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Introduction

In his landmark survey *Antiguo Perú*, Julio C. Tello (1929) pioneered the argument for the autochthonous development of civilization in the Central Andes. Unconvinced by diffusionist models, Tello (*ibid*:14-16) reasoned that Peru's highlands, with their ecological diversity and potential for great productivity under traditional modes of production, were the logical setting for pristine civilization. Highly advanced societies arose as a direct result of the highland Andean economies of agriculture and camelid herding (Tello 1929: 21-23). Furthermore, pastoralism along the extensive belts of high altitude grasslands enabled the widespread dispersion of Andean culture. The Recuay culture was one of Tello's key examples of highland Peruvian adaptation and achievement.

Most scholars, following Tello, accept that Recuay groups of Peru's North Highlands, in the Department of Ancash, prospered through intensive agro-pastoral economic strategies (Bonavia 1991; Lanning 1967; Lumbreras 1974). Until recently, however, camelid use among Recuay peoples was documented only by circumstantial evidence. There has been little direct study, for example, of faunal remains. Although recent work has clarified the economic importance of camelids in other Andean highland cultures, such as Chavín and Tiwanaku (*e.g.*, Browman 1989; Miller and Burger 1995), camelid use among the Recuay people remains largely speculative.

This paper focuses on new faunal data from the site of Chinchawas, in the Casma headwaters of the Cordillera Negra (Figure 1). Although the analyses are ongoing, the assemblages from sequential occupations confirm the intensive use of camelids in highland settlements during the Early Intermediate Period and Middle Horizon, especially between A.D. 500 and A.D. 900. Abundant archaeological remains, including camelid bones and textile making equipment, indicate that throughout the prehistoric occupation of this village camelids were vital to the procurement of its food supply as well as to other aspects of economic production. Although other species are represented, *e.g.*, cervids, rodents, canids, and birds, the data demonstrate that local groups relied on camelids as their primary animal resource. Changing environmental conditions and cultural interaction may have favored new dispositions encouraging the intensification of local camelid use during the early Middle Horizon.

Background

The analysis of archaeological faunal assemblages furnishes important insights into prehistoric economic practices in the Central Andes. The llama and alpaca are the largest New World domesticates and are transport animals as well as sources of meat, textile fiber, dung, and bone (Flores-Ochoa 1977; Franklin 1982; Gilmore 1950). The emergence of camelid raising coincides with important transformations in technology, exchange, and sedentism in prehistoric

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Andean societies (Bonavia 1996; Browman 1989; Wing 1986). Ethnohistoric sources indicate that herding and the cloth production played crucial roles in the political economy and ideology of archaic states (Murra 1965).

Faunal studies provide invaluable data for understanding the initial exploitation and domestication of Andean camelids. Most of the best evidence comes from investigations in the extensive *puna* grasslands (ca. 4000 to 4900 masl) of the Central and South-Central Highlands. By the fourth millennium B.C., faunal assemblages associated with incipient herding often show a dramatic reorientation toward camelids, distinctive morphological changes or characteristics, and killoff patterns associated with systematic culling or disease (Browman 1989; Kent 1982; Rick 1980; Wheeler 1984, 1998; Wing 1972, 1986). Some scholars emphasize the discernible shift from intensive hunting to herding strategies among later sedentary groups (*e.g.*, Miller and Burger 1995; Shimada 1985; Wing 1972) and the diverse forms of prehistoric land use and modification that supported agro-pastoralism (Lane 2005).

Important ethnoarchaeological studies treat Andean herding practices, butchering patterns, variability in bone survivorship, and long-term ecological adaptation (Flannery *et al.* 1989, Kent 1982; Kuznar 1995; Miller 1979; Stahl 1999). Ethnoarchaeological research has also focused on the economic and cultural importance of camelid fleece and spinning yarn in contemporary Andean groups (Dransart 2002). Though traditionally associated with highland developments, it is clear that camelids also played important economic roles in diet, textile production, and transport for coastal societies by the first millennium B.C. (Shimada and Shimada 1985).

PATTERNS OF ANIMAL USE IN HIGHLAND ANCASH

Although Ancash (Figure 1) does not contain the *puna* expanses of Junín or the Titicaca altiplano, there are grasslands throughout the Cordilleras Blanca and Negra that certainly provided important zones for camelid pastoralism (Lynch 1980:11-12). Domestic camelids are well-documented by the Early Horizon (900-1 B.C.) in highland Ancash (Burger 1985; Wing 1980). Their use at Chavín de Huántar as sources of meat, as well as pack animals, appears to have intensified as part of the new cultural and economic orientations established during the height of the Chavín cult (Miller and Burger 1995). The production of freeze-dried camelid meat (charqui), differential access to younger animals, and general spread of camelid herding/transport characterize the Janabarriu phase (400-200 B.C.) at Chavín de Huántar (Miller and Burger 1995:448-453).

The collapse of the Chavín civilization coincided with a widespread disruption of cultural patterns in highland Ancash (Burger 1985; Gero 1991; Lau 2000; Lumbreras 1974). Marked transformations in ceramic style associated with Huaras groups of the early part of the Recuay cultural tradition, as well as in settlement patterns, indicate the proliferation of small independent groups who largely rejected the principles of Chavín religion and appear to have been characterized by village-level economies and social arrangements (Lau 2004. Distinctive elite cultures re-emerged later in Recuay groups, especially in key drainages that favored agricultural production, herding, and trade. Corporate labor projects and elaborate mortuary remains evince substantial socio-political integration in the area around the modern towns of Cabana to the north of the Callejón de Huaylas, near the present day communities of Caraz, and Huaraz within the Callejón, around Pomabamba to the east of the Callejón, Aija in the upper Huarmey

Valley, and in the upper Nepeña Valley (Figure 1). Large chiefdoms were probably the dominant political organization.

Animal use during Recuay times, circa A.D. 1-800, is poorly understood. Perhaps the best-known evidence for Recuay camelid use comes from the iconography of elaborate hand-modeled ceramics (Reichert 1977; Smith 1978). Specifically, some scholars have identified scenes of animal husbandry in ceramic vessels depicting a single well-attired male leading a camelid by a rope around its neck (*e.g.*, Lumbreras 1974: figure 124). The imagery draws from cultural dispositions that celebrated camelids as a source of wealth and status for certain segments of Recuay society (Gero 2001: 40; Smith 1978: 65). Recent arguments maintain that the vessels do not depict a simple herding scene, but rather llama sacrifice in the context of highland religious practices (Lau 2002). The funerary contexts of Recuay fineware as well as the elaborate clothing, headdresses, and accoutrements of the human figures seems incongruous with everyday herding practice.

Smith (1978:26-38) proposed a general model for Recuay culture, with two major divisions defined by regional ecological constraints: 1) a southern zone characterized by "mobile agro-pastoralism" in the Callejón de Huaylas and 2) a northern zone based on "sedentary circumscribed agriculture" in the fertile valleys around Cabana. The northern Recuay entity, based at the civic-ceremonial center of Pashash, supplanted its southern counterpart as the nexus of Recuay political power during the late Early Intermediate Period (Smith 1978:34).

A different type of Recuay camelid utilization appears to be documented by settlement surveys of north-central coastal valleys. Mid-valley sites located strategically for defense and trading become increasingly typical of Early Intermediate Period occupations in the Moche, Virú, Santa and Nepeña Valleys (Proulx 1982; Topic and Topic 1982, 1983; Wilson 1988). This pattern suggests an intensification of coastal-highland relations based on exchange involving cargo-bearing llamas. In the lower Santa Valley, walled enclosures have been found on key trails connecting the coast with the highlands. These contain surface evidence of highland presence, including Recuay-related kaolinite sherds and desert ground drawings of llamas (Wilson 1988: 171-176, 189-193). According to Wilson (1988:355), the enclosures functioned as corrals to pen the transport llamas of Recuay trading caravans.

Faunal data elucidating camelid use in the Recuay culture are limited. There are several preliminary reports from studies in the Callejón de Huaylas (Burger 1985; Rofes, in Ponte 1999; Sawyer 1985). Brief citations to faunal materials recovered from ceremonial contexts in Recuay tradition hilltop sites are also available. The assemblages appear related to feasting activities sponsored by local community leaders to establish political authority (Gero 1991, 1992; Lau 2002). Nonetheless, there is no complete faunal inventory from a Recuay site. Furthermore, it is presently impossible to reconstruct and compare Recuay animal use practices diachronically.

Paleoclimate and Ice-core Records

Paleoenvironmental conditions in northern Peru are also poorly known, especially in relation to changing economic practices and animal resources in the highlands. Glacial ice-cores furnish the best available evidence for local climate change (Thompson 2001; Thompson and Mosley-Thompson 1989; Thompson *et al.* 1992).

The dimensions and contents (*e.g.*, pollen, dust, and chemical elements) of ice-cores provide annual measures of local rainfall, temperature, and vegetation cover. The thickness of annual ice accumulation, for instance, serves as a proxy index of yearly precipitation. Drier conditions correspond to periods of low ice accumulation, while rainy conditions correlate with thicker ice layers. Growth layers also record paleothermometric information because colder places and times result in isotopically lighter precipitation, preserved as ice (Alley 2000: 1331). Studies demonstrate a strong correlation between colder temperatures and lower (more negative) $\partial^{18}O$ values (Thompson and Mosley-Thompson 1989; Thompson *et al.* 1986, 1992).[1]

Scholars have employed ice-core evidence, specifically that of the Quelccaya ice cap in the South Central Andes, in their models of the rise and collapse of the ancient Andean polities (*e.g.*, Kolata 1996; Shimada 1994; Shimada *et al.* 1991). The need for high resolution paleo-climatic data has overshadowed reservations about the temporal precision of the cores.[2] It also remains to verify whether ice-core records, taken from one region, reflect ancient conditions in other parts of the Central Andes, *e.g.*, Quelccaya evidence applied to the North Coast of Peru (*cf.* Shimada 1994:125-126).

This discussion examines new data from Nevado Huascarán (Thompson 2001), located only 50 km to the northeast of Chinchawas (Figure 1). Patterns in oxygen isotope ratios help inform the reconstruction of changing resource zones and local animal use during the mid-to-late first millennium A.D. Review of these data follows a brief overview of the site investigations and faunal assemblages by phase.

ARCHAEOLOGICAL INVESTIGATIONS AT CHINCHAWAS

Chinchawas is an ancient hilltop settlement, about a day's walk due west of Huaraz, Department of Ancash, Peru (Figure 1). Chinchawas emerged as a small village by A.D. 300, but its most intensive occupation occurred around A.D. 500-900. At 3850 masl, the community was situated to exploit high altitude agricultural lands and *puna* grasslands ideal for camelid pasture (Figure 2). Moreover, the site overlooked a major route between the coast (Casma) and the Recuay heartland of the Callejón de Huaylas. Field investigations aimed to elucidate cultural changes in village life before, during, and after the expansion of Wari, one of the first major Andean states. The results presented here form part of a larger research program focused on transformations in Recuay economic and ceremonial practices during the Early Intermediate Period (A.D. 1-700) and Middle Horizon (A.D. 700-1000).

The maximum extent of Chinchawas is only about 4 hectares, but it contains a diversity of standing stone architecture, in two major zones. Sector 1 (Figure 3) refers to the principal hilltop mound, and consists of a series of enclosures, terraces, room complexes, and special-use constructions. Sector 2 lies to the east of Sector 1, and is comprised entirely of small mortuary constructions on low-lying ridges of exposed bedrock. All data indicate that Sector 1 functioned mainly for residential and public activities, while Sector 2 served as the primary cemetery.

[1] Oxygen isotope ratios expressed as $\partial^{18}O$ (the relative difference in isotopic abundance ratio $^{18}O/^{16}O$ between the sample and a standard). In addition, $\partial^{18}O$ values correlate positively with rainfall patterns, where less negative values indicate generally wetter conditions. In contrast, more negative values indicate generally drier conditions.

[2] The lowermost levels of the Quelccaya cores, which extend back some 1500 years, are so compressed that the differentiation between annual layers and their contents becomes problematic. Thus, the correlation of absolute years from the lowermost sequence of the ice-core should be subject to a ±20-year standard deviation (Thompson *et al.* 1986:363; for additional discussion of general concerns with ice-core data, see also Alley 2000). Notably, a preliminary review of the cores from Huascarán shows close correlation with overall temperature and precipitation trends outlined by the Quelccaya records (Thompson *et al.* 1995).

Chinchawas was a small settlement during its initial use which took place during the Kayán phase (A.D. 300-600). It consisted of a series of enclosures and houses on the topmost part of Sector 1. Later, during the Chinchawasi 1 phase (A.D. 600-700), the site was expanded outwards and downhill. It reached its maximum extent and nucleation during the early Middle Horizon (Chinchawasi 2 phase, A.D. 700-850). Intensive occupation continued through the Warmi phase (ca. A.D. 850-950), but was characterized by poorer quality construction, reuse of older buildings, and de-emphasis of patio enclosures.

Overall, steep areas were reclaimed by building large retaining walls, which served to open level living and work spaces, form the outer walls for habitations, and provide perimeter defenses. Agglutinated rooms clustered adjacent to terrace areas, especially to the north and west. Excavations found abundant bone refuse within these contexts, generally as floor scatter. In several cases, the inhabitants appropriated older structures as dumps for major deposits of animal bone (OP48 and OP49).

Abundant animal remains were also found associated with centrally located special purpose buildings. Enclosures 1 and 2 feature fine stone masonry, drainage works, and Recuay tradition stone sculpture. An elaborate circular building lies to the east, on the highest part of Sector (Figure 4). It has concentric walls and is known as the Torreón. Dense animal remains were recovered in these buildings and in directly adjacent areas. A previous study identified refuse associated with Enclosure 2 as the discard of large scale feasting activities (Lau 2002).

Walled terraces and large, well-made corrals extend away from the southern end of Sector 1. Other large walled enclosures, made by piling rough fieldstones, occur approximately 50 m to the south and southeast uphill from the Chinchawas ridge-top. Such constructions are commonly identified as corrals in the highlands (Parsons *et al.* 1997, 2000). Several test units (OP25 and OP36) within the interiors of these large walled areas revealed evidence, including dark organic deposits of dung-like granules, consistent with this interpretation (Kuznar 1995:73-76; Lau 2001:143-144).

Excavations proceeded by natural strata. Floors and features were defined on the basis of soil texture, color, or contents. In deposits where natural strata could not be discerned, excavations were done in 10-20 cm arbitrary levels. All soil was sieved through 0.5 cm mesh screens to maximize artifact recovery. On selected occasions when floor levels and features such as cooking areas were being excavated, 0.2 cm mesh screens were used.

Chinchawas Faunal Remains: Character and Study Methodology

The present discussion reports the results of research conducted during the summers of 1998 and 1999 in Huaraz, Peru. Over 229 kg of animal bones were recovered during the 1996-97 excavation seasons, of which over 140 kg (or 13,331 individual specimens) belonged to animals identified to family, genus, or species level (Table 1).[3]

Cleaning of the bone materials was followed by identification and documentation. Information on species, siding, fusing, and skeletal measurements were logged first on handwritten forms and then computerized as spreadsheet data.[4] Detailed examination of bone taphonomy

[3] Additional identified bone elements from the surface and plow zones belonged to, in decreasing order of abundance: goat and sheep, pig, cattle, and horse. Human elements were also occasionally represented in prehistoric levels, but are excluded from the descriptions.

[4] Siding aims to distinguish right and left elements of an animal; it is basic for calculating skeletal representation as well as estimates for minimum number of individuals (MNI).

and intra-skeletal survivorship remains for another study.

The preservation quality of the assemblage is highly variable, but, in general, is characterized by well-preserved individual elements, especially from the site's midden deposits (Lau 2001, 2002). It should be noted that the predominant use of 0.5 cm screens likely resulted in an under-representation of small animals. The remains of rodents, and possibly fish, may have been particularly affected (Stahl 1982; Valdez and Valdez 1997).

The process of identification and analysis discerned clear size patterns in camelids. Metrical data will be presented to characterize the size variability of the assemblage. All proximal first phalanx and distal humerus measurements reported here were taken on fused elements, and exclude incomplete or otherwise altered specimens (*e.g.*, from erosion, cracking, spalling, and gnawing).[5]

The analysis focused on faunal materials retrieved from midden and fill deposits with secure phase associations. Data from mixed contexts were not included in the appraisal. It should be noted that all samples and contexts may not be strictly comparable. The small assemblages from the initial (Kayán) and latest occupations (Chakwas, A.D. 950 to Inca), which consist mainly of fill lots or floor scatter, may preclude direct comparison to the large samples from the intermediate periods, which include refuse from dense midden deposits.

The present discussion aims to characterize the faunal assemblages diachronically, emphasizing the comparison of proportions rather than absolute frequencies. Therefore, the research seeks to detail broad patterns of animal use at Chinchawas. What animals are represented at the site, and in what relative abundances? What cultural activities and economic priorities are evidenced by the remains? How do these patterns change through time?

The data are organized according to the site's cultural sequence. Of main utility here will be tabulations for NISP (number of individual specimens), bone weights, MNI (minimum number of individuals)[6], and estimates of usable meat weight (Table 1).[7] Discussion will consider

Fusion refers to the ossification process of skeletal elements during the maturation of a given animal. Different bones of an animal skeleton fuse at different points in time. Identification of fusion loci aids in the determination of age at death as well as of MNI.

[5] To facilitate comparison, measurements were taken at points described in previous investigations, specifically: [proximal first phalanx (maximum latero-medial width and anterior-posterior width)] and [distal humerus (maximum latero-medial width)]. Additional measurements were taken on the following elements: first phalanx, astragalus, calcaneum, metapodial (distal), humerus (distal), radio-ulna (distal), femur (distal), and tibia (distal). Locations of measurements are described in Miller (1979, 2003), Miller and Burger (1995), and Shimada (1985), the latter derived from Wing (1972: figure 1).

[6] MNI was calculated by determining the most numerous sided element in the assemblage per taxon. For example, left distal humerus was used for camelids. The element was used to determine MNI for the same taxon across phases to produce conservative estimates of species abundance. In the case of camelids, MNI calculations also distinguished fused and unfused specimens of the left distal humerus. Fusion of the distal humerus epiphysis occurs around 12 months (Miller 2003: appendix B). Unfused distal humeri was used to infer individuals younger than 12 months.

[7] Usable meat weight is an additional estimate of relative contribution and is derived by multiplying each taxon's MNI with the animal's carcass weight. All usable meat weight figures, however, should be taken as *estimates* due to variability attributable to age, health, conditioning, and, in the case of camelids, different varieties. Weights, unless specified below, are reproduced from Miller (1979: table 8) and Miller and Burger (1995: table 1). The approximation of 50g per individual was used for indeterminate rodents (Simonetti and Cornejo 1992: table 2). For camelids older than 12 months, the carcass weight used was 45 kg [average of adult llama (57.5 kg) + adult alpaca (32.5 kg)]. A carcass weight of 20 kg was used for camelids under 12 months; the liveweights of year-old alpacas in Central Chile averaged 41.5 kg (Castellaro *et al.* 1998:512). For cervids, a weight of 36.5 kg per individual was used [average of *taruka* (25 kg) and

briefly the archaeological contexts for the remains and variability in terms of animal species, general ages, and camelid carcass sections represented in the archaeological sample. Finally, other artifacts will be described to illuminate the importance of textile production in Recuay village communities. General observations on the faunal assemblages and their significance in broader comparative contexts will conclude the article.

Kayán phase (A.D. 300-600)

Kayán deposits were almost exclusively in the lowermost strata of the excavations in terraces and walled enclosures. The exception was operation OP45, which sampled the interior floor of a rectangular house structure. The Kayán phase NISP consists of 145 bones, represented mainly by camelid (81.4%), followed by cervids (6.2%), guinea pig (2.1%), and dog (0.7%). Unidentified bones included indeterminate artiodactyls (8.3%) and small mammals (1.4%). The total weight of all bone materials, including NISP and unidentified remains, in Kayán deposits totaled 1.53 kg. The limited sample of animal bone can be attributed, at least in part, to the small number of intact Kayán phase deposits uncovered during the field investigations.

The Kayán assemblage consists mainly of camelids, as reflected in NISP (n=118, or 81.4%), MNI (n=5), or usable meat weight (74.7%) for the phase. Fused and unfused elements were represented, indicating that camelids of different ages were available to the local Kayán groups at Chinchawas. Sixty percent of the MNI estimate consisted of individuals older than 12 months.[8]

The Kayán camelids were most likely of domestic varieties, although the exploitation of wild animals (*i.e.*, vicuña and guanaco) cannot be ruled out. Metrical data for several first phalanges support the identification of domestic animals. The length and proximal and distal widths fit well within the typical ranges of known alpaca and llama specimens (Kent 1982: Appendix IV.2; Miller 1979:140-159; Miller and Burger 1995:430-433; Wing 1972).

Based on the current sample, the Kayán occupation at Chinchawas can be characterized as heavily reliant on camelids, with supplementary dietary contributions of deer, guinea pig, and possibly dog. These figures seem reasonable in light of similar patterns found in much larger samples from subsequent phases.

Chinchawasi 1 phase (A.D. 600-700)

Chinchawasi 1 phase contexts included major bone deposits from floor scatters (*e.g.*, OP47, OP54), middens (*e.g.*, OP46e and OP49), fill lots (*e.g.*, OP31, OP35), and special purpose constructions (OP54). The Chinchawasi 1 phase collection consists of 2715 identified bones (NISP). The entire phase corpus, including NISP and unidentified bone, weighed 25.5 kg. In addition to an apparent increase in overall frequency, a wider range of animals is represented in the sample, including species such as viscacha (*Lagidium peruanum*), birds, and small rodents.

The dependence on camelid meat evident during the Kayán phase continues into Chinchawasi 1. Camelids comprised nearly 75% of the NISP total (n=2025) and 89% of the usable meat weight index. Of the 26 individuals, half were older than 12 months of age. Deer contributed 7.7% of the usable meat weight, followed by dog (2.3%), guinea pig (0.6%) and small amounts of bird, viscacha, and small rodents.

white-tailed deer (45 kg)] (after Miller 1979:160).

[8] As represented by fused left distal humerus.

Chinchawasi 2 phase (A.D. 700-850)

Chinchawasi 2 phase contexts included bone deposits from floor scatters (*e.g.*, OP30), middens (*e.g.*, OP38, OP48), fill lots (*e.g.*, OP31, OP35), and special purpose constructions (*e.g.*, OP54). A total of 8263 (NISP) bones were identified from a phase assemblage weighing 99.2kg, including indeterminate bone fragments. The NISP and total bone weights for the Chinchawasi 2 sample more than triple the analogous totals for the Chinchawasi 1 phase. Although the sample derives from more frequent and richer Chinchawasi 2 contexts, the greater abundances also probably reflect more intensive animal use and local discard.

Chinchawasi 2 deposits contained a range of species. In addition to deer, dog, and guinea pig (3.1%, 1.3%, and 0.2% of usable meat weight, respectively), viscacha, bird, and small rodents accounted for limited meat contributions. The sample demonstrates unprecedented representation of camelid remains: 6577 bones, or 79.6% of the phase assemblage. During the Chinchawasi 2 occupation, an MNI of 96 camelids contributed 95.3% of the usable meat weight, approximately 3320 kg. Sixty-two percent of the MNI were older than 12 months.

Warmi phase (A.D. 850–950)

The abundance of animal bones decreases considerably during the Warmi phase. The phase assemblage is represented by 1116 bones (NISP). The assemblage's weight (NISP and unidentified bones) totaled 8.4kg.

The range of species represented is comparable to earlier periods, with a preponderance of camelids, followed by limited quantities of cervid (6.7%), dog (4.1%), guinea pig (0.3%), viscacha (0.2%), bird (0.2%), and small rodents (0.1%), in relative order of usable meat weights. Interestingly, small rodents comprised a large proportion of the assemblage's NISP (n=172, or 15.4%); however, the meat contribution from them appears negligible. Fourteen camelid individuals (MNI) are represented, accounting for 88.5% of their meat contribution to the phase sample. Fifty-seven percent of the MNI consisted of animals older than 12 months.

DISCUSSION

Species represented: hunting and herding at Chinchawas

Throughout the occupation of Chinchawas, the data confirm that camelids were the primary animals exploited. During the Early Intermediate Period and Middle Horizon, camelids constituted the bulk of the usable meat weight estimates: Kayán (74.7%), Chinchawasi 1 (89.4%), Chinchawasi 2 (95.3%), and Warmi (88.5%). These figures are consistent with other post-Formative assemblages reflecting herding practices in the North Highlands (Burger 1985; Sawyer 1985; Shimada 1982, 1985; Wing 1980: 159).

Domestic dog and guinea pigs are also represented in the sample, although in fairly low quantities. By phase, guinea pigs never exceed 1% of the usable meat weight. However, it is probable that *Cavia* sp. is consistently underrepresented in the sample because of factors limiting small-bone preservation and recovery.

Bone materials from small wild rodents (n=548) are also present, sometimes in large quantities, such as in the Chinchawasi 2 and Warmi phases. Presently, their use or incidental occurrence cannot be ascertained definitively. Simonetti and Cornejo (1991) propose that small rodent (*i.e.*, *Octodontidae*) consumption in highland South America may be identified on the basis of burned bone elements which result from cooking animals over open fires (Wing 1980:152-153). Although some dietary contribution from small rodents cannot be ruled out, none of the specimens at Chinchawas, mainly of mice, shows evidence of burning. Regardless, small wild rodents do not appear to have played a significant role in local consumption.

Although hunted animals are present throughout the sequence, their contribution to the local diet compared to domestic animals appears to be relatively minor, accounting for approximately 4-16% of usable meat weight by phase. Cervids include both white-tailed deer (*Odocoileus virginianus*) and *taruka* (*Hippocamelus antisensis*).[9] It is surmised that the deer were hunted along the nearby forested belts lining the Río Pira's course to the north and east of Chinchawas. Deer may have also been obtained at higher elevations in the *puna* lands to the south and southeast, but these are farther away from the site. Viscacha and birds were almost certainly taken, as they are still today, along the steep rocky outcrops and precipices located uphill from the site, about 200 m due south. Fish were not identified in the faunal assemblages.

It cannot be stated with absolute confidence that domestic varieties represented the only camelids being exploited at the site. On the basis of proximal width measurements of first phalanges (Figures 5, 6), several specimens appear to fall within the size range of contemporary vicuñas; similarly, several examples show proximal widths and maximum lengths consistent with contemporary guanacos (Kent 1982; Miller 1979). The large majority of the 281 examples of first phalanges, are, however, typical of size ranges found amongst contemporary domestic camelids. The data show a bias towards camelids of a particular size that corresponds well with the known range of contemporary domestic animals, especially alpaca, with very occasional representation by smaller (vicuña-like) and larger (guanaco-like) animals.

Whether the smaller animals represent vicuñas or undersized alpacas and whether the large animals represent guanaco or a large variety of llamas cannot be resolved at present. It should be noted that, at 3850 masl, Chinchawas lies outside the preferred natural range of guanacos (Kent 1982:43). Chinchawas is within the natural range of vicuñas, but the immediate zone surrounding the site is poor in permanently damp and well-watered pasturages commonly considered to be optimal vicuña territory (Kent 1982:41-43). The presence of deer and smaller game demonstrates that hunting was certainly practiced by the prehistoric residents of Chinchawas. Hunting strategies may have also targeted vicuña and guanaco, but wild camelids, if any, likely played a minor role in the local subsistence economy during Chinchawas' occupation.

Some cultural materials associated with hunting practices, such as atlatl hooks and projectile points, are present at the site but in small quantities (Lau 2001: Chapter 11). On the other hand, rounded pebbles, which could have been used as sling stones, are not uncommon (Table 2). Overall, however, the presence, but in limited numbers, of wild animals and hunting equipment is consistent with the argument that hunting comprised a supplementary subsistence strategy. Given the sedentary village setting and the first millennium A.D. date, there is no major shift from hunting to herding. Camelid husbandry was already widely established in highland Ancash and practiced long before the rise of the Recuay culture.

In general, few species are represented in the Chinchawas faunal sample. By phase, the greatest diversity occurs during Chinchawasi 2,

9 Deer species distinguished on the basis of antler (n=43). Of the 26 antler remains identified to species, twenty were of *taruka*, the remainder from white-tailed deer. "Cervids" in Table 1 includes all identified cervids. MNI was derived from postcranial elements (right distal humerus), partly because antler may have been collected as a raw material.

although this can be partly attributed to the larger sample size and intensity of site occupation. Limited diversity also characterizes assemblages from other North Highland settlements with sedentary residential populations, such as Huaricoto, Chavín de Huántar, and Huacaloma. In spite of their proximity to alluvial zones, with access to riverine and valley fauna, the range of species represented at these sites is fairly small (Miller and Burger 1985: Sawyer 1985: 23-28; 429; Shimada 1982:321; 1985: 301). In contrast, post-Chavín assemblages from Guitarrero Cave (Complex IV) and Manachaki Cave (Empedrada phase), which provided temporary shelter to mobile groups, demonstrate a wider spectrum of species exploited (Church 1996: 824; Wing 1980:154). For sedentary populations, the low faunal diversity appears to underscore reliable access to camelids, via local specialized production or distribution.

Paleoclimatic conditions

Climate likely played a significant role in shaping local resources and subsistence strategies at Chinchawas. Given Chinchawas' location at the upper limits of agriculture, it stands to reason that long term patterns of significant paleoclimatic change could alter the productive capacities of the local environment.

Ice-core data from Nevado Huascarán, located in the heart of the Callejón de Huaylas, indicate that mean temperatures in highland Ancash dropped discernibly during the latter half of the first millennium A.D., as reflected in gross 100-year averages of oxygen isotope ratios (Figure 7). The trend bottomed out between the sixth and eighth centuries A.D. (Thompson 2001; Thompson *et al.* 1986, 1992).[10]

[10] Data from World Data Center A for Paleoclimatology Data Contribution Series #2001-008. NOAA/NGDC Paleoclimatology Program, Boulder. Accessed October 2001. (http://www.ngdc.noaa.gov/paleo/icecore/trop/huascaran/huascaran_data.html).

Ecological zonation in the Andes is highly dependent on altitude and temperature (Pulgar Vidal 1972; Tosi 1960). Following a correlation between mean temperature and elevation, it has been suggested that decreases of 1° to 2°C could lower the upper limits of cultivation 200 to 400 m (Cardich 1985). In this model, colder weather would have promoted the advance of *puna*-like grasslands over the greater Chinchawas area during the site's primary occupations (A.D. 500-900). The retreat of major Andean glaciers and a strong warming trend during the twentieth century are reflected in a $\partial^{18}O$ ratio of -17.38. By comparison, the figures for the 6^{th}-10^{th} centuries A.D. are more consistent with the range recorded for the Little Ice Age (*circa* 1400-1800), that is, between -18.3 and -19.34 (Thompson 2001).

Under colder conditions, one would expect that Chinchawas' economic orientations by mid-millennium could have turned increasingly toward camelid herding, with the propinquity of natural pasturage as well as the retreat downward of arable lands. The important belt of land between 3700 and 3900 masl, in which modern farmers cultivate potatoes and other high-altitude cultigens, would probably have shifted to lower altitudes during cold weather periods of Chinchawas' occupation. The dense quantities of camelid remains, the general infrequency of agricultural and hunting implements, the presence of large ancient corrals, and abundant spindle whorls (Table 3) throughout the site sequence support the hypothesis that stock-raising, benefited from nearby pasture lands and played a key role in the prosperity of Chinchawas.

Camelids at Chinchawas

Different varieties and ages of camelids were used during Chinchawas' prehistoric occupation. Although the abundances of camelid bone vary considerably by phase, there is general continuity in the proportions of animals used.

For example, between the Kayán and Warmi phases, animals under the age of 12 months featured commonly, accounting for 40-50% of the camelid MNI by phase (Figure 8). It seems reasonable that young animals formed a consistent part of the local diet, probably because of the culling of undesirable animals and the preference for younger, more tender meat.

In addition, although camelids of different sizes were represented, there appears to have been a sustained dependence on smaller-sized camelids. Metrical data (Figures 5 and 6) indicate that most of the Chinchawas sample lies between the mean dimensions of llamas and alpacas, but clusters towards the latter category in the size gradient. The pattern is quite different from the distinctly bimodal distribution of small versus large camelids at Qhataq'asallacta or Chavín de Huántar (Urabarriu phase; Miller 1979:145; Miller and Burger 1995:431). The Chinchawas pattern seems more in line with general distributions of the Early and Middle Cajamarca gradients at Huacaloma, with the clear majority of first phalanges measuring 17-21 mm in proximal width (Shimada 1982: fig. 5).

The Chinchawas sample contains very limited proportions of large camelids comparable to contemporary llamas (Figure 6). This contrasts with assemblages from other highland Peruvian sites, where large camelids predominate. For sites near Cusco, Miller (1979:160) identified 79% large camelids in usable meat weight at Marcavalle, an Early Horizon site at 3,300 masl, and 70% at Qhataq'asallacta, an Inca period site at 3600 masl. For occupations at Huaricoto (2750 masl), in the Callejón de Huaylas, large camelids made up 94% of the sample during the Huarás phase, 51% during the Recuay phase, and 72% during the later Marcará phase (Sawyer 1985:44).

An indicator for the homogeneity of the camelid population is a sample's coefficient of variation, *V* (Miller 1979: 143).[11] The *V* for the total sample of maximum proximal widths (first phalanx) is 10.5, a value indicating variability due likely to the presence of multiple varieties (Table 3). If a hypothetical large-size grouping is distinguished, based on proximal widths greater than or equal to 21 mm, the *V* for the sample (n=45) is 5.5, while the *V* of the remaining animals (widths lesser than 21 mm, n=236) is 6.9.[12] The latero-medial width measurements of distal humeri (n=122) yield comparable results. These values are consistent with the hypothesis that the majority of the Chinchawas camelids falls within the range of a smaller size category.

The metrical data are remarkable because the first phalanx and distal humerus samples mainly contain specimens beyond the typical range of contemporary alpaca, suggesting the presence of larger alpaca, very small llama animals, or hybrids (Miller 2003:32-35; Miller and Gill 1990:64). Wing (1972: 337) found that small camelids at Kotosh, during the post-Chavín Higueras phase, also occupied the "large end of the small camelid range," but concluded that they were "undoubtedly alpaca".

Several suggestions can be offered to account for the patterns at Chinchawas. First, local people may have relied on smaller-sized camelids as their preferred source of meat. The

[11] Taken as the standard deviation divided by the mean x 100 to read as a percentage (Shennan 1997). Values around 5-6 are usually taken as good indicators of homogeneity within a species. Higher figures may indicate impure samples, including animals of different ages or minor taxonomic divisions (Simpson *et al.* in Miller 1979: 143-144).

[12] These values are reasonable but can be compared to values if the small/large division is set to 20 mm [large (N=76), V=6.9; small (N=205), V=6.2] or to 22 mm [large (N=30), V=3.98; small (N=251); V=7.6]. Comparative measurements of known species are available (Kent 1982: appendix IV.2; Miller 1979:140-159; Miller and Burger 1995:430-433).

faunal remains were found mainly in residential and midden contexts, and are associated with cooking and consumption. On-site butchery is supported by common crude flaked cutting tools (Table 2), mainly of a poor quality cherts (*silex*). The general bias towards small-sized animals at Chinchawas may be consistent with some cultural dispositions favoring alpaca meat over llama (Miller 1979).

Another likely reason for strong smaller-sized camelid representation is local specialization in fiber processing. Alpacas today generally produce a finer hair fiber than llamas, suitable for warm, light, and valuable woven textiles (Gilmore 1950). Recent studies, it should be noted, posit that llamas may have also been bred for fiber production, as indicated by mummified llamas bearing fine-fiber fleece at the Chiribaya site of El Yaral in the Moquegua Valley (Wheeler *et al.* 1992).

At Chinchawas, actual weaving is documented only by a small number of needles and weaving implements, made of bone, wood, and metal (Lau 2001: Chapter 11). Substantial attention, however, appears to have been directed at processing and spinning camelid hair fiber, as reflected by spindle whorls (Table 4).

As finished artifacts, spindle whorls served as counterweights on the ends of narrow rods, *i.e.*, spindles, to facilitate the spinning of camelid hair fiber (Arnold 1987; Bird 1979; Dransart 2002). Considerable variability characterizes Chinchawas' large whorl assemblage, including whole, broken, and partly-finished specimens, or blanks (Lau 2001:399-404). Typically, they were manufactured expediently out of broken pottery sherds (n=266), but specimens of fired clay (n=5), bone (n=7), and ground stone (n=8) were also recovered. Some whorls employ kaolinite sherds or painted fragments, reflecting small aesthetic choices in the whorl production process. The ground-stone specimens can be considered modest sumptuary items, based on their craftsmanship, rarity, and significance as grave-offerings and items for public display (Lau 2001:403). In all likelihood, weaving expertise was a highly valued skill for the ancient residents of Chinchawas, and easy access to camelid hair fiber comprised a significant component of the community's economic prosperity.

Camelid utilization is the most prominent during the Chinchawasi 2 phase. This seems to be reflected not only in considerable quantities of bone refuse, but in large numbers of spindle whorls and whorl blanks. Increased access to camelids apparently filled the growing local demand for meat and raw textile fiber. The mean dimensions of perforated ceramic whorls support the trend of economic intensification (Table 4). Chinchawasi 2 whorls are, on average, 3.5 mm wider and slightly thicker (0.1 mm) than in previous phases. The larger whorls may indicate a new interest in heavier weights to process greater and/or thicker quantities of thread.

The innovations in camelid use coincide with other important economic changes at the site. In particular, long-distance commerce and interregional connections become increasingly important. By the end of the Chinchawasi 2 phase (circa A.D. 800), local peoples at Chinchawas were actively participating in Wari's sphere of economic influence. Long-distance imports of exotic ceramics including those in Wari, Cajamarca, Nievería, and North Coast styles, as well as of lesser known non-local wares, Quispisisa source obsidian, marine shell, and copper-metal adornments from unknown sources all occur in greater frequency during the Chinchawasi 2 occupation and are linked to a widening of exchange ties during Wari expansion (Burger and Glascock 2000; Lau 2005).

Located along one of the major passes from the lower coastal valleys to the Callejón de

Huaylas, Chinchawas functioned as a node in the coast-highland trading networks of Northern Peru (see Topic and Topic 1983). Local people probably provided agro-pastoral products, including tubers, camelid meat, raw textile fiber, and possibly finished Recuay-style cloth, in return for much-desired sumptuary goods and exotic commodities, such as salt, dried seafood, and fruit. It seems unlikely that Chinchawas people were themselves full-time traders. The infrequency of large sized camelids represented at Chinchawas suggests limited local presence or consumption of llama-sized pack animals.

An oft-cited behavioral pattern concerns the charqui effect proposed by Miller (1979). Foot and head bones should be more common in high-altitude charqui production sites. Meat-rich upper limb bones, meanwhile, should be more frequent in lower altitude settlements acquiring charqui through exchange (Miller 1979: 210-214; Miller and Burger 1995: 441-444; Shimada 1982: 313-314, 1985:296; Stahl 1999).

Rather than focusing on the differential representation of individual bone elements, the present analysis employs bone weight proportions of elements grouped according to five sections of a butchered carcass (Table 5), described as "meat packages" (Miller 1979: 43-52).[13] The following discussion proceeds on the premise that the proportions of certain packages (by weight), relative to one another, may reflect significant changes or continuities in camelid use by phase.

Although current evidence cannot demonstrate whether *ch'arki* production constituted a significant economic activity, several potentially relevant patterns can be noted. First, cranial remains show a continuous decline from the Kayán to the Warmi phase. In addition, forelimb representation shows steady incremental increases in importance, suggesting perhaps increased representation of better meat-bearing cuts during the Chinchawasi and Warmi occupations.

Foot and cranial elements are consistently present, indicating local butchery and discard of all skeletal elements. Combined proportions of foot and cranial elements are the greatest during the Kayán (37.6%), Chinchawasi 1 (41.2%), and Warmi (37%) phases. Notably, foot and head sections (28.9%) are not as well-represented in Chinchawasi 2. There is a 30% reduction from the previous phase. The intensification of camelid use during the Chinchawasi 2 occupation (as evidenced in local consumption, fiber processing, and coast-highland interaction) therefore does not seem to have coincided with an increase in *ch'arki* production/distribution.

Archaeological contexts and inferences for economic activities by phase

As expected, very little faunal refuse was recovered from the Sector 2 cemetery area of Chinchawas. Sector 1 accounted for the majority of the faunal collection. In general, faunal materials were found in deposits located in peripheral areas of Sector 1, clustered in terrace areas (*e.g.*, OP15, OP38) or in abandoned room structures (e.g., OP48 and OP49). Miscellaneous bone refuse was also recovered from surficial, plow zone, destruction, and construction fill levels.

The sample can be characterized as resulting from two broadly distinctive activity/discard patterns. The first consists of bone refuse most likely from general domestic functions, and is typified by burnt and calcined bones, less com-

[13] Postcranial sections were grouped as follows: forelimb (scapula, humerus, radio-ulna, and epiphyses), hindlimb (pelvis, femur, tibia, patella, and epiphyses), podial (carpal, metacarpal, metatarsal, metapodial, tarsal, astragalus, calcaneum, phalanges, and epiphyses), and axial atlas, axis, sacrum, vertebra, and epiphyses (and includes ribs and sternum).

plete bone elements, and proximity to hearths (*e.g.*, OP6/20, OP43/46). The second type (represented by OP38, and possibly OP48 and OP49) appears related to larger more intensive activities consistent with discard from feasting episodes (Lau 2002). Patterns include fewer burned bones, larger and more complete elements, dense and apparently rapid accumulation, and no apparent association with hearths. These generalizations should be considered hypotheses that await quantitative evaluation.

An earlier report (Lau 2001), completed before the present summary, could not illuminate the activities of the Torreón structure crowning Sector 1 (Figure 4). Special functions were ascribed provisionally, given its prominent location, the unusual use of well-built concentric walls, frequent inclusions of high-status pottery and metal objects, stone carving, and formal similarity to important buildings with segmented arc-shaped rooms elsewhere in highland Ancash (Tello 1929: 32; Terada 1979:151-161). Dating to Chinchawasi phases 1 and 2, the innermost chamber measures roughly 9 m in diameter and encircles a tall meter-high bedrock outcrop in the center. Other portions of living rock are incorporated into the inner wall (Figure 4).

Excavation sampling (OP54) of the structure recovered abundant faunal remains: NISP= 491 and camelid MNI=6. Because of erosion, the density of the original deposit is unclear. Nonetheless, the current evidence indicates repeated episodes of camelid meat consumption within the Torreón as part of its suite of activities.

Special architecture on Recuay hilltop settlements appears related to ceremonial patterns found in other highland cultures at the end of the Early Intermediate Period. Settlement surveys in the Tarama-Chinchaycocha highlands (Junín) identify a series of hilltop special function "concentric-ring" sites in the *puna*; in these cases, the rings are massive walls enclosing the entire settlement (or large portions thereof), rather than a single building (Parsons *et al.* 1997). Later ceremonial sites occur only along ecotonal transitions between *puna* herding lands and high altitude *kichwa* (also spelled *quechua*) cultivation zones, at circa 3800-4000 masl, like Chinchawas. These sites, which were established during the Late Intermediate Period, have been interpreted as strategic settings between the major production zones dedicated to regular economic and ritual interactions between farmers and herders (Parsons *et al.* 1997, 2000).

This interpretation draws from Duviols' well-known ethnohistorical study (1973) of the interdependent, but often combative relations, between paired ethnic agricultural (*huari*) and pastoral (*llacuaz*) groups in Peru's Central Highlands. While the co-existence of different groups based on occupational specialization is not documented at Chinchawas, the hilltop location, ecological and socio-economic context, and architectural features are most certainly shared features with the developments in Tarama-Chinchaycocha. Moreover, it seems reasonable that camelid herding, in conjunction with high-altitude cultivation, sustained these montane communities and underwrote their establishment.

CONCLUSIONS

The preceding discussion has focused on the character and changes of animal use at the Chinchawas site, Ancash, Peru. Animal use, especially of camelids, is documented at least as early as the Kayán phase (beginning about A.D. 300). Patterns become clearer during the Chinchawasi 1, Chinchawasi 2, and Warmi phases; large faunal samples and other artifacts indicate intensive camelid use for meat and textile fiber production. Some data introduce faunal resource patterns for the subsequent Chakwas phase (Table 1), and reiterate the importance of domestic camelids to local groups after the Middle Horizon.

Smaller-sized camelids, interpreted provisionally as domestic alpaca, were preferred throughout the occupation of the site, presumably due to traditional desires for quality meat and textile fiber. The reliance on camelid-based economic strategies at Chinchawas appears to coincide with long-term decreases in mean temperatures, as reflected in proxy ice-core records from nearby Huascarán. It is hypothesized that the prolonged drop in temperatures lowered the limits of viable cultivation and brought grassland zones closer to the local inhabitants of the site, much as the twentieth century warming trend has allowed inhabitants to reclaim increasingly higher parts of the Andes for agriculture (Cardich 1985).

The height of local camelid use occurs during the Chinchawasi 2 phase, as reflected in the abundance of camelid bone and fiber processing tools. The boom in camelid-based economic activities represents part of broader transformations during the early Middle Horizon. Specifically, the intensification of long-distance trade, marked cultural innovations (in local decorated pottery, architecture, and stone sculpture), and introduction of exotic Wari cultural influences indicate that Chinchawas flourished in a larger social and economic network associated with Wari expansion into the North Highlands (Lau 2005). The spread of Wari culture into peripheral regions frequently coincides with exchange interests (Topic 1991). Access to wool resources, specifically, has been suggested as a motivation for Wari expansion into the Chicha-Soras Valley of the southern highlands (Meddens 1989).

It should be noted that the new cultural patterns at Chinchawas were not simple emulations or direct results of Wari culture, but represented local strategies based on earlier Recuay traditions and adopted to respond to new sociopolitical priorities. In addition to fulfilling a more vigorous role in fiber processing and textile production, greater camelid use at Chinchawas appears to have been related to festive events sponsored to augment prestige and establish relations of labor obligation (Lau 2002).

For certain highland groups, domestic camelids were an essential component of the cultural idiom for wealth, generosity, and labor recruitment by the Early Intermediate Period. The well-known funerary vessels depicting elaborately attired Recuay individuals leading camelids for sacrifice seem more comprehensible under the context of highland ceremonial practices aimed at establishing and maintaining prestige through conspicuous displays of a critical commodity.

Julio C. Tello privileged the highlands in Andean civilization because he intuited that herding and agriculture, together formed a highly productive and adaptive economic system. Anticipating models of verticality, Tello (1929:15-16) realized that traditional socioeconomic strategies profited from Andean highland resource zonation: ". . . y para obtener . . . productos en canje, descendían los indios de las alturas conduciendo la carne, la lana y los productos agrícolas de su región . . . las quebradas transversales que descienden hacia el Pacífico, favorecieron no sólo el comercio de los habitantes de las tierras altas con los de las bajas, sino la formación de comunidades dentro de un mismo valle, íntimamente emparentadas; parentesco más íntimo quizá que el que pudo existir con los habitantes vecinos del litoral . . ." Highland-based herding, for cultures such as Chavín and Recuay, was one of the "factores fundamentales que perfilaron el carácter especial de su civilización" (Tello 1929: 15).

The archaeological evidence from Chinchawas confirms that camelid stockraising, complemented by agriculture and exchange, was a critical dimension of the economy of Recuay groups. Additional faunal research in Peru's North Highlands, at the scale of assemblage, activity area, and settlement, should continue to better define the socio-economic significance of animal use in complex societies.

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	Camelid	Cervid	Indet artio-dac	*Cavia sp.*	Indet rodent	*Canis f.*	*Lagidium p.*	Bird	Indet small mammal	Totals
Kayán NISP	118	9	12	3	0	1	0	0	2	145
%	81.4%	6.2%	8.3%	2.1%	-	0.7%	-	-	1.4%	100%
Kayán MNI	5	1	-	1	-	1	-	-	-	8
%	62.5%	12.5%	-	12.5%	-	12.5%	-	-	-	100%
Usable wt (kg)	175	36.5	-	0.7	-	22	-	-	-	234.2
%	74.7%	15.6%	-	0.3%	-	9.4%	-	-	-	100%
CW1 NISP	2025	102	346	37	131	1	12	6	55	2715
%	74.6%	3.8%	12.7%	1.4%	4.8%	0.04%	0.4%	0.2%	2.0%	100%
CW1 MNI	26	2	-	8	4	1	2	2	-	45
%	57.8%	4.4%	-	17.8%	8.9%	2.2%	4.4%	4.4%	-	100%
Usable wt (kg)	845	73	-	5.6	0.2	22	2.2	1	-	949
%	89.0%	7.7%	-	0.6%	0.02%	2.3%	0.2%	0.1%	-	100%
CW2 NISP	6577	115	1244	48	196	4	7	7	65	8263
%	79.6%	1.4%	15.1%	0.6%	2.4%	0.05%	0.1%	0.1%	0.8%	100%
CW2 MNI	96	3	-	9	19	2	3	1	-	133
%	72.2%	2.3%	-	6.8%	14.3%	1.5%	2.3%	0.8%	-	100%
Usable wt (kg)	3320	109.5	-	6.3	0.95	44	3.3	0.5	-	3484.55
%	95.3%	3.1%	-	0.2%	0.03%	1.3%	0.1%	0.01%	-	100%
Warmi NISP	745	18	75	63	172	1	4	12	26	1116
%	66.8%	1.6%	6.7%	5.6%	15.4%	0.1%	0.4%	1.1%	2.3%	100%
Warmi MNI	14	1	-	2	11	1	1	2	-	32
%	43.8%	3.1%	-	6.3%	34.4%	3.1%	3.1%	6.3%	-	100%
Usable wt (kg)	480	36.5	-	1.4	0.55	22	1.1	1	-	542.55
%	88.5%	6.7%	-	0.3%	0.1%	4.1%	0.2%	0.2%	-	100%
Chakwas NISP	20	0	0	0	0	0	0	0	2	22
%	90.9%	-	-	-	-	-	-	-	9.1%	100%
Chakwas MNI	2	-	-	-	-	-	-	-	-	2
%	100.0%	-	-	-	-	-	-	-	-	100%
Usable wt (kg)	90	-	-	-	-	-	-	-	-	90
%	100.0%	-	-	-	-	-	-	-	-	100%

Table 1. Relative abundance of Chinchawas vertebrate taxa. See note 7 for estimates of carcass weights.

	Flake cutting tools	*Points*	*Atlatl hooks*	*Pebble/ slingstones*
Kayán	5	1	-	3
Chinchawasi 1	67	1	-	26
Chinchawasi 2	126	12	1?	70
Warmi	39	5	1	32
Chakwas	1	-		-

Table 2. Summary of hunting and butchery equipment discussed in text.

Element & size grouping	*Measurement*	*n*	*Mean*	*SD*	*Range*	*V*
First phalanx						
All	Proximal latero-medial width	281	19.2	2.02	14.1-25.4	10.5
Small grouping	Proximal latero-medial width	236	18.5	1.28	14.1-20.9	6.9
Large grouping	Proximal latero-medial width	45	22.8	1.24	21.1-25.4	5.5
Humerus						
All	Distal latero-medial width	122	39.4	3.94	31.8-52.2	10
Small grouping	Distal latero-medial width	96	37.8	2.33	31.8-41.6	6.2
Large grouping	Distal latero-medial width	26	45.3	2.93	42-52.2	6.5

Table 3. Descriptive statistics for first phalanx and humerus measurements from Chinchawas. Small and large categories as hypothesized groupings.

Whorl diameter	n	Mean	SD	Range
Kayán	2	28.5	0.7	28-29
Chinchawasi 1	6	29.61	4.49	26.3-37.4
Chinchawasi 2	33	33.09	7.64	20-55
Warmi	12	31.97	5.09	24-42
Total	67	31.7	6.52	17-55

Whorl thickness	n	Mean	SD	Range
Kayán	2	6.85	2.05	5.4-8.3
Chinchawasi 1	6	7.23	1.65	4.8-9.0
Chinchawasi 2	40	7.29	2.29	4.4-15.5
Warmi	15	7.55	2.95	4.9-15.5
Total	84	7.49	2.45	4.4-15.5

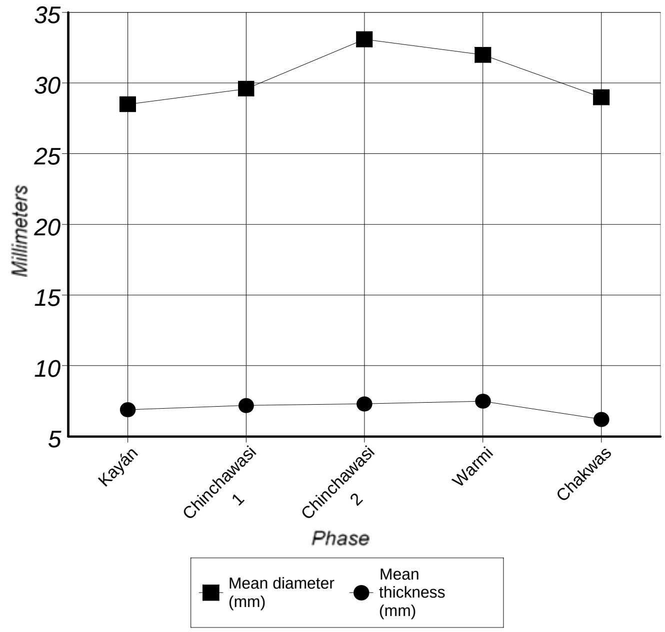

Table 4. Summary statistics and chart of mean dimensions of perforated ceramic spindle whorls.

Phase	*Camelid cranial*	*Camelid forelimb*	*Camelid hindlimb*	*Camelid podial*	*Camelid axial*
Kayán					
Total weight	227	272	481	311	139
% camelid	15.9%	19.0%	33.6%	21.7%	9.7%
Chinchawasi 1					
Total weight	2298	4314	4808	6648	3677
% camelid	10.6%	19.8%	22.1%	30.6%	16.9%
Chinchawasi 2					
Total weight	5703	17949	24038	19404	19944
% camelid	6.6%	20.6%	27.6%	22.3%	22.9%
Warmi					
Total weight	437	1877	1944	2370	972
% camelid	5.8%	24.7%	25.6%	31.2%	12.8%
Chakwas					
Total weight	16	78	49	59	67
% camelid	5.9%	29.0%	18.2%	21.9%	24.9%

Table 5. Camelid bone representation at Chinchawas, grouped according to carcass section (total bone weight), by phase.

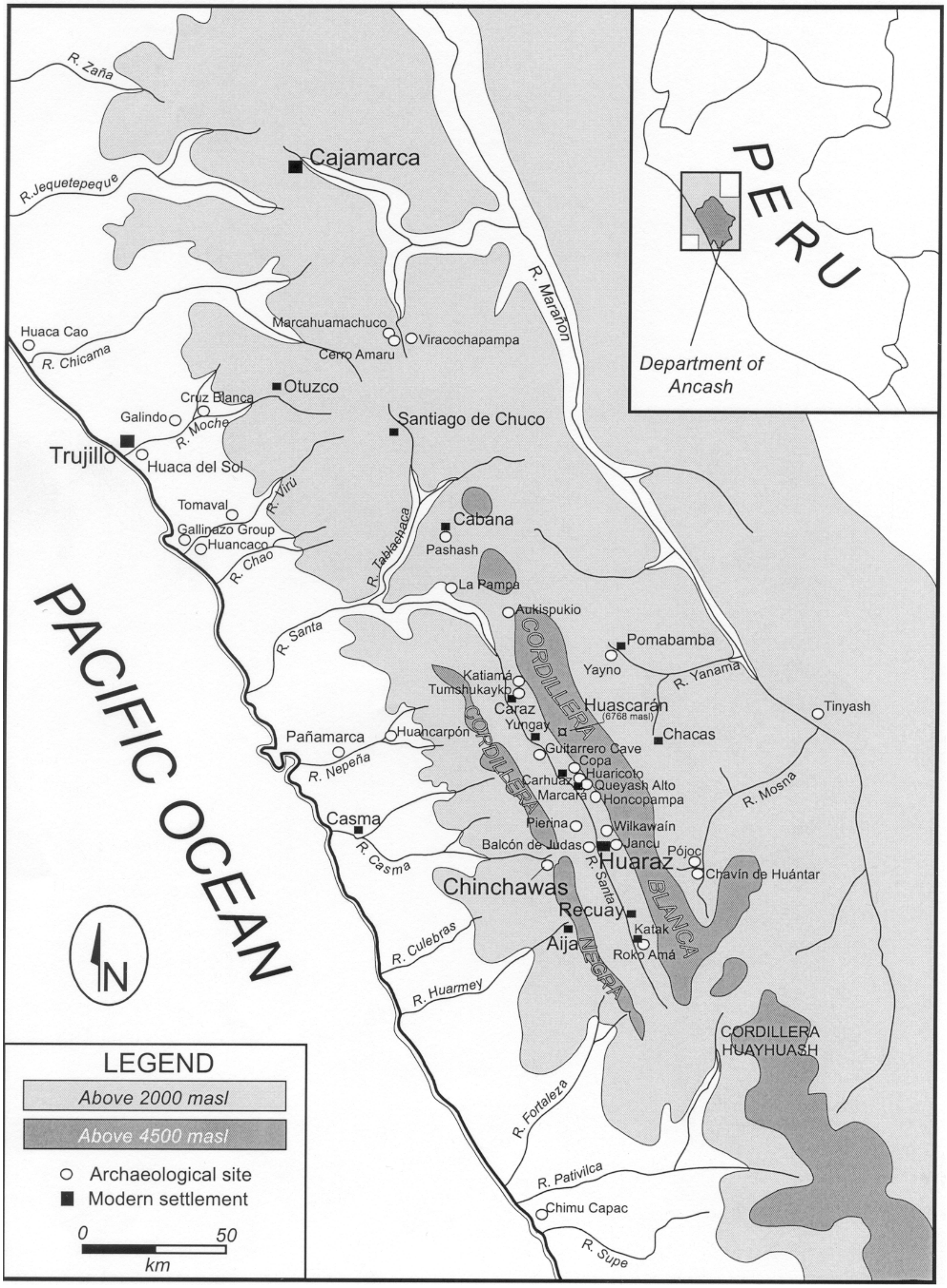

Figure 1. Map of North-Central Peru and the location of the Department of Ancash, Chinchawas, and other sites mentioned in text. Callejón de Huaylas refers to the intermontane valley of the Río Santa bounded by the Cordillera Blanca and Cordillera Negra (after Lau 2002: figure 1).

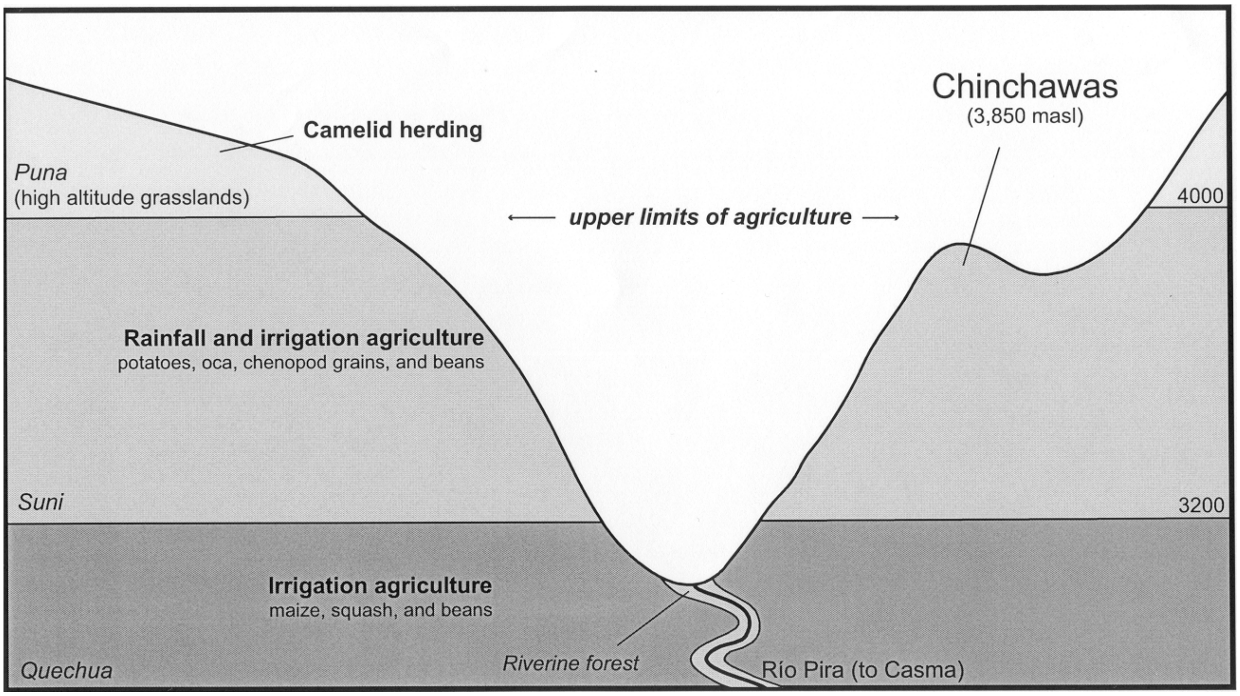

Figure 2. Schematic reconstruction of land-use zones around Chinchawas.

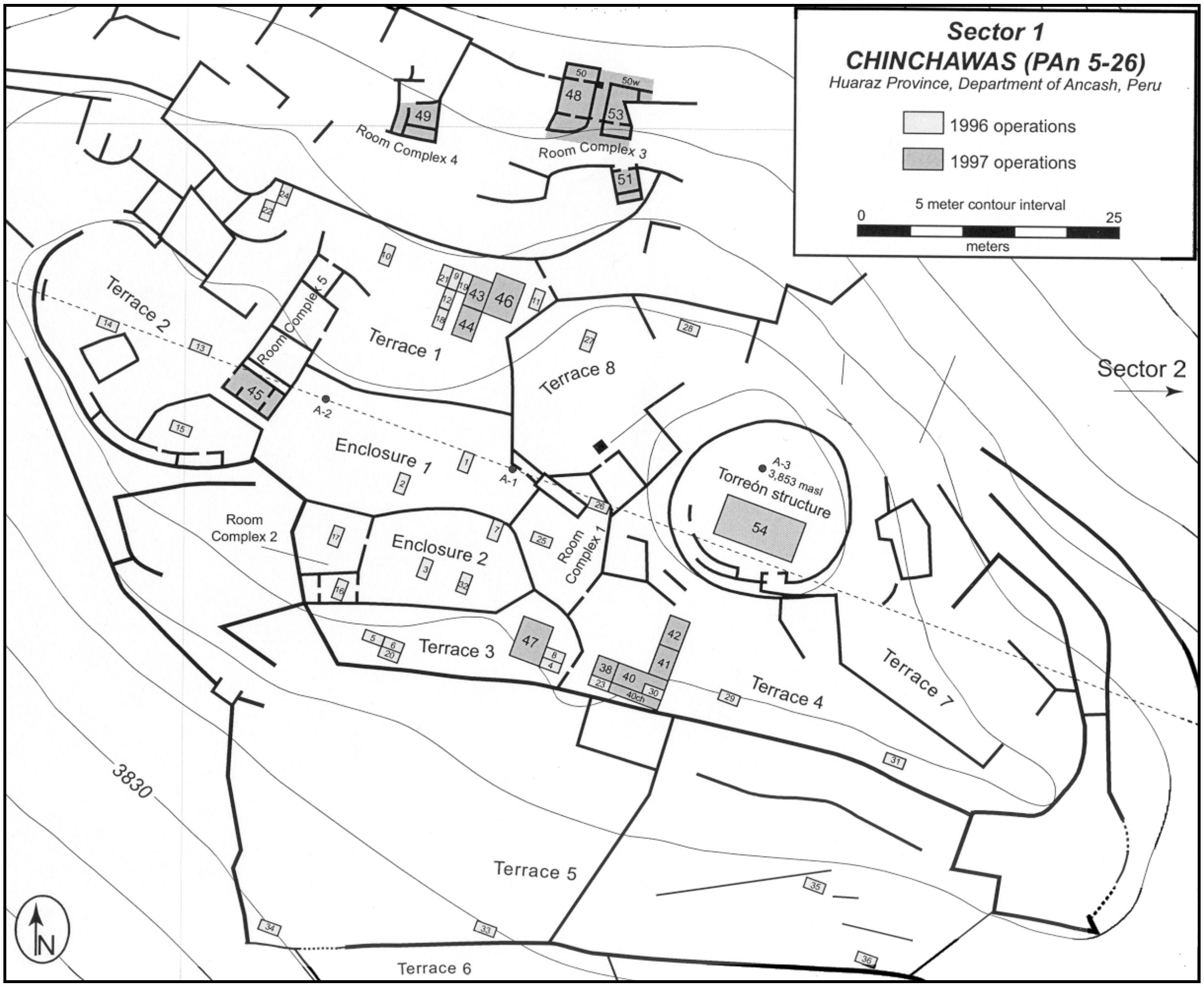

Figure 3. Site map of Sector 1, Chinchawas, identifying the location of excavations and surface architecture on the site. Numbers within shaded areas refer to Operations (e.g., OP54). Note the large corrals extending away from the southern portion of the mound. Corrals, made of fieldstone masonry, continue up the mountainside to the south and southeast (after Lau 2002: figure 2).

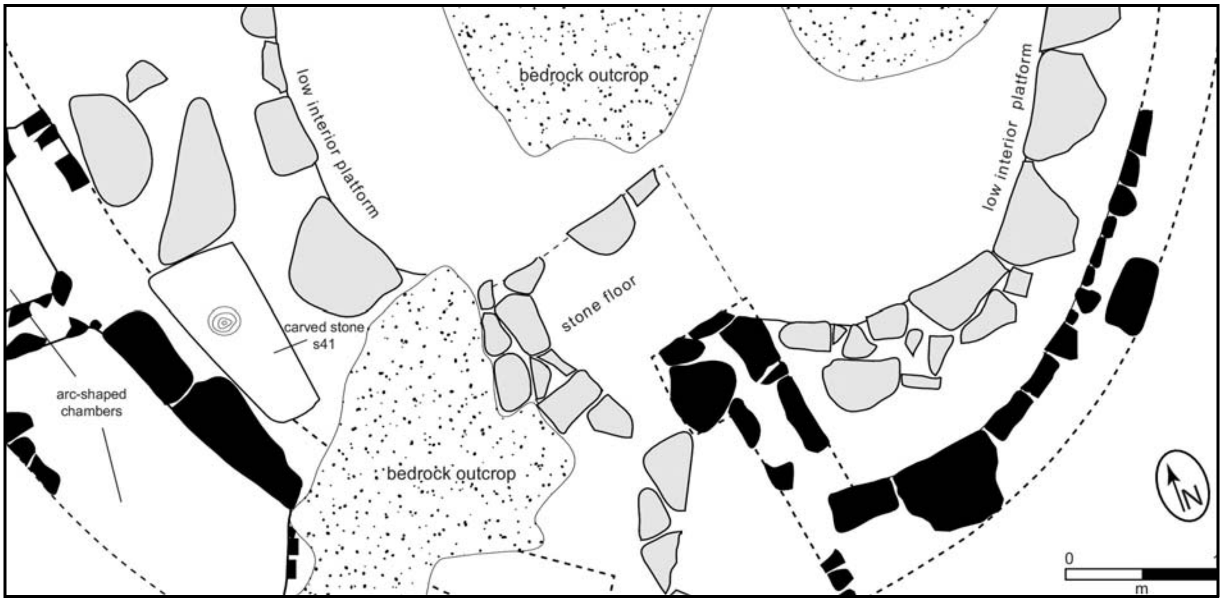

Figure 4. Plan view of Operation 54, the Torreón structure at Chinchawas. Light shading the flat stones of a low, bench-like platform and associated paved floor, both raised only slightly above the interior dirt floor. Black shading identifies the building's outer, load-bearing walls. Abundant bone refuse was found throughout the central to eastern portion of the structure. Ashy sediments with bone refuse and metal ornaments were found just outside the eastern wall. Carved stone (s41) depicts a spiral or series of concentric circles and probably formed part of the original outer wall.

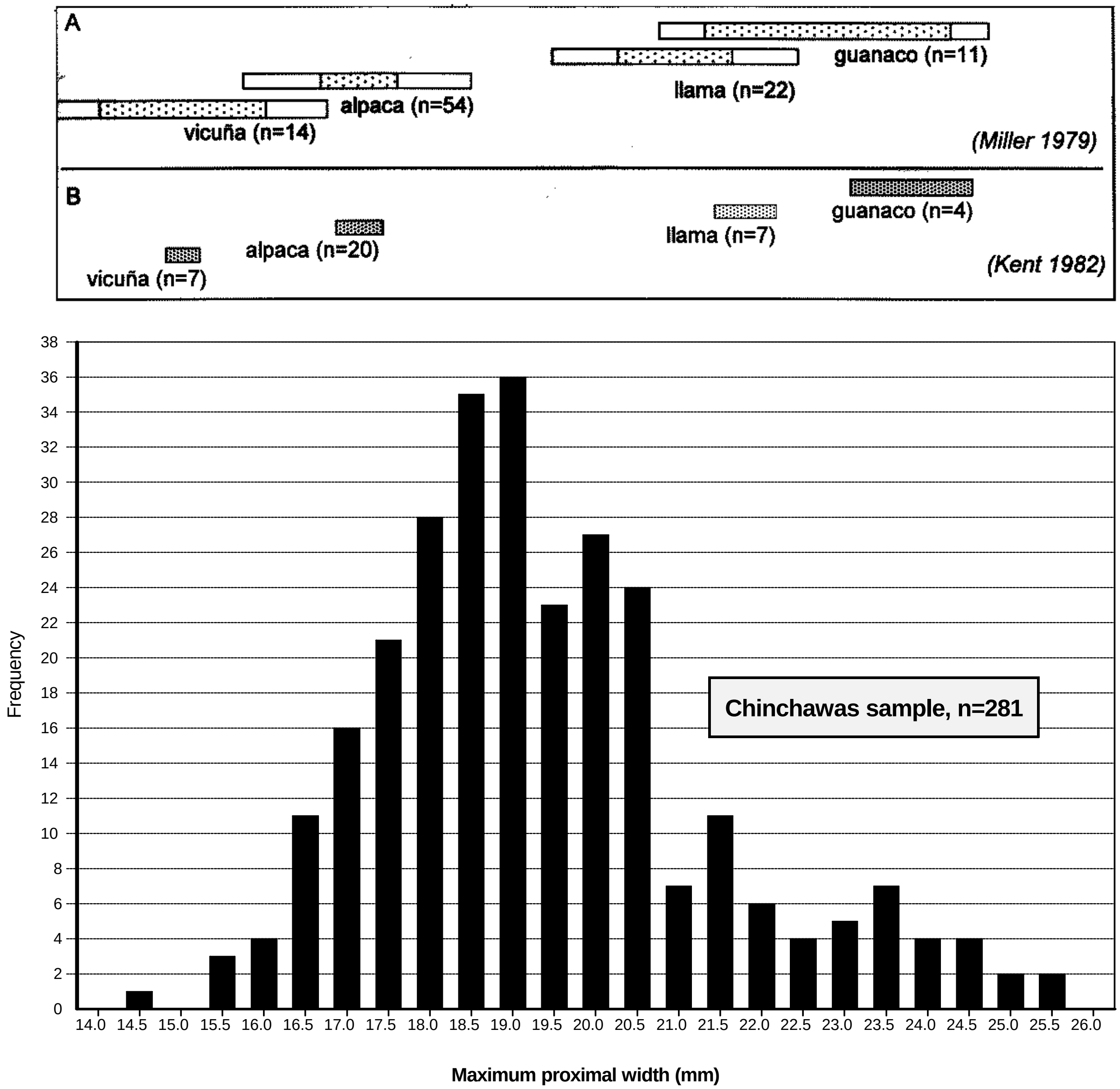

Figure 5. Histogram of Chinchawas first phalanx proximal widths, and illustration of measurement ranges for known contemporary camelids. Ranges adapted from Miller (1979: figures 4-8) and Kent (1982: appendix IV.2) at one standard error.

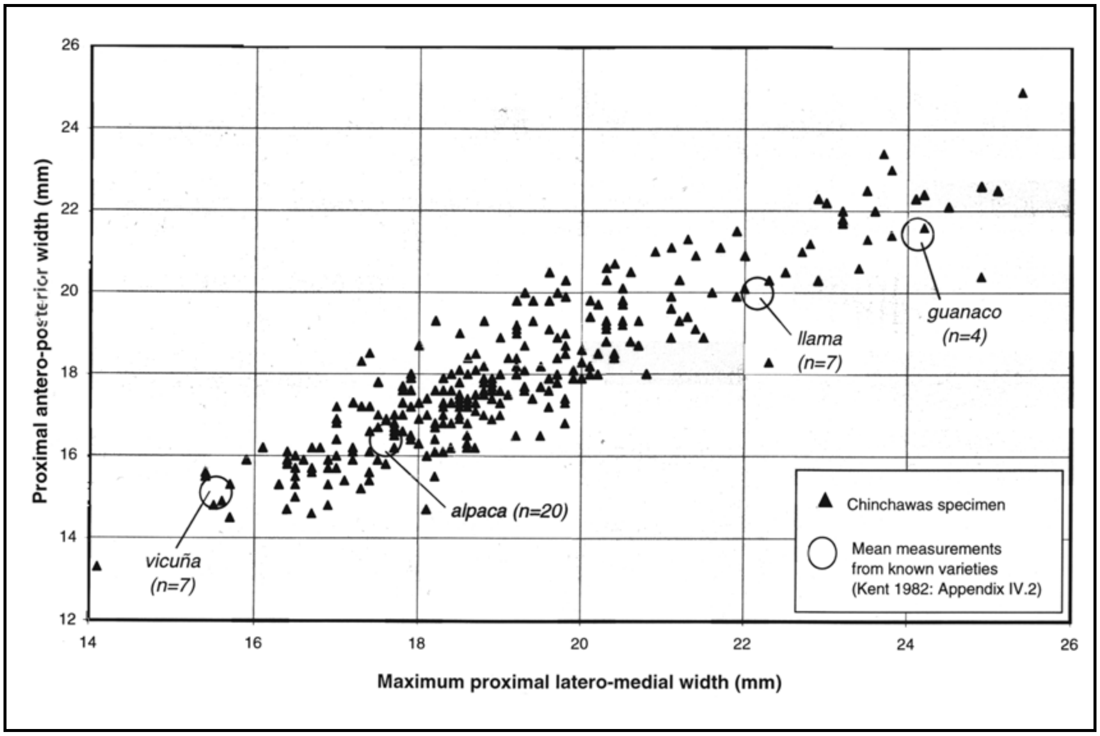

Figure 6. Bivariate scatter diagram of Chinchawas first phalanx measurements, plotting proximal latero-medial width versus antero-posterior width (mm). Note the gradient of measurements between contemporary alpaca and llama, but a discernible clustering around a smaller camelid variety.

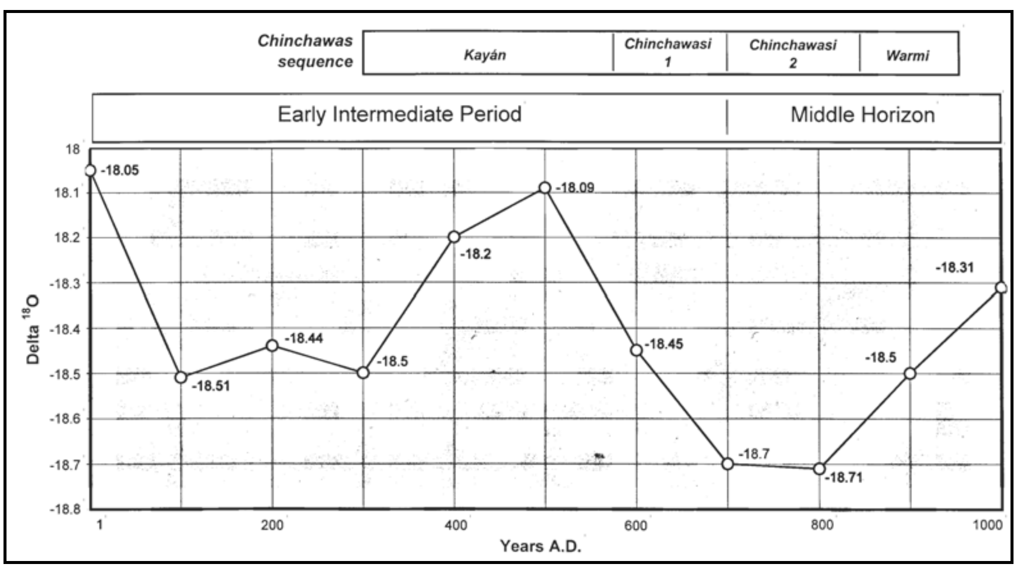

Figure 7. Graph plotting ∂^{18}O ratios of the Huascarán ice core, during the first millennium A.D. Ratios represent century-long averages of the preceding 100 years (Thompson 2001). For comparison, the ∂^{18}O ratio for the last 100 years measured -17.4 and the range for the "Little Ice Age" (A.D. 1400-1800) between -18.3 and -19.3.

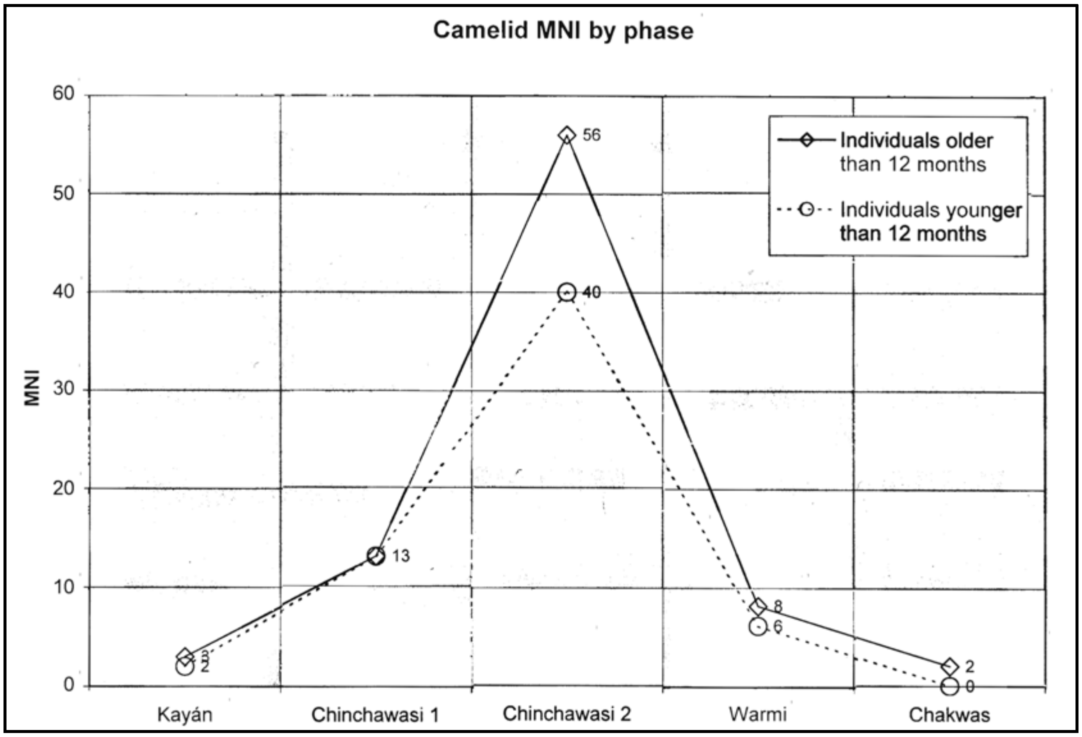

Figure 8. Chart of camelid MNI by phase.