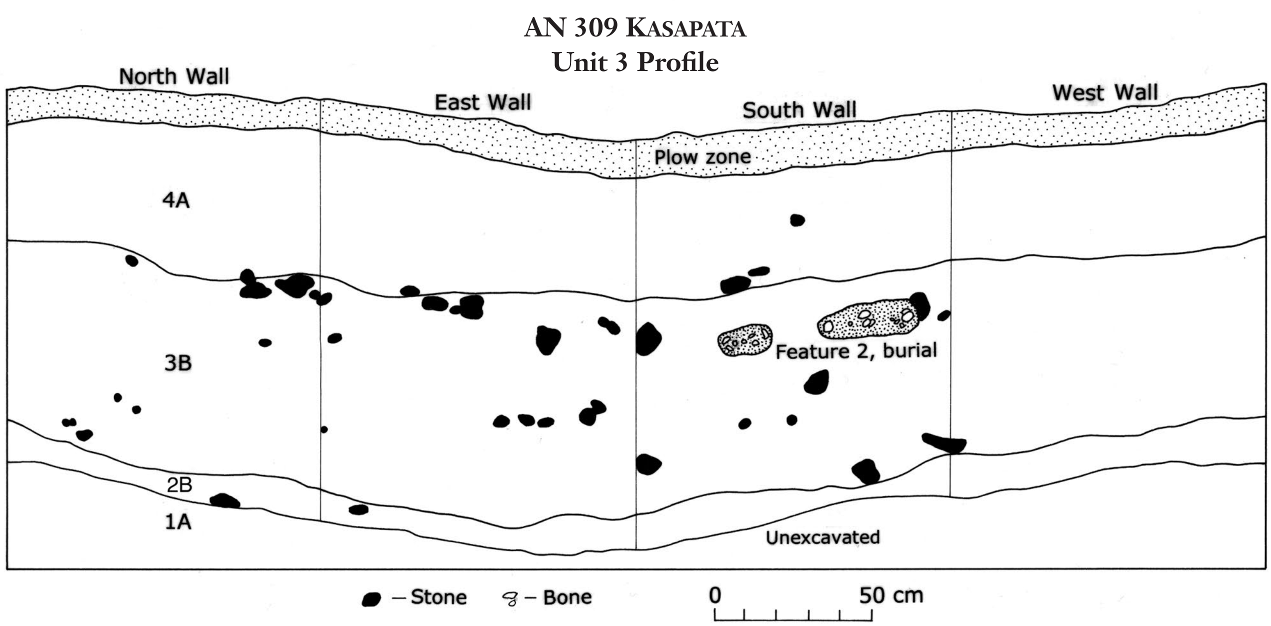

Figure 1.9. Profile of Unit 3.

FIGURE 1.10. Artifact no. 331, a complete bone awl.

FIGURE 1.11. Artifact no. 332, polished bone with side notching.

Figure 1.12. Several antler billets used in stone working that were recovered during excavations at Kasapata.

and bone. Underlying the late occupation materials was a 70-cm-thick Stratum 2 deposit pertaining to the early occupation of the site. No lots or features were identified in this stratum, although lithics, bone, and carbon remnants were collected. Unlike in Units 4 and 11 (see below), there is little evidence for two distinct occupational zones in the Stratum 2 deposit. Rather, the upper portions of the deposit have a relatively high concentration of artifacts that greatly diminishes in the final 20 cm. Carbon extracted from the Stratum 2 deposit provided a calibrated date of approximately 4350 BC.[13] The base of the early occupation deposit rested on sterile red clay (Substratum 1A).

Unit 3 was a 1-×-1-m test unit located 40 m east of the primary datum on Transect 1. The upper 50 cm of this unit consisted of Substratum 4A material, of which the upper 10–15 cm was plow zone (Figure 1.9). Underlying this disturbed context was an intact Stratum 3 deposit, 80 cm thick, pertaining to the late occupation of the site. Significant quantities of lithic, bone, and carbon were recovered during the excavation. In addition, a complete "awl"[14] (Figure 1.10), a polished bone fragment with side notching (Figure 1.11), and an antler billet used in stone working were found (Figure 1.12). The excavators also recorded two burials, one of an infant (Feature 3-1)[15] and the other of an adult (Feature 3-2)[16] (see Sutter and Cortez, Chapter 3). In the ultimate 10–15 cm the excavators noted the presence of a reddish brownish matrix that may be a thin Substratum 2B context. Only lithics were encountered in this context. The cultural deposits overlay sterile red clay (Substratum 1A).

Unit 4 was a 1-×-1-m unit, the northeastern corner of which was located at the primary datum on Transect 1. Excavation of this unit revealed that below 10–20 cm of plow zone were intact Substratum 3B deposits pertaining to the late occupation of the site (Figure 1.13). The context appears to be a general midden that is approximately 35 cm thick. The majority of cultural materials recovered were burned stone, bone, and lithic debitage and tools. In the northeastern portions of the unit there is an extension of the large pit feature full of burned stone, lithic debitage, and bone subsequently documented in Unit 11 (Lot 11-3: see

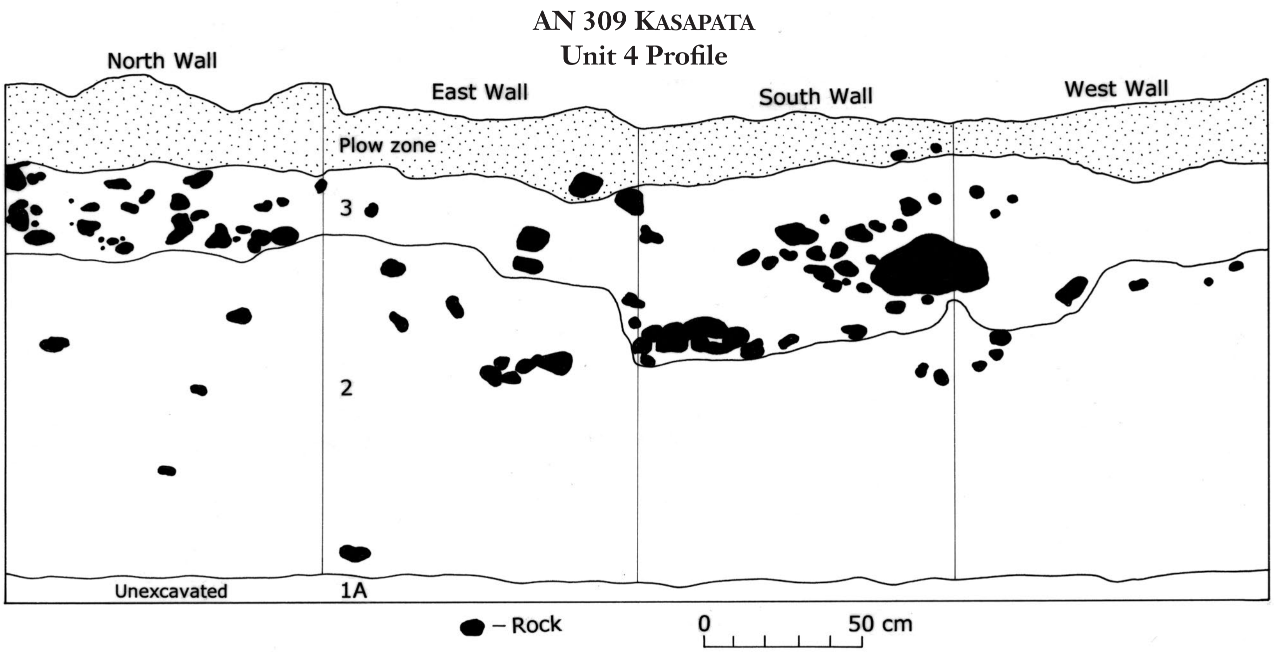

Figure 1.13. Profile of Unit 4.

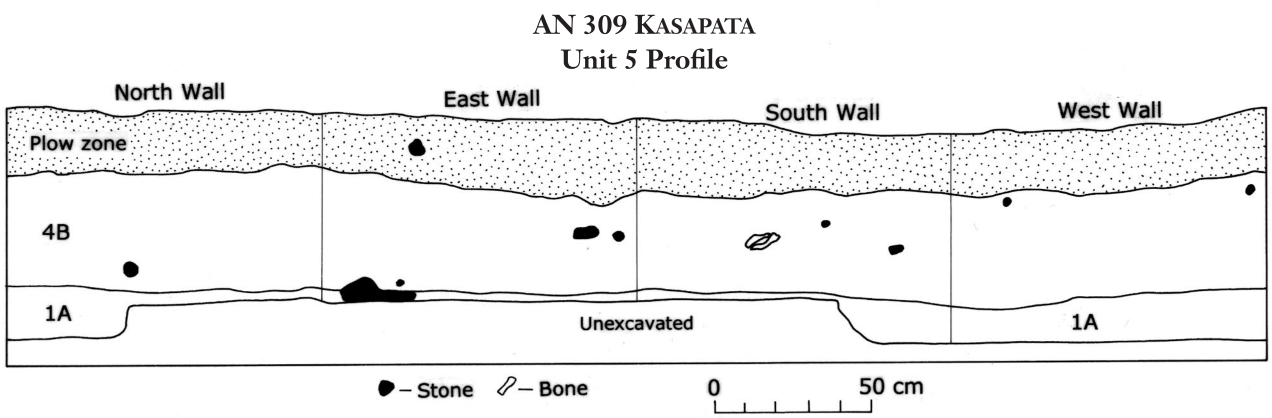

Figure 1.14. Profile of Unit 5.

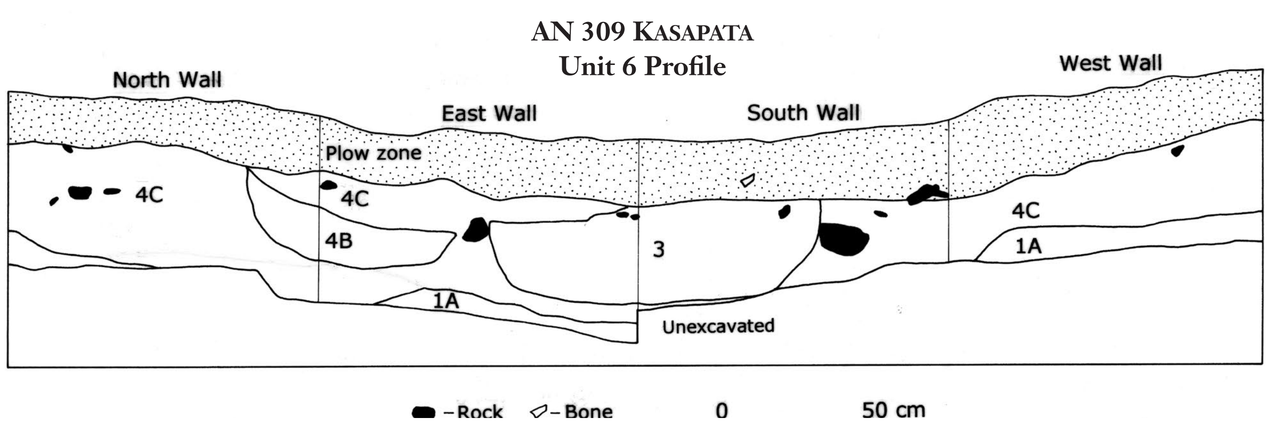

Figure 1.15. Profile of Unit 6.

discussion below). Underlying the late occupation deposit were Stratum 2 deposits, 90 cm thick. In general, the Stratum 2 deposits consisted of general sheet midden containing lithics, bone, and carbon. The upper 30 cm of the Stratum 2 deposit appeared to have formed during a period of more intense occupation, for we recovered eight bifaces,[17] along with large quantities of other artifact classes. The underlying 30 cm continued to produce lithic, bone, and carbon materials in much reduced quantities. The final 30 cm of the unit appeared to correspond to the earliest occupational period. In this lowest layer there was a notable increase in the amount of carbon collected, much in association with a small pit feature found near the center of the unit and dug into the sterile clay (see below). Carbon extracted from the pit feature provided a calibrated date of approximately 4300 BC.[18] Excavations were terminated with the appearance of red clay (Substratum 1A) throughout the unit.

Unit 5 was a 1-×-1-m unit located 9 m west and 20 m south of the primary datum on Transect 2. Although Unit 5 produced a sizable sample of lithic and bone artifacts, as well as some ceramics, no intact cultural deposits were recorded. Instead, the upper 50–60 cm consisted of 10–20 cm of dark brown plow zone over a deposit of disturbed Substratum 4B materials (Figure 1.14). These overlay sterile red clay (Substratum 1A).

Unit 6 was a 1-×-1-m unit located 11 m east and 20 m south of the primary datum on Transect 2. The excavation of Unit 6 was complicated by clear disturbances of the Archaic Period deposits (Figure 1.15). Below the approximately 20 cm of plow zone was a 30- to 35-cm-thick deposit of matrix that was a combination of Substratum 4B and 4C deposits cross-cut by several apparent pit features containing what appeared to be Stratum 3 deposits.[19] Materials recovered in this level included lithics, bone, carbon, and a few ceramic fragments. This overlay red clay basal sediments, although a possible veneer of Stratum 2 matrix was observed at the interface of the basal sediment and the disturbed deposit. Possibly related to the early occupation of the site was a shallow pit in the corner of the unit that was excavated as Lot 6-1. Because of the evidence of disturbance and the uncertain nature or timing of the pit features, the materials in this unit are not considered to be of secure contexts and thus are of limited interpretative value.

Unit 7 was a 1-×-1-meter unit located 31 m east and 20 m south of the primary datum on Transect 2. The excavation of Unit 7 recorded approximately 30 cm of Substratum 4B matrix overlaid by a 10-cm layer of Substratum 4A deposits (Figure 1.16). Beneath these disturbed contexts was 40 cm of intact stratified deposits pertaining to the early and late occupations of the site. The upper 10 cm pertained to the late occupation midden deposit, and were typical of other Substratum 3B contexts across the site, with bone, lithics, and carbon being recovered in good quantity. This stratum rests on an approximately 30-cm-thick deposit of Stratum 2 matrix pertaining to the early occupation of the site. Artifacts recovered included lithics, bone, and carbon, and the overall character of the deposit suggests that the context was general midden, associated with low-intensity occupation. Overall, the quantity of artifacts recovered in this stratum was notably less than that recovered from the Substratum 3B layer. A possible pit feature or pit hearth (Lot 7-1) was recorded in the southeastern corner of the unit in Stratum 2 contexts and extending 30 cm down to sterile basal sediments. At the base of the Stratum 2 deposit, sterile red clay sediments (Substratum 1A) were encountered.

Unit 8 was a 1-×-1-m unit located 51 m east and 20 m south of the primary datum on Transect 2. The excavation of Unit 8 revealed that beneath approximately 60 cm of gray-brown plow zone and redeposited materials (Substratum 4B) was an intact Stratum 3 deposit associated with the late occupation of the site (Figure 1.17). Lithic materials, bone, and carbon were all recovered in moderate quantities during the excavation of the late occupation layer. Two pieces of worked bone were also recovered, one of which was perforated. The second piece was most likely also perforated; however, it has been broken. These items appear to be ornamental (Figure 1.18).[20] No features or other unique contexts were recognized during the excavation, and the Stratum 3 deposit appears to be an extension of the midden associated with the Late Archaic occupation of the site.

Unit 9 was a 1-×-1-m unit located 71 m east and 20 m south of the primary datum on Transect 2. The excavations in Unit 9 revealed that no intact archaeological deposits were located in this portion of the site. The upper 40 cm of the unit below the thin plow zone consisted of a deposit of disturbed materials (Substratum 4B) that in turn had been deposited on sterile basal sediments composed of yellow clay with a high gravel content (Substratum 1C) (Figure 1.19).

Unit 10 was a 2-×-2-m unit located 4 m east and 2 m north of the primary datum on Transect 1. The area near the primary site datum was selected for this larger test unit, since the excavation of Unit 4 documented

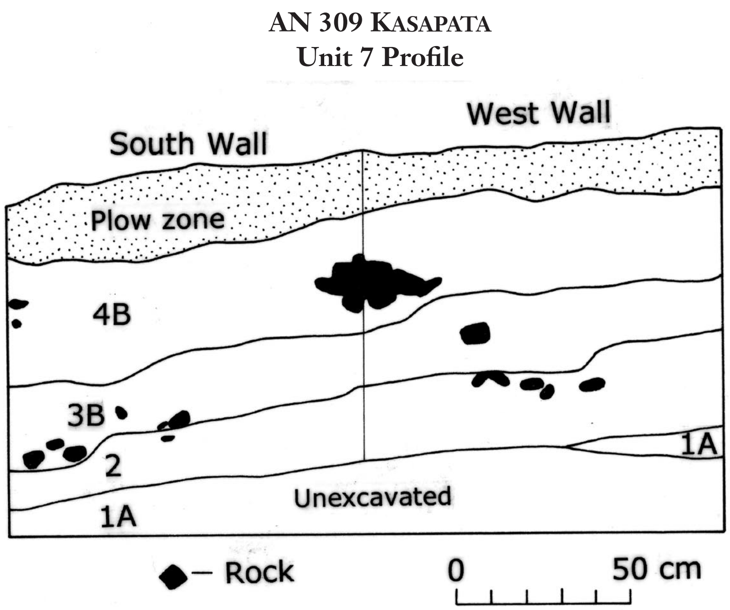

FIGURE 1.16. Profile of Unit 7.

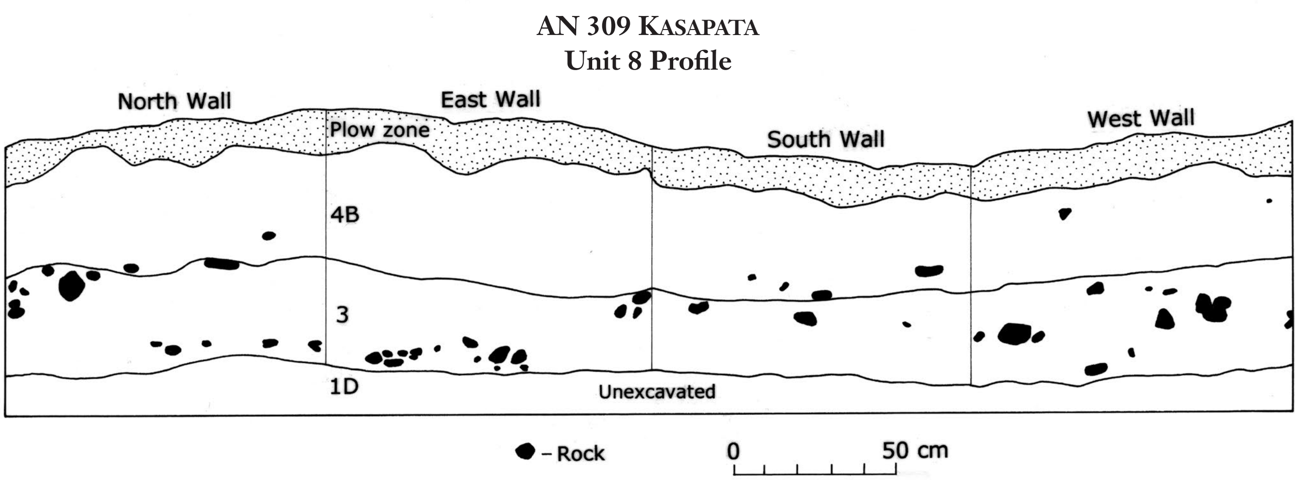

FIGURE 1.17. Profile of Unit 8.

that well-preserved remains could be found there. The upper 25 cm of Unit 10 contained disturbed Stratum 3 plow zone (Figure 1.20). Below this was a layer of Substratum 3B materials with an average depth of 45 cm that can be characterized as midden material associated with the late occupation of the site. The excavations recovered large samples of lithic materials, bone, and carbon, as well as numerous bifaces,[21] six pieces of modified bone,[22] and a ground stone bowl[23] fragment from general midden contexts. The excavators also identified several burials, pit features, and post molds in Stratum 3 contexts. Three burials, two adult and one infant (Feature 10-1), were uncovered in the upper portions of the deposit. The two adult burials (bag 1017) appear to have been located in the same general area, but were poorly preserved and possibly disturbed by recent plowing.[24] Each of these burials is described in detail in Chapter 3. Four pit features, Lots 10-1, 10-2, 10-3, and 10-6, were excavated as separate contexts, as were Lots 10-4, 10-5, 10-7, and 10-8, all of which appeared to be large post molds associated with late occupation structures (see discussions below).

The late occupation (Stratum 3) deposit overlay a significant Stratum 2 deposit approximately 60 cm

Figure 1.18. Artifacts nos. 821 and 823, worked bone from Unit 8.

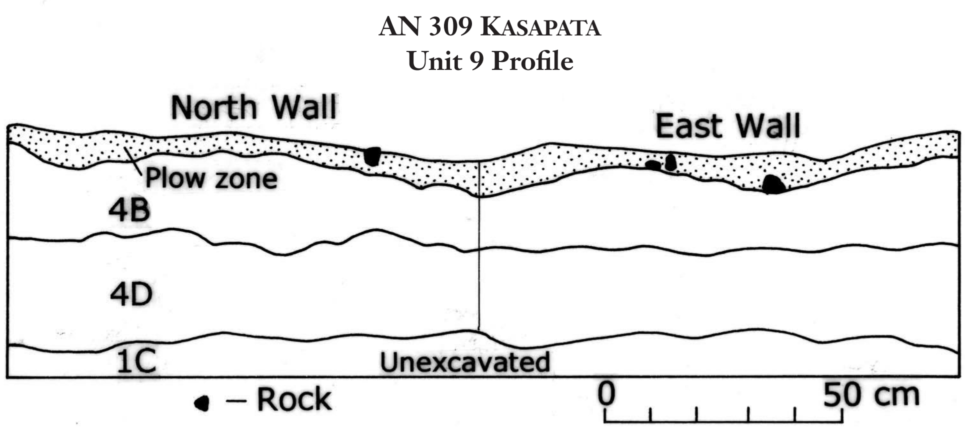

Figure 1.19. Profile of Unit 9.

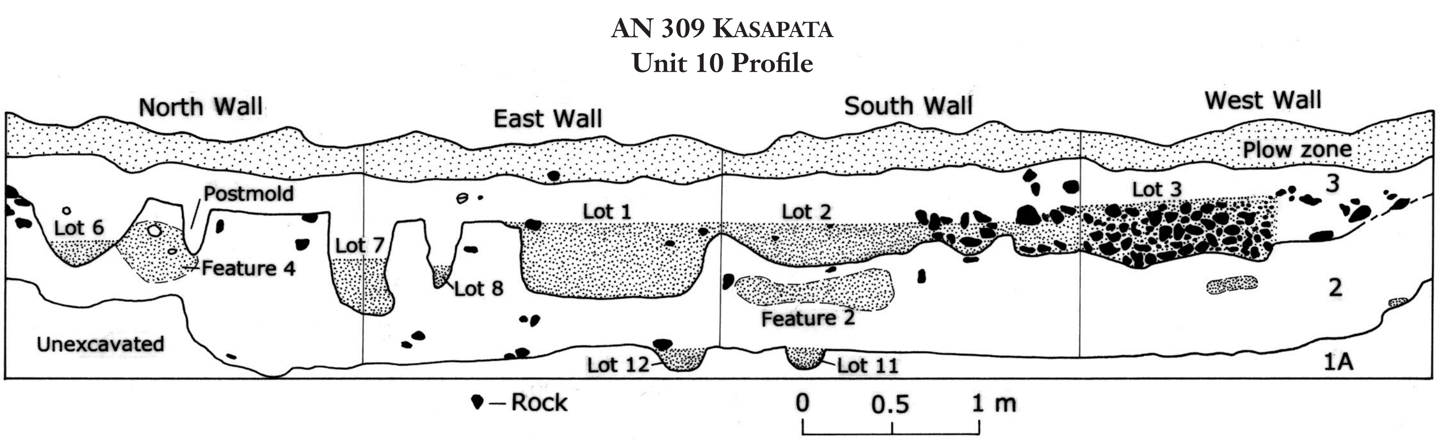

Figure 1.20. Profile of Unit 10.

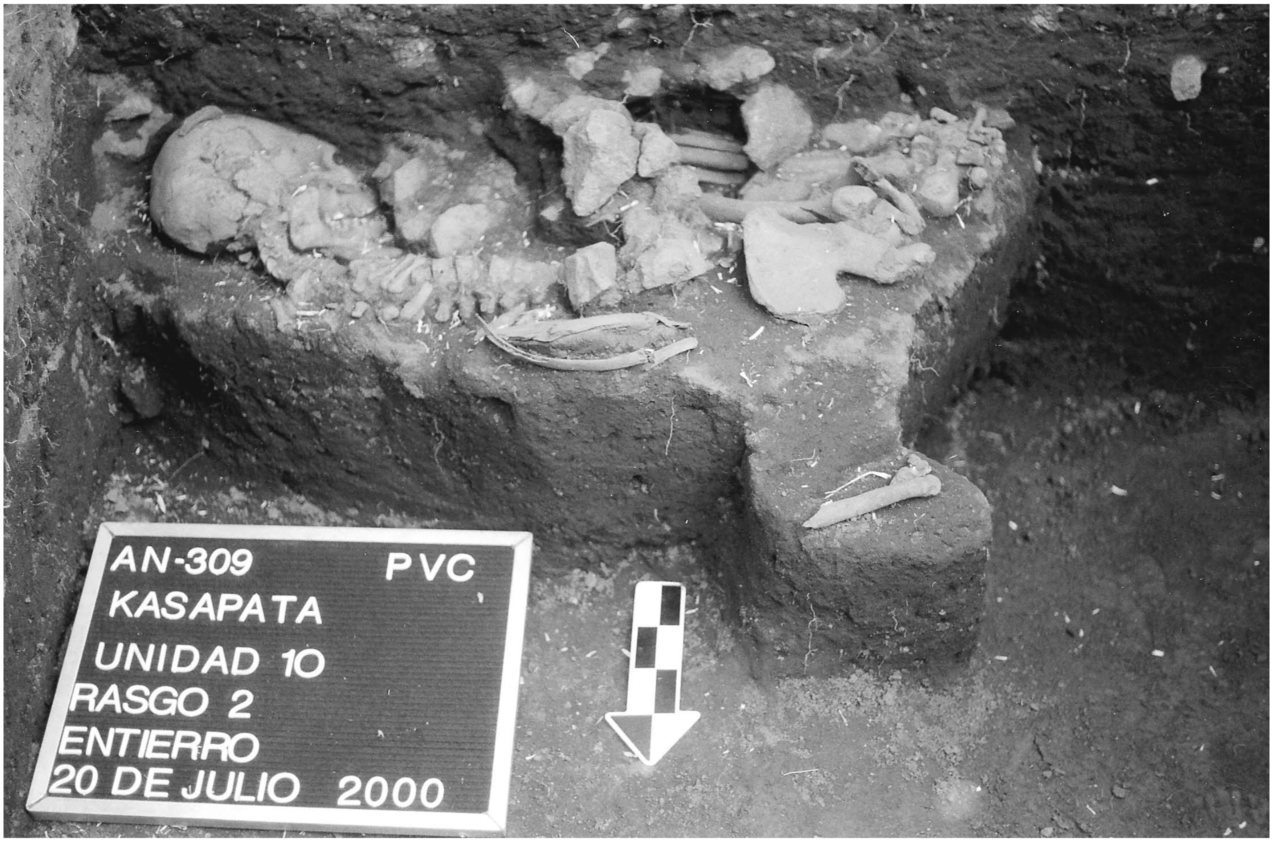

FIGURE 1.21. The excavation of Feature 10-2 (bag 10121), showing rocks placed on top of the burial.

thick. As was the case for Unit 4, this deposit has been tentatively divided into two zones based on the presence of artifacts and features. The upper zone consists of the upper 30 cm of the Stratum 2 deposit, a midden deposit containing a high quantity of lithics, bones, and carbon. In addition, various bifaces[25] and pieces of modified bone[26] were recovered from this general context. This zone was also associated with an area of hardened matrix (Lot 10-9) in the northeastern quadrant of the unit that may represent a floor or occupation surface. A single biface,[27] carbon samples, bone fragments, and lithics were recovered in association with this "floor."

Five burials were also associated with the upper occupation. Features 10-2,[28] 10-3,[29] and 10-4[30] each held the remains of an adult. The remains of two infant burials were also found (see Sutter and Cortez, Chapter 3).[31] Features 10-2 and 10-3 were especially notable since they appeared to have been marked by loads of hot rocks that had been placed on top of the burials (Figure 1.21). The infant burials were also unusual in that they showed evidence of having been covered with yellow and red ocher.

Approximately 20 cm beneath this upper zone, another zone of increased artifact density was associated with a hearth (Lot 10-13), two pits (Lots 10-11 and 10-12), and 20 small post molds. Artifacts recovered from general midden contexts included lithics, bone, and carbon, as well as various bifaces[32] and pieces of modified bone.[33] Two carbon samples[34] extracted from this area provided a calibrated date of approximately 4400 BC (see Appendix 1). The hearth, pits, post molds, and associated artifacts and dates are discussed in more detail later in this chapter. At the base of the Stratum 2 deposit, sterile red clay (Substratum 1A) was encountered, and the excavation unit was closed.

Unit 11 was a 2-×-2-m unit located 37 m east and 2 m north of the primary datum on Transect 1. The excavation of Unit 11 confirmed the continuation of the thick cap of disturbed material (Substratum 4A) first noted during the excavation of the adjacent Unit 3 (Figure 1.22). This deposit was found to be approximately 60 cm thick and overlay an intact and well-preserved deposit of Substratum 3B matrix. The excavators recovered numerous bifaces from this disturbed layer.[35] The

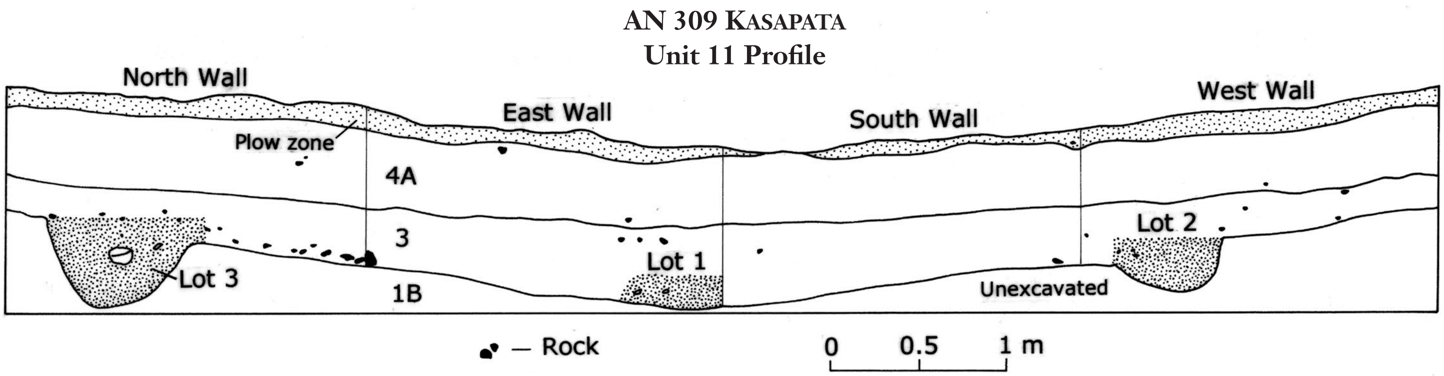

Figure 1.22. Profile of Unit 11.

late occupation, Stratum 3 deposit is approximately 40 cm thick and rests on red clay (Substratum 1A) in the southeastern portions of the unit but on a formation of hardened red clay (Substratum 1B) in the northwestern portions of the unit.

In general, the Stratum 3 deposits in Unit 11 are undifferentiated midden material from which large quantities of lithics, bone, and carbon were collected. Also recovered in this general midden context were 14 bifaces,[36] a possible stone hoe,[37] six bone tools or ornaments,[38] and an antler billet fragment.[39] The excavators also documented five full or partial burials (Features 11-2, 11-3, 11-4, 11-5, and Lot 11-3), which, with the exception of Lot 11-3,[40] are all discussed later in this report, as well as in Chapter 3.[41] In addition, an area of compacted matrix was identified in the southeastern corner of the unit and excavated separately as Feature 11-1. Initially believed to be a floor, the location of the feature adjacent to several burial pits led us to conclude that it is an area of compacted backfill from the original burial pits. Two bifaces[42] were recovered during the removal of this feature. Finally, two pit features (Lots 11-2 and 11-3) were found dug through the surface of the hardened sterile red clay matrix (Substratum 1B). The nature of these pits is unclear, though Lot 11-3 may be a burial pit. Once the sterile basal sediments were exposed throughout the unit, the excavation was terminated.

Unit 12 was a 1-×-1-m excavation located 11 m east and 9 m south of the secondary datum on Transect 4. The excavation of this unit encountered 90 cm of disturbed Substratum 4B matrix. Lithic, carbon, bone, and ceramic fragments were recovered throughout the deposit. At the base of this deposit the excavators encountered a thin lens of brown-red clay that capped a deposit of small to medium-sized gravels that was excavated for 45 cm before the unit excavation was terminated without finding the base of the deposit. Interestingly, the excavations of this final deposit continued to find very low quantities of cultural materials, including ceramics (Figure 1.23). It is not clear at the present time how this deposit formed. It does, however, represent a clearly disturbed context.

Unit 13 was 1-×-1-m test unit located 60 m east of the primary datum on Transect 1. Twenty centimeters below the surface and the plow zone the excavators encountered an approximately 30-cm-thick deposit of Substratum 4B matrix with evidence of disturbed cultural contexts. Beneath this the excavation encountered another layer of disturbed materials (Substratum 4A matrix) that extended for an additional 20–30 cm. These two layers overlay an intact late occupation deposit of Substratum 3A matrix approximately 20 cm thick (Figure 1.24). Materials recovered from this general midden deposit included lithic, bone, and carbon. Below this deposit were sterile red clay basal sediments (Substratum 1A).

Unit 14 was a 1-×-1-m unit located 9 m south of the secondary datum on Transect 4. The upper 20–30 cm of this unit was disturbed Substratum 3B plow zone containing modern artifacts, as well as ceramic, lithic, and bone materials. The remaining 25 cm of the 3B deposit yielded an intact midden deposit associated with the late occupation of the site (Figure 1.25). Lithic, bone, and carbon materials were recovered in significant numbers. A bone tool,[43] a punctated, burned bone fragment,[44] and two bifaces were also recovered. Two moderately well-preserved infant burials were also excavated in the unit. The ultimate 10 cm of the unit was identified as Substratum 3A matrix resting on sterile red clay sediment (Substratum 1A).

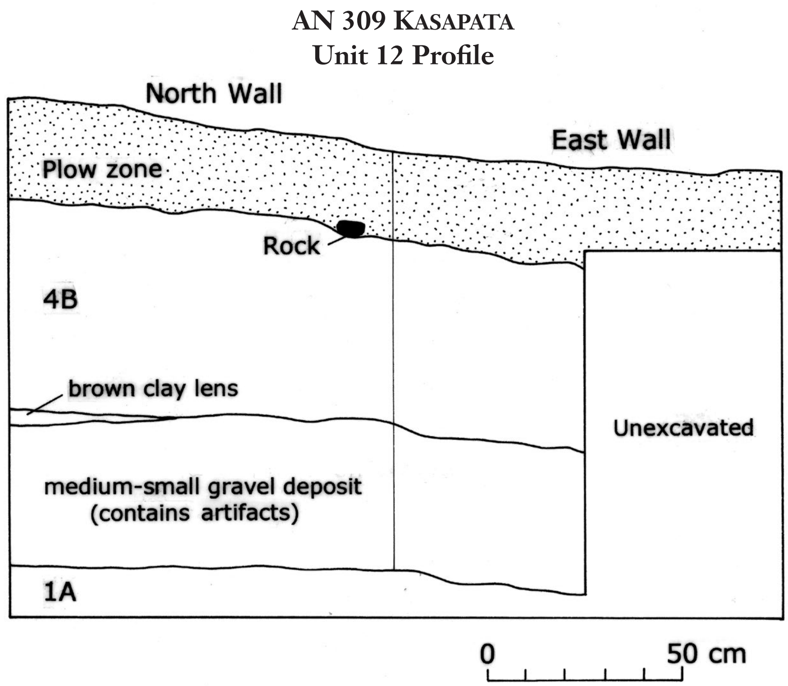

FIGURE 1.23. Profile of Unit 12.

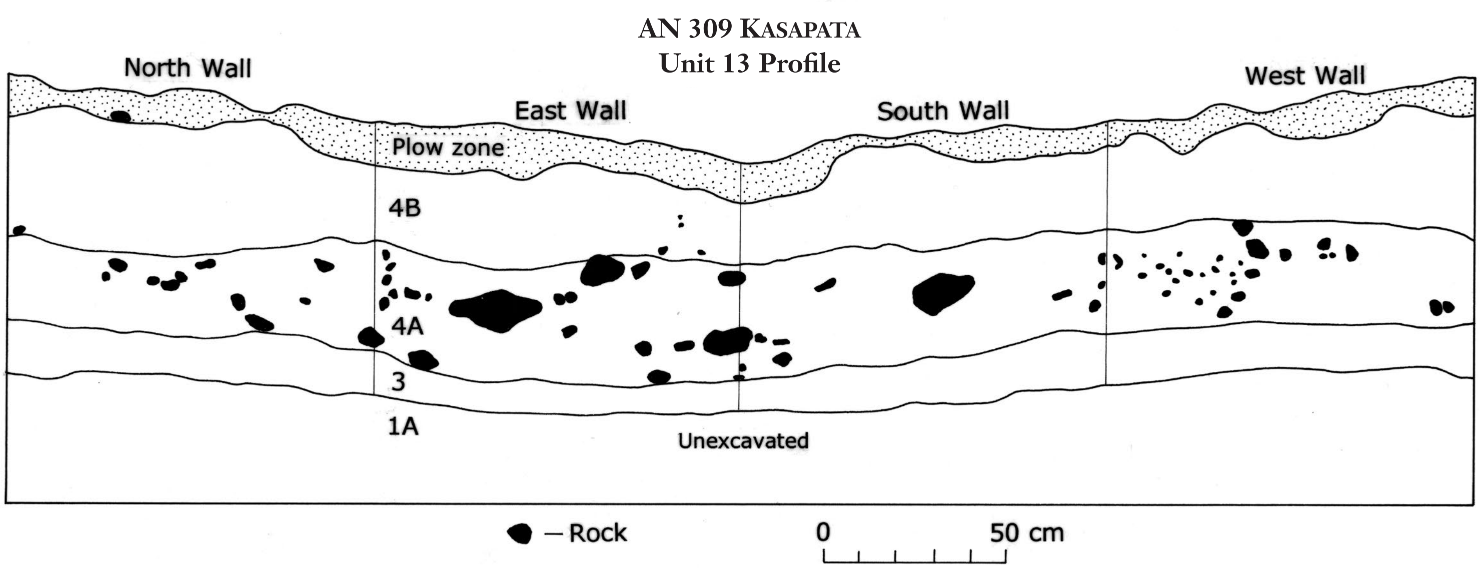

FIGURE 1.24. Profile of Unit 13.

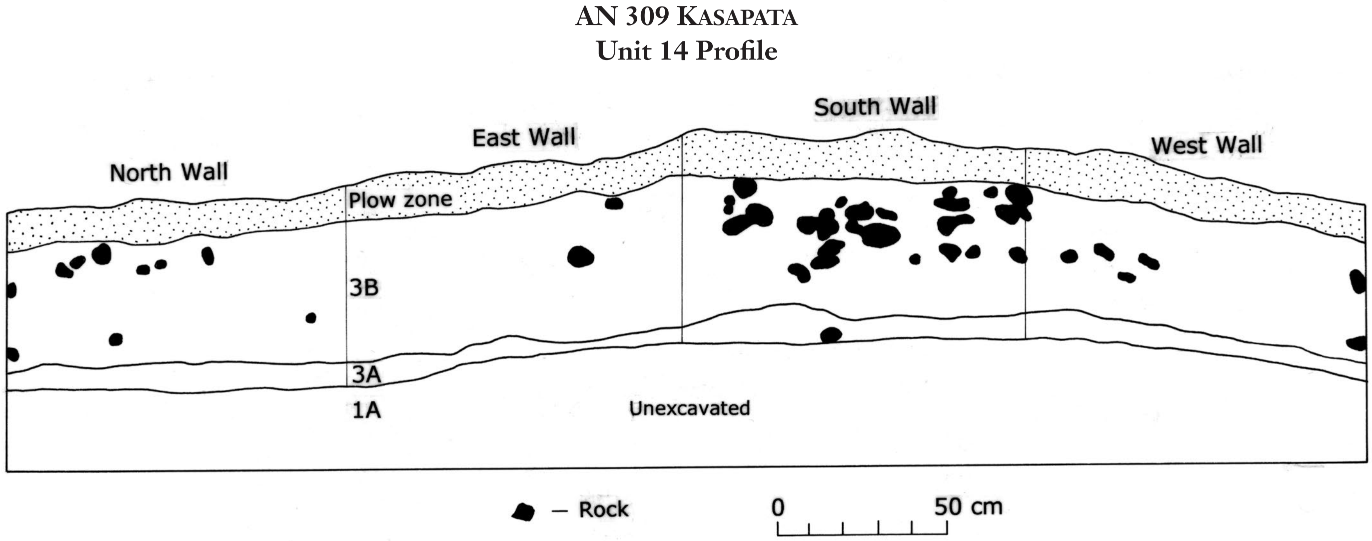

Figure 1.25. Profile of Unit 14.

Unit 15 was a 1-×-1-m unit located 9 m west and 20 m north of the primary datum on Transect 3. Unlike the units excavated south of Unit 15 on Transect 2, the surface deposit here is a red clay, with little cultural material on the surface. The unit was dug in arbitrary levels to a depth of 132 cm below the surface of the northeastern corner. During the excavation of the final 50 cm, the excavation unit was reduced first to a 1.0-×.5-m unit and finally to a .25-×-.25-m column in the last 20 cm. The excavation revealed a deep deposit of sterile Substratum 1A red clay that became looser at around 112 cm below surface, with inclusions of sandstone appearing in the very final centimeters. No cultural artifacts were recovered in the excavation, and no intact archaeological deposits were identified.

Unit 16 was a 1-×-1-m unit located 31 m east and 20 m north of the primary datum on Transect 3. As in Unit 15, the excavation of Unit 16 revealed only red clay deposits (Substratum 1A,) with occasional artifacts in the upper levels. After 40 cm the unit was closed.

SITE OCCUPATION OVERVIEW

During the course of our excavations at the site, two occupational strata (3 and 2) were identified and were subsequently referred to as the late and the early occupation, respectively. Carbon samples recovered from these two strata indicate that they are separated in time by approximately 1000 years. The revised site size estimates, based on the excavation data, suggest that the intact early occupation, associated with Stratum 2, is restricted to a 30-×-30-m area.[45] At one time it may have been larger, since the late occupation may have destroyed portions of it. The area of the late occupation, associated with Stratum 3, is much larger, wrapping around the southern, eastern, and northeastern slopes of the ridge in a band approximately 30–50 m wide and 100 m long.

The Late Occupation (Stratum 3)

The late occupation is easily recognized in the excavations by the presence of a dark brown to black clay loam (Stratum 3) that forms a moderately dense sheet midden. Found in Units 1, 2, 3, 4, 6, 7, 8, 10, 11, 13, and 14, Stratum 3 covers the upper and lower slope of the site and varies in depth from 5 to 80 cm. The stratum is thickest near the center of the site and thins considerably near its edges.

The sheet midden could be easily differentiated from the numerous burial and trash pits that were found within it. While there are various delimited lenses within the sheet midden and appreciable differences in the compaction of its matrix, no stratigraphic breaks suggestive of in situ soil formations or prolonged periods of site abandonment were recorded. Thus it appears likely that the deposit resulted from the gradual accumulation of material discarded during the course of daily activities at the site over a single prolonged period or several shortly spaced occupations.

ARTIFACTS AND CONTEXTS

The late occupation yielded large quantities of lithic debitage, primarily of andesite, indicating the production of numerous chipped stone tools. The recovery of hammer stones and antler billets supports such a supposition, although no defined areas of lithic production or workshops were detected. Rather, lithic production seems to have been a daily activity associated with the domestic sphere. Among the lithic tool types recovered, there are numerous examples of bifaces, scrapers, edge-modified flakes, and ground stone bowls (mortars).

Small to medium-sized burned stones are common in this stratum, but the majority, having no form or patterning, appear to have been redeposited in the midden.[46] Many of these stones may originally have been used for cooking or heating. Because similar stones are not part of the natural deposits at the site, it is clear that they were collected in nearby outcrops for use by its occupants.

Bones of various animal species are abundant in the stratum (see deFrance, Chapter 4). Such a finding is not surprising, given that many of the recovered stone tools were presumably used in the hunting, butchering, and processing of animals. Analysis of the faunal remains from Stratum 3 indicates that much of the butchering of the animals occurred on-site. A relatively large number of well-preserved bone tools, including awls and needles, as well as several decorated nonutilitarian items were also recovered in Stratum 3 (Figures 1.26 and 1.27). These provide further evidence that hide working and a range of other general domestic activities occurred at the site.

Although we currently have little direct data on the use of plants by the inhabitants of Kasapata, we do have several lines of indirect evidence. The recovery of stone bowls (mortars) and other grinding stones in Stratum 3 contexts minimally suggests that plant materials were being crushed at the site. Also, the very character of the Stratum 3 deposit, an organically rich loam with much carbon, indicates that large amounts of plant materials were used at the site during this period. Unlike the earlier occupation, which is associated with significant quantities of artifacts but a low organic content in the surrounding matrix, Stratum 3 deposits are defined by organic content.

Our test excavations also recorded a number of archaeological features in Stratum 3, including large postholes, floors, pit features, and burials, that provide important insights into the prehistoric activities that took place at the site. The clearest data we have on habitation structures at Kasapata, dating to the

FIGURE 1.26. Bone awls and needles recovered at Kasapata.

FIGURE 1.27. Sample of other worked bone objects recovered at Kasapata.

late occupation, come from a suite of features found during the excavation of Unit 10. We identified a series of five probable postholes in the northern portion of the excavation unit, all of which were found to be cut through the underlying Stratum 2 deposits (Figure 1.28). Of these postholes, four (Lots 10-4, 10-5, 10-7, and 10-8) were excavated separately.[47] A fifth posthole was recognized during the profiling of the north wall of the excavation unit (See Unit 10 profile, Figure 1.20). The postholes averaged 10–20 cm in diameter and more than 20 cm in depth, indicating that the structures constructed during the late occupation were substantial.

Four pit features were found immediately south and west of these postholes (Lots 10-1, 10-2, 10-3, and 10-6). The close association of these four pits with the postholes reinforces the idea that the postholes defined the outer edge of a structure, the interior of which was located northeast of Unit 10.[48] The pits are substantial in size and were cut through the lower Substratum 3B and upper Substratum 2B deposits. The pits varied in size and shape from circular to oblong, each appearing to correspond to a different activity episode. Each pit yielded significant quantities of lithic debitage, stone tools, bone, small to medium-sized stones (many of which were burned), and carbon. In general terms, each of the pits appears to have served as a refuse dump for materials associated with a broad spectrum of daily activities.

Because these pits represent distinct analytical units, they are discussed in detail. The nomenclature Lot 10-1 was initially applied to a large area covering most of the southern half of the unit, but the subsequent excavation made it possible to separate this area into three distinct pit features: Lot 10-1 in the southeastern corner, Lot 10-2 along the southern unit wall, and Lot 10-3 in the western unit wall and southwestern corner of the unit.

Intersected on its eastern and western edges by Lots 10-1 and 10-3, respectively, Lot 10-2 is the earliest of these features. Unlike Lot 10-1 and Lot 10-3, Lot 10-2 is a broad, shallow, and irregularly shaped pit. Although the edges of Lot 10-2 were recognizable from changes in the compaction of the surrounding matrix, it is possible that this pit was a natural surface depression that served as a de facto refuse deposit. The contents of Lot 10-2 were general refuse and included small to medium-sized stones, bone fragments, and lithic debitage and

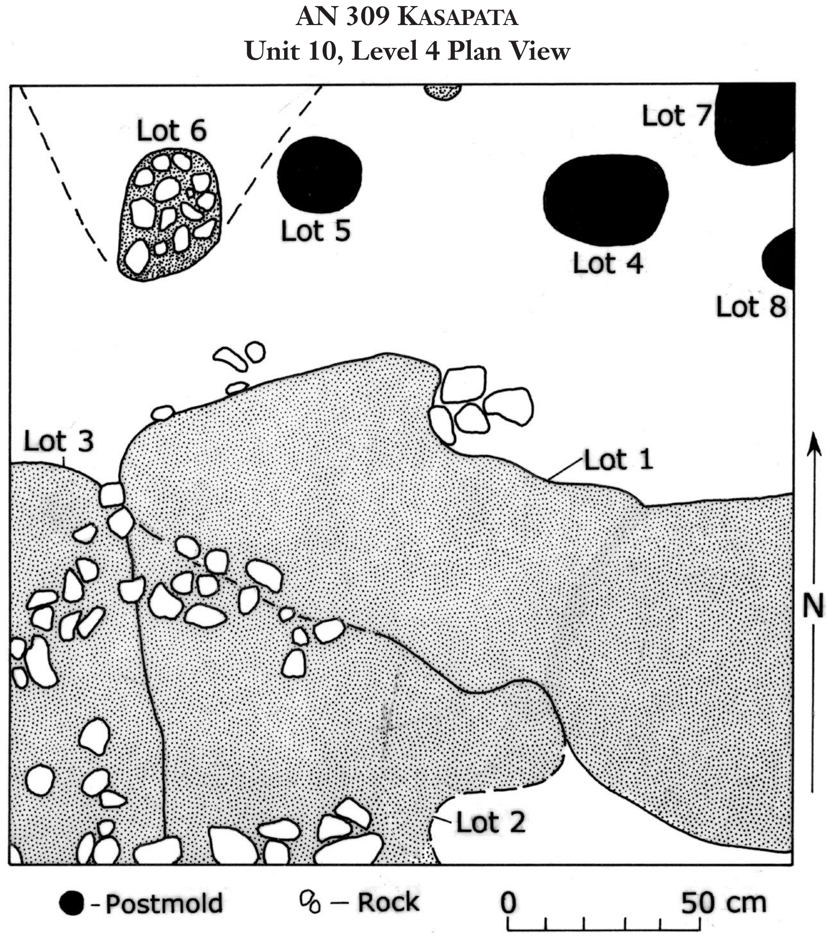

FIGURE 1.28. Plan view of Unit 10, Level 4, showing several large postholes.

tools. One aspect of Lot 10-2 noted by the excavators was that it had a cap of brown matrix, similar to Stratum 2 deposits, covering it. It is likely that this brown matrix cap was a backfill deposit from the original excavation of Lot 10-1 (on the eastern edge of Lot 10-2), which deeply cuts into the underlying Stratum 2 deposit.

Lot 10-1 is a well-defined pit that extends beyond the limits of Unit 10 in the east. It is relatively circular in plan, with straight sides that gently curve near the base, and a relatively flat bottom (see Unit 10 profile). Although there is no doubt that the prehistoric inhabitants of the site dug this pit, its contents appear to be similar to those recovered from Lot 10-2 and in Stratum 3. In other words, this pit was filled with general refuse associated with daily activities.

Lot 10-3 is a large pit situated in the western and southern sector of Unit 10. It was filled with a dense deposit of burned small to medium-sized stones with which bone and lithic debitage mixed in, and it was easily distinguished from Lots 10-1 and 10-2. Based on an analysis of the eastern and southern profile of Unit 4, in which a dense cluster of stone was also present, this pit feature appears to extend into that unit. Unlike the previous two pits, Lot 10-3 may represent a single episode of dumping materials, including heated stones used in food preparation. Such activities are well documented archaeologically for other societies, as well as ethnographically in the contemporary Andean practice of *pachamanka* cooking.

The fourth pit excavated in the unit was Lot 10-6. This pit was defined as a cluster of stones associated with loose Substratum 3B matrix in the northwestern corner of the unit. During excavation it was noted, however, that the edges of the pit were difficult to define. A subsequent review of the northern profile of the unit (see Unit 10 profile) revealed that this difficulty resulted from an overly conservative definition of the lot. In other words, while Lot 10-6 was in fact a large, irregular pit, we excavated only a portion of it separately from its surrounding matrix. As was the case with the previously described pits, Lot 10-6 contained a variety of lithic and bone debris.

In addition to the pits identified in Unit 10, similar features were identified in Units 6 and 11. In both of these cases the pits are relatively small, less than 50 cm in diameter, and were filled with general Substratum 3B matrix that included small stones, debitage, and bone. The pit in Unit 11 (Lot 11-2) was distinct in that it had been cut into the underlying bedrock of the unit. The pits in Unit 6 were more problematic in that they occurred in disturbed contexts.[49]

Unit 2 also yielded a possible hearth feature in Stratum 3 contexts. In Level 5 of Unit 2 the excavators noted a cluster of small to medium-sized stones associated with high levels of carbon, debitage, and bone. There was, however, no evidence of fire hardening or discoloration of the surrounding matrix. It is possible that this represents a chance accumulation or a possible hearth that has been dispersed by human or natural action.

During the course of the excavation, 11 burials were identified within Stratum 3, four adults and seven infants or young children. After laboratory analysis, the number of individuals in these burials was increased to five adults and ten infants. The burials had been placed in shallow pits dug into the midden, with little or no grave elaboration.[50] The bodies were generally in a semiflexed position and varied in their orientation. Only one burial contained grave goods. In this case, a string of 12 bone beads, made from the humerus of a fox, had been placed on the legs of a small child.

The Early Occupation of Kasapata (Stratum 2)

The area of the early occupation at Kasapata, associated with the Stratum 2 deposits, was far more restricted in size than that of the late occupation. Stratum 2 deposits were identified only in Units 2, 3, 4, 7, and 10, on the southern side of the ridge. Radiocarbon samples taken from the lowest level of Stratum 2 dated the earlier portion of this occupation to around 4400 BC. In contrast to the Stratum 3 deposits, believed to be the product of a single prolonged occupation (or one characterized by many closely placed occupations), Stratum 2 appears to reflect a series of shorter occupations that occurred at longer intervals. The overall character of these deposits, as well as the associated artifact assemblages, suggests these occupations reflect a more mobile lifestyle than those of the late occupation.

Based on the Unit 4 and 10 excavations, we have tentatively identified two distinct zones of occupation within Stratum 2. The first zone was identified in the upper 20–30 cm of Stratum 2 deposits in these units (Substratum 2B). A second zone of occupation was encountered in the ultimate 20 cm of the deposit, overlying the sterile basal sediment of the ridge (Substratum 2B). These two zones of higher-density archeological materials are separated by levels in which the quantities of artifacts recovered were comparatively low. Carbon extracted from these occupation layers suggests that they are separated by approximately 100 years.[51]

ARTIFACTS AND ARCHAEOLOGICAL CONTEXTS

Given the modest scale of the excavations, information on the activities that occurred at the site during the early occupation is limited. The artifacts recovered from the Stratum 2 deposits suggest that the early occupation inhabitants of the site were involved in a broad spectrum of activities. The most prominent artifact class represented in the excavation collections was lithics. The abundant debitage recovered suggests that a common activity at the site was the production of lithic tools, including bifaces and other chipped stone tools. Associated with lithic tool production were andesite cores, hammer stones, and, in Unit 10, two antler billets. The primary lithic resource utilized was locally available andesite. A small sample of obsidian and chert was also recovered from Stratum 2 context. Analysis of the obsidian from the site indicates that it all came from the same source (see Burger and Glascock, Chapter 5).

We can infer from the animal bone recovered that one of the important activities at the site was the procurement, processing, and consumption of several taxa of animals. Faunal analysis (see deFrance, Chapter 4) suggests that many of the animals, including deer, camelid, and guinea pig, were butchered at the site. Presumably plants were also an important component of the daily diet for the early inhabitants of Kasapata.

The two occupation zones identified within Stratum 2 also provided additional if limited information on the activities of the site's early inhabitants. The majority of the materials recovered in the upper zone appear to pertain to a general midden, with the exception of a hardened surface in Unit 10 (Lot 10-9). Lot 10-9, an

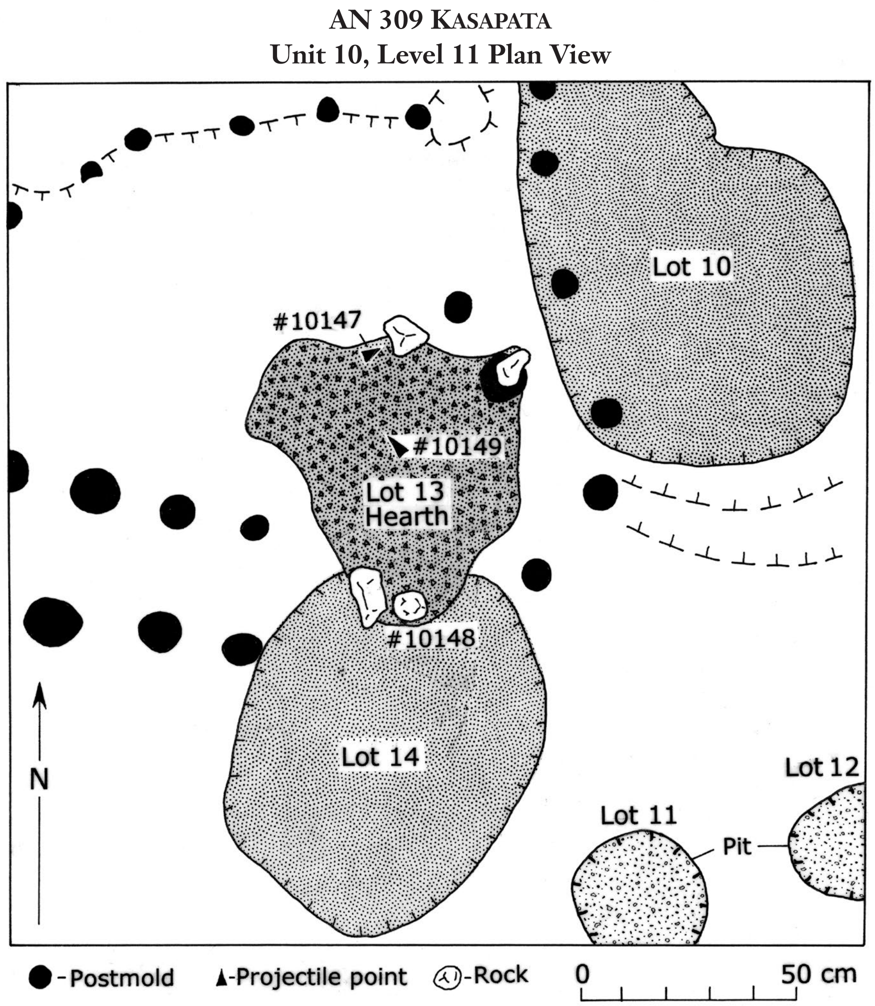

FIGURE 1.29. Plan view of Unit 10, Level 11. A series of postholes and a fire pit may define the area of a small circular hut.

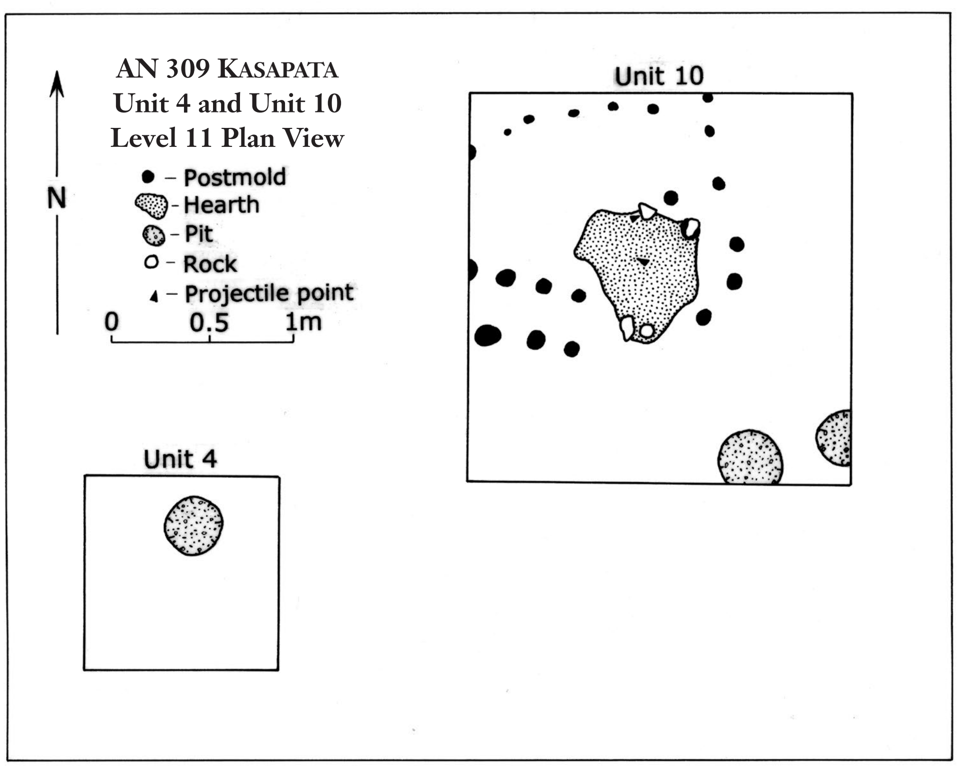

FIGURE 1.30. Plan view of Units 4 and 10.

area of approximately 65 × 65 cm in the northeastern portion of the unit, is notable for the compaction of the matrix, which we believe is the remnant of an occupation surface. Embedded in the area was a mix of artifacts, including lithic materials, bone, and carbon. The lack of other associated features such as postholes or hearths, however, makes interpretation of this area difficult.

In Unit 7, the excavators also encountered a tight cluster of small and medium-sized stones (Lot 7-1) associated with bone and carbon in the southeastern corner. Lot 7-1 had two distinct layers of stones, the upper more dispersed and the lower tightly clustered. At the base of Lot 7-1 there was evidence of fire hardening of the surrounding matrix. The amount of carbon, though relatively high, was not unprecedented for other general midden contexts at Kasapata, and it is unclear whether Lot 7-1 represents a small pit hearth or simply a pit into which hot materials may have been deposited.

More remarkable evidence pertaining to the early occupation comes from Units 4 and 10, at the interface of the Stratum 2 cultural deposit with the underlying natural sediments. In Unit 10 a series of 20 small postholes, averaging less than 10 cm in diameter, were found dug into the sterile basal clay. These postholes appear to define a small semicircular hut or windbreak 1–2 m in width (Figures 1.29 and 1.30). Associated with the area enclosed by these postholes was a striking suite of features and artifacts. These included a hearth (Lot 10-13) constructed of small stones in a circular arrangement associated with andesite and obsidian debitage, large pieces of carbonized materials, two deer antlers, five bifaces,[52] and a stone slab with a pecking or ground depression.[53] Also found in the context of Lot 10-13 were pieces of baked clay, presumably formed as a result of the heating of the basal surface. Although Lot 10-13 appears to have suffered from some postdepositional disturbance (including a burial, Feature 10-3), it nonetheless remains the best evidence for a hearth recorded during the Kasapata excavations.

On the outside of the area demarcated by the postholes were two small circular pits (Lots 10-11 and Lot 10-12) identical in depth and circumference to a pit similarly cut into the basal sediment in Unit 4. The function of these pits is unclear, although their careful construction and the absence of ash or significant bone or lithic materials may indicate that they functioned as storage pits of some sort.

Five burials, three adults and two infants, were also associated with the Stratum 2 deposits. Two of the adult burials were found in tightly flexed positions, with portions of their bodies covered with small to medium-sized stones (see Sutter and Cortez, Chapter 3). One of these burials was oriented to the east and the other to the north. These burials appear to have been placed in shallow pits.[54] The mixing of various materials, including bone, flakes, and carbon, suggests that the burials were placed into midden deposits. The third adult burial was found buried in a poorly defined manner. Finally, the two infant burials were also placed in shallow, poorly defined pits, though notably one was covered with powdered ocher.

DISCUSSION

The Cuzco Archaic remains a vast and largely unexplored time period. The largest and best-preserved Archaic Period site identified to date in the Cuzco region is that of Kasapata. This site was selected in 2000 for test excavations. Although the analysis of certain materials from the excavations is still being conducted, some general conclusions can be presented. Most important, the excavations revealed two, exceptionally well-preserved cultural strata at the site that date to roughly 4400 BC and 3100 BC.

The lowest cultural deposits (Stratum 2, also called the early occupation) provide evidence of a series of temporary, perhaps seasonal, camps. Stratified sheet middens containing andesite debitage and several obsidian flakes were found. Projectile points, bone tools, unworked bone, and burned stones were also recovered in the middens. The faunal remains included numerous large (camelid and deer) and small mammal (guinea pig) remains. The postholes of at least one small circular structure with a hearth were identified, as were various pits and several adult and infant burials. Two of the infant burials provided evidence of the use of red ocher.

A dense midden deposit, in places 80 cm thick, defined much of the upper cultural deposits (Stratum 3, also called the late occupation). It contained large quantities of andesite debitage, as well as appreciable quantities of obsidian and a few fragments of chert. There were numerous projectile points and other bifaces, bone tools, and bone ornaments. There were also examples of ground stone bowls, mortars, and stone hoes (Klink et al. 2001). Burned small to medium-sized stones were also common in the Late Archaic Phase stratum. Faunal remains included bones of various large and small mammals similar to those found in the lower levels of excavation.

Although no complete structures were excavated, several large postholes and various large pits were identified. Various burials were also recovered from the Late Archaic Phase contexts, including numerous infants as well as several youths, young adults, and adults. Although most of the burials did not contain grave goods, one youth was buried with 12 bone beads. Two infant burials also contained evidence of red ocher.

Our survey and the excavation results in the Cuzco Valley support general trends that have been identified elsewhere in the Andean highlands (e.g., Callejón de Huaylas, Ayacucho, and Lake Titicaca) as occurring during the Late Archaic Period. There was a population increase, as reflected in the greater number of sites. The sites are also larger in size and appear to have been inhabited for longer durations. This trend appears to continue until around 2200 BC, when the first permanent villages appear and the hunting and foraging lifeways of the Archaic slowly yielded to a subsistence system based on domestication of plants and animals.

Notes

1. The 2000 field season at Kasapata was supported by the University of Illinois at Chicago's Campus Research Board and the Office of Social Science Research. Project members included Miriam Aráoz, Reynaldo Bustinza, and Carlos Arriola. Excavation help was also provided by archaeology students from the Universidad Nacional San Antonio Abad del Cuzco. Special thanks go to Alfredo Valencia Zegarra for help in coordinating the fieldwork and to Sarah Moore, who drew most of the maps, profiles, and artifacts.

2. Parts of this report have appeared in Bauer et al. (2004). This report, however, represents a major updating and expansion of our findings.

3. The high grassland regions south and southeast of the Cuzco Valley, including the provinces of Chumbivilas and Espinar, hold numerous caves and rockshelters with extensive lithic materials (Astete 1983; Chávez 1988; Lantaron 1988). The dates of these sites, however, are not known.

4. The Lake Titicaca Basin Archaic Period projectile sequence was selected as a working model for developing and testing a Cuzco-based sequence because the Lake Titicaca region is relatively near Cuzco and contains some of the best-researched Archaic Period remains in the Central Andes.

5. We also spent part of our 2000 field season excavating the Early Intermediate Period (200 BC–AD 600) site of Paqoykaypata. The results of those excavations are described in Bauer and Jones (2003).

6. Unfortunately, the map maker incorrectly oriented the eastern half of the baseline, so that units on the eastern side of the primary datum are on a slightly different heading than those on the western side.

7. The south side excavation units indicated that while the best surface collections were from the most eroded slopes of the site, the flatter uphill sections were more likely to contain intact cultural deposits.

8. In place of level numbers (1, 2, 3, etc.), each new level of a lot or feature was assigned a letter (a, b, c, etc.).

9. This fragment was left on site (no. 43).

10. These two substrata are largely based on the excavators' matrix composition observations. Such identifications were more difficult to define in the unit profiles, and as a result, the distinctions often are not marked in the unit profiles.

11. The locations of the units and the elevations utilize the northeastern corner of the unit as their point of reference.

12. Bag 224.

13. Sample AA 39780.

14. Bag 331.

15. Bag 317.

16. Bag 322.

17. Bags 419, 420, 424, 425, 426, 427, 431, and 435.

18. Sample AA 39777.

19. The excavator did not separate these pits in the excavation. Notes on pits are based on postexcavation analysis of the profile.

20. Bags 821 and 823.

21. Bags 1006, 1007, 1008, 1009, 1013, 1014, 1015, 1023, 1025, 1026, 1027, 1032, 1059, 1060, and 1061.

22. Bags 1012, 1020, 1022, 1024, 1031, 1062.

23. Bag 1016.

24. The excavators recorded only one burial in this area, but the osteological analysis found evidence of two individuals, one female and one male. These individuals have been arbitrarily designated 1017-A and 1017-B.

25. Bags 1071, 1072, 1083, 1085, 1086, and 1087.

26. Bag 1084.

27. Bag 1097.

28. Bag 10121.

29. Bag 10134-A.

30. Bag 1088.

31. During the course of the excavation an infant burial was mistakenly given the same bag number (10134) as the adult removed from Feature 10-3. Fortunately, this error was corrected during the analysis of the human remains. At that time the adult was designated 10134-A and the infant was designated 10134-B.

The second infant from Unit 10 was recovered from the area below the adult burial (10134-A) and was placed in bags 10137 and 10140.

32. Bags 10106, 10107, 10108, 10109, and 10116.

33. Bags 10110 and 10111.

34. Samples AA 39779B and AA 39779A.

35. Bags 1104, 1105, 1106, 1107, 1108, 1109, 1110, 1111, 1112, 1115, and 1116.

36. Bags 1121, 1122, 1127, 1128, 1132, 1136, 1137, 1140, 1144, 1145, 1146, 1147, 1148, and 1149.

37. Bag 1139.

38. Bags 1126, 1129, 1134, 1135-2, 1135-3, and 1138.

39. Bag 1135.

40. With the exception of the cranium, the skeletal remains of this individual were located beyond the excavation unit. Since the complete burial could not be recovered, we decided to leave the burial intact and not remove any of the bones.

41. Analysis of skeletal materials suggests that these remains may represent eight individuals.

42. Bags 1156 and 1158.

43. Bag 1425.

44. Bag 1420.

45. Because several Middle Archaic Period projectile points were also recovered on the surface of the site, we believe that there was an even earlier occupation at Kasapata.

46. Lots 10-3 and 7-1 are important exceptions to this statement.

47. Bags 1417 and 1424.

48. The postholes contained only loose Substratum 3B matrix.

49. Ultimately, given the restricted area of the excavation, any reconstruction of the form of these structures remains highly conjectural.

50. As a result, the assignment of the Unit 6 pits to the activities of the late occupation inhabitants of the site remains provisional.

51. The burial pits were difficult to identify because the burials were backfilled with the same matrix into which they were dug. Exceptions are Feature 11-5 and Lot 11-3 in Unit 11 in which the pit, Lot 11-1, was clearly visible because of the very compact matrix into which it cut.

52. Sample AA 39777 is from Substratum 2B in Unit 4 and Sample AA 39779 is from Substratum 2A in Unit 10.

53. Bags 10106, 10107, 10108, 10109, and 10149.

54. Bag 10148.

55. There were no clearly associated grave goods with either burial, although it should be noted that a single biface was recovered with each burial.

CHAPTER 2

THE LITHIC ASSEMBLAGE AT KASAPATA

CYNTHIA KLINK

THIS CHAPTER HAS TWO major objectives. The first is to describe the content and character of the lithic assemblage recovered from the site of Kasapata. Through this description I hope to address several related questions: What kinds of lithic artifacts were produced and used at the site? What activities do they represent? Did the scope of the activities that occurred at the site change over time? The second objective is to examine possible changes in mobility strategies that may have taken place at the site. Did mobility patterns change over time, and if so, how? If there is evidence for increasing sedentism, when did it occur, and how might it have been supported? Understanding changes in mobility is requisite to reconstructing and understanding prehistoric cultural change; as one scholar has noted, "the ways people move exert strong influences on their culture and society" (Kelly 1992:43). A more precise understanding of mobility changes in the Cuzco Valley during the Archaic Period might then, through comparison with mobility changes in other areas, contribute more broadly to our knowledge about general processes of cultural change.

Accordingly, the first part of this chapter describes the lithic assemblage at Kasapata and the second part uses the lithic data to draw inferences about mobility. In both parts I emphasize interpretation of changes between three strata: Stratum 3 (the late occupation) and Substrata 2B and 2A (the upper and lower subdivisions, respectively, of the early occupation) of the site.[1]

I. DESCRIPTION OF THE LITHIC ASSEMBLAGE AT KASAPATA

ANALYTICAL METHODOLOGY

The examination of the lithic materials recovered at the site utilized a combined typological-attribute method of analysis. Artifacts were first sorted into general classes based primarily on morphological and technological characteristics, then specific suites of attributes were analyzed within each class. Use wear analysis was limited to brief examination of tools using a 10 power magnification hand lens, with obvious modification noted and generally described. Lithic artifacts are divided into three main categories: flaked stone, ground stone, and unmodified stone.

The *flaked stone* category includes artifacts made on flakes, shaped by flaking, and from which flakes have been removed, that also lack evidence of modification (intentionally or through use) by grinding, abrasion, pecking, battering, or drilling.

The *ground stone* category includes artifacts whose form is typically created by grinding or that exhibit substantial amounts of grinding, abrading, or pounding use wear. Intentional manufacture and maintenance of ground stone tools may also involve flaking, pecking or battering, and drilling to shape the tool or rejuvenate its work surface.

The *unmodified stone* category consists of artifacts that lack evidence of modification but that clearly have been transported to the site and presumably have economic or other significance.

These categories are definitionally discrete, but the reality of manufacturing trajectories and tool recycling results in some overlap. For example, intentionally shaped ground stone tools in early stages of production may only show evidence of flake removals, and thus would be classed as flaked stone. Furthermore, recycling can result in artifacts moving from one class to another, such as cores that are reused as hammers. In these cases the most recent use was considered definitive and the earlier use was coded as an artifact attribute. I have tried to minimize the use of functional names for tool classes because the classification system was not founded on functional analysis. This objective was best met for flaked stone because the distinction between functional and technomorphological attributes has received a fair amount of attention (see Odell 2004). Ground stone classifications have traditionally used functional terminology, in part because use wear may be the most obvious modification (see Adams 2002); the classification here also relies heavily on functional terms.

Artifacts from all recovery contexts were examined.[2] However, to streamline the presentation and facilitate analysis of change over time, the data were aggregated and summarized by general stratigraphic affiliation (0, 4, 3, 2B, 2A). Because the excavation used a combination of natural and arbitrary levels, some excavation levels span the transition between two strata and contain materials from both. Since Strata 0 and 4 were interpreted in the field as disturbed deposits (a plow zone and a zone of redeposited colluvium, respectively), mixed-stratum excavation levels containing either of these two strata were attributed to the uppermost, disturbed stratum (Table 2.1). For the undisturbed preceramic strata (3, 2), artifacts from mixed-stratum levels were kept distinct in order to isolate assemblages from secure contexts. I chose to maintain the distinction between the upper and lower zones of Stratum 2 (Substrata 2B and 2A, respectively) in order to examine whether their associated artifact assemblages differ, and if so, how.

Table 2.1. Stratigraphic designations used for lithic analyses.

General Stratum Designation for Lithic Analyses	Excavation Level Stratum Designations
0	0, 0/3, 0/4A, 0/4B. Also includes artifacts recovered from the surface.
4	4, 4A, 4A/3, 4B, 4B/1A, 4B/2A, 4B/4A
3	3
2/3	3/2A, 3/2B
2B	2B
2B/2A	2B/2A
2A	2A

LITHIC RAW MATERIALS: DESCRIPTION AND PROVENANCE

A wide variety of lithic raw materials were used at the site. The most common classes are summarized in Table 2.2. Information about source areas was derived in part from a visit to the site and in part from consultation with Dr. Mauro Zegarra, geologist, at the Universidad Nacional San Antonio Abad del Cuzco. Raw materials exposed at or near the site and noted during the site visit included quartzite, rhyolite, sandstone, siltstone, light gray andesite, and miscellaneous igneous rocks. Several materials were not observed: the commonly used dark gray, micaceous andesite, chert, obsidian, and phyllite/slate. Local and regional geological units exposed on the mountain slopes in the general vicinity of Kasapata include (1) Groupo Mitu, (2) Formación Huancane, (3) Formación Yuncaypata, and (4) recent volcanics (Blanco 1991; Zegarra, personal communication 2000). Groupo Mitu is a conglomerate with abundant clasts of gray to violet continental volcanics, quartzite, and various sedimentary rocks. It appears to be the source of the rhyolite, light gray andesite, and some quartzite materials used on the site. Formación Huancane is composed of white to rose-colored sandstone and quartzite with some finer-grained and conglomeratic lenses throughout. This is the probable source of the sandstone and some of the quartzite and siltstone used on-site. Formación Yuncaypata consists of interbedded mudstones, siltstones, and limestones and has been partially altered by contact metamorphism. It is the probable source of the phyllite/slate and some of the fine-grained sedimentary materials worked on-site. Recent volcanics are dark gray to black andesite and latite; they are rarely exposed at elevations

Table 2.2. Lithic raw materials used at Kasapata.

Material	Description	Modal Knapping Quality	Source Area
Andesite	Typically dark to very dark gray color, fine to medium grained, with abundant mica, occasionally other mineralization visible; bedrock and cobble cortex noted. Occasionally light gray with pink mineralization or blue-gray with black mineralization.	Moderate	Available in broader local area or region
Quartzite	Typically color grades from white to purple, fine to very coarse-grained texture, cobble cortex common. Also green variety, fine- to medium-grained, that grades toward siltstone.	Variable: poor to moderate	On site/in general site vicinity
Rhyolite	Grayish purple to red color. Very fine- to medium-grained matrix with common phenocrysts. Cobble cortex noted.	Variable: fair to moderate	On site/in general site vicinity
Phyllite/slate	Phyllite that grades into slate. Gray to blue- or green-gray color, laminated to foliated structure, dull to shiny luster.	Poor	Available in broader local area or region
Sandstone/ siltstone	Sandstone grading to silstone. Typically reddish brown color, fine-grained. Occasionally gray, coarser grained.	Poor	On site/in general site vicinity
Chert	Includes a variety of chert and chalcedony types. Most common is black, opaque chert that grades into both a slightly "grainy" and a "muddy" varietal. Less common are several color varietals of chalcedony (white to banded) and other cherts (red, orange, brown).	High	Available in broader local area or region?
Obsidian	Typically translucent, smoky to clear color with black, and occasionally white, banding. Some opaque, black color, with gray or red-brown bands or swirls.	High	Exotic

comparable to that of Kasapata and typically occur on the upper mountain slopes and peaks. These deposits appear to have been the source of the dark gray, micaceous andesite that dominates the lithic assemblage at the site. Zegarra reports that obsidian is not known to occur geologically anywhere in the Cuzco Valley, and that chert is not common but cobbles occasionally occur in Groupo Mitu conglomerates. Obsidian samples from the site, studied by Burger and Glascock (see Chapter 5), indicate that the obsidian came from what is known as the Alca Source, located more than 175 km from Cuzco.

These probable source observations suggest that nearly all of the raw materials found on the site were accessible within a broadly defined "local" zone around the site. The dominant material used, andesite, likely was obtainable either in the immediate site area (light gray variety) or via somewhat longer forays into the adjacent mountains (the more common dark gray variety). Notable secondary materials, such as quartzite and rhyolite, were available at or immediately around the site. The only known long-distance exotic, obsidian, is extremely rare overall in the lithic assemblage and occurs in similarly low quantities throughout the occupation of the site. Chert is also rare, presumably reflecting the low abundance of chert cobbles in the broader local area. The similarity in the types and range of raw materials present in all strata (Table 2.3) suggests minimal shifts in raw material preferences or accessibility of different materials over time.

Flaked Stone

CORES

Functionally, cores are tools that serve as the source material for flakes that will be used as tools or modified into other tools. In terms of morphology and technology, cores are defined here as artifacts from which at least two flakes large enough for use have been removed, that have not been bifacially shaped or thinned, and that typically show evidence of at least one core striking platform. Cores are subdivided into several types, including unidirectional, bidirectional, multidirectional, bipolar, and tested stone.

Unidirectional cores have a single core striking platform, with flake removals occurring in a single direction.

Bidirectional cores have two striking platforms that, like a biface, share a single edge around part or all of the circumference of the tool. They differ from "classic" bifaces in that they are typically circular in plan view, and in cross-section are thick (3–5 cm) and hexagonal or diamond-shaped.

Table 2.3. Lithic material frequencies for major artifact classes, by stratum.

Artifact	Material	0		4		3		3/2		2B		2B/2A		2A		Class Total	
		No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)
Core		**47**		**45**		**78**		**6**		**26**		**4**		**9**		**215**	
	Andesite	39	(83.0)	39	(86.7)	70	(89.7)	2	(33.3)	23	(88.5)	4	(100.0)	7	(77.8)	184	(85.6)
	Rhyolite	1	(2.7)	0	(0.0)	1	(1.3)	0	(0.0)	1	(3.8)	0	(0.0)	0	(0.0)	3	(1.4)
	Obsidian	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	1	(3.8)	0	(0.0)	0	(0.0)	1	(0.5)
	Quartz	1	(2.1)	3	(6.7)	2	(2.6)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	6	(2.8)
	Quartzite	5	(10.6)	3	(6.7)	5	(6.4)	4	(66.7)	1	(3.8)	0	(0.0)	2	(22.2)	20	(9.3)
	Phyllite/slate	1	(2.1)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	1	(0.5)
Biface	**Undifferentiated**	**63**	**92**	**22**	**33**	**70**	**90**	**6**	**8**	**67**	**72**	**2**	**2**	**19**	**21**	**249**	**318**
	Andesite	57	(90.05)	20	(90.9)	69	(98.6)	6	(100.0)	65	(97.0)	2	(100.0)	18	(94.7)	237	(95.2)
	Rhyolite	1	(1.6)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	1	(0.4)
	Obsidian	2	(3.2)	1	(4.5)	1	(1.4)	0	(0.0)	1	(1.5)	0	(0.0)	0	(0.0)	5	(2.0)
	Chert	3	(4.8)	1	(4.5)	0	(0.0)	0	(0.0)	1	(1.5)	0	(0.0)	0	(0.0)	5	(2.0)
	Quartzite	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	1	(5.3)	1	(0.4)
	Bifacial tool	29		11		20		2		5		0		2		69	
	Andesite	22	(75.9)	8	(72.7)	16	(80.0)	2	(100.0)	3	(60.0)			1	(50.0)	52	(75.4)
	Obsidian	4	(13.8)	1	(9.1)	2	(10.0)	0	(0.0)	0	(0.0)			0	(0.0)	7	(10.1)
	Chert	3	(10.3)	2	(18.2)	1	(5.0)	0	(0.0)	2	(40.0)			1	(50.0)	9	(13.0)
	Quartzite	0	(0.0)	0	(0.0)	1	(5.0)	0	(0.0)	0	(0.0)			0	(0.0)	1	(1.4)
Uniface		**87**		**112**		**195**		**6**		**80**		**8**		**29**		**517**	
	Andesite	64	(73.6)	88	(78.6)	171	(87.7)	6	(100.0)	69	(86.3)	6	(75.0)	21	(72.4)	425	(82.2)
	Rhyolite	13	(14.9)	12	(10.7)	13	(6.7)	0	(0.0)	6	(7.5)	1	(12.5)	2	(6.9)	47	(9.1)
	Obsidian	0	(0.0)	1	(0.9)	4	(2.1)	0	(0.0)	1	(1.3)	0	(0.0)	0	(0.0)	6	(1.2)
	Chert	6	(6.9)	5	(4.5)	3	(1.5)	0	(0.0)	1	(1.3)	1	(12.5)	1	(3.4)	17	(3.3)
	Quartzite	4	(4.6)	6	(5.4)	4	(2.1)	0	(0.0)	2	(2.5)	0	(0.0)	5	(17.2)	21	(4.1)
	Sandstone/ siltstone	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	1	(1.3)	0	(0.0)	0	(0.0)	1	(0.2)
Undifferentiated Flaked Stone		**7**		**7**		**11**		**1**		**3**		**0**		**0**		**29**	
	Andesite	5	(71.4)	5	(71.4)	5	(45.5)	1	(100.0)	3	(100.0)					19	(65.5)
	Obsidian	0	(0.0)	0	(0.0)	1	(9.1)	0	(0.0)	0	(0.0)					1	(3.4)
	Quartzite	0	(0.0)	0	(0.0)	1	(9.1)	0	(0.0)	0	(0.0)					1	(3.4)
	Misc. sedimentary	0	(0.0)	0	(0.0)	1	(9.1)	0	(0.0)	0	(0.0)					1	(3.4)
	Sandstone/ siltstone	1	(14.3)	2	(28.6)	1	(9.1)	0	(0.0)	0	(0.0)					4	(13.8)
	Phyllite/slate	1	(14.3)	0	(0.0)	2	(18.2)	0	(0.0)	0	(0.0)					3	(10.3)
Debitage		**6,317**		**6,359**		**9,162**		**634**		**4,848**		**285**		**1,035**		**28,640**	
	Andesite	5,263	(83.3)	5,149	(81.0)	8,144	(88.9)	555	(87.5)	4,387	(90.5)	195	(68.4)	763	(73.7)	24,456	(85.4)
	Quartzite	434	(6.9)	436	(6.9)	450	(4.9)	37	(5.8)	220	(4.5)	38	(13.3)	132	(12.7)	1,747	(6.1)
	Rhyolite	375	(5.9)	570	(9.0)	237	(2.6)	27	(4.3)	150	(3.1)	19	(6.7)	82	(7.9)	1,460	(5.1)
	Phyllite/Slate	72	(1.1)	65	(1.0)	97	(1.1)	0	(0.0)	12	(0.2)	2	(0.7)	7	(0.7)	255	(0.9)
	Sandstone/ siltstone	36	(0.6)	41	(0.6)	98	(1.1)	6	(0.9)	26	(0.5)	19	(6.7)	15	(1.4)	241	(0.8)
	Obsidian	24	(0.4)	30	(0.5)	31	(0.3)	0	(0.0)	10	(0.2)	4	(1.4)	3	(0.3)	102	(0.4)
	Chert	59	(0.9)	29	(0.5)	64	(0.7)	8	(1.3)	30	(0.7)	7	(2.5)	23	(2.2)	220	(0.8)
	Quartz	29	(0.5)	18	(0.3)	3	(0.0)	0	(0.0)	5	(0.1)	1	(0.4)	0	(0.0)	56	(0.2)
	Other	25	(0.4)	21	(0.3)	38	(0.4)	1	(0.0)	8	(0.0)	0	(0.0)	10	(1.0)	103	(0.4)

Table 2.3. Lithic material frequencies for major artifact classes, by stratum. (*Continued*)

Artifact	Material	0		4		3		3/2		2B		2B/2A		2A		Class Total	
		No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)
Unmodified Stone		**17**		**17**		**13**		**0**		**10**		**0**		**0**		**57**	
	Quartz crystals	7	(41.2)	14	(82.4)	2	(15.4)			0	(0.0)					23	(40.4)
	Ocher	5	(29.4)	2	(11.8)	3	(23.1)			3	(30.0)					13	(22.8)
	Hematite (metallic)	5	(29.4)	1	(5.9)	6	(46.2)			5	(50.0)					17	(29.8)
	Chert	0	(0.0)	0	(0.0)	1	(7.7)			0	(0.0)					1	(1.8)
	Undetermined mineral	0	(0.0)	0	(0.0)	1	(7.7)			2	(20.0)					3	(5.3)
Nonutilitarian Ground Stone		**6**		**2**		**7**		**0**		**4**		**0**		**3**		**22**	
	Quartzite	0	(0.0)	0	(0.0)	1	(14.3)			0	(0.0)			0	(0.0)	1	(4.5)
	Sandstone/ siltstone	0	(0.0)	1	(50.0)	1	(14.3)			0	(0.0)			0	(0.0)	2	(9.1)
	Phyllite/Slate	5	(83.3)	1	(50.0)	3	(42.9)			3	(75.0)			3	(100.0)	15	(68.2)
	Misc. sedimentary	0	(0.0)	0	(0.0)	0	(0.0)			1	(25.0)			0	(0.0)	1	(4.5)
	Undetermined	1	(16.7)	0	(0.0)	2	(28.6)			0	(0.0)			0	(0.0)	3	(13.6)
Utilitarian Grinding Tool		**10**		**10**		**20**		**3**		**10**		**3**		**1**		**57**	
	Andesite	3	(30.0)	2	(20.0)	6	(30.0)	1	(33.3)	3	(30.0)	0	(0.0)	0	(0.0)	15	(26.3)
	Rhyolite	1	(10.0)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	1	(1.8)
	Igneous undiff.	3	(30.0)	3	(30.0)	6	(30.0)	1	(33.3)	4	(40.0)	1	(33.3)	1	(100.0)	19	(33.3)
	Quartzite	0	(0.0)	0	(0.0)	4	(20.0)	0	(0.0)	3	(30.0)	1	(33.3)	0	(0.0)	8	(14.0)
	Misc. sedimentary	3	(30.0)	5	(50.0)	4	(20.0)	1	(33.3)	0	(0.0)	1	(33.3)	0	(0.0)	14	(24.6)
Utilitarian Pounding Tool		**1**		**7**		**5**		**0**		**1**		**1**		**0**		**15**	
	Quartzite	1	(100.0)	2	(28.6)	2	(40.0)			1	(100.0)	0	(0.0)			6	(40.0)
	Igneous undiff.	0	(0.0)	1	(14.3)	1	(20.0)			0	(0.0)	0	(0.0)			2	(13.3)
	Andesite	0	(0.0)	4	(57.1)	2	(40.0)			0	(0.0)	1	(100.0)			7	(46.7)
Other Utilitarian Ground Stone		**1**		**5**		**11**		**1**		**2**		**0**		**1**		**21**	
	Andesite	0	(0.0)	0	(0.0)	5	(45.5)	0	(0.0)	2	(100.0)			1	(100.0)	8	(38.1)
	Phyllite/slate	0	(0.0)	1	(20.0)	6	(54.5)	0	(0.0)	0	(0.0)			0	(0.0)	7	(33.3)
	Quartzite	1	(100.0)	1	(20.0)	0	(0.0)	1	(100.0)	0	(0.0)			0	(0.0)	3	(14.3)
	Igneous undiff.	0	(0.0)	1	(20.0)	0	(0.0)	0	(0.0)	0	(0.0)			0	(0.0)	1	(4.8)
	Misc. sedimentary	0	(0.0)	1	(20.0)	0	(0.0)	0	(0.0)	0	(0.0)			0	(0.0)	1	(4.8)
	Sandstone	0	(0.0)	1	(20.0)	0	(0.0)	0	(0.0)	0	(0.0)			0	(0.0)	1	(4.8)
Undifferentiated Ground Stone		**7**		**4**		**14**		**0**		**0**		**0**		**0**		**25**	
	Phyllite/slate	6	(85.7)	4	(100.0)	12	(85.7)									22	(88.0)
	Sandstone/siltstone	1	(14.3)	0	(0.0)	2	(14.3)									3	(12.0)
Total tools[a]		**275**		**242**		**444**		**25**		**208**		**18**		**64**		**1,276**	
	Andesite	190	(69.1)	166	(68.6)	344	(77.5)	18	(72.0)	168	(80.8)	13	(72.2)	48	(75.0)	947	(74.2)
	Quartzite	11	(4.0)	12	(5.0)	18	(4.1)	5	(20.0)	7	(3.4)	1	(5.6)	8	(12.5)	62	(4.9)
	Rhyolite	16	(5.8)	12	(5.0)	14	(3.2)	0	(0.0)	7	(3.4)	1	(5.6)	2	(3.1)	52	(4.1)
	Phyllite/slate	13	(4.7)	6	(2.5)	23	(5.2)	0	(0.0)	3	(1.4)	0	(0.0)	3	(4.7)	48	(3.8)
	Sandstone/siltstone	2	(0.7)	4	(1.7)	4	(0.9)	0	(0.0)	1	(0.5)	0	(0.0)	0	(0.0)	11	(0.9)
	Obsidian	6	(2.2)	3	(1.2)	8	(1.8)	0	(0.0)	3	(1.4)	0	(0.0)	0	(0.0)	20	(1.6)
	Chert	12	(4.4)	8	(3.3)	5	(1.1)	0	(0.0)	4	(1.9)	1	(5.6)	2	(3.1)	32	(2.5)
	All other materials	25	(9.1)	31	(12.8)	28	(6.3)	2	(8.0)	15	(7.2)	2	(11.1)	1	(1.6)	104	(8.2)

[a] Excludes debitage.

Table 2.4. Major artifact class frequencies, by stratum.

Artifact	Form	0		4		3		3/2		2B		2B/2A		2A		Class Total	
		No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)
Core		**47**		**45**		**78**		**6**		**26**		**4**		**9**		**215**	
	Bipolar	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	1	(3.8)	0	(0.0)	0	(0.0)	1	(0.5)
	Unidirectional	0	(4.3)	4	(8.9)	10	(12.8)	0	(0.0)	1	(3.8)	2	(50.0)	1	(11.1)	18	(8.4)
	Bidirectional	7	(14.9)	11	(24.4)	14	(17.9)	2	(33.3)	7	(26.9)	0	(0.0)	2	(22.2)	43	(20.0)
	Multidirectional	22	(46.8)	20	(44.4)	34	(43.6)	1	(16.7)	14	(53.8)	2	(50.0)	4	(44.4)	97	(45.1)
	Tested stone	1	(2.1)	1	(2.2)	1	(1.3)	2	(33.3)	1	(3.8)	0	(0.0)	0	(0.0)	6	(2.8)
	Undetermined	15	(31.9)	9	(20.0)	19	(24.4)	1	(16.7)	2	(7.7)	0	(0.0)	2	(22.2)	48	(22.3)
Biface		92		33		90		8		72		2		21		318	
	Undiff. biface	63	(68.5)	22	(66.7)	70	(77.8)	6	(75.0)	67	(93.1)	2	(100.0)	19	(90.5)	249	(78.3)
	Bifacial tool	29	(31.5)	11	(33.3)	20	(22.2)	2	(25.0)	5	(6.9)	0	(0.0)	2	(9.5)	69	(21.7)
Uniface		87		112		195		6		80		8		29		517	
	Expedient	41	(47.1)	63	(56.3)	112	(57.4)	6	(100.0)	46	(57.5)	4	(50.0)	18	(62.1)	290	(56.1)
	Retouched	39	(44.8)	41	(36.6)	71	(36.4)	0	(0.0)	33	(41.3)	3	(37.5)	11	(37.9)	198	(38.3)
	Formed	7	(8.0)	8	(7.1)	12	(6.2)	0	(0.0)	1	(1.3)	1	(12.5)	0	(0.0)	29	(5.6)
Undifferentiated Flaked Stone		7		7		11		1		3		0		0		29	
Debitage		6,317		6,359		9,162		634		4,848		285		1,035		28,640	
Unmodified Stone		17		17		13		0		10		0		0		57	
Nonutilitarian Ground Stone		6		2		7		0		4		0		3		22	
	Bead	0	(0.0)	0	(0.0)	2	(28.6)			0	(0.0)			0	(0.0)	2	(9.1)
	Bead preform	1	(16.7)	0	(0.0)	0	(0.0)			1	(25.0)			0	(0.0)	2	(9.1)
	Pendant	0	(0.0)	0	(0.0)	1	(14.3)			0	(0.0)			0	(0.0)	1	(4.5)
	Pendant preform	0	(0.0)	0	(0.0)	0	(0.0)			1	(25.0)			0	(0.0)	1	(4.5)
	Drilled piece	2	(33.3)	2	(100.0)	2	(28.6)			0	(0.0)			2	(66.7)	8	(36.4)
	Ground disk	3	(50.0)	0	(0.0)	0	(0.0)			1	(25.0)			1	(33.3)	5	(22.7)
	Painted stone	0	(0.0)	0	(0.0)	1	(14.3)			0	(0.0)			0	(0.0)	1	(4.5)
	Spherical stone	0	(0.0)	0	(0.0)	1	(14.3)			1	(25.0)			0	(0.0)	2	(9.1)
Utilitarian Grinding		10		10		20		3		10		3		1		57	
	Hand stone	4	(40.0)	3	(30.0)	9	(45.0)	1	(33.3)	5	(50.0)	2	(66.7)	0	(0.0)	24	(42.1)
	Bottom stone	3	(30.0)	4	(40.0)	4	(20.0)	0	(0.0)	0	(0.0)	1	(33.3)	0	(0.0)	12	(21.1)
	Undiff. grinding	3	(30.0)	2	(20.0)	4	(20.0)	2	(66.7)	4	(40.0)	0	(0.0)	0	(0.0)	15	(26.3)
	Multifunctional	0	(0.0)	1	(10.0)	3	(15.0)	0	(0.0)	1	(10.0)	0	(0.0)	1	(100.0)	6	(10.5)
Utilitarian Pounding		1		7		5		0		1		1		0		15	
	Cobble hammer	1	(100.0)	3	(42.9)	3	(60.0)			1	(100.0)	0	(0.0)			8	(53.3)
	Flaked hammer	0	(0.0)	4	(57.1)	2	(40.0)			0	(0.0)	1	(100.0)			7	(46.7)
Other Utilitarian Ground Stone		1		5		11		1		2		0		1		21	
	Sharp-edge abrader	1	(100.0)	1	(20.0)	3	(27.3)	0	(0.0)	1	(50.0)			0	(0.0)	6	(28.6)
	Smooth abrader	0	(0.0)	2	(40.0)	0	(0.0)	1	(100.0)	0	(0.0)			0	(0.0)	3	(14.3)
	Knife	0	(0.0)	0	(0.0)	1	(9.1)	0	(0.0)	1	(50.0)			0	(0.0)	2	(9.5)
	Whetstone	0	(0.0)	1	(20.0)	0	(0.0)	0	(0.0)	0	(0.0)			1	(100.0)	2	(9.5)
	Stone bowl	0	(0.0)	0	(0.0)	1	(9.1)	0	(0.0)	0	(0.0)			0	(0.0)	1	(4.8)
	Chopping tool	0	(0.0)	0	(0.0)	1	(9.1)	0	(0.0)	0	(0.0)			0	(0.0)	1	(4.8)
	Perforator	0	(0.0)	0	(0.0)	1	(9.1)	0	(0.0)	0	(0.0)			0	(0.0)	1	(4.8)
	Point/point preform?	0	(0.0)	1	(20.0)	4	(36.4)	0	(0.0)	0	(0.0)			0	(0.0)	5	(23.8)
Undifferentiated Ground Stone		7		4		14		0		0		0		0		25	

Multidirectional cores have two or more striking platforms, with flake removals oriented in multiple different directions. If there are only two platforms, they do not share a single edge, as in a bidirectional core.

Bipolar cores have flakes removed from directly opposing striking platform faces and platform edge or surface for crushing or battering.[3]

Tested stones have only a few flake removals and often lack an obvious core striking platform.

Although the analysis did not include an intensive study of core reduction techniques, the general impression is that only the bidirectional cores, given their highly specific shape and consistent reduction via bifacial techniques, were products of a formal prepared-core technology.[4] The uni- and multidirectional cores from Kasapata did not have specific shapes or forms, typically showed minimal evidence of platform preparation beyond the creation of a noncortical platform surface, and exhibited flake scars suggesting that a wide range of flake sizes and shapes had been removed. The unidirectional cores appear to have been discarded after the initial core platform lost its utility, while on multidirectional cores the core was reoriented and a new platform was created one or more times before the core was discarded.

Multidirectional cores are the most common core form in all strata, followed by bidirectional cores (Table 2.4). Bidirectional cores decline in frequency and unidirectional ones increase in frequency between Substratum 2B and Stratum 3. Less than half of all cores at the site retain cortex, with the lowest proportion seen in intact strata occurring in Substratum 2B (Table 2.5). Relatively few cores at the site were used to the point of exhaustion, but the percentage increases steadily from Substratum 2A through Stratum 3.[5] Most cores are fragmentary, but the proportion declines notably between Substratum 2A and 2B.

Cores and raw materials may be cached or stockpiled at sites when mobility declines, and this behavior can leave various manifestations (Nelson 1991; Parry and Kelly 1987). Caching and restocking may promote less material-conserving reduction techniques. Thus, the shift away from bidirectional cores in Stratum 3 suggests a decline in strategies aimed at conserving raw material. High core weight variability may also reflect restocking at long-term sites, because as occupation span increases, cores from both extremes of reduction, exhausted and "new," accumulate at the site. As can be seen in Table 2.5, core weight variability increases notably between Substrata 2A and 2B, then declines somewhat in Stratum 3. It should be noted, however, that this variation may be unreliable, given the small number of whole cores in Substratum 2A. Nevertheless, the shift to a greater range of core types in Substratum 2B supports the interpretation of greater core variability at this time. The increasing proportion of whole cores at the site beginning in Substratum 2B also suggests a shift to caching of raw materials.

Andesite dominates the core assemblage, with quartzite being the next most common material (Table 2.3). These are the only materials used as cores during Substratum 2A times, after which there is a shift to both increasing reliance on andesite and the use of a wider range of materials. The one obsidian core in Substratum 2B[6] is an exhausted (1.7 g) bipolar core, with the extent and intensity of reduction presumably reflecting the difficulty of replacing this exotic material. Two cores in Stratum 3 were recycled from broken quartzite manos.[7]

Table 2.5. Miscellaneous core characteristics.

Factor Evaluated	0	4	3	3/2	2B	2B/2A	2A	All Strata
% Cortical	25.5	37.8	46.2	83.3	38.5	50.0	44.4	40.0
% Exhausted	9.7	14.3	13.8	0.0	9.1	66.7	0.0	12.6
% Fragmentary	74.5	60.0	47.4	83.3	38.5	0.0	77.8	56.3
Mean wt.[a] (g)	40.0	37.4	45.2	50.6	50.1b	21.3	51.5	43.1
No. whole	12	16	40	1	16	4	2	91
SD[a]	26.1	22.6	26.4	0	36.4	16.3	12.4	24.2
Coeff. of Variation[a]	0.652	0.606	0.585	0	0.727	0.765	0.241	0.562

[a] Calculated using whole cores only.

[b] Includes an extremely heavy outlier of 163 g. Without the outlier, mean = 42.5 g, count = 15, SD = 21.0, and coefficient of variation = 0.493.

BIFACES

Bifaces are artifacts with only two faces that have at least some part of both faces modified by invasive flake removals. Bifaces are divided into two major categories, undifferentiated bifaces and bifacial tools (Figure 2.1).[8]

Undifferentiated bifaces retain a generalized bifacial form and likely served as multifunctional tools and cores (Kelly 1988). In this study they are categorized by early, middle, and late reduction stages.[9]

Bifacial tools have particular forms or working edge

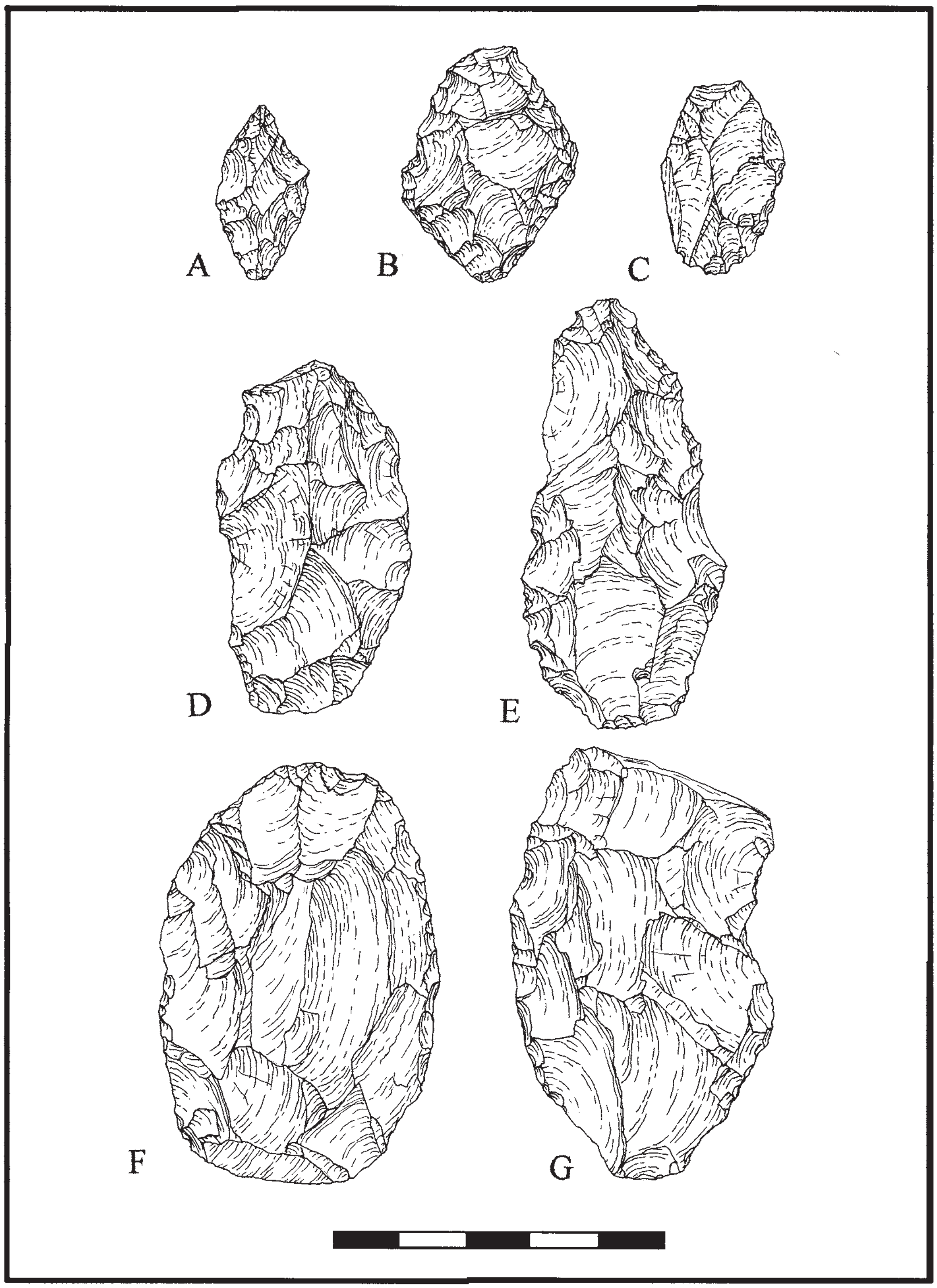

FIGURE 2.1. Bifacial tools (A, B) and undifferentiated bifaces (C–G). **A.** Perforator, bag 12: surface. **B.** Knife, bag 29: surface. **C.** Late-stage biface, bag 1130-19: Unit 11, Level 5, Stratum 3. **D.** Middle-stage biface, bag 1011-35: Unit 10, Level 2, Stratum 3. **E.** Middle-stage biface, bag 1061-1: Unit 10, Level 5, Substratum 2B. **F.** Early-stage biface, bag 10107-1: Unit 10, Level 10, Substratum 2A. **G.** Early-stage biface, bag 1130-19: Unit 11, Level 5, Substratum 2B.

modification that suggest they were manufactured for a specific purpose. They are presumed to be more function-specific and are subdivided into classes based on morphology, edge modification, or inferred primary function (projectile point, drill, etc.).

Undifferentiated bifaces dominate over bifacial tools in all strata of the Kasapata collection, although their proportion drops notably between Substratum 2B and Stratum 3 (Table 2.4). Almost all are made on andesite, with little difference between strata (Table 2.3). Early-stage bifaces are most common at the site, followed by middle-stage and finally late-stage bifaces (Table 2.6). This pattern holds for all strata except 2A, which has a relatively greater proportion of middle-stage than early-stage bifaces. The vast majority of undifferentiated bifaces at the site are fragmentary, with the only possible trend being a slight increase in fragmentation between Substrata 2A and 2B. In general, fragmentation increases as bifaces reach later reduction stages (fragmentation of early stage = 78.7 percent, middle = 88.3 percent, late = 92.7 percent), which is not surprising, given that they are more likely to break the more they are handled or reduced. Few undifferentiated bifaces at the site have cortex, although the percentage with cortex increases steadily from Substratum 2A through Stratum 3. For the site as a whole, the percentage with cortex decreases with increasing reduction stage (early stage: 25.0 percent; middle stage: 6.6 percent; late stage: 1.8 percent). This also is not surprising, since cortex typically is progressively removed with greater thinning and shaping (Ahler 1989). The only notable difference between intact strata is that Substratum 2B has a lower proportion of cortical early-stage bifaces (18.2 percent) than Substratum 2A and Stratum 3 (28.6 percent and 31.4 percent, respectively), which may indicate that initial biface reduction more commonly took place off-site during Substratum 2B times.

Nearly all bifacial tools belong to the projectile point class (Table 2.6). This is a morphological, not functional, class, as it is defined based on tool form. It comprises artifacts with an intentionally shaped haft element and a blade element that is fairly wide and symmetrical, with margins that gradually converge to a point. It is typically assumed that morphological projectile points functioned as the tip elements of hunting armatures such as spears, darts, or arrows. However, microwear studies on archaeological specimens in other areas of the world indicate that although many morphological points did function as projectile points, many were also used as cutting and butchering tools (e.g., Ahler 1971). It is assumed here that points were designed primarily as armatures, but they may also have been used in activities associated with initial carcass processing. Points are the only bifacial tools recovered below Stratum 3.[10] The other rare bifacial tools[11] include one knife,[12] one combination cutting/scraping tool,[13] and three perforators (one each in Strata 0, 4, and 3).

Bifacial tools are predominantly made of andesite, although there are some notable variations between strata (see Table 2.3). The andesite percentage increased while that of chert decreased over time, with the most notable drop between Substratum 2B and Stratum 3. Obsidian is absent below Stratum 3. Nearly all bifacial tools lack cortex, except for a minor percentage in Stratum 3 (Table 2.6). Most bifacial tools at the site are fragmentary, but the proportion declines continually between Substratum 2A and Stratum 3. This finding, combined with the cortex data, suggests that bifacial tools were used less intensively (perhaps reflecting less curation) or were more commonly cached on-site over time.

TABLE 2.6. Miscellaneous biface characteristics.

Artifact		0	4	3	3/2	2B	2B/2A	2A	All Strata
Undiff. bifaces	% Early	25.8	75.0	51.5	20.0	53.2	50.0	36.8	45.6
	% Middle	40.3	15.0	25.0	60.0	34.9	0.0	47.4	32.1
	% Late	33.9	10.0	23.5	20.0	12.7	50.0	15.8	22.4
	% Fragmentary	88.9	86.4	85.7	83.3	83.6	100.0	78.9	85.5
	% Cortical	7.9	22.7	18.6	16.7	13.4	0.0	10.5	14.1
Bifacial tools	% Point	93.1	90.9	90.0	100.0	100.0	N/A	100.0	92.8
	% Fragmentary	65.5	81.8	70.0	100.0	80.0	N/A	100.0	72.5
	% Cortical	0.0	0.0	5.0	0.0	0.0	N/A	0.0	1.4

If we assume that points largely functioned as armatures for hunting, their representative fragments can be used to infer a range of possible on-site activities (Flenniken 1991). For example, blade fragments (tip, medial, and lateral fragments) are indicative of point usage, based on the assumption that points break on impact with animals. Fragments that do not penetrate the animal are typically left at the kill location because they lack reuse potential. Those embedded in the animal are unintentionally retrieved when the carcass is transported to another location for butchery and processing. On the other hand, basal fragments and exhausted whole points are discarded during "retooling" (removal and replacement of nonfunctional points remaining in the haft). Retooling typically occurs in settings where there is "down time," such as a logistical field camp or a residential base, rather than at a kill site. Whole points that are not exhausted may represent either retooling when raw materials are abundant or the caching of points between use episodes, both of which are more likely at longer-term residential bases.

Using these assumptions, what can be inferred about the three intact strata at Kasapata? All three have at least blade elements and basal point fragments. Minimally, then, the basic suite of hunting-related activities occurring at the site was similar over time, and the site was never simply a kill location. Substrata 2A and 2B are similar in only having evidence suggesting transport of carcasses to the site, with subsequent butchery, and retooling during downtime (2A = one blade, one basal fragment; 2B = two blades, two basal fragments, one whole exhausted point). Stratum 3 yielded eight blade fragments, five basal fragments, and four whole exhausted points, with these forms found in essentially equal proportions as in the other two strata. Stratum 3 differs, however, in yielding two whole, nonexhausted points, suggesting that the only variation in hunting-related activities was that point caching may have occurred during this time. Given the similarity in both the types and proportions of point fragments between strata, the most parsimonious interpretation is that the site likely was used as a residential base during all three strata, with Stratum 3 representing longer-term use. This interpretation is supported by the general excavation results (see Chapter 1).

UNIFACES

MORPHOTECHNOLOGICAL ANALYSIS. Unifaces are artifacts with two faces and at least one edge modified by edge retouch or use wear; they do not have invasive flake removals on both faces. Unifaces are divided into three morphotechnological categories based on the nature and extent of edge and facial modification: expedient, retouched, and formed unifaces (Figure 2.2).

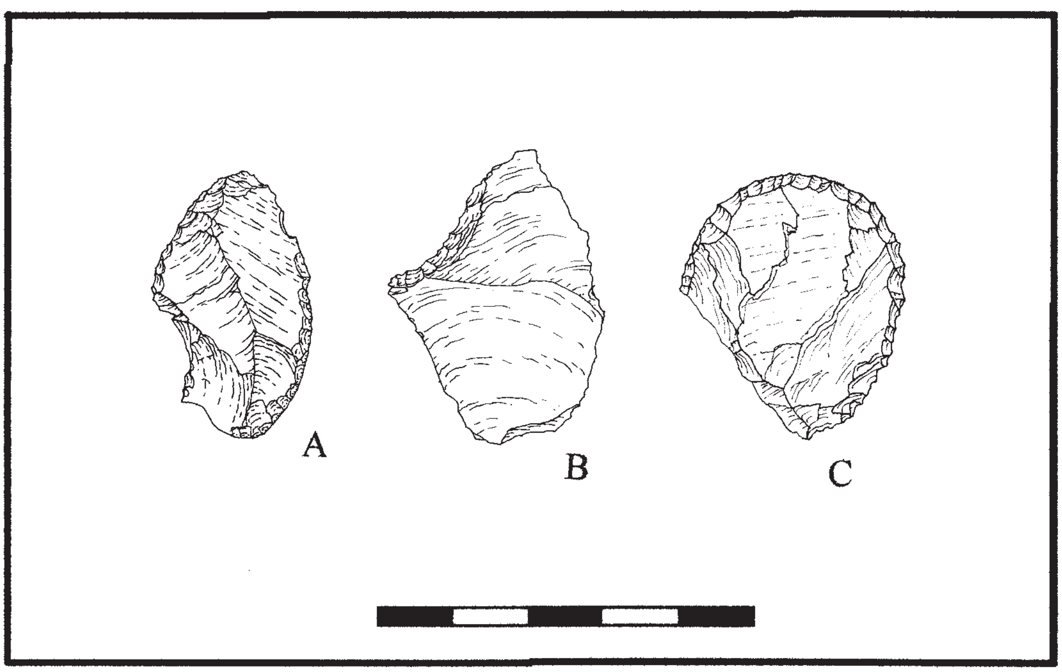

FIGURE 2.2. Retouched (A, B) and formed (C) unifaces. A. Knife, bag 10104-40: Unit 10, Level 10, Substratum 2A. **B.** Spokeshave, bag 1123-59: Unit 11, Level 4, Stratum 3. **C.** Scraper, bag 719-6: Unit 7, Level 8, Substrata 2B/2A.

Expedient unifaces lack evidence of intentional flaking to shape either the working edges or faces. They are identified based on the presence of conspicuous edge modification (i.e., continuous along the tool margin and visible with a 10× hand lens), presumably resulting from use.

Retouched unifaces exhibit intentional flake removals along the tool margin (unifacial or bifacial) designed to create or modify a working edge.

Formed unifaces have not only the working edge but also other portions of the tool margin or one face intentionally flaked to create a more specific tool shape or form. In general, these are highly patterned unifacial tools or have intentionally flaked haft elements.

Expedient unifaces are the most common unifaces at the site, followed by retouched and then formed unifaces (see Table 2.4). This pattern is found in all intact strata except that formed unifaces are not present in Substratum 2A. Combining all strata, most unifaces were discarded whole (Table 2.7). Expedient unifaces were more commonly discarded whole (66.6 percent) than retouched (47.0 percent) or formed unifaces (48.3 percent), which makes sense, given the lesser investment in their manufacture. The uniface assemblage does, however, become increasingly fragmentary over time. Fragmentation of expedient unifaces initially increases between Substrata 2A and 2B (2A: 16.7 percent; 2B: 26.1 percent; 3: 30.4 percent fragmentary), while that of retouched unifaces first increases between Substratum 2B and Stratum 3 (2A: 36.4 percent; 2B: 39.4 percent: 3: 64.8 percent fragmentary). Together, these data suggest progressively more intensive unifacial tool usage over time (i.e., tools were used to the point of breakage before being discarded).

Most unifaces are manufactured on flakes derived from cores, with the percentage increasing notably between Substrata 2A and 2B (Table 2.7).[14] The proportion made on bifacial thinning flakes decreases steadily between Substratum 2A and Stratum 3. Together, these data indicate a shift away from using bifaces as cores over time. A few unifaces are made on flakes derived from ground stone tools.[15] Cortex is present on only a minority of unifaces, with the proportion generally, although not consistently, decreasing from Substratum 2A through Stratum 3. For the site as a whole, andesite is the most common raw material for unifaces, with rhyolite a very distant second (see Table 2.3). Notable trends between intact strata include a decrease in quartzite and an increase in andesite between Substrata 2A and 2B. Formed unifaces differ from expedient and retouched unifaces in that none was made on poorer-quality materials (quartzite, sandstone/siltstone).

Functional Inferences. The uniface assemblage was divided into general functional classes, following Kooyman (2000), based on working edge shape, edge angle, macroscopic use modification, and weight. The classes include scraping tool, cutting tool, chopping tool, spokeshave, perforator, and projectile point.

Spokeshaves have a concave working edge and are generally assumed to be woodworking tools used to create artifacts with a circular cross-section, such as projectile shafts or hafts for other implements (e.g., a hafted scraper).

Perforators have a narrow, pointed working edge and are designed to create holes or grooves in a range of materials. Perforators are often divided into types such as drill, graver, and so on; however, since most perforators have broken tips, they are not subdivided further.

(Unifacial) projectile points are defined based on form, following the definition given in the bifacial tool discussion.

Scraping tools have steeply angled working edges (generally 60–90 degrees) and predominantly unifacial edge wear.

Table 2.7. Miscellaneous uniface technomorphological characteristics.

Factor Evaluated		0	4	3	3/2	2B	2B/2A	2A	All Strata
% Fragmentary		52.9	47.3	43.1	0.0	31.3	25.0	24.1	42.0
% Cortical		20.7	18.8	18.5	16.7	11.3	12.5	27.6	18.0
Flake type	% on BFT	3.4	6.3	3.6	0.0	11.3	0.0	27.6	6.6
	% on core flake	51.7	58.9	46.2	83.3	50.0	25.0	37.9	50.1
	% on ground stone fragment	1.1	0.0	0.5	0.0	0.0	0.0	6.9	0.8
	% on indeterminate flake	43.7	34.8	49.7	16.7	38.8	75.0	27.6	42.6

Abbreviation: BFT, bifacial thinning flake

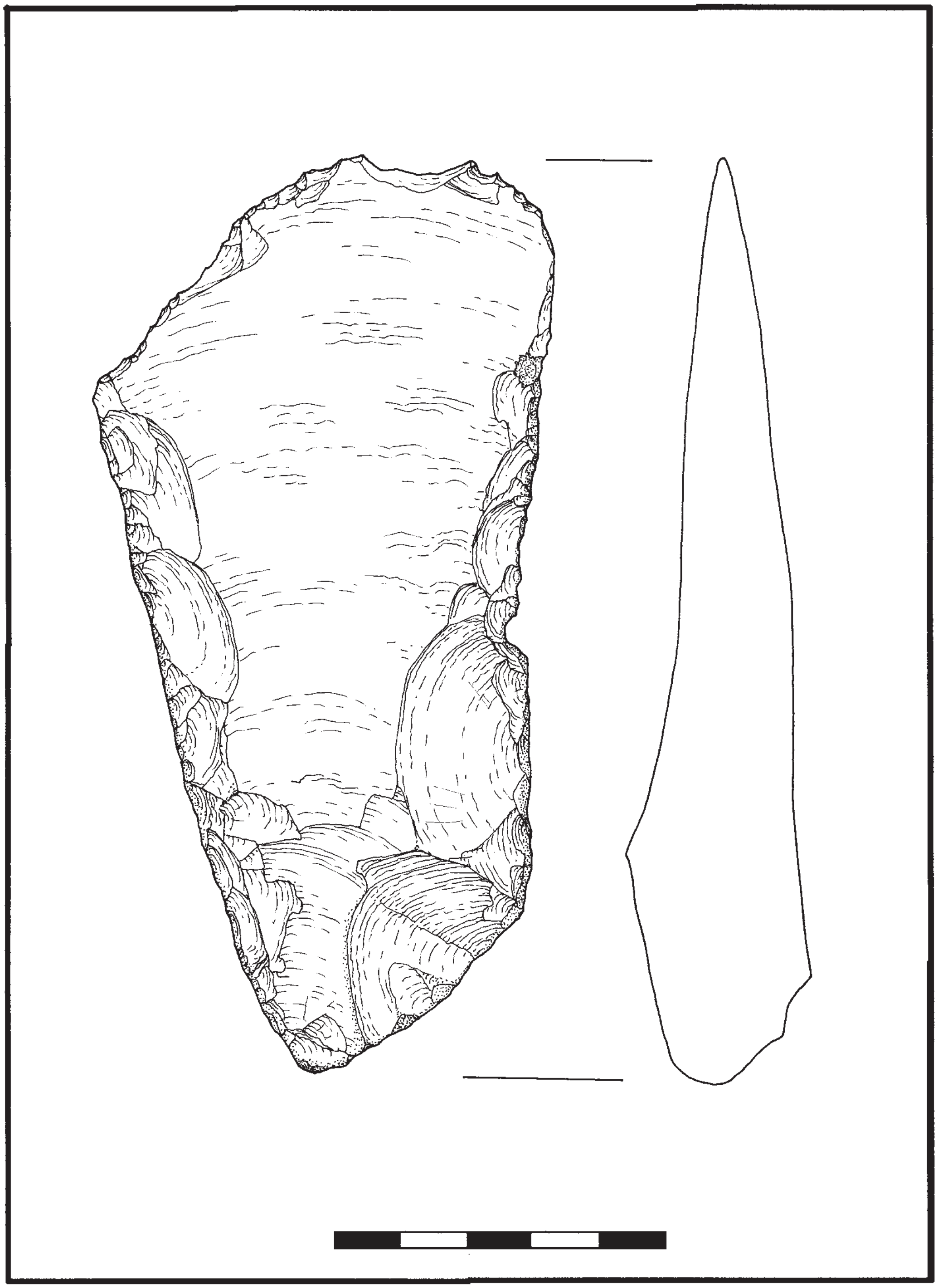

Figure 2.3. Large chopping tool: bag 5, recovered on the surface of the site.

Cutting tools have acute-angled working edges (generally <60 degrees) and predominantly bifacial edge wear.

Chopping tools exhibit bifacial edge wear, including edge crushing and spalling. They typically are heavier and larger tools than most other unifaces, with relatively steep-angled working edges (generally 50–80 degrees). This category includes artifacts commonly referred to as axes, adzes, wedges, and hoes, as well as more informally shaped choppers.

Most expedient unifaces functioned as knives (53.4 percent), while most retouched unifaces functioned as scrapers (70.7 percent). Formed unifaces are dominated by the scraper (48.3 percent) and projectile point (31.0 percent) classes. Spokeshaves and cutting and scraping tools occur in all strata (Table 2.8). Scrapers are more common than cutting tools in all strata except 2A. There is a steady decrease in the percentage of spokeshaves from Substratum 2A to Stratum 3. Perforators first appear in Substratum 2B, while Stratum 3 yielded the earliest unifacial points and chopping tools. All chopping tools except one are minimally modified cobble or flake choppers. The one exception[16] was made on an extremely large, thick andesite core flake (132.2 × 70.3 × 26.1 mm), the nonworking end of which retains the striking platform. The form closely resembles that of an axe: in longitudinal section it is thickest at the poll (nonworking end) and tapers toward the bit, and in plan view it expands in width from the poll to the bit. The bit exhibits heavy wear, including bifacial spalling and intensive edge crushing; there is no obvious use wear on the poll. However, one characteristic is unusual for an axe and more commonly found on hoes: both longitudinal margins are bifacially retouched. All that can be unequivocally inferred was that its last use involved chopping hard materials, given the intensive crushing and spalling along the bit (Figure 2.3).

The general type (hard/soft) of material worked was assessed for all unifaces, again following Kooyman (2000).[17] Unifaces were most commonly used to process soft materials, except in Substratum 2A, where most were used on hard materials (Table 2.8). The relatively greater incidence of hard material processing in

TABLE 2.8. Uniface functions by class and material, by stratum.

Artifact	0		4		3		3/2		2B		2B/2A		2A		Class Total	
	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)
Chop total (all hard material)	**3**	**(3.4)**	**1**	**(0.9)**	**1**	**(0.5)**	**0**	**(0.0)**	**0**	**(0.0)**	**0**	**(0.0)**	**0**	**(0.0)**	**5**	**(1.0)**
Cut total	**18**	**(20.7)**	**34**	**(30.4)**	**74**	**(37.9)**	**5**	**(83.3)**	**28**	**(35.0)**	**4**	**(50.0)**	**13**	**(44.8)**	**176**	**(34.0)**
Cut, hard material	5	(27.8)	17	(50.0)	17	(23.0)	2	(40.0)	4	(14.3)	1	(25.0)	8	(61.5)		
Cut, soft material	13	(72.2)	17	(50.0)	57	(77.0)	3	(60.0)	24	(85.7)	3	(75.0)	5	(38.5)		
Cut + scrape total	**2**	**(2.3)**	**7**	**(6.3)**	**6**	**(3.1)**	**0**	**(0.0)**	**3**	**(3.8)**	**0**	**(0.0)**	**1**	**(3.4)**	**19**	**(3.7)**
Cut + scrape, hard material	2	(100.0)	4	(57.1)	3	(50.0)			2	(66.7)			0	(0.0)		
Cut + scrape, soft material	0	(0.0)	3	(42.9)	3	(50.0)			1	(33.3)			1	(100.0)		
Scrape total	**54**	**(62.1)**	**50**	**(44.6)**	**87**	**(44.6)**	**1**	**(16.7)**	**39**	**(48.8)**	**4**	**(50.0)**	**12**	**(41.4)**	**247**	**(47.8)**
Scrape, hard material	21	(38.9)	25	(50.0)	31	(35.6)	1	(100.0)	14	(35.9)	1	(25.0)	6	(50.0)		
Scrape, soft material	30	(55.6)	25	(50.0)	56	(64.4)	0	(0.0)	25	(64.1)	3	(75.0)	6	(50.0)		
Scrape, und. Material	3	(5.6)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)		
Spokeshave total	**1**	**(1.1)**	**0**	**(0.0)**	**1**	**(0.5)**	**0**	**(0.0)**	**1**	**(1.3)**	**0**	**(0.0)**	**2**	**(6.9)**	**5**	**(1.0)**
Spokeshave, hard material	0	(0.0)			0	(0.0)			1	(100.0)			1	(50.0)		
Spokeshave, soft material	1	(100.0)			1	(100.0)			0	(0.0)			1	(50.0)		
Perforate total (all und. material)	**0**	**(0.0)**	**2**	**(1.8)**	**4**	**(2.1)**	**0**	**(0.0)**	**1**	**(1.3)**	**0**	**(0.0)**	**0**	**(0.0)**	**7**	**(1.4)**
Projectile point total	**2**	**(2.3)**	**2**	**(1.8)**	**5**	**(2.6)**	**0**	**(0.0)**	**0**	**(0.0)**	**0**	**(0.0)**	**0**	**(0.0)**	**9**	**(1.7)**
Point, soft material	2	(100.0)	0	(0.0)	1	(20.0)										
Point, und. material	0	(0.0)	2	(100.0)	4	(80.0)										
Undetermined[a] total	**7**	**(8.0)**	**16**	**(14.3)**	**17**	**(8.7)**	**0**	**(0.0)**	**8**	**(10.0)**	**0**	**(0.0)**	**1**	**(3.4)**	**49**	**(9.5)**
Total unifaces	**87**		**112**		**195**		**6**		**80**		**8**		**29**		**517**	
Total hard material	31	(35.6)	47	(42.0)	52	(26.7)	3	(50.0)	21	(26.3)	2	(25.0)	15	(51.7)	171	(33.1)
Total soft material	46	(52.9)	45	(40.2)	118	(60.5)	3	(50.0)	50	(62.5)	6	(75.0)	13	(44.8)	281	(54.4)
Total und. material	10	(11.5)	20	(17.9)	25	(12.8)	0	(0.0)	9	(11.3)	0	(0.0)	1	(3.4)	65	(12.6)

[a] Material is also undetermined.

Substratum 2A registers for both cutting and scraping tools, although it is most pronounced for cutting tools. This may indicate a shift to greater on-site hide or nonwoody plant processing after Substratum 2A times, given the relative increase in tools used on softer materials and for scraping tasks.

UNDIFFERENTIATED FLAKED STONE

This class contains artifacts that were modified by flake removals but are too fragmentary to be classified to a more specific morphological type. Most are made of andesite, typical of the rest of the flaked stone assemblage (see Table 2.3). A notable minority are made on sedimentary materials, typically used for ground stone tools, and likely represent failures or waste material from the early stages of ground stone tool manufacture. These occur exclusively in Strata 0, 4, and 3.

DEBITAGE

Debitage is any detached piece of flaked stone lacking evidence of modification (intentional flake removals or utilization) after its production. It is the unused by-product of tool manufacture and typically the most common artifact class recovered on archaeological sites. Analysis focuses on assessing aspects of on-site tool manufacturing (production, reduction, and maintenance) activities. Debitage is typically a more direct indicator of on-site manufacture than the tools within an assemblage (Ahler 1989). Tools, especially more formal or highly shaped ones, are often transported between sites and discarded at a location other than where they were produced. Debitage, however, generally remains at the site where it was generated, although it may be moved around within a site during cleaning and dumping activities. The analysis described here used Ahler's (1989) mass analysis methodology; no attempt was made to examine individual flake attributes. All debitage from each provenance unit was first sorted by material type and then subdivided by cortex presence/absence. Each subset was sorted into four size grades by passing it through nested U.S. Standard geological screens, with screen sizes selected to match those used by Ahler (1989:100) to facilitate analytical comparisons.[18] Total debitage count and weight were recorded for each size-graded subset. Raw material counts by stratum are provided in Table 2.3. Detailed analysis was limited to materials used to produce flaked stone tools—andesite, quartzite, rhyolite, chert, and obsidian—and focused primarily on the assemblages from the three intact strata.

Intensity of On-Site Tool Manufacture. An assessment of how much on-site tool manufacture occurred uses debitage density because raw counts are not comparable, owing to differences in excavation volume between strata (Table 2.9). Overall, there is a twofold increase in debitage density between Substrata 2A and 2B, while Substratum 2B and Stratum 3 have essentially the same density. This indicates that a shift toward greater on-site tool manufacture took place between Substratum 2A and 2B times. The primary material worked in all strata is andesite, and the overall increase in debitage density between Substrata 2A and 2B resulted from a significant (more than twofold) increase in on-site use of andesite. The moderate quartzite and rhyolite densities indicate that these materials were not as important as andesite, but both appear to have been used more frequently for on-site tool manufacture during Stratum 2A times. Insofar as andesite was primarily available only at some distance from the site, while quartzite and rhyolite were available in the immediate site vicinity, these shifts imply a change in the organization of raw material procurement. The most likely scenario is a shift from embedded direct procurement under conditions of higher residential mobility

Table 2.9. Debitage density (debitage count per m3).

Material	0	4	3	2B	2A	All Strata
Estimated excavation volume (m3)	7.07	4.47	6.15	3.24	1.35	22.28
Total density (all materials)	893.49	1,422.60	1,489.76	1,496.30	766.67	1,222.27
Andesite density	744.41	1,151.90	1,324.23	1,354.01	565.19	1,097.67
Quartzite density	61.39	97.54	73.17	67.90	97.78	78.41
Rhyolite density	53.04	127.52	38.54	46.30	60.74	65.53
Chert density	8.35	6.49	10.41	9.26	17.04	9.87
Obsidian density	3.39	6.71	5.04	3.09	2.22	4.58

(Substratum 2A) to greater logistical procurement and material caching of better-quality material (andesite) under conditions of lower residential mobility (2B, 3).

The very low densities of chert and obsidian indicate minimal on-site manufacture using these materials. These materials appear to have been heavily conserved because they were the only high-quality knapping materials available, as well as difficult to acquire either because they were exotic to (obsidian) or rare in (chert) the Cuzco Valley. A small amount of debitage in all strata consists of materials used to manufacture ground stone tools, both utilitarian (sandstone/siltstone) and nonutilitarian (phyllite/slate) ground stone (see Table 2.3), and presumably represents debris from their manufacture or maintenance. Debitage counts for these materials likely are skewed to low frequencies because they do not fracture conchoidally, making flakes extremely difficult to identify (Will 2002).

ON-SITE MANUFACTURING ACTIVITIES. Reconstruction of the kinds of manufacturing activities that took place at Kasapata is based on comparing the archaeological samples to experimental data sets, developed by Ahler (1989), where the specific manufacturing activity is known. Ahler's methodology enables use of a number of different measures; which were most appropriate for Kasapata was arrived at through data exploration and consideration of field methodology.[19]

My assessment of tool manufacturing activities used two different weight measures: the relative weight percentage of all debris within the G3 (1/4 inch) and G4 (1/8 inch) size grades (hereafter "G3+4 wt. percent") and the mean weight of all flakes in the G1 through G3 (all debitage larger than 1/4 inch) size grades (hereafter "G1–3 mean wt."). The G3+4 wt. percent indirectly measures the size of the parent tool being knapped and therefore provides an assessment of the tool's position or stage within a production trajectory (Ahler 1989:89–90).[20] G1-3 mean weight directly measures average flake shape, which varies depending on the combination of type of applied force (bipolar, hard or soft hammer percussion, pressure) and the point of force application (marginal vs. nonmarginal) (Ahler 1989:91).[21] The archaeological values for these two measures are plotted against each other and then compared with Ahler's experimental values. Interpretations based on these comparisons must consider, however, that the archaeological assemblages may represent a mixture of different activities, rather than the single activities reported by Ahler.

A comparison of Figures 2.4 through 2.6 suggests that andesite and quartzite were reduced on-site in comparable ways over time. In all intact strata, debitage of both materials most closely resembles hard hammer, nonmarginal reduction, typically associated with core reduction. Obsidian also was used on-site in a very consistent manner, with manufacturing activities limited to finishing or maintaining tools manufactured primarily or entirely at some other location. In contrast, rhyolite and chert show more inconsistent use over time. Predominant usage of rhyolite fluctuates between core reduction (Substratum 2A) and early- or middle-stage biface reduction (Substratum 2B), falling somewhere in between during Stratum 3 times. Chert is less variable in that debris in all three strata resulted primarily from biface reduction, although the predominance of earlier- versus later-stage reduction fluctuates between strata. Nonetheless, these data indicate that very similar manufacturing activities took place at the site over time. The same general range of tool manufacturing activities produced the debitage assemblages in the three intact strata: core reduction, biface reduction, and tool finishing or maintenance. Further, the main activity represented in all strata was core reduction, principally of andesite, but also minimally of quartzite as well.

The Kasapata cortex data (Table 2.10) also provide useful insights into prehistoric technological organization. Ahler (1989) notes that cortex is potentially the most variable characteristic of any debitage assemblage because the proportion of cortical debris can be strongly affected by factors unique to specific archaeological cases. These factors include variability in the availability (local vs. nonlocal) and form (cobble vs. bedrock outcrop) of source materials, as well as human decisions about the staging of intentional cortex removal. The absence of cortical obsidian in most strata presumably reflects its status as a distant exotic and implies that obsidian arrived at the site as late-stage tools. Consistently very low proportions of cortical andesite, in conjunction with available geological information, imply that andesite was preferentially quarried from bedrock outcrops at some distance from the site. The relatively high amounts of cortical quartzite, rhyolite, and chert debris likely reflect their availability as cobbles in local geological formations. There is also a clear pattern of significantly less cortical debris in the Kasapata assemblage, for all materials, relative to Ahler's experiments (Table 2.10; compare with Ahler 1989: Tables 2 and 3). The lesser amount of cortical debris suggests that the prehistoric occupants of Kasapata

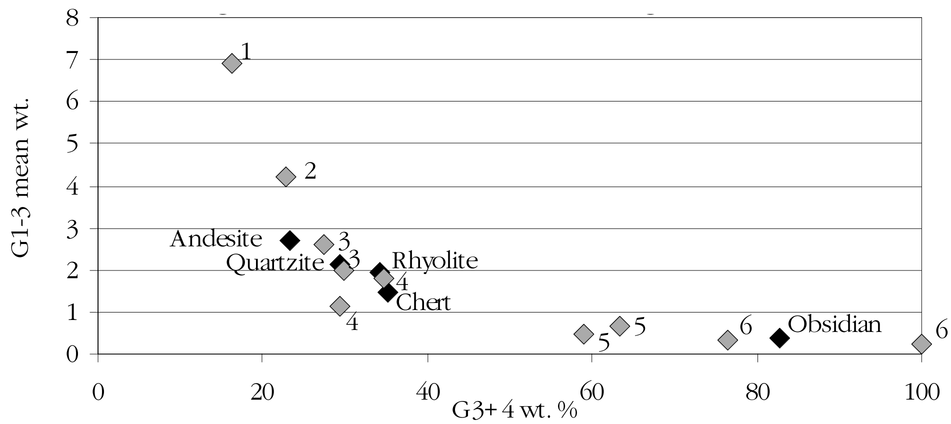

Figure 2.4. Stratum 3 manufacturing activities.

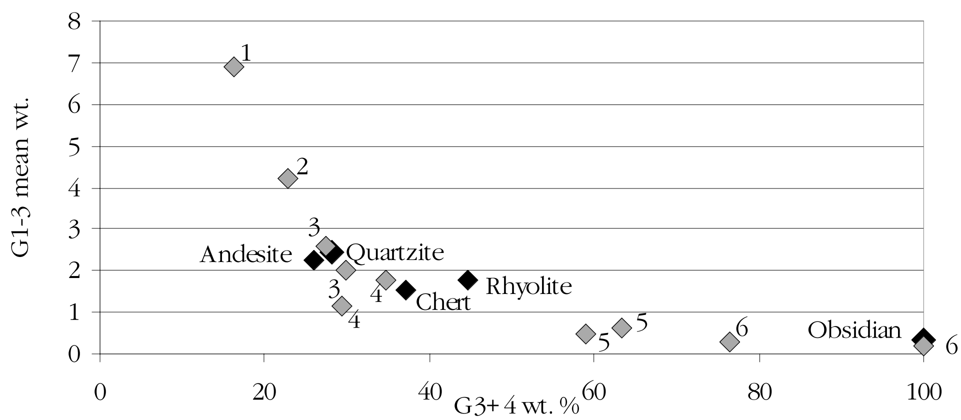

Figure 2.5. Substratum 2B manufacturing activities.

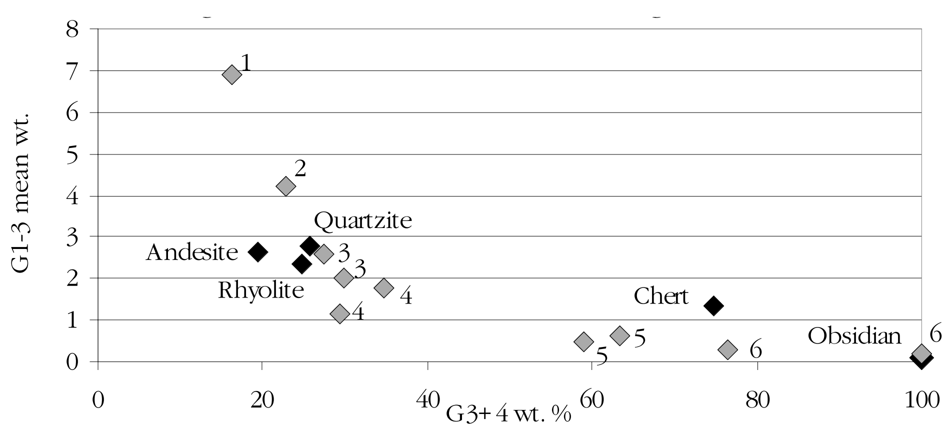

Figure 2.6. Substratum 2A manufacturing activities.

Figures 2.4 through 2.6. Comparison of archaeological samples (black) and experimental data sets (gray). Experimental data from Ahler (1989: Tables 2 and 3) are coded as follows: 1 = hard hammer cobble testing; 2 = hard hammer biface stage 1 blank production; 3 = hard hammer core reduction; 4 = hard hammer/soft hammer biface stage 2–3 edging and thinning; 5 = soft hammer biface stage 2–3 thinning; 6 = soft hammer/pressure biface shaping and finishing.

TABLE 2.10. Percentage cortical debitage by material type.

Material	0	4	3	2B	2A	All Strata
Andesite (%)	11.8	10.8	13.7	9.6	8.3	11.8
Quartzite (%)	34.8	32.1	40.2	30.5	21.2	34.2
Rhyolite (%)	23.7	25.6	14.3	10.0	4.9	20.5
Chert (%)	27.1	30.0	25.0	23.3	13.0	23.5
Obsidian (%)	4.2	0.0	0.0	0.0	0.0	1.0

consistently did at least some initial reduction of all raw materials off-site. This effort was most likely aimed at producing relatively reliable blanks (bifaces or cores) by removing at least some cortex before transporting the material elsewhere.

STYLISTIC ANALYSIS OF FLAKED STONE PROJECTILE POINTS

The primary objective of the stylistic projectile point analysis was to develop a local point typology. Secondary objectives included the assessment of stratigraphic ages and the cultural or social affiliations of the prehistoric site occupants, based on cross-dating and comparison with point types in other regions. Only complete or nearly complete points and fragments with portions of the shoulder and haft sufficient for establishing similarity to other points at the site or to known point types in adjacent regions were used in this analysis. Also included were seven points that were collected on the surface of the site when it was first recorded in 1998 (Bauer 2004).

Stylistic groups were defined based on the subjective evaluation of a variety of attributes, including the presence or absence of a stem and shoulders, haft configuration, blade shape, and manufacturing techniques. Stratigraphic affiliation was not used to define groups. No distinction was made between bifacially and unifacially shaped points if the points otherwise shared the same suite of diagnostic characteristics. At least two points were required to define a group, unless a single specimen duplicated the characteristics of a style documented elsewhere. This procedure resulted in 47 points divided into nine groups, with four untyped points described individually. Table 2.11 summarizes their stratigraphic distribution.

Terms and measurement procedures followed Klink and Aldenderfer (2005) and are briefly recapped here. All projectile points minimally have a blade and a haft element; a shoulder element may or may not be present. A *shoulder* is indicated by a clear change in the angle of the tool margin (in plan view) coinciding with

TABLE 2.11. Stratigraphic distribution of flaked stone projectile point groups, by stratum.

Group	Surface	0	4	3	2B	2A	Total
1						1	1
2	5[a]	2	1	4			12
3	1	1	1	3	1		7
4		2		3			5
5			1	1			2
6	1		1	4			6
7	1		3				4
8		1	1				2
9	3[b]	1					4
Untyped	2[b]				2		4
Total	**13**	**7**	**8**	**15**	**3**	**1**	**47**

[a] Two from 1998 surface collection.
[b] All from 1998 surface collection.

the haft-blade transition. A point has a *stemmed* haft if there is a clear change in the angle of the haft margin (in plan view) along the line running from the apex of the shoulder to the haft base. *Blade edge modification* is intentional retouch that creates a toothed or serrated blade margin. *Shoulder angle* is the angle between the longitudinal midline of the tool and the line defined by the proximal side of the shoulder. Angles less than 90 degrees indicate that the shoulder apex points upward toward the tool tip, whereas angles of more than 90 degrees indicate barbed shoulders where the apex points toward the tool base. The *haft angle* is the angle created by a line drawn perpendicular to the point's longitudinal midline and a line following the haft margin. Haft angles less than 90 degrees describe contracting haft margins, with smaller angles indicating more tightly contracting hafts; angles greater than 90 degrees indicate expanding haft margins. Haft and shoulder angle are reported to the nearest 5-degree measurement. *Tool length/tool width* and *blade length/tool width* ratios describe general tool form and blade shape, respectively, with values greater than 1.00 indicating more elongated forms. *Haft width/tool width* ratios, calculated for stemmed points, help define whether the point is broad-stemmed (ratio > .50) or narrow-stemmed (< .50). Tables 2.12 through 2.14 provide individual attribute data for select specimens of most point groups and untyped points.

Typed Points

Group 1. Projectile Group 1 consists of a single, bifacially flaked, basal point fragment from Substratum 2A (Figure 2.7, example A). It is a broad-stemmed form with an expanding-haft element and straight base. The appearance of an expanding haft is created by pressure retouch and notching from the side. The final steps of haft manufacture involved basally thinning both faces via pressure retouch and grinding the base and lower haft margins. The one partially intact shoulder has a small projection that could have served as a lashing feature for securing the haft.

This point is directly comparable to Neira's (1990) Sumbay type II-E, which occurs in Middle to Late Archaic contexts dated ca. 5400–6200 BP in the Sumbay area of the Arequipa highlands. (All dates given for comparative purposes here, and throughout the stylistic analysis, are uncalibrated radiocarbon years before present.) Directly comparable points have recently been documented by Cipolla (2005) in Late to possibly Terminal Archaic contexts in the Huancané-Putina drainage in the northern Lake Titicaca Basin. Although Cipolla finds that these points, which she defines as SCAH type 4G, are very common in the northern Titicaca Basin, Klink and Aldenderfer (2005) note that SCAH 4G-like points are exceedingly rare in the southern Lake Titicaca basin.

Table 2.12. Metric data for projectile point Groups 1, 2, and 4.

Parameter Evaluated	Group 1	Group 2				Group 4		
No.	10116-1	1032-1	1026-1	1156-1	1130-20	1123-20	1118-1	1141-1
	Unit 10, Level 11	Unit 10, Level 4	Unit 10, Level 3	Unit 11, Feature 1	Unit 1, Level 5	Unit 11, Level 4	Unit 11, Level 3	Unit 11, Level 6
	Sst. 2A	St. 3	St. 3	St. 3	St. 3	St. 3	St. 3	St. 3
Tool length	Und.	41 (frag.)	29 (frag.)	34	Und.	18	27	23
Tool width	25 (frag.)	21	19	21	21	13	17	14
Tool thickness	8	9	9	7	6	5	7	5
Blade length	Und.	31	20	25	Und.	12	17	15
Haft length	12	10 (frag.)	9 (frag.)	9	7	6	10	8
Haft width	20	17	16	15	15	8	13	10
Tool L/W	Und.	1.95 (frag.)	1.53 (frag.)	1.62	Und.	1.38	1.59	1.64
Blade L/Tool W	Und.	1.48	1.05	1.19	Und.	0.92	1	1.07
Haft W/Tool W	0.80 (frag.)	0.81	0.84	0.71	0.71	0.62	0.76	0.71
Haft angle	115o, 105o	80o, 85o	70o, 80o	80o, 65o	75o, 80o	70o, 60o	75o, 75o	75o, 75o
Shoulder angle	Und., Und.	35o, 30o	60o, 35o	50o, 25o	40o, 35o	65o, 30o	60o, 25o	90o, 50o
Manufacture	Biface	Biface	Biface	Uniface	Uniface	Biface	Biface	Uniface

TABLE 2.13. Metric data for projectile point Groups 5 and 6.

Parameter Evaluated	**Group 5**		**Group 6**			
No.	209-33	512-21	318-46	1118-2	1122-1	1146-1
	Unit 2, Level 4	Unit 5, Level 5	Unit 3, Level 7	Unit 11, Level 3	Unit 11, Level 3	Unit 11, Level 6
	St. 3	Sst. 4B	St. 3	St. 3	St. 3	St. 3
Tool length	33	29	Und.	28	33 (frag.)	30
Tool width	18	14	18	16	17 (frag.)	20
Tool thickness	7	7	6	8	9	5
Blade length	20	15	20	18	Und.	24
Haft length	13	14	Und.	10	12	6
Haft width	13	11	11	12	13	11
Tool L/Tool W	1.83	2.07	Und.	1.75	Und.	1.5
Blade L/Tool W	1.11	1.07	1.11	1.13	Und.	1.2
Haft W/Tool W	0.72	0.79	0.61	0.75	Und.	0.55
Haft angle	105o, 95o	105o, 105o	Und.	70o, 65o	80o, 70o	65o, 60o
Shoulder angle	45o, 40o	60o, Und.	45o, 35o	85o, 35o	35o, 40o	55o, 50o
Manufacture	Biface	Biface	Biface	Biface	Biface	Uniface

TABLE 2.14. Metric data for projectile point Group 9 and select untyped points.

Parameter Evaluated	**Group 9**			**Untyped**		
No.	L3	L4	L15	1097-1	L1	L7
	Surface (1998)	Surface (1998)	Surface (1998)	Unit 10, Lot 9, Level A	Surface (1998)	Surface (1998)
				Sst. 2B		
Tool length	45	46	44	Und.	Und.	49 (frag.)
Tool width	25	22	22	23 (frag.)	22	21
Tool thickness	Not recorded	Not recorded	Not recorded	4	Not recorded	Not recorded
Blade length	21	21	16	Und.	Und.	30 (frag.)
Haft length	24	25	28	13	11	19
Haft width	N/Aa	N/Aa	N/Aa	15	14	17
Tool L/Tool W	1.8	2.09	2	Und.	Und.	2.33 (frag.)
Blade L/Tool W	0.84	0.95	0.73	Und.	Und.	1.43 (frag.)
Haft W/Tool W	N/A[a]	N/A[a]	N/A[a]	0.65 (frag.)	0.64	0.89
Haft angle	75o, 65o	75o, 80o	70o, 80o	95o, 90o	105o, 110o	75o, 80o
Shoulder angle	15o, 30o	N/A, 15°	10o, 10o	85°, Und.	65o, 65o	45°, N/A
Manufacture	Biface	Biface	Biface	Biface	Biface	Biface

[a] Only for stemmed points.

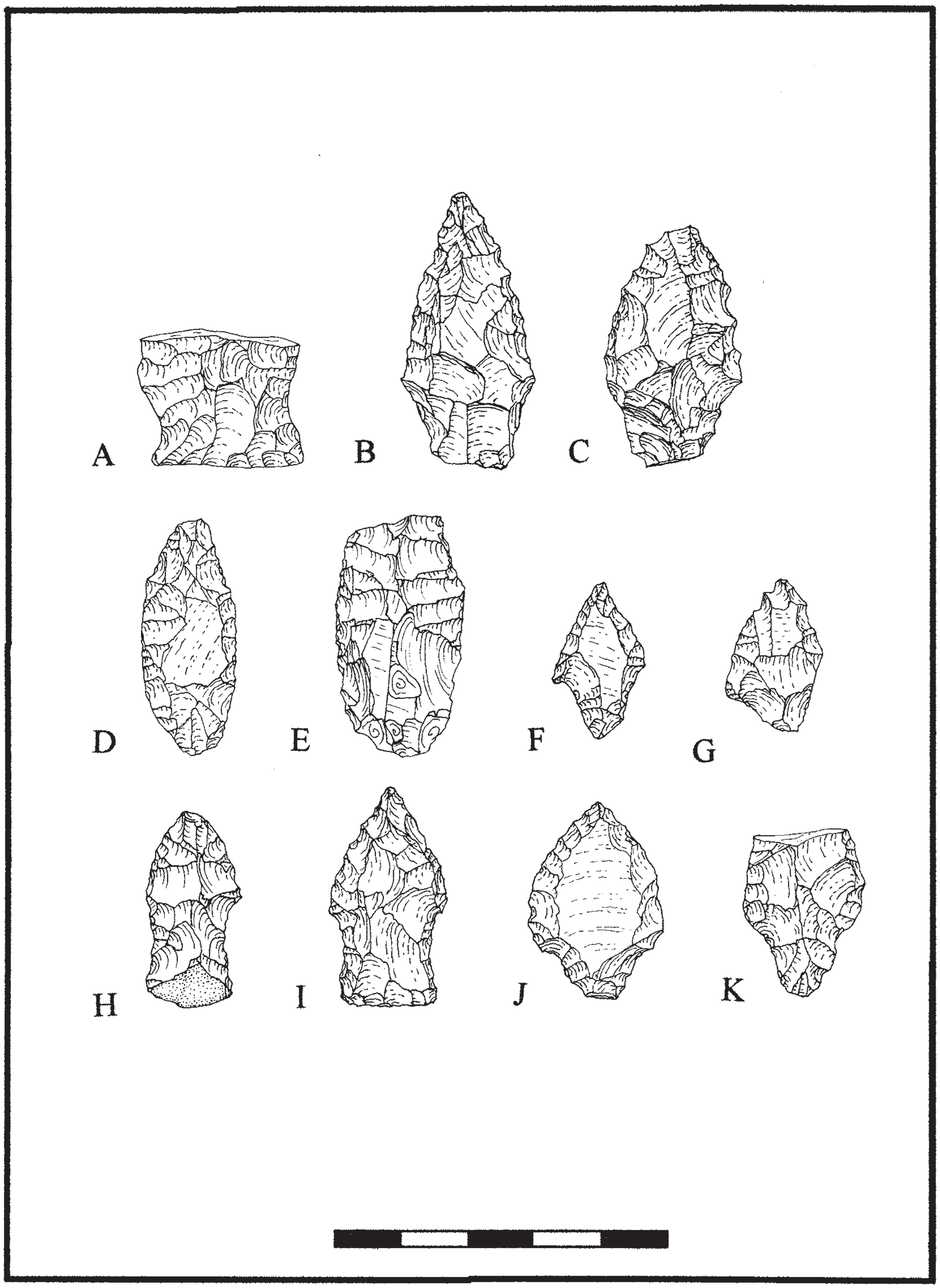

Figure 2.7. Point Groups 1–6. **A.** Group 1, bag 10116-1: Unit 10, Level 11, Substratum 2A. **B.** Group 2, bag 1032-1: Unit 10, Level 4, Stratum 3. **C.** Group 2, bag 1156-1: Unit 11, Feature 1, Stratum 3. **D.** Group 3, bag 1137-1: Unit 11, Level 5, Stratum 3. **E.** Group 3, bag 1086-1: Unit 10, Level 7, Substratum 2B. **F.** Group 4, bag 1141-1, Unit 11, Level 6, Stratum 3. **G.** Group 4, bag 1101-44: Unit 11, Level 1, Stratum 0/4B. **H.** Group 5, bag 512-21: Unit 5, Level 5, Substratum 4B. **I.** Group 5, bag 209-33: Unit 2, Level 4, Stratum 3. **J.** Group 6, bag 1146-1: Unit 11, Level 6, Stratum 3. **K.** Group 6, bag 0-2: Surface.

Group 2. Group 2 projectile points are crudely made, large, broad-stemmed points with elongated, triangular blades and hafts that vary from parallel-sided to slightly contracting (Figure 7.6, examples B and C). There are 12 specimens in this group, two of which are unifacially shaped. Large size refers to tool length (35–64 mm) and tool width (18–23 mm); most are also thick. The bifacial points are very thick (8–11 mm), while the unifacial points are thinner (6–7 mm). Blade shape varies from squat triangular to elongated triangular (1.05–2.05 blade length/tool width ratios), with squatter blades typically showing evidence of resharpening. Haft angles range between 65 and 90 degrees. Stems are quite broad (0.71–0.84 haft width/tool width ratios). Although all examples share these characteristics, they are not highly standardized and are relatively poorly made. The shoulders are often located at slightly different positions along opposing tool margins, and one is commonly more pronounced or well-defined than the other. Both hafts and blades are often asymmetrical in plan view and may have somewhat irregular margins. Shoulder and haft angles can vary notably from one side of the tool to the other. Flake scars are often irregularly spaced, and pressure flaking scars, when present, are typically confined to tool margins. The base shape varies from straight to convex. Most have some grinding along the base or haft margins. Six have some type of blade edge modification.

These points are directly comparable to the South-Central Andean Highland (SCAH) point type 4D (Klink and Aldenderfer 2005). SCAH type 4D is known in that region from dated Late Archaic contexts ranging between ca. 5600 and 4400 BP, with most from contexts dating to ca. 4600–4400 BP.

Group 3. Group 3 projectile points are elongated, foliate points with contracting hafts and a convex base; they do not have a stem or shoulders (Figure 2.7, examples D and E). There are seven bifacially shaped points in this group. Their width ranges from 14 to 20 mm, length from 35 to 45 mm, and thickness from 7 to 13 mm. Tool length/width ratios, based on the three complete or nearly complete specimens, vary from 2.05 to 2.38, demonstrating that these points have a more elongated shape than other point groups at the site. One point has grinding on the basal and haft margins. All lack blade edge modification.

These points are directly comparable to SCAH type 3D, a style which in that region (as well as in most of the Andes) is only a very general temporal diagnostic, for it spans the entire preceramic era from ca. 10,000 to ca. 3600 BP (Klink and Aldenderfer 2005).

Group 4. Projectile Group 4 points are small, broad-stemmed points with contracting hafts and squat, triangular blade elements (Figure 2.7, examples F and G). This group consists of one unifacial and four bifacially shaped points. Small size refers to both tool length (18–27 mm) and tool width (12–17 mm); most are fairly thin as well (5–7 mm). The short, squat blade elements (.92–1.29 blade length/tool width ratios) may reflect resharpening. Two obsidian points have been extensively resharpened and appear to have been discarded during aborted rejuvenation attempts. Hafts are slightly more contracting (haft angles of 60–75 degrees) than on Group 2 points. Three have convex bases, two have straight bases. None shows blade edge modification, and only one exhibits basal grinding. Most have well-defined, angular shoulders, except for the heavily reworked obsidian pieces. Although asymmetrical in some characteristics, overall these points appear fairly well made: unreworked margins are generally regularized, and they commonly exhibit fine pressure retouch and facial shaping.

These points are directly comparable to SCAH type 4F, which in that region is known from Late to Terminal Archaic contexts dating to ca. 4600–3400 BP (Klink and Aldenderfer 2005).

Group 5. Points in projectile Group 5 are moderate-sized, broad-stemmed points with distinctive expanding hafts and very squat, triangular blade elements (Figure 2.7, examples H and I). There are only two specimens, both bifacially shaped, one from Stratum 3 and one from Stratum 4. They are well-made, being symmetrical in plan view, with regularized margins and relatively fine retouch. Both have basal grinding and lack blade edge modification.

The Group 5 points strongly resemble the SCAH type 4H defined by Cipolla (2005), building on the typological framework established by Klink and Aldenderfer (2005), as a Late to Terminal Archaic point style exceedingly common, in the northern Lake Titicaca Basin. The results of Cipolla's work indicate that expanding-haft, broad-stemmed point styles, much like those of both the Kasapata point Groups 1 and 5, are ubiquitous in the Huancané-Putina river drainage of the northern Lake Titicaca Basin. In contrast, Klink and Aldenderfer (2005) note that expanding-haft stemmed points are very rare in the southern Lake Titicaca Basin.

Group 6. Group 6 projectile points are moderate-sized, broad-stemmed points with contracting hafts. They are distinctive in having ovo-triangular blade elements and poorly defined, rounded shoulders (Figure 2.7, examples J and K). Of the six examples, one is unifacial. The broadly rounded shoulders and excurvate blade margins result in a much more ovoid blade element than in other point groups. Poor shoulder definition makes shoulder angles difficult to measure; the measurements in Table 2.13 are approximations. These rounded features do not appear to result from resharpening and reworking, as both the smaller and larger examples, as well as the unifacial and bifacial ones, all share these characteristics. Two exhibit basal grinding; all lack blade edge modification.

There are no direct correlates for Group 6 points. In size and haft configuration they are similar to SCAH type 4F, dated there to the Late/Terminal Archaic, ca. 3400–4600 BP (Klink and Aldenderfer 2005). They also resemble a couple of illustrated examples of Ravines' (1972) point type P5 at Toquepala. Type P5 occurs exclusively in the uppermost stratum at Toquepala, which is not directly dated, although it is aceramic.

Group 7. Group 7 projectile points are small, triangular points with basal concavities; they do not have a stem or shoulders (Figure 2.8, example A). One of the four specimens is unifacial. The only complete point is 27 mm long, 27 mm wide, and 7 mm thick, and lacks blade edge modification. The remainder are basal fragments that vary in width from from 11 to 22 mm and in thickness from 3 to 6 mm. Two exhibit grinding on the base and lower haft margins. There are also four ground stone artifacts (one in Stratum 4, three in Stratum 3) that appear to duplicate the form of the Group 7 points but may not be functional armatures.[22]

Group 7 points are directly comparable to SCAH type 5D. That type occurs in Terminal Archaic through Late Horizon (Inca) contexts dating to between ca. 2400 BC (4400 BP) to AD 1500, although they are most common in Formative contexts dating to ca. 1600 BC (3600 BP) to AD 500 (Klink and Aldenderfer 2005).

Group 8. Projectile points in Group 8 are also small, triangular points lacking a stem and shoulders. They differ from Group 7 points in lacking a concave base; their bases are either straight or convex (Figure 2.8, example B). There are two examples. One is a complete unifacial point (24 mm long, 17 mm wide, 5 mm thick) that lacks both blade edge modification and haft grinding. The other is a small bifacial basal fragment with basal and haft margin grinding and a small ear or projection at the base-haft juncture, presumably to facilitate lashing to the haft. Of note, a single ground stone point in Stratum 3 (see Figure 2.9, example C) duplicates the Group 8 form.

Group 8 points are directly comparable to SCAH type 5B. That type occurs in Terminal Archaic through Middle Horizon contexts dating to between ca. 2400 BC (4400 BP) and AD 1100, although they are most common in Formative contexts dating to ca.1600 BC (3600 BP) to AD 500 (Klink and Aldenderfer 2005).

Group 9. This group consists of four bifacial points (Figure 2.8, examples C, D, and E). They are characterized by (1) the lack of a stem, (2) the presence of a shoulder, (3) a pentagonal overall shape, with the fifth "side" being the base, and (4) long, contracting hafts. All are large (44–46 mm long, 18–25 mm wide), elongated (1.80–2.44 tool length/width ratios), and have straight bases. Three have squat blade elements (.73–.95 blade length/tool width ratios) that likely resulted from resharpening, insofar as all show signs of edge rejuvenation and have asymmetrical blades. One (L15) may have been reworked into some type of perforator, because the blade is very narrow and shows some evidence of crushing and polishing. Shoulder angles are acute, and shoulder form is typically angular. One (L4) is single-shouldered. Three have haft margin grinding.

Group 9 points are directly comparable to SCAH type 2C, which in that region is known from Middle Archaic contexts dating to ca. 8000–6000 BP (Klink and Aldenderfer 2005). They are also similar to Rick's (1980) types 2C and 3C (both dated to ca. 8000-6500 BP)

Untyped Points

1097-1. This point is a bifacially flaked, basal point fragment from Stratum 2B (Figure 2.8, example I). It generally resembles Group 2 points in that it is broad-stemmed and has nearly parallel-sided haft margins and a straight base, but it differs in other ways. The one intact shoulder has an angle approaching 90 degrees, broader than the Group 2 points, which indicates a more lanceolate than triangular blade. The haft is actually slightly expanding, with one haft angle measuring 95 degrees. It also is better made. The fragment is quite thin (4 mm) and symmetrical, and the margins are regularized. Both faces show remnants of a large basal thinning scar extending from the base onto the blade element. The lateral and basal haft margins and at least the shoulder area of the blade were subsequently

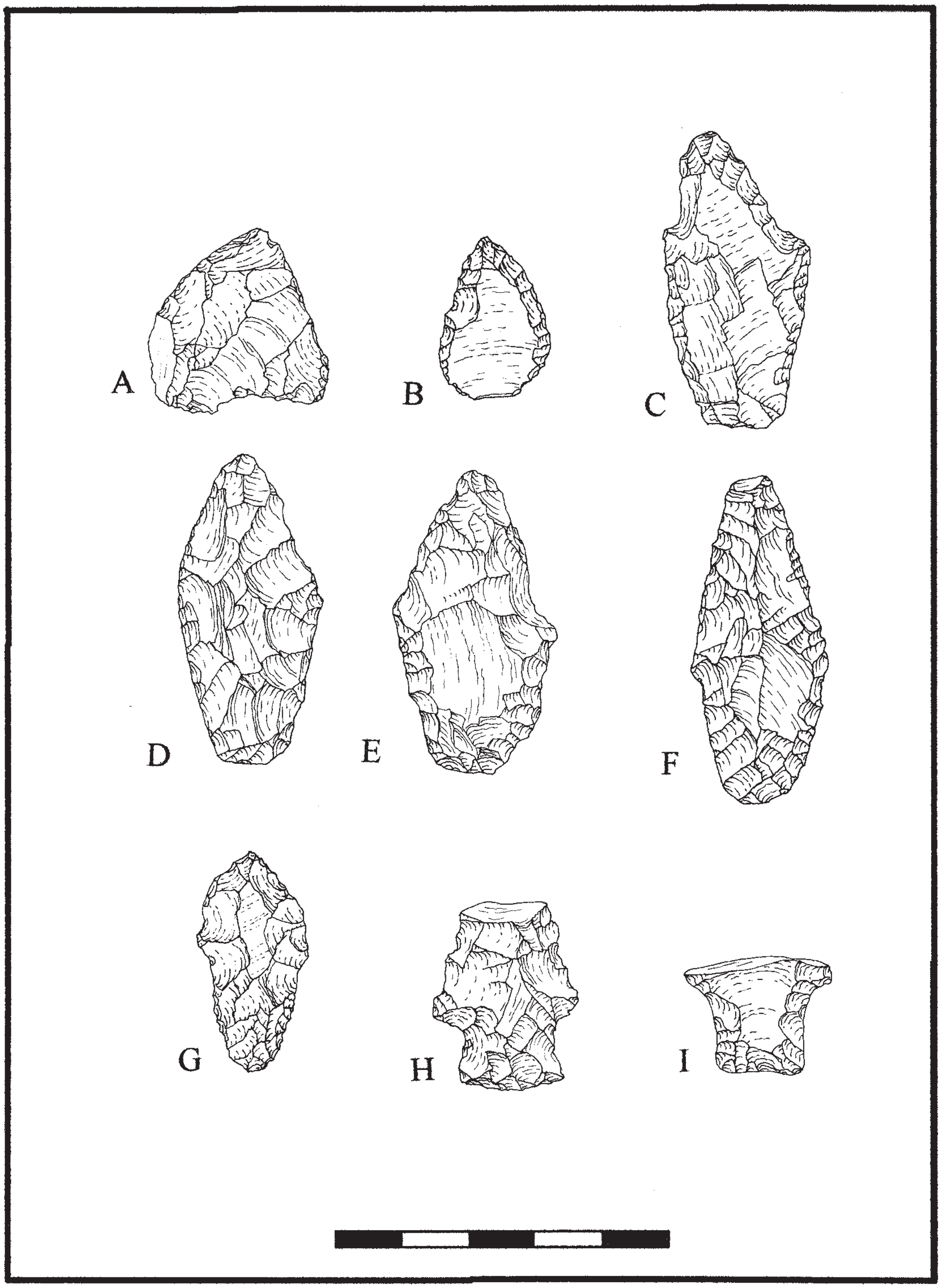

FIGURE 2.8. Point Groups 7–9 and untyped points. **A**. Group 7, bag 1116-1: Unit 11, Level 2, Substratum 4A. **B.** Group 8, bag 1113-12: Unit 11, Level 2, Subtratum 4A. **C.** Group 9, bag L15: surface. **D.** Group 9, bag L15: surface. **E.** Group 9, bag L3: surface. **F.** Untyped, bag 228-1: Unit 2, Level 9, Substratum 2B. **G.** Untyped, bag L1: surface. **H**. Untyped, bag 1097-1: Unit 10, Lot 9, Substratum 2B. I. Untyped, bag 1097-2: Unit 10, Lot 9, Stratum 2B.

finished by pressure retouch. The base and lower haft margins exhibit grinding.

This point lacks direct correlates. It has some similarities to the SCAH type 4D points from the site of Quelcatani from a level dating to just after ca. 5600 BP (Klink and Aldenderfer 2005). The Quelcatani points have 90-degree shoulder angles, wide, lanceolate blade elements, and regularized, symmetrical blade margins. Both Quelcatani specimens lack the basal portion of the haft, but intact sections do not retain evidence of basal thinning or an expanding haft. The Kasapata fragment also resembles the base of a "fishtail" point, best known from well-dated Paleoindian to Early Archaic contexts in southern South America (Politis 1991). It is possible that this piece was scavenged from an older site by the prehistoric occupants of Kasapata, but the intact portion shows no evidence to support this conjecture: there are no weathered surfaces, and all flake scars appear equally fresh. It seems more likely that this point represents a local style developed in the general region by or during the Late Archaic, given that both expanding hafts and basal thinning occur on the Group 1 point, as well as on illustrated examples of Late Archaic points from the Sumbay area (Neira 1990).

228-1. This complete, bifacial point from Substratum 2B has the stemless, unshouldered, elongated foliate form of the Group 3 points. It differs in having a pointed base, creating a bipointed form, and round projections on the margins at the haft-blade transition (Figure 2.8, example G). These projections show slight polish and rounding, suggesting that they were a lashing feature of the haft. It is 33 mm long, 17 mm wide, and 7 mm thick. The blade is heavily resharpened.

There are no known direct correlates. The point combines some elements of the SCAH types 3E (bipoint foliate) and 3B (convex base foliate with blade edge modification), both of which date to the Middle Archaic ca. 8000–6000 BP (Klink and Aldenderfer 2005). The point also resembles several of Rick's (1980) point types at Pachamachay (2A, 2H, 4C, 4D; all bipointed foliates with spined or angular shoulders), which range in age from ca. 11,500-8500 BP to ca. 4200-3300 BP

L1. This basal fragment from the 1998 surface collection most closely resembles the Group 2 points in size, form, and manufacture; it differs in having an expanding haft (Figure 2.8, example H). Differences in size, haft and blade length, and manufacture distinguish it from other expanding-haft points at the site. It probably represents a Group 2 expanding-haft variant and likely is of comparable age.

L7. This item is a nearly complete bifacial point from the 1998 surface collection (Figure 2.8, example F). It is an elongated foliate, broad-stemmed form with a long haft contracting to a convex base. The stem is defined only on one margin, as a slight indentation below the shoulder. It is well-made: haft and blade margins are regularized, with final shaping via systematic pressure flaking. Light grinding is present near the haft-blade transition. Points with these same characteristics are common in the Huneque and Ilave drainages in the Lake Titicaca Basin. However, it is not a type formally defined by Klink and Aldenderfer (2005) because it is not known from excavated, dated contexts, and therefore its age cannot be confirmed. It is possible this is a Middle Archaic or transitional Middle/Late Archaic style, based on the strong similarities to the SCAH Middle Archaic type 3B, the long haft, similar to other Middle Archaic forms, and the minimal expression of a stem, which is common on Late Archaic forms.

Unmodified Stone

Three raw materials account for nearly the entire assemblage of unmodified stone: quartz crystals, ocher, and metallic hematite[23] (see Table 2.3). The quartz crystals are almost exclusively masses of small, intertwined milky quartz crystals, some clearly from vein fillings; only one in Stratum 4 is clear crystalline quartz. Ocher occurs as small (<5 g) nodules of red, earthy materials. The hematite is gray to black with a metallic luster and occurs in small (<11 g) masses or chunks. It is possible that the quartz and hematite relate to the on-site production of powdered ocher: crushed and ground metallic hematite produces a red powder, and some pieces of hematite occurred as growths attached to milky quartz, while some milky quartz crystals had small growths of metallic hematite on them. It is worth noting that several of the infant burials recovered during the excavations of Kasapata had been covered with red ocher (see Sutter and Cortez, Chapter 3).

The remainder of the unmodified stone assemblage consists of a small (10.2 g) cortical nodule of chert in Stratum 3 and two small (<3 g), green mineral fragments of undetermined material in Substratum 2B. No material caching appears to have taken place during Substratum 2A times, given the absence of unmodified stones, while both seem to have occurred after this time frame.

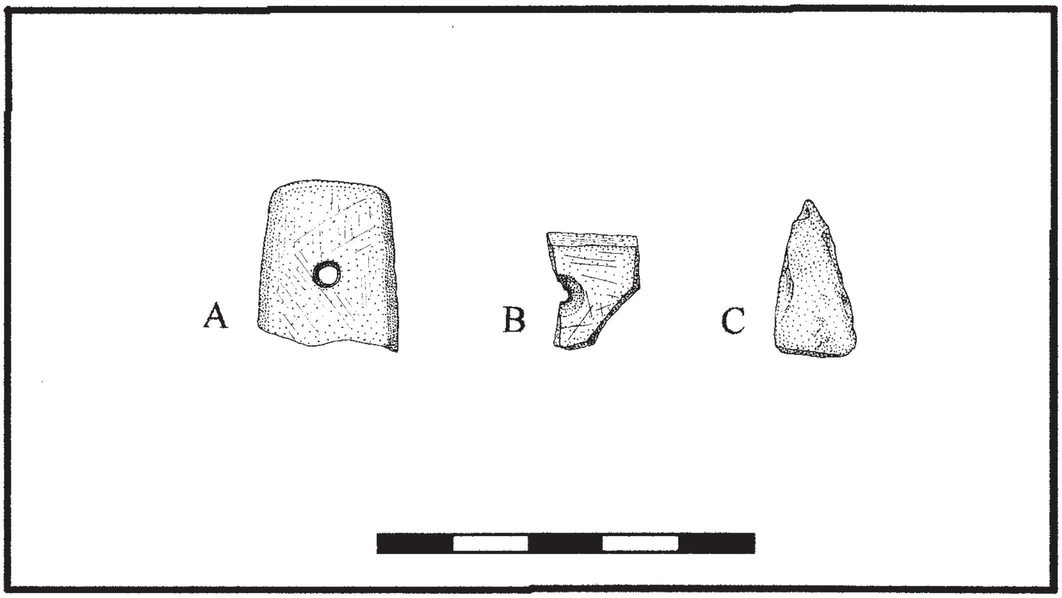

FIGURE 2.9. Nonutilitarian ground stone (A, B) and ground stone point (C). **A.** Pendant, bag 336-1: Unit 3, Level 12, Stratum 3. **B.** Drilled piece, bag 10100-45: Unit 10, Level 9, Substratum 2B. **C.** Bag 209-24: Unit 2, Level 4, Stratum 3.

Ground Stone

NONUTILITARIAN GROUND STONE

Nonutilitarian objects are decorated, decorative, or shaped artifacts whose form and modification do not indicate use in the more mundane tasks of daily life, such as tool manufacture and resource procurement or processing. Nonutilitarian artifacts are relatively rare at the site (see Table 2.4). For the site as a whole, most are fragmentary (68.2 percent); in intact strata, fragmentation is greatest in Substratum 2A (2A: 100 percent; 2B: 75.0 percent; 3: 71 percent). The phyllite/slate material category dominates for this artifact class, with nearly all artifacts in Substrata 2A and 2B made on these materials (see Table 2.3). This category is divided into types based on shape, modification,or inferred function. The types include beads, bead preforms, pendants, pendant preforms, drilled pieces, ground disks, a single painted stone, and spherical stones (Figure 2.9, examples A and B). Four types—beads, pendants, painted stone, and spherical stones—apparently represent finished artifacts, while the remainder are more likely artifacts that were in production when discarded (bead and pendant preforms, drilled pieces, and ground disks). Thus the overwhelming majority (72.7 percent) may represent production failures, including all artifacts found in Substratum 2A.

The two beads in Stratum 3 are (1) a whole disk bead (8 mm diameter, 1.9 mm thick) of an undetermined material (opaque light green) whose interior hole and exterior are completely ground smooth and polished,[24] and (2) a fragmentary disk bead (3.5 mm thick) of a dark-colored igneous material with a biconically drilled hole and a smoothed but not polished exterior.[25] The bead preform in Stratum 0 is a whole circular piece (11.2 × 10.3 × 3.9 mm) of an unknown light-colored fine-grained material with an incomplete biconically drilled hole.[26] The bead preform in Substratum 2B is a fragmentary circular phyllite/slate piece (3 mm thick) with a uniconically drilled hole; only one face has been ground smooth.[27] The pendant in Stratum 3 is a beautifully shaped and completely ground rectangular fragment (19.2 mm wide, 5.1 mm thick) made of green slate.[28] The lateral margins are ground flat, and the biconically drilled hole (interior partially smoothed) is offset to one end. The pendant preform in Substratum 2B is a tabular phyllite/slate fragment (2.5 mm thick) with striated and moderately abraded surfaces and a biconically drilled hole near one end.[29]

The drilled pieces are all tabular pieces of phyllite/slate (2–5 mm thick) with drilled holes. All but one show evidence of crude flake scars, and half also have lightly abraded surfaces. Form is undeterminable except for one fragment, found in Stratum 0, that appears to be circular in plan view. Holes are uniconically or biconically drilled, sometimes incompletely, and lack interior smoothing. All have a single hole, except one fragment in Stratum 4 that has two. Drilling may have broken most of these artifacts, because the majority (62.5 percent) are fractured across the drill hole. Their function is unknown, but they may be bead or pendant blanks.

The ground disks are all tabular pieces of phyllite/slate that are generally circular in plan view and lack any evidence of a drilled hole. The three in Stratum 0 are whole (16.3 × 14.1 × 4 mm, 27 × 23 × 5 mm, 24 × 22 × 3 mm), with evidence of crude flake scars partially obliterated by surface abrasion. The fragments in Substrata 2A and 2B lack evidence of flake scars and have more heavily ground faces and edges. These may be bead or button preforms, or possibly finished artifacts such as gaming pieces.

The two spherical stones are both whole, made of sedimentary rock, and pecked over their entire surfaces. The one in Stratum 3[30] is roughly egg-shaped (36 × 25 × 24 mm) and heavily abraded. The example from Substratum 2B[31] is nearly spherical (20.2 × 19.5 × 17.9 mm).

The one painted stone comes from the fill associated with a burial in Stratum 3.[32] It is a thin, smooth slab of quartzite with two lines (one bright orange, one deep red), presumably of ocher, encircling one end; a third line is created by a natural purple band within the quartzite. Direct association with the burial is uncertain, given the recovery context, but intentional interment cannot be ruled out. For example, Quilter (1989) notes that smooth beach pebbles were sometimes placed on the grave fill of preceramic burials at Paloma, and that "small pebbles rubbed with red pigment" were found in some burials at the Las Vegas site in Ecuador (Quilter 1989:70, citing Stothert 1985).

UTILITARIAN GRINDING TOOLS

Utilitarian grinding tools are artifacts that have one or more surfaces ground through use; they may have other forms of modification as well (Figures 2.10 and 2.11). This class consists of various types of hand (top) and bottom stones that were often used in paired sets as compound grinding tools, such as the mano and metate or the pestle and mortar. These tools may or may not show evidence of intentional manufacture and shaping. Utilitarian grinding tools are divided into four basic categories: hand stones (manos, pestles, etc.), bottom stones (milling slabs, metates, etc.), undifferentiated grinding tools (too fragmentary to determine if hand or bottom stone), and multifunctional grinding tools (tools with other kinds of use wear in addition to grinding surfaces).

Most researchers typically use the frequency of grinding tools in archaeological assemblages to infer the relative importance of plant foods in prehistoric diets (see, e.g., Harris and Hillman 1989). However, it is also known that grinding tools have been used to crush and grind inorganic materials, such as pigments (Adams 2002), and to pulverize the remains of large and small animals (Sutton 1993; Yohe et al. 1991); as well, hand stones may be used to process hides or work other materials (Adams 1988, 2002). An alternative interpretation of grinding tools, specifically compound tools, associates them with subsistence intensification: such tools would have provided a means of increasing the volume of edible product and nutritive value of both plant and animal foods (Stahl 1989; Sutton 1993; Wright 1994). Therefore, although utilitarian grinding tools may reflect an increasing reliance on plant foods, they may also indicate subsistence intensification achieved by using more thorough or more exhaustive food-processing techniques to increase the energy or nutritive yield of the food.

Utilitarian grinding tools occur in all strata. Hand stones are most common at the site, followed by undifferentiated grinding tools and then bottom stones (see Table 2.4). Hand stones are divided into two morphological types based on the degree of use or shaping. Informal grinders are cobbles minimally modified by use wear; they are unshaped except for having one or more broad surfaces exhibiting abrasion or more intensive grinding. Manos appear more uniform in shape and more intensively used. They are typically oval or circular in plan view and have well-defined shoulders; some exhibit pecking or abrasion on their margins or sides, as well as on the working surfaces. Most hand stones are manos; informal grinders occur only in Stratum 3 (Table 2.15).

Bottom stones are also divided into morphological types. Milling slabs have one or more flat ground surface; typically they do not appear intentionally shaped. Metates have one or more faces with a broad concave surface; their overall form may or may not be intentionally shaped. Mortars have a relatively deep oval or circular basin; they typically show evidence of intentional shaping (flaking, pecking, grinding on nonuse surfaces). The one grinding palette[33] is a tabular stone

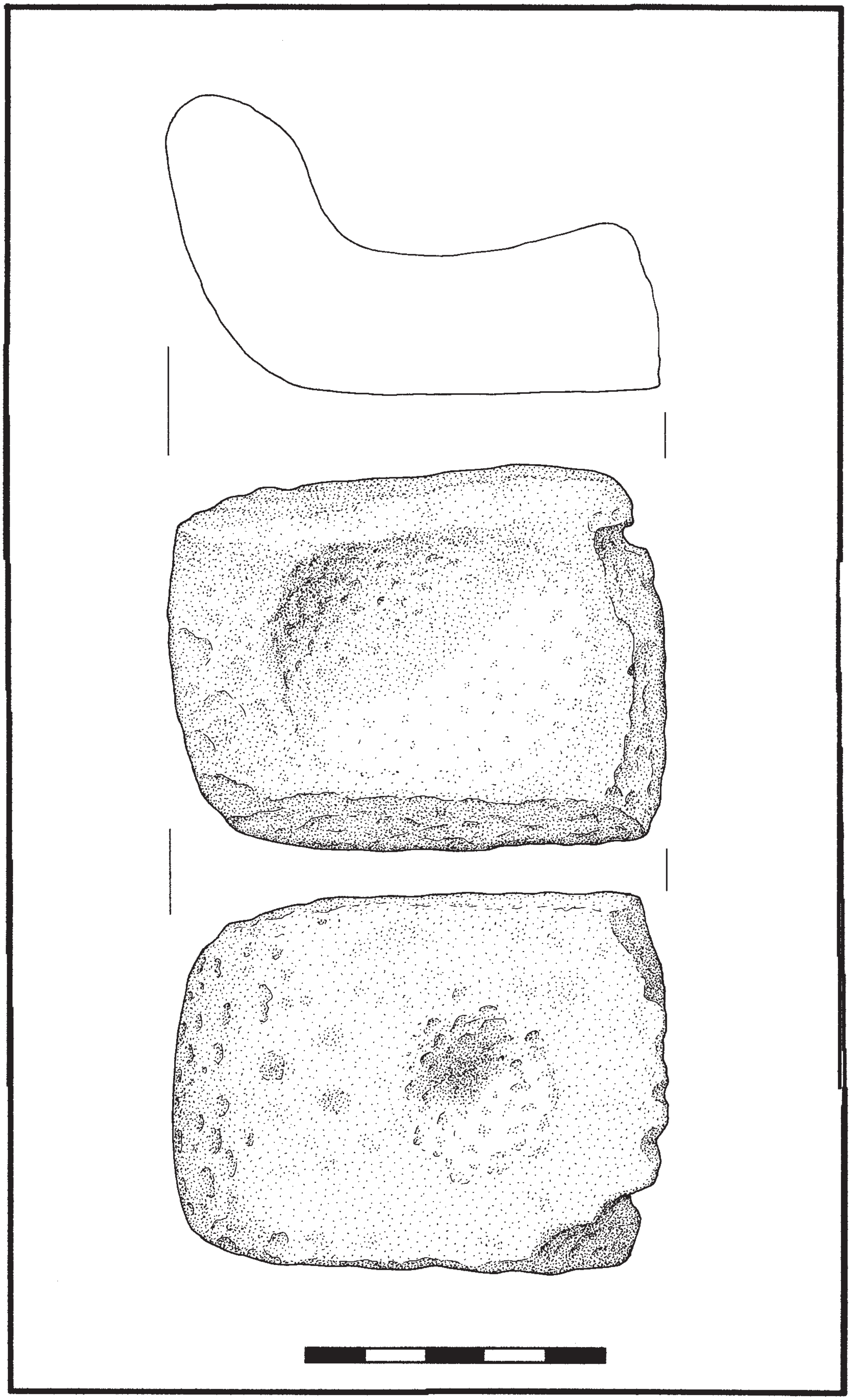

FIGURE 2.10. Ground stone mortar, bag 1310-33: Unit 13, Level 4, Strata 4A/3.

Figure 2.11. Ocher-stained multifunctional utilitarian grinding tool, bag 10148-1: Unit 10, Lot 13, Level A, Substratum 2A.

whose broad, flat surfaces have abrasive wear and retain pigment residues (orange, red). Bottom stones are rare below Stratum 3, and those in Stratum 3 are minimally shaped. More formally shaped bottom stones come from the upper disturbed strata. The predominance of hand stones over bottom stones below Stratum 3 may indicate that before this time, hand stones were not used primarily as compound grinding tools (mano/metate, etc.) for processing food resources.

Multifunctional grinding tools are a minority of the utilitarian grinding class, but they occur in all intact strata (Table 2.15). Hammer/grinders (n = 3) are hand stones with two working surfaces, one used for grinding and one for hammering or crushing. Hammer/grinder/anvils (n = 2) have, in addition to ground and battered working surfaces, a small, shallow, circular concavity on one face that exhibits pecking or pitting. Although these tools are relatively small (hand-sized), functionally they served as both the hand and the bottom stone for resource processing, most likely of ocher, as both examples have ocher residue on their work surfaces. This is the only kind of utilitarian grinding tool recovered in Substratum 2A.[34] The other example was recovered from the fill associated with a burial in Stratum 3.[35] A minority of other grinding tools also were used with pigments, given the red to orange residues on their working surfaces (Table 2.15). Some may have been used to process hides with ocher, as at Asana (Aldenderfer 1998) and Telarmachay (Lavallée et al. 1985), to prepare ocher for use in burials, as suggested by the burials with red ocher in Strata 3 and 2B (see Sutter and Cortez, Chapter 3), or to decorate tools, because ocher-decorated artifacts occur in Stratum 3 (stone) and possibly Stratum 2 (bone).

When all strata are combined, nearly all utilitarian grinding tools were discarded as fragments. This pattern holds for all strata except Substratum 2A, which has a single complete grinding tool. These data suggest that grinding tools were used intensively during all periods, except during Substratum 2A times. Grinding tools were predominantly made on igneous materials, but a notable minority were made on sedimentary materials such as quartzite and sandstone (see Table 2.3). There does not appear to be a difference in raw material choice for different grinding tool subcategories, nor are any temporal trends apparent.

TABLE 2.15. Utilitarian grinding tool forms and select assemblage characteristics, by stratum.

Form	0		4		3		3/2		2B		2B/2A		2A		Class Total	
	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)
Hand stones	**4**		**3**		**9**		**1**		**5**		**2**		**0**		**24**	
Informal grinder	0	(0.0)	0	(0.0)	2	(22.2)	0	(0.0)	0	(0.0)	0	(0.0)			2	(8.3)
Mano	4	(100.0)	2	(66.7)	6	(66.7)	1	(100.0)	4	(80.0)	2	(100.0)			19	(79.2)
Hand stone undiff.	0	(0.0)	1	(33.3)	1	(11.1)	0	(0.0)	1	(20.0)	0	(0.0)			3	(12.5)
Bottom stones	**3**		**4**		**4**		**0**		**0**		**1**		**0**		**12**	
Milling slab	2	(66.7)	1	(25.0)	2	(50.0)					0	(0.0)			6	(41.7)
Metate	1	(33.3)	1	(25.0)	0	(0.0)					1	(100.0)			3	(25.0)
Mortar	0	(0.0)	1	(25.0)	0	(0.0)					0	(0.0)			1	(8.3)
Grinding palette (ocher)	0	(0.0)	0	(0.0)	1	(25.0)					0	(0.0)			1	(8.3)
Bottom stone (undiff.)	0	(0.0)	1	(25.0)	1	(25.0)					0	(0.0)			2	(16.7)
Multifunctional	**0**		**1**		**3**		**0**		**1**		**0**		**1**		**6**	
Hammer/grinder		(0.0)	1	(100.0)	2	(66.7)			1	(100.0)[a]			0	(0.0)	4	(66.7)
Hammer/grinder/anvil (ocher)		(0.0)	0	(0.0)	1	(33.3)			0	(0.0)			1	(100.0)	2	(33.3)
Total % bottom stones		30.0				20.0		0.0		0.0		33.3		0.0		21.1
Total % multifunctional		0.0		10.0		15.0		0.0		10.0		0.0		100.0		10.5
Total % with ocher staining		0.0		0.0		20.0		0.0		10.0		0.0		100.0		10.5
Total % fragmentary		100.0		90.0		85.0		100.0		90.0		100.0		0.0		89.5

[a] One tool with ocher staining.

We can make several inferences based on these data. First, grinding tools became more important, diversified in function, and intensively used in Substratum 2B times. This inference is based on the relative decrease in multifunctional grinding tools, increase in fragmentation rate, and shift away from using grinding tools exclusively with pigments between Substrata 2A and 2B. These changes likely signal an increasing reliance on plant foods, although whether by the addition of new foods, a greater total contribution to the diet, or changes in preparation methods is unclear. The notable increase of bottom stones in Stratum 3 signals further changes. The greater importance of compound grinding tools at this time (ones lacking ocher residues) implies a shift toward more intensive food-processing procedures, perhaps related to increasing reliance on plant foods or efforts to process foods more thoroughly because of dietary stress.

UTILITARIAN POUNDING TOOLS

Utilitarian pounding tools are artifacts that have pecking, battering, or crushing use wear on one or more surfaces and do not have surfaces ground through use. They may or may not show evidence of intentional manufacture and shaping. Their use wear characteristics suggest that they were used exclusively in a pounding motion, presumably as hammers. This class has two morphological types, cobble hammers and flaked hammers. Cobble hammers are unshaped, naturally rounded stones that have pitting on one or more ends or faces. These kinds of tools typically are assumed to have functioned as hammer stones for flaked stone tool production (Odell 2004), but they may also have served to pulverize raw materials for later grinding or to crack hard food resources (bone, nuts). Flaked hammers are flaked stone objects that exhibit crushing and battering over flake scar arrises or striking platform edges, often to the point where these sharp edges have completely collapsed and been beaten dull and flat, as well as pitting and crushing on flaked surfaces. It is unclear whether flaked hammers were intentionally manufactured; at least some appear to be flaked stone tools, such as cores, that were recycled as hammers. Flaked hammers may have functioned as pecking stones to manufacture ground stone tools or to rejuvenate the working surfaces of utilitarian grinding tools, or as heavy-duty chopping tools to process hard materials such as bone and wood, as in parts of North America (Adams 2002; Will 2002).

Utilitarian pounding tools are rare below Stratum 3 (see Table 2.4). Combining all strata, cobble and flaked hammers occur in roughly equal proportions at the site. Pounding tools do not appear to have been used to process ocher, because none retained any pigment residues. For the site as a whole, most pounding tools were discarded fragmentary (66.6 percent), with cobble hammers more commonly fragmentary (75.0 percent) than flaked hammers (57.1 percent). All flaked hammers were made on andesite, while cobble hammers were made of either quartzite or undetermined igneous materials (see Table 2.3).

Temporal trends are difficult to discern, given the low numbers of tools, but there appears to be an increase in flaked hammers over time starting at least by Stratum 3 times. The contemporaneous increase in utilitarian grinding tools, especially of bottom stones, suggests that flaked hammers were used, at least in part, to shape and maintain grinding tools.

OTHER UTILITARIAN GROUND STONE

This general class consists of utilitarian artifacts lacking use modification indicating that they functioned as grinding or pounding resource-processing tools but do have a specific form or a specific type of use wear to suggest that they had some other utilitarian function. The utilitarian ground stone group includes artifacts that functioned as tools to make other artifacts or that were used in resource procurement or in other subsistence-related activities. These artifacts are relatively rare at the site (see Table 2.4). Combining all strata, nearly half are fragmentary (47.6 percent). The proportion of fragmentary tools decreases over time (percent fragmentary in 2A: 100 percent; 2B: 50.0 percent; 3: 36.4 percent), suggesting a shift toward either less intensive tool use or more on-site tool caching. Andesite is the most common material in this general class, followed closely by phyllite/slate (see Table 2.3). There is one clear temporal trend: andesite use decreases over time in favor of phyllite/slate (Stratum 3) and subsequently other materials. The shift in raw material away from andesite presumably reflects changes in the kind and range of tools used over time, as only a very narrow range of tools were found below Stratum 3.

This category is divided into types based on form, modification, or inferred function and includes: sharp-edge abraders, smooth abraders, knives, whetstones, stone bowls, chopping tools, perforators, and possible ground stone points or point preforms. The most common classes are abraders (sharp-edged and smooth). Sharp-edged abrasives are flaked stone artifacts (flakes, cores, flaked or split cobbles) that have heavily worn abrasion facets flattening and obliterating sharp edges and rough surfaces that were created by flake scar arrises, flake removals, or fractures. All are either andesite or quartzite. Smooth abraders are cobbles or pebbles with abraded facets, sometimes with multiple, very shallow striations visible. Abraders presumably were used to shape other artifacts; smooth abraders were most likely used for polishing or smoothing surfaces and sharp-edged abraders for incising, grooving, or grinding smaller areas on hard materials.

Both knives have low-angle working edges created by bifacial edge grinding. The Substratum 2B knife[36] is andesite and fragmentary. The Stratum 3 specimen[37] is whole and made on a large (63.8 × 44.1 × 70 mm), tabular piece of phyllite. The two whetstones (both fragments) have several deep striations or incised lines with V-shaped cross-sections, suggesting use as an edge-shaping tool. The perforator[38] is a small (0.8 g), andesite proximal (working end) fragment. It most likely is the bit of a drill: the working end is formed from multiple elongated ground facets that converge to a narrow point, and the extreme tip is flattened, with rounded, and slightly polished sides.

The stone bowl[39] is a lateral-basal fragment about 108 mm high and 33 mm thick.[40] It is made of light gray andesite and is completely shaped through pecking and grinding. The intact portion has a flat base, nearly vertical sides (meeting the base at an angle of about 80 degrees), and a flat rim approximately 20 mm wide; the form indicates it was circular in plan view when whole. Most of the grinding wear on the vessel's interior bottom and sides appears to have resulted from manufacture rather than use wear, suggesting that its primary function may have been as a vessel or container rather than as a mortar. Bauer (2004:41, citing Chávez 1980) notes that "imported greenstone bowls of an uncertain source" were recovered at the Formative site of Marcavalle in the Cuzco Valley. Grieder et al. (1988:100–101) document several "mortars" that are very similar in shape and manufacturing quality to the Kasapata specimen in Initial Period contexts at La Galgada. Pozorski and Pozorski (1987:40–41, 49) also recovered very similar artifacts in Initial Period contexts, from Pampa de las Llamas-Moxeke and Tortugas in the Casma Valley.

The two ground points and the three point preforms are all phyllite/slate and occur only in the upper strata

(4, 3). Three are whole and two are basal fragments. All are very small (<25 mm long, <17 mm wide), extremely thin (<3 mm), triangular in form, and lack a stem element. Four have concave bases (one in Stratum 4, three in Stratum 3) and look like ground stone versions of flaked stone point Group 7. One (Stratum 3) has a straight base and mimics the form of flaked stone point Group 8 (Figure 2.9, example C). None is extensively modified. Most retain some evidence of flaking along part of their margins, but the grinding is rudimentary and commonly confined to edges, and light surface abrasion occurs on only two specimens. These may not be functional armatures: their manufacture is crude, the blade edges are not sharp, and the material is fairly soft. Ground stone points or knives that are more clearly functional occur, though rarely, exclusively in early ceramic-era contexts at several Central Andean sites such as Pachamachay, Lauricocha, Chavín, La Galgada, and San Diego and Pampa Rosario in the Casma Valley (Burger 1998; Grieder et al. 1988; Pozorski and Pozorski 1987; Rick 1980). Most of these, however, are intensively shaped via grinding, have beveled margins resulting in a diamond or hexagonal lateral section, and a lanceolate form in plan view. There is a single specimen at Pachamachay (Rick 1980:Figure 8.3b) that has the same triangular outline as the Kasapata specimens. Ground stone points currently are not documented in the South-Central Andean highlands.

The chopping tool is a complete, highly shaped artifact whose surface is extensively modified by grinding (Figure 2.12).[41] The form resembles a hoe: it is long but relatively thin (12.2 × 58.8 × 12.1 mm), rectangular in plan, and generally lenticular in lateral section. The bit was ground to shape and the opposite end was initially thinned and shaped by flaking. However, it has some unusual features for a hoe. Both longitudinal margins are ground along their entire length into flat, elongated facets rather than a sharp edge. Slate also seems a poor raw material choice because it is not as durable as other, more commonly used materials, and it is available only at some distance from the site. In fact, all other slate artifacts at Kasapata are nonutilitarian items. However, the bit and butt ends of this artifact clearly were used in chopping activities: both exhibit edge spalling and crushing, and there are incipient fractures forming at both ends.

UNDIFFERENTIATED GROUND STONE

Undifferentiated ground stone objects are artifacts that are too fragmentary or whose form and modification are too amorphous to allow reliable classification to a specific ground stone category. Nearly all are made on

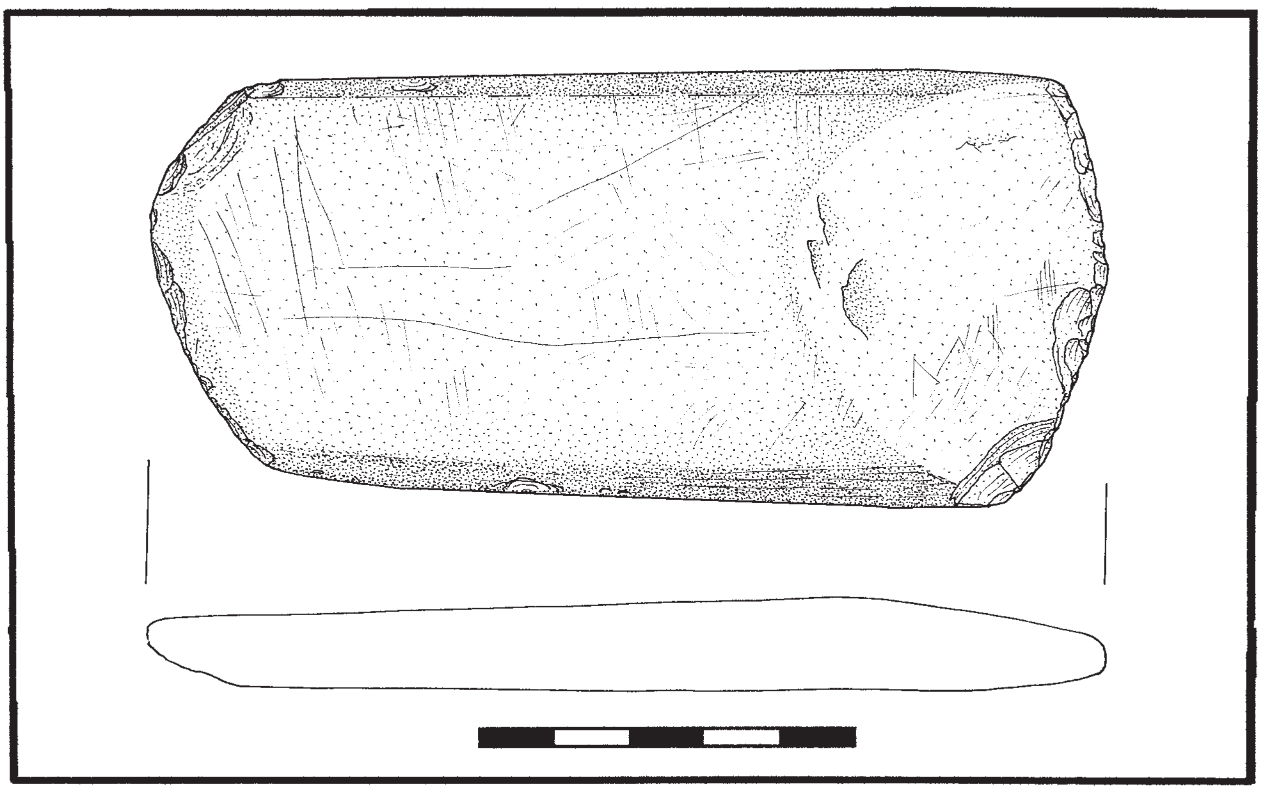

FIGURE 2.12. Ground stone chopping tool, bag 1139-1: Unit 11, Level 5, Stratum 3.

phyllite/slate, with a minority of sandstone/siltstone (see Table 2.3). All have edge or surface abrasion (or both), and most (71.0 percent) also have flaked edges. The majority (83.3 percent) are fragmentary. Their presence in Stratum 3 and above (see Table 2.4) likely reflects a relative increase in the amount of on-site ground stone tool use and manufacture beginning in Stratum 3 times.

Inferences from Descriptive Analyses

The lithic artifacts and debris recovered in the three intact strata at Kasapata provide evidence of a wide range of activities, including tool manufacture, on-site tool use, and the processing of diverse resources, as well as examples of nonutilitarian items that served as personal adornments, recreational or perhaps ceremonial equipment. Based on these data, and working at the stratum level of analysis, Kasapata appears to have been used consistently as a residential base during preceramic times. (A residential base is the hub of all subsistence-related activities for a family group or groups and the place where most manufacturing, maintenance, and processing activities took place [Binford 1980].) More specifically, tool production and maintenance are documented in all three strata by the presence of tool fabricators, such as cores, spokeshaves, and whetstones or abraders. Debitage from flaked stone tool manufacture is abundant, with a similarly diverse range of raw materials worked at the site over time. Debitage analysis also demonstrates a consistent pattern of on-site manufacturing activities: core reduction predominated, augmented by biface reduction and tool finishing and maintenance. Retooling is evidenced by discarded basal point fragments or exhausted whole points throughout the sequence. The presence of unfinished items and production failures indicates continuous on-site manufacture of nonutilitarian ground stone. Consistent (if low) debitage densities of various sedimentary materials also point to the manufacture and maintenance of utilitarian and nonutiliarian ground stone tools. The on-site use of a variety of tools is attested to in all three strata by high frequencies of expedient unifaces, the presence of retouched uniface working edge fragments, and the presence of fragmentary undifferentiated bifaces from all stages of reduction. Uniface and utilitarian grinding tool analyses indicate that basic resource processing was consistently diverse and included the cutting and scraping of hard and soft materials, as well as the processing of ocher.

There are, however, other differences between the three intact strata that reflect the intensification of some activities and the addition of others. Beginning in Substratum 2B times, on-site flaked stone tool manufacture increased significantly, as indicated by a doubling in debitage density. The rising frequencies of utilitarian grinding tools, mostly discarded tool fragments that do not retain pigment staining, suggest a greater reliance on plant foods or an intensification of resource-processing efforts. Analysis of the uniface tools points to relatively greater processing of softer materials and an increasing emphasis on scraping tasks, likely signaling greater on-site hide or nonwoody plant processing. Multiple lines of evidence support a shift to on-site artifact or lithic material caching. This evidence includes changes in core characteristics, the first appearance of unmodified stone, a significant increase in on-site andesite reduction (a material that likely had to be brought to the site), and possibly also the presence of several new classes of intensively shaped flaked and ground stone tools.

Beginning in Stratum 3 times, certain trends intensify further. Caching behavior continued and likely became more common, based on the shift away from material-conserving core forms, the presence of whole, nonexhausted points, and the significant increase in utilitarian grinding bottom stones, which would have been cumbersome to transport between sites. There was greater on-site manufacture of utilitarian and nonutilitarian ground stone tools. This is indicated by the initial presence of both undifferentiated flaked and ground stone artifacts of sedimentary materials typically used to make ground stone tools, as well as an increase in debitage of various sedimentary materials between Substratum 2B and Stratum 3. The concomitant increase in hammers (both cobble and flaked hammers) also suggests more on-site tool manufacture, although it may also relate to a shift in food processing tasks. That food processing efforts did intensify during Stratum 3 times is supported by the substantial increase in the use of compound grinding tools. This was likely due to increasing reliance on plant foods or to greater effort to process foods (possibly including animals) more thoroughly because of dietary stress. Unequivocal chopping tools first appear in Stratum 3, including one possible hoe as well as other more informally shaped tools. Their presence, with a subsequent increase in overlying strata, suggests that the cultivation of wild or domesticated plants may have been under way by Stratum 3 times.

The stylistic projectile point analysis provides other useful information. The stratigraphic distribution of point types at the site (see Table 2.11), combined with their age estimates based on comparisons with known point types from dated contexts in adjacent regions, strongly supports the stratigraphic assessments made during excavation and match well with the available radiocarbon dates for the site. The single point from Substratum 2A stylistically cross-dates to a transitional Middle/Late Archaic period ca. 6200–5400 BP (uncalibrated radiocarbon years). This age estimate fits with the two available radiocarbon dates of 5645 ± 76 and 5532 ± 49 BP (uncalibrated) for this stratum.

Stratum 3 contains several different point styles, two of which securely cross-date to the Late Archaic (Group 2; ca. 5600–4400 BP uncalibrated) and Terminal Archaic (Group 4; ca. 4600–3400 BP uncalibrated). Two others (Groups 5 and 6) most closely resemble styles to the south dating to the Terminal Archaic. Based on these correlations, the maximum estimated age range for Stratum 3 is ca. 5600–3400 BP (uncalibrated). It is possible that Stratum 3 could represent a shorter time span of ca. 4600–4400 BP, given (1) the absence of flaked stone Group 7 and 8 points (although there are possible ground stone equivalents) and (2) the known range of temporal overlap of Group 2- and Group 4–like points to the south. Interestingly, the one radiocarbon date of 4428 ± 37 BP (uncalibrated) for Stratum 3 falls within this more restricted time frame. Working against this interpretation, however, are the presence of ground stone points and the bowl in the uppermost levels of Stratum 3, as these kinds of artifacts are known elsewhere only from early ceramic-era contexts.

Substratum 2B is difficult to cross-date because the points lack direct style correlates, but an estimate of sometime between ca. 5400 and 4600 BP seems reasonable, given the cross-dating of Substratum 2A and Stratum 3. This is slightly younger than the two available dates of 5507 ± 61 BP and 5464 ± 53 BP (uncalibrated). Strata 4 and 0 appear to represent mixed deposits that include both Archaic and ceramic-era artifacts. This supposition is based on the unique occurrence of Group 7 and 8 flaked stone points, dating elsewhere to ca. 2400 BC to AD 1500 and AD 100, respectively; the intermittent presence of ceramics; and the wide temporal range of other point styles within these two strata, as well as the exclusive occurrence of Group 9 points, cross-dated to the Middle Archaic, ca. 8000–6000 BP (uncalibrated), on the site surface. These data strongly suggest that the use of Kasapata continued during transitional Late Archaic/Formative era times, but the bulk of these younger deposits were subsequently disturbed by a variety of postdepositional processes.

Burger et al. (2000) have proposed that the Cuzco Basin should be considered part of the South-Central Andean Archaeological Area, rather than part of the Central Andean Archaeological Area as has been traditionally proposed. The stylistic projectile point analysis compellingly supports this idea. The point styles at Kasapata suggest strong relationships between people in the Cuzco region and the South-Central Andean highlands, beginning at least as early as the Middle Archaic. The vast majority of Kasapata points are stemmed forms, a general stylistic tradition that is uncommon in the Central Andean highlands but common in the South-Central Andes. Further, there are direct correlates to multiple *specific* point types unique to the South-Central Andean highlands and a lack of correlates to types unique to the Central Andean highlands (see Kaulicke 1999; Lavalleé et al. 1985; Rick 1980). During Late/Terminal Archaic (Stratum 3) times, more localized styles appear in the Cuzco region (Group 5 and 6 points), one of which may have correlates only in the more restricted area of the northern Titicaca Basin. Assuming that point styles reflect social interaction or group affiliation (see Rick 1996), this suggests the development of more localized social identities or a narrowing of the geographic extent of social interactions with people to the south at this time. The appearance of ground stone points and stone bowls late in Stratum 3 times may also indicate increasing interaction with people to the north during the preceramic-Formative transition, as these kinds of artifacts are currently best known in early ceramic-era contexts at several Central Andean sites (Burger 1998; Grieder et al. 1988; Pozorski and Pozorski 1987; Rick 1980). Burger et al. (2000) indicate there is evidence from obsidian sourcing that also suggests the development of at least low-level interaction between peoples of the Cuzco region and those farther north as Chavín became an important religious center.

II. ASSESSMENT OF MOBILITY PATTERNS

THEORETICAL CONSIDERATIONS

What Are Mobility and Sedentism?

Understanding prehistoric mobility patterns is important because research indicates that declining mobility, or *sedentarization*, correlates with or "precipitates dramatic changes in food storage, trade, territoriality, social and gender inequality, male/female work patterns, subsistence, and demography . . . as well as cultural notions of material wealth, privacy, individuality, cooperation, and competition" (Kelly 1992:43–44). It is important to understand, however, that mobility is a complex phenomenon with multiple dimensions (Kelly 1992, 1995).

The organization of mobility is one of the most fundamental dimensions. Organization of mobility refers to Binford's (1980) distinction between residential and logistical mobility, which generally correlates with group versus individual movements. Residential mobility is the movement of the entire coresidential group from one residential base camp to another. Logistical mobility is movement of individuals or small subsets of the residential group out from and back to the residential camp on longer-term forays aimed at procuring specific resources (e.g., food, toolstone) for use at the residential base. Logistical and residential mobility commonly are inversely related, particularly for hunter-gatherers (Binford 1980; Kelly 1995; Shott 1986), but also for at least some horticulturalists (see, e.g., Cowan 1999). Essentially, as the residential base becomes increasingly permanent in location, it becomes increasingly necessary for task groups to provision the camp with previously acquired resources by moving the entire camp directly to the resources. A second important dimension of mobility patterns is what Kelly (1992:45) calls "long-term mobility," or the "cyclical movements of a group among a set of territories" on a longer temporal scale than the annual round. Long-term mobility subsumes both the total geographic extent of mobility over multiple years or even generations (Binford 1982) and the frequency of reuse of specific sites and areas within this larger territory (see Nelson and Lippmeier 1993). These two aspects of long-term mobility also are commonly inversely related, with the frequency of site reuse increasing as the total geographic territory habitually used becomes smaller.

Sedentarization, as a long-term evolutionary process, is traditionally defined as a reduction in mobility that eventually results in the establishment of sedentary residential bases, in the sense that a residential base is continually occupied by at least part of the group year-round (Kelly 1992:49). Research on sedentarization therefore has focused on reduction in residential mobility. At the analytical level of the site, this means finding evidence for longer-duration occupations at residential camps. The temporal resolution of the archaeological record, however, makes it difficult to distinguish between increasing length of stay during individual episodes of site use and increasingly frequent site reuse, such as on a seasonal basis, even at extremely well-dated sites. It would be useful to clearly differentiate between these two situations, but for our purposes here it is not necessary, because the process of sedentarization typically involves shifts in long-term mobility as well as mobility organization. Therefore, the phrase "residential mobility" as I use it here should be understood as subsuming both the duration of stay at a residential base and the degree of reuse as a residential base.

Quantifying residential mobility in absolute terms, such as "one-month occupation" or "reused every winter," is also difficult. Instead, sedentarization is normally described qualitatively, with shifts in residential mobility interpreted as less mobile or more sedentary relative to some earlier point in time. It should also be kept in mind that whereas the sedentarization process is conceptualized as unilinear in the long-term, evolutionary view, this may not be apparent when mobility patterns are examined over shorter time frames. The following sections address the middle-range theory necessary to connect lithic data with the sedentarization process.

Anticipated versus Actual Residential Mobility

The difference between anticipated and actual mobility should be examined when investigating the sedentarization process (Kent 1991; Klink 2001b; Nelson and Lippmeier 1993). *Anticipated mobility* reflects peoples' intentions and plans about how the landscape, sites, and resources will be used, and is analogous to Binford's (1987:498–499) concept of planning depth. It refers to expectations about how long a residential site will be occupied, and whether and how frequently it may be reoccupied. Anticipated mobility is reflected primarily in technological organization: how tool production is staged, how tools are designed, and whether raw materials or tools are cached or stockpiled at sites. Technological strategies and tactics are used or interwoven differently depending on whether it is anticipated that residential mobility will be high (expectation of short-term use or no expectation of reuse) or low (expectation of longer-term use or expectations of regular reuse). Most lithic indicators of shifts in mobility or sedentism are based on shifts in technological organization, and hence measure shifts in anticipated mobility.

Actual mobility refers to the true length of time a site was occupied and whether it was actually reused. It is reflected primarily in the intensity of on-site tool use (Klink 2001b; Nelson and Lippmeier 1993). Investigation of the sedentarization process traditionally has not focused on shifts in actual mobility, in part because many factors can influence tool use intensity, such as degree of investment in manufacture, raw material availability, and tool transport (Klink 2001b; Nelson and Lippmeier 1993; Webb 1998). Actual mobility is also more susceptible to stochastic variation due to short-term, unpredictable environmental (natural and cultural) perturbations. For example, unexpectedly encountering an abundant resource may allow a group that anticipates high residential mobility to actually remain at a site for a longer time, and conversely, groups that anticipate low residential mobility may be forced to leave a site sooner than expected if others have used the site in their absence and the resources that were projected to be available prove to be significantly diminished. Reconstructions of actual mobility therefore may be much "noisier," in the short term, than reconstructions of anticipated mobility.

Kent's (1991) research indicates that there is generally congruence between anticipated and actual mobility, as people commonly adjust their expectations and plans to better conform to their actual experiences. As her study and others (Klink 2001b; Nelson and Lippmeier 1993) demonstrate, however, it is important to distinguish between anticipated and actual mobility because identifying situations where the two are incongruent can provide valuable clues to how and why mobility patterns changed.

ANTICIPATED MOBILITY AND TECHNOLOGICAL ORGANIZATION

The Basic Framework

Numerous studies indicate that anticipated mobility affects the technological strategies people employ (Cowan 1999; Kelly 1988; Kuhn 1994; Nelson 1991; Nelson and Lippmeier 1993; Odell 1996, 1998; Parry and Kelly 1987; Shott 1986; Torrence 1983, 1989). The basic framework used in most of these studies links high residential mobility to the use of a transported toolkit that consists of a limited number of tools, with tool design emphasizing portability, standardization, multifunctionality, and long use-life tools (Kuhn 1994; Odell 1998; Parry and Kelly 1987; Shott 1986). This linkage is founded on the equation of high residential mobility with a foraging (sensu Binford 1980) subsistence-settlement system.

High residential mobility sets up opposing problems for foragers (Cowan 1999; Kelly 1988; Parry and Kelly 1987; Shott 1986). Frequent or long-distance moves limit the number of tools that can easily be carried between residential camps, but the wide range of tasks commonly performed at and from residential bases demands that a potentially wide array of tools be available. The unpredictability of moves also generates uncertainty about the *specific* resources available at the next or future residential bases, and thus uncertainty about the specific functional tasks to be performed and whether sufficient raw materials will be available at the next base to produce the tools necessary to do those tasks. The compromise solution is to design a portable toolkit that minimizes the number of tools carried, allows for the transport of raw material, and includes some tools designed for use in a broad range of tasks. As residential mobility declines, the pressures that foster reliance on small, transportable or multifunctional toolkits lessen. When residential sites are occupied longer or returned to more frequently, tools as well as raw materials can be cached and stockpiled. If transportability and the potential unavailability of raw material are no longer problems, then less effective multifunctional tool designs should be replaced by more effective single-function tool designs. Another consequence of reduced mobility is the expansion of the nonportable technological inventory (Hitchcock 1982, cited in Shott 1986). Several specific predictive models of lithic assemblage change can be derived from this basic framework. Two are presented here.

Model 1: Bifaces versus Expedient Cores

Parry and Kelly (1987) have tied high residential mobility to greater use of bifacial technology and low residential mobility to greater use of expedient core-flake production, with expedient specifically meaning the use of unprepared and nonstandardized core forms and flake removal techniques. Both strategies typically were used simultaneously, but each was relied on to greater or lesser degrees under different mobility constraints. Several aspects of bifaces make them a suitable technological solution to the constraints of high mobility (Cowan 1999; Kelly 1988; Nelson 1991; Odell 1998; Parry and Kelly 1987). Bifaces can serve as highly portable cores because they can produce a relatively large number of flakes for use as tools from a minimum amount of toolstone. Bifacial shaping produces tools that are more resistant to breakage and can be frequently resharpened without altering the form of the functional edge. Undifferentiated bifaces have high multifunctional utility because their generalized form allows them to function sufficiently in a wide range of tasks, or to be modified into more task-specific tools if necessary. In contrast, unprepared cores are typically quite heavy, and the thin edges of unretouched flakes may break easily during transport (Kuhn 1994;, Nelson 1991). Unless flakes are quite large, they have limited potential to be resharpened or reshaped into other forms. Expedient core-flake technologies are wasteful of raw material, a serious hindrance if it is difficult to predict when and where retooling may be possible.

Nonetheless, expedient core-flake technologies have certain advantages over bifacial and prepared core technologies (Andrefsky 1994; Cowan 1999; Parry and Kelly 1987). They involve significantly lower tool production costs because little skill or production time is required and poor-quality materials can be used. Low production cost also means effort does not have to be expended in conserving flake tools in order to recoup production effort. Expedient core reduction can produce a wider range of flake forms, which enables selection of more suitable flake shapes for specific tasks. The generalized form of undifferentiated bifaces also is not the most efficient design for many specific tasks (Nelson 1991). Therefore, under conditions of lower residential mobility, bifaces and prepared cores are less ideal technological strategies, and there should be greater emphasis on expedient core-flake technology. Archaeological case studies demonstrate that lower residential mobility is often correlated with a decrease in specific measures such as the ratio of bifaces to cores, the ratio of prepared to unprepared cores, the percentage of bifaces, and the percentage of biface thinning flakes, among others (Cowan 1999; Odell 1998; Parry and Kelly 1987).

Model 2: Sufficient/Multifunctional versus Efficient/Single-Function Tool Designs

Shott's (1986) research indicates that high residential mobility is strongly correlated with lower-diversity, multifunctional toolkits, while low residential mobility is associated with higher-diversity toolkits that contain more efficient, functionally specific tool designs. More efficient task-specific tools can be produced in a variety of ways, including using expedient core-flake production strategies, as in Model 1, or using "curated" strategies that involve more elaborate preparation and shaping to design tools with specific characteristics (for a discussion of curated and expedient technological strategies, see Nelson 1991; Odell 1996).

The circumstances of high residential mobility provide little incentive to make an array of curated, efficient stone tools, because the cost of their manufacture is unlikely to outweigh their use benefits unless the tool can be easily incorporated into a small, transportable toolkit (Binford 1979; Hayden and Gargett 1988; Torrence 1983, 1989). Effort should be invested in producing these kinds of tools only if it can be recouped through long-term tool use. Many ground stone tools are particularly costly because they are typically larger and heavier than flaked stone tools (and so less easily transported), and intentionally manufacturing ground stone tools is a much slower process than flint knapping, potentially involving hours' or days' worth of shaping (Adams 1993; Simms 1983). Several conditions of lower residential mobility increase the potential for long-term tool use and thus the benefits gained from investing production effort in creating more efficient tools. The probability of repeating specific tasks at a location increases as the duration of occupation increases, and infrequent moves permit tools to be reliably stored between use episodes. When it is anticipated that a site will be regularly reused, tools may also be cached on-site between occupations.

For flaked stone, the intentional production of more efficient, task-specific tools often involves extensive unifacial or bifacial shaping to produce particular kinds of working edges, specialized overall forms, and hafted tools (Bleed 1986; Keeley 1982; Nelson 1991; Odell 1994). For utilitarian ground stone, identification of the production of more efficient, task-specific tools can be based on the presence and extent of shaping on nonworking surfaces (Adams 1999; Horsfall 1987; Nelson and Lippmeier 1993), as well as on the relative proportions of multifunctional tools. Archaeological case studies have demonstrated that decreasing residential mobility is correlated with increasing use of hafted tools, specialized bifacial tools, formed unifaces, and shaped grinding tools (Klink 2001a, 2001b; Nelson and Lippmeier 1993; Odell 1994, 1998).

ACTUAL RESIDENTIAL MOBILITY AND ON-SITE TOOL USE INTENSITY

The actual length of time a residential site was occupied and the frequency with which it was actually reoccupied should be reflected in measures of the intensity of nontransported tool use. The basic model employed to investigate actual mobility associates low actual mobility with signs of greater on-site tool use intensity. Simply put, the longer a tool is used at a site, the more evidence of wear it should show. Most investigations of actual mobility to date have focused on utilitarian grinding tools, such as hand and bottom stones, because these artifacts tend to be fairly bulky and heavy and therefore less likely to be transported between sites (Klink 2001b; Nelson and Lippmeier 1993; Schlanger 1991; Webb 1998). Numerous studies have explored how to assess flaked stone tool use lives (e.g., Odell 1996; Shott 1989; Weedman 2002), but these studies have focused on curated and potentially transported flaked stone tools such as projectile points, bifaces, hafted end scrapers, and the like. Critical to any attempt to measure actual mobility is identifying and focusing exclusively on tools that were not part of a curated, transported toolkit (Klink 2001b; Nelson and Lippmeier 1993). Tools that are maintained and carried between sites will show signs of long-term use wear, but this is wear accumulated from use at multiple different locations and therefore does not accurately reflect use intensity at the site where the tool was ultimately discarded. The degree of investment in manufacture also influences tool curation (Webb 1998), and therefore it is also critical to compare measures of use intensity between tools with similar levels of investment in tool shaping.

Measures of actual mobility at Kasapata using flaked stone tools focus on expedient unifaces and unprepared cores, because only these artifacts have high potential to have been used exclusively at the site where they were discarded (see Nelson 1991; Parry and Kelly 1987). Measures using ground stone tools are based on a narrower range of utilitarian tools, for similar reasons.

WHAT SUPPORTS LOWER RESIDENTIAL MOBILITY? COMPLICATIONS OF LOGISTICAL MOBILITY

Increasing sedentism typically requires a shift in subsistence strategies in order to provide sufficient resources for longer-term occupations or more frequent site reuse. The several cultural means by which this can be achieved include (1) increasing logistical mobility, (2) expanding diet breadth, (3) shifting to food production, or (4) procuring foodstuffs through trade with other groups (Bouey 1987; Christensen 1980; Keeley 1988; Price 1985). Lithics are not the most direct indicator of subsistence changes, but such changes can be reflected in shifts in certain aspects of lithic assemblages. The following discussion focuses specifically on increasing logistical mobility versus reliance on locally procured or produced plants, as reliance on each generates different expectations of lithic assemblage change.

The studies documenting a shift from bifacial to expedient core reduction strategies with sedentarization are cases where increasing sedentism was supported initially by increasing reliance on wild and then domesticated plants (Cowan 1999; Odell 1998; Parry and Kelly 1987). The initial trend away from bifaces began relatively early in each culture historical sequence, but, as Parry and Kelly have noted in an assessment of several cultures (the U.S. Eastern Woodlands, Southwest, and Plains, and Mesoamerica), the most pronounced shift "does seem to correlate with the first emphasis on maize as a major staple in the diet of each area" (Parry and Kelly 1987:297). Further, Parry and Kelly restrict their expectations about increasing reliance on expedient core technology to "relatively sedentary peoples who do not move long distances residentially *or logistically*" (1987:300, emphasis added). For ethnographically known hunter-gatherers, high logistical mobility typically supports low residential mobility (Binford 1980; Kelly 1995; Shott 1986). Logistical mobility creates similar problems as high residential mobility and fosters generally similar technological solutions—an emphasis on bifaces and portable tools (Cowan 1999;

Kelly 1988). Evidence of production and replacement of artifacts constituting the logistical transported toolkit will occur at residential bases if either the gearing up for logistical forays or the retooling afterward occurs at the residential camp. Thus, if low residential mobility is supported primarily by high logistical mobility rather than by an emphasis on locally available wild or domesticated plants, the expectations of Model 1, the biface versus expedient core model, should not be met. For example, in Klink's (2001a) California case study, where domesticated plants were not part of the prehistoric diet, neither undifferentiated bifaces nor prepared cores decreased as mobility declined.

If increasing logistical mobility underpins lower residential mobility there should, however, be other recognizable shifts in lithic assemblages, because logistical forays differ from high residential mobility in that they are typically planned in advance to target bulk acquisition of specific resources (Klink 2001a). The transported toolkit used by logistically organized task groups should contain more predesigned, task-specific tools than that used by residentially mobile foragers. At the same time, it should still include undifferentiated bifaces that could function as multipurpose tools or cores, but their characteristics are expected to differ. Larger, earlier-stage bifaces have greater multifunctional potential than smaller, later-stage bifaces because their greater mass and less acute edge angles are adequately functional for a wider variety of tasks (Kelly 1988; Nelson 1991). However, their inclusion in portable logistical toolkits reduces the number of task-specific tools that can easily be carried. Therefore, reliance on later-stage bifaces would better balance the needs of transporting more task-specific tools while still ensuring that some potentially multifunctional tools are present (Klink 2001a).

Other changes should occur if at least some logistical forays focused on hunting large game. Ellis (1997) has shown that ethnographically, stone-tipped projectiles were used almost exclusively to hunt large (>40 kg), game while organic-tipped projectiles were used nearly exclusively to hunt small (<40 kg) terrestrial game and birds. From a design standpoint (see Nelson 1991; Odell 1996), stone points can be defined as task-specific tools designed for efficient flesh piercing and slicing. Stone points are also clearly a portable tool, as hunting necessarily takes place away from the residential base. Kelly (1988) ties the increasing use of unifacial points to a shift from opportunistic hunting, typically associated with foraging (sensu Binford 1980), to target-specific and planned hunting, typically associated with logistical hunting. This is based on the idea that under conditions of logistical procurement, "hunting weapons might have had to become more reliable rather than maintainable weapons" (Kelly 1988:731). Odell and Cowan's (1986) experimental studies support the contention that unifacial points are less maintainable than bifacial points. Therefore, if hunting large game via logistical mobility is important, there should be an overall increase in stone points, as well as the greater use of unifacial points. Several case studies indicate that reliance on late-stage bifaces, stone, and unifacial points increased as logistical mobility and sedentism increased (Cowan 1999; Klink 2001a; Odell 1998).

DATA ANALYSIS

Analytic Methodology

The analysis presented here used 18 individual measures to ultimately construct three aggregate indices that assess changes in (1) anticipated residential mobility, (2) actual residential mobility, and (3) logistical mobility. The use of multiple measures helps ensure the reliability of results, because any single measure is susceptible to error due to a variety of factors, including the assumptions necessary to operationalize theoretical ideas. The individual measures are explained below, and the results are tabulated in Table 2.16. The three aggregate indices provide mean relative mobility rankings per stratum. For each individual measure, the value indicating highest mobility (or least sedentism) is ranked as 1 and the value indicating least mobility (or greatest sedentism) is ranked as 10 (see Tables 2.17 through 2.19). The rank for the remaining stratum is determined by where it falls between the minimum and maximum values. The aggregate index for each mobility type (anticipated residential, actual residential, logistical) averages the ranks for all relevant indices and is the basis of all subsequent evaluations of changes in mobility over time. The analysis focused on the three intact strata, 2A, 2B, and 3, but values for individual measures were also compiled for Stratum 4.

When examining sedentarization, it is important to compare assemblages from similar site types in order to eliminate potential variability in assemblage content and character resulting from differences in site function. Assemblages from residential sites ideally should be used because sedentarization highlights changes in residential mobility. Further, the expected relationships

TABLE 2.16. Lithic indicators of mobility, by stratum.

Indicative Form	**4**	**3**	**2B**	**2A**	**Mobility Type**
Biface/core ratio	0.73	1.15	2.77	2.11	Anticipated residential
Prepared core/unprepared core ratio	0.44	0.31	0.41	0.40	Anticipated residential
% Undiff. bifaces in flaked stone tool assemblage	16.8	24.1	39.8	32.2	Anticipated residential
% Unifaces on biface thinning flakes	6.3	3.6	11.3	27.6	Anticipated residential
% Unifaces on core flakes	58.9	46.2	50.0	37.9	Anticipated residential
% Formed unifaces in uniface assemblage	7.1	6.2	1.3	0.0	Anticipated residential
% Shaped utilitarian ground stone	13.6	44.4	23.1	0.0	Anticipated residential
% Multifunctional grinding tools	10.0	15.0	10.0	100.0	Anticipated residential
% Bifacial tools	33.3	22.2	6.9	9.5	Anticipated residential or logistical
% Projectile points	6.1	6.1	2.8	3.4	Anticipated residential or logistical
% Late-stage bifaces	10.0	23.5	12.7	15.8	Logistical
Mean weight undifferentiated biface (g)	19.13	22.22	25.78	26.70	Logistical
% Unifacial points	16.7	21.7	0.0	0.0	Logistical
% Fragmentary expedient unifaces	44.4	30.4	26.1	16.7	Actual residential
% Exhausted unprepared cores	12.0	15.6	11.8	0.0	Actual residential
Mean weight unprepared cores (g)	36.23	44.75	40.76	51.50	Actual residential
% Fragmentary utilitarian grind & pound	82.4	80.0	90.9	0.0	Actual residential
% Fragmentary unshaped ground stone	57.1	62.5	66.7	50.0	Actual residential

TABLE 2.17. Anticipated residential mobility aggregate rank index.

Indicative Form	**3**	**2B**	**2A**
Biface/core ratio	10	1	5
Prepared/unprepared core ratio	10	1	2
% Undifferentiated bifaces	10	1	5
% Unifaces on biface thinning flakes	10	7	1
% Unifaces on core flakes	7	10	1
% Formed unifaces in uniface assemblage	10	3	1
% Shaped utilitarian ground stone	10	6	1
% Multifunctional grinding tools	10	10	1
% Bifacial tools	10	1	2
% Projectile points	10	1	2
Mean anticipated rank	**9.7**	**4.1**	**2.1**

Note: 10 = most sedentary, 1 = most mobile.

TABLE 2.18. Actual residential mobility aggregate rank index.

Indicative Form	**3**	**2B**	**2A**
% Fragmentary expedient unifaces	10	7	1
% Exhausted unprepared cores	10	8	1
Mean weight unprepared cores (g)	7	10	1
% Fragmentary utilitarian grinding and pounding	9	10	1
% Fragmentary unshaped ground stone	8	10	1
Mean actual rank	**8.8**	**9**	**1**

Note: 10 = most sedentary, 1 = most mobile.

TABLE 2.19. Logistical mobility aggregate rank index.

Indicative Form	**3**	**2B**	**2A**
% Bifacial tools	10	1	2
% Projectile points	10	1	2
% Late stage bifaces	10	1	3
Mean weight undifferentiated biface (g)	10	3	1
% Unifacial points	10	1	1
Mean logistical rank	**10**	**1.4**	**1.8**

Note: 10= high logistical mobility, 1= low logistical mobility.

between residential mobility and technological organization or tool use intensity outlined in Models 1 and 2 are applicable only to assemblages at residential sites. I assume that the stratigraphically designated assemblages at Kasapata resulted from continuous reuse of the site as a residential base; this appears to be substantiated by the results of the descriptive lithic analyses.

Individual Measures

1. *Biface/core ratio*. This measure assesses the relative dependence on bifaces versus cores and is calculated as the number of undifferentiated bifaces divided by the number of cores. Higher ratios are expected under conditions of anticipated high residential mobility following both Models 1 and 2 for anticipated mobility. This assumes that undifferentiated bifaces functioned as portable cores as well as multifunctional tools, and that cores are generally nontransported, single-function tools. However, if logistical mobility increases as residential mobility declines, there may be continued reliance on bifaces, resulting in no apparent change or even an increase in the proportion of bifaces. This assumption also applies to measures 2 through 5.
2. *Prepared/unprepared core ratio*. Measure 2 examines whether prepared or unprepared ("expedient") cores were used to produce flake tools. Higher ratios are expected when the anticipated residential mobility is high (Model 1). The ratio is calculated as the number of bidirectional cores divided by the number of remaining cores, excluding undifferentiated core fragments.
3. *Percent undifferentiated bifaces*. This measure assesses the overall degree of reliance on generalized, multifunctional biface designs. It is calculated as the number of undifferentiated bifaces in the flaked stone tool assemblage (excluding debitage). Higher percentages are expected when it is anticipated that residential mobility will be high, following both models for anticipated mobility. This assumes that undifferentiated bifaces functioned as portable cores as well as multifunctional tools, and that morphological cores are generally nontransported, single-function tools.

4 and 5. *Percent unifaces made on biface thinning*, *core flakes*. These measures both assess the same question: What types of cores were used to produce flakes used as tools? Following Model 1, higher percentages on biface thinning flakes are expected when anticipated residential mobility is high, and higher percentages on core flakes should occur when anticipated residential mobility is low. Percentages are based on the number of unifacial tools made on a specific flake type relative to the total number of unifaces.

6. *Percent formed unifaces*. This factor measures reliance on more efficient, task-specific tools and is calculated as the percentage of formed unifaces in the uniface assemblage. Higher percentages are expected under conditions of anticipated low residential mobility (Model 2), assuming that formed unifaces were intentionally shaped in order to produce single-function or hafted tool designs. It should be noted that only a minority of formed unifaces are projectile points, and so this index does not directly measure changes in the production of unifacial points.
7. *Percent shaped utilitarian ground stone*. Measure 7 gauges investment in intentional shaping of utilitarian ground stone tools. Higher percentages are expected when anticipated residential mobility is low (Model 2), assuming that shaping indicates intentional production of more specialized or more efficient tools. The index is calculated as the number of intentionally shaped tools within the utilitarian ground stone assemblage.
8. *Percent multifunctional grinding tools*. This measure assesses reliance on sufficient versus efficient grinding tools and is calculated as the percentage of multifunctional tools in the utilitarian grinding tool assemblage. Lower percentages are expected under conditions of anticipated low residential mobility (Model 2), assuming that tools with multiple kinds of wear were intentionally designed or selected to have multiple simultaneous functions.
9. *Percent bifacial tools*. This measure examines reliance on specialized biface designs, and is calculated as the number of bifacial tools within the biface assemblage. Higher percentages are expected when anticipated residential mobility is low (Model 2), assuming that undifferentiated bifaces are more generalized and bifacial tools are more specialized tool designs. Since nearly all bifacial tools that were found in intact strata at Kasapata are projectile points, increases in the percentage of bifacial tools could also be interpreted as evidence for greater logistical (hunting) mobility as residential mobility declined. If projectile points are eliminated from both the counts of bifacial tools and the biface assemblage, the overall pattern is essentially the same for the three strata (2A = 0 percent, 2B = 0 percent, 3 = 2.8 percent; compare with Table 2.16).

10. *Percent projectile points*. Measure 10 evaluates the overall importance of stone points and is calculated as the number of points (bifacial and unifacial) in the flaked stone tool assemblage (excluding debitage). Higher percentages are expected when it is anticipated that residential mobility will be low (Model 2) or if logistical mobility (hunting) is important, assuming that points were designed to be more specialized tools used in hunting and butchering.
11. *Percent late-stage bifaces*. This measure assesses the relative use of late- versus earlier-stage bifaces. It is calculated as the number of late-stage bifaces divided by the number of undifferentiated bifaces that could be reliably staged. Higher values are expected only when high logistical mobility supports low residential mobility, assuming that late-stage bifaces were produced or replaced at the residential base and were part of the transported logistical mobility toolkit.
12. *Mean weight of undifferentiated bifaces*. Measure 12 is an alternative means of evaluating dependence on later- versus earlier-stage bifaces. It is calculated as the average weight of all whole undifferentiated bifaces (the sample number by stratum is 3 for 2A, 11 for 2B, and 10 for 3). Greater reliance on later-stage bifaces should be indicated by lower mean biface weights, because a biface's weight decreases as it is progressively reduced. Lower values are expected when high logistical mobility supports low residential mobility.
13. *Percent unifacial points*. This measure examines reliance on unifacial versus bifacial points and is calculated as the number of unifacial points divided by the total number of bifacial and unifacial points. Higher percentages are expected when high logistical mobility (hunting) supports low residential mobility, assuming that the use of unifacial points correlates with a shift to planned, target-specific hunting.
14. *Percent fragmentary expedient unifaces*. This measure gauges the use intensity of expedient flake tools and is calculated as the number of fragmentary tools in the expedient uniface assemblage. Higher percentages are expected when actual residential mobility is low. This assumes that expedient unifaces were used exclusively at the site where they were discarded and that fragmentation reflects use intensity, that is, the longer or more frequently an expedient uniface is used, the more likely it is to break.
15. *Percent exhausted unprepared cores*. Measure 15 assesses the use intensity of unprepared cores and is calculated as the number of exhausted cores in the unprepared core assemblage (all cores except bidirectional forms and undifferentiated core fragments). Higher percentages are expected when actual residential mobility is low, because cores are more likely to reach the end of their use life the longer or more frequently they are reduced. This assumes that all reduction of unprepared cores, beyond potential initial testing at off-site procurement locations, occurred at Kasapata.
16. *Mean weight of unprepared cores*. This is a slightly different measure of unprepared core use intensity in that it assesses average use intensity rather than what proportion was used to the point of exhaustion. It is calculated as the average weight of all whole unprepared cores, with "unprepared core" defined as in measures 2 and 15 (for intact strata, the sample number by stratum is 2 for 2A, 10 for 2B, and 31 for 3). Lower values are expected when actual mobility is low. This assumes that weight decreases as the core is reduced, all unprepared cores began their use life at a similar weight, and all subsequent reduction occurred on-site.
17. *Percent fragmentary utilitarian grinding/pounding tools*. Measure 17 assesses the use intensity of grinding and pounding ground stone tools and is calculated as the number of fragmentary tools in the utilitarian grinding and pounding tool assemblages. Higher percentages should occur when actual mobility is low, assuming these tools were not transported between sites because of their relatively large size and that fragmentation reflects use intensity.
18. *Percent fragmentary unshaped ground stone*. This measure gauges the use intensity of all ground stone tools that are not clearly intentionally shaped. It is calculated as the number of fragments within the unshaped ground stone tool assemblage. Higher percentages are expected when actual mobility is low. This assumes that unshaped ground stone tools were not transported between sites because of lack of investment in their manufacture and that fragmentation reflects use intensity.

Mean Rank Indices

ANTICIPATED RESIDENTIAL MOBILITY

The mean ranks for this index indicate that relatively high anticipated mobility during Substrata 2A and 2B times, with Substratum 2B appearing somewhat less mobile than 2A, was followed by a notable shift toward greater sedentism by or during Stratum 3 times

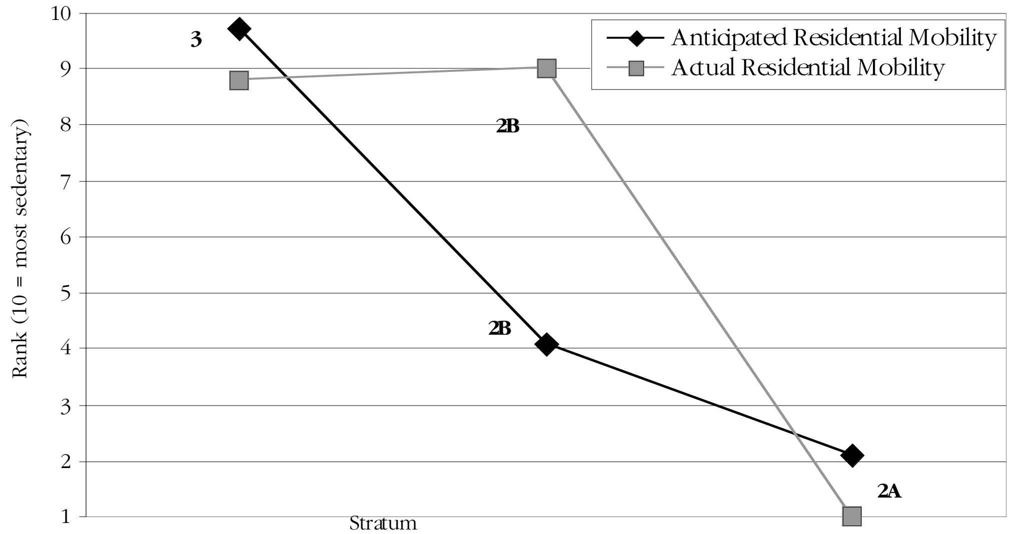

Figure 2.13. Anticipated versus actual residential mobility rank.

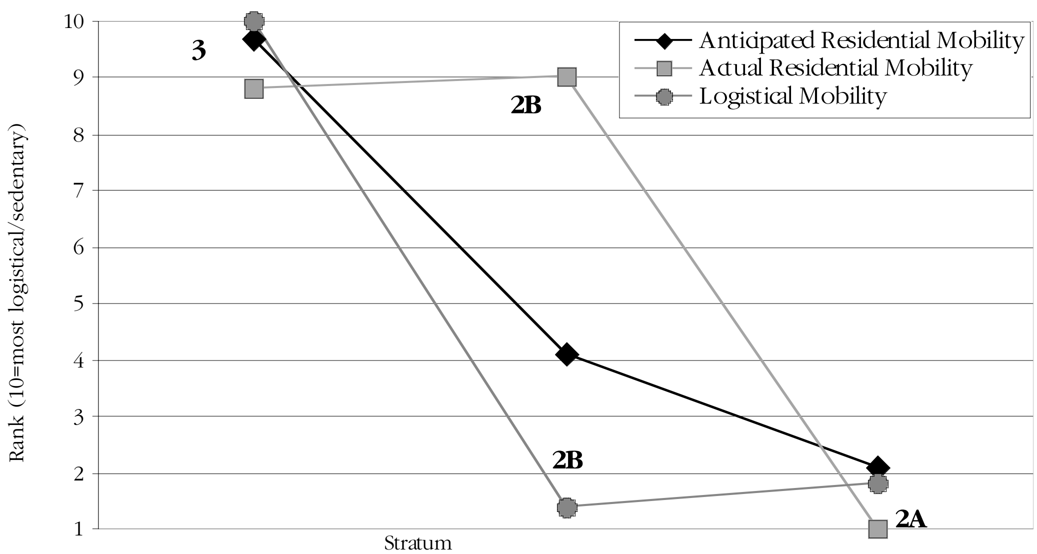

Figure 2.14. Logistical versus residential mobility

(Table 2.17, Figure 2.13). This index is based on ten measures, all of which appear sensitive to change and reveal the same general pattern of decreasing mobility over time. Six show the specific trend of most pronounced change between Substratum 2B and Stratum 3, three suggest the major change occurred between Substrata 2A and 2B, and one shows a steady decline in mobility across all three intact strata. In a few cases, Substratum 2B appears slightly more mobile than 2A. These variations appear minor, given the inherent imperfection of archaeological samples as well as the means of assessing them, and I consider this index reliable.

ACTUAL RESIDENTIAL MOBILITY

This index shows the same general pattern as that for anticipated mobility of increasing sedentism over time (Table 2.18, Figure 2.13). However, here the primary shift consistently occurred between Substrata 2A and 2B, with Substratum 2B and Stratum 3 similarly ranking as much more sedentary than Stratum 2A. The magnitude of difference between Substratum 2B and Stratum 3 varies between individual measures: three measures indicate that 2B was slightly more sedentary, while two indicate the opposite. The interpretation that actual residential mobility declined substantially between Substratum 2A and 2B is also supported by other changes in the lithic assemblage (see discussion of descriptive analyses).

LOGISTICAL MOBILITY

This index is most similar to that for anticipated residential mobility: Substrata 2A and 2B have comparable ranks, while Stratum 3 ranks markedly higher (Table 2.19, Figure 2.14). It is important to remember that logistical mobility differs organizationally from residential mobility, and typically occurs when residential mobility is relatively low. The logistical mobility rankings support an interpretation of increasing residential sedentism, then, because they follow the expected pattern of low or no logistical mobility when residential mobility was high (at least anticipated residential mobility, Substrata 2A and 2B), and greater logistical mobility when both anticipated and actual residential mobility were low (Stratum 3).

Shifts in logistical mobility can be difficult to separate from residential mobility not only because the two are closely linked, but also because some of the lithic tool changes could be due to either increasing logistical mobility or increasing residential sedentism in the absence of logistical mobility. This is the case for measures 9 and 10. Nonetheless, recalculating the logistical index without these two measures does not significantly change the mean ranks (Substrata 2A and 2B both rank 1.67). Therefore this index does appear to be a robust measure of logistical organization.

WERE THERE CHANGES IN RESIDENTIAL MOBILITY?

The results of all three mobility indices indicate that residential mobility declined over the time frame represented by Substratum 2A through Stratum 3. The trend toward greater sedentism clearly began during Substratum 2B times, using both the anticipated and actual residential mobility ranks (see Figure 2.7). Still to be resolved, however, is the temporal rhythm of mobility shifts, including the timing of most pronounced change, because of the significant difference between actual and anticipated mobility for Substratum 2B. This is addressed further below, and the issue of timing is temporarily put aside.

The primary question then becomes, how sedentary was the "more sedentary" occupation in Stratum 3? Although neither the aggregated mean ranks nor the calculated values for individual measures can be directly translated into quantified time frames, it is possible to gain insight into whether the sedentarization process was still undergoing change after Stratum 3 times, as well as a sense of the scale of change occurring at Kasapata. If the sedentarization process continued after Stratum 3 times and the Stratum 4 deposits were intact, we would expect to see values indicating greater sedentism for the Stratum 4 individual measures. However, since Stratum 4 appears mixed with materials from older strata, it is likely that the values are skewed, to an unknown degree, toward "less sedentary/more mobile" values. If, despite skewing, multiple measures still indicate that Stratum 4 appears more sedentary, we should assume that sedentarization continued at Kasapata after the period represented by the intact Stratum 3 deposits (i.e., an admixture of artifacts from older, more mobile occupations was insufficient to completely mask the pattern of continued change). The data in Table 2.16 suggest that there was at least some post-Stratum 3 occupation, now incorporated into Stratum 4, that was indeed more sedentary than that of Stratum 3. There are "more sedentary" values on five measures of anticipated residential mobility (measures 1, 3, 5, 6, and 9), two measures of actual residential mobility (14 and 16), and two measures of logistical mobility (9 and 12). Thus, although sedentism increased substantially during Stratum 3 times, the process apparently was not complete, and Stratum 3 occupations may not have been fully sedentary (year-round occupation).

The potential magnitude of change between Substratum 2A and Stratum 4 times can be ascertained by comparing the values for specific measures at Kasapata to those that have been determined for other areas. Table 2.20 shows changing biface/core ratios for several areas of North America where residential mobility declined significantly over time. There is notable variation in absolute values for roughly comparable periods (i.e., Archaic, preceramic, etc.), and it is extremely unlikely that any specific values are directly comparable to those from Kasapata, owing to local variation in specific subsistence strategies, raw material quality and availability, and so on. However, the magnitude of change, represented by the percent reduction in biface/core ratios between

Table 2.20. Comparative biface/core ratios from other regions.

	Kasapata		
Region Compared	**Substratum 2A = 2.11**	**Stratum 3 = 1.15**	**Stratum 4 = 0.73**
North Dakota[a]	Middle/Late Archaic? = 2.92	Plains Village? = 1.34	
Northwestern New Mexico[b]	Preceramic = 0.80	Puebloan = 0.13	
Southwestern Colorado[c]	BMII = 2.83	BMIII = 0.71	Pueblo I = 0.95
Valley of Oaxaca, Mexico[d]	Archaic = 1.09	Early Formative = 0.03	

[a] From Parry and Kelly (1987:Table 12.1): Site 32DU452, workshop near Flint River Quarries.
[b] From Parry and Kelly (1987:Table 12.2): Surface collections in lower Chaco drainage.
[c] From Parry and Kelly (1987:Table 12.4): Dolores Project Area. BM, Basketmaker.
[d] From Parry and Kelly (1987:Table 12.5): Archaic sample is from Guila Naquitz, Early Formative from San Jose Mogote.

time frames, is likely to be comparable. The 58 percent reduction in biface/core ratios between Substratum 2A and Stratum 3 at Kasapata is similar to the 54 percent reduction between the Archaic and Village Periods in North Dakota. If we make the simplifying assumption that the Stratum 4 biface/core ratio is accurate, the 73 percent reduction between Substratum 2A and Stratum 4 at Kasapata is comparable to the 75–97 percent reduction seen in other areas with the shift to what has been interpreted as "fully sedentary" settlements (e.g., the Puebloan and Formative Periods). From this it seems reasonable to conclude that there was a culturally significant decline in residential mobility between Substratum 2A and Stratum 3 times, perhaps with Stratum 3 representing occupation at least twice as sedentary as Substratum 2A. Again, however, there is evidence that suggests the sedentarization process was not complete by the end of Stratum 3 times.

WHAT SUPPORTED LOWER RESIDENTIAL MOBILITY?

Decreasing residential mobility can be maintained through a variety of different subsistence strategies, including trade, logistical procurement, expanding diet breadth or intensifying processing efforts, and shifting to food production. For the preceramic peoples of Kasapata, the option of procuring resources through trade apparently was not pursued, insofar as obsidian use shows no change, which suggests there was no shift in the degree of long-distance social interaction, and there is no lithic evidence of craft specialization, which suggests no production for bulk commodity exchange.

The logistical mobility index shows no change between Substrata 2A and 2B, indicating that some other strategy underpinned the decreasing mobility of Subtratum 2B times. However, mobility patterns clearly were reorganized to include logistical provisioning in Stratum 3 times, based on the substantial jump in logistical rank between Substratum 2B and Stratum 3. It is likely that one important objective of Stratum 3 logistical forays was hunting large game. This is suggested by the increasing percentages of projectile points and unifacial points, both of which are specifically linked to large game procurement. Nonetheless, logistical provisioning probably was not the only or even the key mechanism supporting the increased sedentism of Stratum 3 time. It was predicted that the expectations of Model 1, the "biface versus expedient core model, would not be met if logistical procurement was the crutch for lower residential mobility. This is obviously not the case: all five measures derived exclusively from this model (measure 1 through 5) show that use of undifferentiated bifaces and prepared cores declined substantially over time, with four of the five clearly showing greatest change between Substratum 2B and Stratum 3. Therefore, while logistical provisioning clearly became more important than in earlier times, it probably served to supplement or complement other evolving subsistence strategies.

An increased reliance on plant foods most likely enabled the lower residential mobility of Substratum 2B times, based on the relative decrease in multifunctional grinding tools, a higher grinding tool fragmentation rate, and a shift away from using grinding tools exclusively with pigments between Substrata 2A and 2B. The shift to greater use of unifacial tools on "soft" materials in Substratum 2B is also compatible with this interpretation. Whether increased reliance meant dietary expansion to include new plant foods, more intensive procurement such that plants contribute more to the overall diet, or changes in food processing efforts remains to be demonstrated.

Further subsistence intensification, likely including both a shift to more intensive food processing and the cultivation of wild or domesticated plants, probably was a key ingredient in the greater sedentism of Stratum 3 times. More, and more intensive, plant food processing is suggested by the greater frequency of grinding tools and the importance of compound grinding tools at this time. The simultaneous increase in pounding tools may also reflect a shift toward more thorough food processing. The most direct evidence for plant cultivation is the initial appearance of unequivocal chopping tools, including one possible hoe, in Stratum 3. The association between chopping tools and horticulture has been documented elsewhere, such as Odell's (1998) Illinois case study, which found that functional chopping tools increased as sedentism and domestication co-evolved. The marked change in measures derived from Model 1, the biface versus expedient core model, between Substratum 2B and Stratum 3 provides indirect evidence for domesticated plant use during Stratum 3 times. This assumes that Parry and Kelly's (1987) observation from other areas of the New World about the correlation between the first emphasis on domesticated plants as dietary staples and the most pronounced changes in biface/core assemblages also applies to the Cuzco Valley. Whether subsistence intensification included herding is unclear. However, the inferred continued importance of large game hunting for Stratum 3 occupations suggests that herding may have been unimportant.

THE DISCREPANCY BETWEEN ACTUAL AND ANTICIPATED RESIDENTIAL MOBILITY

Identifying when anticipated and actual residential mobility are out of sync draws our attention to anomalous time frames worthy of further investigation. The rank indices show that actual and anticipated residential mobility are strongly correlated in Substratum 2A and Stratum3 (see Figure 2.13). This indicates that people using the site during Substratum 2A times clearly expected to, and actually did, stay for a relatively short time, or did not return to the site with any regularity, while those who used it in Stratum 3 times anticipated staying relatively longer or returning regularly, and actually did so. Substratum 2B, however, is clearly anomalous, with anticipated and actual mobility seemingly seriously out of sync. The anticipated mobility ranks indicate much greater mobility compared to Stratum 3, but the actual mobility ranks imply that the Substratum 2B occupations were just as sedentary as those of Stratum 3.

There are two possible explanations for the incongruity, which are not mutually exclusive. First, the apparent divergence may result from more frequent and regular site reoccupation rather than increasing length of stay during individual site-use episodes during Substratum 2B times. Although the actual mobility measures were carefully designed to gauge on-site tool use intensity, it cannot be determined whether nontransported tools were used exclusively during a single occupation. It is equally possible that more regular reoccupation enabled tool reuse, resulting in greater accumulation of wear. However, this would be wear that had accrued over multiple periods of site use. Intentional caching of tools or raw materials would increase the likelihood of reuse, and thus the evidence discussed previously for a shift to on-site artifact caching beginning in Substratum 2B times may also imply more regular site visits.

Second, anticipated and actual mobility truly may have been out of sync. Simply put, something that the people of Kasapata did not anticipate may have changed, causing them to stay longer or return more frequently than they had planned. If so, it may or may not be significant for understanding the long-term process of sedentarization. If the difference results simply from stochastic variation, such as a bumper year for some resource, it may be merely random noise. Alternatively, it might be very significant, as it may mark the onset of a long-term trend that people did not recognize or acknowledge as such when it first began. For example, the initiation of longer-term climatic changes that alter resource distribution and abundance may be perceived as temporary events that do not require people to significantly alter their future plans, or the encroachment of others into one's territory may be seen as a short-term problem rather than a long-term fact. Direct subsistence data, an understanding of human health, regional land use patterns, and paleoenvironmental data could all help shed light on this question by providing information that constrains or narrows possible explanations.

SUMMARY

The residential use of Kasapata became significantly more sedentary during the time frame represented by Strata 2A, 2B, and 3. However, site use during Stratum 3 times may not have been fully sedentary (year-round), as there is evidence to suggest that the sedentarization process continued to develop further at the site after this period. Still to be resolved are the meaning and the long-term significance of notably more sedentary than anticipated occupations in Substratum 2B. The incongruity between actual and anticipated mobility may indicate that the first stage in the sedentarization process in the Cuzco Valley predominantly involved a reduction in long-term mobility that translated into increasingly frequent site reuse. Lower residential mobility during Substratum 2B times probably was supported by increasing reliance on plant foods. The greater sedentism during Stratum 3 times apparently was supported by a number of mechanisms: increasing logistical provisioning, probably with a focus on large game; more intensive plant (and possibly animal) food processing; and plant cultivation, possibly including the use of domesticated plants.

NOTES

1. Throughout this chapter, I refer to Strata 3, 2B, and 2A as "the intact strata," to differentiate them from the overlying, disturbed Strata 4 and 0. However, it should be noted that there is no obvious stratigraphic break between Substrata 2B and 2A in terms of sediment color, texture, and so forth; instead, these substrata are tentatively defined by Jones and Bauer (see Chapter 1) as two vertically separated zones of higher cultural material density within Stratum 2.

2. I was unable to examine all the obsidian debitage, as a few pieces had been removed for sourcing studies by the time I began analysis (see Burger and Glascock, Chapter 5).

3. Bipolar reduction is an informal or uncontrolled technique normally used when raw material is extremely scarce or a costly to replace resource, with the material correspondingly reduced intensively in order to extract as much usable material as possible (Odell 1996).

4. Prepared-core technologies involve the design and intentional shaping of a core prior to use in order to produce portable or material-conservative cores that enable more controlled raw material reduction or standardized flake production (Kelly 1988; Nelson 1991).

5. Exhaustion was defined subjectively as the point at which potentially usable flakes could no longer be removed, based on the size of core.

6. Bag 1081: Unit 10, Level 7.

7. Both from bag 1029: Unit 10, Level 4.

8. Artifacts that have only bifacially retouched edges are classified as unifaces.

9. This classification follows Callahan (1979), with my terms "early," "middle," and "late" stages essentially equivalent to Callahan's Stage 2/initial edging, Stage 3/primarily thinned, and Stage 4/secondarily thinned, respectively.

10. Projectile point styles are described at the end of the flaked stone section.

11. See the section on unifaces for how these categories are defined.

12. Bag 29: surface.

13. Bag 1128: Unit 11, Level 4, Stratum 3.

14. The identification of flake type was subjective and used the criteria outlined in Andrefsky (1998), including platform modification or faceting, platform size, flake curvature, and number and orientation of dorsal scars. I categorized flakes to a specific type only when multiple criteria were clearly identifiable. This conservative approach resulted in a relatively large minority of unifaces being classed as made on "indeterminate" flake types. These were primarily fragmentary tools, and retouched and formed unifaces whose modification obscured some original flake characteristics.

15. Flakes off ground stone tools retain part of the original tool shaping or use modification on the dorsal face.

16. Bag 5: surface.

17. The term "hard" here is presumed to subsume Kooyman's hard (dry antler, bone, dried wood) and medium-hard (fresh wood, fresh antler) material categories; "soft" includes Kooyman's soft (meat, fresh hides, nonfibrous plants) and medium-soft (dry hides, fibrous plants) material categories. Use on soft materials typically results in microchipping scars that are small, narrow, and have feather terminations; it may also generate edge rounding and polish. Use on harder materials generates microchipping scars that are wider, larger, and have step terminations; such use may also generate edge flattening and crushing.

18. The four size grades are essentially equivalent to the following screening mesh sizes: G1—1 inch, G2—1/2 inch, G3—1/4 inch, and G4—1/8 inch. See Ahler (1989) for specifics.

19. Raw count data were not used because the field method of using quarter-inch screens prevented systematic collection of small (G4-sized, 1/8 inch) flakes. This, unfortunately, also makes it difficult to "see" activities that produce primarily just small debris (i.e., <1/4 inch), such as flake tool production or biface finishing via soft hammer or pressure flaking, regardless of which measures are used. Cortex data

also are not used because the archaeological and experimental samples do not appear comparable.

20. Theoretically, this measure should not be significantly biased by screening methodology. Nonsystematic recovery of G4 debris should not substantially alter relative weight percent across size grades because these very small flakes contribute much less to the assemblage's total weight than individual large flakes. Data exploration indicates that the G3+4 wt. percent data from the archaeological samples are comparable to the experimental data sets, although the archaeological samples do consistently appear skewed toward slightly lighter than expected values.

21. This measurement should not be skewed because G4 data have no bearing on how it is calculated; this is supported by data exploration.

22. The ground stone points are discussed later in this chapter under "Other Utilitarian Ground Stone."

23. Material identifications are tentative, as they were not based on geochemical analyses.

24. Bag 1135: Unit 11, Level 5.

25. Bag 1123: Unit 11, Level 4.

26. Bag 1301: Unit 13, Level 1.

27. Bag 1057: Unit 10, Level 5.

28. Bag 336: Unit 3, Level 12.

29. Bag 10100: Unit 10, Level 9.

30. Bag 315: Unit 3, Level 6.

31. Bag 437: Unit 4, Level 10.

32. Bag 1150: Unit 11, Lot 1, Level A.

33. Bag 1123: Unit 11, Level 4, Stratum 3.

34. Bag 10148: Unit 10, Lot 13.

35. Bag 1171: Unit 11, Lot 3.

36. Bag 1091: Unit 10, Level 8.

37. Bag 212: Unit 2, Level 5.

38. Bag 1123: Unit 11, Level 4, Stratum 3.

39. Bag 1016: Unit 10, Level 2, Stratum 3.

40. Another stone bowl fragment was observed on the surface but was not collected and so is not described or included in the artifact tables here.

41. Bag 1139: Unit 11, Level 5.

CHAPTER 3

ANALYSIS OF HUMAN SKELETAL MATERIALS FROM THE SITE OF KASAPATA

RICHARD C. SUTTER AND ROSA J. CORTEZ V.

IN THIS CHAPTER WE report on the human skeletal materials recovered from the Late Archaic Period site of Kasapata (AN-309).[1] We begin with a brief discussion of how the human skeletal data were recorded, and the methods and techniques used in the subsequent analyses. We then report the results of our analyses for individual interments and summary data for all human remains recovered from the site. Finally, we conclude with some possible explanations for the recorded human skeletal data from Kasapata and the inferences that can be drawn about the lifeways of these early people of the Cuzco Valley.

METHODS

Except as noted, our human skeletal data collection procedures strictly followed those outlined in *Standards for Data Collection from Human Skeletal Remains* (Buikstra and Ubelaker 1994). We used this protocol to record human skeletal and dental materials present (both for discrete burials and for commingled human remains), skeletal age criteria, and indicators of sex, osteometric measures, pathological conditions, and epigenetic skeletal traits. Data for human skeletal materials were recorded using both written descriptions and copies of the scoring sheets from the appendices of Buikstra and Ubelaker (1994). Where relevant, osteometric measures were also recorded for adult and subadult skeletal elements in accordance with the descriptions of Buikstra and Ubelaker (1994), again using copies of data sheets from the appendices of that publication.

Similarly, each bone bag examined that contained isolated or commingled human skeletal elements was recorded using procedures and forms from Buikstra and Ubelaker (1994). In addition to recording a basic inventory of each bag's contents, we attempted to determine age at death, sex, and the presence of any pathological conditions or cultural modifications, to aid in calculating the minimum number of individuals present.

Equipment used during our examination of the Kasapata human skeletal materials included a Paleotech osteometric board, Paleotech tape measure, and Mitutoyo needle-nose digital calipers. Photographs were taken with a Pentax K-1000 single lens reflex camera and Ektachrome 200 film. Unfortunately, no formal photographic station was available for standardizing photographic orientations and conditions.

Skeletal Age Estimation

ADULTS

Age at death was determined for each individual by examining the auricular surface (Lovejoy et al. 1985) and costal ribs (Işçan and Loth 1986). No pubic symphyses were present to age for the Kasapata materials, an important lacuna. Ectocranial sutures (Meindl and Lovejoy 1985) and dental wear (Brothwell 1981; Lovejoy 1985; Miles 1962) were used to age specimens only when no other age indicator was available.

SUBADULTS

For subadults, skeletal age was assigned primarily using dental cusp and root development (Ubelaker 1978) and secondarily using long bone measures and their associated developmental ages from Johnston (1962).

If no traditional subadult aging techniques were possible, either because of the absence or the fragmentary nature of the skeletal elements, then other osteometric measurements were used and compared with data from other burials at Kasapata and aged according to comparable measures for other subadults for which traditional means (i.e., dental measurements, long bone lengths) had been used to determine subadult skeletal age at death. In other words, when no maximum long bone length measures were possible for a given burial but the diameters of the long bones or osteometric measures for other elements (dimensions of either the basilar or petrous portion of the occipital, the ilium, etc.) could be measured, then these measurements were compared with those for other skeletally aged materials from the site for which the alternative measures were also recorded.

Sex Estimation

ADULTS

Sex was determined for each individual by examining traditional nonmetric pelvic and cranial indicators of sex (Buikstra and Ubelaker 1994). General size and robusticity were also examined but were not given as much weight as pelvic and cranial indicators unless no other sexing criteria were available.

SUBADULTS

Although skeletal sex assignment for subadults has traditionally been thought to be dubious at best, recently developed subadult sexing techniques proposed by Schutkowski (1993) have proved useful when independently tested on a sample of prehistoric known-sex autopsied subadults from the Andes (see Sutter 2003). For this study, morphological variation in the expression of the subadult sexing traits proposed by Schutkowski (1993) was recorded on a scale of 1 to 5, using scoring methods described by Sutter (2003).

ACHIEVED ADULT STATURE

Generally, stature estimates are not made for subadults in bioarchaeological reports. Achieved adult stature was estimated using Trotter and Gleser's (1958) formula developed from long bone measurements in Mongoloids. Because of the discrepancies that exist between stature estimate formulas developed by Trotter and Gleser and those developed by others, we provide the measurements for each long bone. Preference was given to bones of the lower limb, followed by the humerus and radius. Because the ulna generally has the largest standard error estimates associated with the relevant equations, stature estimates based on this bone are provided only when no other measurable long bones were available.

Skeletal and Dental Pathologies

All skeletal and dental pathologies and abnormalities were recorded using the procedures and data sheets from Buikstra and Ubelaker (1994). Our emphasis was on accurate description of the diagnosis of pathologies, unless it was obvious.

Cultural Modifications

We recorded premortem, perimortem, and postmortem cultural modifications. Premortem cultural modifications, such as tattooing, piercings, and cranial deformations, were all common in the prehistoric Andes (Allison 1985; Allison, Gerszten, et al. 1981; Allison, Lindberg, et al. 1981; Bórmida 1966; Cobo 1990 [1653]). Because preservation at the site did not permit the observation of potential tattoos and body piercings, we follow the protocol discussed in Buikstra and Ubelaker (1994) for the recording of cranial deformations.

Perimortem cultural modifications, generally caused by unhealed cut marks made on wet bone, are those that are made to an individual shortly before or shortly after the time of death. This noncommittal classification reflects the uncertainty associated with identifying whether such cut marks were the cause of death or were made shortly after death.

Postmortem cultural modifications were also common in the prehistoric Andes and included complex mummification practices (Allison 1985; Arriaza 1995), cremation and toasting of the dead (Benfer and Edwards 1988; Bird 1988; Quilter 1989), the placement of pigments on soft or hard tissues (Nelson 1998) mutilation

(Standen and Santoro 1994), and secondary interments (Nelson 1998; Verano 1995).

Epigenetic Dental Traits

Nonmetric or epigenetic dental traits were recorded using casts and descriptions from the Arizona State University Dental Trait Recording System. Scoring procedures are outlined in Turner et al. (1991).

Calculation of the Minimum Number of Individuals

Given the large number of commingled human skeletal elements we encountered during our inspection of human osteological remains from Kasapata, we estimated the minimum number of individuals (MNI) for human skeletal materials from the site. As is commonly done to calculate the MNI, we compared the age, sex, and side for each of the commingled skeletal elements with those present for discrete materials (Bökönyi 1970; Chaplin 1971:69–75). The MNI was calculated in this fashion for the site as a whole and by unit. While we are aware of the issues related to calculating an aggregate MNI value by unit (such as the possibility of some individuals' elements being represented in multiple units), we agree with Brian Bauer's assessment that the excavated units were far enough apart to make it unlikely that human remains from one unit would have migrated to an adjacent excavated unit.[2] With the exception of Units 10 and 11 (which were placed adjacent to Units 3 and 4, respectively), the test units at Kasapata were spaced 20 m apart (see Jones and Bauer, Chapter 1).[3] For those who might take issue with our summing of MNI values by unit, we also calculate the MNI for the overall site.

INVENTORY OF DISCRETE BURIALS

The human skeletal materials from Kasapata were examined from July 30 through August 4, 2000, in Cuzco, Peru. Our report includes those burials identified during excavation. We also went through all bags that contained faunal remains.[4] Some of the human skeletal material reported here was not identified as such during excavation or was intermingled with identified burials. We consulted the excavator's field notes, plans, and profiles only after we had completed our analyses. We mention this because many of the inferences we made, based on our independent analysis of human skeletal materials, were corroborated by the excavator's observations.

Burial features were identified by excavators in Units 2, 3, and 10. With one noteworthy exception (Unit 10 S/N), we do not describe isolated or commingled elements in this section of our report unless they were elements associated with burial features identified by the excavators. We do, however, deal with isolated and commingled elements in our calculations of the minimum number of individuals.

THE HUMAN REMAINS OF UNIT 2

Bag 224: Level 8 (Substratum 3B: Late Occupation)

According to the field notes, no. 224 represents the remains of a relatively incomplete infant in a good state of preservation. The excavator noted that most of the major long bones were present for this burial. These impressions were generally confirmed by our inspection of no. 224's skeletal materials. We recorded all left long bones, the left ilium, and two left ribs for no. 224. In addition, an adult left proximal phalanx was associated with those from the identified burial.

AGE ESTIMATE. Our age estimate for no. 224 is based on subadult long bone measurements provided by Johnston (1962). According to long bone measures made for no. 224 (Table 3.1), we estimate that the individual was between 6 months in utero and newborn in age.

SEX ESTIMATE. Subadult skeletal sexing features established by Schutkowski (1993) were scored for no. 224 according to procedures described by Sutter (2003). Given the uniformly female morphological features for no. 224 (Table 3.2), it is likely that this individual was female.

SKELETAL AND DENTAL PATHOLOGIES. Inflammatory reactions consistent with periostitis were noted on muscle attachments of the left long bones of this burial. No other pathologies were detected.

CULTURAL MODIFICATIONS. None apparent.

ADDITIONAL COMMENTS. None.

SUMMARY OF NO. 224

The skeletal elements of no. 224 represent either a late-term fetus or a newborn that may have been female. There was no evidence to suggest any cultural

TABLE 3.1. Long bone skeletal elements, their measurements, and age-at-death estimates for subadult burials from Kasapata.

	Long Bone Measurement												
Specimen	R Humerus	L Humerus	R Ulna	L Ulna	R Radius	L Radius	R Femur	L Femur	R Tibia	L Tibia	R Fibula	L Fibula	Skeletal Age
224	—	61.9 mm	—	57.6 mm	—	50.7 mm	—	71.2 mm	—	63.2 mm	—	—	6 mo in utero – newborn
317	62.7 mm	64.7 mm	—	60.4 mm	51.6 mm	—	—	74.4 mm	63.9 mm[a]	—	—	—	Newborn
1021	—	—	—	—	—	—	70.2 mm	70.1 mm	62.0 mm[a]	62.2 mm[a]	60.0 mm[a]	60.0 mm[a]	6 mo in utero – newborn
10134-B	—	—	—	—	—	—	—	77.8 mm	—	—	—	—	Newborn
1161	113.6 mm[a]	114.4 mm	101.1 mm	—	89.3 mm[a]	—	—	—	—	—	—	116.4 mm[a]	18 mo – 2 years
1162	68.8 mm[a]	—	—	66.6 mm[a]	—	57.5 mm[a]	81.4 mm	—	—	71.0 mm	—	—	Newborn – 6 months
1421	—	—	—	—	46.4 mm	—	—	63.8 mm	—	—	—	—	6 mo in utero – newborn
1422	57.0 mm	55.7 mm	53.6 mm	—	46.8 mm	—	—	—	—	57.1 mm	—	—	6 mo in utero – newborn

[a]Measurement represents an estimate from an incomplete element.

TABLE 3.2. Nonmetric subadult sex characteristics and their expressions for subadult burials from Kasapata.

	Nonmetric Character							
Specimen	Iliac Curvature	Sciatic Notch Shape	Sciatic Notch Depth	Arch Criteria	Auricular Elevation	Gonial Eversion	Mandibular Arcade Shape	Mental Protuberance
224	Very female	Very female	—	Very female	Very female	—	—	—
1021	Slightly female	Very female	—	Very female	—	—	—	—
1160	—	Ambiguous	Ambiguous	—	—	Slighly female	—	Slighly female
1161	Very male	Very male	Slightly male	—	—	Slightly female	Very female	Slightly female
1162	Slightly male	Slightly male	Very male	Slightly male	—	—	—	—
1163A	Very female	Very female	Very female	Very female	—	—	—	—
1163B	Very female	Very female	Very female	Very female	—	—	—	—
1421	Very female	Very female	Very female	Very female	—	—	—	—
1422	—	—	—	—	—	Very female	Ambiguous	Ambiguous

modifications. There may have been some systemic infection causing inflammatory reactions where muscles attached to the long bones of the individual; however, it is not possible to make a diagnosis with the evidence available.

THE HUMAN REMAINS OF UNIT 3

Bag 317: Level 6, Feature 3-1 (Stratum 3: Late Occupation)

According to the excavator's notes, burial no. 317 represents a relatively complete infant in fair condition. Upon inspection we found that no. 317 was relatively complete. Numerous skull fragments were present but highly fragmented, with a measurable petrous portion, baso-occipital, and right parietal centers of ossification; a partial (ca. 60 percent) left mandible and the left mandibular deciduous incisors and molars were present. Measurable right and left clavicles and measurable upper left and right limbs were also present. The left femur was measurable; however, the right femur was missing its proximal and distal ends. Neither the left (ca. 75 percent complete) nor the right (ca. 95 percent complete) tibia was measurable, owing to missing ends, while both fibulae were missing. The left (ca. 85 percent complete) and right (ca. 25 percent complete) scapulae were both present but immeasurable. Two unidentified thoracic vertebrae were present and complete. Eleven left ribs were present and complete, while six complete right ribs and six additional right fragments were also present. There were also a number of unidentifiable (>1 mm) bone fragments.

AGE ESTIMATE. Dental development of the mandibular deciduous incisors and molars indicates that Burial 317 was aged between newborn and 6 months when it died; the crowns of the deciduous incisors were complete, while the crowns of the first and second deciduous premolars were nearly complete. We also provide age estimates using long bone measurements for no. 317 (Table 3.1). Given the general agreement of both skeletal and dental subadult aging criteria, we conclude that no. 317 was likely a newborn.

SEX ESTIMATE. Owing to the fragmentary nature of the relevant sites, it was not possible to score any of the subadult sex characteristics.

SKELETAL AND DENTAL PATHOLOGIES. None observed. All long bones showed normal signs of remodeling associated with growth.

CULTURAL MODIFICATIONS. None apparent. This individual did not show evidence of cranial deformation.

ADDITIONAL COMMENTS. An inventory for deciduous dentitions was recorded for no. 317.

SUMMARY OF NO. 317

These remains represent a newborn of undetermined sex. There is no evidence to suggest either skeletal pathologies or cultural modifications.

Bag 322: Level 6, Feature 3-2 (Stratum 3: Late Occupation)

According to the field notes, no. 322 is an adult burial in fair condition. The individual was buried in either a fetal or a supine position at the edge of the excavation unit. Only those elements in Unit 3 were removed for subsequent analysis.

During our inspection of the burial, we identified a partial right parietal (>50 percent complete), a complete left parietal, and a partial (ca. 75 percent complete) maxilla. For the postcranial skeleton, both left and right clavicles and scapulae were present but incomplete. Numerous cervical, thoracic, and lumbar vertebrae were recovered in varying states of completeness. Both left and right first and second ribs were present but incomplete (ca. 75 percent), while both right and left ribs III through X were present but highly fragmented. The sternum was complete.

Both left and right humeri, ulnae, and radii were present and nearly complete. Three unsided carpals, five unsided metacarpals, and two unsided phalanges were present for the hand. For the lower limb, with the exception of one unsided tarsal, six unsided metatarsals, and two unsided phalanges, only the proximal epiphysis and proximal third of the diaphysis of the left tibia were present.

Eight teeth (left UI2, UP2, UM1, right UP2, UM1, UM2, and left LI2, LC) were observed. The lower teeth were loose, while the upper teeth were still embedded in their respective tooth sockets.

AGE ESTIMATE. Relatively few skeletal elements useful for skeletal aging were present. Among those present, we noted that the costal ribs corresponded to Phase 5 (34.4–42.2 skeletal years) (Işcan and Loth 1986), while the epiphysis of the medial clavicle was fused (>27 skeletal years). No arthritic lipping was noted on any of the vertebral bodies. Based on these criteria, we suggest that no. 322 was approximately 35–45 skeletal years of age.

SEX ESTIMATE. It was not possible to evaluate any of the traditional adult sexing criteria for no. 322; however, both the size and robusticity of all long bones strongly suggest this individual was a male. Further, the transverse diameter of the humeral head (43.9 mm) was within the range of reported diameters for adult males of the New World (Dittrick and Suchey 1986).

STATURE ESTIMATE. Generally, it is not recommended that stature estimates be made from long bones of the upper limb, unless no other elements are available (Trotter and Gleser 1958:120). This is especially true of the ulna, which has the largest standard error estimates of any of the long bones. However, in this case, given the absence of other relevant long bone measures, we estimated no. 322's stature using Trotter and Gleser's (1958) formulas for ulna lengths of Mongoloid males (Table 3.3). According to this single measure, the stature of no. 322 was somewhere between 158.7 cm (5 ft 2.5 in) and 168.1 cm (5 ft 6 in).

SKELETAL AND DENTAL PATHOLOGIES. While no skeletal pathologies were observed on any of the skeletal elements of no. 322, a lingual abscess was noted on the lingual surface of the left maxilla at the level of the first maxillary molar. Furthermore, three linear enamel hypoplastic areas were observed on the left mandibular canine (LLC). Finally, the dental wear, a normal physiological age- and diet-related process, was severe, but similar to dental wear levels noted for other pre-agricultural populations (Hinton 1981; Smith 1984).

CULTURAL MODIFICATIONS. None apparent.

ADDITIONAL COMMENTS. Epigenetic dental traits were recorded for no. 322.

TABLE 3.3. Long bone skeletal elements, their measurements, and stature estimates for adult burials from Kasapata.

	Specimen		
	322	10121	
Long Bone			Estimated Stature
L Ulna	24.7 cm	—	163.4 ± 4.6 cm
R Ulna	—	25.0 cm	164.5 ± 4.66 cm
L Humerus	—	29.9 cm[a]	163.2 ± 4.16 cm

[a]Measurement represents an estimate from an incomplete element.

SUMMARY OF NO. 322

The remains represented an adult male approximately 35-45 years old who stood between 158.7 and 168.1 cm tall. With the exception of a lingual abscess and three linear enamel hypoplasias, no. 322 did not exhibit any evidence of skeletal pathology or cultural modifications.

THE HUMAN REMAINS OF UNIT 10

Bag 1017-A: Level 2 (Substratum 3B: Late Occupation)

The excavator's notes describe this burial as an incomplete adult in fair condition. This burial was never assigned a feature number, and apparently the integrity of this burial was low, because the bones from the burial were scattered southward from the northwest corner of the unit. The excavator stated that the burial was associated with the sheet midden and that there was no evidence of a pit or burial goods.

Our inspection of the human skeletal elements collected for no. 1017 revealed that two individuals were represented, one an adult female, with the majority of the skeletal elements present, and the other an adult male, with far fewer elements present. On subsequent inspection of the excavator's plan, it was apparent that at least two individuals were represented by no. 1017. We arbitrarily assigned no. 1017-A to the adult female and no. 1017-B to the adult male. We discuss no. 1017-B separately below.

Cranial elements identified for no. 1017-A include the right temporal (including the temporomandibular joint) and a portion of the left mandible.

Both the right and left clavicle were present and well preserved, while the left and right scapulae were present but in poor condition. Although the patella and sacrum were not present, the left side of the os coxae was represented by a poorly preserved ilium, while the right os coxae was represented by a poorly preserved ilium and acetabulum and a fairly well-preserved ischium and auricular surface. The pubis was present but severely eroded. All seven cervical vertebrae were identified and in fair to excellent condition, while six of seven thoracic vertebrae recovered were in excellent condition. Only four lumbar body fragments and three arch fragments were identified. Both left and right ribs I and II were recovered in fair to excellent condition, while eight left (two complete) and nine right (five complete) ribs III to X were examined. There were also 17 unsided rib fragments. We believe all of these elements belong to no. 1017-A, given similarities in their general color, degree of preservation, absolute size, and robusticity.

For the long bones of 1017-A, the distal third of the left humerus and all but the proximal and distal ends of the right humerus were present and in fair condition. For the left radius, all but the distal third was present and in excellent condition. The right radius and both left and right ulnae were missing. The proximal and middle third of the left femur were present, while all elements but the proximal and distal ends of the right femur were present. The middle and distal third of the left tibia were present and in excellent condition, while all elements but the proximal epiphysis of the right tibia were present. The right tibia was in fair to excellent condition. Although the left fibula was missing, all elements but the proximal and distal ends of the right fibula were present and in excellent condition. Four unsided phalanges of the hand were recovered, while the foot was represented by four unsided metatarsals and one unsided phalanx.

AGE ESTIMATE. The age estimate for no. 1017-A is largely based on age-related morphological changes of the left auricular surface; however, other secondary and tertiary indicators were also considered.

The auricular surface of no. 1017-A was evaluated at Phase 4, indicating that the individual was aged between 35 and 40 skeletal years when she died. The epiphysis of the medial clavicle was fused, indicating the individual was older than 27 skeletal years, while the bodies of the lumbar vertebrae and other skeletal elements all retained a youthful, arthritis-free appearance.

SEX ESTIMATE. The sex estimate for no. 1017-A was principally based on a very female-appearing morphology for the greater sciatic notch and the preauricular sulcus. The general size and robusticity in comparison with adult males identified at the site also suggest that no. 1017-A was a female.

STATURE ESTIMATE. Because relevant elements are missing or incomplete, no stature estimate is possible for no. 1017-A.

SKELETAL AND DENTAL PATHOLOGIES. A number of skeletal pathologies were noted for no. 1017-A. The right acetabulum was shallow and the superior margin of the acetabulum had a diffuse lesion with a poorly defined margin and some sclerotic healing suggestive of either dislocation or some kind of trauma to the right hip.

FIGURE 3.1. Specimen no. 1017-A. Note sclerotic scar on the middle third of the anterior mid-shaft of the right tibia.

The anterior portions of the right fibula and both right and left tibial shafts demonstrated light but active periostitis. There was a sclerotic scar on the middle third of the anterior mid-shaft of the right tibia (Figure 3.1). The bilateral nature of this periosteal reaction suggests a more systemic etiology for the pathology as opposed to a unilateral pathology that might be indicative of trauma.

Only the maxillary right second and left first molars were present for no. 1017-A. Both exhibited moderate levels of occlusal attrition that typifies pre-agricultural societies for individuals in their late thirties (Scott score for LUM1 = 34 and for RUM2 = 20). Neither tooth showed any other kind of pathology, nor was any alveolar bone present to evaluate for abscesses or premortem tooth loss for the other teeth.

The canine of another individual was also associated with the remains from no. 1017. The incomplete root suggests the canine was from an individual who would have been 10 dental years of age. The canine showed no dental wear but had two linear enamel hypoplasias.

CULTURAL MODIFICATIONS. None apparent.

ADDITIONAL COMMENTS. Epigenetic dental traits were recorded for no. 1017-A.

SUMMARY OF NO. 1017-A

The skeletal elements of no. 1017-A represent one of two individuals collected during the excavation of this burial, which had been interred in a sheet midden. Number 1017-A was an adult female who likely died in her mid- to late thirties. She was slender and likely had suffered some mild systemic infection for quite some time that caused bilateral periostitis in her lower limbs. She also likely walked with a limp due to trauma to her right hip. No other evidence for either skeletal pathologies or cultural modifications was noted. Owing to a lack of measurable long bones, it was not possible to evaluate the stature of no. 1017-A.[5]

Bag 1017-B: Level 2 (Substratum 3B: Late Occupation)

As noted earlier, more than one individual was represented by the skeletal elements associated with Burial 1017. Therefore, the remains of the second, probably male, individual were arbitrarily assigned no. 1017-B. This individual was represented by a partial (ca. 25 percent complete) and poorly preserved mandible consisting of four anterior sockets (RLC through LLI1), a complete and well-preserved right humerus, the proximal epiphysis of the left ulna, a well-preserved proximal and middle third of the left tibia, poorly preserved proximal and middle third of the right tibia, and the middle third of both the right and left fibular shaft. We believe all these elements belong to the same individual, given their general color, degree of preservation, size, and robusticity.

AGE ESTIMATE. No skeletal adult aging sites were available for no. 1017-B, and therefore we can only provide a general age estimate. For the right humerus, there is no evidence of the epiphyseal plate, and none of the articular surfaces of the long bones demonstrated signs of osteoarthritis, suggesting that this was a young to middle-aged adult (20–35 years).

SEX ESTIMATE. The mandibular protuberance was large and extremely robust, as were the other long bone fragments present for this individual. Based on this evidence, we suggest that no. 1017-B likely represents a male.

STATURE ESTIMATE. It is unclear why, but no long bone measurement of the right humerus was made.

SKELETAL AND DENTAL PATHOLOGIES. The anterior shaft of the left tibia exhibited an active periosteal reaction. While not pathological per se, the deltoid tuberosity of the right humerus was extremely robust, indicating that no. 1017-B performed a great deal of right upper limb physical activity.

No teeth were associated with the mandibular fragment of no. 1017-B. However, the alveolar bone for the left mandibular central incisor (LLI1) had completely resorbed, indicating the tooth had been lost pre-mortem.

CULTURAL MODIFICATIONS. None apparent.

ADDITIONAL COMMENTS. None.

SUMMARY OF NO. 1017-B

The elements representing no. 1017-B were of an adult male who experienced premortem tooth loss of his left central incisor and had an active periosteal lesion on his left anterior tibial shaft. No other pathologies or cultural modifications were apparent.

Bag 1021: Level 3, Feature 10-1 (Substratum 3B: Late Occupation)

According to the excavator's notes, no. 1021 (Feature 10-1) represents the lower limbs of a well-preserved infant burial. Our inspection of this burial is in agreement with these observations. We encountered an unsided rib and both right and left ilia, femora, tibiae, and fibulae. In all instances it was possible either to measure or to estimate the measurements for these bones.

AGE ESTIMATE. Age estimates for no. 1021 were made using long bone measurements (Table 3.1). Given the consistency of all long bone age estimates for no. 1021, we suggest that this individual died sometime between 6 months in utero and around the date of birth.

SEX ESTIMATE. We were able to observe subadult skeletal sexing criteria established by Schutkowski (1993) and Sutter (2003) for Burial 1021 (Table 3.2). However, given the poor performance of iliac curvature and the acceptable performance of both sciatic notch morphology and the arch criteria for subadult sexing (see Sutter 2003), we can only tentatively suggest that no. 1021 may have been a female.

SKELETAL AND DENTAL PATHOLOGIES. The unsided rib exhibited abnormal shape along the body of the rib. Although we are unclear as to the exact cause of this abnormal shape, it is suggestive of osteomyelitis.

CULTURAL MODIFICATIONS. None apparent.

ADDITIONAL COMMENTS. None.

SUMMARY OF NO. 1021

Our assessment of the lower limb elements present for no. 1021 (Feature 10-1) indicates that it represents either a late-term fetus or a newborn that may have been female. No pathologies or cultural modifications were apparent.

Bag 1088: Level 7, Feature 10-4 (Substratum 2B: Early Occupation)

The excavator noted that no. 1088 is an incomplete adult burial consisting largely of poorly preserved skull fragments. Only the portion of the burial that entered Unit 10 from the north was excavated and removed for analysis. In addition to numerous skull fragments, we also identified three fragmented vertebrae (one cervical, one thoracic, and one lumber), a left clavicular fragment, and the proximal end of a left tibia.

The skull fragments that were identifiable included posterior, articulated fragments of the right and left parietals, the posterior petrous and squamosal portion of the left temporal bone, and the right squamosal portion of the occipital bone (lambdoidal suture edge). The skull bones were thick, and the muscle attachments on the occipital bone's superior nuchal line were robust.

AGE ESTIMATE. Although no definitive age indicators were present, the sagittal, lambdoidal, and temporal sutures were all completely open, suggesting that this individual was a relatively young (<35 skeletal years) adult. Further, none of the bodies and articular surfaces of any of the vertebrae exhibited age-related osteoarthritic changes.

SEX ESTIMATE. Based on the thickness of no. 1088's skull bone fragments and the robustness of the muscular attachments on both the occipital and tibial fragments, this individual was likely a male.

STATURE ESTIMATE. None was possible.

SKELETAL AND DENTAL PATHOLOGIES. None observed.

CULTURAL MODIFICATIONS. None apparent. Of note, the skull fragments did not exhibit evidence of cranial deformation.

ADDITIONAL COMMENTS. Some rodent gnawing was apparent on the right tibial fragment of no. 1088.

SUMMARY FOR NO. 1088

This burial likely represents a relatively young adult male. No additional observations were possible from the limited number of skeletal elements available for study.

Bag 10121: Level 7, Feature 10-2, Level A (Substratum 2B: Early Occupation)

The excavator described no. 10121 (Feature 10-2) as a relatively complete but highly fragmented adult burial that exhibited a clear pathology. After conducting our examination of the skeletal remains from this burial, we learned that the excavator suspected that stones located on top of the burial likely represented a cairn feature.

Most of the skull bones were present and in excellent if highly fragmented condition (Figure 3.2). The only incomplete or missing skull bones were the sphenoid and palatine bones. The left clavicle was complete, but the right was missing.

FIGURE 3.2. The skull and upper torso from bag 10121 (Feature 10-2) during excavation.

The left scapula was missing, while the right scapula was present and in fair condition. Both patellae were missing, but the sacrum was present and well preserved. Both the left and right os coxae were present and in excellent condition, with the exception of the pubes, which were missing. Both the right and left acetabula were present, but only the right auricular surface was preserved. All of the vertebrae were present and in excellent condition. Both right and left ribs I, II, XI, and XII were present. Numerous other unsided rib fragments were inspected.

Of the long bones, the left humerus was complete and in excellent condition, but only the middle third of the right humeral shaft was present. The proximal and middle third of the left radial shaft were recovered; the right radius was complete. The left ulna was missing, but the right ulna was complete and in excellent condition. All elements but the proximal epiphysis of both the right and left femora were present, while the proximal epiphyses of both right and left tibiae were present. Only the distal two-thirds of the left tibia and the distal one-third of the right tibia were recovered. The distal two-thirds of the left fibula was identified, while all but the proximal epiphysis of the right fibula was present. Four left and four right carpals were recovered, as were five left and five right metacarpals. We also identified four unsided phalanges. For the foot, we identified five left and five right tarsals, five left and five right metatarsals, two left and one right phalanges, and four unsided phalanges.

Age Estimate. For age estimation, we were able to evaluate the right auricular surface, two costal ribs, and both external and internal cranial vault sutures, as well as the incisive suture of the palate. The auricular surface was scored as Phase 5 (40–44 skeletal years), and the two preserved sternal ends of costal ribs were also scored as Phase 5 (34.4–42.3 skeletal years). All of the cranial sutures examined were open, suggesting a relatively youthful individual. Two of the lumbar vertebral bodies, L3 and L5, exhibited osteophytes consistent with age-related osteoarthritic changes. Based on these criteria, we suggest that no. 10121 was somewhere between 35 and 45 skeletal years of age when he died.

Sex Estimate. All pelvic and skull indicators of no. 10121 exhibited strongly male features. The sexing features examined included the ventral arc, subpubic concavity, ischiopubic ramus, greater sciatic notch, and preauricular sulcus, while for the skull the nuchal crest, mastoid processes, supraorbital margins, glabella, and the mental eminence (chin) were scored.

Stature Estimate. Stature estimates were made for no. 10121 using Trotter and Gleser's (1958) formulas for Mongoloid males (Table 3.3). Insofar as the two elements available for stature estimation were from the upper limb, there is a wide range for no. 10121's stature estimate. According to the measurements recorded, no. 10121 would have stood between 159.0 and 169.2 cm tall.

Skeletal and Dental Pathologies. A number of skeletal and dental pathological conditions were recorded for no. 10121. In light of the skeletal age at death, it is likely that 10121 suffered from some osteoarthritis. The third lumbar vertebra (L3) had very small osteophytes projecting anteriorly from the superior portion of its body. Lumbar vertebra five (L5) had a marked ring of osteophytes projecting horizontally from the superior and anterior portion of its body. In addition, L5 exhibited some anterior compression.

For the os coxae, the superior rim of the right acetabulum exhibited some distortion, with small, porous erosion and a poorly defined border (Figure 3.3). This state is consistent with osteochondritis, a condition in which underlying articular cartilage is traumatized in some way and leaves the underlying bone exposed. Osteochondritis can be caused either by direct trauma to the joint in question or by excessive or unusual stress on the joint.

The right femur exhibited the most obvious pathology: beginning approximately at the level of the distal halfway down the shaft of the femur and terminating at the level of the distal epiphysis, both woven bone and some intermittent sclerotic healing were noted

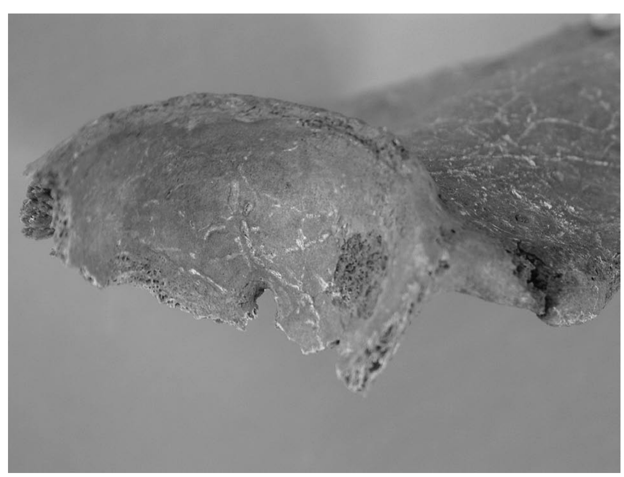

Figure 3.3. The os coxae of Burial 10121. Some distortion is evident, along with small, porous erosion and a poorly defined border.

FIGURE 3.4. The right femur of Burial 10121, exhibiting woven bone and some intermittent sclerotic healing.

FIGURE 3.5. The right fibula of Burial 10121, showing a healing periosteal reaction.

(Figure 3.4). Approximately one-third of the way from the distal end of the femur were two cloacae, one on the anterior surface of the shaft and the other on the posteromedial aspect. Both cloacae were approximately 2 cm long by 1 cm wide and had smooth edges and a clearly visible drainage track along the sclerotic shaft of the femur. The shape of the femur was abnormally thick. Such a condition is often associated with chronic osteomyelitis, a condition that often results either from direct trauma or from a blood infection that introduces a bacterial infection (usually either *Staphylococcus* spp. or *Streptococcus* spp.) into the marrow cavity of the bone in question (Carek et al. 2001; Ortner and Putchar 1985). In the case of no. 10121, the exact cause is difficult to determine, but, as we discuss later, we believe the osteomyelitis exhibited by no. 10121 resulted from a systemic blood infection.

The right fibula exhibited a light and healing periosteal reaction on the medial and lateral aspects of the distal third of the shaft (Figure 3.5). Fine spicules and bone deposition were also noted approximately one-third of the way down the posterior aspect of the fibular shaft.

We suggest that the osteochondritis exhibited on both the right acetabulum and the proximal phalanx of the right toe was ultimately caused by the abnormal stress placed on these joints from the limping that would have resulted from the osteomyelitis of the right femur.

The dentition of no. 10121 also exhibited a number of pathologies. Observations were possible for all teeth or alveolar bone, with the exception of the mandibular third molars, which were congenitally absent, and LUI2, LLI2, and RLI1, which were absent post-mortem. For the maxillary dentition, the first right maxillary molar (RUM1) was absent pre-mortem, as evidenced by the alveolar resorption of its tooth socket. Associated with the alveolar bone of RUM1 was a large abscess on both the buccal and lingual aspects of the alveolar process. LUM1 exhibited a gross dental carie that had destroyed most of the occlusal surface. Large abscesses affected both the buccal and the lingual aspects of the alveolar bone of LUM1.

The mandibular dentition of no. 10121 also exhibited a number of pathologies. LLP1 had a small occlusal carie, while LLM1 had a large carie on the mesial aspect of the cemento-enamel junction. Abscesses were noted on the lingual surface of the alveolar process for LLM2 and on the buccal surface of the LLM1 socket.

Occlusal wear for all teeth was heavy, with Scott (1979) occlusal wear scores of 19 for both UM2s, while the mandibular M1s and M2s had scores of 36 and 31, respectively. All anterior teeth (incisors, canines) exhibited Smith wear scores of either 6 or 7. Because of the excessive wear exhibited on the incisors and canines, no linear enamel hypoplasias were noted.

CULTURAL MODIFICATIONS. During our examination of no. 10121 we noted a number of small burns on the anterior thoracic vertebral bodies and on both the internal and external surfaces of some of the fragmented ribs. At first we were uncertain whether the blackened, eroded areas on the first few bones were burned or whether we were simply seeing an instance of carbonized wood (tree roots, etc.) that might have worked its way into the bone. However, on further inspection we found lower thoracic vertebral bodies and external rib surfaces with grayed, chalky margins, indicating that low-intensity coals had been in contact with the remains of no. 10121.

The aforementioned observations were made before we consulted the excavator's notes. After we consulted the field notes and burial plans, it became apparent that the suspected cairn feature was indeed just that. We suspect that heated stones had been placed on top of no. 10121, resulting in the charring of some skeletal elements. The placement of hearth stones and smoldering coals with preceramic human burials is not unknown in the Andes (see Benfer and Edwards 1988; Bird 1988; Chauchat 1988; Quilter 1989:70–85).

None of the skull fragments present suggested cranial deformation of no. 10121.

ADDITIONAL COMMENTS. Epigenetic dental traits were recorded for no. 10121.

SUMMARY FOR NO. 10121

These remains represent a male adult who was between 35 and 45 skeletal years of age at death. He would have stood between 159.0 and 169.2 cm tall. He suffered from chronic osteomyelitis of the right thigh that likely caused him to walk with a severe limp, thus causing the osteochondritis noted on the right hip and proximal bone of the big toe. He suffered from moderate osteoarthritis of the lower back. His teeth exhibited advanced stages of tooth wear, and he had cavities on three of his teeth (one of which was extremely large) and numerous abscesses on both the upper and lower jaw.

The articular surface of the proximal phalanx on the first digit of the right foot exhibited an erosion with a well-defined border (Figure 3.6). As for the right acetabulum of no. 10121, this pathological finding is consistent with osteochondritis, a condition that occurs when the subchondral bone has been subjected to either trauma or abnormal (or excessive) use.

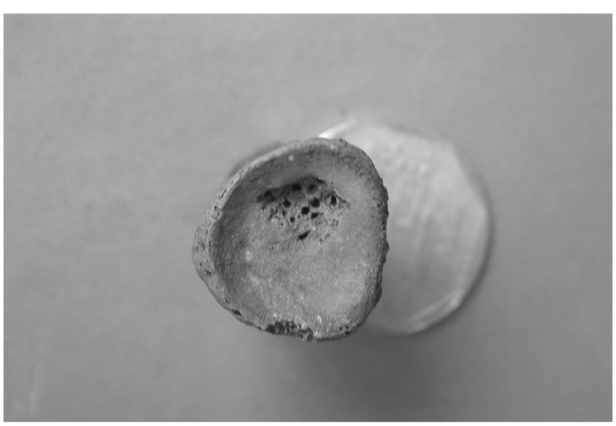

FIGURE 3.6. Burial 10121. The articular surface of the proximal phalanx on the first digit of the right foot exhibited an erosion with a well-defined border.

FIGURE 3.7. Feature 10-3 (bag 10134-A) after removal of the cairn.

Bag 10134-A: Level 8, Feature 10-3 (Substratum 2B: Early Occupation)

During the course of the excavation, two separate burials were mistakenly designated no. 10134. They are easily distinguished, however, since one is an adult and the other is an infant. We assigned no. 10134-A to the adult, which was the first of the two individuals we encountered during our examination of the human skeletal remains from the site. The infant burial is given the designation no. 10134-B in the context of our report.

The excavator described no. 10134-A as a complete adult burial in a poor state of preservation. Our study of no. 10134-A disclosed that the skeletal elements were highly fragmented but that preservation was very good to excellent (Figure 3.7).

For the skull, both right and left parietals, temporals (including the temporomandibular joint), sphenoids, zygomatics, and the maxilla were present and in excellent condition. The mandible, frontal, and occipital were also present and in excellent condition. The only skull bones missing were the palatines.[6]

Both right and left clavicles were present. Although the left scapula and patella were missing, the right counterparts of these bones were present and in good condition. The sacrum was present but poorly preserved.

Both right and left sides of the os coxae were present, but the pubes were missing. All other aspects of the os coxae were well preserved.

For the vertebrae, all cervical vertebrae were present except for C7. For T1–T9, only three complete vertebrae were identified, while three of the five lumbar vertebrae retained centra and neural arches.

The sternum was not present. Both right and left ribs I were present, while only the right rib II was present, in fair condition. For ribs III through X, four left and seven right ribs were present. The remaining rib elements were too highly fragmented to determine side or position.[7]

Among the long bones recovered, both left and right humeri were present but fragmented. Only the proximal epiphysis of the left radius was also recorded, while the proximal half of the left ulna was present. The left femur was missing the proximal and distal ends, while the right femur was highly fragmented, but all portions of the bone are present. Both the left and right tibiae were highly fragmented and missing the distal epiphyseal ends, while the right and left fibulae were missing both the proximal and distal epiphyses.[8]

For the hands, we identified six unsided carpals, five unsided metacarpals, and six unsided phalanges.[9] For the feet, both left and right talus and calcaneus bones were present, but fragmented and only in fair condition. It was not possible to evaluate the number of other tarsals, metatarsals, and phalanges because of the presence of soft tissue of the feet (see "Additional Comments").

Age Estimate. Our age estimate for no. 10134-A is primarily based on the morphology of the auricular surface (Phase 3), which corresponded to an adult between 30 and 35 skeletal years of age. We also note that all of the cranial sutures were open, only a relatively moderate amount of occlusal wear was exhibited on the teeth, and the individual did not have osteoarthritis. All of these age indicators are consistent with a relatively young adult, between 30 and 35 skeletal years.

Sex Estimate. A number of sexually dimorphic skeletal features were evaluated for no. 10134-A. In the pelvis, the greater sciatic notch was acute, and the specimen lacked a preauricular sulcus. In the skull, the nuchal crest, mastoid processes, and mental eminence were all pronounced. The supraorbital margins were indeterminate. In addition, the muscle attachments and general size and thickness of the long bones were consistent with a male. Based on these data, we classify no. 10134-A as a male.

Stature Estimate. No relevant measurements were possible to allow for a stature estimate of no. 10134-A.

Skeletal and Dental Pathologies. No skeletal pathologies were apparent for no. 10134-A. However, we did observe a number of dental pathologies. Although only 18 teeth were present, all 32 tooth sockets were present for examination. The following teeth were missing post-mortem, and therefore we could not evaluate the presence of dental pathologies: both left and right UC, UI2, and UI1; LUM2 and LUM3; both left and right LC; and RI2, RI1, and LLM2. Among the pathologies observed for no. 10134-A were one occlusal dental carie on LUP1 and three occlusal caries on LUM1. In addition, no. 10134-A exhibited premortem tooth loss of RLM1.

No observations were recorded for linear enamel hypoplasias because of the lack of comparable teeth (i.e., UI1, LC).

Cultural Modifications. Much as described above for no. 10121, carbonized erosions with grayish margins were observed on a number of bony elements of the anterior bodies of thoracic vertebrae and both internal and external rib surfaces of no. 10134-A. Once again, after consulting the excavator's notes and plans, it became apparent that the mourners at Kasapata had placed a cairn of hot stones and ash on top of burial no. 10134-A.

It is important to note that the skull of no. 10134-A showed no evidence of cranial deformation.

Additional Comments. Epigenetic tooth traits were also recorded for no. 10134-A.

It is also noteworthy that soft tissue was still present on the feet. Although we can only speculate at this time, the preservation of soft tissue may have resulted from the use of heated stones to mark the burial.

SUMMARY FOR NO. 10134-A

The data registered for no. 10134-A indicate that it was an adult male aged 30–35 skeletal years at death. The individual was relatively robust and healthy: only two of the observable teeth were carious, and one had been lost before death. Apparently, like no. 10121, no. 10134-A was buried under a cairn of hot coals and rocks.

Bag 10134-B (Substratum 2B: Early Occupation)

The second burial labeled 10134 is described by the excavator as an incomplete infant in poor condition that was covered with red and yellow ocher. In the context of this report, this burial is designated no. 10134-B.

We found that this burial was indeed poorly preserved, with relatively few measurable or identifiable elements (compared to the amount of highly fragmented skeletal material present). We were able to identify a complete left petrous portion of the temporal bone, left anvil, occipital fragments (ca. 75 percent), right parietal fragment (ca. 25 percent), nearly complete left and right frontals, CI and C2, three paired and one unpaired vertebral segments, one centrum, both a right clavicle and humerus (still articulated by soft tissue), a left proximal humerus (ca. 50 percent complete), a left scapula (lateral 40 percent), a right scapula (lateral 15 percent), a reconstructed right femur, two left ribs, and 11 unsided rib fragments.

AGE ESTIMATE. Our age estimate is based solely on the femoral length of no. 10134-B, which was 77.8 mm (Table 3.1). According to Johnston's (1962) data, a measurement of this length is associated with a perinatal or newborn individual.

SEX ESTIMATE. No sex estimate was possible for no. 10134-B.

SKELETAL AND DENTAL PATHOLOGIES. None observed.

CULTURAL MODIFICATIONS. As noted by the excavator, red and yellow ocher were identified on the right femur, both humeri, the right clavicle, the left scapula fragment, some of the vertebral fragments, and nine of the 13 ribs and rib fragments. Red ocher was also found on both the external and internal cranial fragments (Figure 3.8). In addition, yellow ocher was identified on the external surface of one of the larger occipital fragments (Figure 3.9).

ADDITIONAL COMMENTS. None.

FIGURE 3.8. Red ocher was found on both the external and internal cranial fragments of no. 10134-B.

FIGURE 3.9. Yellow ocher was identified on the external surface of one of the larger occipital fragments of no. 10134-B.

SUMMARY OF NO. 10134-B

Burial no. 10134-B represents a newborn with no detectable pathologies. Although the remains are highly fragmented and poorly preserved, the presence of red and yellow ocher on skeletal elements of this individual offers evidence of postmortem cultural modification by the mourners at Kasapata.

Bags 10137 and 10140 (Substratum 2B: Early Occupation)

Bag 10137 (Feature 10-3, Level B) contained the remains associated with an infant burial. Although this individual was not given a separate feature designation by the excavators, it was apparent on inspection of the excavator's notes that this child burial was identified during the removal of no. 10134-A and was collected separately.[10] It also became apparent during our analysis (from consulting the excavator's notes, observing the similar age of the remains in the two bags, and noting nonoverlapping elements) that the infant skeletal materials contained in bags 10137 and 10140[11] were from the same individual. We describe the infant burial from both bags here, while noting which elements were contained in which bag.

A number of cranial elements were recovered for this individual. In bag 10137 there were a number of small cranial fragments, in addition to an unsided superior portion of an orbit and an unsided parietal fragment. In bag 10140 we also identified numerous cranial fragments, a basal portion of the occipital, an unsided petrous portion of the temporal, and complete left and right mandibular segments.

For the postcranial skeleton, a first or second rib, two unsided rib fragments, and the centrum of a vertebra were identified during inspection of the human skeletal material from bag 10137. Two unsided proximal tibial fragments from separate tibiae and numerous unsided rib fragments were identified during inspection of the human skeletal material from bag 10140.

AGE ESTIMATE. Our age estimate for the individual represented in bags 10137 and 10140 is based on the relatively few measurements possible and comparison with other infant remains from Kasapata for which age estimates were possible. The basilar part of the occipital measured 13.4 mm (length) by 15.5 mm (width), while the diameter of the left tibia was 6.3 mm. Relative to other subadults from Kasapata, these measurements would suggest that this was a perinatal or newborn burial.

SEX ESTIMATE. No estimate was possible.

SKELETAL AND DENTAL PATHOLOGIES. The superior orbital portion of the frontal bone in bag 10137 exhibited active cribra orbitalia, while the parietal fragment exhibited porotic hyperostosis. These conditions are both bone pathologies associated with overreaction of the diploë bone due to an anemic reaction of unknown etiology (Stuart-Macadam 1991, 1992). Such anemic reactions can be caused by parasites, diarrheal infections, or metabolic deficiencies. No other pathologies were observed.

CULTURAL MODIFICATIONS. All skeletal elements had red ocher on them.

ADDITIONAL COMMENTS. None.

SUMMARY OF NOS. 10137/10140

The infant represented by elements from bags 10137 and 10140 was likely a newborn that suffered from active cribra orbitalia and porotic hyperostosis. There is also evidence of postmortem cultural modification in the form of red ocher applied as part of the Kasapata mourners' burial practices.

Unit 10 S/N

Among the materials recovered from Unit 10 is a bag labeled "Unit 10 S/N" ("Unit 10 without a number"). This bag holds a set of human bones whose provenance was lost while they were being washed.

The bag contains both a left and a right parietal fragment and the right squamosal portion of an occipital bone, including the articulation with the lambdoidal suture and superior nuchal line. A nearly complete left clavicle (ca. 95 percent complete), left rib I (90 percent complete), the posterior internal fragment of a left rib, a right rib fragment, a complete lumbar vertebra, and two additional lumbar vertebral fragments are also present. Skull elements include a left mandibular fragment from LI2 to LM2 that includes LP1, LP2, and two loose right mandibular teeth (LC and LP2). Given the size, coloration, and occlusal wear on the loose teeth, we believe they were from the same individual.

AGE ESTIMATE. Assuming that all of the elements from this bag are from the same individual, they represent an adult more than 27 skeletal years of age (fused medial clavicle). The lambdoidal suture is open, and wear on the mandibular dentition suggests this individual was a middle-aged adult (30–45 years old).

SEX ESTIMATE. Based on general bone density, size of the lumbar vertebrae and vertebral fragments, and morphology of the mandibular fragment, the elements in this bag were probably from a male.

STATURE ESTIMATE. Stature cannot be estimated because relevant elements are missing.

SKELETAL AND DENTAL PATHOLOGIES. The middle one-third of the left clavicle has a long healed fracture. The left LM2 was lost pre-mortem, as evidenced by alveolar resorption immediately distal to the LM1 tooth socket.

CULTURAL MODIFICATIONS. The occipital fragment exhibits 19 perimortem cut marks along the superior nuchal line, possibly indicating some form of defleshing of the individual after death (Figure 3.10).

Another interesting if not too surprising observation was excessive dental wear of the left LPM1 (Figure

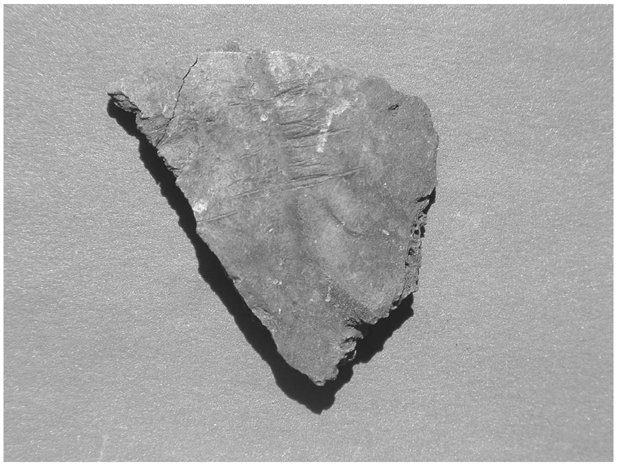

FIGURE 3.10. From the bag labeled Unit 10 S/N, an occipital fragment exhibiting a series of perimortem cut marks along the superior nuchal line, possibly indicating some form of defleshing of the individual after death.

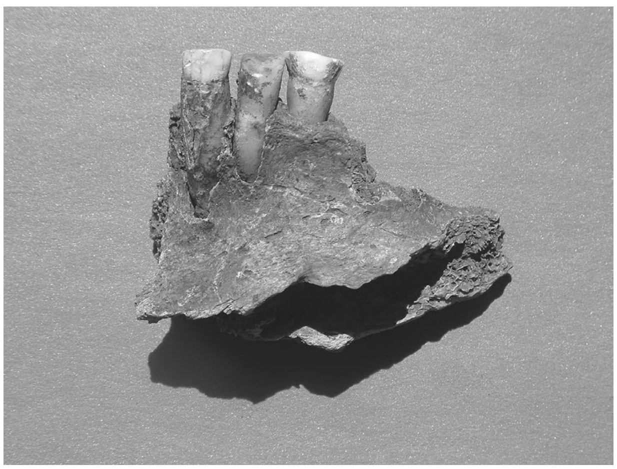

FIGURE 3.11. From the bag labeled Unit 10 S/N, the left LPM1, displaying excessive dental wear. The wear was particularly pronounced lingually, suggesting that the individual had processed sinew or some other fibrous material using this tooth.

3.11). The wear is particularly pronounced lingually, suggesting that the individual had processed either sinew or some other fibrous material using this tooth.

ADDITIONAL COMMENTS. It is clear that the remains from this bag could not be from adult male burials 1088, 10121, or 10134, given the presence of either an occipital or mandibular bone or dentition in association with those burials. If these remains are from any of the burials in Unit 10, then the most likely candidate would be 1017-B. This individual was an adult male, much like the remains associated with the bag labeled Unit 10 S/N, and there are no duplicated elements. Indeed, it is possible that the mandibular fragments for Unit 10 S/N and 1017-B match. We did not attempt this match. However, we cannot completely rule out that these elements may be associated with an element not described in this report, the isolated os coxae of a 40- to 45-year-old male that was found in bag 1052.

Epigenetic dental traits were recorded for Unit 10 S/N.

SUMMARY OF UNIT 10 S/N

The individual represented by elements from the bag labeled Unit 10 S/N likely was a young adult male, aged 20–35 skeletal years at death. The individual had a fractured left clavicle that had healed, premortem tooth loss of the left second mandibular molar, and anterior wear of the left lower first premolar that is indicative of using the tooth for processing hides or fibers. Further, the remains of Unit 10 S/N also exhibited 19 perimortem cut marks perpendicular to the superior nuchal line of the occipital bone that may have resulted from postmortem defleshing of the individual.

THE HUMAN REMAINS OF UNIT 11

Bag 1160-A, -B, -C: Feature 11-2 (Stratum 3: Late Occupation)

According to the excavator's notes, the remains in bag 1160 represented an incomplete subadult in a fair state of preservation. The remains consisted primarily of the skull and upper torso (see Figure 3.12). During our inspection of bag 1160 we also encountered skeletal elements that clearly belonged to two additional individuals; we were able to make this determination because of the age differences among the elements associated with the bag. The one described by the excavator was a child 2–3 skeletal years of age at death, while the elements of the two unidentified individuals were perinatal and adult in age. Therefore, we have arbitrarily chosen to refer to the remains identified during the excavation as no. 1160-A. The two other individuals were designated no. 1160-B and no. 1160-C.

The burial identified by the excavator (1160-A) was represented by highly fragmented but largely complete frontal, occipital, temporal, and parietal bones (both right and left). Both zygomatics were present and complete, as were the mandible and maxilla, which contained some developing deciduous and permanent teeth. All deciduous teeth were present, as were all first permanent molar crowns (mandibular crowns were still in the crypt).

Figure 3.12. The southeast corner of Unit 11, which held various burials. Number 1160-A, which included the partial remains of a 2- to 3-year-old child, is located at the center of the photograph. Number 1161, a 1.5- to 2-year-old child who was buried with a string of 12 bone beans, is located at upper right. Number 1162, a 6-month-old child, is located at lower left. Number 1163, which included the incomplete remains of several individuals, is located at the lower right-hand side of the photograph, at the edge of the excavation unit.

Both the body and the manubrium of the sternum were present. For the vertebral column, the atlas, axis, 12 vertebral arches, and a single fragmented vertebral body were present. There were 10 right and four left rib fragments, as well as 35 unidentified rib fragments. The right ischium was complete; the right ilium was present but incomplete (ca. 30 percent complete).

Approximately one-half of both the right and left humeral diaphyses were present, while the left ulnar diaphysis was 75 percent complete. Approximately 50 percent of the left femoral diaphysis was present, as was 75 percent of the right tibial shaft. Fragments of both the left (25 percent) and right (ca. 75 percent) fibular diaphyses were present. Four unsided phalanges of the hand and eight of the foot were identified.

The first previously unidentified individual (no. 1160-B) was a newborn. The remains consisted of an unidentified cranial fragment, a distal right mandibular fragment, three complete vertebral bodies, and two unidentified long bone fragments. No pathologies or cultural modifications were evident on inspection of the limited number of elements present for no. 1160-B.

The elements of the second previously unidentified individual (no. 1160-C) were those of an adult and included an unidentified long bone diaphysis, the second cuneiform of the left foot, and a proximal phalanx of digit 1 of the foot. No pathologies or cultural modifications were evident on inspection of the limited number of elements present for no. 1160-C.

Age Estimate. Our age estimate was based on tooth crown and root development as outlined by Ubelaker (1978). According to our inspection of the roots and crowns of both the deciduous and permanent dentition present, we estimate that no. 1160-A was between 2 and 3 dental years of age at death. Unfortunately, none of the long bones provided measurements we were able to use to estimate the age of no. 1160-A.

Sex Estimate. Subadult sexing characteristics evaluated for no. 1160-A are provided in Table 3.2. Because most of the measurement criteria (especially those of the ilia) were ambiguous, we could not assign no. 1160-A a sex with any degree of confidence.

Skeletal and Dental Pathologies. Burial 1160-A exhibited mild and active porotic hyperostosis on the left parietal fragment. No other pathologies were apparent.

Cultural Modifications. No cultural modifications were apparent for no. 1160-A.

Additional Comments. None.

SUMMARY FOR NO. 1160-A

Based on our evaluation of the osteological elements present for no. 1160-A, we estimate this was a child of unknown sex and 2–3 skeletal years of age at death. No pathologies or cultural modifications were apparent.

Bag 1161: Feature 11-3, Level A (Stratum 3: Late Occupation)

The excavator described no. 1161 as a complete child burial in good condition (Figures 3.12, 3.13 and 3.14). Of note, this was the only burial that was clearly

FIGURE 3.13. Burial 1161, a 1.5- to 2-year-old child.

FIGURE 3.14. Although fragmented, the skull of Burial 1161 shows evidence of cranial deformation and possible evidence of treatment with red ocher.

Figure 3.15. Bone beads (made from the humerus of a fox) found with Burial 1161.

associated with grave goods: 12 bone beads had been placed near the feet of the individual (Figure 3.15). An analysis of the beads indicated that they were produced from the humerus of a fox (see deFrance, Chapter 4).

Our inventory of no. 1161 indicated that nearly all skeletal elements were present. For the skull, we found most of the bones to be fragmented but nearly 100 percent complete. Among the skull bones present and nearly complete were the frontals, parietals, occipital, temporals, maxilla, and left zygomatic. The mandible was nearly complete (ca. 95 percent). With the exception of the upper right canine, all deciduous teeth were present. A number of developing permanent teeth were also present. The right UI1, UI2, and UM1 and the left UI2 and UM2 were identified, as were both the left and right LM1s. A supernumerary tooth was also identified between the left UI1 and UI2.

The vertebral column was represented by seven centra and nine complete and seven unmatched vertebral arches. Although only a few of the ribs were complete, we were able to identify (based on the presence of the head and neck) 12 right and 11 left ribs; there were an additional 22 unsided rib fragments.

For the pelvic girdle, the left ilium, the right ischium, and both left and right pubes were present. A single sacral element was also identified.

Both the right and left clavicles (100 percent) and scapulae (lateral 25 percent) were present. The right and left humeri were complete, while the right (100 percent) and left (ca. 90 percent) ulnae were present, as were the right (95 percent) and left (85 percent) radii. The lower extremities were represented by the right and left femora (90 percent complete—both missing the distal end of the diaphysis), left and right tibiae (90 percent), and right (75 percent) and left (100 percent) fibulae. Four phalanges were also identified, but it was not possible to determine their associated appendage or position.

Age Estimate. Root development for all deciduous teeth of no. 1161 indicates that this child was between 18 months and 2 years of skeletal age at death. We are also able to make age estimates for no. 1161 based on long bone measurements presented in Table 3.1. Given the congruence of both dental and skeletal indicators of age at death, we are confident that no. 1161 was between 1.5 and 2 skeletal years of age.

Sex Estimate. Table 3.2 provides the subadult sexing characteristics that were evaluated for no. 1161. Although a number of the criteria for no. 1161 are in disagreement, Sutter (2003) reported that subadult sexing criteria of the ilia performed better than did criteria of the mandible when evaluated for autopsied known-sex prehistoric Andean mummies. Because of this, we tentatively suggest that this individual was a male.

Skeletal and Dental Pathologies. For no. 1161, we observed an inflammatory/periosteal reaction on the deltoid tuberosity of the left humerus and a mild periosteal reaction on the shaft of the left fibula. In addition, the left fibula showed signs of inflammation of the mid-shaft consistent with osteomyelitis: the mid-shaft was abnormal (swollen) in size relative to its right counterpart.

No other skeletal or dental pathologies were observed for no. 1161.

Cultural Modifications. Although the skull bones were fragmented, it was apparent that no. 1161 had a tabular oblique cranial deformation (Figure 3.14), according to classification criteria recommended by Buikstra and Ubelaker (1994). Cranial deformation represents an intentional premortem cultural practice of molding of the skull.

The frontal, parietal, and occipital fragments exhibited red stains. Although no pigment was adhering to these bones when we inspected them, it appears that the no. 1161 burial may have been treated with red ocher (Figure 3.14).

Additional Comments. None.

SUMMARY FOR NO. 1161

Burial no. 1161 represents an infant between 1.5 and 2 skeletal years of age. The infant was likely a male, and suffered from osteomyelitis. The skull had been bound during infancy to produce a tabular erect cranial deformation. It is also possible that red ocher was used as part of the funerary rites.

Bag 1162. Feature 11-4 (Stratum 3: Late Occupation)

The excavator's notes for no. 1162 indicate that it was the burial of a largely complete child in fair condition (Figure 3.12). We found that although many elements were present, they tended to be fragmented or eroded by natural processes.

For the skull, portions of both right and left frontals, parietals, and petrous portions of the temporals were present. Fragments of the right zygomatic (75 percent), body and greater wing of the sphenoid, and maxilla (70 percent) were present. The basicranium and both left and right lateral and squamosal portions of the occipital bone were present. The anterior portion of the left half of the mandible was present. There were also 31 additional unidentifiable cranial fragments.

Three deciduous maxillary teeth were identified (right dm1 and both left and right dm2).

For the vertebral column, six paired and four unpaired neural arches were inventoried. A right ilium was also identified.

The lateral portions of both left (50 percent) and right (25 percent) scapulae were present, as were six right and five left ribs. Seven unsided rib fragments were also recorded. The right clavicle was nearly complete (ca. 90 percent), while both the right and left humeri were nearly complete (ca. 90 percent). The left ulna and radius were approximately 95 percent complete. Portions of the both the right and left femora, tibiae, and fibulae were present.

Age Estimate. Both deciduous and permanent dental development indicate that no. 1162 was approximately 6 months of age at death.

A number of long bone measurements were also made for no. 1162 (Table 3.1). Given the general agreement of both dental and skeletal indicators of age at death, we are confident that no. 1162 was approximately 6 skeletal months of age when it died.

Sex Estimate. Subadult sexing criteria that were scored for no. 1162 are provided in Table 3.2. Based on the criteria scored, we tentatively suggest that no. 1162 was a male.

SKELETAL AND DENTAL PATHOLOGIES. Mild, active porotic hyperostosis was noted on the left parietal fragments.

CULTURAL MODIFICATIONS. None was apparent.

ADDITIONAL COMMENTS. None.

SUMMARY OF NO. 1162

This individual was an infant that likely died at approximately 6 months of age. Skeletal features suggest that no. 1162 may have been a male who suffered from some form of anemic reaction, as evidenced by the mild porotic hyperostosis. We found no evidence of cultural modifications or additional pathologies.

Bag 1163-A, Feature 11-5 (Stratum 3: Late Occupation)

This burial was an incomplete subadult that was only partially located in Unit 11 (Figure 3.12). The excavator also noted that only a few loose elements in Unit 11 were collected for subsequent analysis. Apparently, no. 1163 was found buried in the pit in the floor feature (Feature 11-1) associated with Stratum 3.

During our inventory of skeletal elements associated with no. 1163, we identified the skeletal elements of two subadults and one adult. Of the subadults, one was a young adolescent and the other was an infant. After we completed our analysis we learned that the excavator had also mentioned a possible infant burial mixed in with no. 1163. We assigned no. 1163-A to the young adolescent and no. 1163-B to the infant elements, which are described below.

The adult elements were assigned no. 1163-C. These elements included a first and third metatarsal, as well as an unsided navicular. It was not possible to determine much from these elements other than that they were from an adult. Because of the lack of duplicated identifiable elements, it is possible that the elements we identified in bag 1163 may belong to the same individual as those described above for no. 1160-C. Because of their limited context, they are not described further here.

The adolescent burial (no. 1163-A) was represented by a basicranial fragment, 12 unidentified cranial fragments, the left ilium and ischium, fragmented sacral elements I and III–V, a complete second sacral element, right talus (90 percent complete), the left humeral head, and five unsided phalanges of the hand. No other elements were available for examination. Despite the relatively limited number and fragmented nature of the elements for no. 1163-A, the elements were in good condition.

AGE ESTIMATE. For burial no. 1163-A, we found that the epiphyses for the left humeral head, iliac crest, and ischial tuberosity were still open. Of the primary centers of ossification, we noted that the ilium-pubis, ischium-pubis, and ischium-ilium had not ossified. The same was true for all of the sacral elements. Given the appearance and lack of fusion of these elements, we estimate that no. 1163-A was between 10 and 12 skeletal years of age at death.

SEX ESTIMATE. The subadult sexing criteria scored for no. 1163-A are provided in Table 3.2. Based on the criteria scored, we suggest that no. 1163-A was a female.

SKELETAL AND DENTAL PATHOLOGIES. No skeletal pathologies were observed for no. 1163-A.

CULTURAL MODIFICATIONS. No cultural modifications were apparent for no. 1163-A.

ADDITIONAL COMMENTS. None.

SUMMARY FOR NO. 1163-A

The skeletal elements available for 1163-A suggest that it was a 10- to 12-year-old female. We found no evidence of skeletal pathologies or cultural modifications on the relatively few skeletal elements that were recovered for analysis.

Bag 1163-B, Feature 11-5 (Stratum 3: Late Occupation)

The elements of an infant were mixed in with those of no. 1163-A. The excavator noted that this individual was largely incomplete. During our inventory of the elements present in no. 1163-A, we identified the following elements of an infant skeleton: the basilar portion of the occipital and six unidentified cranial fragments, seven vertebral bodies, the body of the sternum, one left and one right rib fragment, an unsided mandibular condyle, and the left ischium (80 percent complete) and left ilium (100 percent complete).

AGE ESTIMATE. Our age estimate for no. 1163-B is based on our comparison of the basilar portion of the occipital and length and width measurements of the ilium and ischium with measurements made on other subadult skeletons from the site. We concluded that no. 1163-B was between 2 and 3 skeletal years of age at death.

SEX ESTIMATE. The subadult sexing criteria that were scored for no. 1163-B are provided in Table 3.2. Based on the criteria that were scored, we tentatively suggest that no. 1163-B was a female.

SKELETAL AND DENTAL PATHOLOGIES. No skeletal pathologies were observed for no. 1163-B.

CULTURAL MODIFICATIONS. No cultural modifications were apparent for no. 1163-B.

OTHER COMMENTS. After inspecting our inventories for other similarly aged subadult remains from Unit 11, we concluded that the elements for no. 1163-B likely represented a distinct individual. The only two possible candidates were the 2- to 3-year-old remains from no. 1160-A and from no. 1161. In light of the overlapping features present—both mandibular condyles and the sternal body of no. 1160-A were present, both mandibular condyles and the left ilium of no. 1161 were present, and an unsided mandibular condyle, sternal body, and left ilium were all present for no. 1163-B—it appears that these remains represent those of a third 2- to 3-year-old burial.

SUMMARY FOR NO. 1163-B

The elements for no. 1163-B were from a subadult who was approximately 2-3 skeletal years of age at death. From our observations of the subadult sexing criteria available for scoring, we tentatively conclude that no. 1163-B may have been a female. Although none of the skeletal elements demonstrated evidence of pathologies or cultural modifications, it is difficult to say anything conclusive, given the incomplete nature of no. 1163-B.

THE HUMAN REMAINS OF UNIT 14

Bag 1421, Level 5, Lot 14-1 (Stratum 3: Late Occupation)

Field notes indicate that the human elements associated with this bag came from a moderately well-preserved to well-preserved infant burial. The excavator also stated that this burial was disturbed and was placed in a sheet midden (see Jones and Bauer, Chapter 1). Nevertheless, during our inspection of the remains from this burial, we noted the exceptional condition of the skeletal material. Indeed, many of the elements were complete.

For no. 1421, we identified two unidentifiable cranial fragments, the basilar portion of the occipital, five paired thoracic neural arches, one unpaired thoracic vertebral arch, ten left ribs (100 percent complete), two left ribs (50 percent complete), and three unsided rib fragments (ca. 25 percent) complete).

For the upper extremities, the left scapula was ca. 75 percent complete, while the right radius was complete. The lower extremities were represented by the left ilium and pubis, the left femur (100 percent complete), the proximal half of the right femur, an unsided fibula (50 percent complete), one unsided metacarpal, and two unidentifiable long bone fragments.

AGE ESTIMATE. A number of long bone measures were recorded for no. 1421 (Table 3.2). Given the skeletal indicators of age at death, we are confident that no. 1421 was a late-term fetus when it died.

SEX ESTIMATE. The subadult sexing criteria that were scored for no. 1421 are provided in Table 3.2. Based on the criteria we scored, we tentatively suggest that this burial was a female.

SKELETAL AND DENTAL PATHOLOGIES. No skeletal pathologies were observed for no. 1421.

CULTURAL MODIFICATIONS. No cultural modifications were apparent for no. 1421.

ADDITIONAL COMMENTS. None.

SUMMARY FOR NO. 1421

The elements recovered for no. 1421 are those of a late-term fetus that we tentatively suggest was a female. No pathologies or cultural modifications were apparent.

Bag 1422, Lot 14-1 (Stratum 3: Late Occupation)

The excavator described no. 1422 as a complete, undisturbed infant burial in good condition. We found that many of the bones were present and in an excellent state of preservation, although often fragmented.

In addition to the elements we identified for no. 1422, we also identified an infant's (clearly older than newborn) unsided proximal first phalanx of the foot that belonged to neither no. 1422 nor no. 1421. The presence of the element was recorded and is not discussed further here.

During our inventory of this burial we identified the basilar, lateral, and squamosal portions of the occipital (95 percent complete), unsided fragments of the parietal (from the parietal bossing it was apparent that one was from each side, but it was unclear which side) that were approximately 95 percent and 70 percent complete, four unsided sphenoid fragments, both right and left petrous portions of the temporals (95 percent complete), and both right and left mandibular haves (95 percent complete).

Postcranial elements identified included both the left and right clavicles (both 100 percent complete), two complete right ribs, eight complete left ribs and two left rib fragments (ca. 35 percent complete each), and five unsided rib fragments. Six paired and three unpaired neural arches were identified.

The upper extremity of no. 1422 was represented by the left scapula (95 percent complete), both right and left humeri (100 percent), the right ulna and radius (100 percent) and either a metacarpal or a phalanx (proximal and distal ends missing).

For the lower extremity of no. 1422 we identified the left tibia (100 percent) and an incomplete left fibula (50 percent complete). A single unidentified sacral element was also present.

AGE ESTIMATE. A number of long bone measurements relevant for age estimation were made for no. 1422 (Table 3.1). Given the general agreement among the skeletal indicators of age at death, we are confident that this was a late-term fetus.

SEX ESTIMATE. Three subadult sex-related characteristics of the mandible were recorded for no. 1422 (Table 3.2); however, based on the criteria discussed here, we cannot make any sex estimate for this burial. Although there was very little gonial eversion (a trait expression usually associated with subadult females), Sutter (2003) found that gonial eversion performed poorly for sex assignment of autopsied known-sex prehistoric subadult Andean mummies.

SKELETAL AND DENTAL PATHOLOGIES. No skeletal pathologies were observed for no. 1422.

CULTURAL MODIFICATIONS. No cultural modifications were evident for no. 1422.

ADDITIONAL COMMENTS. None.

SUMMARY FOR NO. 1422

Our analysis indicates that this burial was a late-term fetus. No sex estimate was possible for no. 1422. Furthermore, no skeletal pathologies or cultural modifications were apparent for this burial.

ANALYSIS OF SKELETAL DATA FROM KASAPATA

Minimum Number of Individuals

In addition to the identified burials and the elements that were intermingled with identified burials, we recorded an additional 305 isolated and commingled human skeletal elements that are not described in detail in this report. As discussed under "Methods" at the beginning of the chapter, we calculated the minimum number of individuals (MNI) both for the site as a whole (Table 3.4) and by summing values determined for each unit separately (Table 3.5), with the exception that the proximity of Unit 4 to Unit 10 and Unit 3 to Unit 11 led us to calculate the MNI values for these units as pairs.

MNI FOR THE ENTIRE SITE

PRE- AND PERINATAL REMAINS. We identified an MNI of 9 within the recovered pre- and perinatal remains. The most abundant unique element for this age class at Kasapata was the occipital. We identified complete or nearly complete occipitals in Burial 10134-B, 10137/10140, 1421, and 1422. In addition, we identified another five complete or nearly complete pre- or perimortem occipitals from isolated or commingled bags containing human remains.[12]

INFANTS (6 MONTHS–3 YEARS). Five discrete burials ranging in age from 6 months to 3 skeletal years at death were recovered from the site, including Burials 317, 1160, 1161, 1162, and 1163-A. With the exception of 1163-A, the left portion of the frontal and both left and right humeri were present. Although 1163-A was missing these elements, it was determined that the remains did not come from any of the neighboring burial features (see discussion in previous section). From bags containing skeletal materials from Unit 10, we identified one left frontal (no. 1040) and one left (no. 1048) and one right (no. 1037) humerus. For the right humerus from no. 1037, we were able to eliminate this element as having come from no. 1163-A, owing to the

TABLE 3.4. Minimum number of individual (MNT) estimates for the entire site of Kasapata.

	Age Class					
	Fetal – Perinatal	Infant	Child	Adolescent	Adult	
Sex		(>NB – 3 yrs)	(4 – 10 yrs)	(11 – 18 yrs)	(>18 yrs)	Total
Indeterminate	9	6	1	1	1	18
Male	—	—	—	1	5	6
Female	—	—	—	1	2	3
Total	**9 (33.3%)**	**6 (22.2%)**	**1 (3.7%)**	**3 (11.1%)**	**8 (29.6%)**	**27**

TABLE 3.5. Minimum number of individuals (MNI) estimates calculated by unit for the site of Kasapata. Owing to their proximity, we combined MNI estimates of Unit 3 with Unit 11 and Unit 4 with Unit 10.

	Age Class					
	Fetal – Perinatal	Infant	Child	Adolescent	Adult	
Sex		(>NB – 3 yr)	(4 – 10 yr)	(11 – 18 yr)	(>18 yr)	Total
Indeterminate	12	7	2	1	9	31 (75.6%)
Male	—	—	—	1	6	7 (17.1%)
Female	—	—	—	1	2	3 (7.3%)
Total	**12 (29.3%)**	**7 (17.1%)**	**2 (4.9%)**	**3 (7.3%)**	**17 (41.5%)**	**41**

Note: NB, newborn.

estimated age at death for the right humerus from no. 1037 (6 months–1 year). Therefore, the overall MNI for infant remains (6 months–3 skeletal years of age at death) at Kasapata is 6.

CHILDREN (4–10 YEARS). The excavators did not identify any human remains for this age class in the field. During our examination of isolated and commingled human remains from Kasapata, we identified numerous skeletal elements ranging between 4 and 10 years of age from Units 3, 10, and 11. However, we could not exclude the possibility that these elements came from the same individual. Therefore, for the entire site, the MNI for child remains is 1.

ADOLESCENTS (11–18 YEARS). A single adolescent burial was identified during excavations at the site, no. 1163-A, which we determined was a 10- to 12-year-old female (see discussion in previous section). We identified seven additional adolescent elements, including the right humerus of a 15- to 18-year-old male (no. 1018) and two right adolescent humeri of unknown age and sex (in bags 426 and 1010). Given that no. 1163-A lacked a right humerus, we can estimate from the right humerus that the MNI for adolescents at Kasapata is 3.

ADULTS (>18 YEARS). After reviewing the identified elements for both adult males and females, we found only one unidentified adult individual unaccounted for. Based on our identification of adult male and female elements (from identified burials and isolated/commingled elements), there were a total of eight left clavicles and eight left humeri. Of the eight left clavicles, five were accounted for by adult males (nos. 322, 1088, 10121, 10134-A, and Unit 10 S/N) and two by adult females (nos. 1080 and 1017-A), which left a single unidentified adult left clavicle (no. 302). For left humeri, we identified three adult males (nos. 322, 10121, and 10134-A), two adult females (nos. 416 and 1017-A), and three adult left humeri of unidentifiable sex (nos. 302, 325, and 1048). After calculating a total MNI of 7 for adults of identifiable sex (five males, two females), we are left with a single unaccounted-for adult of indeterminate sex, for a total adult MNI of 8.

MINIMUM NUMBER OF INDIVIDUALS BY UNIT

PRE- AND PERINATAL REMAINS. Our MNI calculation by unit indicates a count of one pre- or perinatal individual from Unit 2 (multiple elements), five from Unit 10,[13] three from Units 3 and 11 combined,[14] and three from Unit 14.[15] Based on these numbers, the MNI for pre- and perinatal remains calculated by unit, then summed, is 12.

INFANTS (6 MONTHS–3 YEARS). When infant elements ranging between 6 months and 3 skeletal years of age were examined by unit, we determined a count of at least one individual from Unit 3 (no. 317), two from Unit 10,[16] and four from Unit 11.[17] Summing these unit MNIs gives a total MNI of 7 for children between 6 months and 3 skeletal years of age at Kasapata.

CHILDREN (4–10 YEARS). If the MNI is calculated for children (4–10 skeletal years of age) by unit at Kasapata, and we take into account the proximity of Units 3 and 11 and treat them as a single unit, then the MNI for children is 2. This count is adjusted for the multiple elements from bags 325 and 1131, 1142, and 1157 (combined and counted as a single individual), and the single left mandibular canine, approximately 8–10 years of age, from bag 1010.

ADOLESCENTS (11–18 YEARS). Calculating the MNI by unit for Kasapata adolescent skeletal elements yielded a total of 3, which agrees with the MNI for adolescents as determined by the whole-site method, so we shall not elaborate further.

ADULTS (>18 YEARS). As noted earlier, to calculate MNI by unit, we decided to combine Units 3 and 11 and Units 4 and 10, given the close proximity of the units in these pairs to one another. Taking this arrangement into account, we identified one indeterminate adult individual for Unit 1[18] and one indeterminate adult individual for Unit 2.[19] For Units 3 and 11 combined, we calculated an MNI of 3.[20] Based on our identification of 7 left clavicles from Units 4 and 10 combined, we calculated an MNI of 7.[21] We also identified one indeterminate adult individual from Unit 6 (represented by anterior mandibular fragment with sockets from bag 612), one indeterminate adult from Unit 7 (represented by a right femoral fragment from bag 710), one indeterminate adult individual from Unit 12 (represented by an unsided parietal fragment and a rib fragment from bag 1216, and a left frontal fragment from bag 1220), one indeterminate adult individual from Unit 13 (represented by a right mandibular first molar from bag 1301), and one indeterminate adult individual from Unit 14 (represented by a right ulna from bag 1407 and a thoracic vertebra from no. 1414). Summing these MNI values, there were a total of nine indeterminate adults, six adult males, and two adult females, for a total adult MNI of 17.

Demographic Trends for Kasapata

Depending on how the MNI is calculated, there are either 27 or 41 individuals represented by the human skeletal elements from Kasapata. Given the relatively few individuals and the numerous problems in making paleodemographic inferences, we have chosen to discuss the trends in frequencies of individuals by age class.

Regardless of how the MNI is calculated—for the site as a whole or by summing unit values—a disproportionately large percentage of individuals represented by skeletal remains from the site are late-term fetuses, newborns, and infants. From the MNI of 28 individuals calculated for the site as a whole (Table 3.4), late-term fetal and perinatal remains represent 32.1 percent (9/28) of the sample, while infants account for 21.4 percent (6/28). When an MNI value of 41 is used (obtained by summing unit values; Table 3.5), fetusal and perinatal remains account for 29.3 percent (12/41) of the sample and infants account for 17.1 percent (7/41). Children and adolescents are almost certainly underrepresented at Kasapata, but both demographic and paleodemographic studies often find a decrease in mortality for these age groups (Buikstra and Konigsberg 1985; Buikstra and Mielke 1985; Goodman and Armelagos 1989; Steckel et al. 2002). Adults (individuals >18 skeletal years of age) represent 32.1 percent (9/28) of individuals when the MNI is calculated for the entire site, and 41.5 percent (18/41) of the population when the MNI is calculated by summing unit values. Of the two general demographic profiles produced by the two methods of calculating the MNI, one for the site as a whole and one by summing the unit values, the latter, less conservative MNI probably produces a more realistic demographic profile than the former, more conservative MNI: the MNI calculated for the site as a whole produces a demographic profile skewed toward a higher perinatal and infant population and a lower adult population.

An inspection of the demographic data available for other Archaic Phase Andean mortuary populations shows that the percentages of perinatal and infant remains from Kasapata[22] are more than twice those reported for other sites (Allison 1984; Benfer 1990; Bird and Hyslop 1985; Malina 1988; Ubelaker 1980, 2003). These frequency differences raise a number of questions, such as the biases that may have been introduced by recovery techniques or differential preservation. Although we would prefer to err on the side of caution, we point out that other bioarchaeologists have reported that prenatal, perinatal, and infant remains tend to be underrepresented, not overrepresented, in mortuary populations because of their smaller size and differential preservation (Buikstra and Konigsberg 1985; Walker et al. 1988). We found that in most cases at Kasapata the quality of the human skeletal elements was quite good, especially for older subadults and adults, even if the elements were highly fragmented at times. If a discrepancy exists between the demographic picture indicated by the MNIs and the true demographic profile of the inhabitants of Kasapata, this discrepancy may be due to sampling error rather than to differential preservation or recovery techniques (a point we return to later in the discussion).

Although the percentage of perinatal and infant remains is an estimate, based on MNI calculations, it is clear from the human skeletal elements examined that many of the Kasapata inhabitants did not survive infancy. Although it is unclear whether modern Andeans are genetically adapted to high altitudes (Frisancho and Greksa 1989; Rupert and Hochachka 2001), it is unlikely that earlier inhabitants would have fared better than their modern descendants. Numerous studies of modern Andeans have documented that the rate of stillbirths and infant mortality both increase with altitude (Ballew and Haas 1986; Eckhardt and Melton 1992; Keyes et al. 2003; Mazees 1975; McClung 1969; McCullough et al. 1977), while average birth weight decreases (Giussini et al. 2001; Mortola et al. 2000) because of hypoxia. Indeed, infant mortality among some of the highest Andean communities is sometimes greater than 100 per 1,000 live births. We suggest that as the high-altitude inhabitants of the Cuzco region began to adopt a more sedentary lifestyle, the youngest members of the population had the hardest time adapting to the stresses of high altitudes, and this difficulty is reflected in the age profile of human skeletal remains from Kasapata.

Achieved Adult Stature

Insofar as achieved adult stature estimates could be determined for only two adult male burials at Kasapata,[23] these estimates were based on elements of the upper limb, it is difficult to discuss the data in anything more than a descriptive manner: the stature estimate for no. 322 was based on the maximum length of the ulna, while no. 10121 presented a measurable ulna and an estimated measurement based on an incomplete humerus. With these limitations kept in mind, the average achieved stature estimate for these two burials is 163.7 cm (approximately 5 ft 4.5 in).

Most previous stature estimates for prehistoric Andeans are for coastal populations (Allison 1984; Benfer 1990; Burgess 1999; Ubelaker 2003; Verano 1994, 1998), although Malina (1988) has reported stature estimates for the Late Archaic mortuary population from La Galgada, a site located in the sierra of northern Peru. Interestingly, the average stature estimate for the two male individuals from Kasapata is greater than that of most previously reported mortuary populations of the Andes. This finding runs counter to our expectations formed from studies of modern living highland Andeans (Frisancho and Greksa 1989; Lasker 1962). The Kasapata stature estimates are based on upper limb measurements, however, and therefore the standard error is greater than that for estimates based on lower limb elements. Thus, although the average stature estimate for the two individuals at Kasapata is greater than expected, any comparisons between the Kasapata stature estimates and those previously reported are suspect, both because of the wide range of error for the Kasapata stature estimates resulting from the use of upper limb estimates and because the stature estimates were derived from only two individuals.

Skeletal Pathologies

INFLAMMATORY INFECTIONS OF THE SKELETON (PERIOSTITIS AND OSTEOMYELITIS)

Periostitis is the most common skeletal lesion identified among prehistoric populations (Steckel et al. 2002). It is caused by infections of the periosteum, which covers the external surfaces of the skeleton. The most common pathogens responsible for periostitis are varieties of *Staphylococcus* or *Streptococcus.* These and other pathogens can enter the periosteum through trauma that compromises the periosteum or through systemic infection.

Osteomyelitis is commonly caused by *Staphylococcus* or *Streptococcus* infections of the bone marrow that, in the case of long bones, result in an abnormal (swollen) bone shaft. Chronic osteomyelitis, which can evolve from untreated osteomyelitis in adults, can result in cloacae, or drainage openings, in the bone, and drainage tracks can often be left on the periosteal surface of the bone shaft (Carek et al. 2001; Ortner and Putchar 1985). As for periostitis, the causative pathogens may gain a foothold as a result of trauma or systemic infection.

For prehistoric mortuary populations, the tibia is the bone most commonly reported to be affected by periostitis and osteomyelitis. We report the incidence of periostitis for upper and lower long bone elements for human skeletal remains from Kasapata by age class in Table 3.6. Despite relatively small sample sizes for long bone elements observed at the site, periostitis was clearly a common infection in both infants and adults. In infants, the incidence of periosteal reactions ranges between 0.0 percent for the right fibula, humerus, ulna, and radius to a high of 40.0 percent (2/5) for the left

TABLE 3.6. Frequency of expression of periosteal lesions by element and age class for Kasapata.

Skeletal Element	Age Class: Infant (NB – 3 yr)		Child (4 – 10 yr)	Adolescent (11 – 18 yr)		Adult (>18 yr)	
L tibia	14.3	(1/7)	—		—	16.7	(1/6)
R tibia	12.5	(1/8)	—		—	60.0	(3/5)
L fibula	40.0	(2/5)	—		—	16.7	(1/6)
R fibula	0.0	(0/4)	—		—	40.0	(2/5)
L femur	16.7	(1/6)	—		—	0.0	(0/4)
R femur	0.0	(0/6)	—	0.0	(0/1)	25.0	(1/4)
L humerus	25.0	(2/8)	—		—	14.3	(1/7)
R humerus	0.0	(0/8)	—		—	0.0	(0/5)
L ulna	25.0	(1/4)	—		—	0.0	(0/4)
R ulna	0.0	(0/0)	—		—	0.0	(0/3)
L radius	20.0	(1/5)	—		—	0.0	(0/4)
R radius	0.0	(0/5)	—		—	0.0	(0/3)
Total elements	**13.6**	**(9/66)**	**—**	**0.0**	**(0/1)**	**16.1**	**(9/56)**

fibula, while in adults, the frequency of periosteal reactions ranges between 0.0 percent for the left femur and all upper limbs except the left humerus (14.7 percent [1/7]) to a high of 60 percent (3/5) for the right tibia. If all long bone elements are considered, the proportion of infant elements affected by periostitis is 13.6 percent (9/66), while for adults it is 16.7 percent (9/56). Overall, 14.6 percent (18/123) long bone elements from Kasapata were affected by periostitis.

In addition to periostitis, two individuals, an infant (no. 224) and an adult (no. 10121), exhibited osteomyelitis on the left fibula and right femur, respectively. Each of these two elements also exhibited periostitis, and therefore each was included in the estimates of periosteal infection for the site. In addition, the perinatal burial no. 1021 exhibited abnormal swelling on an unsided rib that was suggestive of osteomyelitis.

In comparison with other prehistoric Andean mortuary populations, the percentage of skeletal elements affected by periostitis at Kasapata is greater than that reported for most Archaic Phase populations (although see Arriaza 1995) and is consistent with the rate for sedentary Formative Period populations (Benfer 1990; Malina 1988; Ubelaker 2003). We suggest that the levels of periostitis experienced by infants and adults may have resulted from continuous exposure to infectious agents caused by an increasingly sedentary lifestyle. Increased rates of periostitis have been noted for both prehistoric Andeans (Ubelaker 2003) and other mortuary populations around the world (Larsen 1995; Steckel et al. 2002) as they made the transition to a sedentary lifestyle and food production. An increasing population size and continuous contact with human and animal waste are often cited as factors contributing to this increase.

DEGENERATIVE JOINT PATHOLOGIES (OSTEOARTHRITIS AND OSTEOCHONDRITIS)

Relatively few individuals exhibited evidence of degenerative joint pathologies of any kind. If we consider forms of arthritis alone, only three elements from two separate individuals exhibited evidence of osteoarthritis. Osteophytes were noted projecting from the anterior borders of the third and fifth lumbar vertebrae of Burial 10121, while the proximal end of an adult male's left ulna from Burial 1008 demonstrated mild osteoarthritic changes.

Burial 10121 also demonstrated osteochondritis, both on the superior aspect of the right acetabulum (hip socket) and on the proximal phalanx of the right first digit (big toe). Because osteochondritis can be caused either by direct trauma to the joint in question or by excessive or unusual stress to the joint (Hough and Sokoloff 1989), the presence of osteochondritis is not surprising in this individual, given the awkward use of his right lower limb (he limped) as a result of the chronic osteomyelitis he suffered.

The relatively limited evidence for osteoarthritis on adult skeletal elements from Kasapata is surprising. The robust nature of the adult male skeletal remains suggests a relatively rigorous lifestyle on the part of those interred at the site, and we would expect the (assumed) hunting-gathering lifestyle to have caused more osteoarthritis among the adults (Steckel et al. 2002). A possible explanation for the limited findings of osteoarthritis may be the relatively young age of many of the adult elements, and the unknown age of others.

ANEMIC REACTIONS (CRIBRA ORBITALIA AND POROTIC HYPEROSTOSIS)

The relationships of cribra orbitalia and porotic hyperostosis to one another and to iron deficiency anemia have been well documented (Stuart-Macadam 1987, 1988, 1991, 1992). The underlying causes of these anemic reactions vary from insufficient dietary intake of iron to molecular disorders (sickle cell anemia, thalassemia, etc.) to diarrheal and parasitic infections that reduce iron intake. Both cribra orbitalia and porotic hyperostosis represent attempts of the affected individual's anthropoietic (red blood cell-producing) tissues to compensate for the iron deficiency. The diploë—spongy bone sandwiched between the inner and outer layers of the periosteal bone of the skull—can react by expanding through the periosteal layer as a result of the increased demands for red blood cells, thereby giving the superior external surface of the frontal bone's sockets (in the case of cribra orbitalia) or the external surface of the parietals and occipitals (in the case of porotic hyperostosis) a spongy or coral-like appearance. In mortuary populations, both cribra orbitalia and porotic hyperostosis are more commonly observed in subadults than in adults, and more commonly among sedentary food producers than among foragers (Larsen 1995; Steckel et al. 2002).

The number of observations and the frequencies of cribra orbitalia and porotic hyperostosis for Kasapata are provided in Table 3.7. In infants, the frequency of cribra orbitalia is 16.6 percent (1/6), while half of all infant parietals observed exhibited porotic hyperostosis (4/8). No observations were possible for children and adolescents; however, one of the three adult frontals exhibited active cribra orbitalia, while none of the nine observable adult parietals exhibited porotic hyperostosis. Again, it is difficult to extrapolate from so few observations, but the levels of cribra orbitalia and porotic hyperostosis are generally in line with those reported for other Archaic Phase Andean mortuary populations (Allison 1984; Benfer 1990; Malina 1988).

Table 3.7. Frequency of expression of cribra orbitalia and porotic hyperostis by age class for Kasapata.

Age Class	Cribra Orbitalia		Porotic Hyperostosis	
Infant (NB – 3 yr)	16.6	(1/6)	50.0	(4/8)
Child (4 – 10 yr)	—	—	—	—
Adolescent (11 – 18 yr)	—	—	—	—
Adult (>18 yr)	33.3	(1/3)	0.0	(0/9)

OTHER PATHOLOGIES

The only other pathology noted during our examination of skeletal elements from Kasapata was a long, healed fracture on the left clavicle from the bag labeled Unit 10 S/N. This represents the only clear evidence of trauma among the human remains from Kasapata. Although the exact cause of the fractured clavicle cannot be established, this element is often fractured during accidental falls.

Dental Pathologies

Although relatively few human teeth were available for study, a number of general comments can be made regarding dental pathologies. The teeth are among the most sensitive indicators of diet (Powell 1985) and are often among the best-preserved human hard tissues.

Traditionally, bioarchaeological discussions of human dental pathologies are limited to the teeth and supporting structures of adults, in part because any pathologies or evidence of growth arrest for deciduous teeth are no longer present after the deciduous teeth are replaced (although see Cook and Buikstra 1979). None of the subadult dentitions recovered from Kasapata exhibited evidence of dental caries or premortem tooth loss. Further, we examined deciduous teeth for evidence of enamel hypoplasias and found no evidence of them. For these reasons, our discussions of specific dental pathologies are limited to adult dentitions.

OCCLUSAL DENTAL WEAR

Occlusal dental wear is a natural, physiological age-related process related to contact grit and other materials introduced into the diet and thence the mouth as a result of food-processing techniques, and therefore is often used to estimate age at death for prehistoric mortuary samples (Brothwell 1989; Lovejoy 1985; Miles 1962). To be useful as a population-specific aging technique, however, baseline dental wear data for subadults between the ages of 6 and 18 skeletal years are needed. Owing to the lack of dentitions in this age range at Kasapata, dental wear aging was not possible.

Our discussion of occlusal dental wear for adult dentitions from Kasapata is based on our general impressions. Occlusal dental wear on both the anterior and the posterior teeth was relatively severe, generally leading to complete loss of occlusal enamel by the early 40s. However, these levels of dental wear are in agreement with those for other Archaic Phase mortuary populations previously examined by the principal investigator, such as the Chinchorros of northern Chile and multiple preceramic remains from the central coast of Peru (also see Scott and DeWalt 1980). Severe levels of dental wear are often attributed to the processing of plant foods using grinding stones (Powell 1985).

We also identified one individual (mandibular fragment and teeth from Unit 10 S/N) that had pronounced wear along both the lingual and the labial surfaces for some anterior teeth. This wear pattern is commonly observed in individuals who use their anterior teeth to process hides and sinew (Hinton 1981; Smith 1984). Because this was the only example of this kind of anterior wear available for Kasapata, it would be imprudent to make any broad generalizations. However, the kind of anterior wear described for Unit 10 S/N falls within the scope of previously reported anterior wear patterns for pre-agriculturalists. It should also be kept in mind that although this was the only example of anterior tooth wear of this kind observed for Kasapata dentitions, relatively few adult anterior dentitions were observed for the site as a whole.

DENTAL CARIES, PREMORTEM TOOTH LOSS, AND ALVEOLAR ABSCESSES

Dental caries and tooth loss rates are often used to infer the composition of subsistence diets and the relative proportions of carbohydrates consumed by prehistoric peoples (Moore and Corbett 1971; Powell 1985; Turner 1979). Dental caries are a disease process that results from demineralization of a tooth's enamel surface by acids created by bacteria (*Lactobacillus acidophilus*, *Streptococcus mutans*, and many others). These bacteria inhabit the plaque that covers tooth surfaces and ferment dietary sugars (Newburn 1978, 1982). A number of factors contribute to an individual's susceptibility to caries; however, dietary carbohydrates are the only substances that cariogenic bacteria consume. Therefore, individuals who consume greater quantities of carbohydrates are at greater risk of developing caries than individuals who consume lesser amounts. Age also influences the likelihood that individuals will exhibit caries and other forms of dental disease: older individuals' teeth have been exposed to carious processes for longer periods of time than the teeth of younger individuals and would therefore be expected to exhibit higher numbers of caries and teeth lost due to carious processes.

Table 3.8. Frequencies of dental pathologies at Kasapata.

Dental Pathology	Frequency (%)	
Caries	9.0	(6/67)
Premortem tooth loss	4.6	(4/87)
Abscesses	8.0	(7/87)
Linear enamel hypoplasias (LEH)[a]	40.0	(2/5)

[a] Number of individuals exhibiting LEH on their mandibular canine.

A total of 67 secondary teeth and 87 adult toothless sockets were observed at Kasapata (Table 3.8). Of the 67 teeth, six were affected by dental caries (9.0 percent), while four of the 87 tooth sockets (4.6 percent) exhibited alveolar absorption, indicating the tooth had been lost pre-mortem. Given the levels of tooth wear exhibited by adults buried at Kasapata, it is unclear whether these teeth were lost due to carious activities, dental wear, or other factors, such as trauma or periodontal disease. However, studies have shown that increasing levels of premortem tooth loss are strongly associated with increasing levels of carbohydrates in the diet (Larsen 1995).

If the dead interred at Kasapata represent a strictly hunting-gathering society, then the caries rate for Kasapata (9.0 percent) is higher than expected when compared to data reported by Turner (1979) for hunter-gatherers (average of 1.7 percent; range of 0.0–5.3 percent) and other preceramic Andeans (Kelley et al 1991; Scott and DeWalt 1980). According to Tuner's (1979) data, the caries rate observed for dentitions from Kasapata is in line with either mixed-economy societies (average of 4.8 percent; range of 0.44–10.3 percent) or agriculturalists (average of 8.6 percent, range of 2.3–26.9 percent). Further, the caries rate for Kasapata is higher than that for other Archaic Period mortuary populations but is consistent with that of Formative Period groups (Allison 1984; Benfer 1990; Malina 1988; Ubelaker 2003). Direct comparisons among caries rates are complicated by the lack of control for average age for reported samples. Nevertheless, we suggest that the number of diseased and missing teeth indicates that adults interred at Kasapata were consuming levels of carbohydrates (tubers, quinoa?) indicative of a population with a mixed economy.

Dental abscesses can be caused by a number of factors, most commonly exposure of the tooth root by either excessive dental wear or carious processes, which can then lead to infection. Based on our inspection of

87 tooth sockets, the abscess rate for adults interred at Kasapata was 8.0 percent (7/87). Again, this is a relatively high incidence of alveolar abscesses when compared to other Archaic Phase mortuary populations from the Andes.

LINEAR ENAMEL HYPOPLASIAS

Linear dental hypoplasias (LEHs) are permanent defects that result from arrested enamel production during tooth development. Because dental hypoplasias are permanent nonspecific indicators of stress, they are often used to infer the general health of a population, and among living populations they have been shown to be closely associated with socioeconomic status and morbidity (Goodman and Armelagos 1985; Goodman et al. 1987; May et al. 1993). For the purposes of data collection, LEHs were recorded only for the central maxillary incisor and mandibular canine (Buikstra and Ubelaker 1994). The rationale is that these two teeth, because they have different periods of crown development, provide a broad record of infant and childhood growth disturbances.

For Kasapata dentitions, only two (no. 322 and no. 1017-C) of five observed mandibular permanent canines exhibited LEHs (40.0 percent), while neither of the two permanent maxillary central incisors present did so (0.0 percent). Of the two individuals with LEHs identified on the mandibular canines, Burial 322 had three and Burial 1017-C had two. For all five of the permanent mandibular canines examined for Kasapata, the average number of LEHs is one, and the average number of LEHs identified on the two maxillary central incisors is zero.

If we consider that all eight of these teeth, the six mandibular canines and two maxillary central incisors, are from eight different individuals, then the percentage of individuals exhibiting LEHs is 25 percent (2/8). This is a relatively small percentage of an admittedly small sample of individuals, and given the limited sample size of permanent teeth observed among the Kasapata remains, it is difficult to make broad generalizations with any degree of certainty. However, we suggest that, although absolute values for both the percentage of individuals and average number of LEHs per individual are probably not accurate, the relatively few individuals affected and low number of hypoplasias observed do suggest that those buried at Kasapata suffered relatively few LEHs. These results are in agreement with other studies that report relatively few LEH defects suffered by members of pre-agricultural societies compared with agriculturalists both in the Andes (Allison 1984; Benfer 1990; Malina 1988; Ubelaker 2003) and worldwide (see Larsen 1995; Steckel and Rose 2002; Steckel et al. 2002 for discussions of the comparative literature).

Cultural Modifications

A number of cultural modifications were apparent among the human skeletal remains from Kasapata. It is difficult to proclaim any clear trends in terms of cultural modifications because of the general lack of chronological control among the burials owing to postmortem disturbance and the isolated or commingled nature of many of the elements we identified during our analysis. The modifications we did identify are discussed here.

CRANIAL DEFORMATION

Cranial deformation, an intentional, premortem attempt to modify a child's skull, was commonly practiced throughout the prehistoric Andes (see Allison 1985; Allison, Gerszten, et al. 1981; Allison, Lindberg, et al. 1981; Blom 1998; Bórmida 1966; Cobo 1990 [1653]; Guillén 1992; Hoshower et al. 1995). There is some debate as to when the earliest cranial deformations were practiced in the Andes. Although skulls from Lauricocha are suggested to represent the earliest evidence of cranial deformation in the Andes (Bórmida 1966), others have pointed to problems of stratigraphic association among the human skeletal materials and radiocarbon dates from Lauricocha (see Guillén 1992). Although we cannot take up here the question of when and where the earliest cranial deformations occurred, it seems clear that cranial deformation was a widespread form of cultural modification in the Andes by the Late Archaic (Guillén 1992).

During our inspection of human skeletal remains from Kasapata we identified one case of cranial deformation (no. 1161). The burial in question represents an intact infant who was likely a male approximately 1.5–2 skeletal years of age at death. This was also the only burial clearly associated with burial goods, a necklace of bone beads. Clearly, Burial 1161 fits well within the pattern for the emergence of widespread cranial deformations in the Andes during the Late Archaic.

THE USE OF HEATED STONES OR COALS

The skeletal remains of two burials, no. 10121 and no. 10134-A, provided evidence for the use of either heated stones or coals as part of postmortem burial rites. Both burials were recovered in Unit 10 and were adult males. We identified a number of vertebrae and ribs that had small areas of carbonized bone with well-defined, grayish margins, suggesting that an intense fire was not the cause of these regions of burned bone. After we identified these burned areas on the thoracic skeletal elements of no. 10121 and no. 10134-A, we examined the field notes and plans, where the excavator suggested possible cairn features. The condition of the carbonized thoracic vertebrae and ribs is consistent with cairn features that consisted of either heated stones or smoldering coals. As we suggested earlier in the chapter, the bits of soft tissue that still covered the feet of no. 10134-A were likely due to desiccation caused by the associated heated stones and ash from the proposed cairn feature.

Our brief survey of the literature on postmortem mortuary practices in the Andes reveals that cremation and the use of smoldering coals has been reported beginning in Paleoindian times (Bird 1988; Chauchat 1988) and was practiced up through the Archaic (Benfer and Edwards 1988; Quilter 1989). Because we could not find any other reports for Archaic Period burials from open-air highland sites in the Andes, however, it is difficult to say whether the Kasapata Burials 10121 and 10134-A are unique or fit into a broader mortuary pattern practiced in the highlands.

THE USE OF OCHER IN THE TREATMENT OF THE DEAD

A number of reports indicate that pigments such as ocher were used in prehistoric Andean mortuary rituals (Allison 1981; Allison, Gerszten, et al. 1981; Allison, Lindberg, et al. 1981; Arriaza 1995; Nelson 1998; Quilter 1989). Three burials—two from Unit 10 (no. 10134-B and no. 10137/10140) and one from Unit 11 (no. 1161)—exhibited evidence of the postmortem use of ocher. All three of these individuals were very young at the time of death. Burial no. 10134-B was an infant that died sometime within its first year, no. 10137/10140 was a newborn, and no. 1161 was between 1.5 and 2 years old.

It noteworthy that no. 10134-B exhibited evidence of red and yellow ocher on both internal and external aspects of the cranial fragments. We suggest that a great deal of pigment was applied to the dead child's body and that, as the body decomposed and taphonomic processes caused the skeletal remains to fragment, the pigment adhered to the internal surfaces of its fragmented remains. An alternative explanation is that mourners at Kasapata may have applied pigments to both the external and internal surfaces of the skull. Given the lack of evidence for perimortem cut marks, however, we find this alternative explanation unlikely.

Burial 1161 exhibited red ocher stains only on the external surfaces of the parietal, frontal, and occipital fragments. It was also the only burial to exhibit a cranial deformation and any sort of grave good.

Although the finding of ocher application in these burials indicates that mourners at Kasapata used pigments to adorn the graves of some of their young dead, we cannot draw any broader conclusions from the data.

PERI- OR POSTMORTEM HUMAN SKELETAL DISMEMBERMENT, MUTILATION, OR MODIFICATION

We identified two examples, both among the isolated and commingled human remains, that suggest that the mourners who interred their dead at the site may have dismembered, mutilated, or modified human remains. In the bag labeled Unit 10 S/N, we identified the fragment of an occipital bone with 19 perimortem cut marks across the superior nuchal line. In addition, a fragmented frontal bone from bag 421 showed evidence of use wear along the anteriormost margin of the fragment. The temporal lines projecting posteriorly along the external lateral surfaces of the fragments are clearly seen. It is not possible to provide a skeletal age at death for this fragmented frontal; however, based on the size, we suggest that it was an older child (between 5 and 10 years of age). It is not apparent when this human frontal bone was modified. It is possible that the prehistoric occupants of Kasapata recovered it from the midden sheet and simply used it as a tool.

Taken together, the evidence for peri- and postmortem modification of human remains from the site, while limited, is provocative. It should be noted that peri- and postmortem modification of human remains is not uncommon among Archaic Phase Andean mourners and has been particularly noted for human remains reported from the South-Central Andes (Allison 1981; Allison, Gerszten, et al., 1981; Allison, Lindberg, et al. 1981; Santoro et al. 2001; Standen and Santoro 1994).

CONCLUDING REMARKS ON THE HUMAN REMAINS AND MORTUARY PRACTICES AT KASAPATA

Our analysis of the Archaic Period human skeletal remains from Kasapata sheds new light on the transition to sedentism in the Andean highlands. Although other studies have reported on mortuary populations for coastal South America (Bird and Hyslop 1985; Malina 1988; Ubelaker 2003), the human remains from Kasapata represent the only high-altitude mortuary population (as opposed to isolated skeletons from cave sites) for this critical time period in Andean prehistory. Indeed, we were unable to locate any other reports on highland mortuary populations either before or during the transition to sedentism. For this reason alone, the human remains from Kasapata are noteworthy.

Life at Kasapata

Among the most interesting results of this study are the relatively large percentage of perinatal and infant remains from the site and the high frequency of periosteal lesions. These general indicators of health suggest that those interred at Kasapata experienced a difficult time adapting to the combination of high-altitude living and increased sedentism. As was pointed out in previous sections, studies of developing nations' populations, and more specifically of modern highland Andeans, indicate that infants disproportionately suffer from both infectious diseases and death (Ballew and Haas 1986; Chandra 1995; Cooper and Lawton 1974; Dyson 1984; Eckhardt and Melton 1992; Gordon et al. 1963, 1967; Keyes et al. 2003; Mazees 1975; McClung 1977; McCullough et al. 1977). We suggest that the relatively high frequencies of periosteal infections and osteomyelitis among those interred at Kasapata were primarily due to the increased exposure to waste and infectious diseases incurred during the transition to a sedentary lifestyle. The increased infection load, coupled with the hypoxic conditions at Kasapata, likely resulted in an increased frequency of both stillbirths and infant mortality, as is still commonly the case for modern Andean fetuses and infants born at high altitudes.

The human skeletal remains from Kasapata also provide us with some insight regarding the diet of those interred at the site. Although the frequencies of faunal types exploited at Kasapata generally remain the same through time (see DeFrance, Chapter 4), dental indicators suggest that carbohydrates likely played an important role in the diet of inhabitants. Pathological dental conditions by themselves cannot resolve questions regarding which plants were being consumed or whether those plants were domesticated. However, the frequency of dental pathology (caries, premortem tooth loss, alveolar abscesses) is outside the range reported for Archaic Andeans (Allison 1984; Benfer 1990; Bird and Hyslop 1985; Malina 1988; Ubelaker 2003) and at the high end in comparison with mixed-economy populations, but within the range reported for agriculturalists (Turner 1987). The dental conditions observed suggest that starchy carbohydrates constituted a large percentage of the diet at Kasapata. Were the inhabitants of Kasapata already cultivating some high-altitude crops? Paleobotanical studies of macro- and microbotanical remains from Kasapata will be needed to answer this question, and other studies are needed to confirm this trend for other Archaic populations of the Andes.

We also identified a single example of cranial deformation. In light of the current uncertainty regarding the temporal and geographic origins and the distribution of cranial deformation in the Andes (Guillén 1992; Verano 1997), this single example from a Late Archaic burial is a noteworthy contribution to our understanding of this intentional cultural practice of bodily modification. Because cranial deformation has been identified as a frequent ethnic marker in the Andes (Allison 1985; Allison, Gerszten, et al. 1981; Allison, Lindberg, et al., 1981; Blom 1998; Bórmida 1966, Cobo 1990 [1653]; Guillén 1992; Hoshower et al. 1995), we suggest that the use of cranial deformation during the Archaic was due in part to ethnogenesis associated with territorial behavior and sedentism.

Death at Kasapata

Examination of the human skeletal remains sheds light on mortuary practices at Kasapata. We found evidence for the use of heated objects in the form of isolated burns on the ribs and vertebrae of the two adult male burials in the lower levels of the site. The excavator's independent observation of cairn features and ash suggests that heated stones were used to cover these two burials. Contemporaneous burials from the coastal site of La Paloma also show evidence of the use of hot coals and heated stones as a part of mortuary rites (Benfer and Edwards 1988; Quilter 1989). Examination of additional burials dating to the Archaic Period will be necessary to determine the temporal and geographic extent of this mortuary practice.

It is also clear that the mourners at Kasapata treated some of their dead infant burials with ocher. We note that the only burials exhibiting ocher application were infants (not prenatal remains), and that two of these infants were likely male. Interestingly, the Chinchorro mortuary practices of artificial mummification and the use of red and black pigments are primarily observed for infants (Arriaza 1995). We hesitate to call this a trend based on a comparison of the three examples from Kasapata with contemporaneous burials from the South-Central Andes. Additional data on the geographic and temporal extent of the use of pigments as part of mortuary practices in the Andes are necessary before anything definitive can be said about pigments and perimortem observations.

There is also an isolated example of other Archaic Phase Andean mortuary practices at Kasapata. Defleshing of the body, also practiced by Archaic Period mourners in the South-Central Andes, was apparent on a single human occipital fragment with poor context from Unit 10 at Kasapata. Again, we hesitate to posit a trend, insofar as inspection of all human skeletal elements from the site failed to turn up additional evidence of defleshing.

We offer a few additional speculative comments regarding perinatal and infant remains from Kasapata. We are struck by the fact that of the 10 perinatal and infant individuals with good contextual information described in this report, three of the four pre- and perinatal burial features (nos. 224, 1021, and 1421) were tentatively determined to be female, while the fourth (no. 1422) was of indeterminate sex. It is also thought-provoking that all four of the pre- and perinatal burials with contextual information were associated with the Stratum 3 midden sheet (nos. 224, 1021, 1421, and 1422). Although no. 317, a 6-month-old infant of indeterminate sex, was also buried in sheet midden, we may contrast the pre- and perinatal remains with those of infants identified during excavation (i.e., with good contextual information) who were 6 months old or older when they died (nos. 10134, 1160, 1161, 1162, and 1163): those burials were either treated with ocher (no. 10134), buried with grave goods (no. 1161), or associated with possible floor features, not sheet midden.

Given these observations, a number of questions come to mind. Were the inhabitants of Kasapata practicing female infanticide? Did the mourners at Kasapata carelessly dispose of their dead perinatal infants in the midden while more formally interring infants who had survived beyond the first few days of life? Does the possible association of older infants with a possible floor feature represent a mortuary practice? Certainly, evidence from La Paloma, a contemporaneously inhabited site located in a fog oasis along the central coast of Peru, provides evidence of floor burials (Quilter 1989). Might the disproportionate number of infants evident from our MNI calculations be attributed to disposal of perinatal and young infant remains in the midden sheet? Our analyses leave us with more questions than answers for the mortuary practices at Kasapata.

Despite these open questions, the remains at Kasapata have provided our first glimpse into both the lifeways and the mortuary practices of the Late Archaic peoples of the Cuzco region. Skeletal and dental pathologies support the view that the human remains interred at Kasapata represent those of an increasingly sedentary population. Carbohydrates likely played a significant role in their diet, yet it is unknown whether the plants they consumed were wild or domesticated. Finally, the high percentage of perinatal and infant remains may reflect more broadly the difficulties that the Archaic inhabitants of Cuzco faced in coping with the high altitude and the increased infection rate associated with the transition to sedentism.

Notes

1. Funding for the analyses of the human skeletal materials from Kasapata was provided by the National Science Foundation (grant no. 9816958).

2. MNIs calculated across the site tend to minimize the estimated number of individuals, while MNIs that are aggregated (by unit, by stratum, etc.) tend to increase the MNI (Grayson 1984:31).

3. We are also aware of arguments by some investigators that summing the minimum number of individuals from multiple units does not make sense because one cannot sum "'more than' *x* number of individuals from unit *a* with 'more than' *y* number of individuals from unit *b* (O'Connor 2000; Plug and Plug 1990)"; however, we disagree. Although it is clear that the MNI represents a minimum number, and there is uncertainty as to the true number of individuals represented by the MNI, we argue that calculating an aggregate MNI entails summing "at least" *x* number of individuals with "at least *y* number of individuals (as opposed to summing "more than" values). We argue that if the integrity of each excavated unit provides some degree of certainty that materials from one unit are not represented in more than one unit, then

summing the MNI for each of the excavated units provides a more accurate estimate of the true number of individuals buried at Kasapata.

4. Crew members attempted to place human and animal bones in different bags during the excavation work.

5. A youth's canine was also located in the area of these burials.

6. Four small, unidentifiable skull fragments belonging to this burial were also found in bag 10137 (Feature 10-3, Level B).

7. Four unsided rib fragments likely belonging to this burial were in bag 10137.

8. Two additional unidentifiable long bone fragments belonging to this burial were found in bag 10137.

9. An additional hand element belonging to this burial (a proximal phalanx or metacarpal fragment) was found in bag 10137.

10. There were also a number of adult elements in the bag containing this child's remains that almost certainly are from Burial 10134-A.

The infant was buried in the area beneath the adult burial. The close superimposition of at least three burials—no. 10134-A (adult), no. 10134-B (infant with red and yellow pigments), and nos. 10137/10140 (infant with red ocher)—accounts for some of the bag and labeling confusion.

11. Feature 10-3, Level C.

12. The bags containing these occipital elements are nos. 217, 1010, 1018, 1090, and 1157.

13. Occipital elements from bags 10134 and 10137/10140 and bags 1010, 1018, and 1090.

14. Right mandibular elements from bag 1162 and bags 1160 and 1170.

15. Right humeral elements from bag 1407 and bags 1421 and 1422.

16. Occipital elements from bags 10137/10140 and 1068.

17. Bags 1160, 1161, 1162, and 1163.

18. The skull and scapula from bag 102, and a talus and lumbar vertebra from bag 102.

19. Numerous adult hand and foot bones from bags 217, 221, 224, 226, and 236.

20. Left humeri from male burial no. 322 and two from bags 302 and 325 of undetermined sex.

21. Five male left clavicles from Burials 1017-B, 1088, 10121, and 10134-A, and from bag Unit 10 S/N, and two female left clavicles from bags 1017-A and 1080.

22. The data reported for other Andean Archaic Phase mortuary populations each use different age classes. In any case, even when subadults of older age classes are combined into one age class (see Ubelaker 2003, for example), the Kasapata mortuary sample still has more than twice the number of perinatal and infant remains.

23. Bags 322 and 10121.

CHAPTER 4

FAUNAL REMAINS FROM THE SITE OF KASAPATA

SUSAN D. DEFRANCE

The excavations at Kasapata described in this book produced an abundance of well-preserved faunal remains. The paucity of animal remains from Archaic settings in the South-Central Andes in general and the Cuzco Valley in particular makes these data especially important for understanding early Andean foraging behavior. During the Archaic Period ancient Andean hunters established economic and subsistence systems based on the wild progenitors of indigenous mammals, especially camelids and guinea pigs, that would eventually be domesticated. Human survival in the cold, anoxic highland latitudes depended on a reliable supply of animal protein and animal by-products, such as skins, fat, and bone, for raw materials. This chapter presents the results of a zooarchaeological analysis of a sample of the faunal remains from Kasapata and discusses their significance.

MATERIALS AND METHODS

All of the faunal materials from the Kasapata excavations were dry screened using 1/4-inch (6.35-mm) mesh. The excavators completed preliminary processing at the Cuzco field laboratory. The National Institute of Culture granted permission to transport the faunal collection to the Contisuyo Museum in Moquegua, Peru, where I completed the identification of the faunal remains using the vertebrate comparative collection housed at the museum.[1]

I analyzed the zooarchaeological remains recovered in five of the 14 excavation units (Units 2, 4, 7, 10, and 14; see Table 4.1 for information on levels). In addition, I examined the faunal remains present in four other units (Units 1, 3, 8, and 11,) as well as the lower levels of one excavation unit (Unit 2, Levels 10 and 11), solely to identify the taxa present, but did not quantify these remains. For analytical purposes I combined all the materials classified as belonging to either Stratum 2 or Stratum 3 from the five analyzed units.

All the remains were identified to the lowest taxonomic level. I recorded information on skeletal portions, butchering, skeletal and taphonomic modifications, and age criteria. The camelid specimens were classified as belonging to individuals of either small or large size, when size could be discerned. Methods of quantification include the number of identified specimens (NISP), minimum number of individuals (MNI), and skeletal weight.

RESULTS

The faunal assemblage consists of 2,826 specimens representing a minimum of 88 individuals. The relatively older and deeper Stratum 2 materials are slightly more abundant, consisting of 1,535 specimens repre-

Table 4.1. Contexts of analyzed faunal remains.

Unit	Level	Stratum	Bag No.	
1	3	3B	105	(taxa only)
1	4	3A	108	(taxa only)
1	5	3A	110	(taxa only)
2	4	3B	210	
2	5	3B	213	
2	6	3B	217	
2	7	2B	218	
2	8	2B	221	
2	8	2B	224	
2	9	2B	226	
2	10	2B	230	(taxa only)
2	11	2B	236	(taxa only)
2	12	2A/2B	240	(taxa only)
2	13	2A	242	(taxa only)
3	6	3B	316	(taxa only)
3	9	3B	325	(taxa only)
3	10	3B	327	(taxa only)
3	11	3B	330	(taxa only)
3	12	3B	335	(taxa only)
3	13	3B	340	(taxa only)
4	3	3B	405	
4	4	3B	409	
4	5	3B	412	
4	6	3B/2B	416	
4	7	2B	421	
4	8	2B	428	
4	9	2B	432	
4	10	2B	436	
4	11	2B	439	
4	12	2B	442	
4	13	2B/2A	445	
4	14	2A	448	
7	8	2B/2A	718	
7	9	2A	723	
7	10	2A	738	
7	A (7-1-A)	3B	725	
7	A (7-1-B)	3B	727	
7	B	2A	732	
7	C	2A	741	
8	7	3B	820	(taxa only)
8	8	3B/1D	825	(taxa only)
8	9	3B/1D	826	(taxa only)
10	2	3B	1010	
10	2	3B	1017	
10	3	3B	1018	
10	4	3B	1030	
10	5	2B	1056	
10	6	2B	1068	
10	8	2B	1090	
10	9	2B	1099	
10	10	2A	10103	
10	A	2B	10121	
10	B	2B	10124	
10	C	2B	10126	
10	D	2B	10128	
10	A	2B	10134-A	
10	C	2B	10140	
10	A	2B	1088	
10	A-1	3B	1033	
10	B-1	3B	1037	
10	C-1	3B	1040	
10	D-1	3B	1042	
10	D-1	3B	1054	
10	A-2	3B	1044	
10	B-2	3B	1048	
10	A-3	3B	1052	
10	A-6	3B	1065	
10	A-7	3B	1052	
10	A-9	2B	1094	
10	A-10	2A	10118	
10	A-13	2A/2B	10144	
10	A-14	2A	10150	
11	3	3B	1120	(taxa only)
11	4	3B	1124	(taxa only)
11	5	3B	1131	(taxa only)
11	6	3B	1142	(taxa only)
11	A	3B	1157	(taxa only)
11	A	3B	1152	(taxa only)
14	3	3B	1408	
14	4	3B	1411	
14	5	3B/3A	1414	
14	6	3A	1418	

TABLE 4.2. Faunal remains from Kasapata excavations, Stratum 2.

Taxon	Common Name	NISP	%	MNI	%	Weight (g)	%
Tinamidae	Tinamou	6	0.4	2	4.3	2.5	0.1
Cf. Tinamidae	Cf. tinamou	3	0.2	1	2.2	0.9	0.0
Aves uid	Birds uid	16	1.0	0	0.0	6.5	0.3
Total Aves		**25**	**1.6**	**3**	**6.5**	**9.9**	**0.4**
Canidae	Dog, fox	1	0.1	1	2.2	0.6	0.0
Camelidae	New World camels	42	2.7	3	6.5	487.8	19.8
Camelidae/Cervidae	Camelids/deer	42	2.7	0	0.0	89.2	3.6
Odocoileus virginanus	White-tailed deer	2	0.1	1	2.2	87.7	3.6
Cervidae	Deer	66	4.3	2	4.3	460.0	18.7
Cavia sp.	Guinea pig	344	22.4	34	73.9	113.7	4.6
Rodentia uid	Rodent (uid)	2	0.1	1	2.2	0.2	0.0
Rodentia uid(sm.)	Rodent uid (sm.)	9	0.6	1	2.2	0.6	0.0
Mammal uid (lg.)	Mammal uid (lg.)	841	54.8	0	0.0	1,177.2	47.9
Mammal uid (med.)	Mammal uid (med.)	2	0.1	0	0.0	3.0	0.1
Mammal uid (sm.)	Mammal uid (sm.)	1	0.1	0	0.0	0.2	0.0
Mammal uid	Mammal uid	112	7.3	0	0.0	17.4	0.7
Total Mammalia		**1,463**	**95.3**	**43**	**93.5**	**2,437.0**	**99.1**
Tetrapoda	Tetrapods	**47**	**3.1**	**0**	**0.0**	**2.5**	**0.1**
Vertebrata uid	Vertebrates	**n/c**	**0.0**	**0**	**0.0**	**9.9**	**0.4**
Sample Total		**1,535**	**100.0**	**46**	**100.0**	**2,459.3**	**100.0**

Abbreviations: NISP, number of identified specimens; MNI, minimum number of individuals; uid, unidentified; n/c, no count.

TABLE 4.3. Faunal remains from Kasapata excavations, Stratum 3.

Taxon	Common Name	NISP	%	MNI	%	Weight (g)	%
Tinamidae	Tinamou	1	0.1	1	2.4	0.8	0.0
cf. Tinamidae	Cf. tinamou	7	0.5	1	2.4	1.1	0.0
Aves uid	Birds uid	10	0.8	1	2.4	2.1	0.1
Total Aves		**18**	**1.4**	**3**	**7.1**	**4.0**	**0.1**
Chiroptera	Bat	1	0.1	1	2.4	0.2	0.0
Pseudalopex culpaeus	Puna fox	1	0.1	1	2.4	4.3	0.1
Canis familiaris (sm)	Dog	1	0.1	1	2.4	0.9	0.0
Canidae	Dogs, foxes	1	0.1	0	0.0	0.5	0.0
Camelidae/Camelidae	New World camels	58	4.5	5	11.9	914.0	29.4
Camelidae/Cervidae	Camelids/deer	29	2.2	0	0.0	103.1	3.3
cf. *Mazama* sp.	Cf. brocket deer	1	0.1	1	2.4	12.3	0.4
Cervidae	Deer	89	6.9	4	9.5	823.5	26.5
Cavia sp.	Guinea pig	198	15.3	25	59.5	62.7	2.0
Rodentia uid (sm.)	Rodent uid (sm.)	4	0.3	1	2.4	0.4	0.0
Mammal uid (lg.)	Mammal uid (lg.)	744	57.6	0	0.0	1,145.1	36.8
Mammal uid (sm.)	Mammal uid (sm.)	9	0.7	0	0.0	0.5	0.0
Mammal uid	Mammal uid	109	8.4	0	0.0	31.4	1.0
Total Mammalia		**1,245**	**96.4**	**39**	**92.9**	**3,098.9**	**99.6**
Tetrapoda uid	Tetrapods	**28**	**2.2**	**0**	**0.0**	**3.9**	**0.1**
Vertebrata uid	Vertebrates uid	**n/c**	**0.0**	**0**	**0.0**	**5.2**	**0.2**
Sample Total		**1,291**	**100.0**	**42**	**100.0**	**3,112.0**	**100.0**

Abbreviations: NISP, number of individual specimens; MNI, minimum number of individuals; uid, unidentified; n/c, no count.

senting at least 46 individuals (Table 4.2). In contrast, the Stratum 3 sample contains 1,291 specimens representing a minimum of 42 individuals (Table 4.3). Although there is a difference in total number of specimens, the relative abundance of taxa is similar between the two strata.

The assemblage is comprised exclusively of mammals and birds. The identified birds include tinamous (grouse-sized South American birds) and at least one other medium-sized non-tinamou avian individual. The identified mammals include at least two species of deer (white-tailed and a smaller deer species, probably the brocket deer), large and small camelids, guinea pigs, the *puna* (highland Andes) fox, small dog, small rodents, and one bat. The rodents and bat are interpreted as nonfood commensals. The dog and fox may not have been consumed, but probably served other purposes.

The remains of cervids include larger-sized specimens of white-tailed deer (NISP = 2) and several remains of larger-sized deer that could not be distinguished between the white-tailed deer (*Odocoileus virginianus*) and taruca deer (*Hippocamelus antisensis*). Also present is at least one smaller-sized but mature individual, a probable brocket deer (cf. *Mazama* sp.) (NISP = 1; maxilla fragment).Only one of the deer remains was antler that could unequivocally be distinguished as that of white-tailed deer (Unit 10, Stratum 2); many other antler specimens are worked or modified. Many of the other skeletal elements are either fragmentary or butchered specimens within the size range for the two large Andean taxa. The most common portions of the cervid skeletal are axial elements of vertebrae and ribs, followed by foot elements, particularly phalanges (Tables 4.4 and 4.5). For a number of fragmentary axial and cranial elements it was not possible to determine whether they were deer or camelid.

The camelid specimens are also very numerous. In both strata, specimens from large-sized individuals (e.g., guanaco) are more common than the remains from smaller-sized individuals (e.g., vicuña) (Table 4.6). The

Table 4.4. Element distribution for Camelidae and Cervidae, Stratum 2.

Taxon	Portion	No.	%
Camelidae	Cranial	7	16.7
	Axial	13	31.0
	Forelimb	7	16.7
	Forefoot	1	2.4
	Hindlimb	4	9.5
	Hindfoot	1	2.4
	Foot	9	21.4
Total		**42**	100.0
Camelidae/Cervidae	Cranial	12	28.6
	Axial	29	69.0
	Forelimb	0	0.0
	Forefoot	0	0.0
	Hindlimb	1	2.4
	Hindfoot	0	0.0
	Foot	0	0.0
Total		**42**	100.0
Cervidae-all	Cranial	9	13.2
	Axial	21	30.9
	Forelimb	3	4.4
	Forefoot	5	7.4
	Hindlimb	8	11.8
	Hindfoot	6	8.8
	Foot	16	23.5
Total		**68**	100.0

Table 4.5. Element distribution for Camelidae and Cervidae, Stratum 3.

Taxon	Portion	No.	%
Camelidae	Cranial	12	20.7
	Axial	8	13.8
	Forelimb	9	15.5
	Forefoot	3	5.2
	Hindlimb	11	19.0
	Hindfoot	3	5.2
	Foot	12	20.7
Total		**58**	100.0
Camelidae/Cervidae	Cranial	4	13.8
	Axial	21	72.4
	Forelimb	2	6.9
	Forefoot	0	0.0
	Hindlimb	1	3.4
	Hindfoot	0	0.0
	Foot	1	3.4
Total		**29**	100.0
Cervidae-all	Cranial	7	7.9
	Axial	40	44.9
	Forelimb	5	5.6
	Forefoot	5	5.6
	Hindlimb	9	10.1
	Hindfoot	4	4.5
	Foot	19	21.3
Total		**89**	100.0

element distribution for both strata is also similar, with a number of limb portions as well as both head and feet portions. The remains are also from both juveniles and adults, with adult specimens more common. One phalanx from Stratum 3 exhibits osteophytes, suggesting arthritis and possibly advanced age.

The most common mammal in terms of NISP and MNI is the guinea pig. Abundant remains of guinea pigs are present in both strata. Many of the specimens are from immature individuals. Well-preserved elements from all parts of the skeleton are present.

Other mammals present include puna fox and remains of at least one small-sized domestic dog, rodents, and one bat. The small-sized dog remains probably do not represent food refuse. One unidentified mammal fragment from Stratum 2 was gnawed by a carnivore, possibly a canid (dog or fox). The role of the fox is open to speculation; it may have been food, or it may have served other purposes, since its long bones appear to have been preferred materials for beads (see Table 4.9). The rodents include mice, probably *Phyllotis* sp., and other small rodents. A single bat mandible was recovered from Stratum 3.

The birds present in the sample include tinamous and at least one other medium-sized (dove-sized) bird. Birds are not abundant in either stratum. Bone modifications to bird remains include small cuts and one worked shaft (grooved).

Bone modifications present include burning, butchering, and some polishing. One camelid specimen from Stratum 3 shows evidence of rodent gnawing. Summaries of bone modifications and burning for identified taxa are presented in Tables 4.7 through 4.9. Burning is relatively infrequent and includes black and partially burned specimens. No elements have been calcined. Butchering evidence is present on camelids, deer, and guinea pigs (Tables 4.8 and 4.9). Cut marks from hacking, presumably to separate elements into smaller portions, are more common than smaller cuts, which may be related to consumption. Some elements exhibit multiple types of butchering. The only other type of modification present is bone polishing resulting from the use of bone elements for various purposes, and evidence of rodent gnawing on one specimen.

TABLE 4.6. Representation of size-discernible camelid remains, Strata 2 and 3.

		Size	
Stratum, Taxon	**Portion**	**Large (No.)**	**Small (No.)**
Stratum 2			
Camelidae (NISP = 42)	Cranial	3	
	Axial	4	1
	Forelimb	3	
	Forefoot		
	Hindlimb	3	1
	Hindfoot		
	Foot	3	
Total		**16**	**2**
Stratum 3			
Camelidae (NISP = 58)	Cranial	4	2
	Axial	5	
	Forelimb	8	1
	Forefoot	3	
	Hindlimb	8	2
	Hindfoot	3	
	Foot	2	2
Total		**33**	**7**

TABLE 4.7. Frequency and element location of burned camelid and cervid remains, Strata 2 and 3.

Stratum, Taxon	Portion	Burning	No.
Stratum 3 Camelidae	Foot	BK	1
Camelidae/Cervidae	Axial	BK	1
Camelidae/Cervidae	Forelimb	BK	1
Cervidae	Axial	PBK	1
Cervidae	Foot	BK	2
Stratum 2 Camelidae	Axial	BK	1
Camelidae—large	Axial	PBK	1
Camelidae/Cervidae	Axial	BK	3
Cervidae	Foot	PBK	2
Cervidae	Foot	BK	1
Cervidae	Forefoot	BK	1
Cervidae	Forelimb	BK	1

Table 4.8. Butchering type and frequency, Stratum 2.

Taxon	Portion	Butchering/Wear Type	No.
Camelidae	Cranial	Hacked	1
Camelidae	Cranial	Hacked and worked/polished	1
Camelidae	Axial	Hacked	7
Camelidae	Axial	Hacked and cut	1
Camelidae	Forelimb	Hacked and cut	2
Camelidae	Forelimb	Cuts	1
Camelidae	Forelimb	Hacked	2
Camelidae	Hindlimb	Hacked	1
Camelidae	Hindlimb	Hacked and worked/polished	1
Camelidae	Hindfoot	Hacked	1
Camelidae	Foot	Hacked and cut	1
Camelidae/Cervidae	Cranial	Hacked (3); cut (1)	4
Camelidae/Cervidae	Axial	Hacked	10
Camelidae/Cervidae	Axial	Worked/utilized, polished	1
Camelidae/Cervidae	Axial	Hacked and cut	1
Cervidae	Axial	Hacked	11
Cervidae	Axial	Hacked and cut	2
Cervidae	Hindlimb	Hacked and cut	2
Cervidae	Hindlimb	Hacked	3
Cervidae	Hindfoot	Hacked	1
Cervidae	Foot	Hacked	2
Cervidae	Foot	Cuts	2

Table 4.9. Butchering type and frequency, Stratum 3.

Taxon	Portion	Butchering/Wear Type	No.
Camelidae	Axial	Hacked	2
Camelidae	Cranial	Hacked	2
Camelidae	Cranial	Utilized	1
Camelidae	Forelimb	Hacked, polished	1
Camelidae	Forelimb	Small cuts	1
Camelidae	Forelimb	Hacked	2
Camelidae	Forelimb	Small cuts, polished	1
Camelidae	Forelimb	Hacked, small cuts	2
Camelidae	Forefoot	Hacked, rodent gnawed	1
Camelidae	Forefoot	Hacked, utilized	1
Camelidae	Hindlimb	Cut	1
Camelidae	Hindlimb	Hacked	2
Camelidae	Hindfoot	Hacked, small cuts	1
Camelidae	Hindfoot	Cut	1
Camelidae	Foot	Hacked and cut	1
Camelidae	Foot	Hacked	1
Camelidae/Cervidae	Axial	Hacked	5
Camelidae/Cervidae	Hindlimb	Hacked	1
Cervidae	Axial	Hacked	22
Cervidae	Cranial	Hacked	4
Cervidae	Foot	Cut	1
Cervidae	Foot	Hacked	1
Cervidae	Forelimb	Hacked	2
Cervidae	Hindfoot	Cut	1
Cervidae	Hindfoot	Hacked and cut	1
Cervidae	Hindfoot	Hacked	1
Cervidae	Hindlimb	Hacked and cut	2
Cervidae	Hindlimb	Hacked	4

DISCUSSION AND CONCLUSIONS

For purposes of analysis, I combined the faunal samples by stratum (Stratum 2, ca. 4400 BC, and Stratum 3, ca. 3100 BC). Therefore, this discussion focuses on patterns of faunal use throughout the site during these two periods rather than on specific contexts. Faunal data from the Archaic Period in the Cuzco Valley complement data reported in other studies of Archaic Andean highland faunal exploitation (e.g., Aldenderfer 1998; Nuñez 1983; Rick 1980; Santoro and Nuñez 1987) and provide data for a region with no previous zooarchaeological studies of this time period.

The faunal data indicate that locally hunted mammals, especially deer and camelids, yielded the bulk of the animal portion of the diet. Most of the camelid remains are from large-sized individuals, presumably the guanaco. Guinea pig remains are also very numerous. Locally acquired birds supplemented the diet but were a relatively minor component. There are no animals from habitats other than the highland region.

The skeletal portions of deer and camelids present in the assemblage include the full range of body portions. The presence of cranial and foot elements as well as mid-body elements suggest that the inhabitants both killed and processed animals locally. In other words, hunting was localized, with on-site butchering and processing. This conclusion is support by the lithic remains (see Klink, Chapter 2). There is no indication that animals were divided into transportable portions for trade or exchange.

The butchering evidence includes large hack marks, presumably to separate large segments of the carcass.

In addition, smaller knife cuts related to consumption are also present. Evidence of burning is present, but the burning does not appear to be consumption related. The bone tools were primarily manufactured from large mammal specimens, presumably deer or camelids.

The quantity of guinea pig remains indicates that these animals were a staple food source. Their abundance suggests that the inhabitants may have attempted to attract wild guinea pigs to the area of their settlement through habitat modification or some other means. Many of the skeletal elements are from individuals that are not fully mature, suggesting a preference for younger individuals. Juvenile or very young guinea pigs are not present; however, these remains are more subject to destruction or may have been lost during excavation. The abundance of guinea pigs supports a model of local exploitation of faunal resources within a circumscribed terrain rather than a search for higher-yield prey farther from the site. A reliable food source close to the site would have been beneficial and helped to reduce periodic food scarcity.

The inhabitants also acquired or possessed canids (domestic dog and fox), but they may not have been for food (see Wing 1989). The domestic dog is a small-sized breed and is currently one of the earliest domesticates identified in South America. Canid remains identifiable only to the family include two phalanges, one of which has small cuts. The fox remains include a single ulna as well as portions of a fox humerus that was used to make numerous bone beads, recovered in a burial context in Stratum 3.

The most common birds are tinamous. Tinamous are medium-sized, plump-breasted birds that would have been highly desirable for food. At least four species of tinamous are present in the Andes (Meyer de Schauensee 1970). Tinamous could have been hunted with relatively simple technology, such as snares or traps. Since bird bone is relatively fragile, birds may be somewhat underrepresented in the archaeological assemblage.

In summary, the analysis of a well-preserved sample of Archaic Period faunal remains from the Cuzco Valley provides insights into early highland hunting and gathering behavior. The Archaic inhabitants of Kasapata, represented by two distinct Archaic cultural strata, had developed a successful hunting and foraging economy by ca. 4400 BC that appears to have continued relatively unchanged through ca. 3100 BC. Three indigenous families of mammals—deer, camelids, and guinea pigs—provided the bulk of the animal part of the diet. Although large mammals yielded more meat, fat, and raw materials, guinea pigs were clearly dietary staples. Interestingly, both camelids and guinea pigs were later domesticated (see Wheeler 1995; Wing 1982, 1986).

Although two cultural strata are represented at the site, there is no significant difference in faunal use through time. The analysis of a larger sample size from a greater range of contexts might elucidate temporal differences. The Archaic Period apparently served as a type of experimental laboratory for the use and consumption of indigenous fauna that would eventually be domesticated.

Notes

1. At the end of the analysis, all faunal remains were returned to Cuzco.

CHAPTER 5

THE SOURCING OF ARCHAIC OBSIDIAN FROM KASAPATA, DEPARTMENT OF CUZCO

RICHARD L. BURGER AND MICHAEL D. GLASCOCK

As described in this monograph, Kasapata is a small, open-air Archaic site that was occupied by people who followed a hunting and foraging lifeway. Located on a ridge at 3400 masl above the Huatanay River Valley, it is only 3 km to the west of the Inca site of Tipon and 20 km to the east of the departmental capital of Cuzco. Excavations in 2000 documented cultural deposits dating to roughly 4400 BC and 3100 BC, and the investigators distinguish between an early occupation (Stratum 2) and a late occupation (Stratum 3). While obsidian flakes were present in both of these cultural deposits, they were more numerous in the late occupation.

A sample of 11 obsidian flakes from the site was provided to Burger and Glascock for trace element analysis at the Missouri University Research Reactor (MURR), where a project investigating Central Andean obsidian has been going on since 1993.[1] The flakes were small and very thin, no more than 8–10 mm on a side, and none showed remnants of primary cortex. Of the 11 flakes, nine were clear with fine black streaks, one (RLB397) was clear with no dark streaking, and one (RLB 398) had a faint rose-colored tone and no streaking. Such visual variations often impress investigators but rarely correlate with source difference. Although none of these samples was carefully worked, two did show evidence of retouching on one edge (RLB 391, RLB 397), and another showed evidence of use wear (RLB 398).

The 11 samples came from two different excavation units (Units 3 and 10, see Figure 1.4). The two samples from Unit 3 came from Levels 9 and 11, both of which correspond to the site's late occupation. The nine samples from Unit 10 were recovered from Levels 7, 9, and 10, all of which correspond to the early occupation of the site. Thus, while small in number, the obsidian samples studied at MURR spanned the history of this Archaic site.

ANALYTICAL TECHNIQUES AND RESULTS

The samples were prepared for instrumental neutron activation analysis (INAA) by using a gem saw to remove approximately 100 mg from each obsidian artifact. The analytical samples were then weighed into small polyvials made of high-purity polyethylene. Standard samples made from the standard reference materials SRM-278 (Obsidian Rock) and SRM-1633a (Fly Ash) were similarly prepared.

The samples and standards were irradiated sequentially in a flux of 8×10^{13} neutrons cm^{-2} s^{-1} for 5 seconds. Following a 25-minute decay period, so that the activity from ^{28}Al (half-life = 2.24 minutes) would become compatible with the activities from other

TABLE 5.1. Concentrations of elements in artifacts from Kasapata, Peru, and source assignments.

Sample	Al (%)	Ba (ppm)	Cl (ppm)	Dy (ppm)	K (%)	Mn (ppm)	Na (%)	Source Name
RLB 389	6.85	1,018	713	1.86	3.64	482	3.17	Alca-1
RLB 390	8.06	973	720	1.98	3.46	476	3.17	Alca-1
RLB 391	6.87	1,041	801	2.00	3.60	467	3.11	Alca-1
RLB 392	6.68	1,077	758	1.74	3.67	467	3.11	Alca-1
RLB 393	6.67	982	688	2.05	3.50	472	3.11	Alca-1
RLB 394	6.68	1,039	717	2.19	3.78	472	3.16	Alca-1
RLB 395	6.87	1,013	715	2.25	3.43	470	3.16	Alca-1
RLB 396	6.83	985	774	1.93	3.61	479	3.11	Alca-1
RLB 397	6.87	968	847	2.07	3.69	478	3.18	Alca-1
RLB 398	6.94	920	756	1.87	3.73	474	3.02	Alca-1
RLB 399	6.78	998	748	2.17	4.08	491	3.28	Alca-1

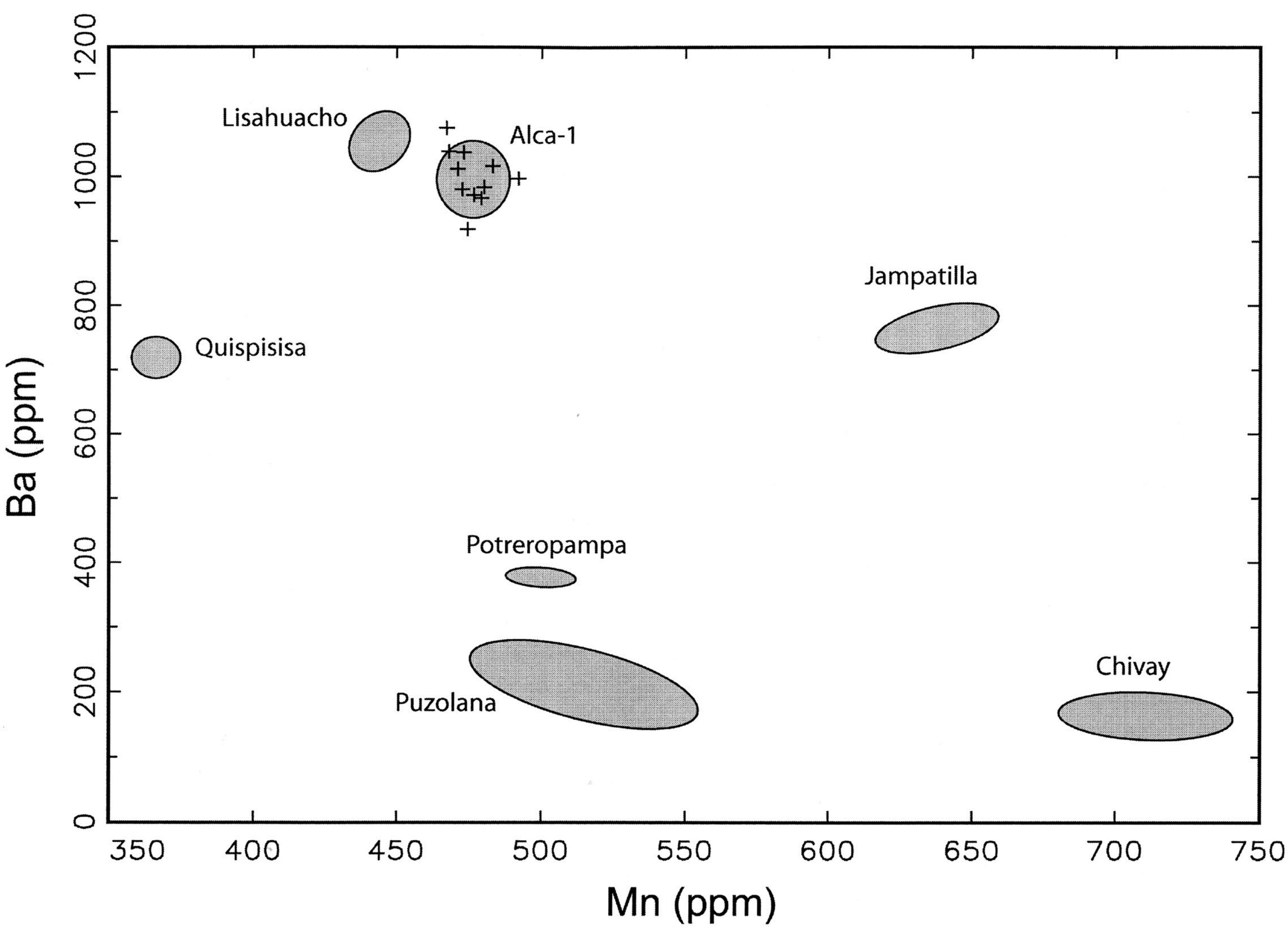

FIGURE 5.1. Bivariate plot of Mn and Ba.

TABLE 5.2. Excavation provenance and source of obsidian artifacts at Kasapata.

Sample	Excavation	Stratum:	Occupation	Source
RLB 389	Unit 3, Level 9	Stratum 3:	Late occupation	Alca-1
RLB 390	Unit 3, Level 11	Stratum 3:	Late occupation	Alca-1
RLB 392	Unit 10, Level 7	Substratum 2B:	Early occupation	Alca-1
RLB 393	Unit 10, Level 7	Substratum 2B:	Early occupation	Alca-1
RLB 394	Unit 10, Level 7	Substratum 2B:	Early occupation	Alca-1
RLB 395	Unit 10, Level 9	Substratum 2A:	Early occupation	Alca-1
RLB 396	Unit 10, Level 9	Substratum 2A:	Early occupation	Alca-1
RLB 397	Unit 10, Level 10	Substratum 2A:	Early occupation	Alca-1
RLB 398	Unit 10, Level 10	Substratum 2A:	Early occupation	Alca-1
RLB 399	Unit 10, Level 10	Substratum 2A:	Early occupation	Alca-1

short-lived radioisotopes, the samples and standards were counted for 12 minutes each using a high-purity germanium (HPGe) detector. The gamma-ray spectra were processed and element concentrations for seven short-lived elements were determined by comparing the measured counts per second from unknown samples to those measured from the standards. The elements Al, Ba, Cl, Dy, K, Mn, and Na were determined, as shown in Table 5.1.

In order to identify the source(s) for individual artifacts, bivariate plots of various element pairs were examined by projecting the artifacts against 95 percent confidence ellipses calculated from data for the major obsidian sources in southern Peru. All of the bivariate plots are in excellent agreement. One of the most representative examples is the plot of Mn versus Ba, shown in Figure 5.1.

DISCUSSION

Our analysis indicates that all 11 of the analyzed obsidian samples from the site of Kasapata came from the Alca Source in the Cotahuasi Valley of central Arequipa (Peru). This finding is noteworthy, since it demonstrates that this pattern of obsidian provisioning dates back to at least 4400 BC, 3,000 years older than had been documented previously.[2] With this new information it can be concluded that the Alca Source provided the obsidian for the inhabitants of the Cuzco region for at least six millennia (Burger et al. 2000).

The inhabitants of Kasapata were mobile hunters and gatherers, judging from the site structure and contents, and it is interesting that they would have been able to obtain volcanic glass from a source 175 km away. The journey to Alca would have required crossing the Continental Divide onto the western Andean slopes, and such a journey could have taken well over a week in this rugged terrain. Chert and andesite are more commonly used raw materials at Kasapata and were easily available in the region immediately surrounding the site, but these materials do not produce the sharp cutting edges of obsidian flakes and tools.

Knowledge of the Alca obsidian deposit appears to have been widespread long before the appearance of agricultural villages with their established trading networks. In fact, this source of volcanic glass was familiar to early hunters and gatherers long before Kasapata was established. At the Paleo-Indian occupation of the Quebrada Jaguay, located between the Ocoña and Camana drainages of the Arequipa shoreline, coastal dwellers were already exploiting the Alca obsidian source between 11,015 and 9850 BP (Sandweiss et al. 1998).

When the Alca Source was first identified, it was documented for a limited area at around 2850 masl (Burger et al. 1998). It was recognized, however, that the deposits extended farther upstream, into the headwaters of the drainage. Subsequent research by Justin Jennings revealed that the deposits are vast, covering 51 sq km and ranging from 2700 to 4300 masl. The geological survey by Jennings revealed at least 16 areas that could have been used in antiquity, and the results from MURR demonstrated several areas within the source that could be distinguished using trace element analysis (Jennings and Glascock 2003). It is interesting that all of the samples from both the early occupation and the late occupation of Kasapata belong to a single chemical subgroup known as Alca-1. Jennings encountered considerable diversity in the visual appearance of obsidian from Alca, and this is consistent with the variability in the appearance of the flakes analyzed in this study (including clear, streaked, and rosy), none of which proved to be meaningful.

The fact that all obsidian so far sampled from Kasapata is from the Alca Source contrasts with the situation at three open-air Archaic sites in the Province of Chumbivilcas and a cave site of Huki Wasi near Sicuani.[3] The rare obsidian type found at the Chumbivilcas sites has never been found outside the Province of Chumbivilcas, and it does not appear to have been exchanged or transported beyond its presumed source area. The presence of Chivay and Alca obsidian at the site of Huki Wasi is an early example of a long-term pattern at sites near the frontier between the Cuzco Basin and the Titicaca Basin (Burger et al. 2000). Furthermore, as it has been documented that occupants of the Titicaca Basin, even during the Archaic, also exploited the Chivay Source and obsidian from this source in Colca Valley, this can be used as one index of contact with these Altiplano peoples (Burger et al. 2000; Stanish et al. 2002).

The emphasis on Alca materials by the Kasapata archaic peoples is intriguing, especially since analysis of their projectile point styles (see Klink, Chapter 2) indicates that they are similar to those being made in the Lake Titicaca region during this period. These findings reflect that fact that "style" and raw materials are different media and hence may provide different ways of measuring contact with areas outside of the Cuzco basin. The link between the Cuzco and the Alca regions was a strong one and endured until modern times. The Inca road from Lake Parinacochas crossed the puna into the Cotahuasi Valley and then into the Cuzco region. This trail was used five centuries later by Hiram Bingham III during his explorations (Burger et al. 1998). It would have provided a natural route for the mobile hunters and gatherers millennia earlier and would have allowed easy access to the volcanic glass deposits in the Alca area.

Notes

1. A twelfth flake (RLB 388b) was provided but proved to be of a material other than obsidian, probably chert.

2. In a comprehensive survey of obsidian sourcing in southern Peru prior, it was observed that beginning in the Initial Period occupation of the Cuzco Basin, most obsidian was acquired from the Alca Source, located approximately 195 km to the southwest of Cuzco on the western slopes of central Arequipa (Burger et al. 2000), and that this pattern continued for nearly 3,000 years. A major disruption did occur, however, during the Middle Horizon, when Quispisisa and other obsidian sources traditionally exploited by Wari took on an unprecedented prominence.

3. While no excavated Archaic sites were known in Cuzco prior to the Kasapata research, Sergio Chávez identified early lithics on the surface of sites in the Province of Chumbivilcas in the Department of Cuzco (Chávez 1988). At the three sites of Kulluwata, Choqo Choqo, and Wiraqocha Orqo in the District of Velille, Chavez identified obsidian points that, based on their form, were probably Archaic (or preceramic) in date (Burger et al. 2000:281–284). Five samples of these early lithics were analyzed at Lawrence Berkeley Laboratory, and none corresponded to a known source; all appeared to come from an as yet unidentified obsidian deposit with a chemical signature referred to tentatively as the Chumbivilcas Type.

Huki Wasi, a high-altitude cave north of Sicuani, in the Province of Canchis, is another preceramic site in the Department of Cuzco. It was investigated by Percy Paz and tentatively dated to the Archaic based on the form of the points recovered (Burger et al. 2000:284). Seven samples were analyzed from the Huki Wasi at the Lawrence Berkeley Laboratory and the results indicated that three were made of obsidian from the Alca Source, three from the Chivay Source in the Colca Valley of southern Arequipa, and one from an unidentified source. If the dating of these samples is correct, it would be the earliest evidence of Alca obsidian being utilized in the Department of Cuzco prior to this study.

CHAPTER 6

THE ARCHAIC PERIOD OF THE CUZCO VALLEY

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UNTIL RECENTLY, IT WAS widely believed that the first inhabitants of the Cuzco Valley were Formative Period villagers (ca. 1000 BC) and that there were no Archaic Period remains in the region. This perspective was challenged during a systematic survey of the valley (1994, 1997–1999), when numerous preceramic sites were found. Additional information came from excavations at the site of Kasapata (2000), the largest preceramic site identified during the survey. It is now clear that the Cuzco Valley, like many other regions of the Andes, was inhabited soon after the retreat of the Pleistocene glaciers and that it supported thriving cultures of hunters and foragers for hundreds of generations before the advent of permanent settlements.

Although our understanding of the long Archaic Period (9500–2200 BC) in the Cuzco Valley is still just beginning, general trends are emerging. The Early Archaic Phase (9500–7000 BC) begins with small groups of highly mobile hunters and foragers. The population levels of these migratory groups were so low and their impact on the environment was so minimal that their campsites are almost undetectable. Nevertheless, from isolated projectile points recovered during the survey, we know that their hunting tools were made of high-quality, exotic materials, and we can propose that these groups included the Cuzco Valley within larger seasonal movements (Bauer et al. 2004).

The Middle Archaic (7000–5000 BC) and Late Archaic (5000–2200 BC) Phases bring with them larger bands with greater archaeological visibility. The survey results indicate that these early societies had favored sites in the valley. Although the bands were still mobile, they returned repeatedly to preferred locations in the Cuzco Valley and most likely stayed for longer periods (Bauer et al. 2004). Furthermore, based on an analysis of projectile points, it appears that the earliest peoples of the Cuzco Valley had closer relationships with peoples of the South-Central highlands than with those of the Central highlands. This cultural trend continued perhaps until as late as AD 500 (Bauer 2004; Burger et al. 2002). Indeed, analysis of the obsidian samples from Kasapata indicates that they were derived from the Alca sources in the Cotahuasi Valley, some 175 km south of the Cuzco Valley. Although we cannot be certain of the exact nature of the regional interactions between Archaic peoples at this time, the obsidian provides material evidence of their existence and possible scope.

THE SITE OF KASPATA

Excavations at the site of Kasapata have provided additional information on the lifeways of the early inhabitants of the Cuzco Valley. Research indicates that Kasapata was first visited during Middle Archaic times and that the visitations grew increasingly common, and were of longer duration, during the Late Archaic. Although the Middle Archaic occupation is currently represented only by surface artifacts, excavations at the site identified two distinct occupation strata, an early Late Archaic occupation (Stratum 2) and a late Late Archaic occupation (Stratum 3). Radiocarbon samples reveal that these strata date to approximately 4400 BC and 3100 BC, respectively.

The artifacts recovered from Strata 2 and 3 indicate that a wide range of activities were occurring at the site over time. These activities included the manufacture, maintenance, and use of a broad range of flaked and ground stone tools, as well as the processing of diverse resources and materials. In addition, various nonutilitarian items, such as personal adornments, were being produced from stone and animal bone. There is also evidence of a wide range of hunting activities, the construction of huts and storage pits, and the burial of individuals. Nevertheless, clear differences exist between the strata that point to gradual changes in subsistence strategies and lifeways over time.

The Early Late Archaic Occupation (Stratum 2)

The early Late Archaic occupation (Stratum 2) at Kasapata provided evidence of small structures (almost certainly circular huts supported with wooden poles), an assortment of pits, a hearth, various human burials, and well-stratified sheet middens. The sheet middens in turn yielded numerous stone tools, lithic debris, worked and unworked animal bones, and large amounts of carbon. The vast majority of the stone tools and lithic debris were produced from local andesite resources. However, we know that travel to or trade with other regions was also occurring, since some exotic materials, such as obsidian, are present in the collections.

The lithic analysis indicates that increasing sedentism during Stratum 2 times involved gradual shifts in long-term mobility patterns with increasingly frequent site reuse. There is evidence for greater on-site tool making and raw material caching through time. The increasing diversity, frequency, and use intensity of grinding tools, as well as the increase in soft material processing, suggest that the expanding sedentism during Stratum 2 times was mostly supported by a growing reliance on plant foods.

The analysis of faunal remains from Stratum 2 indicates that a well-developed hunting economy, focused on locally available mammals and the occasional use of medium-sized birds (including the grouse-sized tinamous), was established in the Cuzco Valley by the early Late Archaic Period, and almost certainly well before that time. The most important hunted mammals were the large-sized deer of the forested valley slopes and the large-sized wild camelids (*guanaco*) of the higher grasslands. Guinea pig (*cuyes*) remains are also abundant, and these animals would have provided a steady meat supply. The abundance of guinea pig remains suggests an intensification of hunting activities directed toward smaller but more reliable food sources during this period. Also present in the assemblage were the remains of dog (perhaps the earliest identified for the Andean highlands), fox, and small rodents.

The Late Late Archaic Occupation (Stratum 3)

The terminal preceramic occupations of the Cuzco Valley left signs of an increasingly sedentary lifestyle. The greater numbers and larger site sizes are suggestive of bigger and more sedentary bands (Bauer 2004). Excavations at the site of Kasapata provide greater insights into the late Late Archaic times of the region.

The excavations in the Stratum 3 deposit revealed a series of large post molds that would have supported structures of substantial size and duration. The excavations also encountered numerous burials reflecting the full mortality range (infants, youths, young adults, and adults), which also indicates a more sedentary lifestyle. The Stratum 3 deposits themselves were substantial in both size and depth, suggesting a considerable occupation history during this period.

The artifacts recovered from Stratum 3 deposits at the site of Kasapata indicate that the sedentarization process most likely involved significant increases in the duration of individual occupation episodes. This is reflected in the dramatic increase in both number and range of stone tools produced at the site. Nonetheless, subsistence intensification rather than logistical procurement was probably the key support mechanism of the greater sedentism during Stratum 3 times.

The faunal remains representing the two strata exhibit many similarities, indicating continuity through time of various patterns of animal acquisition, processing, and probably consumption. Although there are minor changes in the relative abundance of the large-sized mammals (e.g., camelids and deer), there are no significant differences in the portions of these animals present in the two strata, nor are there observable changes in the methods of animal butchering. There is a slight reduction in the relative abundance and diversity of deer between Stratum 2 and Stratum 3 (early and late occupations, respectively). The reduced occurrence of deer remains in Stratum 3 may reflect a shift in human hunting behavior through time to a greater focus on camelids. Alternatively, an increase in human population density in the area in the later occupation may have resulted in the displacement of deer to other habitats through time, making them less accessible to human hunters.

The greater exploitation of guinea pigs in Stratum 2 may indicate that people increased their focus on locally available fauna that could be hunted near their settlement. The greater use of cuyes in the more recent strata may also suggest the emergence of predomestication habits of encouraging small wild mammals (e.g., discarding vegetable matter) near human occupation to facilitate capture. Although the more recent stratum includes less diverse remains of deer (no small deer taxa were recovered) and canids (neither *puna* fox nor dog was recovered, and only one canid specimen), the sample sizes representing these animals are too small to draw definitive conclusions to be drawn concerning human behavior. Interestingly, the faunal remains contain no evidence that new animals were incorporated into the diet through time. We can tentatively suggest that the Kasapata faunal remains indicate a minor shift in patterns of human hunting through the Archaic away from wild species and toward a greater reliance on the mammals that were eventually domesticated, including the guinea pig and possibly camelids. These preliminary interpretations should, however, be corroborated with other Archaic samples in the region or elsewhere in the Central Andes.

LIFE AND DEATH DURING THE LATE ARCHAIC PERIOD

Analyses of the human skeletal remains from Kasapata offer a number of provocative insights into both life and death during the Late Archaic Phase in the Cuzco Valley. The mortality profile for the human remains and the levels of skeletal infection suggest that the Late Archaic peoples of the valley suffered high infant mortality and high rates of infectious diseases, perhaps exacerbated by their slow transition to sedentism at high altitudes. Both skeletal and dental pathologies suggest that carbohydrates were a significant component of the diet of those interred at Kasapata during this time period. Furthermore, we have early evidence for the practice of cranial deformation at the site.

Excavations revealed two adult burials, dating to early Late Archaic times, both beneath small cairns of heated rocks. Apparently the occupants of the site used heated stones to warm their dead adults, and perhaps to provide visible markers of their graves. Interestingly, the heat of these rocks was sufficient to lightly burn isolated parts of the skeletons, resulting in the preservation of small amounts of soft tissue. This mortuary custom does not appear to have continued into the late Late Archaic.

There may have also been differential treatment of those who died around the time of birth and those who survived for at least a few months. Examination of the skeletal and excavation data tentatively allows the conclusion that pre- and perinatal remains were disposed of in a less formal manner—perhaps in the site's midden—than were the remains of older infants and subadults. Also noteworthy is the fact that two infant burials, one dating to the early Late Archaic and the other to the late Late Archaic, showed clear evidence of the application of ocher as part of the mortuary ritual. Another infant, also dating to the late Late Archaic, was buried with a string of beads carved from a fox humerus.

Evidence of caries and premortem tooth loss, especially in the remains from late Late Archaic strata, support the general view that plant foods were important components of subsistence and may have been key in supporting the increased sedentism. Nevertheless, the strikingly high newborn and subadult mortality rates recorded in the later burials indicate that this was not a smooth or problem-free transition.

Given the relative lack of comparative materials for this time period for the highlands, it is difficult to determine whether our findings represent broader Andean trends or are unique to the Cuzco Valley. Nevertheless, the site of Kasapata is one of the oldest sites known in the highlands and among a very limited number of excavated open-air sites. The generally outstanding preservation of cultural materials at the site and the existence of numerous human burials make it even more remarkable. It is now clear that the Cuzco Valley was occupied thousands of years before the first villages were established. Additional research is necessary to understand the Archaic Period peoples of the region and the gradual and no doubt uneven shift toward a sedentary life.

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APPENDIX 1

RADIOCARBON DATES FROM THE SITE OF KASAPATA

Site	Laboratory Number	Cultural Context	Radiocarbon Age	Calendar Age	Approximate Calibrated Date		Calibrated Date
Kasapata	AA 39776[a]	Stratum 3	4428 ± 37 BP	2478 ± 37 BC	3100 BC	68.2%	3270 BC (07.3%) 3230 BC 3100 BC (42.8%) 3010 BC 2990 BC (18.0%) 2920 BC
						95.4%	3330 BC (21.7%) 3220 BC 3180 BC (03.2%) 3150 BC
Kasapata	AA 39777[b]	Substratum 2B	5464 ± 53 BP	3514 ± 53 BC	4300 BC	68.2%	4360 BC (68.2%) 4240 BC
						95.4%	4460 BC (91.7%) 4220 BC 4190 BC (03.7%) 4160 BC
Kasapata	AA 39780[c]	Substratum 2B	5507 ± 61 BP	3557 ± 61 BC	4350 BC	68.2%	4450 BC (15.6%) 4420 BC 4400 BC (39.4%) 4320 BC 4290 BC (13.2%) 4250 BC
						95.4%	4460 BC (95.4%) 4220 BC
Kasapata	AA 39779B[d]	Substratum 2A	5567 ± 38 BP	3617 ± 38 BC	4400 BC	68.2%	4450 BC (28.7%) 4415 BC 4405 BC (39.5%) 4355 BC
						95.4%	4460 BC (95.4%) 4330 BC
Kasapata	AA 39779A[e]	Substratum 2A	5645 ± 76 BP	3695 ± 76 BC	4500 BC	68.2%	4550 BC (68.2%) 4360 BC
						95.4%	4690 BC (95.4%) 4340 BC
Kasapata	Mean date for AA 39779A and AA 39779B	Substratum 2A	5532 ± 49 BP	3582 ± 49 BC	4400 BC	68.2%	4450 BC (23.7%) 4410 BC 4400 BC (44.5%) 4330 BC
						95.4%	4460 BC (88.0%) 4330 BC 4290 BC (07.4%) 4250 BC

[a] Unit 11, bag 1143/1.
[b] Unit 4, bag 423/3.
[c] Unit 2, bag 231.
[d] Unit 10, bag 10105/1.
[e] Unit 10, bag 10105/1.

Although the Cuzco Valley of Peru is renowned for being the heartland of the Incas, little is known concerning its pre-Inca inhabitants. Until recently it was widely believed that the first inhabitants of the Cuzco Valley were farmers who lived in scattered villages along the valley floor (ca. 1000 BC) and that there were no Archaic Period remains in the region. This perspective was challenged during a systematic survey of the valley, when numerous preceramic sites were found. Additional information came from excavations at the site of Kasapata, the largest preceramic site identified during the survey. It is now clear that the Cuzco Valley was inhabited, like many other regions of the Andes, soon after the retreat of the Pleistocene glaciers and that it supported thriving cultures of hunters and foragers for hundreds of generations before the advent of permanent settlements.

This edited volume provides the first overview of the Archaic Period (9000 – 2200 BC) in the Cuzco Valley. The chapters include a detailed discussion of the distribution of Archaic sites in the valley as well as the result of excavations at the site of Kasapata. Separate chapters are dedicated to examining the lithics, human burials, faunal remains, and obsidian recovered at this remarkably well-preserved site.

"This [volume] is the first substantial work on the preceramic occupation of the Cuzco region, and it will provide an invaluable set of research criteria for further studies. As such, the book breaks important new ground, and will be appealing to scholars who have an interest in related processes occurring in other parts of the Andean region. It will be the reference for guiding further research on the preceramic occupation of the Cuzco region." – R. Alan Covey, Southern Methodist University

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